



# Savannah Coastal Refuges Complex

**Blackbeard Island National Wildlife Refuge**

**Harris Neck National Wildlife Refuge**

**Pinckney Island National Wildlife Refuge**

**Savannah National Wildlife Refuge**

**Tybee National Wildlife Refuge**

**Wassaw National Wildlife Refuge**



## Comprehensive Conservation Plan





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**Comprehensive Conservation Plans provide long-term guidance for management decisions; set forth goals, objectives, and strategies needed to accomplish refuge purposes; and identify the Fish and Wildlife Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.**

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# Savannah Coastal National Wildlife Refuges Complex

## Comprehensive Conservation Plan



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

*September 2011*

Submitted by: Jane M. Griess  
Jane Griess, Project Leader  
Savannah Coastal Refuges Complex

Date: April 1, 2011

Concur: Brett E. Hunter  
for Pete Jerome, Refuge Supervisor  
Southeast Region

Date: 6/15/11

Concur: David Viker  
David Viker, Regional Chief  
Southeast Region

Date: 6/15/11

Approved by: Mark Muscare  
"for" Cynthia Dohner, Regional Director  
Southeast Region

Date: 6/15/11

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## **COMPREHENSIVE CONSERVATION PLAN**

### **SAVANNAH COASTAL REFUGES COMPLEX**

**Blackbeard Island, Harris Neck, Pinckney Island, Savannah,  
Tybee, and Wassaw National Wildlife Refuges**

*Chatham, Effingham and McIntosh Counties, Georgia, and Jasper and Beaufort Counties,  
South Carolina*

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

*Southeast Region*  
**Atlanta, Georgia**

**September 2011**

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## *Executive Summary*

The Fish and Wildlife Service (Service) has prepared this Comprehensive Conservation Plan (CCP) to guide the management of six of the seven refuges which comprise the Savannah Coastal Refuges Complex (Complex). This CCP includes management guidance for Blackbeard Island, Harris Neck, Pinckney Island, Savannah, Tybee, and Wassaw National Wildlife Refuges. The CCP for Wolf Island National Wildlife Refuge was completed in 2008. This CCP outlines programs and corresponding resource needs for the next 15 years, as mandated by the National Wildlife Refuge System Improvement Act of 1997.

Before the Service began planning, it conducted the following: biological reviews of each refuge's wildlife and habitat management program and visitor services reviews of each refuge's visitor services program. Several public scoping meetings were held to solicit public opinion of the issues that the CCP should address. The biological review teams were composed of biologists, resource management professionals from federal and state agencies, and non-governmental organizations having an interest in the refuges. The visitor services review teams were comprised of staff from the Service's Southeast Regional Office and other Service staff. Public input for the development of the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) was obtained, in part, through three public scoping meetings held in the vicinity of the refuges. A 30-day public review and comment period of the Draft CCP/EA was provided to solicit public reaction to the proposed alternatives.

The Service developed and analyzed three alternatives per refuge. Alternative A was a proposal to maintain the status quo or current management. Management emphasis would continue to be directed towards accomplishing the refuge's primary purposes. Complex staff would continue habitat management of existing beaches, wetlands, open waters, forested habitats, scrub/shrub habitat, grasslands, and open lands. All ponds, levees, moist-soil water management units, water control structures and pumps would continue to be maintained to provide critical habitat for threatened and endangered species, waterfowl, and wetland-dependent birds. Current water quality information would be addressed on an as-needed basis and would continue to be limited. All other habitat management programs would remain unchanged.

Current management of migratory birds would continue to provide suitable habitat for waterfowl, contributing to the objective of the North American Waterfowl Management Plan. Surveying, monitoring, and managing of colonial waterbirds, shorebirds, neotropical migratory birds, wading birds, marsh birds, and other resident birds would continue at the present level. The operation and management of the refuges that would provide for the basic needs of these species varies, but generally would include feeding, resting, and breeding. Current programs of wildland fire and forest management would be maintained with no improvements or adaptations. Control of invasive and exotic plant species would continue to be performed by Complex staff on an opportunistic basis as funding and staffing permitted. Additionally, the Complex staff would continue efforts to control/remove invasive, exotic, and/or nuisance wildlife on the refuges.

The Service would maintain the current levels of wildlife-dependent recreation activities (e.g., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation). The refuge headquarters would serve only as administrative offices with no enhancement of the grounds for public use and interpretation. In general, under Alternative A, management and administrative decisions and actions would occur when triggered by demands and sources outside the refuge. Under this alternative, the existing level of funding and staffing would be maintained.



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Accordingly, some positions would not be filled when vacated if funds needed to be reallocated to meet rising costs or new priorities.

The alternative described above (Alternative A) is required by NEPA and is the “no-action” or “status quo” alternative in which no major management changes would be initiated by the Service. This alternative also provides a baseline to compare the current habitat, wildlife, and public use management to the two action alternatives (B and C).

The preferred action (Alternative B) was selected by the Service as the alternative that best signifies the vision, goals, and purposes of the refuges. Additionally, this alternative was developed based on public input and the best professional judgment of the planning team. Under Alternative B, the emphasis would be on restoring and improving refuge resources needed for wildlife and habitat management and providing enhanced appropriate and compatible wildlife-dependent public use opportunities, while addressing key issues and individual refuge mandates. This alternative would focus on augmenting wildlife and habitat management to identify, conserve, and restore populations of native fish and wildlife species, with an emphasis on migratory birds and threatened and endangered species. These objectives would partially be accomplished by increased monitoring of waterfowl, other migratory and resident birds, and endemic species in order to assess and adapt management strategies and actions. Additionally, information gaps would be addressed by the initiation of baseline surveys, periodic monitoring, and ultimately the addition of adaptive habitat management.

Habitat management programs for impoundments, beaches, wetlands, open waters, forested habitats, scrub/shrub habitat, grasslands, and open lands would be reevaluated and step-down management plans would be developed to meet the foraging, resting, and breeding requirements of priority species. Additionally, monitoring and adaptive habitat management would be implemented to potentially counteract the impacts associated with long-term climate change and sea-level rise.

Alternative B enhances each refuge’s visitor services opportunities (except for Tybee National Wildlife Refuge, which would remain closed to the public) by: improving the quality of fishing opportunities; streamlining the quota hunt process and where possible evaluating the options of allowing the use of crossbows and creating additional hunting opportunities; maintaining and where possible expanding environmental education opportunities by developing refuge-specific environmental education programs, enhancing current partnerships and construction of new environmental education facilities; enhancing wildlife viewing and photography opportunities by expanding walking, bicycling, driving, and boating access for wildlife observation and photography by establishing trailhead kiosks, building observation platforms, installing spotting scopes, providing photography workshops and identifying additional wildlife viewing areas; developing and implementing a visitor services management plan, and enhancing personal interpretive and outreach opportunities. Volunteer programs and a “Friends of the Refuge” group would be expanded to enhance all aspects of refuge management and to increase resource availability. Law enforcement activities to protect archaeological and historical sites and provide visitor safety would be intensified. The allocation of an additional law enforcement officer for the Complex would provide security for cultural resources, but would also ensure visitor safety and public compliance with refuge regulations.

Under this alternative, the priority of land acquisition at Harris Neck National Wildlife Refuge would be to acquire lands that provide resource and public use values from willing sellers by: fee title purchase, donation, mitigation purchase and transfer, or other viable means. This would include an investigation into expanding the current acquisition boundary. At Savannah National Wildlife Refuge, focus would be increased on acquiring lands that provide resource and public use values from willing sellers by any viable means.

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Administration plans would stress the need for increased maintenance of existing infrastructure and construction of new facilities. Funding for new construction projects would be balanced between habitat management and public use needs. Additional staff members would be required to accomplish the goals of this alternative. Personnel priorities would include employing an environmental education coordinator, law enforcement officers/park rangers, a volunteer coordinator, biological technicians, maintenance workers, refuge managers, refuge assistant managers, and a geographic information systems specialist. The increased Complex budget and staffing levels would better enable the Complex to meet the obligations of wildlife stewardship, habitat management, and public use.

Under Alternative C, the management of the refuge resources would be employed to allow natural succession to take place on the refuges, while maintaining the current slate of public use opportunities. All purposes of the refuges and mandated monitoring of federal trust species and archaeological resources would be continued, but other wildlife management would be mostly performed on an incidental basis.

This alternative would utilize a custodial habitat management strategy. The Service would continue mandated activities for protection of federally listed species. Conservation of federally listed threatened and endangered species would be continued through current habitat management and monitoring programs accomplished primarily through established partnership and research projects. Impoundments, beaches, wetlands, open waters, forested habitats, scrub/shrub habitat, grasslands, and open lands would not be actively managed and would allow natural disturbance to maintain succession, unless the habitats primarily focus on the needs of threatened and endangered species or the needs of priority species, such as migratory birds. Fire management would be reduced to include wildfire response only. Control of invasive and exotic plant species would continue to be performed by Complex staff on an opportunistic basis as funding and staffing permitted. Additionally, the Complex staff would continue efforts to control/remove invasive, exotic, and/or nuisance wildlife on the refuges.

The Service would maintain the current levels of wildlife-dependent recreation activities (e.g., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation). Public use facilities would continue to be maintained, as would the current visitor services program.

No additional land acquisition would be perused under this alternative. Only additional law enforcement staff would be added to the staff to increase emphasis on resource protection and public safety. This includes being designated to uphold current regulations and for protection of wildlife, visitors, and cultural and historical resources. The Service would maintain the refuge as funding allows.

The Service selected Alternative B as its preferred alternative as reflected in this CCP. Alternative B addresses the refuge's highest priorities with reasonable increases in staffing, volunteers, and funding.





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# *I. Background*

## **INTRODUCTION**

This Comprehensive Conservation Plan (CCP) for Savannah, Tybee, Pinckney Island, Wassaw, Harris Neck, and Blackbeard Island National Wildlife Refuges, located within the Savannah Coastal Refuges Complex (Complex) was prepared to guide management actions and direction for the refuges. A separate CCP was completed for Wolf Island National Wildlife Refuge and will need to be referenced for specific details pertaining to future management strategies. Fish and wildlife conservation will receive first priority in refuge management; wildlife-dependent recreation will be allowed and encouraged as long as it is compatible with, and does not detract from, the mission of the refuges or the purposes for which they were established.

A planning team developed a range of alternatives that best met the goals and objectives of the refuges and that could be implemented within the 15-year planning period. The draft of this plan was made available to state and federal government agencies, conservation partners, and the general public for review and comment. The comments from each entity were considered in the development of this final CCP, describing the Fish and Wildlife Service's preferred plan.

## **PURPOSE AND NEED FOR THE PLAN**

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

Specifically, this CCP is needed to:

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

## **FISH AND WILDLIFE SERVICE**

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

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

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

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

As part of its mission, the Service manages more than 550 national wildlife refuges covering over 95 million acres. These areas comprise the National Wildlife Refuge System, the world's largest collection of lands set aside specifically for fish and wildlife. The majority of these lands, 77 million acres, is in Alaska. The remaining acres are spread across the other 49 states and several United States territories. In addition to refuges, the Service manages thousands of small wetlands, national fish hatcheries, 64 fishery resource offices, and 78 Ecological Services field stations. The Service enforces federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

## **NATIONAL WILDLIFE REFUGE SYSTEM**

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

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

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

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

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- 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 provide refuge managers authority to determine compatible public uses.

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

Approximately 35 million people visited national wildlife refuges in 2006, most to observe wildlife in their natural habitats. As the number of visitors grows, there are significant economic benefits to local communities. In 2006, 87 million people, 16 years and older, fished, hunted, or observed wildlife, generating \$120 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 surrounding communities grew to 120 per refuge, up from 87 jobs in 1995, pouring more than \$2.2 million into local economies. The 15 refuges in the study were Chincoteague (Virginia); National Elk (Wyoming); Crab Orchard (Illinois); Eufaula (Alabama); Charles M. Russell (Montana); Umatilla (Oregon); Quivira (Kansas); Mattamuskeet (North Carolina); Upper Souris (North Dakota); San Francisco Bay (California); Laguna Atacosa (Texas); Horicon (Wisconsin); Las Vegas (Nevada); Tule Lake (California); and Tensas River (Louisiana), the same refuges identified for the 1995 study. Other findings also validate the belief that communities near refuges benefit economically. Expenditures on food, lodging, and transportation grew to \$6.8 million per refuge, up 31 percent from \$5.2 million in 1995. For each dollar spent on the Refuge System, surrounding communities benefited with \$4.43 in recreation expenditures and \$1.42 in job-related income (Caudill and Laughland 2003).

Volunteers continue to be a major contributor to the success of the Refuge System. In 2006, over 36,000 volunteers contributed nearly 1.5 million hours on refuges nationwide. The value of their labor was more than \$26 million; their in-kind services the equivalent of 696 full-time employees.

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

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

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

## **LEGAL AND POLICY CONTEXT**

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

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

Treaties, laws, administrative guidelines, and policy guidelines assist the refuge manager in making decisions pertaining to soil, water, air, flora, fauna, and other natural resources; historical and cultural resources; research and recreation on refuge lands; and provide a framework for cooperation between the Complex and other partners, such as the Georgia and South Carolina Departments of Natural Resources (GADNR and SCDNR), The Nature Conservancy (TNC), the Western Hemisphere Shorebird Reserve Network, and private landowners, etc.

Lands within the Refuge System are closed to public use unless specifically and legally opened. No refuge use may be allowed unless it is determined to be appropriate and compatible as defined in the Service Manual (603 FW 1&2). All programs and uses must be evaluated based on mandates set forth in the Improvement Act. Those mandates are to:

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

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

### **Biological Integrity, Diversity, and Environmental Health Policy**

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

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judgment incorporates: (1) Field experience; (2) knowledge of refuge resources; (3) knowledge of refuge's role within an ecosystem; (4) applicable laws; and (5) best available science, including consultation with others both inside and outside the Service.

## **NATIONAL AND INTERNATIONAL CONSERVATION PLANS AND INITIATIVES**

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

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

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

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

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

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

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

## **RELATIONSHIP TO STATE WILDLIFE AGENCY**

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

GADNR and SCDNR are state-partnering agencies with the Service, charged with enforcement responsibilities relating to migratory birds and endangered species, as well as managing state natural resources, coastal marshes, and wildlife management areas. These agencies direct each state's wildlife conservation program and provide public recreation opportunities on state wildlife management areas. The participation of the GADNR/SCDNR throughout this planning process provides ongoing opportunities for an open dialogue to improve the ecological sustainability of fish and wildlife in Georgia and South Carolina. A key aspect of the planning process is the integration of common objectives between the Service and the state agency, where appropriate. An essential part of comprehensive conservation planning is integrating common mission objectives where appropriate. Comprehensive Wildlife Conservation Strategies for the states of Georgia and South Carolina are summarized below.

### *Georgia's Comprehensive Wildlife Conservation Strategy:*

In December 2002, the Wildlife Resources Division (WRD) of GADNR began a process to develop a Comprehensive Wildlife Conservation Strategy (CWCS). Through the Wildlife Conservation and Reinvestment Program, 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 and matching funds were provided through Georgia's Nongame Wildlife Conservation Fund. The goal of the CWCS strategy 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 included: (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.

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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/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 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.

*South Carolina's Comprehensive Wildlife Conservation Strategy:*

In May 2002, the SCDNR began a process to develop the Comprehensive Wildlife Conservation Strategy (CWCS) that was funded through the State Wildlife Grants (SWG) program. The SCDNR committed to developing the CWCS and begin implementing the conservation actions by October 1, 2005. The goal of the CWCS is to emphasize a cooperative, proactive approach to conservation while working with federal, state, and local governments; local businesses; and conservation-minded individuals to join in the effort of maintaining the fish and wildlife resources of South Carolina.

The actions considered critical in this planning effort included: increasing baseline biological inventories with emphasis on natural history, distribution, and status of native species; increasing commitment by natural resource agencies, conservation organizations, and academia toward establishing effective conservation strategies; increasing financial support and technological resources for planning and implementation of these strategies; and creating public-private partnerships and educational outreach programs for broad-scale conservation efforts.

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The following are the required elements in South Carolina's CWCS:

- Information on the distribution and abundance of species of wildlife, including low and declining populations as the state fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife.
- Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in the first element (above).
- Descriptions of problems, which may adversely affect species identified in the first element (above) or their habitats, and priority research and survey efforts needed to identify factors, which may assist in restoration and improved conservation of these species and habitats.
- Descriptions of conservation actions determined to be necessary to conserve the identified species and habitats and priorities for implementing such actions.
- Descriptions of the proposed plans for monitoring species identified in the first element (above) and their habitats, for monitoring the effectiveness of the proposed conservation actions, and for adapting these conservation actions to respond appropriately to new information or changing conditions.
- Descriptions of procedures to review the CWCS at intervals not to exceed 10 years.
- Descriptions of the plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the CWCS with federal, state, and local agencies and Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats.
- Descriptions of the necessary public participation in the development, revision, and implementation of the CWCS.



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## *II. Refuge Overview*

### **INTRODUCTION**

A chain of seven national wildlife refuges form the Savannah Coastal Refuges Complex that extends from Pinckney Island NWR near Hilton Head Island, South Carolina, to Wolf Island NWR near Darien, Georgia. Between these two refuges lie five additional national wildlife refuges: Savannah (the largest unit in the Complex), Wassaw, Tybee, Harris Neck, and Blackbeard Island NWRs. These seven refuges total 56,949 acres, span about 100 miles of the Atlantic Ocean coastline, and are administered from their headquarters at the Savannah NWR Visitor Center (Figure 1).

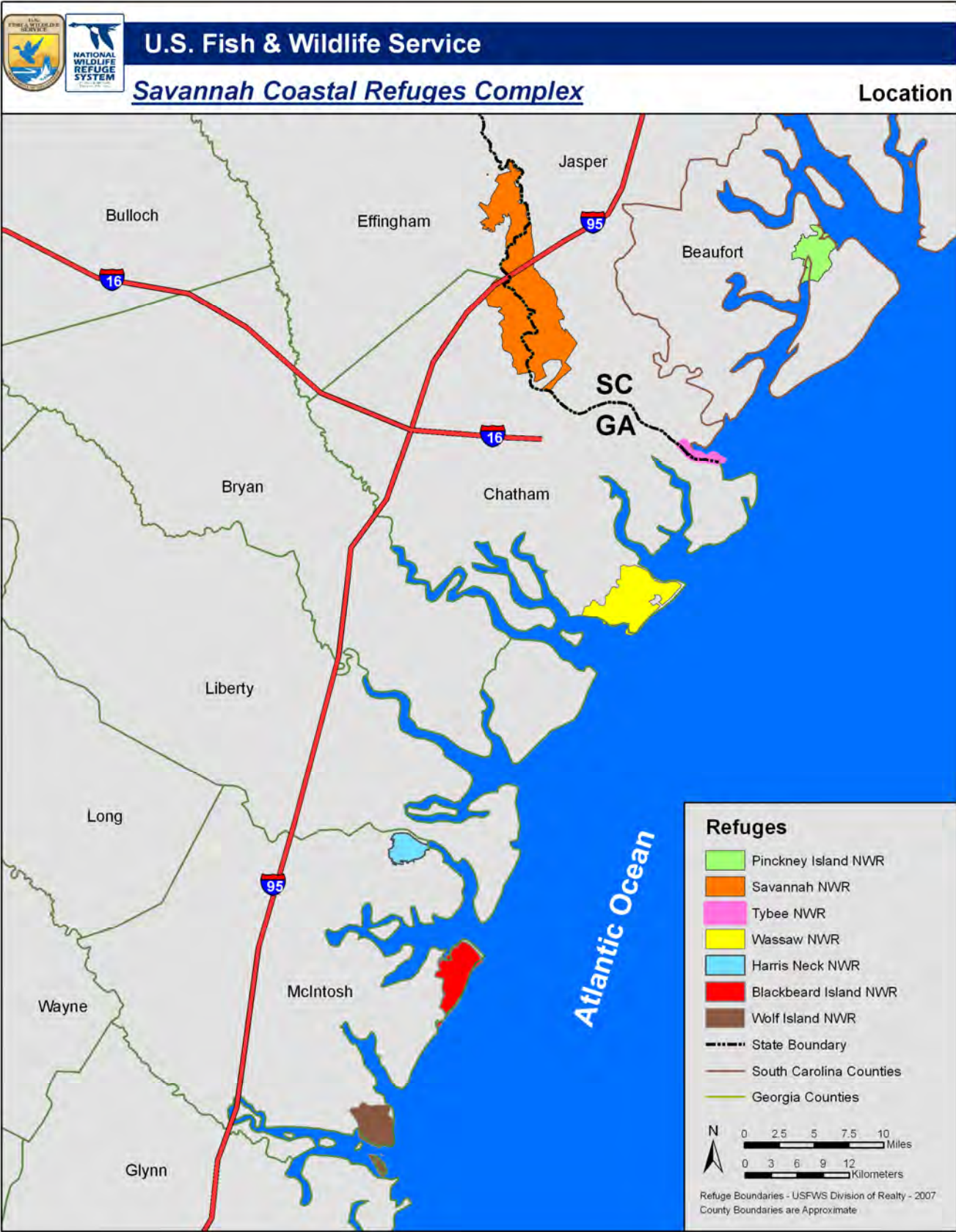
These refuges are located in an ecosystem characterized by coastal marsh and barrier islands and locally referred to as "Lowcountry," bordered on the west by sandhill ridges and on the east by the Atlantic Ocean, and extending from Georgetown, South Carolina, to St. Mary's, Georgia.

The variety of birdlife within the Lowcountry is enhanced by its location on the Atlantic Flyway. During the winter months, thousands of mallards, pintails, teal, and many other species of ducks migrate into the area, joining resident wood ducks on the coastal refuges. In the spring and fall, transient songbirds and shorebirds stop briefly on their journeys to and from northern nesting grounds. Among these casual visitors are the warblers (e.g., magnolia, prairie, blackpoll, American redstarts, black-throated blue), and sandpipers (e.g., buff-breasted, white-rumped, pectoral, whimbrels, semipalmated sandpipers, short-billed dowitchers). Many migratory songbirds and shorebirds terminate their southern journeys and spend the winter. The hermit thrush, rubycrowned kinglet, yellow-rumped warbler, black-bellied plover, and sanderling are a few of the winter residents.

The barrier islands provide ideal habitat for a wide variety of plants and animals, including species of concern such as the American alligator, piping plover, wood stork, loggerhead sea turtle, and southern bald eagle. The saltwater marshes that lie behind the barrier islands are nurseries for countless marine organisms, including shrimp, oysters, crabs, striped bass, and other commercial and sport species that are particularly important to the coastal economy. Such an abundance of life in the salt marsh invites other animals to rest, feed, or nest -- promoting the diversity of flora and fauna found in the Lowcountry coastal plain and the barrier islands habitats.

With the exception of Wolf Island NWR, the development of this CCP for the remaining six refuges comprising the Complex was initiated in 2008. The CCP for Wolf Island NWR was initiated in 2006 and completed in 2008. This CCP contains concepts to guide further development and implementation of land use and management programs and associated facilities and management structures for the next 15 years. Consideration of physical, biological, and cultural resources, along with the socioeconomic environment and refuge management and administration, is taken into account and analyzed to produce an overview of each refuge and the challenges it faces. An Environmental Assessment (EA) was prepared in compliance with the National Environmental Protection Act (NEPA) guidelines, and was included in the draft of this plan. In addition to documenting the existing natural environmental and socioeconomic setting, the EA evaluates the impact of the proposed and alternative actions and no action in order to facilitate selection of the alternative most suitable for implementation.

Figure 1. Savannah Coastal Refuges Complex



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## REFUGE HISTORY AND PURPOSE

### *HISTORICAL OVERVIEW*

By various estimates, man has inhabited the North American continent for 10,000-40,000 years. There is increasing evidence that human occupancy of what is now the coastal region of the southeastern United States extends at least 10,000 years into the past. This is difficult to prove because archaeological evidence in coastal areas is quickly destroyed by changing sea levels with constant erosion and deposition so that many early sites are probably located under the water on the continental shelf and visible traces of human occupation date back only about 4,000 years. Sites on the barrier islands dating from A.D. 500 to 1300 reveal that the inhabitants cultivated corn, beans, pumpkins, and other crops before contact with Europeans. Shell heaps and middens attest to the importance of shellfish in the diet of the original inhabitants.

European influence began in 1568 with the establishment of the first Spanish missions. Although periodically destroyed or otherwise interrupted, these missions tenaciously clung to survival for over 100 years. During their tenure, the Spaniards enriched the native fare by the introduction of exotic plants (e.g., figs, oranges, other fruits) and domesticated animals (e.g., hogs, goats). In 1685, the English and their native allies invaded from the north and destroyed the missions and the island natives. For about 50 years, the islands remained uninhabited and, except for occasional visits by pirates and Indians, undisturbed.

In 1732, King George I of England granted the region to General James Oglethorpe as a buffer against the Spanish in Florida. Oglethorpe landed in Savannah in 1733, and established it as the first settlement recognized by the English government in colonial days. Oglethorpe's efforts toward colonization extended south to St. Simons where he built Fort Frederica and ended the Spanish threat in North America. Subsequently, by 1776, Savannah, Richmond Hill, Midway, Sunbury, Darien, Brunswick, and St. Mary's were thriving agricultural communities. Naval stores (tar, pitch, turpentine) and live oak timbers were the earliest major economic resources of the islands, which soon came under intensive agriculture. On the mainland, as well as the islands, the colonists experimented with a variety of subtropical plants including olives, dates, oranges, figs, rice, indigo, hemp, pomegranates, coffee, tea, and silk. The climate proved unsuitable for oranges, although they persisted as a minor crop for many years. Silk was a major crop for a few years and was produced on a minor scale as late as 1790. By 1750, rice and indigo were well established as profitable crops. The Revolutionary War brought about a decline in the market for indigo, which was largely supplanted by rice except on the islands.

Rice was grown in diked fields at the mouths of mainland rivers. Production reached its peak between 1850 and 1860. Chatham County was the leading producer, followed by Camden, McIntosh, Glynn, Liberty, and Bryan counties. In 1859, planters were harvesting an average of 50 bushels per acre, with about 23,000 acres in cultivation. Total state production was 52,507,652 pounds.

Long-staple cotton, imported from the Bahamas about 1785, was first grown on St. Simons and was soon cultivated on the other islands and the adjacent mainland along the Georgia and South Carolina coasts. This variety, known as Sea Island cotton, was considered superior to upland cotton and sold for two to five times the price of the latter (Procher and Fick 2005)

The plantation era on the Georgia coast was marked by a sophisticated level of land management. Despite malaria and yellow fever, which drove the white planters and their families inland during the growing season, the planters cleared thousands of acres of forest and cypress swamp to grow rice and other crops. Plantation owners were well educated and included some of

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the most advanced agriculturists in the nation, employing practices generally attributed to a much later age. These included irrigation, drainage, liming, fertilization, crop rotation, fallowing, composting, mulching, and biological insect control (using flocks of turkeys to control leaf worm caterpillars in cotton). Of particular interest was the application of marsh mud, crushed oyster shell, cordgrass, and stable manure to the fields. The application of marsh mud to the fields was considered essential to successful crop production.

The Civil War and the ensuing abolition of slavery signaled the end of the Plantation Era. Survivors of the war returned to their devastated lands and attempted to restore the plantation system with paid labor, but the freed slaves and imported Irish and Chinese laborers proved to be undependable sources of labor and the plantations were soon abandoned (U.S. Department of the Interior National Park Service 1974).

Thus, within a few years, the coastal area changed from one of the most prosperous regions in the nation to one of the poorest. Most of the islands were more or less deserted until the 1890s when wealthy industrialists purchased them and restored some of the remaining plantations. Except for Blackbeard Island, which was in public ownership, the islands remained private, relatively natural, well-managed retreats.

## **PURPOSES**

Although the Complex has an overriding purpose of providing for the habitat needs of migratory birds, each refuge within the Complex has a unique purpose and establishing legislation. This CCP identifies specific goals, objectives, and strategies that are intended to support these individual refuge purposes.

### **Blackbeard Island National Wildlife Refuge**

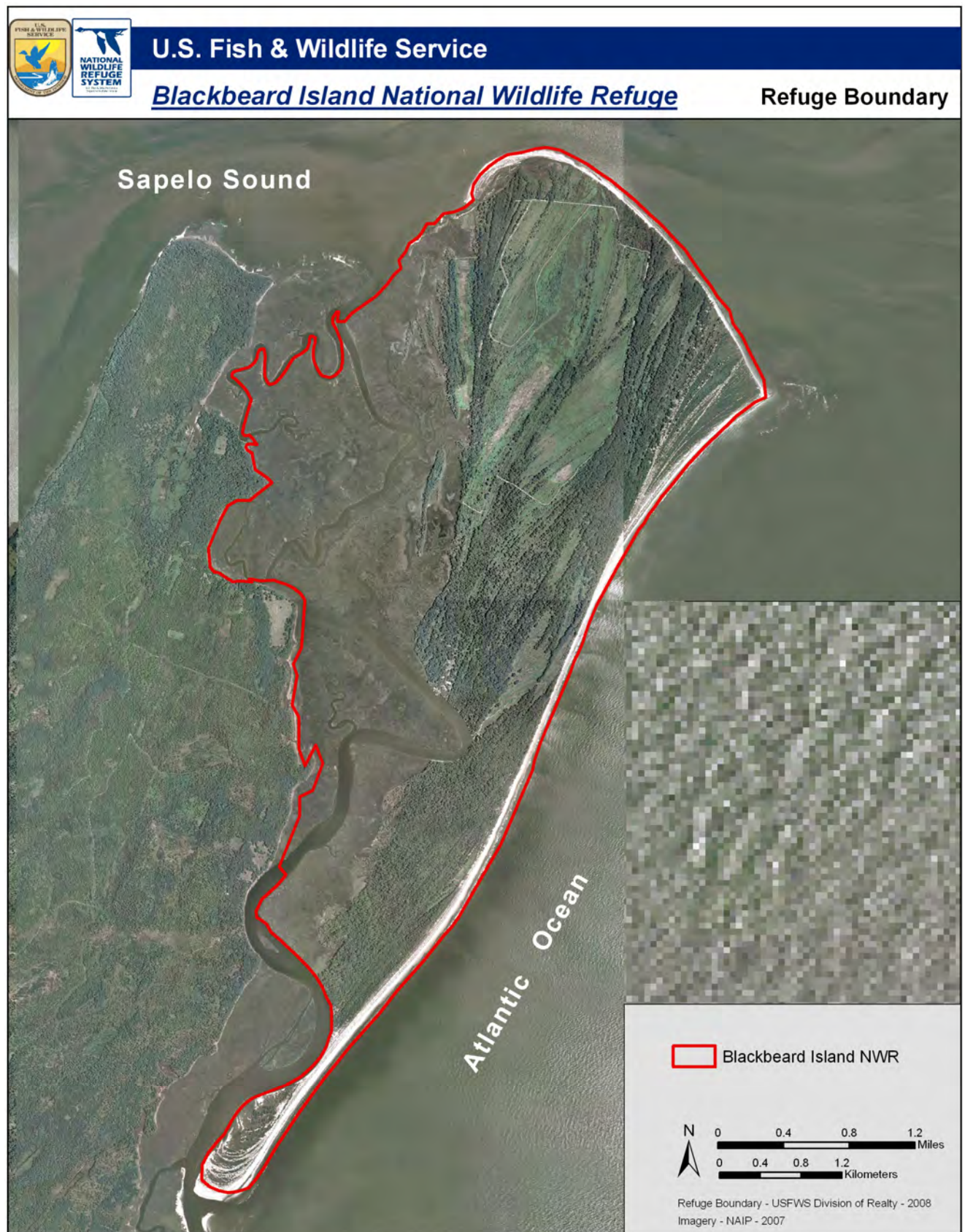
*“for use as a bird refuge and as an experiment station for acclimatization of certain foreign game birds” (Executive Order 4512, September 20, 1926); and, “for use as an inviolate sanctuary, or for any other management purpose for migratory birds” (16 U.S.C. 715d, Migratory Bird Conservation Act)*

Blackbeard Island was acquired by the Navy Department at public auction in 1800 as a source of live oak timber for ship building. The U.S. Navy transferred land in McIntosh County, Georgia, to the Bureau of Biological Survey (a predecessor to the Fish and Wildlife Service) in 1924, by Executive Order 4512, to establish a bird refuge. A presidential proclamation in 1940 changed its designation from Blackbeard Island Reservation to Blackbeard Island NWR. Today, the refuge’s 5,618 acres include maritime forest, salt marsh, freshwater marsh, and beach habitat (Figure 2). In 1975, 3,000 acres of the refuge were set aside as National Wilderness by Public Law 93-632. The primary management objectives for Blackbeard Island NWR are as follows:

- Provide wintering habitat and protection for migratory birds.
- Provide protection and habitat to promote resident and migratory wildlife diversity.
- Provide protection and management for threatened and endangered plant and animal species (e.g., loggerhead sea turtle, American alligator, wood stork, piping plover).
- Provide environmental education, interpretation, and recreational opportunities to the visiting public.



Figure 2. Blackbeard Island National Wildlife Refuge



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## Harris Neck National Wildlife Refuge

*“particular value in carrying out the national migratory bird management program” (16 U.S.C. 667b, An Act Authorizing the Transfer of Certain Real Property for Wildlife, or other purposes); “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (16 U.S.C. 715d, Migratory Bird Conservation Act); and, for “the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various treaties and conventions” (16 U.S.C. 3901(b), 100 Stat. 3583, Emergency Wetlands Resources Act of 1986).*

Harris Neck NWR was established in 1962 by transfer of federal lands formerly managed by the Federal Aviation Administration as a WWII Army airfield. The refuge’s 2,824 acres consist of saltwater marsh, grassland, mixed deciduous woods, and freshwater impoundments (Figure 3). Because of this great variety in habitat, many different species of birds are attracted to the refuge throughout the year. The primary management objectives for Harris Neck NWR are as follows:

- Provide habitat and protection for migratory birds.
- Provide protection and habitat to promote resident and migratory wildlife diversity.
- Provide protection and management for threatened and endangered species (e.g., American alligator and wood stork).
- Provide protection and management necessary to sustain and promote colonial nesting bird populations that use the refuge.
- Provide wildlife education and interpretation and recreational opportunities to the visiting public.

## Pinckney Island National Wildlife Refuge

*“as a wildlife refuge and as a nature and forest preserve for aesthetic and conservation purposes, without disturbing the habitat of the plant and animal populations except as such disturbance may be necessary to preserve the use of the real property for the purposes above mentioned” (Deed of Donation, December 4, 1975); and “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (16 U.S.C. 715d, Migratory Bird Conservation Act)*

Pinckney Island NWR, established December 4, 1975 by a Deed of Donation, was once included in the plantation of Major General Charles Pinckney, a prominent lawyer active in South Carolina politics after the American Revolution. Few traces of the island’s plantation life in the 1800s exist today. The 4,053-acre refuge includes Pinckney Island, Corn Island, Big and Little Harry Islands, Buzzard Island, and numerous small hammocks (Figure 4). Pinckney is the largest of the islands and the only one open to public use. Nearly 67 percent of the refuge consists of salt marsh and tidal creeks. A wide variety of land types is found on Pinckney Island alone: salt marsh, forestland, brushland, fallow field, and freshwater ponds. The primary management objectives for Pinckney Island NWR are as follows:

- To protect and provide habitat for threatened and endangered species.
- To provide and maintain habitat for migratory and resident birds that utilize and or nest annually on the refuge.
- To provide, enhance, and maintain habitat for native wildlife.
- To promote wildlife interpretive and recreational opportunities.



Figure 3. Harris Neck National Wildlife Refuge





Figure 4. Pinckney Island National Wildlife Refuge





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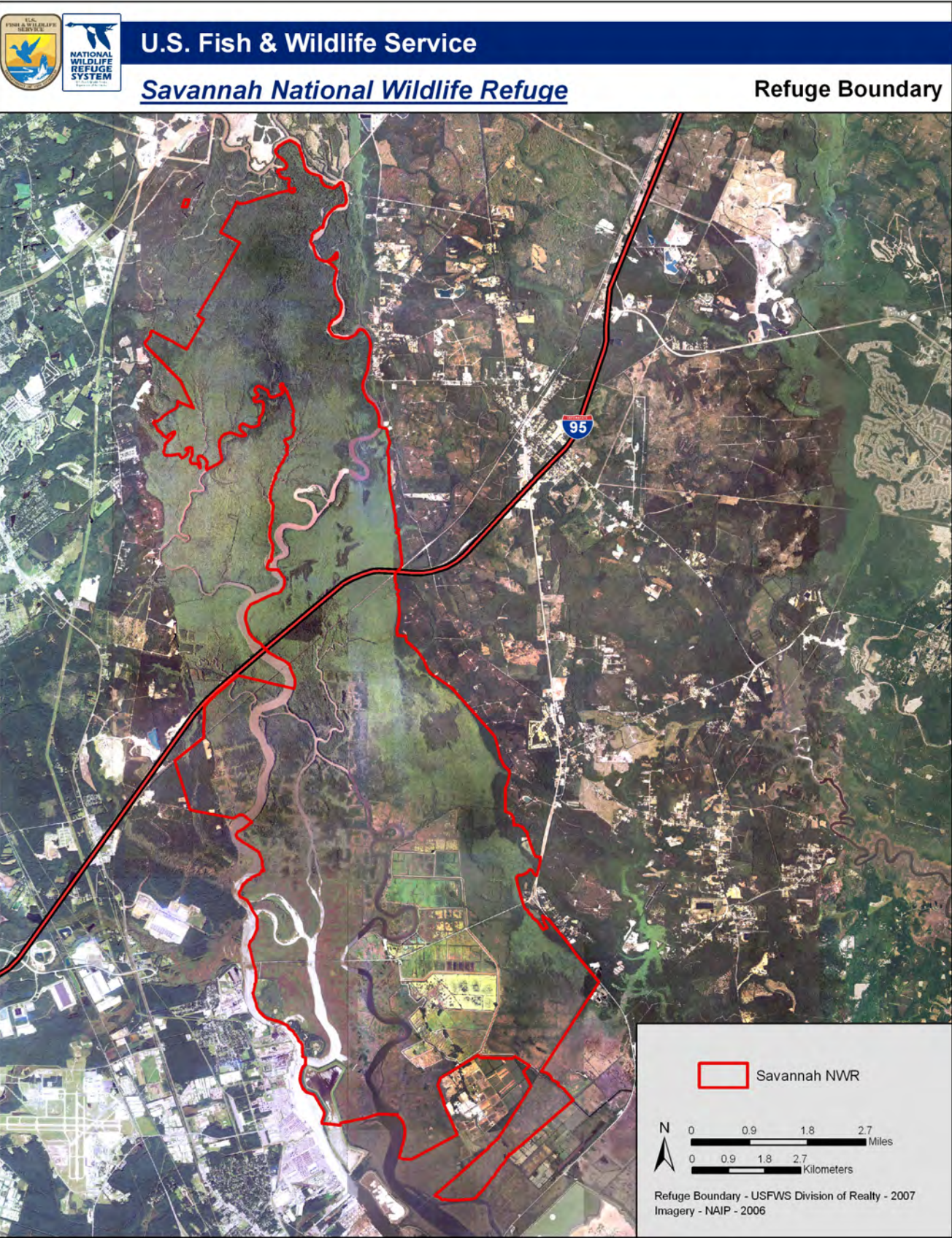
## Savannah National Wildlife Refuge

*“as a refuge and breeding ground for birds and wild animals subject to future use in navigation if necessary and to valid existing rights if any” (Executive Order 5748, April 6, 1927); for lands acquired under the Migratory Bird Conservation Act “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (16 U.S.C. 715d); for lands acquired under the Refuge Recreation Act for “(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species” (16 U.S.C. 460k); for “the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions” (16 U.S.C. 3901(b), 100 Stat. 3583, Emergency Wetlands Resources Act of 1968); “for the development, advancement, management, conservation, and protection of fish and wildlife resources” (16 U.S.C. 742f(a)(4)); and, “for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude” (16 U.S.C. 742f(b)(1), Fish and Wildlife Act of 1956)*

Savannah NWR was established on April 6, 1927, by Executive Order No. 4626, which created the Savannah River Bird Refuge and set aside 2,352 acres as a preserve and breeding ground for native birds. On November 12, 1931, Executive Order No. 5748 added 207 acres to the refuge and renamed the area the Savannah River Wildlife Refuge. An additional 6,527 acres were assigned to the refuge on June 17, 1936, by Executive Order No. 7391. On July 30, 1940, Presidential Proclamation 2416 renamed the refuge the Savannah National Wildlife Refuge. These three Executive Orders established the 9,086-acre core of the present refuge; subsequent acquisition using Duck Stamp funds and other special funding added 3,557 acres. An additional 459 acres were added when the fee title to Hog Marsh Island and adjacent lands to the north were acquired through an exchange of spoilage rights with Chatham County, Georgia. In 1964, Savannah Electric and Power Company deeded 34 acres to the refuge in exchange for a power line right-of-way. In 1978, the 12,472-acre Argent Swamp tract was purchased from Union Camp Corporation using Land and Water Conservation Funds. Bear Island (687 acres) was purchased in fee title from a private individual on October 19, 1993. In order to straighten the eastern boundary, two tracts totaling 54 acres were purchased from Union Camp Corporation on August 27, 1996. The Barrows tract (535 acres), which lies adjacent to the southeast boundary, was purchased in fee title during 1998. Another tract of land was added onto the mid-western portion of the refuge; the Solomon tract was purchased in 1999 and is 887 acres. The total current refuge acreage consists of 29,175 acres of freshwater marshes, tidal rivers and creeks, and bottomland hardwoods (Figure 5). About half of the refuge is bottomland, composed primarily of cypress, gum, and maple species. Access to this area is by boat only. The primary management objectives for Savannah NWR are as follows:

- To utilize refuge property as "a refuge and breeding ground for native birds and wild animals."
- To provide habitat and protection for those species of plants and animals whose survival is threatened or endangered.
- To provide habitat and sanctuary for migratory birds consistent with the objectives of the Atlantic Flyway.
- To maintain and enhance as needed the habitats of all other species of indigenous wildlife and fishery resources.
- To provide opportunities for environmental education, interpretation, and quality wildlife-dependent recreation for the visiting public.

Figure 5. Savannah National Wildlife Refuge





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## **Tybee National Wildlife Refuge**

*"Effectuate further the purposes of the Migratory Bird Conservation Act."* Tybee NWR was established on May 9, 1938, by Executive Order No. 7882, as a breeding area for migratory birds and other wildlife. The majority of the 400-acre refuge is covered with sand deposits from the U.S. Army Corps of Engineers' dredging activities in the Savannah River (Figure 6). The more stable portions of the island are densely covered with such woody species as eastern red cedar, wax myrtle, and groundsel. Saltwater marsh borders parts of the island. At low tide the shoreline provides a resting and feeding place for many species of migratory birds. Stated objectives of the refuge only dictate basic ownership and protection. Tybee NWR was established by executive order to "effectuate further the purposes of the Migratory Bird Conservation Act." The refuge is primarily managed for the benefit of nesting shorebirds. Due to its small size, limited habitat, and funding, Tybee NWR is closed to the public.

## **Wassaw National Wildlife Refuge**

*"for the purpose of creating a fish and wildlife refuge to be maintained as nearly as practicable in its natural state" (Deed of Donation, October 20, 1969); and, "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (16 U.S.C. 715d, Migratory Bird Conservation Act)*

Wassaw, one of Georgia's coastal barrier islands, was designated a national wildlife refuge on October 20, 1969, by a Deed of Donation from the Nature Conservancy for the sum of one dollar. Unlike many of Georgia's Golden Isles, little development and few management practices have modified Wassaw's primitive character. The 10,053-acre refuge includes beaches with rolling dunes, live oak and slash pine woodlands, and vast salt marshes (Figure 7). The island supports rookeries for egrets and herons, and several species of wading birds are abundant in the summer months. In summer, telltale tracks on Wassaw's beach attest to nocturnal visits by the threatened loggerhead sea turtles that come ashore for egg laying and then return to the sea. The primary management objectives for Wassaw NWR are as follows:

- Maintain and protect the coastal maritime forest, marsh, and beach communities.
- Provide habitat for migratory birds, wading and shorebirds, and native fauna.
- Provide habitat for threatened and endangered loggerhead sea turtles, wood storks, peregrine falcons, and piping plovers.
- Provide recreation and environmental education for the public.

## **SPECIAL DESIGNATIONS**

Lands within the Complex were reviewed for their suitability in meeting the criteria for Wilderness Areas, as defined by the Wilderness Act of 1964. On Blackbeard Island NWR, 3,000 acres (and all of Wolf Island NWR) are designated as a Wilderness Area. A Wilderness Area (in contrast with those areas where man and his own works dominate the landscape) is recognized and defined as "an area where the earth and its community of life are untrammelled by man, where man himself is a visitor and does not remain." An area of wilderness is further defined as an area of undeveloped, federal land retaining its primal character and influence without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which:

1. Generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable;
2. Has outstanding opportunities for solitude or a primitive and unconfined type of recreation;

Figure 6. Tybee National Wildlife Refuge

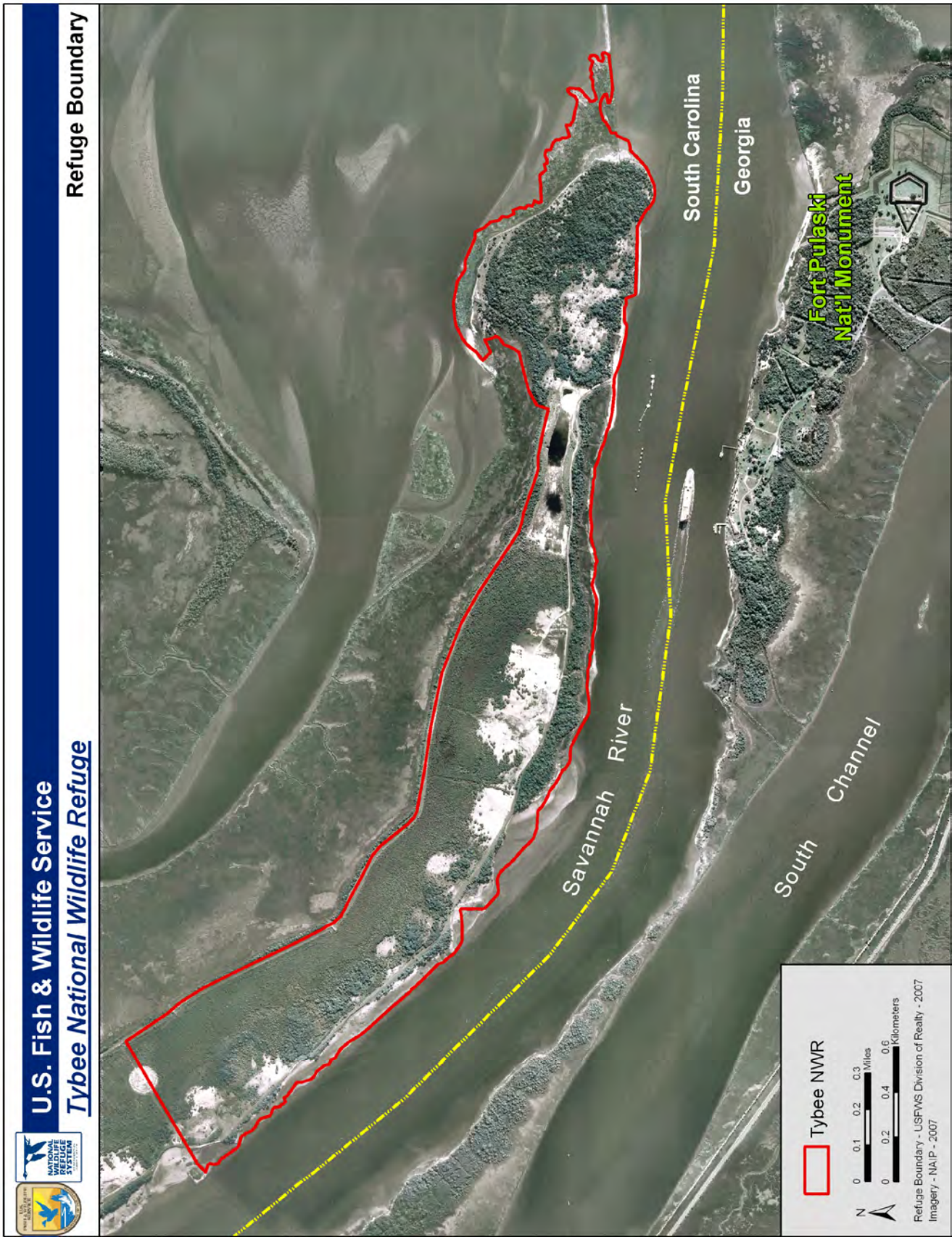




Figure 7. Wassaw National Wildlife Refuge



1. Has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and
2. May also contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

No areas in the other five refuges were found to meet these criteria. Therefore, the suitability of refuge lands for wilderness designation is not further analyzed in this CCP.

The Service administratively designates Research Natural Areas (RNAs) on refuges; currently there are 210 such areas on refuges totaling 1,955,762 acres. RNAs are part of a national network of reserved areas under various ownerships. RNAs are intended to represent the full array of North American ecosystems with their biological communities, habitats, natural phenomena, and geological and hydrological formations. In RNAs, as in designated wilderness, natural processes are allowed to predominate without human intervention. Under certain circumstances, deliberate manipulation may be used to maintain the unique features for which the research natural area was established. Activities such as hiking, bird watching, hunting, fishing, and wildlife observation and photography are permissible, but not mandated, in research natural areas. RNAs may be closed to all public use if such use is determined to be incompatible with primary refuge purposes. Virgin slash pine-hardwood habitat on Blackbeard Island NWR has been designated as RNA.

Biosphere reserves are protected areas of representative terrestrial and coastal environments which have been internationally recognized under the UNESCO Man and the Biosphere Program for their value in conservation and in providing the scientific knowledge, skill, and human values to support sustainable development. Biosphere reserves are united to form a worldwide network which facilitates sharing of information relevant to the conservation and management of natural and managed ecosystems. Five units of the Refuge System are included in Biosphere reserves, and three of these are found on the lower Coastal Plain of Georgia and South Carolina: Blackbeard Island NWR, Wolf Island NWR, and Cape Romain NWR.

The Georgia Department of Natural Resources has designated several high-priority waters associated with the Complex. These are streams, estuarine, and marine waters that contain important populations of high-priority aquatic species or are representative of an aquatic system and its associated community. South Carolina's Department of Health and Environmental Control has also designated outstanding resource waters in the immediate area of the Complex. Outstanding resource waters are designated as freshwater or saltwater that constitutes an outstanding recreational or ecological resource.

The following are those designated waters:

<u>High Priority Waters/Outstanding Resource Waters</u>	<u>Associated Refuges</u>
<u>Georgia</u>	
Savannah River, Site 46	Savannah NWR
Savannah River, Coastal Site 235	Savannah and Tybee NWRs
Wilmington/Bull/Tybee, Coastal Site 241	Wassaw NWR
Little Ogeechee/Skidaway Coastal Site 226	Wassaw NWR
S. Newport/Barbour Is./Wahoo/Johnson, Coastal Site 232	Harris Neck NWR
Crescent/Sapelo/Julienton Coastal Site 219	Harris Neck NWR
Doboy/Teakettle/Mud/Cabretta Coastal Site 224	Blackbeard Island NWR
[Altamaha River, Site 28	Wolf Island NWR]
[Darien/North/Black/Carnigan, Coastal Site 223	Wolf Island NWR]
<u>South Carolina</u>	
Colleton River and its tributaries including the Okatie River	Pinckney Island NWR

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The Savannah River which flows through the Savannah NWR has also been designated by the Nationwide Rivers Inventory (NRI) as a free-flowing river segment possessing "outstandingly remarkable" natural or cultural values of more than local or regional significance. About a 170-mile segment of the Savannah River (from river mile 20 at King's Island upstream to river mile 190) is designated as having outstandingly remarkable values of scenery, recreation, geology, fish, wildlife, history, and cultural resources.

Harris Neck, Pinckney Island, Savannah, and Wassaw NWRs are recognized as Important Bird Areas (IBA) by the National Audubon Society.

The Wolf Island NWR (Wolf, Egg, and Little Egg Islands) is located at the mouth of the Altamaha River. The Altamaha River has also been designated by the NRI as a free-flowing river segment possessing "outstandingly remarkable" natural or cultural values of more than local or regional significance. About a 128-mile segment of the Altamaha River (from Altamaha Sound upstream to river mile 128 at the junction of Oconee and Ocmulgee Rivers) is designated as having outstandingly remarkable values of scenery, recreation, geology, fish, wildlife, history, and cultural resources.

## **ECOSYSTEM CONTEXT**

An ecosystem is a geographical area that includes and interconnects all the living (biotic) organisms, their physical (abiotic) surroundings, 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 aspen) or large (an entire watershed including hundreds of forest stands across many different ownerships).

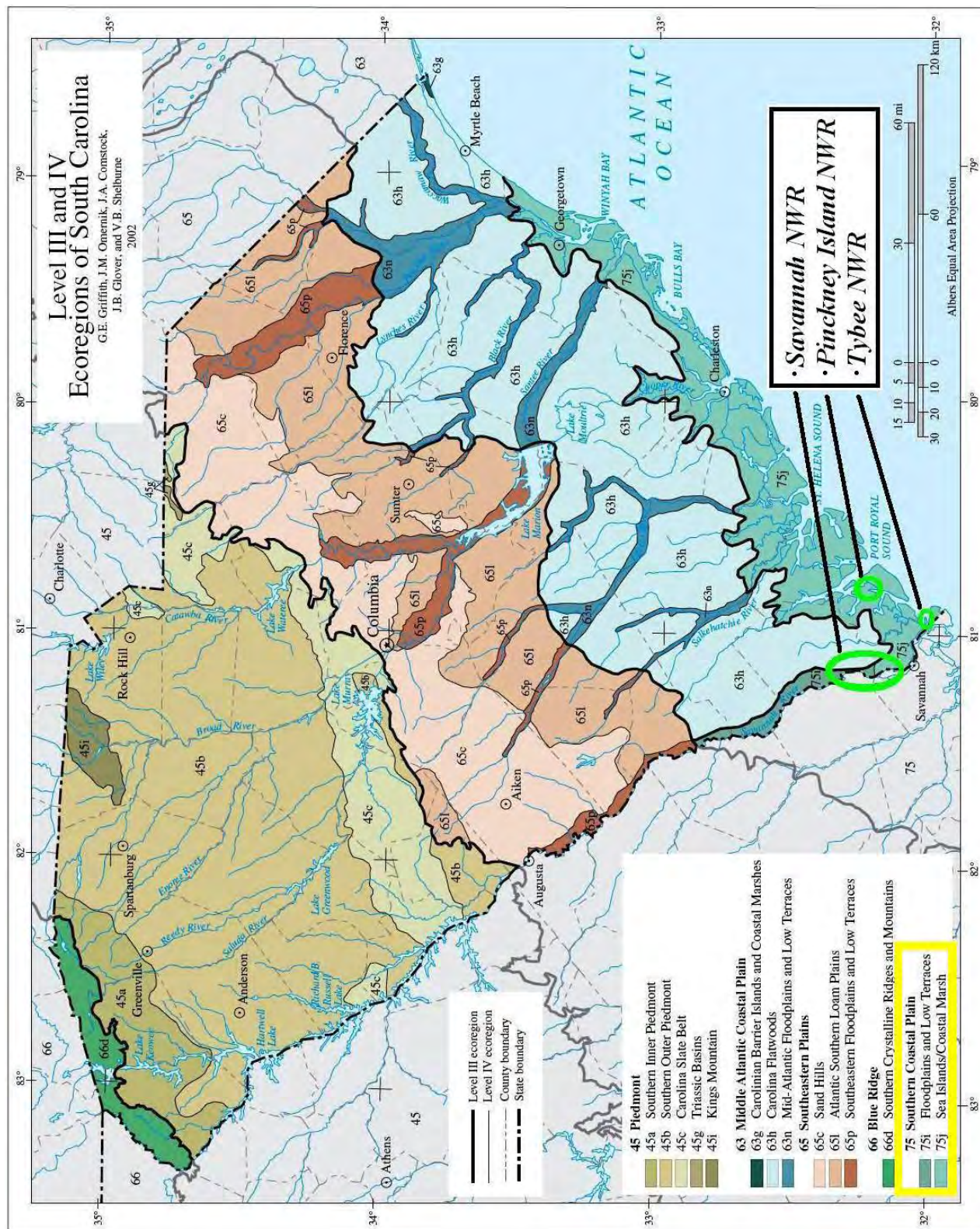
The United States (including Alaska, Hawaii and Puerto Rico) is comprised of 14 Ecosystem Divisions. Of these 14 ecosystem divisions, the Subtropical Division (230) includes the Southern Atlantic and Gulf Coast States. Within the Subtropical Division lies the Outer Coastal Plain Mixed Forest Province (232) (Bailey 1978).

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. The Southern Coastal Plain Ecoregion lies within the Outer Coastal Plain Mixed Forest Province (Loveland and Acevedo 2008). Regionally, the Southern Coastal Plain Ecoregion, an area of over 14 million square kilometers, extends from South Carolina and Georgia through much of central Florida, and along the Gulf coast lowlands of the Florida Panhandle, Alabama, and Mississippi (area 75-Level III Ecoregion). The Savannah Coastal Refuges Complex (SCRC) is located in the Southern Coastal Plain Ecoregion. Figures 8 and 9 illustrate the Southern Coastal Plain ecoregion in Georgia and South Carolina (Environmental Protection Agency 2009a and 2009b). This ecoregion is lower in elevation with less relief and wetter soils than the more inland, adjacent Southeastern Plains ecoregion. Once covered by a variety of forest communities that included longleaf pine, slash pine, pond pine, beech-magnolia, and mixed upland hardwoods, land cover in the region is now predominantly slash and loblolly pine plantations with cypress-gum, bay swamp, and bottomland hardwoods in low-lying areas (GADNR 2005).

Ecoregional subdivisions (Level IV) in Georgia and South Carolina of the Southern Coastal Plain include: the Okefenokee Plains (75e); Sea Island Flatwoods (75f); Okefenokee Swamp (75g); Bacon Terraces (75h); Floodplains and Low Terraces (75i); and Sea Islands/Coastal Marsh (75j). The SCRC lies almost entirely in the Sea Islands/Coastal Marsh ecoregion subdivision (75j), as shown in Figures 8 and 9 (Environmental Protection Agency 2009a and 2009b). A portion of the Savannah NWR also lies in the Floodplains and Low Terraces ecoregion subdivision (75i), which is characterized by the broad floodplains and terraces of major rivers, such as the Savannah,



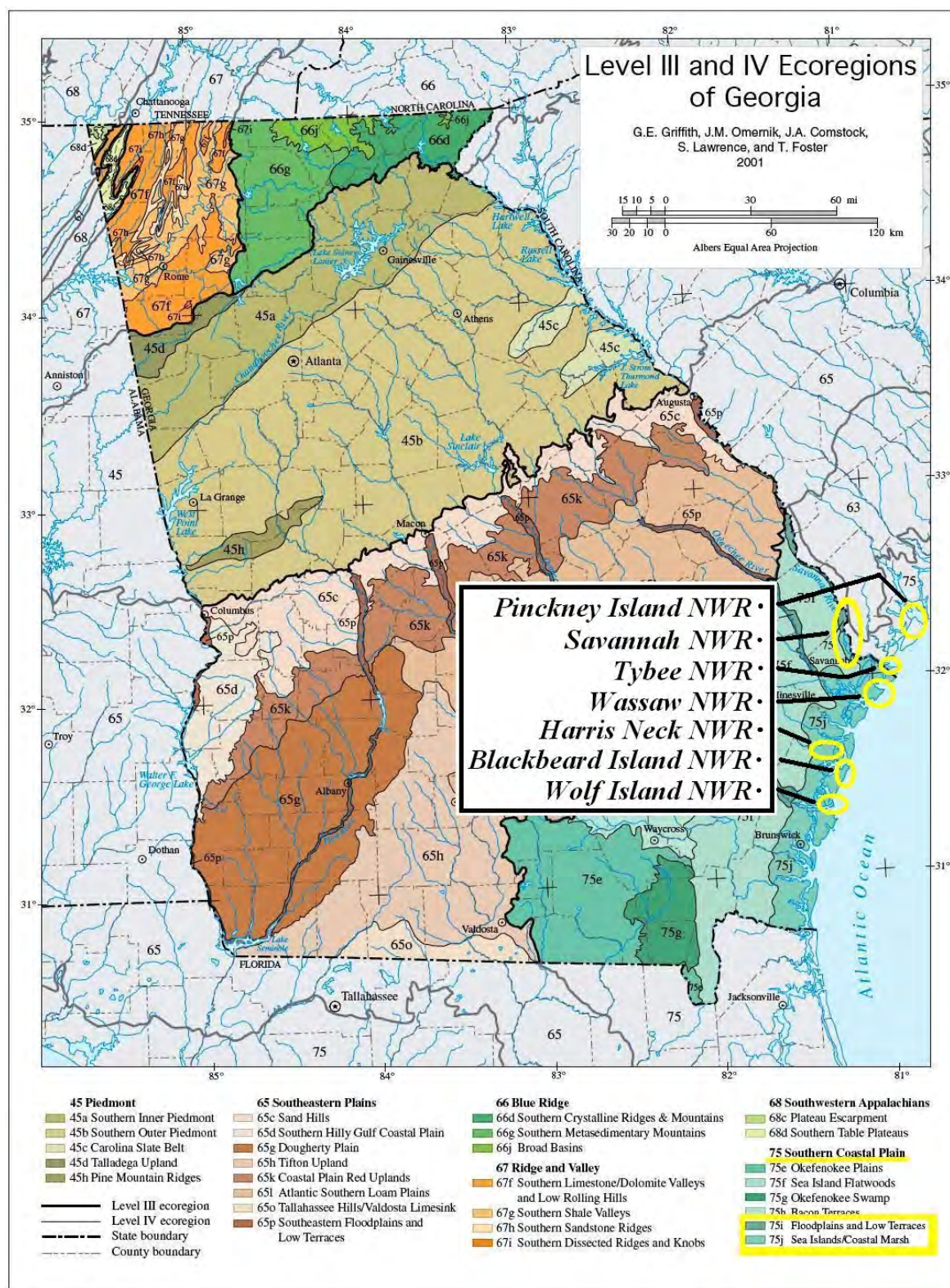
**Figure 8. Ecoregions of South Carolina Levels III and IV**



Source: U.S. Environmental Protection Agency, Western Ecology Division. "Ecoregions of North Carolina and South Carolina." [http://www.epa.gov/wed/pages/ecoregions/ncsc\\_eco.htm](http://www.epa.gov/wed/pages/ecoregions/ncsc_eco.htm)



**Figure 9. Ecoregions of Georgia Levels III and IV**



Source: U.S. Environmental Protection Agency, Western Ecology Division. "Ecoregions of Alabama and Georgia." [http://www.epa.gov/wed/pages/ecoregions/alga\\_eco.htm](http://www.epa.gov/wed/pages/ecoregions/alga_eco.htm)

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Ogeechee, and Altamaha. Soils consist of stream alluvium and terrace deposits of sand, silt, clay, and gravel, along with some organic muck and swamp deposits. The ecoregion subdivision includes large sluggish rivers and backwaters with ponds, swamps, and oxbow lakes. River swamp forests of bald cypress and water tupelo and oak-dominated bottomland hardwood forests provide important wildlife habitat (GADNR 2005).

The Sea Islands/Coastal Marsh ecoregion subdivision, encompassing Blackbeard, Harris Neck, Pinckney Island, Tybee, Wassaw, Wolf Island and major parts of Savannah NWRs, contains the lowest elevations in South Carolina and Georgia and is a highly dynamic environment affected by ocean wave, wind, and river action. Quaternary unconsolidated sand, silt, and clay have been laid down as beach, dune, barrier beach, saline marsh, terrace, and nearshore marine deposits. Mostly sandy soils are found on the barrier islands, while organic and clayey soils often occur in the freshwater, brackish, and salt marshes. Maritime forests of live oak, red cedar, slash pine, and cabbage palmetto grow on parts of the sea islands, and various species of cordgrass, saltgrass, and rushes are dominant in the marshes. The island's dunes are dominated by sea oats, which play a primary role in stabilizing the dune. Other dune plants include bayberry, dogfennel, bitter panic grass, broomsedge, wax myrtle, and Spanish bayonet. The island, marsh, and estuary systems form an interrelated ecological web, with processes and functions valuable to humans, but also sensitive to human alterations and pollution. The coastal marshes, tidal creeks, and estuaries are important nursery areas for fish, crabs, shrimp, and other marine species. Parts of the region have a long history of human alterations. Native Americans cultivated corn, melons, squash, and beans. A Spanish mission period during the 1500s-1600s included crops of citrus, figs, peaches, olives, artichokes, and onions. During the colonial and antebellum periods in the late 1700s and 1800s, a plantation agriculture economy produced indigo, rice, sugar cane, and Sea Island cotton. Savannah Harbor is one of the largest container ship ports on the east coast, and it also contains one of the largest commercial shrimp fisheries in the state, raising concerns about the health of the estuary, coastal marshes and associated flora and fauna. While parts of this region are now managed as wildlife refuges or estuarine research reserves, the expanding resort economy continues to broadly change land uses, water quality, and the once more isolated Gullah and Sea Island cultures (Griffith et. al 2002, and EPA 2009b).

Blackbeard Island, Harris Neck, and Wassaw NWRs (and Wolf Island NWR) are located in the Service's Altamaha River watershed ecosystem unit. Savannah, Pinckney Island, and Tybee NWRs are located in the Service's Savannah-Santee-Pee Dee River watershed ecosystem unit. The watershed ecosystem approach is comprehensive in that it is based on all of the biological resources within a watershed and it considers the ecological health of communities within that watershed.

## **REGIONAL CONSERVATION PLANS AND INITIATIVES**

The Complex is a component of many regional and ecosystem conservation planning initiatives, which are described in the following paragraphs.

Many regional conservation plans and initiatives are derivatives of national plans (mentioned in Chapter I, National and International Conservation Plans and Initiatives). These regional plans are developed by a variety of cooperating regional organizations and agencies and are being planned and implemented in the southeastern United States. Some of the more notable which are compatible with the mission and purpose of the Complex are listed below:

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## **The North American Waterfowl Management Plan**

Recognizing the importance of waterfowl and wetlands to North Americans and the need for international cooperation, the United States and Canada governments developed a strategy to restore waterfowl populations through habitat protection, restoration, and enhancement. The strategy was documented and the North American Waterfowl Management Plan (NAWMP) was signed in 1986 by the Canadian Minister of the Environment and the U.S. Secretary of the Interior, the foundation partnership upon which hundreds of others would be built. With its update in 1994, Mexico became a signatory to the Plan. The Plan is innovative because its perspective is international in scope, but its implementation functions at the regional level. Its success is dependent upon the strength of partnerships, called "joint ventures," involving federal, state, provincial, tribal, and local governments; businesses; conservation organizations; and individual citizens. Joint ventures develop implementation plans focusing on areas of concern identified in the Plan. The vision of the NAWMP is to recover waterfowl populations by restoring and managing wetland ecosystems, to conserve biological diversity in the western hemisphere, to integrate wildlife conservation with sustainable economic development, and to promote partnerships of public and private agencies, organizations, and individuals for conservation. Canada, the United States, and Mexico are committed to the ongoing continental effort to restore North America's waterfowl and wetland resources.

## **The North American Waterbird Conservation Plan**

The North American Waterbird Conservation Plan (NAWCP) is the product of an independent partnership of individuals and institutions having interest and responsibility for conservation of waterbirds and their habitats in the Americas. This partnership—Waterbird Conservation for the Americas—was created to support a vision in which the distribution, diversity, and abundance of populations and habitats of breeding, migratory, and non-breeding waterbirds are sustained or restored throughout the lands and waters of North America, Central America, and the Caribbean. The Plan provides a continental-scale framework for the conservation and management of 210 species of waterbirds, including seabirds, coastal waterbirds, wading birds, and marshbirds utilizing aquatic habitats in 29 nations throughout the Americas. Threats to waterbird populations include destruction of inland and coastal wetlands, introduced predators and invasive species, pollutants, mortality from fisheries and industries, disturbance, and conflicts arising from abundant species. The NAWCP provides an overarching continental framework and guide for conserving waterbirds. It sets forth goals and priorities for waterbirds in all habitats, at nesting sites, during annual migrations, and during non-breeding periods. It advocates continent-wide monitoring; provides an impetus for regional conservation planning; proposes national, state, provincial and other local conservation planning and action; and gives a larger context for local habitat protection.

## **Southeast United States Waterbird Conservation Plan**

This Plan seeks to elaborate on the goals and objectives established in the North American Waterbird Conservation Plan. Within the context of the continental plan, stepped down goals and objectives are described for the southeastern regional landscape. In the regional plan, priority species are identified, major threats to waterbirds are described, and conservation actions are outlined. This Plan, by providing a link between the national plan and local conservation initiatives, outlines a framework through which partners can identify and develop projects that build upon existing information to move waterbird conservation forward at both the regional and continental scale. 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, sandhill cranes, whooping



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cranes, interior least terns, and populations of brown pelicans. A key objective of this Plan is the standardization of data collection efforts to better recommend effective conservation measures (Waterbird Conservation for the Americas).

### **Partners in Flight Bird Conservation Plan**

The Partners in Flight Bird Conservation Plan (PIF) is a cooperative partnership between government agencies, private organizations, individuals, academic communities, and industry. PIF was launched in 1990 in response to growing concerns about many land bird species. The central premise of PIF has been that resources of public and private organizations in North and South America must be combined, coordinated, and increased in order to achieve success in conserving land bird populations in this Hemisphere. Bird conservation plans have been developed for physiographic areas. These plans identify priority species for conservation efforts in each area, recommend population and habitat objectives for managing these priority species, and provide implementation and management strategies for reaching objectives.

### **U.S. Shorebird Conservation Plan**

The U.S. Shorebird Conservation Plan (USSCP) is a partnership effort throughout the United States to ensure that stable and self-sustaining populations of shorebird species are restored and protected. The USSCP was developed by a wide range of agencies, organizations, and shorebird experts for separate regions of the country, and identifies conservation goals, critical habitat conservation needs, key research needs, and proposed education and outreach programs to increase awareness of shorebirds and the threats they face. Of particular interest to the Complex is the Southeastern Coastal Plain - Caribbean Shorebird Conservation Plan, which calls for an annual habitat objective to provide 4,000 acres of suitable shorebird foraging habitat (e.g., mudflats) during both the south-bound and north-bound migration for shorebirds (Hunter et al. 2005).

### **North American Bird Conservation Initiative**

The North American Bird Conservation Initiative (NABCI) is a coalition of government, private, and academic organizations, and private industry leaders addressing bird conservation. The initiative's vision is to achieve regionally based, biologically driven, landscape-oriented partnerships that deliver the full spectrum of bird conservation across the North American continent and that support simultaneous, on-the-ground delivery of conservation for all birds. It evolved in 1998 out of recognition of the value of coordinating efforts of the NAWMP, NAWCP, PIF, and USSCP. Populations and habitats of North America's birds are protected, restored, and enhanced through coordinated efforts at international, national, regional, state, and local levels, guided by sound science and effective management. Bird Conservation Regions (BCR) encompasses landscapes having similar bird communities, habitats and resource issues. The South Atlantic Coastal Plain Bird Conservation Region (BCR 27) includes the Complex.

### **The South Atlantic Migratory Bird Initiative**

Under NABCI, the South Atlantic Migratory Bird Initiative (SAMBI) represents one of the initial efforts in North America to integrate the objectives of four major bird conservation plans (NAWMP, USSCP, NAWCP, and PIF) into a single plan that land managers, biologists, administrators, and private landowners can use to achieve common goals and objectives for bird conservation across a regional landscape. The primary objectives are to develop population and habitat goals for priority species, delineate "all bird" focus areas, develop a long-term framework

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for bird conservation in the Southeastern Coastal Plain, and develop and seek funding for "all bird" projects (The South Atlantic Migratory Bird Initiative).

### **American Oystercatcher Conservation Plan for the Atlantic and Gulf Coasts of the United States**

This plan focuses on *H. p. palliatus* in the United States, referred to as "American Oystercatcher" or simply as "oystercatchers." The present plan addresses only the populations on the East and Gulf coasts and summarizes current knowledge of their life history, distribution, and population trends, describes current threats, lists research and management needs, and outlines recommended conservation actions. Conservation activities recommended to address these threats include: Identification and protection of existing habitat; creation of new habitat through carefully designed use of dredge-spoil materials; management of existing protected areas to reduce predation and disturbance; and control of predator populations, especially in the nesting season (Schulte et al. 2006).

### **The Atlantic Coast Joint Venture**

The Atlantic Coast Joint Venture (ACJV) is a partnership focused on the conservation of habitat for native birds in the Atlantic Flyway of the United States from Maine south to Puerto Rico. The joint venture is a partnership of the 18 states and commonwealths and key federal and regional habitat conservation agencies and organizations in the joint venture area. The joint venture was originally formed as a regional partnership focused on the conservation of waterfowl and wetlands under NAWMP, and has since broadened its focus to the conservation of habitats for all birds consistent with major national and continental bird conservation plans and NABCI.

### **Atlantic Loggerhead Sea Turtle Recovery Plan (Revised 2008)**

Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect the species. This plan is intended to serve as a guide that delineates and schedules those actions believed necessary to restore the Atlantic Loggerhead (*Caretta careua*) as a viable self-sustaining element of its ecosystem. It is intended to determine population status and trends along the Atlantic (and Gulf) coast of the United States and to determine progress towards the recovery.

### **Wood Stork Recovery Plan (Revised 1996)**

The objective of the recovery plan is to assure the long-term viability of the U.S. breeding population of the wood stork in the wild, allowing initially for reclassification to threatened status and ultimately removal from the list of threatened and endangered species.

### **The National Estuary Program**

Established as part of the 1987 amendments to the Clean Water Act (CWA), this program seeks to protect and restore 28 designated estuaries of national significance that are deemed to be threatened by pollution, development, or overuse. Several federal agencies participate in the planning and assessment efforts: EPA, NOAA, USGS, DOI, and USDA (EPA 2007).

### **USGS National Coastal Program Plan**

"A Plan for a Comprehensive National Coastal Program" describes a comprehensive National Coastal Program that responds to critical regional needs while addressing national issues associated with coastal change, including nutrient enrichment, oxygen depletion, harmful algal blooms, chemical contamination, diseases in marine organisms, and fish kills; shoreline erosion,

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the increasing susceptibility of coastal communities to natural hazards and sea level rise, increasing demands on non-living resources (including groundwater, sand and gravel, and energy resources); and declines in living marine resources, habitat loss, loss of biodiversity, and invasions of non-indigenous species (USGS undated).

### **The Office of Ocean and Coastal Resource Management**

The Office of Ocean and Coastal Resource Management (OCRM) provides national leadership, strategic direction, and guidance to state and territory coastal programs and estuarine research reserves. It oversees six major programs. Each program has a national reach, but is designed to account for local resources and needs. OCRM works with state and territory coastal resource managers to develop a scientifically based, comprehensive national system of marine protected areas (MPAs) and supports effective management and sound science to protect, sustain, and restore coral reef ecosystems. These activities are mandated by the Coastal Zone Management Act, the MPA Executive Order, and the Coral Reef Conservation Act (NOAA 1999).

### **Southeast Aquatic Resources Partnership**

The Southeast Aquatic Resources Partnership (SARP) includes fish and wildlife agencies from 14 southeastern states; the Gulf and Atlantic States Marine Fisheries Commissions; the Gulf of Mexico and South Atlantic Fishery Management Councils; the U.S. Fish and Wildlife Service; and NOAA Fisheries. The SARP focuses on six key issue areas: Aquatic Habitat Conservation; Public Use; Imperiled Fish and Aquatic Species Recovery; Fishery Mitigation; Inter-jurisdictional Fisheries; and Aquatic Nuisance Species. These partnering entities work together for the conservation and management of aquatic resources in the southeast.

### **Partners for Fish and Wildlife**

The Partners for Fish and Wildlife Program (Partners) is working with landowners to restore, enhance, and protect fish and wildlife habitat on private lands. Through alliances with organizations and individuals, the Partners program is a voluntary partnership whose focus is to restore vegetation and hydrology to historic conditions on private lands.

### **Partners for Fish and Wildlife Program-Southeast Region**

The Service seeks to engage willing private landowners through non-regulatory incentives (with technical and financial assistance) to conserve and protect valuable fish and wildlife habitat on privately owned lands.

### **South Carolina Comprehensive Wildlife Conservation Strategy**

The South Carolina Comprehensive Wildlife Conservation Strategy (CWCS) identifies the challenges facing the State of South Carolina's diverse wildlife species and devises strategies to conserve those "species with the greatest conservation need," and their habitats. It is a guide to conserving the 1,240 species of fish and wildlife that have immediate conservation needs or are key indicators of the diversity and health of the state's wildlife. The CWCS emphasizes a cooperative, proactive approach to conservation, inviting local governments, businesses and conservation-minded organizations and individuals to join in the task of maintaining the fish and wildlife resources (SCDNR 2006).

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## **Georgia Comprehensive Wildlife Conservation Strategy**

Supported by the State Wildlife Grants (SWG) Program, Georgia's Comprehensive Wildlife Conservation Strategy (CWCS) (also known as the State Wildlife Action Plan) identifies the challenges facing Georgia's diverse wildlife species and devises strategies to conserve those "species with the greatest conservation need," and their habitats. Georgia ranks sixth in the nation in overall species diversity based on numbers of vascular plants, vertebrate animals and selected invertebrates. The state currently has 223 species that are protected by state or federal laws and hundreds of additional animal and plant species in need of conservation. The CWCS is a guide to conserving the species of fish and wildlife that have immediate conservation needs or are key indicators of the diversity and health of the state's wildlife. The CWCS emphasizes a cooperative, proactive approach to conservation, inviting local governments, businesses, and conservation-minded organizations and individuals to join in the task of maintaining the fish and wildlife resources (GADNR 2005).

### **South Carolina's Statewide Water Resource Plans**

In addition to South Carolina's CWCS (above), other resource plans and initiatives guide the management and protection of South Carolina's natural and cultural resources:

#### 208 Water Quality Management Plan of South Carolina:

This plan is developed for the purpose of encouraging and facilitating the development and implementation of area wide waste treatment management plans. It requires states to identify areas with water quality problems and designate an entity to develop area wide waste treatment management plans so as to attain the national goal of "fishable-swimmable waters" as required by the Clean Water Act (SCDHEC 1997).

#### South Carolina Water Plan:

The purpose of this plan is to establish guidelines for the effective management of the state's surface and ground water resources, to sustain the availability of the water resource for present and future use, to protect public health and natural systems, and to enhance the quality of life for all citizens (Badr et al. 2004).

### **Georgia's Statewide Natural Resource Plans (Georgia Department of Natural Resources)**

In addition to Georgia's CWCS (above), several other natural resource plans and initiatives guide the management and protection of Georgia's natural and cultural resources:

The Department of Natural Resources Strategic Plan (A 10-year Strategic Plan for the Georgia Department of Natural Resources) was developed with input from the Board of Natural Resources, DNR leadership and staff, and facilitators from the University of Georgia Fanning Institute and approved by the Board of Natural Resources in March 2007. It focuses on ways in which DNR can improve efficiency through better internal coordination and communications; expand public-private partnerships to address critical natural and cultural resources issues; and provide high-quality customer service to the citizens of Georgia.

To ensure continued service to current and future Georgians, the Parks, Recreation and Historic Sites Division formulates a comprehensive statewide recreation policy every five years. This policy is contained within the Georgia Statewide Comprehensive Outdoor

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Recreation Plan (SCORP), a plan that also makes the state eligible to receive and distribute federal funds from the Land and Water Conservation Fund (LWCF). LWCF grants support state, county and city outdoor recreation projects in three categories: land acquisition, development and rehabilitation.

Under the National Historic Preservation Act of 1966, each State Historic Preservation Office (SHPO) is charged with developing a statewide historic preservation plan. Georgia's State Historic Preservation Plan 2007-2011: Building a Preservation Ethic provides common direction for all organizations and individuals who support the preservation of Georgia's historic places. The plan includes information about trends in Georgia and how they may affect historic properties; mission, vision and goals for historic preservation; information about Georgia's historic and archaeological resources, information about how preservation works in Georgia, and about the statewide preservation planning process.

## **ECOLOGICAL THREATS AND PROBLEMS**

In order to prepare a CCP that would establish goals and objectives on how to manage the Complex over the next 15 years, a number of planning steps were followed. One of those steps was a review of known ecological threats and problems that may hinder the ability of refuge personnel to fulfill the objectives of the individual refuges. This iterative, ongoing review process has recognized a number of common regional concerns, which are of particular importance to refuges in the Complex.

- Large industries (especially pulp and paper and chemical industries) attracted to the coastal region of Georgia and South Carolina by an abundance of water, seaport facilities, climate, and an available and receptive labor force have contributed to major pollution problems. The estuaries receive stormwater runoff, pollutants from industries and municipalities along the coast, and from river systems carrying agricultural pesticides and sewage and industrial wastes from towns and cities upstream along the rivers, additionally, these industries are depleting ground water necessary to recharge freshwater wetlands. Besides being aesthetically objectionable and hazardous to human health, the impacts on wildlife, recreation, commercial and sport fishing and tourism are detrimental.
- Dredging associated with the expansion and maintenance of harbors and inland waterways, coastal development, highway construction, etc., results in alteration of circulation patterns, shoreline erosion and sediment deposition (not to mention the direct loss of marshlands by the dredging activities per se). Dredging increases the silt load and turbidity of the waters, reducing photosynthesis and decreasing primary production. Benthic organisms can be buried by silt and fisheries impacted by the anoxia developed due to the exposure of bottom sediments (for example, disturbed sediments from Wassaw Sound have been found to have the potential to remove the oxygen from a volume of water, 535 times the same volume of sediment [Frankenberg and Westerfield 1968]).
- Dredging activities in the Savannah area have also raised concerns that the deeper dredging might crack or weaken the compacted silty sand of the freshwater aquifer that keeps sea water out.
- Beach erosion is a problem on all barrier islands due to storm surges, global warming/sea-level rise, and sand-starved refuge beaches. Littoral currents which flow from north to south along the Georgia and South Carolina coastline carry sand deposited by coastal rivers. This sand is subsequently redeposited on the beaches of the barrier islands. Dredging activities in the Savannah River delta have interrupted this natural southward transport of sand by dumping the



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dredged material on land at the mouth of the river (i.e., Tybee NWR-Oysterbed Island) and robbing the Georgia barrier islands of their sand supply. The result is that barrier islands in coastal Georgia are sand starved.

- Sea Level Rise (SLR) model simulations (Sea Level Affecting Marshes Model – SLAMM) predict a rise of approximately 39 cm (Scenario – SRES A1B mean) along the South Carolina and Georgia coastlines by the year 2100. Tidal marshes are among the most susceptible ecosystems to climate change, especially accelerated SLR. Rising sea levels may result in tidal marsh submergence and habitat migration as salt marshes transgress landward and replace tidal freshwater and brackish marsh (Church et al. 2001; Meehl et al. 2007).
- Several Invasive/exotic species are a common concern among most (if not all) of the refuges in the Complex:
  - Laurel Wilt – the Ambrosia beetle with its associated fungus can kill a mature red bay tree in a matter of days;
  - Invasive plants – Chinese tallow trees (an exotic that is a serious threat because of its ability to invade high-quality, undisturbed forests); Cogon grass (a rapidly spreading ground cover presenting the potential for problems for native plants and trees); Alligator weed; water hyacinth; Chinaberry; etc.
  - Feral hogs – feral hogs destroy native plants and compete with other wildlife for food; and, are a special concern because of their egg predation of loggerhead nests.

### **Blackbeard Island NWR**

Blackbeard Island NWR is located on Sapelo Sound in coastal Georgia and represents some of the most important estuarine habitat in the southeastern United States. It is characterized by extensive salt marshes and freshwater marshes which support one of the most biologically productive systems in the world. The primary threat to this region is urban development, which will contribute to increased stormwater runoff, pollution, groundwater depletion and sedimentation of offshore habitats.

- Blackbeard Island NWR consistently has one, if not the highest density of nests in Georgia, and is considered a most important loggerhead beach. The Blackbeard Island NWR sea turtle project began in 1966 and represents one of the longest sea turtle nest study/protection programs in Georgia.
- Approximately 340 acres of Blackbeard Island NWR's beach appear to be eroding, especially at the north and south ends of the island. Lack of beach sand has negative impacts on the invertebrates that support shorebirds and limit sea turtle nesting.
- At one time, a large aquifer supplied the impoundments on the refuge with freshwater via artesian wells. Industrial growth placed such a demand on the aquifer that water no longer flows from the wells. Therefore, the sole source of impoundment freshwater replenishment is rainfall. Freshwater fishing on Blackbeard Island NWR has not been reported since 2001 due to prolonged drought and the lack of aquifer freshwater.
- Invasive species of management concern are:
  - The Ambrosia beetle (most if not all red bay trees over 4 feet in height are dead as a result of ambrosia beetle fungus infestation on the island);

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- Feral hog control/removal is conducted prior to and during the sea turtle nesting season in an effort to decrease egg and hatchling depredation. The population of feral hogs on the island is assumed to be expanding. Management and control is hindered due to the island's dense palmetto understory. Predation of logger head sea turtle nests by feral hogs is a potential problem ;
  - Cattails have overgrown both open water ponds on the refuge. The wood stork rookery and the largemouth bass fishery no longer exist on Flag Pond due to the cattail (and other nuisance vegetation) invasion and the drought and lack of freshwater.
  - Sea Level Rise (SLR) model simulations (Sea Level Affecting Marshes Model – SLAMM) predict a rise of approximately 58 cm (Scenario – SRES A1B mean) for Blackbeard Island NWR by the year 2100 (Craft et. al 2008).

### **Harris Neck NWR**

Harris Neck NWR is located on the South Newport River in coastal Georgia. This area represents some of the most important estuarine river systems in the southeastern United States. It is characterized by extensive salt marshes and freshwater marshes which support one of the most biologically productive systems in the world. The primary threat to this region is urban development, which will contribute to increased stormwater runoff, pollution, and sedimentation of offshore habitats. Management is focused on six man-made impoundments utilized by the endangered wood stork and a variety of wading birds. Management activities by refuge have resulted in this being one of the most stable and productive colonies in the United States relative to colony growth and productivity. Personnel from Savannah River Ecology Laboratory, GADNR, and University of Florida and refuge staff biologists continue to collect and share wood stork data from the Woody Pond rookery.

- The land around the refuge is becoming fragmented at an alarming rate for housing development, and more encounters with "unwanted animals" continue to grow.
- Invasive species of management concern are the ambrosia beetle, armadillos, coyotes, feral cats and dogs, and greenbrier (*Smilax spp.*) and emergent aquatic plants (cattails and *Sesbania*) in the refuge's ponds.
- Sea Level Rise (SLR) model simulations (Sea Level Affecting Marshes Model – SLAMM) predict a rise of approximately 58 cm (Scenario – SRES A1B mean) for Harris Neck NWR by the year 2100 (Craft et. al 2008).

### **Pinckney Island NWR**

Pinckney Island NWR is located in Beaufort County, South Carolina. The refuge is 0.5-mile west of Hilton Head Island, South Carolina, and hosts approximately 1.5 million tourists each year, resulting in an average of 58,000 vehicles crossing the refuge daily.

- Migratory songbird habitat management is a primary objective of the refuge with a special emphasis on painted buntings. A decline in the painted bunting's population in recent years is of concern.

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- Heavy domestic and industrial withdrawals of groundwater from the Floridan aquifer have caused a decline in artesian pressure, with resulting saltwater encroachment into the freshwater coastal water aquifer, and serious declines in both freshwater quality and quantity. Cones of depression are largest and most serious in the Savannah and Hilton Head (and St. Mary's) areas. A joint monitoring effort between Georgia's Environmental Protection Division and the South Carolina Department of Health and Environmental Control uses three monitoring wells on the refuge to track the movement and rate of saltwater intrusion into the Floridan aquifer and has been ongoing for the last 10 years.
  - Despite the many small ponds on the refuge, freshwater supplies are limited because of large domestic, commercial, and industrial demands on the regional groundwater aquifer and the resultant water table drawn down and saltwater intrusion into the aquifer. This limits the ability of refuge personnel to develop freshwater wetlands for migratory songbirds, reptiles, and amphibians. Saltwater intrusion has moved under the Port Royal sound and been detected in Moss Creek. The refuge's freshwater ponds are permanently closed to public fishing. Limited freshwater supplies are further exacerbated by recent drought conditions (and by the future anticipated effects of climate change).
  - Invasive species of management concern are Johnson grass, Chinese privet, Chinese tallow, and feral cats.
  - Sea Level Rise (SLR) model simulations (Sea Level Affecting Marshes Model – SLAMM) predict a rise of approximately 52 cm (Scenario – SRES A1B mean) for Pinckney Island NWR by the year 2100 (Craft et. al 2008).

### **Savannah NWR**

Savannah NWR is located in Chatham and Effingham Counties, Georgia, and Jasper County, South Carolina, on the lower Savannah River between mile markers 18 and 41. The port city of Savannah (with a metropolitan population of over 320,000) lies immediately downstream of the refuge and is a center of pulp, paper, and organic chemical industries. Savannah NWR contains approximately 6,000 acres of impounded freshwater wetlands, of which about 3,000 acres are actively managed by 22 water control structures. These freshwater impoundments are the most important managed habitat within the refuge. Several refuge management concerns arise due to the intrusion and activities from the Savannah metropolitan regional area.

- Impacts of Savannah River dredging and harbor deepening activities (from a 42-foot to a 48-foot depth to accommodate mega ships) threaten aquatic habitats, especially those of the endangered shortnose sturgeon and the striped bass, due to lowered dissolved oxygen (DO) levels. Prior to 2005, striped bass fishing in the Savannah River system was closed for 16 years due to low recruitment of young fish caused by harbor modifications and higher salinities in traditional spawning areas of the river.
- Saltwater intrusion due to past dredging projects has resulted in a loss of tidal freshwater marshes on the refuge from 6,000 acres in 1927 to less than 2,800 acres today. A study to assess the changes in plant communities and the corresponding interstitial salinity gradient (a follow-up to studies conducted in 1986-87 and 1993-94) is ongoing with plans to continue indefinitely until the freshwater marsh fully recovers. Also scientists from the National Wetlands Research Center and the University of New Orleans are investigating forest dieback in the tidal freshwater swamps and the influence of saltwater intrusion within the refuge.

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- The Port of Savannah, which includes the Garden City and Ocean terminals, is the nation's fastest growing port, the second busiest container port on the East Coast, and the fourth busiest in the nation. Transportation fuel (e.g., diesel, oil) spills from large marine vessels (e.g., tankers, barges, boats) and chemical spills from industries hold the potential to adversely impact the refuge's river and marsh habitats.
  - Commercial and residential development and urban sprawl along the border of the refuge are unprecedented. (Jasper County, South Carolina, has an estimated population growth of 600 percent in the next 15 years.) Consequently, boundary encroachment and increasing frequent law enforcement issues (e.g., prostitution, drugs, poaching, theft) are threatening the purposes (i.e., "*Inviolable sanctuary*" and "*preserve and breeding ground for native birds*") for which the refuge was established. (The city of Hardeeville's efforts to annex the refuge are also of political concern.)
  - Clear-cut logging threatens nearly 3,000 acres of mature bottomland hardwood habitat on Mill Creek, one known nesting site for the swallow-tailed kite on the Savannah River.
  - Commercial truck traffic of SC 170/GA 25 highway (bisecting the refuge east to west) is very high, resulting in many accidents, debris and trash, and congestion – disturbing the aesthetic and primitive character of the refuge; reactivation of the Seaboard Coastline Railroad and development of a new port will lead to further disturbance to the habitat and native wildlife of the refuge.
  - Some invasive plant species of management concern are: Alligator weed, Chinese tallow, water hyacinth, American lotus, cattails, and Chinaberry.
  - The feral hog is an exotic species on the refuge and poses significant threats to refuge management and other native wildlife. As hogs feed, they root up large sections along dikes which then erode during rains and high tides. They also destroy native plants and compete with other wildlife species for food.
  - Sea Level Rise (SLR) model simulations (Sea Level Affecting Marshes Model – SLAMM) predict a rise of approximately 52 cm (Scenario – SRES A1B mean) for Savannah NWR by the year 2100 (Craft et. al 2008).

### **Tybee NWR**

Tybee NWR is considered a sanctuary for migratory birds. The refuge is located in Jasper County, South Carolina, at the mouth of the Savannah River. Originally only a 1-acre oyster shoal until 1998, it is now used as a spoil site for material dredged from the Savannah River by the Corps of Engineers and presently encompasses an area of about 400 acres of scrub/shrub habitat, sand beaches, and marsh.

- Impacts of Savannah River dredging and harbor deepening activities threaten aquatic habitats, especially those of the endangered shortnose sturgeon.
- Dredged spoil from the Savannah River (deposited on Tybee NWR) and the high volume of international shipping provide a constant source of invasive plant species. The exotics Common Reed (*Phragmites communis*) and Salt Cedar (*Tamarix* spp.) have invaded the refuge and are of concern.

- Transportation fuel (e.g., diesel, oil) spills from marine vessels (e.g., tankers, barges, boats) and chemical spills from industries adversely impact the refuge's river and marsh habitats.
- Construction and development of a new port in Jasper County, South Carolina, will lead to further disturbance to the habitat and native wildlife of the refuge.
- Sea Level Rise (SLR) model simulations (Sea Level Affecting Marshes Model – SLAMM) predict a rise of approximately 52 cm (Scenario – SRES A1B mean) for Tybee NWR (and Savannah NWR) by the year 2100 (Craft et. al 2008).

### **Wassaw NWR**

Wassaw NWR is located in Chatham County between the Wilmington and Vernon Rivers in coastal Georgia, approximately 14 miles south of Savannah. Unlike many of Georgia's barrier islands, Wassaw NWR has experienced little in the way of human influences. Minimizing disturbance to wintering and nesting birds on beaches is the primary management opportunity.

- The highlight of the refuge is its 7 miles of undeveloped, spectacular beaches. However, the refuge's oceanfront beach is characterized by an eroding shoreline along its northern and southern ends. Sand is potentially being lost by dredging operations in the Savannah River, creating a deficit in the overall sand which historically replenished barrier islands, including Wassaw NWR.
- Dunes, beaches, and sand bars are critical for migratory birds as nesting, feeding, loafing, and roosting habitat. (A Monitoring Avian Productivity and Survivorship banding station is in its 10th year of operation on Wassaw Island.) Even more critical for shorebirds are the invertebrate prey populations these habitats support. Sea turtles nest on barrier island beaches and feed in offshore waters. Lack of sand, as a result of dams and dredged harbors, is having a negative impact on the sea turtle habitats. An ongoing sea turtle research program, begun in 1973, is conducted by the Caretta Research Project.
- Freshwater aquifers on the island have ceased to flow due to a cone of depression created by industrial and municipal withdrawals from the Floridan aquifer. Freshwater habitats on the island are temporary and seasonal. Water levels in refuge ponds are impacted by increased withdrawal of groundwater by local industry, eliminating flow from artesian wells on the refuge.
- Invasive species of management concern are the Ambrosia beetle (most if not all red bay trees over 4 feet in height are dead as a result of ambrosia beetle fungus infestation on the island); feral hogs; Chinese tallow; and cogon grass.
- Sea Level Rise (SLR) model simulations (Sea Level Affecting Marshes Model – SLAMM) predict a rise of approximately 58 cm (Scenario – SRES A1B mean) for Wassaw NWR (and Savannah NWR) by the year 2100 (Craft et. al 2008).

## **PHYSICAL RESOURCES**

### *CLIMATE*

The Georgia-South Carolina Coast, from Blackbeard Island NWR to Pinckney Island NWR experiences relatively moderate climate conditions. Sea breezes offer some relief from intense summer heat. Average summer (June through August) temperatures hover around the 80°F mark,

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with Savannah at 80.7°F and Sapelo Island at 80.4°F. Maximum summer temperatures average about 90 °F. The warmest day on record was July 20, 1986, when temperatures reached 105 °F at both Savannah and Sapelo Island. Winters are relatively mild and short. Average winter (December through February) temperatures are around 50°F, with Savannah at 51.4°F and Sapelo Island at 52.3°F. Minimum winter temperatures average about 40°F. The Georgia-South Carolina coastal area experiences few cold days. Historically, Savannah and Sapelo Island have temperatures below 32°F only about 26 and 16 days a year, respectively. The coolest day on record was January 21, 1985, when temperatures fell to 3 °F at both Savannah and Sapelo Island.

Precipitation along the coast averages about 50 inches per year. The maximum 1-day (24 hours) rainfall totals at Savannah and Sapelo Island are 8.47 inches (associated with Hurricane Easy-September 5, 1950) and 8.07 inches (June 23, 1984), respectively. Snowfall along the Georgia coast is rare. However, Savannah and Sapelo Island did record significant snowfall (3 to 4 inches) in December 1989. November and December are typically the driest months of the year whereas August and September, included in the hurricane season, are usually the wettest months.

The first recorded hurricane to cause significant damage to the Georgia coast struck the Charleston, South Carolina, area on September 15, 1752. Since that time, numerous hurricanes have passed along the Georgia coast, but surprisingly few have caused serious damage. The Georgia coast has not had a major hurricane (defined as at least a category 3 hurricane) since the late 1890s. Hurricanes off the east 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 its 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 (Carter 1970). Details for temperature and precipitation data are given in Table 1 and Figures 10 and 11.

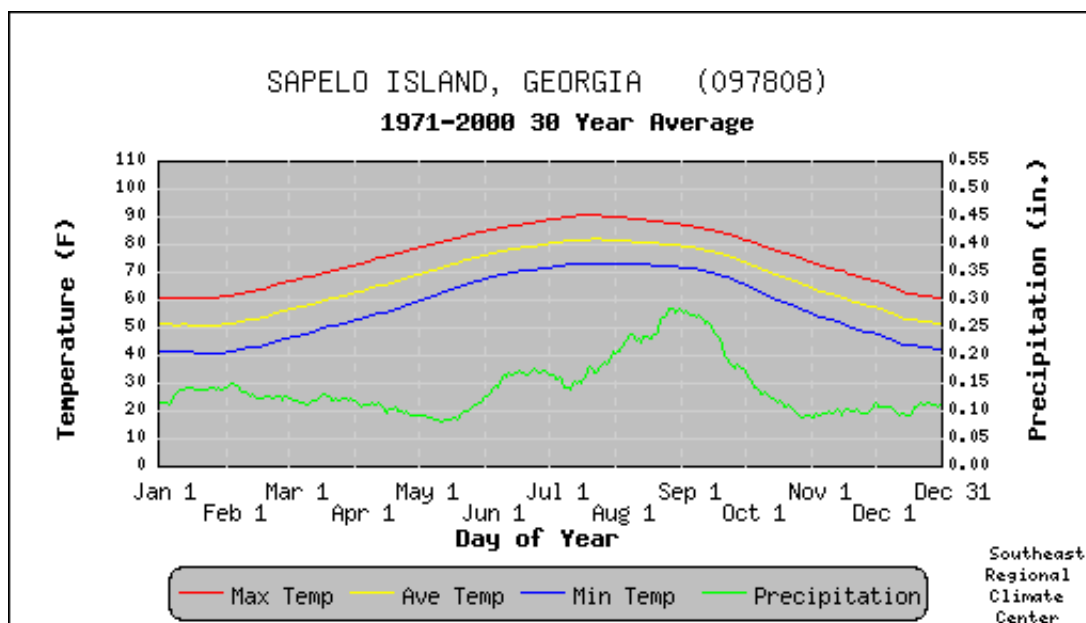
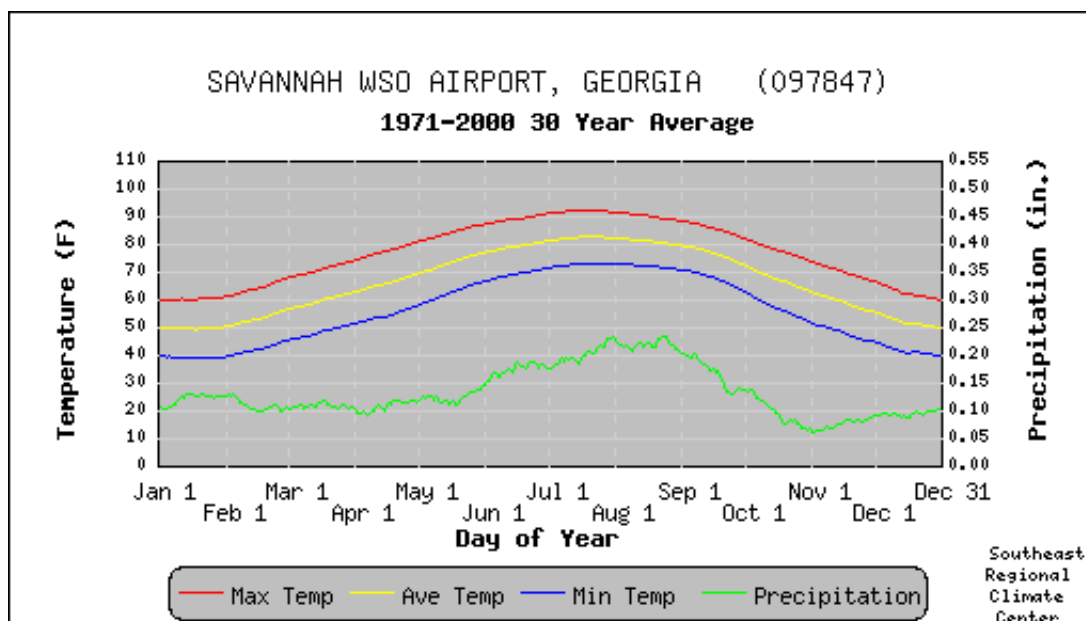
In Savannah the average relative humidity in mid-afternoon is about 54 percent. Humidity is higher at night, and the average at dawn is about 86 percent. The sun shines about 62 percent of the time in summer and winter. The wind is predominantly from the northeast and northwest in the winter (December – February), from the south in spring and summer (March – August), and from the northeast in the fall (September – November). The northerly winds of the winter and fall are much stronger than those of the summer and spring. Average wind speed is highest, 8.8 miles per hour, in February and March.

### *CLIMATE CHANGE AND GLOBAL WARMING*

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

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

Figures 10 and 11. 1971 - 2000 Temperature and precipitation



[Data is smoothed using a 29 day running average.]

- - Max. Temp. is the average of all daily maximum temperatures recorded for the day of the year.
- - Ave. Temp. is the average of all daily average temperatures recorded for the day of the year.
- - Min. Temp. is the average of all daily minimum temperatures recorded for the day of the year.
- - Precipitation is the average of all daily total precipitation recorded for the day of the year.

Source: The University of North Carolina, Chapel Hill. "The Southeast Regional Climate Center," Historical Climate Summaries for Georgia. [http://www.sercc.com/climateinfo/historical/historical\\_ga.html](http://www.sercc.com/climateinfo/historical/historical_ga.html)

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Global warming, resulting in melting of glaciers and ice sheets, will cause sea levels to rise. Globally, sea level has risen 4–10 inches during the past century. NASA estimates that the polar ice cap is melting at the rate of 9 percent per decade and that Arctic ice thickness has decreased 40 percent since the 1960s. NASA estimates that yearly, 50 billion tons of ice is melting from the Greenland ice sheet. NASA aerial surveys show that more than 11 cubic miles of ice is disappearing from the ice sheet annually. Considering that land less than 10 meters above sea level contains 2 percent of the world's land surface but 10 percent of its population -- in the United States, major impacts will be felt by large numbers of people living on the low-lying coastlands, particularly the Gulf and East coast states. The current pace of sea-level rise is three times the historical rate and appears to be accelerating.

The effects of climate change and global warming will be changes in weather/rainfall patterns, decreases in snow and ice cover, rising sea levels, and stressed ecosystems. For the southeastern United States and the Southern Coastal Plain region this can mean extreme precipitation events; greater likelihood of warmer/drier summers and wetter/reduced winter cold; and, alterations of ecosystems and habitats due to these changes in weather patterns – to name but a few possibilities. For example, since 1957, the climate of South Carolina has been characterized by warmer and drier conditions. According to recent observations (1957-1991), the annual average temperature increased by nearly 1°F. The largest temperature increase resulted during the 1980s from warmer than average wintertime temperatures. Precipitation decreased 6 percent or 3.2 inches primarily due to lower than average springtime rainfall. Thus, the current trend in South Carolina's climate resulted in warmer and drier conditions (SCDNR undated).

In regard to alterations of ecosystems and habitats, a recent study of the effects of climate change on eastern U.S. bird species concluded that as many as 78 bird species could decrease by at least 25 percent, while as many as 33 species could increase in abundance by at least 25 percent due to climate and habitat changes (Matthews et al. 2004).

## Georgia

- By 2100, temperatures in Georgia could increase by about 2°F in summer (with a range of 1-4°F), 3°F in winter and spring (with a range of 1-7°F), and 4°F in fall (with a range of 2-9°F). Precipitation is estimated to increase by about 10 percent in winter and spring and by 15-40 percent in summer and fall.
- Although it is not clear how severe storms such as hurricanes would change, an increase in the frequency and intensity of summer thunderstorms is possible.
- Georgia's coastline, only about 100 miles long, has a barrier island system that includes 13 islands – The Golden Isles of Georgia. Behind the barrier islands of the Georgia coast lie extensive salt marshes dominated by smooth cordgrass. These 375,000 acres of salt marshes make up 1/4 of the remaining salt marshes in the eastern United States. The highly productive marshes provide homes for oysters and clams and serve as nursery grounds for young shrimp, crab, and fish. The marshes protect the shorelines from erosion and also act as a purification system by filtering out many pollutants added to the waters by human activities. Changes in rainfall would alter stream flow and flooding patterns of these wetlands, which are very sensitive to fairly small changes in water levels.
- In the Savannah area sea level is rising by 13 inches per century, and it is likely to rise another 25 inches by 2100. The wetlands along the low-lying coasts of Georgia are subsiding and may be either flooded or washed away as sea levels rise.



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- Possible responses to sea level rise include building walls to hold back the sea, allowing the sea to advance and adapting to it, and raising the land (i.e., replenishing beach sand and elevating houses and infrastructure). Each of these responses will be costly, either in out-of-pocket costs or in lost land and structures. For example, the cumulative cost of sand replenishment to protect the coast of Georgia from a 20-inch sea level rise by 2100 is estimated at \$154 million to \$1.3 billion (EPA, September 1997).
  - Ecosystems in Georgia consist largely of extensive forests and diverse wetlands, including the Okefenokee Swamp, extensive coastal tidal marshes, tidal creeks, and riparian forests, all of which are sensitive to changes in climate, especially changes in rainfall.

#### **South Carolina:**

- By 2100, temperatures in South Carolina could increase by 3°F (with a range of 1-5°F) in all seasons (slightly less in winter and summer, slightly more in spring and fall) (EPA, September 1998). Higher temperatures and increased frequency of heat waves may increase the number of heat-related deaths and the incidence of heat-related illnesses.
- There are 2,876 miles of tidally influenced shoreline in South Carolina. Historical rates of accretion and erosion vary considerably across the state's coastline — erosion has been most severe on a 20-mile section of the Grand Strand and parts of the Santee delta, while Kiawah Island is accreting at a rate of 9 feet per year.
- At Charleston, sea level is rising by 9 inches per century, and it is likely to rise another 19 inches by 2100. The cumulative cost of sand replenishment to protect the coast of South Carolina from a 20-inch sea level rise by 2100 is estimated at \$1.2-\$9.4 billion (EPA, September 1998).
- Erosion is likely to increase under a 1- to 3-foot rise in sea level. The potential for increased storm damage as a result of sea level rise is particularly high along the densely developed Grand Strand.
- Sea level rise could lead to flooding of low-lying property, loss of coastal wetlands, erosion of beaches, saltwater contamination of drinking water, and decreased longevity of low-lying roads, causeways, and bridges. In addition, sea level rise could increase the vulnerability of coastal areas to storms and associated flooding.
- Warmer seas could contribute to the increased intensity, duration, and extent of harmful algal blooms, called red tides. These blooms damage habitat and shellfish nurseries, can be toxic to humans, and can carry bacteria like those causing cholera. Brown algal tides and toxic algal blooms already are prevalent in the Atlantic Ocean. Warmer ocean waters could increase their occurrence and persistence.
- South Carolina is dominated by coastal ecosystems that provide critically important habitat for endangered and threatened species such as the American alligator, Bachman's warbler, brown pelican, loggerhead sea turtle, piping plover, red-cockaded woodpecker, shortnose sturgeon, and wood stork. Sea level rise under a changing climate could threaten many low-lying coastal ecosystems.

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The SCDNR, Office of the State Climatology, further details some of the changes the state (and the southeast) might expect:

- Agriculture and the fishing industry -- While experts estimate that United States agricultural production will be adequate for domestic needs even under the most extreme scenario, they do expect major regional changes in the production and quality of food commodities. Production is generally seen as shifting northward, with crops in the southeast particularly vulnerable.
- Productivity could change -- Although warmer temperatures may lead to increased yields in some parts of the country, Georgia and South Carolina already have a high baseline temperature. Adding to it is likely to increase the moisture and heat-stress crops are subjected. The wettest scenario does not offset crops' increased water needs, and the dry one suggests yield could decrease by nearly 80 percent. Even the direct positive effects on photosynthesis of a CO<sub>2</sub>-enriched atmosphere cannot in such cases make up for the indirect effects of moisture-stress resulting from climatic change.
- Need for irrigation may increase -- Under the wet model scenario of the Goddard Institute of Space Studies, it is still estimated that the southeast will require increased irrigation. Already-irrigated land will require more water, and more land will require irrigation.
- Crop mix may change -- With warmer temperatures, crops like corn would cease to be profitable in the southeast, while heat-tolerant crops like cotton could make a comeback.
- Disease and pest vulnerability might increase -- Warmer conditions may accelerate the life cycles of insect pests, leading to attacks on plants at earlier and more susceptible stages of growth. The range of some southeast coast pests could also shift northwards if winters became less severe.
- Cultivated acreage could decrease -- Because many farms are already marginal enterprises, farmers may not be able to compete in a changed environment. The amount of land under cultivation could decrease.
- Fish and shellfish populations could be reduced -- Both increased water temperatures and changes in the salinity of habitats could reduce the population of species profitable to the state's fishing industry.
- Forestry -- Dieback of forests in 30 to 80 years. Even modest warming could cause significant changes, but a CO<sub>2</sub>-induced warming poses the additional threat of occurring so quickly that forests would not be able to adjust in time.
  - Loss of species. Southern hardwoods (e.g., black gum, laurel oak, and elm) might replace loblolly pines as the dominant species.
  - Conversion of forests to grasslands. The drier scenarios suggest that sections of the southeast might not support forests at all. Abandoned farms that have traditionally reverted to forests might now remain in grasses.
  - Increased vulnerability to pests and disease. Not only is the range of pests likely to increase, but climate-stressed stands are more susceptible to attack by disease, pests, and fire.
- Water Resources -- Exactly how water resources will be affected by climate change is difficult to ascertain. Not only do the Global Climate Models (GCMs) vary widely in how they predict precipitation (i.e., the supply of water) to change, but climate changes will also influence the demand for water.

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- Water resource availability could change. Studies indicate the regional availability and reliability of water resources may be responsible for the most dramatic effects of climate change. With warmer temperatures, demand for water is likely to increase for agriculture, energy, cooling, and recreation. It is not certain whether the supply will be able to meet the demand.
  - Water quality could be affected. Regardless of precipitation changes, water quality could be affected. Drier scenarios create oxygen-starved lakes and streams; wet scenarios increase the threat of pollution from runoff.
  - Risk of flooding might increase. The capacity of current drainage system to handle an increase in the frequency of large amounts of precipitation might be exceeded under some scenarios.
- Energy -- Our demand for electricity is rather sensitive to the weather and to industrial growth. Changes in the weather patterns mean changes in energy consumption. Higher temperatures would mean:
    - An increase demand for air conditioning. Higher summertime temperatures would mean increased use of air conditioners.
    - Decrease in demand for heating. Warmer winters would decrease the amount of energy required for heating.
    - Require an increase in electrical capacity. Higher demands for air conditioning in the summer would be partially offset by higher wintertime temperatures, affecting total consumption only moderately. But the periods could require a significant increase in South Carolina and Georgia's electrical capacity.

## *GEOLOGY AND TOPOGRAPHY*

The mainland rivers that flow into the Atlantic Ocean along the Georgia and southern South Carolina coasts 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 relic coastal features, such as barrier islands and lagoons, are still evident in many places. The Coastal Plain (the youngest province) is divided into upper and lower regions. The western edge of the lower Coastal Plain is marked by the ocean's highest incursion, (extending inland for approximately 65 miles between Savannah and St. Mary's Rivers), during the Pleistocene epoch, which began about 2 million years ago.

The eastern lower Coastal Plain is characterized by eight major islands and island groups bordering the 100 miles of the Georgia and southern South Carolina coast as shown in Figure 12. The larger barrier islands are a composite of a core of beach and dune deposits formed about 40,000 – 50,000 years ago during the Pleistocene epoch when sea levels were about 6 feet above the present level.

**Table 1. Climatological normals**

<b>Climatological normals for the Years 1971-2000  National Climatic Data Center (NCDC)  Savannah,GA (097847) and Sapelo Island, GA (097808)</b>								
	<b>Savannah</b>				<b>Sapelo Island</b>			
<b>Month</b>	<b>High (°F)</b>	<b>Low (°F)</b>	<b>Mean (°F)</b>	<b>Rain (inches)</b>	<b>High (°F)</b>	<b>Low (°F)</b>	<b>Mean (°F)</b>	<b>Rain (inches)</b>
<b>Jan</b>	60.4	38.0	49.2	3.95	60.1	41.9	51.0	4.07
<b>Feb</b>	64.1	40.9	52.5	2.92	62.1	43.7	52.9	3.53
<b>Mar</b>	71.0	47.5	59.3	3.64	68.0	49.9	59.0	3.97
<b>Apr</b>	77.7	52.9	65.3	3.32	74.5	56.2	65.4	3.01
<b>May</b>	84.3	61.3	72.8	3.61	81.0	64.7	72.9	2.81
<b>Jun</b>	89.5	68.1	78.8	5.49	86.4	71.1	78.8	4.98
<b>Jul</b>	92.3	71.8	82.1	6.04	89.8	73.7	81.8	4.98
<b>Aug</b>	90.3	71.3	80.8	7.20	88.3	73.3	80.8	7.48
<b>Sep</b>	86.0	67.3	76.7	5.08	84.5	70.3	77.4	7.30
<b>Oct</b>	78.1	56.1	67.1	3.12	77.2	60.9	69.1	3.85
<b>Nov</b>	70.5	46.9	58.7	2.40	69.7	51.5	60.6	2.87
<b>Dec</b>	62.6	40.1	51.4	2.81	61.7	44.1	52.9	2.99
<b>Annual</b>	77.2	55.2	66.2	49.58	75.3	58.4	66.9	51.84

**Figure 12. Barrier Islands of the Lower Coastal Plain**



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About 15,000 years ago, when the shoreline was 75-80 miles east of where it is today (along the edge of the continental shelf), glaciation ended, the continental ice sheet melted, and the sea-level began to rise. About 5,000 years ago, the rate of sea-level rise decreased from 3 feet per century to less than 1 foot per century. Holocene barrier islands began to form and migrate westward, and welded onto the older Pleistocene barrier islands. This westward migration is still occurring as the advancing seas continue to erode the eastern-facing beaches and redeposit the sediments into the marshes and lagoons behind the islands. The Holocene barrier islands directly south of the Savannah River (Tybee and Wassaw) and south of the Altamaha River (Little St. Simons and Sea Island) are more separated from their Pleistocene counterparts than the other Holocene islands. The inward advancement of these islands has been impeded by the far more copious output of sediments by the Savannah and the Altamaha Rivers relative to the other smaller rivers. Where the smaller rivers produced less sediment, the Holocene islands have migrated closer and, in some cases, have become attached to the older islands (St. Catherine's and Cumberland).

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.

Elevations on the barrier islands typically range from sea level to about 25 feet, although individual dunes may be higher. Broad, nearly level areas interspersed with low, gently sloping ridges typically characterize topography of the islands. Islands and portions of islands that are of more recent origin (Wassaw and Blackbeard) may be characterized by steep, parallel dune ridges. 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

Soils directly influence the kind and amount of vegetation and the amount of water available. In this way they indirectly influence the kind of wildlife that can live in an area. Soils are organized into a taxonomic classification system by the U.S. Department of Agriculture, Natural Resources Conservation Service, in which each soil is categorized by order, suborder, great group, subgroup, family, and soil series. Nationwide, there are twelve soil orders, three of which are predominantly found on the refuges of the Complex – Inceptisols (Humaquepts); Entisols (Quartzipsamments and Sulfaquepts); and, Spodosols (Alorthods and Alaquods).

The principal sources of heavy minerals and sands on the Georgia and southern South Carolina coast are the (1) Altamaha and Savannah Watersheds, which originate in the Piedmont and mountainous Blue Ridge province, respectively; (2) smaller Coastal Plain watersheds that are of more recent origin; and (3) suspended material from the continental shelf.

Soils of the Blue Ridge and Piedmont provinces are derived from crystalline rocks dating to pre-Cambrian time. 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 account for most of the exchange capacity. They are subject to moderate to severe leaching, and many are excessively drained. Principal soil series include Blanton, Galestown, Klej, Lakeland, and Palm Beach.

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The lower, poorly drained coastal area is characterized by soils of the following series: Mandarin, Rutlege, Chipley and Seabrock. These soils dominantly have a thermic soil temperature regime, an aquic soil moisture regime, and sandy-siliceous mineralogy. They are very deep, usually poorly drained with rapid to moderate permeability, and often loamy. Parent material of the coastal soil series are primarily marine and to a lesser extent fluvial. Most of these soil series are characteristically very acid, but locally on the islands they may be neutral to slightly alkaline due to the presence of oyster shells in the profile. Dunes along the beaches contain relatively few shell fragments. The seaward beaches and dune ridges of the barrier islands are made up of fine quartz sands. Apparently, both of these attributes are due to the low wave energies along the Georgia and southern South Carolina coast, which lack the ability to transport, fragment, and abrade materials. Heavy minerals of the beaches and dunes more closely resemble assemblages from the Piedmont rivers than they do assemblages from Coastal Plain rivers. This suggests that Coastal Plain rivers are less important contributors to present beach sediments than the Piedmont rivers. There is also an apparent relationship between the composition of beach sands and the mineralogy of the adjacent continental shelf, giving further evidence that continental shelf material is another important sediment source.

The Bohicket and Capers soils series are dominant in tidal marshes of the barrier islands. These are silty clay loam soils which are very poorly drained and very slowly permeable. They tend to be slightly acid to moderately alkaline (USDA 2008).

## *GROUNDWATER*

The limestones of Tertiary and Quaternary age that underly the Coastal Plain of Georgia and southern South Carolina form one of the most productive aquifer systems in the country. The Tertiary limestone is several thousand feet thick, ranging in age from Paleocene to Pliocene. The hydrologic unit of this limestone, deposited in the period from mid-Eocene to mid-Miocene, is the principal artesian or Coastal Plain aquifer.

Three named aquifers characterize the groundwater regime of southeastern Georgia and southern South Carolina the: (a) Surficial aquifer system; (b) Floridan aquifer system; and, (c) Southeastern Coastal Plain aquifer system. Along the coast of Georgia and southern South Carolina, the surficial aquifer system is typically less than 50 feet, largely composed of unconsolidated sand and shell and generally thickens coastward. Complex interbedding of fine- and coarse-textured rocks and sandy marine terrace deposits (ranging in age from Pleistocene to Holocene) is typical of the surficial system. The surficial aquifer is typically unconfined and most of the water that enters the system moves quickly along short flowpaths and discharges as baseflow to surface streams. Thin clay beds separate the surficial system from the Floridan system.

The Floridan aquifer is the largest, oldest, and deepest aquifer in the southeastern United States, ranging over 100,000 square miles and underlying coastal parts of South Carolina, Georgia, Alabama, and all of Florida (University of Florida, 2003). It has an estimated flow of approximately 10 billion gallons of water per day (bgd). The aquifer is one of the major sources of groundwater in the United States, supplying more than 3 bgd. The aquifer supplies over 50 percent of the water requirements for coastal Georgia and South Carolina. Georgia alone withdraws approximately 700 million gallons per day.

The Floridan aquifer, composed of a thick layer of carbonate rocks of Tertiary age, can be divided into the Upper and Lower Floridan systems, differentiated by porosity and permeability and separated by a less-permeable confining unit. The Upper Floridan, which consists of the Suwannee and Ocala limestones and also the upper portion of the Avon Park formation, is highly permeable and is the source of the majority of withdrawals from the Floridan aquifer. The Lower Floridan includes the

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lower part of the Avon Park formation as well as the Oldsmar limestone and the upper part of the Cedar Keys formation. Before development of the Floridan aquifer, nearly all of its discharge was to springs and streams and offshore freshwater springs in coastal areas. Development of the aquifer began in the late 1800s in Savannah. Since then, large industrial, municipal, commercial, and agricultural withdrawals of groundwater have led to a large cone of depression (~50 km radius) in the groundwater table in the Savannah area, and to a lesser extent in other coastal areas of Georgia (i.e., Brunswick and St. Mary's). This has resulted in declining water levels, saltwater intrusion, and lack of fresh groundwater supplies.

## *SURFACE WATER*

Stream – aquifer relations for the Upper Floridan aquifer are important. The surface water systems interact with the underlying groundwater system to varying degrees, largely based on the degree of incision of a river into a surficial aquifer and on topography. The surface streams and rivers are interconnected with the surficial aquifer and form a single hydrologic entity that is stressed by natural hydrologic and climatic factors (viz. drought) and anthropogenic factors. In general, there is greater interconnection between the surface water and groundwater systems in the upper Coastal Plain, due to greater incision of aquifers by streams and greater topographic relief, than in the lower Coastal Plain.

There are four major river systems within the Complex area and along the coastal regions of southern South Carolina and Georgia. They are (north to south) the Salkehatchie, Savannah, Ogeechee, and Altamaha Rivers. The Salkehatchie River basin is approximately 3,300 square miles and lies entirely within the southern portion of South Carolina, draining most of Beaufort and Jasper Counties. Near the coast, the Salkehatchie basin comprises several interconnecting smaller drainages. The Broad River joins the Chechessee River and the Beaufort River to form Port Royal Sound. Calibogue Sound accepts drainage from the May River, the Cooper River, and Broad Creek, and is connected to Port Royal Sound via the Atlantic Intracoastal Waterway (AIWW). The AIWW continues to connect the system to the New River, the Wright River, and the Savannah River, all draining into the Atlantic Ocean. The Savannah River, which forms the border between South Carolina and Georgia, is about 300 miles long, has a drainage area of approximately 10,600 square miles, and an average discharge of 13,100 cubic feet per second (cfs). The lower 50 miles of the Savannah River are tidal. The Ogeechee River is about 266 miles in length, drains approximately 5,220 square miles and has an average annual flow of about 4,000 cfs. The lower, coastline portion of the Ogeechee basin drains almost all of Chatham, Bryan, Liberty, and McIntosh Counties in Georgia. The Altamaha River has the greatest discharge along the Atlantic coast. It is formed by the confluence of the Ocmulgee and Oconee Rivers, has a drainage area of approximately 13,600 square miles and an average discharge of about 14,300 cfs, but drains only a small portion of McIntosh County.

The Georgia and southern South Carolina coasts are subject twice daily to tides, both approximately the same height. The height of the tide varies between 5 and 9 feet. The tidal movement of saline waters into the estuaries and the drainage of rivers into them cause the complicated hydrologic patterns characteristic of estuaries, with tidal action usually serving as the dominant force mixing freshwater and saltwater.

## *WATER QUALITY*

Coastal waters in the United States include estuaries, coastal wetlands, coral reefs, mangrove and kelp forests, seagrass meadows, and upwelling areas. Critical coastal habitats provide spawning grounds, nurseries, shelter, and food for finfish, shellfish, birds, and other wildlife. The nation's coastal resources also provide nesting, resting, feeding, and breeding habitat for 85 percent of waterfowl and other migratory birds. Estuaries are bodies of water that provide transition zones



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between the freshwater from rivers and the saline environment of the ocean. This interaction produces a unique environment that supports wildlife and fisheries and contributes substantially to the economy of the United States.

According to the EPA, the overall condition of southeast coast estuaries is fair to good, with environmental stressors (e.g., nutrients, contaminants) and conditions for aquatic life showing few signs of significant impairment. However, there is evidence of human-induced stress in some areas caused by rapid population growth in coastal areas of South Carolina and Georgia. Stressors associated with such population growth include habitat loss, resource depletion, nonpoint source pollution, and nutrient loadings to estuaries and coastal waters. The ecological condition evaluation is based on five indicators: (1) Water quality index (dissolved oxygen, chlorophyll *a*, nitrogen, phosphorus, water clarity); (2) sediment quality index (sediment toxicity, sediment contaminants, sediment TOC), (3) benthic index (number of species, species dominance, species abundance, pollution-sensitive species); (4) coastal habitat index (wet-land loss and wet-land loss rate); and (5) fish tissue contaminants index (metals, pesticides, PCB's).

Localized water quality concerns are related to low dissolved oxygen concentrations in Point Royal Sound and the Savannah River Harbor; elevated concentrations of fecal coliform bacteria in coastal waters limiting shell fishing; and elevated concentrations of mercury in some species of fish. Both South Carolina and Georgia warn citizens against consuming large quantities of king mackerel, because of potential mercury contamination.

#### *AIR QUALITY*

The Clean Air Act (CAA) of 1970 (as amended in 1990 and 1997) requires the EPA to implement air quality standards to protect the nation's health and welfare. National Ambient Air Quality Standards (NAAQS) were set for six pollutants commonly found throughout the United States: lead, ozone, nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), and particulate matter less than 10 and 2.5 microns in diameter (PM<sub>10</sub> and PM<sub>2.5</sub>) (EPA undated).

The GADNR, Environmental Protection Division (EPD), Air Protection Branch, Ambient Monitoring Program conducts monitoring to satisfy CAA monitoring requirements and has monitored air quality in Georgia for more than 30 years. In 2006, the Air Sampling Network collected data at 65 locations in 37 counties in Georgia. Among these 65 locations, there are 8 air sampling locations in southeastern Georgia in the vicinity of the Complex, along the Atlantic coastline – five are in Chatham County, and three are in Glynn County. The five air quality monitoring sites in the Chatham County/Savannah area are: Shyman Middle School (130510014), Market Street (130510017), East President Street (130510021), Mercer Middle (130510091), and West Lathrop/Augusta Avenue (130511002). The three sites in the Glynn County/Brunswick area are: Arco Pump Station (131270004), Risley Middle School (131270006), and Brunswick College (131273001) (GADNR 2006).

The South Carolina Department of Health and Environmental Control (DHEC), Bureau of Air Quality (BAQ) operates National Ambient Monitoring Stations (NAMS), State and Local Ambient Monitoring Stations (SLAMS), and industrial monitoring sites to measure concentrations of the six NAAQS pollutants. In 2006, the BAQ operated a network of 130<sup>±</sup> monitors/samplers at 55 sites throughout the state. Among these 55 sites, one air quality monitoring location is in southeastern South Carolina in the vicinity of the SCRC. The site is in Beaufort County, in Beaufort on King Street (45-013-0007) (DHEC 2006).

Areas that meet the national ambient air quality standards are designated “attainment areas,” while areas not meeting the standards are termed “non-attainment” areas. The 2005-2006 monitoring results, from the total of nine Georgia and South Carolina air monitoring sites listed above, indicate that the entire Complex area would qualify as an attainment area for all monitored pollutants, and that regional air quality improvement is being noted (Tables 2 and 3).

The Air Quality Index (AQI) is a summary index for reporting daily air quality. It tells how clean or polluted the air is, and what associated health effects might be of concern. The AQI focuses on health effects that may be experienced within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. (Because all areas of the United States are currently attaining the NAAQS for lead, the AQI does not specifically address lead.) For each of these pollutants, EPA has established national air quality standards to protect public health. Based on this Index, and data collected in 2006 and 2007, air quality in Chatham and Glynn Counties in Georgia; and, in Beaufort, South Carolina, show the following (EPA):

County	<u>Good/Moderate Air Quality</u>		<u>Unhealthy Air Quality</u>	
	<u>2006(%)</u>	<u>2007(%)</u>	<u>2006(%)</u>	<u>2007(%)</u>
Chatham, GA	99.5	98	0.5	2
Glynn, GA	99.5	99.5	0.5	0.5
Beaufort, SC	100	99	0	1

## BIOLOGICAL RESOURCES

### *HABITAT*

Plants of special concern and/or significance of the SCRC are listed in Appendix I.

### **Blackbeard Island NWR**

Blackbeard Island NWR's 5,618 acres include approximately 1,163 acres of freshwater impoundments and marshes, 2,000 acres of saltwater marsh, 2,115 acres of pine and oak forests, and 340 acres of sand beach. The more than 2,000 acres of forest are a mosaic habitat of old growth maritime forest, savannahs, and levees. The north end of Blackbeard NWR is thickly vegetated with palmettos beneath a canopy of live oaks and other hardwoods. Two freshwater impoundments on the north end concentrate ducks in the winter months and wading birds, including the federally endangered wood stork, in the summer. These ponds are populated year-round by great numbers of American alligators. In 1975, 3,000 acres of salt marsh and pine forest on the south end of the island were designated as Wilderness. The southern end of the island supports old growth slash and loblolly pine with a diverse understory that includes red bay, yaupon holly, and wax myrtle. These habitats provide for one of the highest breeding concentrations of painted buntings on the east coast (USFWS, Jan. 17, 2008). Saltwater creeks passing through the marshlands are open to fishing and the beaches provide recreational opportunities such as sunbathing and fishing. Miles of pristine beach provide important habitat for Atlantic loggerhead sea turtles, piping plovers, and many other beach-dependent wildlife species. Table 4 details the general land cover classifications of Blackbeard NWR. Blackbeard NWR habitat details are displayed in Figure 13.

Table 2. Air quality by county

Air Quality Statistics by County, 2005 and 2006 <sup>a</sup>											
County	2000 Population	CO 8-hr (ppm)	Pb Qmax (µg/m <sup>3</sup> )	NO <sub>2</sub> AM (ppm)	O <sub>3</sub> 1-hr (ppm)	O <sub>3</sub> 8-hr (ppm)	PM <sub>10.0</sub> Wtd AM (µg/m <sup>3</sup> )	PM <sub>2.5</sub> Wtd AM (µg/m <sup>3</sup> )	PM <sub>2.5</sub> 24-hr (µg/m <sup>3</sup> )	SO <sub>2</sub> AM (ppm)	SO <sub>2</sub> 24-hr (ppm)
2005											
Chatham County, GA	232048	ND	0.00	ND	0.083	0.068	24.0	14.9	31.0	0.005	0.040
Glynn County, GA	67568	ND	0.00	ND	0.077	0.064	22.0	12.8	26.0	0.001	0.008
Beaufort County, SC	120937	ND	0.00	ND	ND	ND	ND	IN	IN	ND	ND
2006											
Chatham County, GA	232048	ND	0.00	ND	0.080	0.069	ND	13.9	28.0	0.003	0.023
Glynn County, GA	67568	ND	0.00	ND	0.078	0.069	ND	11.6	26.0	ND	ND
Beaufort County, SC	120937	ND	0.00	ND	ND	ND	ND	11.0	24.0	ND	ND
National Ambient Air Quality Standards --		9.0	1.50	0.053	0.125	0.085	50.0	15.0	65.0	0.030	0.140

CO - Highest second maximum non-overlapping 8-hour concentration (applicable NAAQS is 9 ppm)

Pb - Highest quarterly maximum concentration (applicable NAAQS is 1.5 µg/m<sup>3</sup>)

NO<sub>2</sub> - Highest arithmetic mean concentration (applicable NAAQS is 0.053 ppm)

O<sub>3</sub> (1-hour) - Highest second daily maximum 1-hour concentration (applicable NAAQS is 0.125 ppm)

O<sub>3</sub> (8-hour) - Highest fourth daily maximum 8-hour concentration (applicable NAAQS is 0.085 ppm)

PM<sub>10.0</sub> - Highest weighted annual mean concentration (applicable NAAQS is 50 µg/m<sup>3</sup>)

- Highest second maximum 24-hour concentration (applicable NAAQS is 150 µg/m<sup>3</sup>)

PM<sub>2.5</sub> - Highest weighted annual mean concentration (applicable NAAQS is 15 µg/m<sup>3</sup>)

- Highest 98<sup>th</sup> percentile 24-hour concentration (applicable NAAQS is 65 µg/m<sup>3</sup>)

SO<sub>2</sub> - Highest annual mean concentration (applicable NAAQS is 0.03 ppm)

- Highest second maximum 24-hour concentration (applicable NAAQS is 0.14 ppm)

ND - Indicates data not available

AM - Annual mean

Q<sub>max</sub> - Quarterly maximum

<sup>a</sup> U.S. Environmental Protection Agency, <http://www.epa.gov/airtrends/factbook.html>

IN - Indicates insufficient data to calculate summary statistic

µg/m<sup>3</sup> - Units are micrograms per cubic meter

ppm - Units are parts per million

**Table 3. Air quality by city**

Air Quality Statistics by City, 2005 and 2006 <sup>a</sup>										
Metropolitan Statistical Area	2000 Population	CO 8-hr (ppm)	Pb Qmax (µg/m <sup>3</sup> )	NO <sub>2</sub> AM (ppm)	O <sub>3</sub> 1-hr (ppm)	O <sub>3</sub> 8-hr (ppm)	PM <sub>10.0</sub> Wtd AM (µg/m <sup>3</sup> )	PM <sub>2.5</sub> Wtd AM (µg/m <sup>3</sup> )	PM <sub>2.5</sub> 24-hr (µg/m <sup>3</sup> )	SO <sub>2</sub> 24-hr (ppm)
<b>2005</b>										
Savannah, GA MSA	293000	ND	0.000	ND	0.083	0.068	24.0	14.9	31.0	0.005
<b>2006</b>										
Savannah, GA MSA	293000	ND	0.000	ND	0.080	0.069	ND	13.9	28.0	0.003
<b>National Ambient Air Quality Standards --</b>		<b>9.0</b>	<b>1.50</b>	<b>0.053</b>	<b>0.125</b>	<b>0.085</b>	<b>50.0</b>	<b>15.0</b>	<b>65.0</b>	<b>0.140</b>

CO - Highest second maximum non-overlapping 8-hour concentration (applicable NAAQS is 9 ppm)

Pb - Highest quarterly maximum concentration (applicable NAAQS is 1.5 µg/m<sup>3</sup>)

NO<sub>2</sub> - Highest arithmetic mean concentration (applicable NAAQS is 0.053 ppm)

O<sub>3</sub> (1-hour) - Highest second daily maximum 1-hour concentration (applicable NAAQS is 0.125 ppm)

O<sub>3</sub> (8-hour) - Highest fourth daily maximum 8-hour concentration (applicable NAAQS is 0.085 ppm)

PM<sub>10.0</sub> - Highest weighted annual mean concentration (applicable NAAQS is 50 µg/m<sup>3</sup>)

- Highest second maximum 24-hour concentration (applicable NAAQS is 150 µg/m<sup>3</sup>)

PM<sub>2.5</sub> - Highest weighted annual mean concentration (applicable NAAQS is 15 µg/m<sup>3</sup>)

- Highest 98<sup>th</sup> percentile 24-hour concentration (applicable NAAQS is 65 µg/m<sup>3</sup>)

SO<sub>2</sub> - Highest annual mean concentration (applicable NAAQS is 0.03 ppm)

- Highest second maximum 24-hour concentration (applicable NAAQS is 0.14 ppm)

ND - Indicates data not available

**Table 3, Continued**

AM - Annual mean

Q<sub>max</sub> - Quarterly maximum

µg/m<sup>3</sup> - Units are micrograms per cubic meter

ppm - Units are parts per million

Notes: Data from exceptional events are not included. The monitoring data represent the quality of air in the vicinity of the monitoring site and, for some pollutants, may not necessarily represent county-wide air quality.

<sup>a</sup> U.S. Environmental Protection Agency, <http://www.epa.gov/airtrends/factbook.html>

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### *Dune Habitat on Blackbeard Island NWR*

A Coastal Plain Southern Maritime Forest habitat is present on stabilized upland dunes of barrier islands, and near-coastal strands from central South Carolina (approximately Santee River) southward to approximately Volusia County, Florida. Vegetation structure and composition are influenced by salt spray, extreme disturbance events, and the distinctive climate of the immediate coast. Vegetation may include different woodland communities often dominated by southern pine species (i.e., longleaf, pond, and slash pine), densely shrubby oak-dominated (especially live oak) sub-canopies, and understories that can also include a Magnolia component. Unlike maritime vegetation to the north, this system may be more heavily influenced by natural fire regimes that may explain the dominance of fire-tolerant pine species.

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 deposition of more sand causes the dune to grow. Dunes and dune ridges along the Georgia-South Carolina 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.

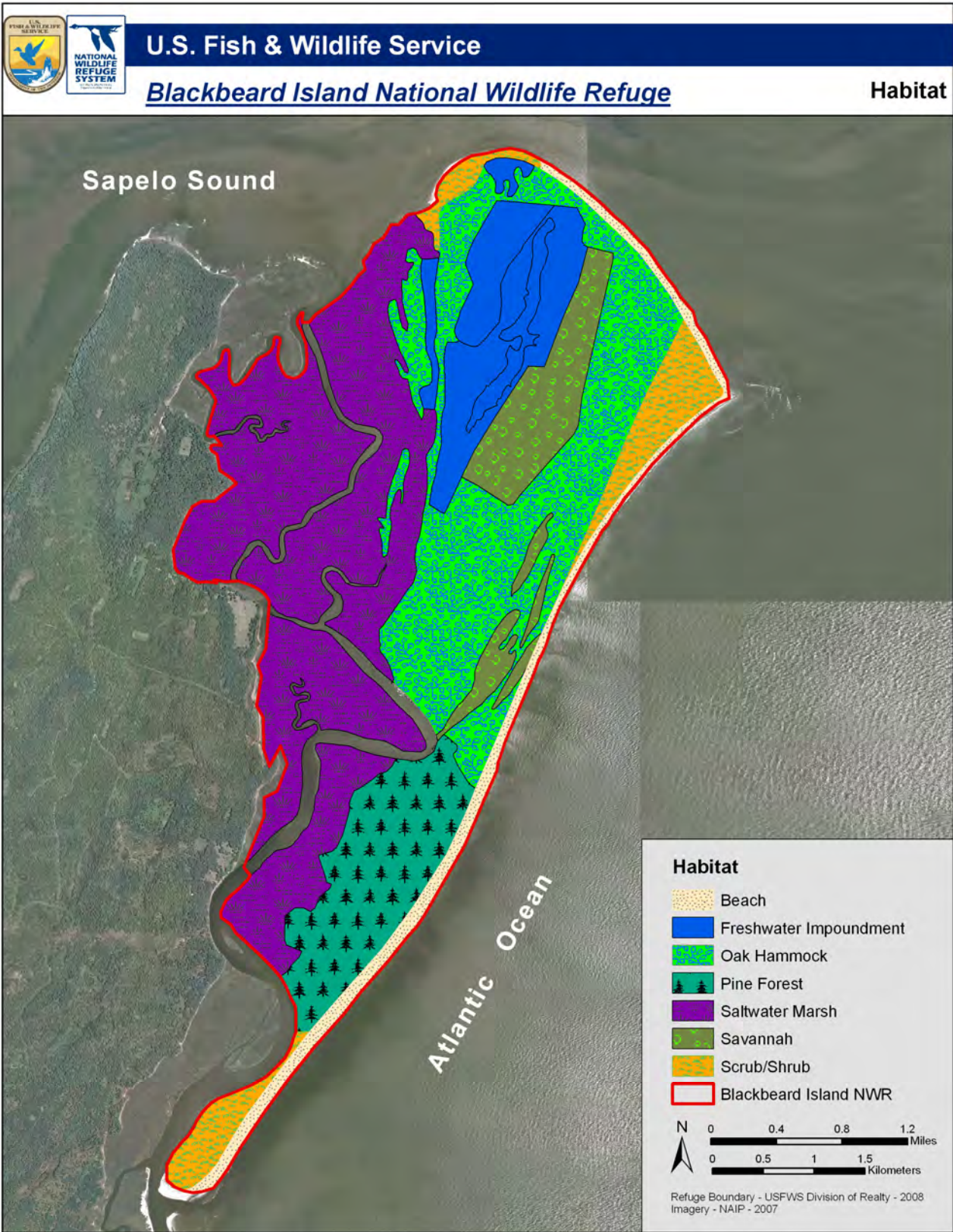
Vegetation also plays an important part in the formation and stabilization of dunes. Salt-resistant beach plants trap windblown sand, forming little mounds of sand or dunelets that grow as the plants respond with increased growth and trap more sand. Few species of vascular plants can survive the extremely harsh physical environment of the beaches and dunes. To inhabit this area, plants must have the ability to withstand salt spray, constant wind, full light

**Table 4. Land cover classifications**

Blackbeard Island NWR	
Cover Type	Percent
Developed Dry Land	0.1%
Undeveloped Dry Land	34.0%
Swamp	6.1%
Inland Fresh Marsh	10.3%
Tidal Fresh Marsh	1.5%
Transitional Salt Marsh	0.8%
Salt Marsh	34.3%
Estuarine Beach	0.7%
Tidal Flat	0.5%
Ocean Beach	0.4%
Inland Open Water	2.0%
Estuarine Water	4.8%
Open Ocean	0.0%
Brackish Marsh	2.0%
Tidal Swamp	2.6%
<b>Totals</b>	<b>100.0%</b>



Figure 13. General habitat types on Blackbeard Island National Wildlife Refuge





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intensity, high evaporation, high temperatures, roots that will endure exposure, and stems that will withstand burial by shifting sands. They also must be perennials able to keep above the sand, spread laterally, and withstand drought.

Distance from the surf and location relative to dunes or protective vegetation on the seaward side will determine the exposure of a site to the limiting factors listed above. 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. Plants occurring on the foredunes and the windward slope of the rear dunes are exposed to a greater intensity of salt spray and 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. Plants occurring on the lee slope of the foredunes or in the interdune area, where little salt is deposited, include some of the species previously mentioned along with bluestem (occupying the drier sites), prickly pear, seaside goldenrod, beach primrose, juniper, yaupon, wax myrtle, and live oak. Low, flat areas behind breaks in the foredunes that are periodically inundated by unusually high tides may contain stands of salt meadow cordgrass.

Behind the crest of the rear dunes, where sites are more protected from harsh conditions, vegetation is more diverse, with trees and shrubs being the dominant plants, including oak, red bay, wax myrtle, juniper, yaupon, cabbage palm, saw palmetto, and groundselbush. These trees and shrubs are often asymmetrical in form, with a sloped, sheared appearance, because they are damaged on the windward side by wind and salt spray—salt enters the leaves through abrasions caused by the lashing of wind action, and the resulting high chloride ion concentrations produces necrosis and death of exposed leaves and branches. However, pruning stimulates vigorous sprouting, resulting in the rapid formation of a dense canopy that reduces the efficiency of deposition on the plant and on the individual stems.

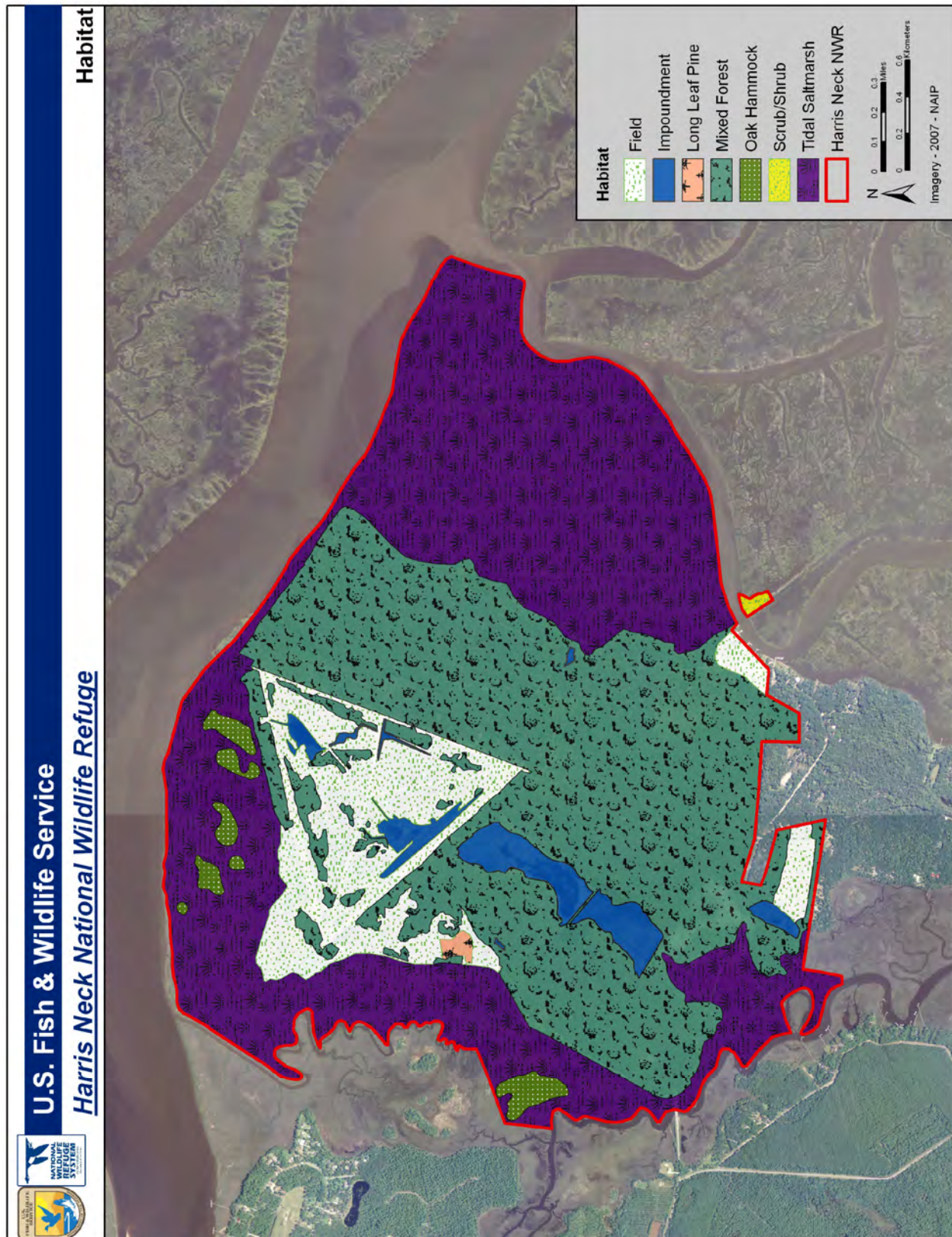
### **Harris Neck NWR**

Harris Neck NWR's 2,824 acres consist of approximately 705 acres of open fields, 663 acres of mixed pine/oak forest, 1,297 acres of salt marsh, and 157 acres of managed freshwater impoundments. Mudflats, thickets, swamps, and natural ponds are interspersed throughout the refuge. Table 5 details the general land cover classifications of Harris Neck NWR. There are 15 miles of paved roads and runways, which are remnants of the refuge's history as an airfield. The refuge supports notable concentrations of waterfowl, wading birds, shorebirds, songbirds, raptors, deer, turkey, quail, and alligators. Due to its accessibility and bird diversity, Harris Neck NWR was chosen as one of 18 sites forming the Colonial Coast Birding Trail, established in 2000. The refuge has six managed freshwater impoundments that support a wide variety of aquatic bird species. One impoundment has been intensively managed to support the endangered wood stork, with over 100 artificial nesting structures providing a safe, stable environment for a breeding colony. Some ponds are maintained as foraging areas for wood storks and many other species of wading birds. Harris Neck NWR habitat details are displayed in Figure 14.

**Table 5. Land cover classifications**

Harris Neck NWR	
Cover Type	Percent
Developed Dry Land	0.7%
Undeveloped Dry Land	50.8%
Swamp	3.0%
Inland Fresh Marsh	1.6%
Transitional Salt Marsh	1.1%
Salt Marsh	34.2%
Estuarine Beach	0.2%
Tidal Flat	0.0%
Inland Open Water	1.0%
Estuarine Water	2.0%
Brackish Marsh	5.5%
<b>Totals</b>	<b>100.0%</b>

Figure 14. General habitat types on Harris Neck National Wildlife Refuge



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## Pinckney Island NWR

The 4,053-acre Pinckney Island NWR includes Pinckney Island, Corn Island, Big Harry and Little Harry Islands, Buzzard Island, and numerous small hammocks. All together, the refuge is 2,729 acres of salt marsh and tidal creeks, 274 acres of forest, 240 acres of brush, 100 acres of grassland and fallow fields, 60 acres of roads and administrative land, and 38 acres of freshwater ponds; which collectively support a diversity of bird and plant life (Table 6). Table 7 details the general land cover classifications of Pinckney Island NWR.

Pinckney Island NWR has several unique/threatened habitats: maritime forest, slash pine, saw palmetto, ephemeral wetlands, and bluff oak associated with magnolia and spruce pine. The north end of Pinckney Island NWR, including many small hammocks, is dominated by live oak with water oak, loblolly pine, and cabbage palm as associates; secondary species include hickory, pecan, magnolia, sweet gum, red cedar, and lesser numbers of maple, southern red oak, laurel oak, sassafras, hackberry, redbud, and winged elm. A small number of longleaf, loblolly, and slash pine plantations and volunteer pine stands are located throughout the refuge. Brush and hedge rows are dominated by wax myrtle and sweet gum with lesser amounts of sassafras, sumac, sycamore, and black cherry. The salt marsh consists primarily of salt marsh cord grass. Other typical vegetation found in a narrow band around the islands and in the higher marsh hammocks includes glasswort, needle grass, and sea oxeye.

Freshwater habitat on Pinckney Island NWR is limited to approximately 38 acres. There are between 30-50 small ponds/depressions, ranging from 0.5-acre up to 4 acres, which hold water during wetter periods of the year. Two of the freshwater ponds are recognized as among the best wading bird colony sites in the South Carolina coastal plain. Pinckney Island NWR habitat details are displayed in Figure 15.

## Savannah NWR

Savannah NWR, comprising 29,175 acres, is one of the largest federally protected tracts of land on the Georgia and South Carolina coasts. Refuge habitats include: (1) Bottomland hardwoods, (2) palustrine, (3) estuarine and (4) tidal freshwater wetlands. Managed freshwater impoundments (pools) make up about 3,000 acres and there are 38 miles of river and over 25 miles of streams and creeks within the refuge boundaries. In addition, hardwood hammocks, and scattered upland tracts comprised of hardwoods, mixed hardwoods, pines, and grassland fields are present on Savannah NWR. All wetlands outside of managed impoundments are subject to tidal fluctuations with amplitudes ranging from 6 to 10 feet. Finally, an additional 87 acres are used for administrative areas, and the Seaboard Coastline Railroad has a 24-acre right-of-way agreement with the Service. Habitat acreages are shown in Table 8. Table 9 details the general land cover classifications of Savannah NWR.

Savannah NWR contains approximately 6,000 acres of impounded freshwater wetlands. These impoundments were formerly plantation rice fields, which date back to the mid- or late-1700s. Approximately 3,000 acres of former fields are now actively managed by 22 water control structures effectively serving as impoundments to provide feeding areas and sanctuary for waterfowl, shorebirds, wading birds, and other wildlife. The remaining 3,000 acres are in the East Marsh Unit.

The managed freshwater impoundments are the most important managed habitat within the refuge. They are the principle means of meeting one of the refuge's primary objectives (i.e., provide habitat and sanctuary for waterfowl). The managed freshwater impoundments provide wintering habitat for approximately 22 species of waterfowl. The freshwater plant communities within the management units are extremely diverse and compositionally complex. This diversity makes impounded areas ideal habitat for a myriad of water birds. In addition, prescribed fire and mechanical and chemical treatments are used to manipulate plant successional stages and regulate undesirable and noxious

plants within these impoundments. However, the primary means of management of these systems is dependable water level control utilizing rice trunk, and stop-log water control structures and the 9-mile diversion canal associated with this system.

Savannah NWR habitat details are displayed in Figure 16.

**Table 6. Acreages of habitat types on Pinckney Island National Wildlife Refuge**

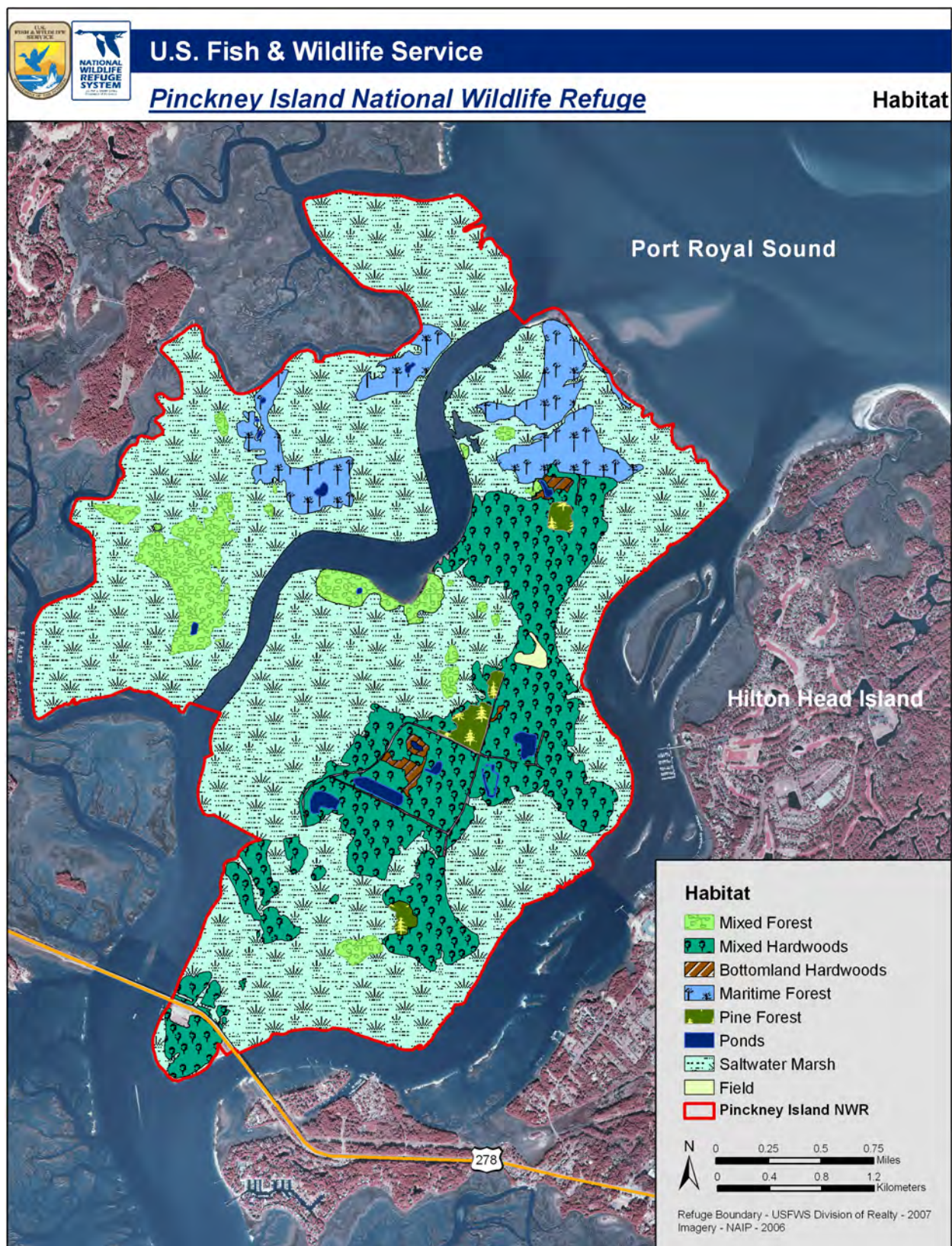
HABITAT TYPE	ISLAND	ACREAGE
<b>Upland</b>		
<b>Hardwood/Pine</b>	Pinckney Island	515
	Big Harry Island	33
	Little Harry Island	36
	Corn Island	28
Total Hardwood/Pine		<b>886</b>
<b>Pine</b>	Pinckney Island	200
	Big Harry Island	34
	Little Harry Island	30
	Corn Island	10
Total Pine		<b>274</b>
<b>Grassland</b>	Pinckney Island	100
Brush	Pinckney Island	210
	Big Harry Island	30
Total Brushland		<b>240</b>
<b>Administrative Land</b>	Pinckney Island	60
Total Upland		<b>1,286</b>
<b>Wetland</b>		
<b>Saltwater Marsh/Tidal Creeks</b>	Entire Refuge	2,729
<b>Freshwater Ponds</b>	Pinckney Island	38
Total Wetland		<b>2,767</b>
<b>TOTAL REFUGE ACREAGE</b>		<b>4,053</b>



**Table 7. Land cover classifications**

<b>Pinckney Island NWR</b>	
<b>Cover Type</b>	<b>Percent</b>
Developed Dry Land	0.4%
Undeveloped Dry Land	32.0%
Swamp	1.0%
Inland Fresh Marsh	0.1%
Transitional Salt Marsh	0.2%
Salt Marsh	43.9%
Estuarine Beach	2.3%
Tidal Flat	0.0%
Inland Open Water	0.5%
Estuarine Water	17.6%
Brackish Marsh	2.0%
Tidal Swamp	0.1%
<b>Totals</b>	<b>100.0%</b>

Figure 15. General habitat types on Pinckney Island National Wildlife Refuge



**Table 8. Acreages of habitat types on Savannah National Wildlife Refuge**

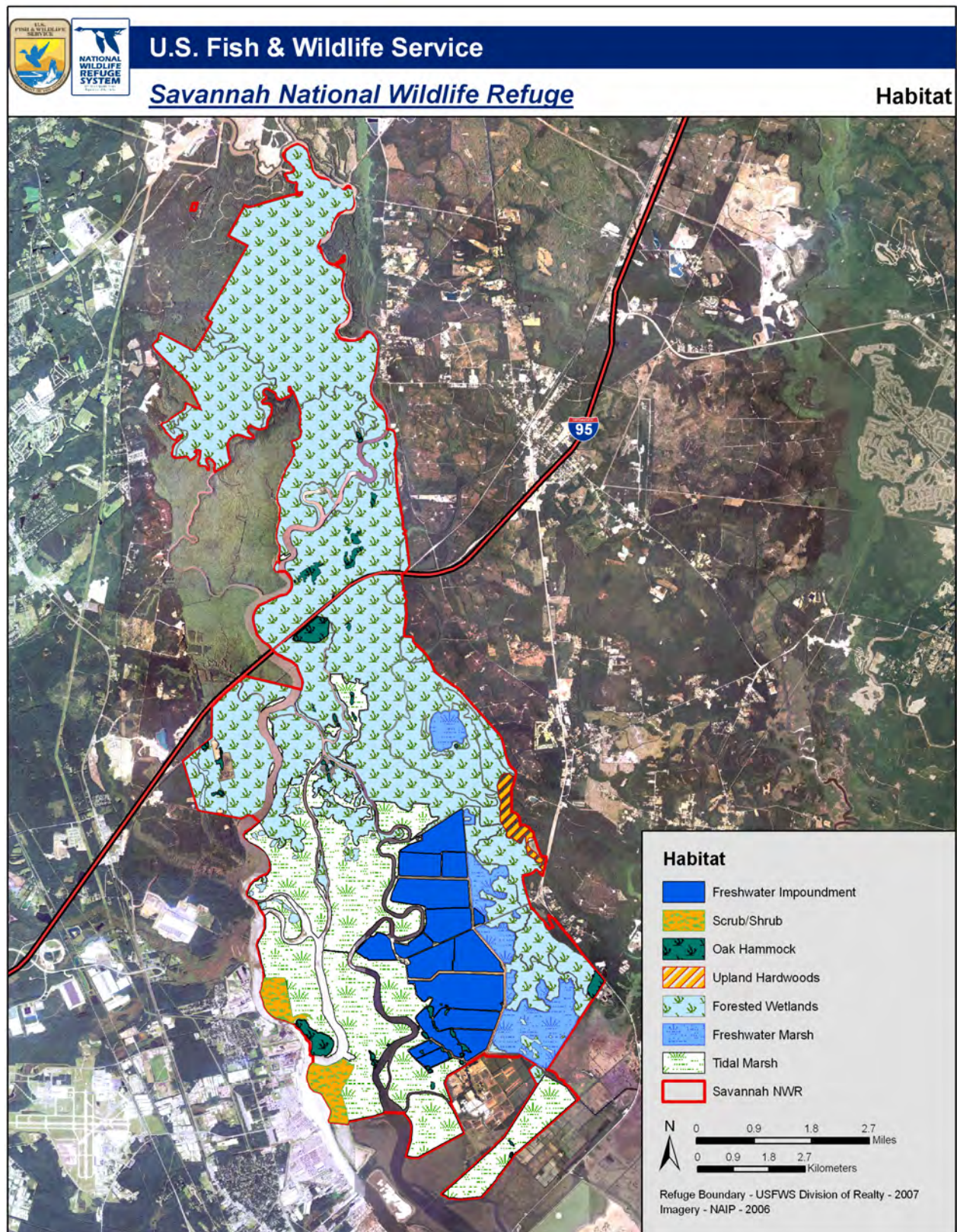
Habitat Type	Acres
Bottomland hardwood	6,546
Harwood hammocks	437
Upland Pine	275
Cypress–Gum Swamp	10,398
Mixed Hardwoods	883
Grassland Field	155
Upland Hardwood	178
Managed Impoundments	3,000
Tidal Marsh	7,192
Right-of-ways	24
Administrative Areas	87
<b>Total</b>	<b>29,175</b>

**Table 9. Land cover classifications**

Savannah NWR	
Cover Type	Percent
Developed Dry Land	0.2%
Undeveloped Dry Land	12.1%
Swamp	9.9%
Cypress Swamp	0.0%
Inland Fresh Marsh	2.4%
Tidal Fresh Marsh	20.8%
Transitional Salt Marsh	0.0%
Salt Marsh	0.0%
Estuarine Beach	0.0%
Tidal Flat	0.1%
Inland Open Water	1.4%
Riverine Tidal Open Water	4.8%
Estuarine Open Water	0.1%
Brackish Marsh	4.7%
Freshwater Shoreline	0.0%
Tidal Swamp	43.4%
<b>Totals</b>	<b>100.0%</b>



Figure 16. General habitat types on Savannah National Wildlife Refuge



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## **Tybee NWR**

Tybee NWR consists of approximately 400 acres of scrub/shrub habitat, sand beaches, *Spartina* marsh, tidal creeks, and several invasive plants (e.g., salt cedar, tallow, tropic soda apple). Much of the refuge is covered with sand deposits from the Corps of Engineers' dredging activities in the Savannah River. Sandy portions of the island are covered with only sparse vegetation. The more stable portions of the island are densely covered with such woody species as eastern red cedar, wax myrtle, and groundsel. The saltwater marsh areas surrounding the island are dominated by salt marsh cordgrass. Tybee NWR habitat details are displayed in Figure 17.

## **Wassaw NWR**

Wassaw NWR, like Blackbeard Island NWR, is a barrier island with extensive dune habitat. Please see the discussion of dune habitat under "Blackbeard Island NWR," above, entitled, "*Dune Habitat on Blackbeard Island.*"

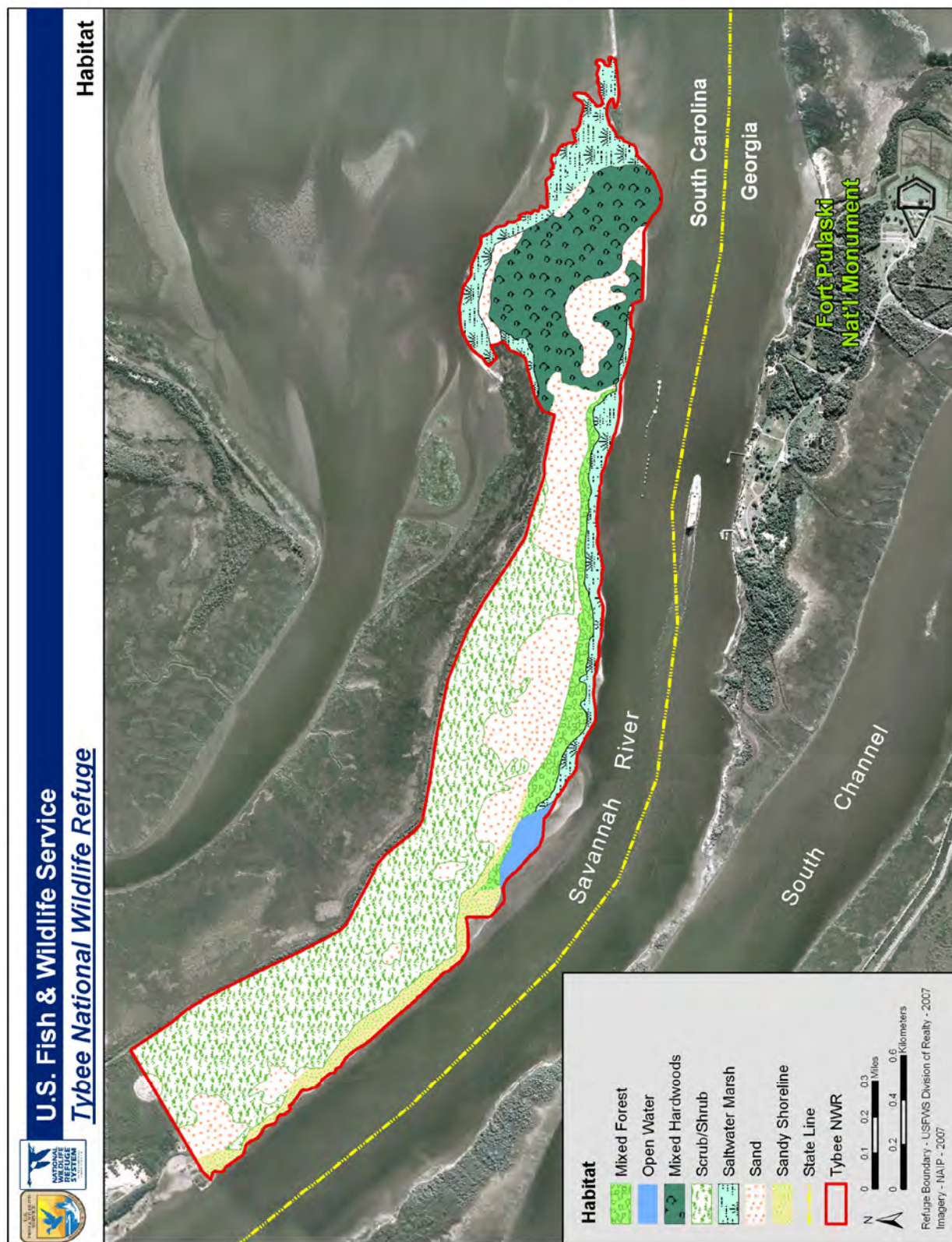
Wassaw NWR, totaling 10,053 acres, includes a single barrier island, two smaller islands (collectively known as Little Wassaw Island), several small hammocks, and the salt marsh habitat. The refuge includes beaches with rolling dunes, live oak and slash pine woodlands, and salt marshes. With about 25 miles of boundary or shoreline, the refuge includes about 7,640 acres of saltwater marsh dominated by smooth cordgrass and about 2,360 acres of beach dune and pine-oak upland forests. The estuarine wetlands are very important as nursery habitat for juvenile fish, crabs, and shrimp that take refuge among the vegetation for protection from predators. The woodlands consist of lush virgin stands of oak, pine, and cedar along with magnolia, cabbage palm, and holly. The refuge has a prominent central dune ridge reaching elevations of nearly 45 feet above sea level, with a series of lower dune ridges parallel to the main ridge. Numerous depressions and ponds lie between these ridges. These ponds and the saltwater creeks passing through the marshlands provide habitat for many species of fish and excellent foraging opportunities for birds as the aquatic organisms may be highly concentrated within these unique habitats. The 7 miles of undeveloped beach provides important habitat for numerous species of shorebirds and several threatened and endangered species of turtles. Little development and few management practices have modified Wassaw NWR's primitive character. The refuge is considered the most primitive island on the Georgia coast. This lack of disturbance has allowed natural climax plant communities to flourish, which, in turn, supports a natural diversity of animals species. Table 10 details the general land cover classifications of Wassaw NWR. Wassaw NWR habitat details are displayed in Figure 18.

## **WILDLIFE**

The refuges within the Complex provide habitat for a variety of resident and migratory wildlife. Many species of wading and shorebirds can be found on all refuges year-round. Migratory songbirds pass through in the spring and fall months, while a number of migratory waterfowl species spend the winters resting and feeding on the refuges. Sea turtles, namely the threatened Atlantic loggerhead, utilize the beaches of the Wassaw and Blackbeard Island NWRs for nesting, and Harris Neck NWR is home to one of the most successful endangered wood stork rookeries in the southeast. All species of concern and/or significance found on the Complex are listed in Appendix I.



Figure 17. General habitat types on Tybee National Wildlife Refuge



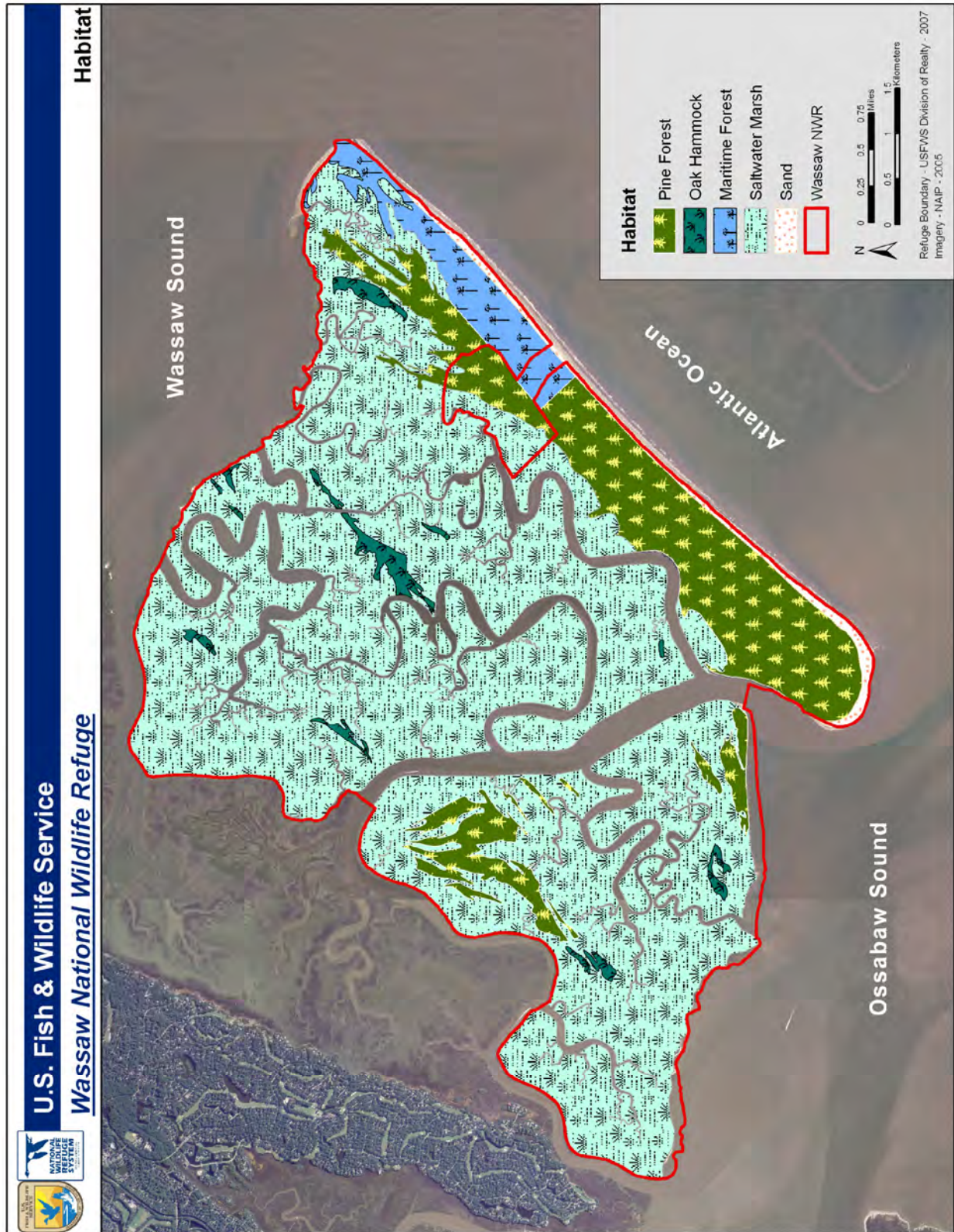
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**Table 10. Land cover classifications**

<b>Wassaw NWR</b>	
<b>Cover Type</b>	<b>Percent</b>
Developed Dry Land	0.0%
Undeveloped Dry Land	16.0%
Inland Fresh Marsh	0.1%
Transitional Salt Marsh	1.6%
Salt Marsh	66.7%
Estuarine Beach	1.1%
Tidal Flat	0.0%
Ocean Beach	1.6%
Inland Open Water	0.1%
Estuarine Water	12.1%
Tidal Creek	0.2%
Open Ocean	0.0%
Brackish Marsh	0.4%
<b>Totals</b>	<b>100.0%</b>



Figure 18. General habitat types on Wassaw National Wildlife Refuge



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## **Blackbeard Island NWR**

Blackbeard Island NWR supports a wide diversity of wildlife, including about 240 species of breeding and wintering birds, at least 20 species of mammals, and an undetermined number of reptiles, amphibians, and fish. The refuge is within the range of several listed threatened or endangered wildlife species.

The Georgia coastal marshes are a historic migration corridor for waterfowl that use the Atlantic Flyway. Populations vary greatly from year-to-year, depending on water levels and weather conditions farther up the flyway. Species range from dabbling ducks, such as mallards, gadwall, and teal, to diving ducks, such as scaup and ring-necked ducks.

Blackbeard Island NWR supports a diverse population of songbirds. A number of surveys to document the passerine populations on the refuge have been conducted through point counts. The refuge is a very important area for wintering shorebirds, including the endangered piping plover. Waterbirds such as pelicans, loons, and grebes use the refuge during winter for foraging and resting. During winter months, bald eagles and peregrine falcons are often seen from the beach. In the summer, flocks of black skimmers, terns, and brown pelicans congregate along the beach front. At least 15 species of terns and gulls have been recorded for the refuge. Most are observed foraging in open areas of the estuarine marsh and along the beach. Large numbers of waterbirds congregate at the north end of Blackbeard Island to rest and loaf. Raptor species that have nested on the refuge include osprey, bald eagle, red-tailed hawk, and Cooper's hawk. Other raptors likely to use the refuge all year include red-shouldered hawk, barred owl, great horned owl, eastern screech owl, barn owl, turkey vulture, and black vulture. Seasonal visitors include American kestrel, merlin, peregrine falcon, sharp-shinned hawk, northern harrier, and swallow-tailed kite.

Listed species occurring at Blackbeard Island NWR include the wood stork, West-Indian manatee, and sea turtles. The refuge is a very important nesting site for loggerhead and green sea turtles. Resident game species include white-tailed deer, bobwhite quail, and feral hog. Bobcats historically occurred in the woodlands and savannahs. Other furbearing species include river otter, mink, and raccoon. Non-game resident wildlife potentially includes Rafinesque's big-eared bat, northern yellow bat, and southeastern myotis, but specific information about their use of the refuge is unknown.

Blackbeard Island NWR has an abundant fisheries resource in refuge waters. The lifeblood of the fishery production is the cycle of tidal flow of the estuarine marshes. Salt marshes provide important nursery habitat for a variety of marine organisms including many species of fish, shrimp, and oysters. These food resources are the basis of the food chain and support higher level predators such as larger sport fish and birds. In addition to the estuarine resources, the 300-acre Flag Pond once supported a world class freshwater bass fishery. Due to prolonged drought conditions and decreased freshwater flow from the artesian wells, nearly all of the pond's acreage has now converted to a dense, emergent marsh.

## **Harris Neck NWR**

Harris Neck NWR supports a wide diversity of wildlife, including nearly 240 species of breeding and wintering birds, more than 20 species of mammals, and an undetermined number of reptiles, amphibians, and fish. The refuge is within the range of several listed threatened or endangered wildlife species.

The Georgia coastal marshes are a historic migration corridor for waterfowl that use the Atlantic Flyway. Populations vary greatly from year-to-year, depending on water levels and weather conditions farther up the flyway. Species range from dabbling ducks, such as mallards, gadwall, and teal, to diving ducks, such as scaup and ring-necked ducks.

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Harris Neck NWR supports a diverse population of songbirds. A number of surveys to document the passerine populations on the refuge have been conducted, including annual Christmas bird counts. The refuge is a very important area for wading birds, including the endangered wood stork. Great blue herons, great egrets, snowy egrets, little blue herons, herons, night herons, and white ibis are residents of the refuge impoundments and salt marshes. At least 12 species of terns and gulls have been recorded for Harris Neck NWR. Most are observed in open areas of the estuarine marsh and along the edges of the moist-soil units. Raptor species that use the refuge year-round include the bald eagle, red-tailed hawk, red-shouldered hawk, Cooper's hawk, sharp-shinned hawk, osprey, barred owl, great horned owl, eastern screech owl, barn owl, turkey vulture, and black vulture. Seasonal visitors include American kestrel, merlin, peregrine falcon, swallow-tailed kite, Mississippi kite, and northern harrier.

Listed species occurring on or near Harris Neck NWR include the wood stork, West-Indian manatee, and sea turtles. Resident game species include white-tailed deer, wild turkeys, and bobwhite quail. Bobcats are common throughout the woodlands and field edges. Other furbearing species include otter, gray fox, and raccoon. Non-game resident wildlife potentially includes Rafinesque's big-eared bat, northern yellow bat, and southeastern myotis, but specific information about their use of the refuge is unknown.

Harris Neck NWR has an abundant fisheries resource in refuge waters. The lifeblood of the fishery production is the cycle of tidal flow of the estuarine marshes. Salt marshes provide important nursery habitat for a variety of marine organisms including many species of fish, shrimp, and oysters. These food resources are the basis of the food chain and support higher level predators such as larger sport fish and birds.

### **Pinckney Island NWR**

Pinckney Island NWR is managed to maximize habitat diversity. A variety of wildlife species occurs on the refuge, including a number of species federally listed as endangered, threatened or as species of concern. Two federally listed endangered and threatened species known to occur within the boundary of the refuge are the wood stork, which feed and roost on the refuge but do not nest, and the West Indian manatee, which occurs in waters adjacent to the refuge and are frequently sighted near Daws Island and in Port Royal Sound.

The refuge bird list contains over 250 species. The most popular and colorful is the painted bunting, a common summer resident on the island and in brushy habitat throughout the area. In fall and early winter, warblers are common among the live oaks and in the scrub/shrub habitat. Waterfowl, shorebirds, wading birds, raptors, and neotropical migratory birds are common on the refuge—Pinckney Island NWR is one of the best places in South Carolina to see breeding yellow-crowned night herons. Other species of wading birds breeding on the refuge include: snowy egret, cattle egret, tri-colored heron, little blue heron, and black-crowned night heron. These breeding herons are joined in summer by a few non-breeding wood storks.

A variety of reptiles, amphibians, fish, and mammals occurs on the refuge and in the waters in the immediate vicinity. Some of the more common snake species seen on the refuge include the cottonmouth, black racer, corn snake, and yellow and grey rat snake. Mammals common to the refuge include white-tailed deer, bobcat, raccoon, opossum, eastern gray squirrels, fox squirrels, river otter, and red fox.



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## **Savannah NWR**

Savannah NWR is home to a large variety of wildlife including: ducks, geese, wading birds, shorebirds and several endangered and/or threatened species including the Flatwoods salamander, wood stork, shortnose sturgeon, and manatee. The refuge is one of the most important wildlife refuges on the east coast, and during migratory periods is visited by over 20 species of warblers and 22 species of ducks. The refuge also provides nesting areas for wood ducks, great horned owls, bald eagles, osprey and swallow-tailed kites, among others.

During the winter months, thousands of mallards, pintails, and as many as 22 species of ducks migrate into the area, (including the rarely seen cinnamon teal, Eurasian widgeon, and black bellied whistling duck) joining resident wood ducks on the refuge. Other wintering birds include the peregrine falcon, northern harrier, short-eared owl, Virginia rail, common snipe, American woodcock, and a host of songbirds, including the American robin, hermit thrush, fox sparrow, and winter wren. In the spring and fall, transient songbirds stop briefly on their journey to and from northern nesting grounds. Twenty-one species of warblers, including Swainson's, Cape May, worm-eating, blackpoll, black-throated blue, and magnolia, have been seen in spring and autumn migrations. The hardwood hammocks serve to attract and concentrate the songbirds. In the summer months, sightings of purple gallinules and wood ducks, and flocks of white ibis and glossy ibis, are observed feeding together.

## **Tybee NWR**

The refuge's small size provides minimal habitat for wildlife. However, numerous species of birds utilize the available shoreline, tidal saltwater marsh, open spoil banks, and shrubby uplands. At low tide the shoreline provides a resting and feeding place for many species of migratory birds including gulls, terns, neotropical migratory songbirds, and shorebirds. Black skimmers, Wilson's plovers, and several other shorebird species have also nested on the spoil deposits during the spring and summer. During all seasons, the refuge's shoreline and open spoil deposits are used as resting sites for brown pelicans, gulls, terns, egrets, herons, and many other species. Willets have been recorded nesting and raising their young as well as oystercatchers, killdeer, clapper rails, and red-tailed hawks (Tomkins 1965). Some winter visitors include whimbrels, purple and pectoral sandpipers, dunlin, redknobs, and northern gannets. Permanent residents include clapper rails, fish crows, and boat-tailed grackles. Endangered species, including piping plovers and wood storks, have been observed on the refuge, while shortnose sturgeon and manatees have been found in the waters bordering the refuge.

## **Wassaw NWR**

Wassaw NWR supports a wide diversity of wildlife, including at least 257 species of breeding and wintering birds and an undetermined number of mammal, reptile, amphibian, and fish species. In most cases, a thorough inventory has not been completed for Wassaw NWR. Therefore, the true extent of its value as wildlife habitat is not well known. The refuge is within the range of several listed threatened or endangered wildlife species.

The refuge also provides habitat for migratory and resident waterfowl. The Georgia coastal marshes are a historic migration corridor for waterfowl that use the Atlantic Flyway. Populations vary greatly from year-to-year, depending on water levels and weather conditions farther up the flyway. Species range from dabbling ducks, such as mallards, gadwall, and teal, to diving ducks, such as scaup and ring-necked ducks.

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Wassaw NWR supports a diverse population of songbirds. The refuge is a very important area for wintering shorebirds, including the endangered piping plover. Waterbirds such as pelicans, loons, and grebes use the refuge during winter for foraging and resting. At least 15 species of terns and gulls have been recorded for the refuge. Most are observed foraging in open areas of the estuarine marsh and along the beach. Raptor species that have nested on the refuge include osprey, bald eagle, red-tailed hawk, Eastern screech-owl, and great horned owl. Other raptors likely to use the refuge all year include barn owl, turkey vulture, and black vulture. Seasonal visitors include Mississippi kite, Northern harrier, American kestrel, merlin, and peregrine falcon.

The 7 miles of undeveloped beach provide important nesting habitat for Northern subpopulation of the Atlantic loggerhead sea turtles (as well as piping plovers and many other beach-dependent wildlife species). Due to its extensive long-term data set, Wassaw Island NWR is considered one of the most important index beaches for this subpopulation. Listed threatened and endangered species occurring at Wassaw NWR include the wood stork, West Indian manatee, and possibly Atlantic and short-nosed sturgeon. Resident game species include white-tailed deer and introduced eastern gray squirrel. Other furbearing species include otter, gray fox, mink, and raccoon. Non-game resident wildlife potentially includes Rafinesque's big-eared bat, northern yellow bat, and southeastern myotis, but specific information about their use of the refuge is unknown.

Wassaw NWR has an abundant fisheries resource in its waters. The lifeblood of the fishery production is the cycle of tidal flow of the estuarine marshes. Salt marshes provide important nursery habitat for a variety of marine organisms, including many species of fish, plus shrimp and oysters. These food resources are the basis of the food chain and support higher level predators such as larger sportfish and birds.

## **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 (ACHP). 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 NRHP. 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 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 archaeological sites and historic properties on Service managed and administered lands; by monitoring archaeological investigations by contractors and permittees; and by reporting violations.

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The Complex follows these procedures to protect the public's interest in preserving any cultural legacy that may potentially occur on the refuge. 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 South Carolina and 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 is to notify the SHPO immediately.

The following discussion highlights the important events of recent history for each of the six refuges included in this CCP.

### **Blackbeard Island NWR**

Blackbeard Island NWR is one of the oldest refuges in the country. The island has been in continuous federal ownership since 1800 when it was acquired by the Navy Department at public auction for the sum of \$15,000. The Navy did a limited amount of harvesting of live oaks on the island for ship building.

Between the years of 1880 and 1910, the island served as the South Atlantic Quarantine Station for yellow fever. In addition to housing for medical personnel, a wharf with disinfecting tanks and a hospital and associated buildings were constructed on the island. As crews disembarked from ships, those that were sick were hospitalized, while the healthy were housed separately and examined daily for yellow fever symptoms. Once disinfected, the ships were allowed to continue to their destination. Sulfur dioxide gas was used to disinfect the ships. Located on the north end of the island is a structure referred to as the "crematorium." Although documentation does not exist to confirm the structure was ever used for body incineration, it stands as one of the few reminders of that era. (Sullivan 2001)

Blackbeard Island was named for Edward Teach, alias Blackbeard the Pirate. Legend tells of his murderous and plundering activities along the coast and his periodic retreats to the island for "banking" purposes. Rumors of Blackbeard's buried treasure still flourish, but no evidence of his fortune has ever been discovered.

The island's history as a refuge began on February 5, 1924, when Blackbeard was placed under the jurisdiction of the Bureau of Biological Survey to be maintained as a preserve and breeding ground for native wildlife and migratory birds. In 1940, by Presidential Proclamation, Blackbeard Island was designated as a national wildlife refuge.

### **Harris Neck NWR**

The 2,824 acres composing Harris Neck NWR have had a long, and at times, controversial history. Distinguished as one of the oldest intensively farmed areas along the Georgia coast, Harris Neck was among the first land grants given to early English and Scottish settlers in 1750. While staple crops were produced, it was the high-quality Sea Island cotton which brought European fame to the coastal agricultural industry. Unfortunately, poor farming practices soon exhausted the fragile sandy loam soils, and large scale farming was abandoned in 1860. (Porcher and Fick 2005; Thomas 1923)

The American Civil War brought an end to the "Old South" plantation era, and Harris Neck was divided into smaller farms. The Gullah-Geechee community of Harris Neck emerged from a small group of former slaves who had returned to Thomas' Peru Plantation following the Civil War. The

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community consisted of primarily commercial watermen, who harvested oysters, crabs, and fish from the nearby waters, and small-scale farmers. The community, thus established, continued until the advent of World War II, when the U.S. Government purchased the property for use as an air base. At that time, 250 acres were converted into a triangular landing strip for use as a training facility by the War Department. The P-40 "Kittyhawk," used at Harris Neck Army Airfield, later gained fame from missions with the legendary Flying Tigers, who shot down 286 Japanese aircraft during World War II.

After World War II, the property was given to McIntosh County for guardianship and use as a municipal airport. Due to county mismanagement of the land resources, Harris Neck was transferred to the Federal Aviation Administration. On May 25, 1962, the U.S. Bureau of Sport Fisheries and Wildlife (forerunner of the Service) acquired the property and established the area as a migratory bird refuge (Sullivan 2001).

### **Pinckney Island NWR**

Pinckney Island NWR is archaeologically rich, with numerous prehistoric and historic sites identified. Analysis of the prehistoric sites indicate human occupation dating from the Archaic Period (8000 - 1000 BC), with intensive use during the Mississippian Period (1000 - 1500 AD).

Historic artifacts indicate that small-scale, impermanent settlements were made on Pinckney by French and Spanish groups in the 16th and 17th centuries. Permanent settlements did not occur until 1708 when Alexander Mackay, an Indian trader, obtained title to 200 acres of Pinckney Island. By 1715, Mackay had acquired the rest of Pinckney and most of the other islands which compose the present refuge. In 1736, Mackay's widow sold the islands to Charles Pinckney, father of General Charles Cotesworth Pinckney. General Pinckney was a commander during the Revolutionary War, a signer of the United States Constitution and, in 1804 and 1808, a presidential candidate. Pinckney was an absentee landowner until 1804, when he moved to the island and began managing the property. The Pinckney family developed the islands into a plantation, removing much of the maritime forest and draining and tilling the fertile soil.

The plantation flourished until the Civil War when it was occupied by Union Troops. Small skirmishes took place on Pinckney Island. The most significant incident occurred on August 21, 1862, when the Confederate Beaufort Light Artillery/11th Infantry attacked the camp of Company H, Third Regiment, New Hampshire Volunteers, killing four Union soldiers and wounding ten men (eight Confederate, two Union). Army records also reflect that black troops were recruited for the Union Army from the area. Five military (U.S. Colored Infantry) headstones are located in a cemetery on the northwest side of Pinckney Island, indicating the possibility that slaves living on the plantation during the Civil War were recruited by the United States Army.

After the war, the plantation did not prosper, and by the 1930s, was virtually abandoned. In 1937, after over 200 years of Pinckney ownership, the plantation was sold to Ellen Bruce, wife of James Bruce, a New York banker who used the property as a hunting preserve. Hardwoods and pines were planted, ponds were built to attract waterfowl and for irrigation, and 70 percent of the farm fields were placed back into cultivation.

Edward Starr and James Barker purchased the islands in 1954 and continued to manage them as a game preserve. In 1975, the islands were donated to the Service to be managed exclusively as a national wildlife refuge and as a nature and forest preserve for aesthetic and conservation purposes (see Deed of Donation, 1975, in bibliography).

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## **Savannah NWR**

The area surrounding the Savannah NWR, which includes the port city of Savannah, Georgia, is rich in history. After thousands of years of use by various Indian tribes and cultures, the first European visitor arrived in 1526. James Oglethorpe established the city of Savannah in 1773. By the mid-18th century, rice planters were farming much of the land that is now part of the refuge. The old rice levees, which were built by hand, form the basis for our current impoundment dikes. Remnants of the original rice field trunk water control structures and narrow dikes are still visible in some places. Within the impoundment system there are numerous historic and prehistoric archaeological sites which have been located and inventoried.

## **Tybee NWR**

This 400-acre migratory bird refuge began as a 1-acre oyster shoal. The Corps of Engineers, while engaged in river and harbor improvements, used the shoal as a spoil site. Accumulated spoil created Oysterbed Island (the nucleus of the present refuge). Title to Oysterbed Island was conveyed to the United States by the State of Georgia on December 30, 1820. Since that time, the Corps of Engineers has continued to use the area as a spoil site. Accumulated spoil eventually joined Oysterbed Island and Jones Island to form the north bank of the Savannah River.

Tybee NWR was established by Executive Order No. 7882 on May 9, 1938, "in order to effectuate further the purposes of the Migratory Bird Conservation Act." In the enabling legislation, the United States Coast Guard retained control over a 1-acre site known as the Oysterbed Lighthouse Reservation and the Corps of Engineers retained the authority to deposit soil on the refuge. The legislation does stipulate "that any accretions thereto resulting directly or indirectly from river and harbor improvement work shall when formed become part of the refuge." The Coast Guard transferred the Day Beacon Tower and surrounding area (formerly the Oysterbed Lighthouse Reservation) to the Service on February 17, 1960.

## **Wassaw NWR**

Wassaw's recorded history began with Anthony Odingsell who owned Little Wassaw Island during the early 1800s. During the Civil War, the islands were successively occupied by Confederate and Union troops. Blowing sand once revealed the unmarked grave of a soldier, bones intact, along with a 56-caliber bullet and a uniform button of the First Georgia Regiment. Cannon balls were found the full length of the northern end of the island indicating heavy shelling, possibly by Union troops.

In 1866 the islands were purchased by George Parsons, a wealthy businessman who dealt in railroads, banks, real estate, and cotton. During the following years, he built the existing housing compound as a private hideaway for his family and friends. These houses reflect the New England background of the Parsons and are filled with memorabilia of the family including a family log which recalls the island's colorful history.

In October 1969, after 103 years of Parsons' family ownership, the islands were sold (except for a 180-acre in-holding) to The Nature Conservancy for \$1 million. The Conservancy, in turn, for the sum of \$1, deeded the land to the U.S. Department of the Interior to be managed as a wildlife refuge. The primary purpose of the refuge is to maintain and enhance habitat for migratory birds, the loggerhead sea turtle, other resident and non-resident wildlife, and to protect and preserve this unique barrier island.



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## **SOCIOECONOMIC ENVIRONMENT**

### **REGIONAL DEMOGRAPHICS AND ECONOMY**

A chain of seven national wildlife refuges totaling 56,949 acres form the Complex that extends along the southeastern Atlantic coastline from near Hilton Head Island, South Carolina, to near Darien, Georgia, a span of about 100 miles. This 100-mile span of coastline includes five counties in Georgia (McIntosh, Liberty, Bryan, Chatham and Effingham) and two counties in South Carolina (Jasper and Beaufort). These seven counties - with a combined population of over 550,000 - account for a significant number of visitors to the Complex. The headquarters of the seven-refuge Complex is located on Savannah NWR in Jasper County, South Carolina. The city of Savannah, located on the Georgia-South Carolina border, is the largest metropolitan area in this 100-mile span of coastline and has a population of about 130,000. Chatham County, the sixth largest county in Georgia, has a population of over 240,000 and accounts for almost half of the total population of the entire seven-county coastal area. Further, the population of the Savannah Metropolitan Statistical Area (MSA), consisting of Bryan, Chatham, and Effingham Counties, is over 320,000 and accounts for almost 65 percent of the population for the entire seven-county coastal area (U.S. Census Bureau, Bureau of Economic Analysis, and Bureau of Labor Statistics).

Demographic and socioeconomic data for the Complex area is given in Table 11. The Coastal Plain of Georgia and the Carolinas has in the past been regarded as an economically depressed region; however, recent efforts at the local, state, and national levels are leading to improved economic conditions in the area. A 2003 Pew Oceans Commission Report states that more than half of the United States population resides in coastal counties while composing only 17 percent of the nation's land area, resulting in a coastal population density almost five times the national average. Between 1970 and 2000, the coastal counties of Georgia grew approximately 16 percent per decade. Population growth in the coastal region has been, and is, predicted to continue to outpace adjacent areas, the state, and the nation (Pew Oceans Commission 2003; and Georgia Department of Community Affairs, October 2005).

Per capita income in the coastal area - the five Georgia counties and the two South Carolina counties - is 89 percent and 108 percent of the national average, respectively. The percent of individuals living below the poverty level are 15.3 percent and 12.8 percent, for the five Georgia counties and the two South Carolina counties respectively, compared with a national poverty rate of 12.7 percent.

Savannah historically has been the main economic engine of Georgia's (and southern South Carolina's) coastal region. Not only is Savannah a major tourist attraction and a thriving deepwater port, but the entire coastal economy is quite diverse with manufacturing, retail, tourism, ports operations, and military sectors forming a strong supportive network. The number of jobs in the Savannah MSA is growing twice as fast as that of the state and of the nation as a whole (Chatham County, Finance Staff 2005).

Commercial fishing and forestry historically have been the most important economic activities of the 20th century for the coastal regions of Georgia and southern South Carolina. Today, six industries account for nearly three-quarters of the jobs in the Savannah MSA: manufacturing (9.1 percent), retail trade (11.7 percent), professional and business services (12.5 percent), educational and health services (13.4 percent), leisure and hospitality (12.7 percent) and state and local governments (12 percent). In 2007, employment in manufacturing approached 16,000 workers in Bryan, Chatham, Effingham, and Liberty Counties. Manufacturing employment continues to rise – the manufacturing sector represents about 10 percent of the regional employment base, supports about 17 percent of total employment, generates 22 percent of total labor income, and is responsible for 36 percent of total

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business in the region. In 2006, tourism in the Savannah area was 6.88 million visitors and visitor spending was estimated at \$1.84 billion, resulting in over 22,000 direct jobs. The Port of Savannah, which includes the Garden City and Ocean terminals, is the nation's fastest growing port, the second busiest container port on the east coast, and the fourth busiest in the nation. The total vessel calls have increased 19 percent from 1,745 (FY05) to 2,073 (FY09) (GPA 2009). Ft. Stewart (the largest military installation east of the Mississippi River) in Bryan and Liberty Counties and Hunter Army Airfield in Chatham County are coastal Georgia's largest employers with approximately 25,000 military personnel and 3,900 civilian personnel (Savannah Area Chamber of Commerce 2007).

## OUTDOOR RECREATIONAL ECONOMICS

The National Oceanic and Atmospheric Administration (1999) estimates that coastal tourism and recreation account for 85 percent of all United States tourism revenues. The natural resources of the Complex provide numerous sites for hiking, recreational fishing, and wildlife observation, and are vitally important economically to the Georgia and South Carolina coastal regions. As our country's population increases and the number of places left to enjoy wildlife decreases, the refuges will become even more important to our community. The refuges benefit the community directly by providing recreational and employment opportunities for the local population and indirectly by attracting tourists from outside the area to generate additional income to the local economy. Whether it is gas used to travel to and from the refuge, a meal at a local restaurant, ammunition, or an overnight at a local motel, visitors to the Complex add substantially to the regional economy.

Table 12 presents information summarizing the economic value of hunting, fishing, and wildlife watching in Georgia and South Carolina by U.S. residents, taken from the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. It estimates over 3.5 million people participated in fishing, hunting and wildlife watching in Georgia and over 2 million in South Carolina; and total expenditures from these activities were over \$3.3 billion in Georgia and over \$2.2 billion in South Carolina in 2006.

**Table 11. Demographics and socioeconomic for the Savannah Coastal NWR Complex**

Characteristic	McIntosh County	Liberty County	Bryan County	Chatham County	Effingham County	5-County Georgia Summary	State of Georgia	Jasper County	Beaufort County	2-County S. Carolina Summary	State of S. Carolina	United States
<b><u>Demographic</u></b>												
Population (2006 estimate)	11,248	62,571	29,648	241,411	48,954	393,832	9,363,941	21,809	142,045	163,854	4,321,249	299,398,484
Percent Change (4/1/00 to 7/1/06)	3.7%	1.6%	26.6%	3.9%	30.4%	7.7%	14.4%	5.5%	17.4%	15.7%	7.7%	6.4%
Total Land Area (sq. miles)	433.4	519.0	441.7	438.1	479.4	2,311.6	57,906.0	656.1	586.9	1,243.0	30,109.0	3,537,438
Population Density (pop./sq. mile)	26	121	67	551	102	170	162	33	242	132	144	85
<b><u>Race/Ethnicity (% of Population)</u></b>												
White	64.3%	50.2%	82.0%	55.2%	85.1%	60.4%	65.8%	48.6%	75.9%	72.3%	68.5%	80.1%
Black/African American	34.0%	43.7%	14.5%	40.9%	13.0%	35.7%	29.9%	50.0%	21.5%	25.3%	29.0%	12.8%
Hispanic/Latino (of any race)	1.0%	6.5%	2.4%	2.8%	1.9%	3.2%	7.5%	10.4%	8.9%	9.1%	3.5%	14.8%
Asian	0.4%	2.0%	1.2%	2.3%	0.5%	1.9%	2.8%	0.6%	1.0%	0.9%	1.1%	4.4%
<b><u>Education (% of population over 25)</u></b>												
High School degree, 2000	71.2%	86.8%	79.0%	80.2%	78.9%	80.7%	78.6%	65.2%	87.8%	84.8%	76.3%	80.4%
College degree, 2000	11.1%	14.5%	19.3%	25.0%	13.6%	21.1%	24.3%	8.7%	33.2%	29.9%	20.4%	24.4%

Characteristic	McIntosh County	Liberty County	Bryan County	Chatham County	Effingham County	5-County Georgia Summary	State of Georgia	Jasper County	Beaufort County	2-County S. Carolina Summary	State of S. Carolina	United States
<b>Economic</b>												
Median Household Income, 2004	\$31,055	\$37,048	\$54,365	\$38,248	\$51,185	\$40,673	\$42,679	\$29,717	\$48,577	\$46,067	\$39,454	\$44,334
Per capita Income, 2005	\$21,801	\$23,209	\$29,363	\$34,053	\$26,426	\$30,679	\$30,914	\$23,696	\$39,308	\$37,230	\$28,285	\$34,471
Persons below poverty level, 2004	17.5%	15.6%	9.9%	16.9%	10.1%	15.3%	13.7%	21.6%	11.4%	12.8%	15.0%	12.7%
Employment Growth, 2006	1.8%	4.5%	5.7%	3.0%	6.1%	3.8%	3.2%	1.5%	2.6%	2.5%	2.4%	1.9%
Unemployment Rate, 2006	4.2%	5.5%	3.5%	4.0%	3.3%	4.1%	4.6%	5.1%	5.0%	5.0%	6.5%	4.6%

<sup>a</sup> U.S. Census Bureau, Bureau of Economic Analysis, and Bureau of Labor Statistics (April 14, 2008). <http://www.fedstats.gov/cfi/>

<sup>b</sup> Federal Deposit Insurance Corporation (FDIC), Regional Economic Conditions (RECON), <http://www4.fdic.gov/RECON/>

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**Table 12. Activities in Georgia and South Carolina by U.S. Residents**

	<u>Georgia</u>	<u>South Carolina</u>
<b>Fishing</b>		
Anglers . . . . .	1,107,000	810,000
Days of fishing . . . . .	17,375,000	12,325,000
Average days per angler . . . . .	16	15
Total expenditures . . . . .	\$1,023,343,000	\$1,407,205,000
Trip-related . . . . .	\$370,743,000	\$525,937,000
Equipment and other . . . . .	\$652,600,000	\$881,268,000
Average per angler . . . . .	\$924	\$1,737
Average trip expenditure per day . . . . .	\$21	\$43
<b>Hunting</b>		
Hunters . . . . .	481,000	208,000
Days of hunting . . . . .	8,228,000	4,318,000
Average days per hunter . . . . .	17	21
Total expenditures . . . . .	\$677,762,000	\$278,640,000
Trip-related . . . . .	\$237,162,000	\$121,953,000
Equipment and other . . . . .	\$440,600,000	\$156,686,000
Average per hunter. . . . .	\$1,409	\$1,340
Average trip expenditure per day . . . . .	\$29	\$28
<b>Wildlife Watching</b>		
Total wildlife-watching participants . . . . .	1,987,000	1,115,000
Nonresidential . . . . .	438,000	447,000
Residential . . . . .	1,798,000	924,000
Total expenditures . . . . .	\$1,615,316,000	\$550,777,000
Trip-related . . . . .	\$146,722,000	\$195,804,000
Equipment and other . . . . .	1,468,593,000	\$354,973,000
Average per participant . . . . .	\$812	\$494

Source: USFWS and U.S. Census Bureau. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation - Georgia and South Carolina. <http://www.census.gov/prod/2008pubs/fhw06-nat.pdf>



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## REFUGE ADMINISTRATION AND MANAGEMENT

### *LAND PROTECTION AND CONSERVATION*

#### **Blackbeard Island NWR**

The refuge consists of the 5,618 acres of which there are 1,163 acres of freshwater impoundments, 2,000 acres of saltwater marsh, 2,115 acres of pine and oak forests, and 340 acres of sand beach. Approximately 3,000 acres of the southern and western portion of the refuge are a designated Wilderness Area. The refuge consists of a long narrow strip of oceanfront beach backed by a broad band of dunes, maritime forests, and salt marsh and is located in McIntosh County, approximately 18 miles off the coast of Darien, Georgia, and about 45 miles south of Savannah. There are additional islands in the near vicinity that may be considered for acquisition at some future date. Figure 19 details Blackbeard Island NWR's protected land designations.

#### **Harris Neck NWR**

The refuge consists of the 2,824 acres of which there are 157 acres of man-made freshwater ponds; 705 acres of open fields; 663 acres of pine/oak forests; 1,297 acres of salt marsh; and 2 acres of forested wetland. It is located about 40 miles south of Savannah, near Darien, Georgia, in McIntosh County. There are additional lands in the near vicinity that may be considered for acquisition at some future date, after the completion of a boundary expansion. Figure 20 details Harris Neck NWR's protected land designations.

#### **Pinckney Island NWR**

The refuge consists of five islands: Corn, Little Harry, Big Harry, Buzzard and Pinckney Island (and numerous small hammocks). The refuge totals 4,053 acres, of which approximately 2,700 acres are salt marsh and tidal creeks. Pinckney Island (the largest island) comprises about 1,200 acres, and is the only island open for public use. The refuge entrance is 1/2-mile west of Hilton Head Island, South Carolina, off of U.S. Highway 278. The island lies between Skull Creek (the Intracoastal Waterway) and Mackay Creek. There are additional islands and hammocks in the near vicinity that may be considered for acquisition at some future date. Figure 21 details Pinckney Island NWR's protected land designations.

#### **Savannah NWR**

Savannah NWR, located in Savannah, Georgia, near the mouth of the Savannah River, consists of over 29,000 acres (about 15,000 in South Carolina and 14,000 in Georgia) of freshwater marshes, tidal rivers and creeks, and bottomland hardwoods. Managed freshwater pools make up about 3,000 of these acres. This refuge is the largest of the seven refuges within the Complex. Commercial and residential development around the refuge and annexation proposals by the city of Savannah are issues of concern that continue to impact the refuge. To conserve the integrity of existing refuge lands, providing adequate buffers and wildlife migration corridors is very important. Acquisition of additional public lands will also provide more opportunity for public use. Population growth and development hamper refuge expansion; however, there are additional lands in the near vicinity that may be considered for acquisition at some future date. Figures 22 and 23 detail Savannah NWR's protected land designations and acquisition opportunities.

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## **Tybee NWR**

Tybee NWR, originally a 1-acre oyster shoal (Oysterbed Island) at the mouth of the Savannah River, now consists of 400 acres of accumulated spoil from river and harbor dredging activities. Accretions to Oysterbed Island continue to expand Tybee NWR's acreage. There are no current plans for refuge development or refuge expansion. Figure 24 details Tybee NWR's protected land designations.

## **Wassaw NWR**

The refuge consists of a single barrier island (Wassaw Island), tidal salt marsh, two smaller islands (Little Wassaw Island and Pine Island), and several small hammocks. The refuge is composed of 76 percent salt marsh and 24 percent beach dune and upland forest and upland forest communities. The refuge is located about 14 miles southeast of the city of Savannah and is accessible only by boat. There are additional islands in the near vicinity that may be considered for acquisition at some future date. In the event the 180-acre in-holding ever becomes available, it would be the highest priority for the refuge with respect to acquisition. Figure 25 details Wassaw NWR's protected land designations.

## *VISITOR SERVICES*

### **Blackbeard Island NWR**

Blackbeard NWR (over half of which is a designated Wilderness Area) is accessible only by boat. There are approximately 11,000 visitors to the refuge annually. About 90 percent of total visitation occurs during the Memorial, Independence, and Labor Day weekends on the north and south beaches. The beaches, sea breeze, and remote, pristine setting are the primary visitor attraction. Saltwater fishing, sunbathing, swimming, and bird watching are popular pastimes in the summer. Bird watching is excellent due in part to the location of the refuge along the Atlantic Flyway, which makes it a vital resting and feeding area for hundreds of different kinds of migratory birds. Many visitors enjoy the miles of Atlantic coastline by taking private water craft to the island, and archery hunting for deer is a traditional recreational pursuit. The Wilderness Area is bordered by beach that has become a popular place for boaters and beach users, compromising the wilderness characteristics because of overcrowding, boats, noise, litter, dogs, alcohol, etc.

Public use opportunities on Blackbeard include: Hiking/biking/trails (approximately 20 miles of roads and trails are open to the public year-around); wildlife observation and photography; hunting and fishing (shrimping/crabbing); environmental education/interpretation; sea kayaking and daytime beach use. Figure 26 details Blackbeard NWR public use areas.

- Wildlife Observation and Photography  
Wildlife observation, especially bird watching, is excellent throughout the year on Blackbeard Island. In winter months, waterfowl utilize the marshland and man-made freshwater pools, while songbirds abound in the wooded acres in the spring and fall. The existing trails and roads provide hikers and bicyclers with scenic paths ideal for nature study.
- Environmental Education and Interpretation  
Guided interpretive tours for individuals and families can be arranged through our special use permit holders. These are private, commercial or non-profit organizations that maintain a permit with the Service in order to conduct business on the refuge. Eight such outfits hold permits for conducting guided interpretive tours on Blackbeard Island NWR.

Figure 19. Protected lands of Blackbeard Island National Wildlife Refuge

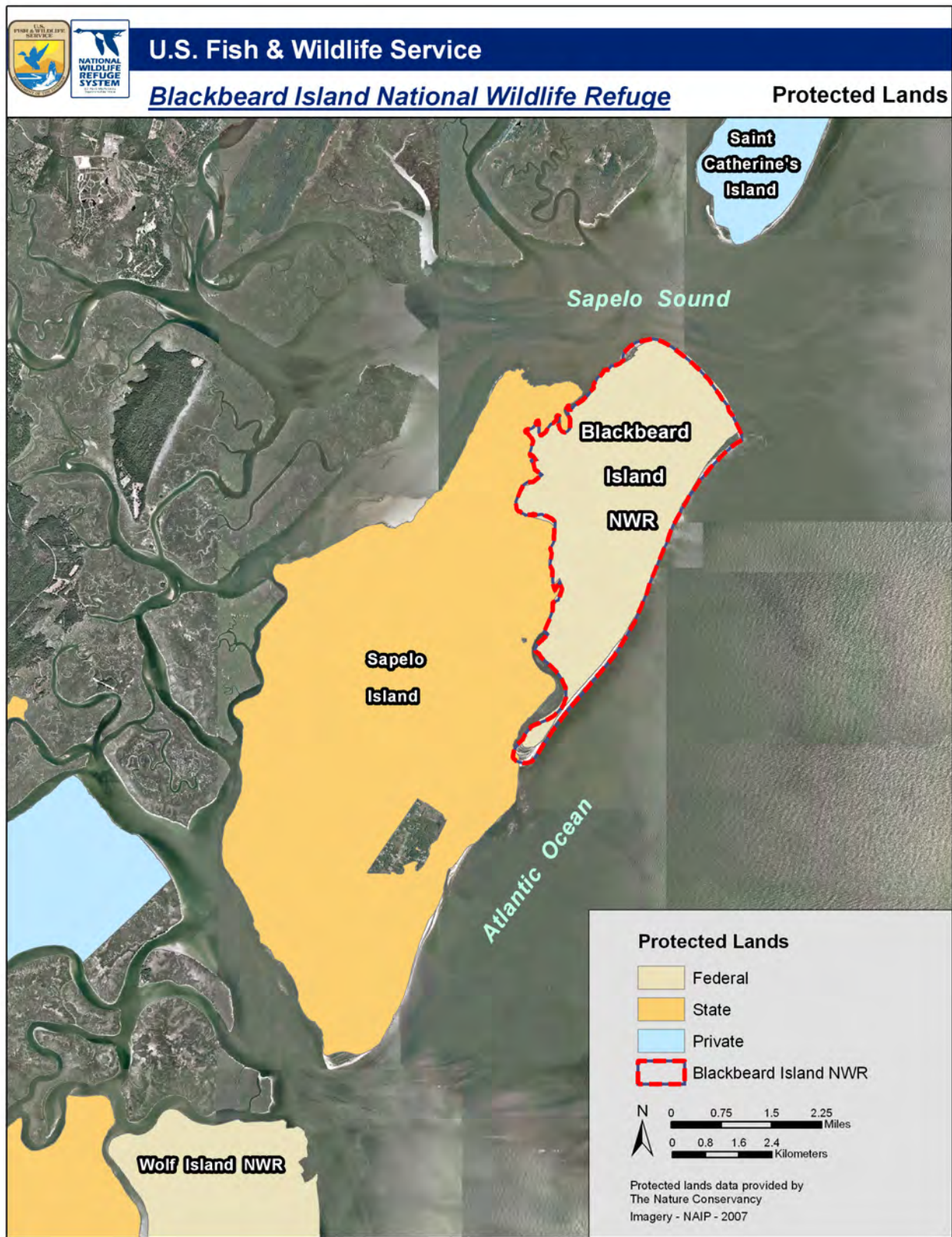


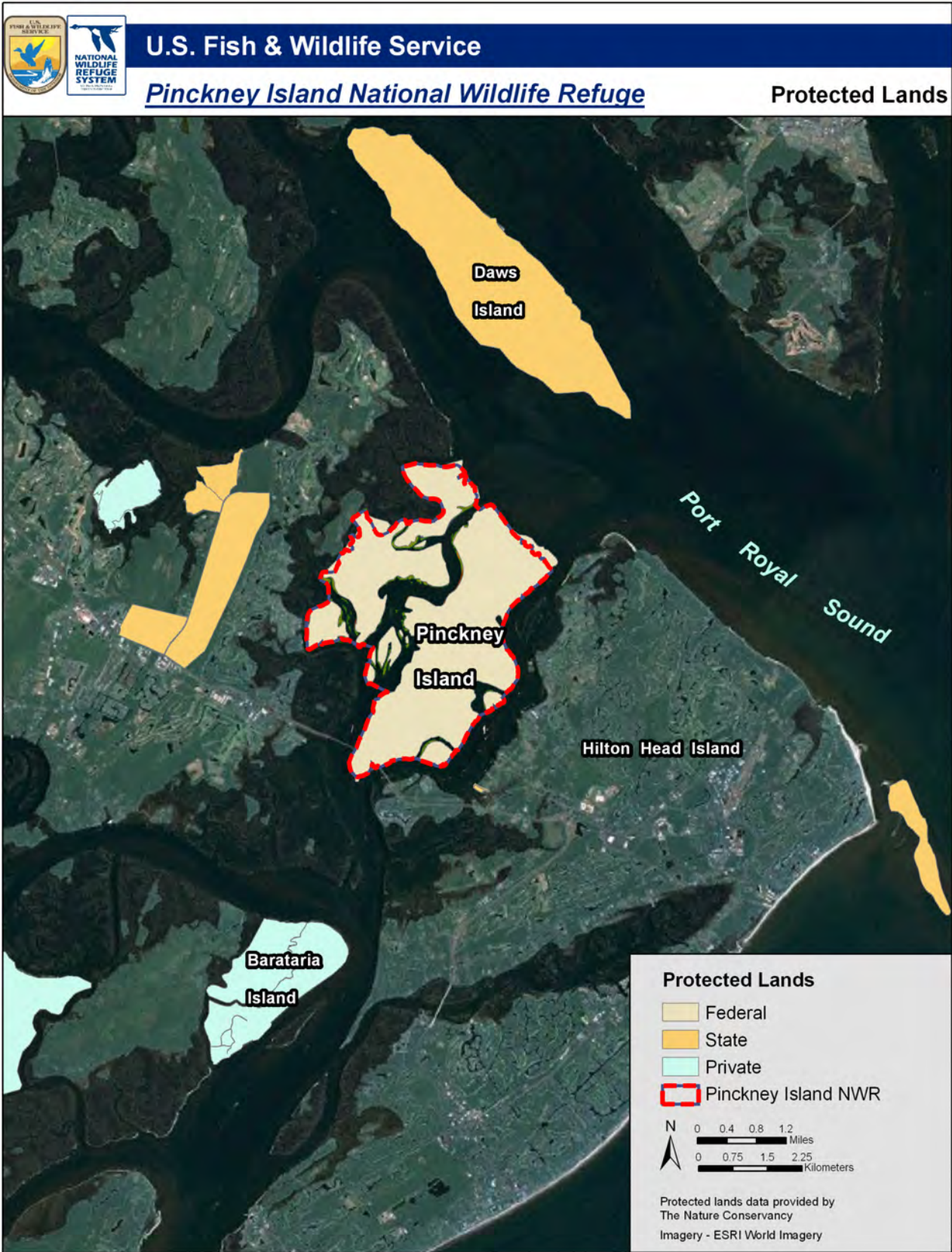


Figure 20. Protected lands of Harris Neck National Wildlife Refuge





Figure 21. Protected lands of Pinckney Island National Wildlife Refuge





**U.S. Fish & Wildlife Service**

***Savannah National Wildlife Refuge***

**Protected Lands**

**Protected Lands**

- Federal
- State
- Private
- Savannah NWR

0 0.7 1.4 2.1 Miles  
0 0.8 1.6 2.4 Kilometers

Protected lands data provided by  
The Nature Conservancy  
Imagery - NAIP - 2006



Figure 23. Acquisition boundary of Savannah National Wildlife Refuge

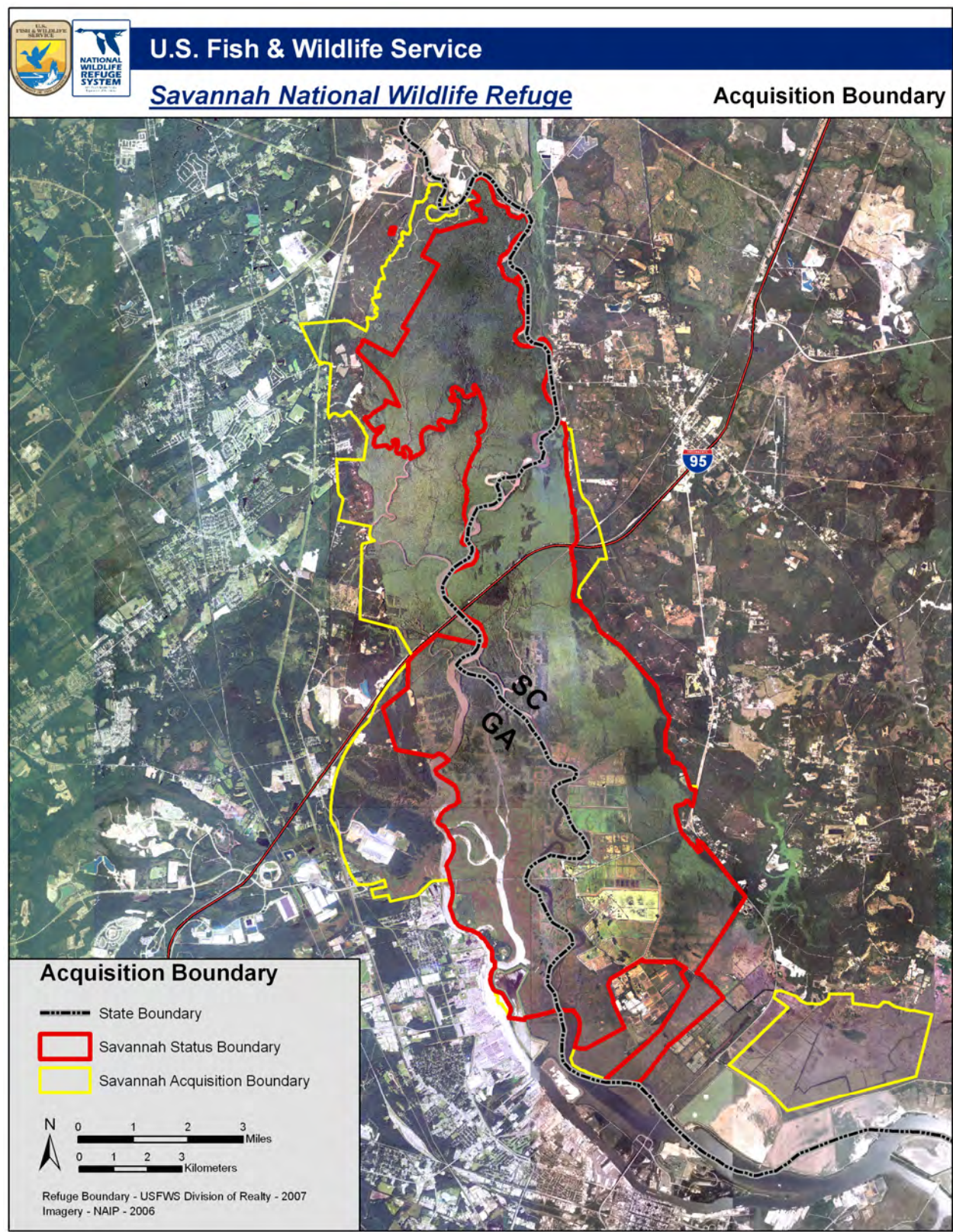




Figure 24. Protected lands of Tybee National Wildlife Refuge

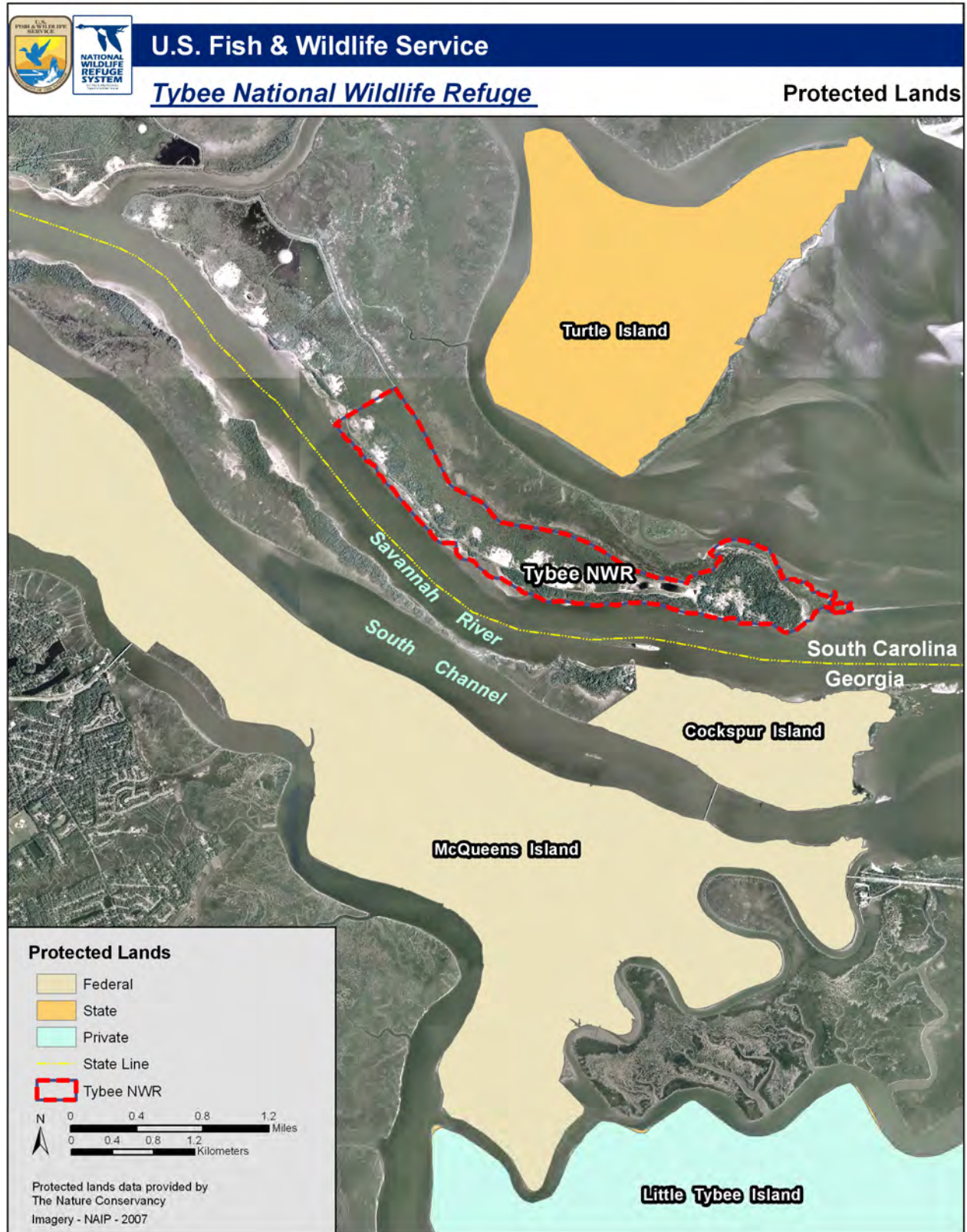




Figure 25. Protected lands of Wassaw Island National Wildlife Refuge

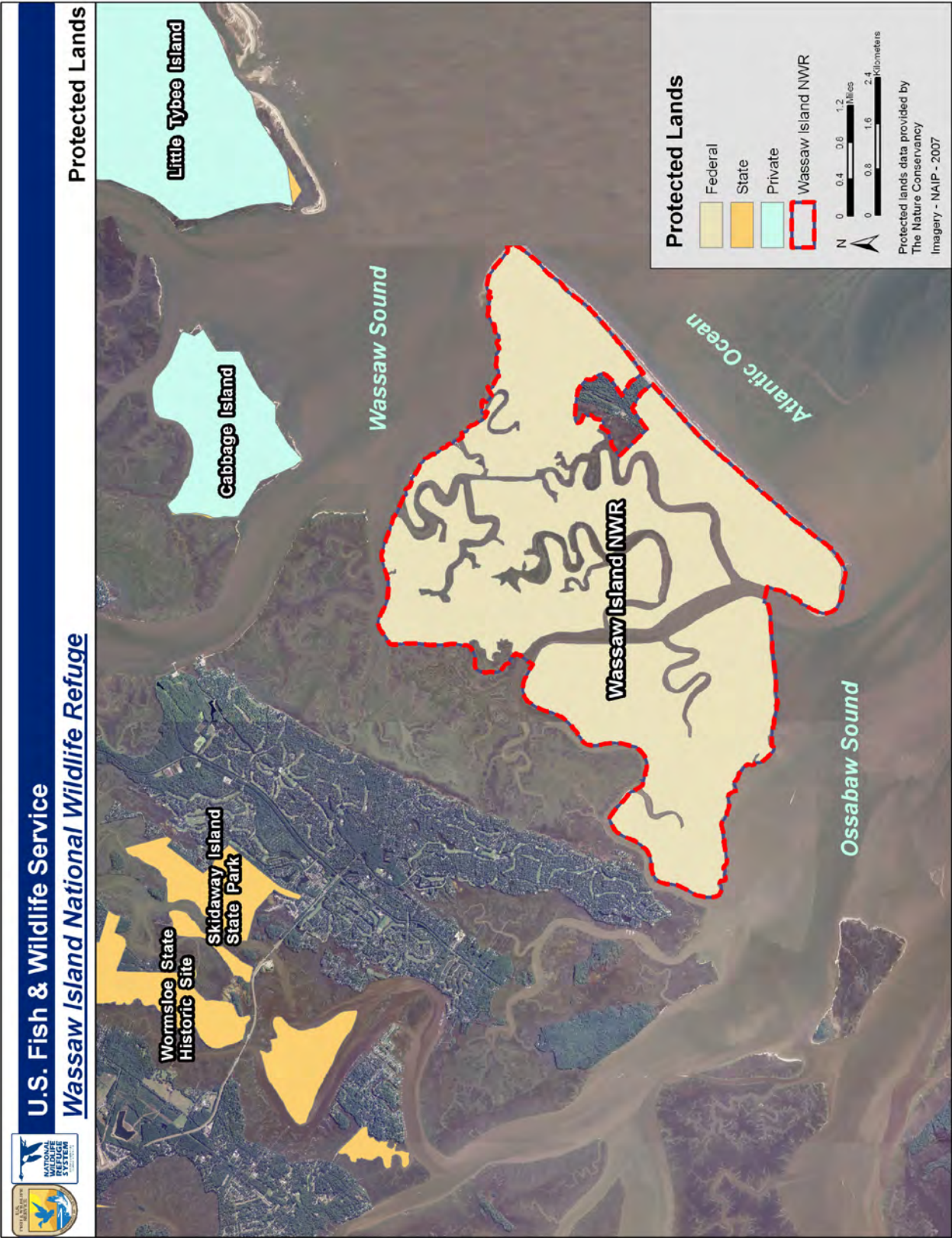
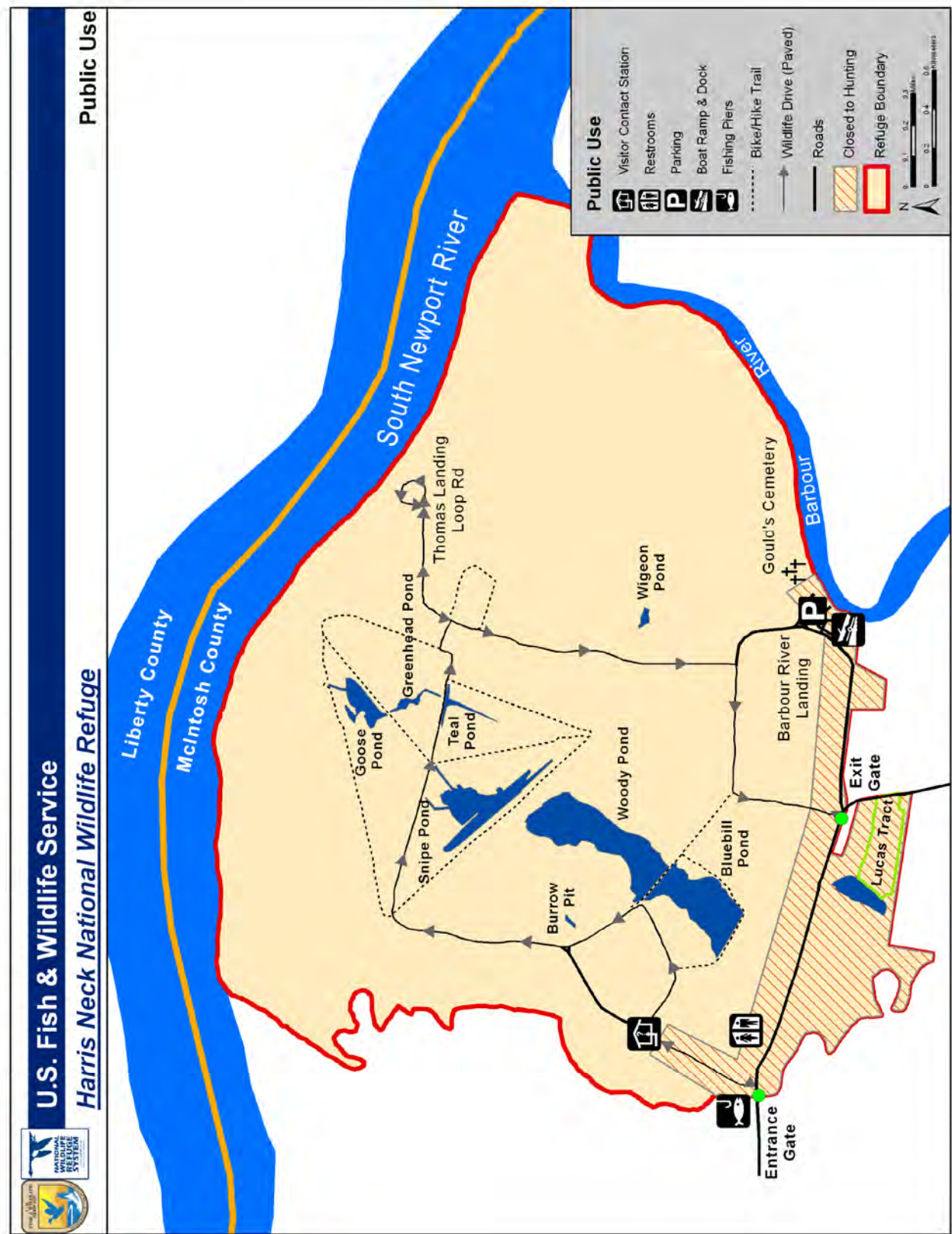


Figure 26. Location of public use areas on Blackbeard Island National Wildlife Refuge





Figure 27. Location of public use areas on Harris Neck National Wildlife Refuge



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- Hunting and Fishing

Two, 3-day deer hunts are scheduled in the fall and winter every year. Both hunts are non-quota, archery hunts, and feral hogs may be taken, as well as deer, on each. Hunters must carry a signed hunt permit with them at all times during the hunts, as well as all required state licenses. The saltwater creeks which pass through refuge marshland are open to fishing the entire year. Due to the degraded condition of the refuge's freshwater ponds, freshwater fishing opportunities no longer exist on Blackbeard Island NWR.

## **Pinckney Island NWR**

Pinckney Island NWR, adjacent to Hilton Head, South Carolina, is an island of habitat surrounded by a "sea of development." There are approximately 200,000 visitors to Pinckney Island NWR annually, the most of any of the seven refuges in the Complex. The island is used exclusively as a nature and forest preserve. Deed restrictions put in place when the Pinckney Island NWR was established limit the ability of the refuge to provide some visitor services (see Deed of Donation, 1975, in bibliography; also see Easement Exchange Agreement, 1981). Studying, viewing, and photographing the island's wildlife and scenery are the most popular activities throughout the year. Visitor facilities at Pinckney Island NWR include a kiosk, information panels, parking area, and trails.

Public use opportunities on Pinckney Island NWR include: wildlife observation and photography; hiking/biking/trails; environmental education/interpretation; and hunting and fishing. Figure 28 details Pinckney Island NWR's public use areas.

- Wildlife Observation and Photography

Studying, viewing, and photographing the island's wildlife and scenery are popular activities throughout the year. There are nine named trails, all originating at the parking area near the refuge entrance. There are 14 miles of trails open to hiking and bicycling; however, no motorized vehicles are allowed north of the parking area. Wildlife viewing is best during the spring and fall months when migrations are at their peak.

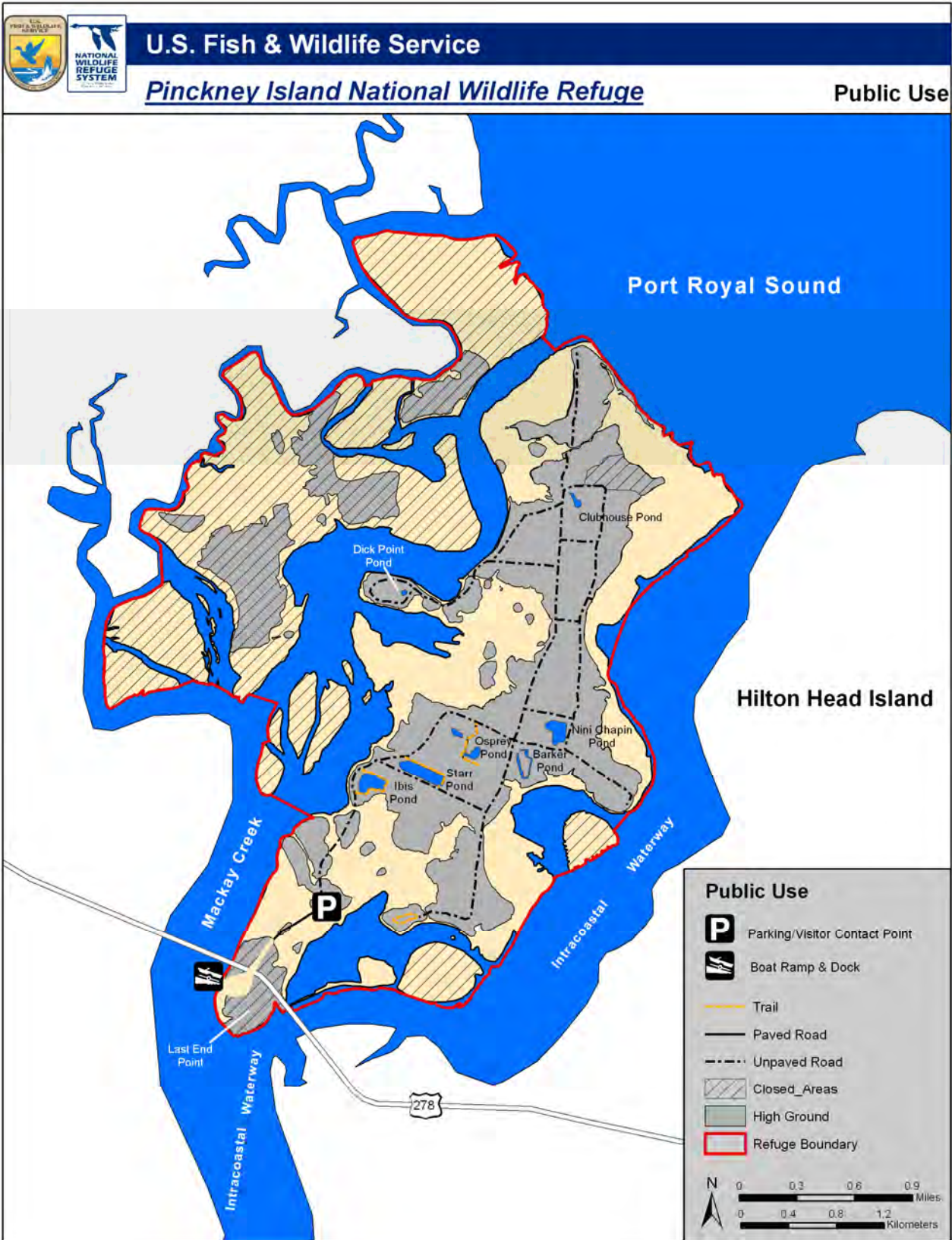
- Environmental Education and Interpretation

Environmental education programs and interpretive tours are available for school, civic and conservation groups by appointment. These tours are generally given by trained refuge volunteers and therefore require a minimum of two weeks' notice. Guided interpretive tours for individuals and families can be arranged through our special use permit holders. These tours are provided by private, commercial, or non-profit organizations that maintain a permit with the Service in order to conduct business on the refuge. Currently, there are five permit holders for Pinckney Island NWR who offer guided interpretive tours.

- Hunting and Fishing

Each year the refuge holds a one-day quota deer hunt to ensure that population numbers remain in balance with the surrounding habitat. Applications for this hunt must be received at the SCRC headquarters office by August 31. Freshwater fishing is not permitted on the refuge. Saltwater fishing is permitted by boat only in the surrounding waters of Skull and Mackay Creeks. Boaters may access these areas from the public boat ramp (Last End Point) located off U.S. Highway 278 across from the refuge entrance and are not allowed to come ashore or moor their boats at any other point on Pinckney Island NWR. Likewise, shellfishing is permitted by boat only in designated areas.

Figure 28. Location of public use areas on Pinckney Island National Wildlife Refuge



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## Harris Neck NWR

There are approximately 90,000 visitors to Harris Neck NWR annually, with the primary public use being wildlife observation and photography. There is a small visitor contact area in the lobby of the office. This area has an artifacts table, posters, and portable exhibits. The information desk is usually staffed from 10:00 a.m. to 4:00 p.m. by volunteers. There is a large effort to recruit, build, and maintain a volunteer program at Harris Neck NWR.

Public use opportunities on Harris Neck NWR include: Hiking/biking/trails (5 trails); auto tour route (4.2-mile Wildlife Drive); wildlife observation and photography; hunting and fishing (shrimping/crabbing); and environmental education/interpretation. Figure 27 details Harris Neck NWR's public use areas.

- Wildlife Observation and Photography  
Because of the great variety of habitats found on Harris Neck NWR, many different species of birds are attracted to the refuge throughout the year. In the summer, thousands of egrets, herons, and wood storks nest in the swamps, while in the winter, large concentrations of ducks (especially mallards, gadwall, and teal) gather in the marsh land and freshwater pools. Over 15 miles of paved roads and trails provide the visitor easy access to these areas.
- Environmental Education and Interpretation  
Environmental education programs and interpretive tours are available for school, civic, and conservation groups by appointment only. These tours are generally given by either staff or trained refuge volunteers and require a minimum of two weeks' notice. Guided interpretive tours for individuals and families can also be arranged through our special use permit holders (fees may apply.) These are private, commercial, or non-profit organizations that maintain a permit with the Service in order to conduct business on the refuge. Three such outfits currently hold permits for conducting guided interpretive tours at Harris Neck NWR.
- Hunting and Fishing  
Two managed deer hunts are conducted on the refuge each year. The first, in the fall, is a non-quota, archery hunt, and the second, in the winter, is a quota, shotgun hunt. Feral hogs can also be taken during both of these hunts. The refuge has six freshwater impoundments that are managed for wading birds and endangered wood storks that are not open to fishing. However, the refuge has two public boat ramps and two fishing piers that provide public access and opportunities for saltwater fishing.

## Savannah NWR

The Savannah NWR has approximately 170,000 visitors annually. There are over 38 miles of river and 25 miles of streams and creeks within the refuge. Visitors have access to a 4-mile wildlife drive (Laurel Hill Wildlife Drive) and two trails, as well as over 30 miles of levees for hiking. The refuge offers seven different hunting events annually. Currently, there is no visitor center or visitor contact facility located at the refuge. A visitor center located off of U.S. Highway 17, 6 miles north of the city of Savannah, will open in 2010.



Figure 29. Location of public use areas on Savannah National Wildlife Refuge (South)

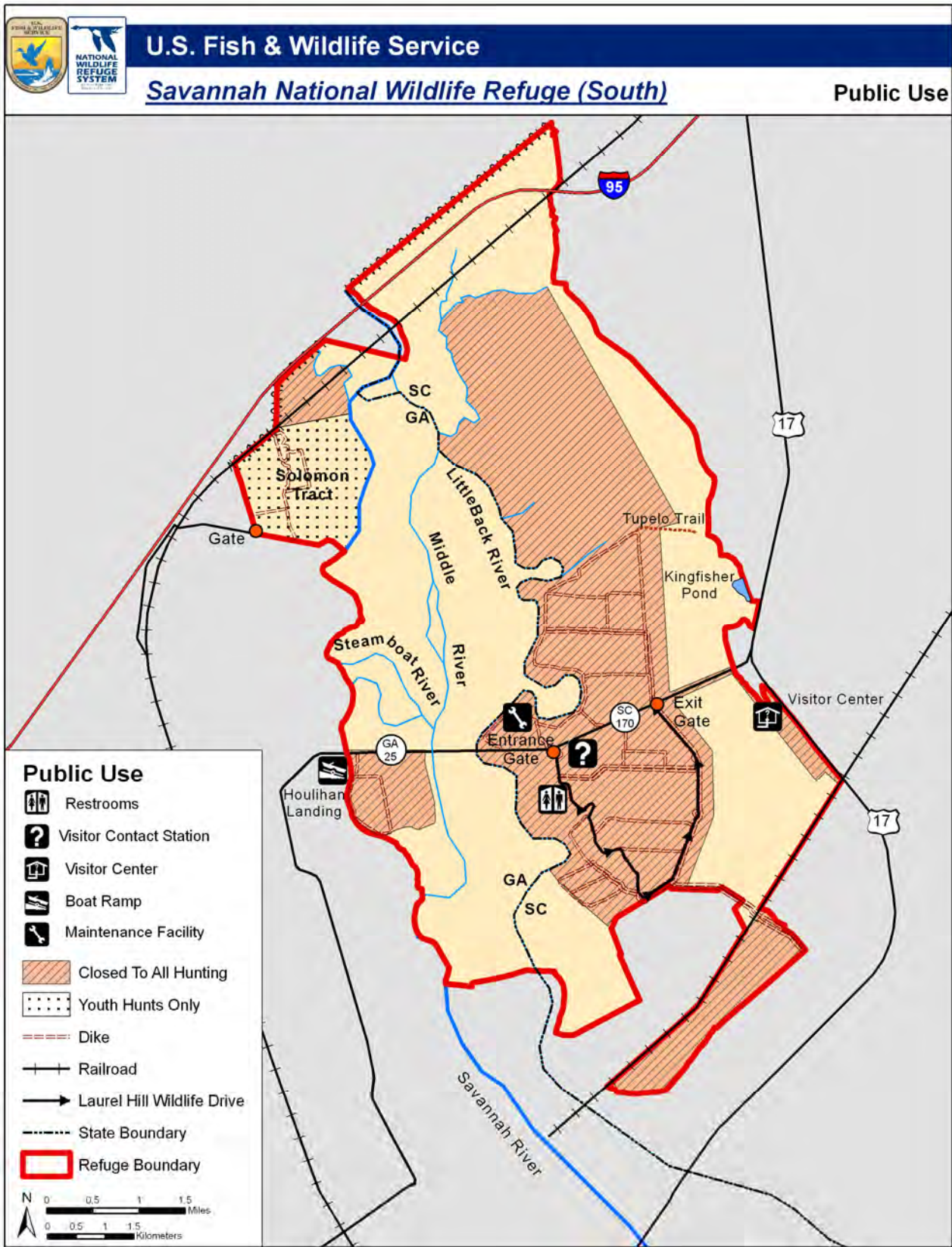
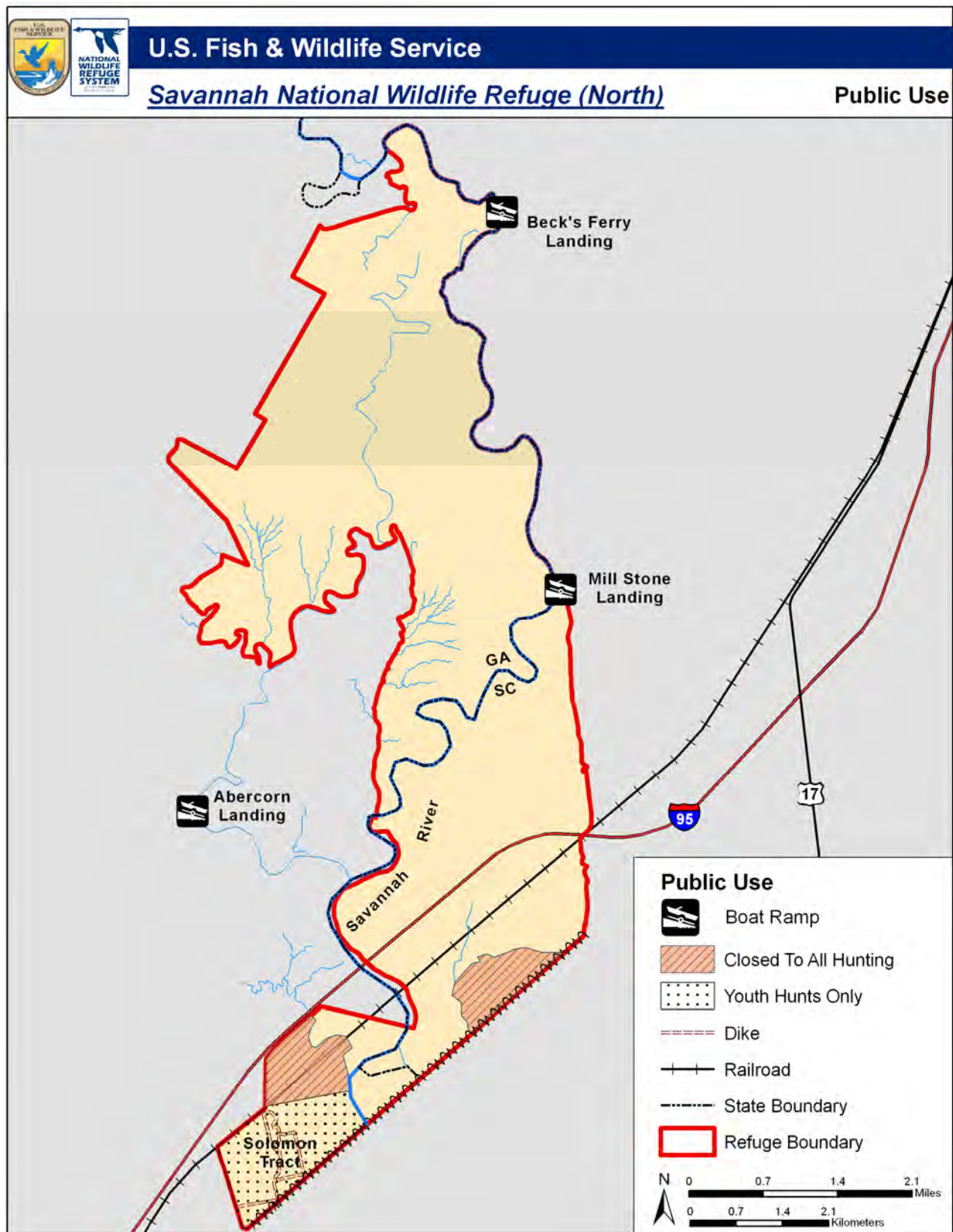


Figure 30. Location of public use areas on Savannah National Wildlife Refuge (North)



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Public use opportunities on Savannah NWR include: wildlife observation and photography; interpretation; hiking and bicycling; fishing and hunting (deer, turkey, feral hog and squirrel); 36 miles of dikes are open seasonally to foot traffic; and the 4-mile Laurel Hill Wildlife Drive is open to vehicular traffic throughout the year. Figures 29 and 30 detail Savannah NWR's public use areas.

- Wildlife Observation and Photography

All dikes are open to foot travel during daylight hours, unless otherwise posted, and provide excellent wildlife observation points. Waterfowl are most abundant from November through February, while alligators and other reptiles are frequently seen from March through October. Birdwatching opportunities are good year-round, but are best from October through April when temperatures are mild and many species of waterfowl and other wintering birds are present. Motorists are welcome on the Laurel Hill Wildlife Drive, off South Carolina Highway 170, which meanders along 4 miles of earthen dikes through managed freshwater pools and hardwood hammocks. The Cistern Trail and other walking routes are also available to the visiting public. From December 1 to February 28, entry into the impoundment area north of South Carolina Highway 170 is prohibited to reduce disturbance while wintering waterfowl numbers are at a peak. However, during this period, one designated route remains open to access the Tupelo Trail.

- Environmental Education and Interpretation

Environmental education programs and interpretive tours are available for school, civic, and conservation groups by appointment. These tours are generally given by trained refuge volunteers and therefore require a minimum of two weeks' notice. Guided interpretive tours for individuals and families can also be arranged through our special use permit holders. These are private, commercial, or non-profit organizations that maintain a permit with the Service in order to conduct business on the refuge. Five such outfits hold permits for conducting guided interpretive tours at Savannah NWR.

- Hunting and Fishing

The refuge administers deer, feral hog, and squirrel hunts during the fall and winter, and turkey hunting in the spring. The archery hunting season for white-tailed deer and feral hogs extends from October 1 through October 31 each year. The firearm season for deer, feral hogs, and squirrel extends from November 1 through November 30 of each year. Designated areas are open to wheelchair-dependent hunters for a 2-day hunt in November. In March, a 9-day feral hog hunt is open to gun hunters. During April there is a 16-day turkey hunt. Waterfowl hunting is permitted in designated areas during state (Georgia and South Carolina) seasons. A portion of the refuge in Georgia is set aside for a youth archery hunt (October 1-31) and waterfowl hunt (6 days in December).

Fishing, although not heavily promoted as a major public use on the refuge, is allowed year-round in the creeks and rivers throughout the refuge. There are four county owned and maintained boat launch areas, immediately outside the refuge boundaries, which provide access to fishing the navigable waterways within the refuge. Fishing is also allowed within the impoundment system (freshwater pools) between March 1 and November 30 of each year from sunrise to sunset and is governed by South Carolina and refuge regulations. Bank fishing from the Laurel Hill Wildlife Drive is permitted year-round. A brochure containing all hunting and fishing regulations as well as all necessary permits for the current year is printed each year around July 1.

## **Tybee NWR**

Tybee NWR is closed to public use. There are no docking facilities or other amenities located on the refuge. The refuge's small size provides minimal habitat for wildlife. Visitor use is not compatible with the nesting, feeding, and resting activities of the refuge's birdlife, since disturbance is a factor in such a limited area.



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## **Wassaw NWR**

There are approximately 15,000 visitors to Wassaw NWR each year, with most visitations occurring on weekends and holidays during the summer. Wassaw Island has remained largely undisturbed and unspoiled as a result of the island's inaccessibility and protection efforts to provide wildlife-dependent recreation. Access to the refuge is only by boat. Most people anchor their boats off the north or south ends of the island. The refuge has a boat dock at the small headquarters office on Wassaw Creek. The public is welcome to load or unload passengers at the dock to access trails or obtain visitor information; however, due to the small size of the dock, only temporary mooring is allowed.

The refuge offers pristine and natural conditions and provides outstanding opportunities for solitude and primitive recreation. There are 7 miles of undeveloped beach to provide nesting habitat for the threatened loggerhead sea turtle. There is no public pier or dock and no potable drinking water available on the refuge. There is a 20-mile system of dirt roads and trails for hiking and wildlife observation and photography. Public use occurs primarily on the beach with popular activities including hiking, bicycling, wildlife photography, saltwater and surf fishing, sea kayaking, and beachcombing. Figure 31 details Wassaw NWR's public use areas.

- Wildlife Observation and Photography  
The 20 miles of dirt roads on Wassaw NWR and 7 miles of beach provide an ideal wildlife trail system for both hikers and bicyclers. The beautiful, undeveloped beach provides ideal nesting habitat for the threatened loggerhead sea turtle, as well as bountiful feeding grounds for numerous species of shorebirds. The island also supports rookeries for egrets and herons and becomes particularly fruitful for birdwatching during the spring and fall migrations.
- Environmental Education and Interpretation  
Guided interpretive tours for individuals and families can be arranged through special use permit holders. These are private, commercial, or non-profit organizations that maintain a permit with the Service in order to conduct business on the refuge. Currently, there are eight groups holding permits that offer guided interpretive tours on Wassaw NWR.
- Hunting and Fishing  
Two 3-day deer hunts are scheduled in the fall and winter every year: one primitive weapon and one gun hunt. The salt waters of the refuge marshland are open to fishing, crabbing, and shrimping throughout the year. Surf fishing is permitted on the beach and saltwater fishing is popular in the refuge's many tidal creeks. However, freshwater fishing from any source on the refuge is prohibited. Boat ramps available to visitors include: Coffee Bluff; Delegal; Skidaway Narrows; Isle of Hope; Bull River; and Fort McAllister.

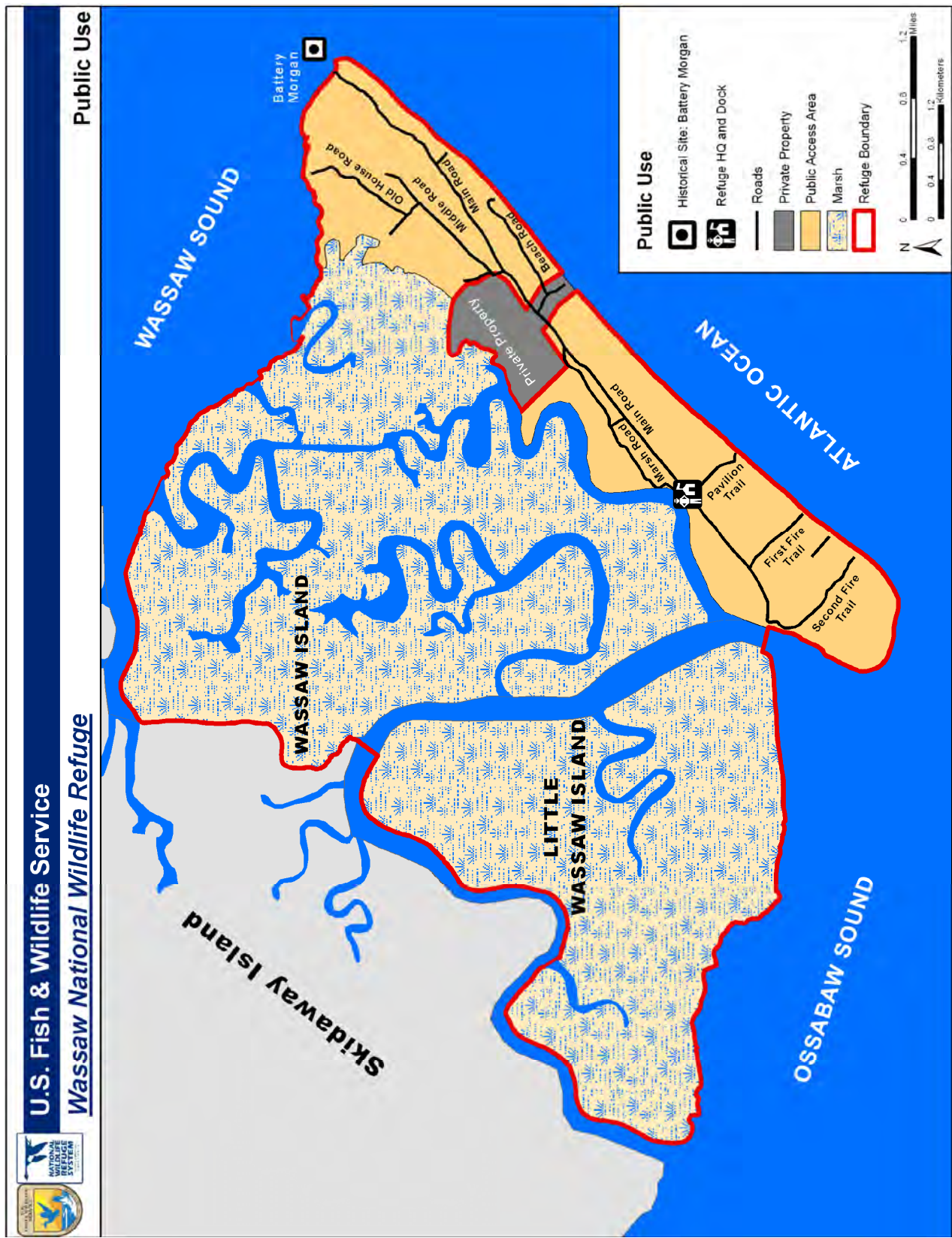
## *PERSONNEL, OPERATIONS, AND MAINTENANCE*

### **Staffing**

The Complex administers seven wildlife refuges between Georgia and South Carolina. 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 are Savannah (the largest unit in the Complex), Wassaw, Tybee, Harris Neck, and Blackbeard Island NWRs. Together they span a 100-mile coastline and total more than 56,000 acres. The Complex is administered from headquarters located in Savannah, Georgia, and has a combined staff of 30 full-time members.



Figure 31. Location of public use areas on Wassaw National Wildlife Refuge



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Volunteer groups spend many hours helping with refuge tasks. The Ogeechee Audubon Society (OAS) currently serves as the refuge support group for the Savannah NWR. OAS joined the Audubon Refuge Keeper (ARK) program in the early 1990s as part of a national thrust to support refuges. A recently formed Friends Group, separate from the OAS, will serve as the main support group for the Complex. The new organization, Friends of the Savannah Coastal Wildlife Refuges, will be active in raising needed funds for developing facilities and promoting best management practices on the refuge (i.e., handicapped accessible fishing piers, invasive aquatic plant management, and recovery efforts for endangered and threatened species).

### **Blackbeard Island NWR**

No Service staff is assigned full-time to Blackbeard Island NWR. Maintenance of refuge facilities and equipment is handled by the four full-time staff assigned to Harris Neck NWR. In addition, other Complex staff members contribute time and expertise to the management of the refuge. There are three refuge law enforcement officers assigned to the Complex, one of which lives in refuge housing on Harris Neck NWR and spends 50 percent of his time at Harris Neck, Blackbeard Island, and Wolf Island NWRs. The refuge has a boat dock, a residence and bunkhouse, a maintenance building, and several smaller buildings, including a walk-in deer cooler for hunters. Many of the facilities are old, but well-maintained. Distance to mainland docks, high fuel costs, structural longevity, weather, and termites are contributing factors to high maintenance costs. Approximately 20 miles of roads and trails are maintained and kept open to the public year-round.

Primary management tools used on the refuge include:

- Mowing/disking
- Prescribed fire and wildfire suppression
- Mechanical/chemical control of invasives
- Public hunting for deer population management
- Education/Interpretation
- Law enforcement
- Partnerships
- Sea turtle nest monitoring

The southern 3,000 acres of Blackbeard Island NWR are designated as wilderness. Natural processes are allowed to take their course. Law enforcement is required to monitor public use in this part of the refuge.

### **Harris Neck NWR**

The refuge is staffed by four full-time employees and a good core of dedicated volunteers. The office and visitor contact area in the lobby of the office are staffed by volunteers. There is a large effort to recruit, build, and maintain the volunteer program at Harris Neck NWR. Other facilities include a 4½-mile auto-tour, two recreational fishing boat ramps, a commercial fishing dock, portable toilets, and an informational kiosk. There are three refuge law enforcement officers assigned to the Complex, one of which lives in refuge housing on Harris Neck NWR and spends 50 percent of his time at Harris Neck, Blackbeard Island, and Wolf Island NWRs. There are over 15 miles of paved road and trails which are maintained.

Primary management tools used on the refuge include:

- Water level management for waterfowl, shorebirds, wood storks, and wading birds
- Mowing and diskings
- Prescribed fire and wildfire suppression
- Mechanical and chemical control of noxious plants

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- Timber management
  - Public hunting for deer population management
  - Education/interpretation
  - Law enforcement
  - Partnerships

### **Pinckney Island NWR**

No Service staff is assigned full time to Pinckney Island NWR. Facilities at Pinckney Island NWR include approximately 4 miles of gravel roads, 10 miles of grass trails, a visitor contact point/interpretive exhibit kiosk, 9 interpretive-wayside exhibits, a parking lot with bus parking, and a county-managed boat ramp and fishing pier. Most of the maintenance of these facilities is done by volunteers and staff from Savannah NWR. Staff and volunteers that may be working on the refuge do not have a regular schedule.

Primary management tools used on the refuge include:

- Water management for wading bird rookeries
- Mechanical/chemical treatment of invasives
- Prescribed fire and wildfire suppression
- One annual, quota deer hunt
- Partnerships
- Education/Interpretation
- Law enforcement
- Timber management

### **Savannah NWR**

There are seven full-time employees assigned to Savannah NWR. Nine additional full-time fire staff report to Savannah NWR; however, fire staff are assigned to the wildland fire crew which serves a designated fire district that includes other refuges in South Carolina and North Carolina, in addition to the seven refuges within the Complex. A visitor center, located off of U.S. Highway 17, 6 miles north of the city of Savannah, opened in 2010. The 4-mile Laurel Hill Wildlife Drive and 30 miles of levees provide opportunities for wildlife observation. An information kiosk with interpretive displays and wayside exhibits, as well as two portable toilets, are located along the drive. Savannah NWR contains approximately 6,000 acres of impounded freshwater wetlands. About 3,000 acres of former rice fields are now maintained in 19 water-controlled impoundments to provide feeding areas and sanctuary for birds. Maintenance of the 3,000-acre impoundments system, 50 miles of levees and dikes, and the 4-mile Laurel Hill Wildlife Drive require constant mowing during the growing season.

Primary management tools used on the refuge include:

- Water level management on 3,000 acres for the benefit of waterfowl, wading birds, and shorebirds
- Prescribed fire and wildfire suppression.
- Mechanical/chemical treatment of undesirable and/or noxious plants
- Deer and feral hog management with public hunting
- Education/Interpretation
- Law enforcement

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## **Tybee NWR**

Tybee NWR is closed to public use and there are no Service personnel or staff assigned to the refuge. Employees of the Complex staff are utilized to manage the refuge.

Primary management tools used on the refuge include:

- Law enforcement (to discourage human disturbance on the refuge)
- Environmental education/interpretation
- Wildfire suppression

## **Wassaw NWR**

There is one full-time Service staff person assigned responsibilities for Wassaw NWR; however, the Complex does not receive funding and there are no permanent staff assigned to Wassaw NWR. Maintenance of refuge facilities and equipment is handled by one employee stationed at the Complex headquarters office. In addition, other Complex staff members contribute time and expertise to the management of the refuge. The refuge has a boat dock, a residence/bunkhouse, a maintenance building, and several smaller buildings, which all serve an administrative function. There is also a walk-in cooler that is made available to hunters during refuge hunts to hang their deer. At this time, there is no public pier or dock for public convenience; the government dock may be used for loading and unloading only. Mooring is an established use in state waters immediately adjacent to the refuge. There is a primitive camp site established adjacent to the refuge compound which is available to hunters only during refuge hunts. Two portable toilets are also maintained throughout the year. Potable drinking water must be carried over from the mainland. There is a 20-mile system of dirt roads and trails maintained for hiking and wildlife observation and photography.

Primary management tools used on the refuge include:

- Prescribed fire and wildfire suppression
- Sea turtle nest monitoring - This is done on Wassaw Island through a partnership with the Savannah Science Museum and their "Caretta Research Project"
- Managed white-tailed deer hunts
- Mechanical and chemical control of invasives
- Law enforcement
- Education/Interpretation

## **Funding**

Funding is received as part of the Complex funding allocation. In Fiscal Year 2008, the budget for the Complex totaled \$3,500,000.

## **Facilities**

The Complex has a good base of facilities and equipment to support management operations for the 56,949 acres that span the seven refuges. Facilities and equipment to support management operations on the seven refuges include: Complex Office and Visitor Center located on Savannah NWR, Office/Visitor Center at Harris Neck NWR; maintenance shop facilities and associated storage buildings and outbuildings located on Savannah, Harris Neck, Pinckney Island, Blackbeard Island, and Wassaw NWRs. There is a public boat ramp and parking lot at Harris Neck NWR along with a commercial dock under lease to local watermen. At Pinckney Island NWR there is a public boat ramp and associated parking area managed under agreement with Beaufort County, South Carolina.





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### *III. Plan Development*

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

In accordance with Service guidelines and NEPA recommendations, public involvement has been a crucial factor throughout the development of this CCP for the Complex. This CCP has been written with input and assistance from interested citizens, conservation organizations, and employees of local and state agencies. The participation of these stakeholders and their ideas has been of great value in setting the management direction for the refuge. The Service, as a whole, and the Complex staff, in particular, are very grateful to each one who has contributed time, expertise, and ideas to the planning process. The staff remains impressed by the passion and commitment of so many individuals for the lands and waters administered by the Complex.

Development of this CCP was initiated in October 2007. The planning team responsible for its development was established in January 2008. It includes natural resource management professionals representing all six national wildlife refuges. The Service established a biological review team for each refuge, with representatives from local and regional Service offices and state and federal agencies, including both Georgia and South Carolina Departments of Natural Resources, which conducted on-site evaluations and completed Biological Review Reports. Individual visitor services review teams were established for each refuge that presented recommendations to the refuge staff and prepared Visitor Services Review Reports (USFWS 2007 and 2008).

Public input for the development of this CCP was obtained, in part, through three public scoping meetings held in the vicinity of the refuges. News releases, word of mouth, and radio and website announcements were utilized to advertise the meetings to the public. These meetings were held during June 2008, and were attended by approximately 42 people. During the public scoping process, both written and verbal comments were received. Comments received during this process are listed in Appendix D. In addition to the public meetings, the Complex sent out written notices to local, state, and federal agencies to invite input in the CCP process. Several letters or comments were received in response to this intergovernmental scoping letter.

In identifying key issues to be addressed during the planning process, the planning team considered recommendations from the Biological Reviews and Visitor Services Review Reports; comments received through the public scoping meetings and intergovernmental scoping letters; and input from open planning team meetings, comment packets, and personal contacts of planning team members. In addition, the team considered opportunities for coordination with other relevant conservation plans; applicable legal mandates; the purposes of all national wildlife refuges, as well as the mission, goals, and policies of the Refuge System; and evaluations and documentation required by Service procedures for refuge planning.

The Service expanded the planning team's identified issues and concerns to include those generated by the agencies, organizations, businesses, and citizens from the local community. These issues and concerns formed the basis for the development and comparison of the different alternatives described in the environmental assessment. The Service made the draft comprehensive conservation plan and environmental assessment available for public review September 15, 2010 through October 15th, 2010. A summary of the public scoping comments and the draft comprehensive conservation plan and environmental assessment comments, as well as the Service's response, are provided in Appendix D.

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## **SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES**

The planning team identified a number of issues, concerns, and opportunities related to fish and wildlife protection, habitat management and restoration, visitor and educational services, and refuge administration. Issues and concerns are based on the professional judgment of the team. In addition, recommendations and discussions with personnel from other conservation agencies and refuges and comments from the public were considered. Key issues included water management, forest management, threatened and endangered species management, migratory bird and waterfowl nesting habitats, hunting and fishing program management, invasive species, refuge access, law enforcement, saltwater intrusion, and expanding environmental education and interpretation programs. The planning team considered applicable local ordinances, regulations, and plans, as well as federal and state mandates.

All public and advisory team comments were considered; however, some issues important to the public fall outside the scope of the decisions made within this planning process. The team considered all issues that were raised throughout the planning process, and has developed a plan that attempts to balance the competing opinions relating to important issues. The team identified the issues that, in its best professional judgment, are most significant to the Complex. A summary of the significant issues follows.

### ***FISH AND WILDLIFE POPULATION MANAGEMENT***

#### **Threatened and Endangered Species**

The protection of threatened and endangered plants and animals is an important responsibility delegated to the Service and the Refuge System. Federal threatened and endangered species are known to occur on many of the habitats within the Complex. These include flatwoods salamander, West-Indian manatee, sea turtles, wood stork, piping plover, Kirtland's warbler, and Atlantic and shortnosed sturgeon.

Flatwoods salamanders breed in isolated pond cypress dominated depressions often with a smaller component of blackgum or slash pine. These ponds are isolated within pine forests. Suitable wetlands have a marsh-like appearance with grasses growing throughout and other herbaceous species in the shallow water edges. A relatively open canopy is necessary to maintain appropriate vegetation, which serves as cover for salamander larvae and their aquatic invertebrate prey. The major threats to this species are habitat destruction, deterioration, and fragmentation.

Kirtland's warblers may stop-over on the Savannah NWR during their migration. Protection and management of the existing bottomland habitat will benefit this species.

Five species of sea turtles inhabit the coastal waters of Georgia. These include the loggerhead, Kemp's ridley, leatherback, green, and hawksbill sea turtles. The most common sea turtle, the loggerhead, is listed as threatened and the other four species are listed as endangered. The loggerhead is the primary turtle nesting in Georgia waters (approximately 1,200 nests per year); 5 to 10 nests per year can be contributed by all the other species combined throughout Georgia.

Blackbeard Island and Wassaw NWRs provide nesting habitat for the northern loggerhead sea turtle subpopulation in the western North Atlantic, and some of the longest recorded nesting data comes from these two beaches. These islands consistently have high densities of nests and are considered some of the most important index beaches within the northern subpopulation. Beach restoration and nest protection will benefit these species.

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West-Indian manatees range up and down the Georgia coast in the warmer months, appearing as early as March and staying as late as December, depending on the weather, water temperature, and sources of warm water. These same manatees spend the winter along the Atlantic coast of Florida before migrating back to Georgia. The general pattern for manatees is one of directed movements to specific core areas that are used for prolonged periods. Manatees have used waters within or adjacent to Savannah, Pinckney Island, Tybee, Wassaw, Harris Neck, and Blackbeard Island NWRs during the summer, feeding in the tidal creeks on various marsh plants. Several recent sightings have occurred on the Barbour River. One of the greatest dangers to this species is the threat of injury by boats.

In Georgia and South Carolina, the coastal barrier islands are important for wintering piping plovers, and the most important wintering area for the endangered Great Lakes population. 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. This species requires a mosaic of beach habitat including some areas of high beach to provide roosting areas during high tides or storm events. They will use a variety of habitats for foraging, including everything from heavy peat relict marsh mud to all other exposed habitats at low tide. Wassaw and Blackbeard Island NWRs contribute to the recovery of this species by providing critical habitat.

The endangered shortnose sturgeon and the Atlantic sturgeon occur within the rivers on the Savannah, Blackbeard Island, and Wassaw NWRs. Issues identified concerning the sturgeon are that public education and law enforcement efforts should be increased to inform local fishermen that take of either of these species is prohibited. In addition, boaters should be informed of the dangers to these species as they tend to breach the water surface and have been known to collide with boats.

The endangered wood stork is found using the impoundments and tidal marshes of various refuges. Harris Neck NWR provides a variety of habitats necessary for their survival and recovery, as do several of the other refuges. They breed in a colony in Harris Neck NWR's Woody Pond, forage in other wetlands/marshes on or near the refuge, and roost in wetlands on-site. Management activities have resulted in this being one of the most stable and productive colonies in the United States, as well as an excellent location for research. Further nesting restoration and protection, along with providing additional feeding opportunities, will benefit this species.

### **Invasive and Nuisance Species**

An "invasive species" is defined as a species that is non-native (or alien) to the ecosystem under consideration, and whose introduction causes or is likely to cause economic harm, environmental harm, or harm to human health (Executive Order 13112). These species are normally introduced by direct or inadvertent human actions.

According to 2006 Refuge Annual Performance Planning (RAPP) data, two million acres of Refuge System lands are infested with invasive plants. There are 4,471 invasive animal populations recorded as well. While refuge personnel are doing their best to control these populations, only about 14 percent of infested acres have been treated thus far.

Plant, insect, and animal nuisance and invasive species currently occur within the Complex. Animal species such as feral hogs compete with native species for limited food supplies and can be destructive to habitats. Removal of hogs has been attempted opportunistically by refuge staff and hunting programs offered to the public.



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The exotic ambrosia beetle with its associated fungus can kill a full-sized red bay tree in a matter of days. The beetle arrived in the area in 2002 in a shipment at the Port of Savannah and spread rapidly. By 2004, most of the Complex's refuges were infested due to being in close proximity to the point of entry. Presently, most red bay trees over 4 feet tall are dead. The beetles' fungus on species in the Laurel family has been termed "Laurel Wilt."

Other invasive plant species found on the refuges include Chinese tallow and Phragmites. Because of the opportunistic and resilient nature of these invasive plant species, they have thrived. The Complex has tried to control invasive plant species through several different means, including chemical and mechanical treatments. One of the worst cases within the Complex is the spread of invasive aquatic vegetation in the ponds and water management units at Harris Neck NWR. Native plants, such as greenbrier and cattail, can also be classified as invasive when densities are high enough to suppress all other plant growth and a mono-specific composition prevails.

## **Resident Wildlife**

While the Service's primary goal is the protection of federal trust species, the refuges' purposes also include improving natural diversity of resident fish and wildlife species. Therefore, it is the responsibility of the refuges to manage resident wildlife within the refuge boundaries. This management needs to be performed in conjunction with, and not to the detriment of, migratory, birds and threatened and endangered species within the refuges. Arrays of wildlife species indigenous to the Southern Coastal Plain Ecosystem inhabit the Complex. The most widely recognized species include white-tailed deer, bobcat, coyote, river otter, raccoon, gray fox, red fox, opossum, beaver, wild turkey, cottontail and marsh rabbit, eastern gray squirrel, fox squirrel, and skunk.

The Coastal Plain of South Carolina and Georgia is a very important region for herpetofauna with high species and habitat diversity and several rare, threatened, and endangered species. Of the approximately 142 species of amphibians and reptiles found in the states, 113 occur in the Coastal Plain, 50 of these are endemic to the coast in South Carolina. Resident reptiles and amphibians include alligators, various snakes, frogs, skinks, salamanders, and turtles.

Each biological review team recognized that the refuges within the Complex lacked specific data on many resident wildlife species, particularly non-game wildlife, such as reptiles, amphibians, mussels, insects, small mammals, and their habitats. Most efforts to collect data on resident wildlife species has focused on studying and management of game species, such as white-tailed deer. The needed studies on species and habitats will require additional staff and funding to come to fruition.

## **Migratory and Resident Birds**

A primary purpose of most of the refuges is to provide wintering and nesting habitats for migratory and resident birds: waterfowl, shorebirds, wading birds, and songbirds. The operation and management of the refuges provide for the basic needs of these species, including feeding, resting, and breeding. Complex management measures include water level management of units that cater to a variety of different species; control of invasive land and aquatic plant species to provide proper nesting and foraging habitat; and providing artificial nesting structures to accommodate particular species needs. Comments from the biological review team and the public expressed a desire to support and expand these efforts.

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## **Waterfowl**

A major issue facing the refuges is the reduction in migrating waterfowl utilizing the refuges. Possible reasons for this could be mild winters in the northern U.S., declines in some populations, and/or the reduction in food and critical habitats locally.

The Atlantic Coast Joint Venture (ACJV) planning region includes all of the refuges within the Complex. Within the ACJV, focus areas have been identified for South Carolina and Georgia and associated waterfowl habitat and population goals. In the South Carolina Low Country, the habitat goals are to protect 20,000 additional acres and enhance an additional 10,000 acres. In the Savannah River region of Georgia the habitat goal is to protect, enhance, and restore 126,000 additional acres for the benefit of priority waterfowl species.

The Georgia and South Carolina coastal marshes are a historic migration corridor for waterfowl that use the Atlantic Flyway. Populations vary greatly from year-to-year, depending on water levels and weather conditions farther up the flyway. Species range from dabbling ducks, such as mallards, gadwall, and teal, to diving ducks, such as scaup and ring-necked ducks.

Wintering waterfowl numbers on Blackbeard Island and Wassaw NWRs are insignificant compared to those of refuges or management areas farther north within the Atlantic Flyway; therefore, waterfowl are not the primary focus of management efforts. On Blackbeard Island NWR, open freshwater impoundments once provided wintering waterfowl habitat, but due to hydrologic changes have closed in with cattail. Artesian wells on the islands have ceased to flow due to a cone of depression created by industrial withdrawal from the Floridan aquifer. This coupled with severe drought has resulted in the near elimination of open water habitat on the island.

Wood ducks nest on the refuges within natural cavities and provided artificial cavities known as nesting boxes. Wood duck nest boxes were once located within most refuge ponds and water management units. However, some programs were suspended after staff observations indicated that alligators were attracted to the boxes and consuming most hatchlings when they landed in the water following emergence from the box. Additional box placement needs to be evaluated and, if boxes are installed, nest success and initial chick survival monitored.

## **Nongame Birds**

These birds are a broad group that includes breeding forest landbirds, breeding scrub/shrub landbirds, transient songbirds, marsh and grassland birds, shorebirds, wading birds, and raptors.

*Shorebirds:* Opportunities to provide habitat for this group of birds is greatest within managed wetland habitat. Higher numbers of shorebirds are moving through the Southeast Coastal Plains during spring migration than during the fall. However, inland feeding habitat may be limited during fall migration, since most of this habitat is provided through impoundments managed for waterfowl requiring a spring drawdown. Opportunities for habitat management directed at shorebirds are limited. To the extent that drawdowns for wintering waterfowl or foraging wading birds can be timed with peak migration times, the impoundments may provide excellent shorebird habitat. Within the Complex, thousands of acres of impoundment habitat are managed for moist-soil vegetation and can be manipulated to provide mudflat habitat seasonally; however, the need to setback vegetation annually is very time consuming and expensive.

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The Southeastern Coastal Plain – Caribbean Shorebird Conservation Plan calls for an annual habitat objective to provide 4,000 acres of suitable shorebird foraging habitat (e.g., mudflats) during both the south-bound and north-bound migration for shorebirds.

Biological review teams devised several different options to provide additional shorebird habitat within the Complex. It was suggested that drawdown of ponds and water management units could be rotated from year-to-year and/or staggered to provide both spring and fall feeding habitat for migratory shorebirds. Pond draw downs would supplement feeding habitat for spring migration by adding additional acres. An additional option could be implemented by delaying draw down until mid-July (after young wading birds have fledged), thus providing additional feeding habitat for fall migratory shorebirds.

*Neotropical birds:* Many nearctic-neotropical migratory landbirds orient southeastward during autumn migration to their tropical (primarily West Indian and South American) wintering areas. The South Atlantic coastline and peninsular Florida, particularly maritime woodlands, appear to be critically important during this migration. The vast majority of Bicknell's thrushes, Cape May, Black-throated blue, Wayne's Black-throated green (coastal populations), and presumably all federally endangered Kirtland's warblers migrate to and from their Bahamian wintering grounds, crossing the South Atlantic coastline. Despite these generalities, each nearctic-neotropical migratory species has its own distinctive seasonal pattern of migration during fall (August - October) and spring (late March-late May).

In many areas of the South Atlantic Coastal Plain, maritime forest has been destroyed for urban development. Forest fragmentation, invasive exotic vegetation, and poor stand quality are issues affecting forest breeding and neotropical migratory birds. Forest stand quality can be improved or maintained through the use of appropriate silvicultural treatments. Many breeding forest birds and migratory species are dependent upon dense understory and ground vegetation for nesting and foraging.

Historically, maritime scrub/shrub encompassed 1.6 million acres in the southeastern United States. Presently, these habitats are less than 10 percent and largely restricted to the Atlantic coast, especially on the Sea Islands. The maritime scrub/shrub community is composed primarily of yaupon holly, wax myrtle, sabal palmetto, and saw palmetto growing in dense thickets. These habitats are relatively resistant to salt spray, sun, wind, drought, and nutrient-poor soils. Along with maritime forest, maritime scrub/shrub represents the most important habitat for neotropical migratory birds moving to and from their tropical wintering grounds.

Scrub/shrub or early successional bird species as a group have continued to decline in the southeastern United States and would benefit from maintenance and restoration of habitat. Early successional habitat is currently being provided throughout the Complex in support of the highest priority scrub/shrub species, including painted bunting. However, some refuge areas have the potential to be maintained in an early successional condition, possibly with the use of prescribed fire, on a 5- to 10-year rotation. Harris Neck NWR currently has an extensive scrub/shrub edge component between grasslands and forest, in addition to the under/mid story component of the forest itself. Buffer strips along forest field edges and crop fields and narrow corridor linkages between forest patches should be managed as scrub/shrub habitat. This would benefit the highest priority scrub/shrub species as well as other important species including field sparrow, orchard oriole, white-eyed vireo, and northern bobwhite.

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## HABITAT MANAGEMENT

Regionally, the southern coastal plain extends from South Carolina and Georgia through much of central Florida, and along the Gulf coast lowlands of the Florida Panhandle, Alabama, and Mississippi. This ecoregion is lower in elevation with less relief and wetter soils than the southeastern plains. Once covered by a variety of forest communities that included longleaf pine, slash pine, pond pine, beech-magnolia, and mixed upland hardwoods, land cover in the region is now predominantly slash and loblolly pine plantations with cypress-gum, bay swamp, and bottomland hardwoods in low-lying areas. Ecoregional subdivisions of the southern coastal plain include the Okefenokee Plains, Sea Island Flatwoods, Okefenokee Swamp, Bacon Terraces, Floodplains and Low Terraces, and Sea Islands/Coastal Marsh (GADNR 2005).

Although the refuges within the Complex are situated within the same ecoregion, each has individual habitat types and management concerns that make it unique. See Section A, Chapter II, for a complete listing of habitat sizes and types within each refuge.

### **Water Management Units and Aquatic Habitat Management**

Moist-soil management refers to providing moist-soil conditions during the growing season to promote the natural production of beneficial plants. Seeds produced by these plants often attract and concentrate waterfowl and other wetland wildlife species. Preferred moist-soil plants provide seeds and other plant parts (e.g., leaves, roots, and tubers) that generally have low deterioration rates after flooding and provide substantial energy and essential nutrients less available to wintering waterfowl in common agricultural grains such as corn, milo, and soybeans. Moist-soil impoundments also support diverse populations of invertebrates, an important protein source for waterfowl. The plants and invertebrates available in moist-soil impoundments provide food resources necessary for wintering and migrating waterfowl to complete critical aspects of the annual cycle such as molt and reproduction.

Blackbeard Island and Wassaw NWRs contain thousands of acres 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. The wide variety of organisms supported by estuarine marshes is linked to the range of salinities that occur. When rain falls upstream, it flows downstream and discharges into the estuaries surrounding Blackbeard Island, Pinckney Island, and Wassaw NWRs. This freshwater temporarily lowers the salinity in the estuaries, making them habitable for organisms that prefer fresher water. Alternatively, when rainfall is limited and salinity levels rise in the estuaries, more saline tolerant species can move in from the Atlantic Ocean and those intolerant of high salinity migrate upstream into the river system.

The diversity and abundance of aquatic fish and invertebrates in the estuary are very important for shorebirds and fish-eating waterbirds. Terns, gulls, and skimmers forage in the top centimeters to meter of the water column of tidal creeks and wetland edges, looking for small fishes or shrimp. Pelicans also use these resources but may dive deeper as do loons, grebes, and diving ducks. Shorebirds utilize shallow 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 coastal islands and their



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associated wetlands support a diversity of aquatic organisms representing one of the most productive habitat types in the world.

### **Scrub/Shrub**

Scrub/shrub communities are areas dominated by woody vegetation less than 20 feet tall. The vegetation includes true shrubs, young trees, and trees or shrubs that may be stunted because of environmental conditions. These areas are sometimes referred to as early successional communities. There are many areas within the Complex that contain this type of plant composition. They include edges between climax tree stands and open fields, mature tree stands and water (either salt or fresh), old fields, open areas, or holes created in a climax tree stand canopy from either biotic or abiotic factors (death of trees, disease, hurricanes, tornados, fire, fire breaks or drought). These habitats are utilized by many species of wildlife.

### **Fire Management**

Fire is a natural process that historically shaped the habitats within the Complex. Fire management within the Complex consists of both wildland fire suppression and prescribed burning activities. Prescribed burning is the application of fire by man to achieve land use objectives under specific conditions. In contrast, wildland fires that occur on the refuges are started by lightning strikes or from human activities.

Pine forest and grassland vegetation communities evolved in the presence of fire and often plants require this type of disturbance to complete their life cycle. The natural fire cycle, however, is often interrupted by human activities. As a result, the vegetation communities often have moved through succession away from their historical assemblages. In addition, fire may be a very useful tool for managing invasive exotic plants. In both cases, fire is a necessary tool for improving and managing wildlife habitat. Comments were made by internal parties that adaptive habitat management should be utilized to evaluate habitat and wildlife response to fire management practices.

There are many challenges to prescribed burning within the Complex. The biggest challenge is managing smoke in the presence of major roads and interstates and the proximity of some of the refuges to residential areas. In addition to the challenges of smoke management, water levels can also limit the window of opportunity for prescribed burning in certain areas within the Complex.

### **Beaches and Dunes**

Because of dredging operations in the Savannah River, the barrier island refuges in coastal Georgia 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. This sand is now dredged from the river and deposited on upland disposal sites, robbing the system of its sand supply. Currently, the Complex's beaches are eroding, especially at the north end Wassaw NWR.

Dunes, beaches, and sand bars are critical for migratory shorebirds as nesting, feeding, loafing, and roosting habitat. Even more critical for shorebirds are the invertebrate prey populations these habitats support. Sea turtles nest on barrier island beaches and feed in offshore waters. Lack of sand, as a result of dams and dredging, is having a negative impact on these habitats.

Several comments were made by the public and members of the biological review teams that reinforced the need to restore or to reduce erosion of the beaches and dunes. One comment recommended the use of beneficial spoil from a local dredging operation to help with this effort.

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Additional comments from the public raised issues about detrimental impacts of beach access and the presence of pets on the beaches and the need to address these issues.

## *RESOURCE PROTECTION*

### **Cultural Resources**

In addition to biological assets, the Complex has cultural sites relating to human settlement that date back as far as 4,000 years ago. Several archaeological investigations have been performed and have produced artifacts and evidence that range from 500 A.D. to post Civil War. Most of these resources are not featured as public use areas due to the likelihood of theft and other adverse affects. It is unlikely that these areas will be open to the public. However, with the increased demand for public recreation and the economic value of artifacts, it may be necessary to increase law enforcement efforts in these areas (Sassaman 2006 and Sanders 2000).

### **Pollution Prevention**

Several refuges that make up the Complex are located adjacent to urban and industrial areas. Water quality and contaminant issues continue to be a major concern for the Complex and adjacent lands. Non-point pollution is on the rise according to GADNR and SCDNR, and will only continue to get worse with new housing developments being constructed around the refuges. Several sources of pollution may be present on the refuge caused by off-refuge sources. Pollutants such as heavy metals can have long-term effects when deposited into the soil column and bio-concentrated through the food chain. Pollutant effects on water quality also are exacerbated by drought, saltwater intrusion, and flooding. Presence of any high contaminant levels should be identified and documented. Keeping lands "Green" has been discussed with the local governments and small steps are being taken to minimize the impact of development in and around the marshes.

Several comments were made by both Complex staff and the public concerned about urban development encroachment and the effects of pollution from harbor dredging and local industry.

## *VISITOR SERVICES*

Six priority public uses on refuge lands have been identified and approved by the Improvement Act. These uses include fishing, hunting, wildlife observation, wildlife photography, and environmental education and interpretation. Other uses on refuge lands must be determined appropriate and compatible for each specific refuge.

### **Hunting and Fishing**

Hunting and fishing opportunities are of great public interest. Some refuges within the Complex offer quota deer hunts to ensure that population numbers remain in balance with the surrounding habitat. Savannah NWR, because of its vast size, has a more liberal hunting season to achieve this balance. Several comments expressed the desire to continue or to enhance hunting opportunities within the Complex. There were also comments to ban these activities.

Both saltwater and freshwater fishing opportunities are available within the Complex. There are also facilities, fishing piers, and boat ramps provided to cater to fishermen.

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## **Wildlife Observation and Photography**

The principal opportunities identified to improve wildlife observation and photography on refuge lands includes the installation of observation platforms, trails, and towers. Providing additional parking and better access for observation and photography opportunities are anticipated to perpetuate additional use. There also may be opportunities to improve wildlife viewing by selectively managing vegetation and food plots in some areas adjacent to refuge roads.

## **Environmental Education and Interpretation**

The environmental education programs offered by the refuges include both on-site and off-site components. Because environmental education is a priority public use, this plan should include a visionary look at how this will be addressed. Recommendations from the visitor service teams included task items to be completed now, intermediately, and long-term. These included the need to look at staffing options, adding additional trails and guided tours, maintaining an accurate teacher contact database, and enhancing the intern and volunteer programs as environmental education support.

Several public comments brought up the need for additional outreach and educational opportunities, especially those designed for youth. One comment wanted the refuges to offer a more safari-like experience for the public.

## ***REFUGE ADMINISTRATION***

### **Law Enforcement**

The demand for recreation, the need to provide visitor safety, and the enforcement of refuge regulations prompted a recommendation for additional law enforcement presence within the Complex. Several different law enforcement issues were brought up by refuge staff and will need to be addressed, such as poaching, illegal trespassing, and drug-related offenses.

### **Staffing and Facility Needs**

The Complex administers seven national wildlife refuges located in both Georgia and South Carolina. Five of the seven refuges do not have permanently assigned staff; however, management and law enforcement are conducted on all refuges in the Complex. Additional resources, including facilities, are needed to meet the refuges' goals and visions for the next 15-years. This plan details these needs by establishing goals, objectives, and strategies. Several comments addressed the need for additional resources.

### **Wilderness Review**

Refuge planning policy requires a wilderness review as part of the CCP process. The results of the wilderness review are included in Appendix H.

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## *IV. Management Direction*

### **INTRODUCTION**

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

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

Three alternatives for managing six refuges within the Complex were considered in the draft comprehensive conservation plan and environmental assessment:

- A. Current Management (No Action Alternative)
- B. Increased Management (Enhanced Biological and Visitor Services Management -Proposed Alternative)
- C. Minimal Intervention Management

Each of the alternatives was described in the Alternatives section of the Environmental Assessment. The Service chose Alternative B “Increased Management” as the preferred management direction.

Implementing the preferred alternative will result in the restoration and improvement of refuge resources needed for wildlife and habitat management, while providing opportunities for a variety of additional compatible wildlife-dependent recreation, education, and interpretive activities. Alternative B aims to increase the knowledge base of the refuges by developing monitoring plans and programs. Additionally, this alternative largely focuses on the needs of threatened and endangered species, species of concern, and federal trust species. This alternative will also allow the refuges to provide additional staffing, providing support for wildlife and habitat management, visitor services, and law enforcement protection that adequately meets the demands of the refuges. The preferred alternative also focuses on issues that are detrimental to wildlife and habitats like invasive, exotic, and/or nuisance plant and animal species and climate change. Visitor services plans will be developed to better manage and expand, when appropriate, public use facilities and opportunities on the refuges.

### **VISION**

Spanning a 100-mile stretch of the Atlantic Seaboard from Hilton Head Island, South Carolina, to the Altamaha River in Georgia, the Savannah Coastal Refuges Complex is part of a national system of lands managed to ensure and safeguard the future of wildlife and their habitat. The Complex will protect a unique network of bottomland hardwood forests, wetlands, grasslands, beaches, and aquatic habitats. In the midst of a rapidly developing coastal environment, these six refuges will lead the way in protection and management of highly diverse habitats. These refuges will contribute to the



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long-term conservation of migratory and native wildlife populations and the recovery of threatened and endangered species.

When compatible, the Complex will offer quality, wildlife-dependent recreational activities. In collaboration with partners, a wide range of interpretive and environmental education programs and activities will be provided to diverse audiences. Visitors will leave with an understanding that this place of incredible diversity and ecological importance is part of a larger network of protected lands within the National Wildlife Refuge System, set aside specifically for wildlife.

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

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

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

### ***FISH AND WILDLIFE POPULATION MANAGEMENT***

**Goal 1.** Protect, maintain, enhance, and restore healthy and viable populations of migratory and resident fish, wildlife, and native plants, including all federal and state threatened and endangered species found within the Atlantic Coastal Plain, in a manner that supports state, national, and international treaties, plans and initiatives.

*Discussion:* The refuges within the Complex provide habitat for a variety of resident and migratory wildlife. Many species of wading birds and shorebirds can be found on all refuges year-round. Migratory songbirds pass through in the spring and fall months, while a number of migratory waterfowl species spend the winters resting and feeding on the refuges. Sea turtles, namely the federally threatened loggerhead, utilize the beaches of the Wassaw and Blackbeard Island NWRs for nesting. Harris Neck NWR is home to one of the most successful endangered wood stork rookeries in the southeast. Each of these individual species has the same general requirements in that it requires food, water, and cover to survive. However, the particular food and cover requirements of a given species often are very specialized. The specific habitat needs of each species vary in some degree from those of every other kind of animal, although many different animals may occupy the same general area. A diversity of habitats encourages and supports a diversity of wildlife species.

### **Waterfowl and Wetland-Dependent Birds**

*Discussion:* The Georgia and South Carolina coastal marshes are a historic migration corridor for migratory waterfowl that use the Atlantic Flyway. Populations and distribution of waterfowl vary greatly from year-to-year, depending on water levels and weather conditions. Species range from dabbling ducks such as mallards, gadwall, and teal; diving ducks such as scaup and ring-necked ducks using near-shore emergent and open water habitats; and sea ducks such as black and white-winged scoters using offshore habitats. Savannah NWR has the most extensive waterfowl habitat and thus management of any of the refuges composing the Complex. It is included in the South Atlantic Migratory Bird Initiative (SAMBI) bi-monthly wintering waterfowl survey conducted October through March annually. These bi-monthly counts are standardized by surveying the same management units consistently throughout the season.

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Wintering waterfowl are not the primary focus of management efforts for the other refuges in the Complex. Wading bird rookeries are present on Savannah, Pinckney Island, Harris Neck, Wassaw, and Blackbeard Island NWRs and monitoring and protection of rookery sites from disturbance should be a priority for these refuges. Coordinated surveys for wading birds are currently conducted only for the wood stork rookery at Harris Neck NWR. Minimal or opportunistic surveying and monitoring take place on the other refuges for wetland-dependent birds but provide only anecdotal information.

Loss of estuarine emergent wetlands has occurred throughout the southeast as development pressures have increased. Several marsh bird species occur on the refuges within these habitats including clapper rail, king rail, yellow rail, Virginia rail, sora, purple gallinule, common moorhen, and American coot. Black rail is likely to occur in the salt marsh habitat year-round, but this species is quite rare, secretive, and very difficult to locate. Surveys for high-priority marsh birds are challenging but would provide useful information on species occurrence and abundance on the refuges.

Swallow-tailed and Mississippi kites feed on flying insects over the moist-soil impoundments during July and August. Savannah NWR has been noted by the Complex as an important staging area for these two species during their southward migration. During the last decade, it has been common to observe from 20 to 50 swallow-tailed kites and more than 75 Mississippi kites daily during late summer. Additional monitoring will help assess the need for habitat improvement allowing Complex staff to actively adapt habitat management strategies to focus on critical needs.

Additional monitoring, where feasible, will help assess the need and efficacy of habitat management, thus allowing Complex staff to actively adapt habitat management strategies to focus on critical needs where appropriate. In addition, this monitoring will evaluate the contributions of the Complex to relevant regional and national bird plans.

**Objective 1.1.a: Blackbeard Island NWR – Wetland-Dependent Birds:** Within 5 years of the date of this CCP, develop a comprehensive surveying and monitoring program for representative wetland-dependent birds.

*Strategies:*

- Identify and map any potential and current wading bird nesting sites and establish a monitoring program.
- Implement priority bird surveys for better understanding of distribution, species diversity, management response, and numbers using standard survey protocols. Input survey data into appropriate databases.

**Objective 1.1.b: Harris Neck NWR – Wetland-Dependent Birds:** Within 5 years of the date of this CCP, develop a comprehensive surveying and monitoring program for representative wetland-dependent birds.

*Strategies:*

- Monitor waterfowl use within all ponds; two surveys per month during October through February. Input these data into the SAMBI database.
- Implement priority bird surveys for a better understanding of distribution, species diversity, management response, and numbers using standard survey protocols. Input survey data into appropriate databases.

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- Evaluate the need for addition or removal of wood duck boxes on the refuge and monitor productivity.

**Objective 1.1.c: Pinckney Island NWR – Wetland-Dependent Birds:** Within 5 years of the date of this CCP, develop a comprehensive surveying and monitoring program for representative wetland-dependent birds.

*Strategies:*

- Implement surveys of priority birds for a better understanding of distribution, species diversity, management response, and numbers using standard survey protocols. Input survey data into appropriate databases.
- Assess the need for research on wetland-dependent birds and facilitate research to address these needs.

**Objective 1.1.d: Savannah NWR – Wetland-Dependent Birds:** Within 5 years of the date of this CCP, develop a comprehensive surveying and monitoring program for representative wetland-dependent birds.

*Strategies:*

- Conduct secretive marsh bird (i.e., king rail) call-back surveys every 3-5 years for all managed impoundment and tidal freshwater habitats using standard protocols.
- Identify and map any potential and current wading bird nesting sites and establish monitoring program.
- Implement surveys of priority birds for a better understanding of distribution, species diversity, management response, and numbers using standard survey protocols. Input survey data into appropriate databases.

**Objective 1.1.e: Wassaw NWR – Wetland-Dependent Birds:** Within 5 years of the date of this CCP, develop a comprehensive surveying and monitoring program for representative wetland-dependent birds.

*Strategies:*

- Conduct roost counts for wading birds seasonally.
- Identify potential nesting sites for wading birds and initiate monitoring.
- Implement priority bird surveys for a better understanding of distribution, species diversity, management response, and numbers using standard survey protocols. Input survey data into appropriate databases. Continue to conduct an annual mid-winter waterfowl survey.

**Objective 1.1.f: Savannah NWR – Waterfowl:** Over the 15-year life of the CCP, continue to conduct waterfowl surveys and provide quality breeding as well as quality migration and wintering habitat to support 10-15 percent of South Carolina's total wintering dabbling and diving duck population.

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*Strategies:*

- Conduct bi-monthly waterfowl ground counts in all suitable habitats (Oct.-Mar.) to document response to management actions following the SAMBI protocols, and enter data into the SAMBI web-based database.
- Meet annual pre-season wood duck banding quota.

**Shorebirds**

*Discussion:* Higher numbers of shorebirds are moving through the southeast coastal plains during spring migration than during the fall. However, inland feeding habitat may be limited during fall migration since most of this habitat is provided through impoundments managed for waterfowl requiring a spring drawdown. During the fall and spring shorebird migration, large groups of birds take advantage of draw downs on managed impoundments. American avocets, greater and lesser yellowlegs, stilt sandpipers, and dowitchers are species more commonly observed. During the growing season, impoundments are managed in moist-soil. These areas produce ample loads of detritus. This net biomass combined with a diverse flooding and draw-down regime helps ensure adequate and dependable invertebrate forage for waterfowl and shorebirds (USFWS, March 2008).

**Objective 1.2.a: Blackbeard Island NWR – Shorebirds:** Within 5 years of the date of this CCP, develop a comprehensive surveying and monitoring program for all high-priority shorebird populations.

*Strategies:*

- Evaluate shorebird use of refuge beaches by continuing to participate in the Georgia count in January, implementing ISS, and entering shorebird survey data into SAMBI database.
- Conduct research to determine best management actions for shorebirds.
- Minimize human disturbance on beaches by increasing signage, law enforcement presence, locating and marking individual nests, restricting beach access during nesting season, and requiring all-terrain vehicle operation below high tide line.

**Objective 1.2.b: Harris Neck NWR – Shorebirds:** Within the 15-year life of this CCP, develop a comprehensive surveying and monitoring program for all high-priority shorebird populations.

*Strategies:*

- As needed, evaluate shorebird use of refuge impoundments.
- As needed, conduct research to determine best management actions for shorebirds.

**Objective 1.2.c: Pinckney Island NWR – Shorebirds:** Within 5 years of the date of this CCP, develop a comprehensive surveying and monitoring program for all high-priority shorebird populations.

*Strategies:*

- Establish shorebird surveys in cooperation with SCDNR using ISS protocol and enter shorebird survey data into SAMBI database.
- Reduce and/or prevent disturbance to American oystercatcher nesting sites annually (April-July).
- Conduct periodic surveys to document winter roost sites for American oystercatcher habitat adjacent to, on, or nearby Pinckney Island NWR in coordination with SCDNR.

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**Objective 1.2.d: Savannah NWR – Shorebirds:** Within 5 years of the date of this CCP, develop a comprehensive surveying and monitoring program for all high-priority shorebird populations.

*Strategies:*

- Conduct shorebird surveys during fall and spring migration using standard protocol and store and manage data in the SAMBI database.
- Evaluate efficacy of modifying management of some impoundments to provide habitat for spring and fall migration stopover sites.

**Objective 1.2.e: Tybee NWR – Shorebirds:** Within 5 years of the date of this CCP, develop a comprehensive surveying and monitoring program for all high-priority shorebird populations.

*Strategy:*

- Conduct shorebird surveys during fall and spring migration using ISS protocol and store and manage data in the SAMBI database.

**Objective 1.2.f: Wassaw NWR – Shorebirds:** Within 5 years of the date of this CCP, develop a comprehensive surveying and monitoring program for all high-priority shorebird populations.

*Strategies:*

- Evaluate shorebird use of refuge beaches by continuing to participate in the Georgia count in January, implementing ISS, and entering shorebird survey data into SAMBI database.
- Conduct research to determine best management actions for shorebirds.
- Minimize human disturbance on the north and south end of island by increasing beach signage and law enforcement presence, locating and marking individual nests, closing beach during the nesting season, and educating volunteers to reduce speed and stay below high tide line when using all-terrain vehicles.

## **Non-game Birds**

*Discussion:* In many areas of the South Atlantic Coastal Plain, the maritime forest has been destroyed for urban development. Forest fragmentation, invasive exotic vegetation, and poor stand quality are issues affecting forest breeding and neotropical migratory birds. Many breeding forest birds and migratory species are dependent upon dense understory and ground vegetation for nesting and foraging. Thus, desired future conditions in much of the existing mature forest stands would emphasize increasing structural diversity by providing a more open overstory canopy to allow sunlight to reach the ground in support of increased ground and understory cover. High-priority, non-game bird species include prothonotary warbler, red-headed woodpecker, brown-headed nuthatch, wood thrush, Kentucky warbler, swallow-tailed kite, Swainson's warbler, northern parula, yellow-throated warbler, hooded warbler, worm-eating warbler, prairie warbler, Henslow's sparrow, field sparrow, painted bunting, logger-head shrike, and American woodcock.

Currently, three of the Complex refuges, with the aid of partners, conduct Christmas bird counts annually. The refuges also provide important habitat for forest breeding birds, many of whose populations have been in decline nationwide in recent years. Due to the decrease in migration numbers over the past several years and the destruction of habitat from natural disasters, it is important to increase monitoring to determine the overall health of the ecosystem. Additional



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monitoring will help assess the need for habitat recovery, allowing refuge staff to actively adapt habitat management strategies to focus on critical needs.

**Objective 1.3.a: Blackbeard Island NWR – Non-game Birds:** Within 5 years of the date of this CCP, evaluate a seasonal monitoring protocol to reveal population trends and response of non-game bird populations to management actions.

*Strategies:*

- Evaluate appropriate breeding bird surveys to monitor non-game birds using the refuge.
- Establish protocol for monitoring non-game bird use of the refuge during migrating and wintering.
- Continue to participate in the painted bunting monitoring program.

**Objective 1.3.b: Harris Neck NWR – Non-game Birds:** Within 5 years of the date of this CCP, evaluate a seasonal monitoring protocol to reveal population trends and response of non-game bird populations to management actions.

*Strategies:*

- Evaluate and/or continue appropriate migratory bird surveys.
- Continue to participate in the painted bunting monitoring program.
- Annually conduct survey for Henslow's and LeConte's sparrows.
- Continue to participate in Christmas bird counts.

**Objective 1.3.c: Pinckney Island NWR – Non-game Birds:** Within 5 years of the date of this CCP, evaluate a seasonal monitoring protocol to reveal population trends and response of non-game bird populations to management actions.

*Strategies:*

- Continue to participate in the painted bunting monitoring program.
- Continue to participate in Christmas bird counts.
- Evaluate appropriate breeding bird surveys to monitor non-game birds using the refuge.
- Establish protocol for monitoring non-game bird use of the refuge during migration and wintering.

**Objective 1.3.d: Savannah NWR – Non-game Birds:** Within 5 years of the date of this CCP, continue and expand where applicable seasonal monitoring to reveal population trends and response of non-game bird populations to management actions.

*Strategies:*

- Evaluate appropriate breeding bird surveys to monitor non-game birds using the refuge.
- Establish protocol for monitoring non-game bird use of the refuge during migrating and wintering.
- Identify non-game bird research needs.
- Continue to participate in Christmas bird counts

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**Objective 1.3.e: Wassaw NWR – Non-game Birds:** Within 5 years of the date of this CCP, continue, and expand where applicable, seasonal monitoring to reveal population trends and response of non-game bird populations to management actions.

*Strategies:*

- Continue to participate in the painted bunting monitoring program.
- Continue Monitoring Avian Productivity and Survivorship operation.
- Evaluate appropriate breeding bird surveys to monitor non-game birds using the refuge.
- Establish protocol for monitoring non-game bird use of the refuge during migrating and wintering.

### **Threatened and Endangered Species**

*Discussion:* The Complex supports a variety of valuable habitats that are home to both federal and state threatened and endangered species and species of special concern. These include: flatwoods salamander, wood stork, piping plover, loggerhead sea turtle, shortnose sturgeon, and West Indian manatee.

The flatwoods salamander breeds in isolated pond cypress-dominated depressions, often with a smaller component of blackgum or slash pine. These ponds often are isolated within pine forests. Suitable wetlands have a marsh-like appearance with sedges and grasses growing throughout and other herbaceous species in the shallow water edges. A relatively open canopy resulting from seasonal prescribed burns is necessary to maintain appropriate vegetation, which serves as cover for salamander larvae and their aquatic invertebrate prey. The major threats to this species are habitat destruction, deterioration, and fragmentation.

The federally endangered wood stork has found the impoundments and tidal marshes of the Complex to provide a variety of habitats necessary for its survival and recovery. It breeds in a colony in Harris Neck NWR's Woody Pond, forages in other wetlands/marshes on or near some of the refuges, and roosts in wetlands. Management activities by the refuge have resulted in this being one of the most stable and productive colonies in the United States relative to colony growth and productivity, as well as an excellent location for research.

The endangered shortnose sturgeon occurs within the rivers of the Complex. While this species of sturgeon is less abundant within the Newport River, it is common within the Altamaha and Savannah Rivers. Public education and law enforcement efforts should be increased to inform local fishermen that take of this species is prohibited. In addition, boaters should be informed of the dangers from this species as they tend to breach the water surface and have been known to collide with boats. Current threats to the species are related to harbor development; the proposed harbor deepening project near Savannah NWR could be a threat.

West Indian manatees range the Georgia coast in the warmer months, appearing as early as March and staying as late as November and December depending on the weather, water temperature, and whether sources of warm water can be found. These manatees spend the winter along the Atlantic Coast of Florida before migrating back to Georgia. The general pattern for manatees is one of directed movements to specific core areas that are used for prolonged periods. Calves learn the locations of key resources and migratory routes from their mothers, and there is more site fidelity to a manatee's warm season range than to its winter range (Deutsch et al. 2003).

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Manatees use the rivers adjacent to the refuges during the summer, likely feeding in the tidal creeks on various marsh plants. Potential problems exist with warm water releases from industrial effluents along the Savannah River, which have been known to hold manatees longer causing cold stress. There are occasional sightings of manatees in the waters around the refuges. The Complex has an interest in informing the public and working with partners for the protection of this species.

Five species of sea turtles inhabit the coastal waters of Georgia. These include the loggerhead, Kemp's ridley, leatherback, green, and hawksbill sea turtles. The most common sea turtle, the loggerhead, is protected under the Endangered Species Act, and is listed as threatened. The other four species are listed as endangered. The loggerhead is the primary turtle nesting on Georgia beaches (approximately 1,200 nests per year); 5 to 10 nests per year can be attributed to all the other species combined throughout Georgia.

Piping plovers occur in three distinct nesting populations: (1) The Atlantic including North Carolina to Maine in the United States and the Canadian Maritime Province (about 1,700 pairs); (2) the Great Lakes group (fewer 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). 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.

**Objective 1.4.a: Blackbeard Island NWR – Threatened and Endangered Species - Sea Turtles:**

Over the 15-year life of this CCP, expand management and research activities which contribute to the recovery of sea turtles as indicated by recovery plans.

*Strategies:*

- Survey all beaches nightly and continue to document nesting and hatching parameters to accomplish recovery goals.
- Evaluate the efficacy of continuing the long-term saturation tagging program.
- Continue to implement predator control for feral hogs, raccoons, and other predators on the beaches.
- Continue to participate in sea turtle stranding and salvage networks.
- Develop partnerships and seek additional funding for sea turtle monitoring.
- Assess future research needs for sea turtles and solicit proposals from universities or other research institutions to meet these needs.

**Objective 1.4.b: Blackbeard Island NWR – Threatened and Endangered Species - Piping Plovers:**

Over the 15-year life of this CCP, expand management and research activities which contribute to the recovery of piping plovers as indicated by recovery plans.

*Strategies:*

- Minimize disturbance to foraging and roosting birds by posting signs readable from offshore at key landing sites to educate people about disturbance.
- Coordinate with GADNR to augment surveys currently being conducted. Initiate monthly surveys (July – April) to monitor use (surveys should occur at a minimum in September, February, and April).
- Evaluate distribution and abundance of food for piping plovers by initiating benthic invertebrate and water quality sampling.

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**Objective 1.4.c: Blackbeard Island NWR – Threatened and Endangered Species - Other:** Over the 15-year life of this CCP, monitor for additional threatened and endangered species and implement steps towards recovery as indicated by recovery plans.

*Strategies:*

- Coordinate with appropriate federal and state agencies in monitoring for potential threatened and endangered species.
- Conduct surveys and, if appropriate, additional research of wood stork feeding activities; breeding and post breeding seasons.
- Require refuge staff to routinely fill out manatee sighting forms in coordination with GADNR.

**Objective 1.4.d: Harris Neck NWR – Threatened and Endangered Species - Wood Stork:** Within 2 years of the date of this CCP, evaluate and expand management and research activities which contribute to the recovery of wood storks as indicated by the recovery plan.

*Strategies:*

- Continue to work with partners in research of wood stork biology.
- Increase size of potential cypress nesting areas through additional cypress plantings.

**Objective 1.4.e: Harris Neck NWR – Threatened and Endangered Species - Other:** Over the 15-year life of this CCP, monitor for additional threatened and endangered species and implement steps towards recovery as indicated by recovery plans.

*Strategy:*

- Coordinate with appropriate federal and state agencies in monitoring for potential threatened and endangered species.

**Objective 1.4.f: Pinckney Island NWR – Threatened and Endangered Species:** Over the 15-year life of this CCP, monitor for threatened and endangered species and implement steps towards recovery as indicated by recovery plans.

*Strategy:*

- Coordinate with appropriate federal and state agencies in monitoring for potential threatened and endangered species.

**Objective 1.4.g: Savannah NWR – Threatened and Endangered Species:** Over the 15-year life of this CCP, monitor for threatened and endangered species and implement steps towards recovery as indicated by recovery plans.

*Strategies:*

- Coordinate with appropriate federal and state agencies in monitoring for potential threatened and endangered species.
- Monitor nesting and roosting habitat for Rafinesque's big-eared bats (state endangered – South Carolina).
- Monitor wood stork use of managed impoundments and East Marsh.

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- Coordinate, where appropriate, with federal and state agencies in surveying for flatwoods salamanders.

**Objective 1.4.h: Tybee NWR – Threatened and Endangered Species:** Over the 15-year life of this CCP, monitor for threatened and endangered species and implement steps towards recovery as indicated by recovery plans.

*Strategy:*

- Coordinate with appropriate federal and state agencies in monitoring for potential threatened and endangered species.

**Objective 1.4.i: Wassaw NWR – Threatened and Endangered Species - Sea Turtles:** Over the 15-year life of this CCP, expand management and research activities which contribute to the recovery of sea turtles as indicated by recovery plans.

*Strategies:*

- Survey all beaches nightly and continue to document all nesting and hatching parameters to accomplish recovery goals.
- Evaluate the efficacy of continuing the long-term saturation tagging program.
- Continue to implement predator control for feral hogs, raccoons, and other predators on the beaches.
- Continue to participate in sea turtle stranding and salvage networks.
- Develop partnerships and seek additional funding for sea turtle monitoring.
- Assess future research needs for sea turtles and solicit proposals from universities or other research institutions to meet these needs.

**Objective 1.4.j: Wassaw NWR – Threatened and Endangered Species - Piping Plovers:** Within 5 years of the date of this CCP, expand management and research activities which contribute to the recovery of piping plovers as indicated by the recovery plan.

*Strategies:*

- Minimize disturbance to foraging and roosting birds by posting signs readable from offshore at key landing sites to educate people about disturbance.
- Coordinate with GADNR to augment surveys currently being conducted. Initiate monthly surveys (July – April) to monitor use (surveys should occur at a minimum in September, February, and April).
- Evaluate distribution and abundance of food for piping plovers by initiating benthic invertebrate and water quality sampling.

**Objective 1.4.k: Wassaw NWR – Threatened and Endangered Species - Other:** Over the 15-year life of this CCP, monitor for additional threatened and endangered species and implement steps towards recovery as indicated by recovery plans.



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*Strategies:*

- Coordinate with appropriate federal and state agencies in monitoring for potential threatened and endangered species.
- Conduct surveys of wood stork feeding activities; breeding and post breeding seasons.
- Continue to work with partners in research of wood stork biology.

**Other Fish, Wildlife, and Plants***Discussion:***Resident Wildlife**

Population and habitat monitoring is an important component of resident wildlife management. Resident game species on the Complex vary by refuge, but include white-tailed deer, turkey, quail, squirrel, and feral hog. Public hunts are held each year to maintain a healthy deer herd and to control feral hogs. There has been no recent evidence of deer herd health problems. Harvested deer examined by refuge biologists have been healthy; however, the health checks are not held on an annual basis.

Species lists of small mammals for the Complex need to be compiled to provide baseline information for future management and research considerations. A survey of bats on the Complex also should be conducted. There are possibly three species of bats within the Complex that are considered rare for the State of Georgia: Rafinesque's big-eared bat, northern yellow bat, and southeastern myotis. Surveys could be conducted by volunteers using cavity searches with a hand-held mirror and q-beam.

Furbearers seen within the Complex include otter, gray fox, and raccoon. There is no current management directed to enhance these species or any trapping season. Currently, the Complex is doing very little to monitor most resident wildlife activity. The implementation of monitoring will help assess the need for both wildlife management and habitat improvement, allowing Complex staff to actively adapt habitat management strategies to focus on critical needs.

**Amphibians and Reptiles**

A diverse array of reptiles and amphibians occur within the Complex, including many different species of frogs, snakes, turtles, and salamanders. This can be attributed to the large acreage of suitable habitat provided by the various wetlands and forested ecosystems. Initial inventories of amphibian and reptile species have been conducted on several of the Complex refuges. However, there is little active management, including monitoring and surveying, taking place on the refuges for reptiles and amphibians. The implementation of monitoring will help assess the need for both population management and habitat improvement, allowing Complex staff to actively adapt habitat management strategies to focus on critical needs.

Amphibians are the most threatened group of animals worldwide. Since 1970, scientists have observed precipitous population declines and entire disappearances of numerous amphibian species (Partners in Amphibian and Reptile Conservation). The Coastal Plain in South Carolina and Georgia is a very important region for herpetofauna with high habitat and species diversity and several rare, threatened, and endangered species occurring within the area. Of the approximately 142 species of amphibians and reptiles found in these states, 113 occur in the Coastal Plain, with 50 of these endemic to South Carolina (SCDNR 2005.)

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## Aquatic Resources

The waters within the Complex support fresh, brackish, and saltwater aquatic ecosystems, in addition to healthy sport and commercial fisheries. The lifeblood of the fishery production is the cycle of tidal flow in the estuarine marshes. Salt marshes provide important nursery habitat for a variety of marine organisms including many species of fish, shrimp, and oysters. These food resources are the basis of the food chain and support higher level predators such as larger sport fish and birds. In addition to the estuarine resources, freshwater ponds and impoundments support fisheries.

**Objective 1.5.a: Blackbeard Island NWR – Other Fish, Wildlife, and Plants:** Over the 15-year life of this CCP, establish a comprehensive inventorying and monitoring program for other fish, wildlife, and plants.

*Strategies:*

- Coordinate with GADNR on Georgia Wildlife Action Plan.
- Complete baseline survey of flora and fauna by 2020.
- Assess research needs for other fish, wildlife, and plants and facilitate research requests, where applicable.

**Objective 1.5.b: Harris Neck NWR – Other Fish, Wildlife, and Plants:** Over the 15-year life of this CCP, establish a comprehensive inventorying and monitoring program for other fish, wildlife, and plants.

*Strategies:*

- Complete baseline surveys of flora and fauna by 2020.
- Coordinate with GADNR on Georgia Wildlife Action Plan.
- Initiate gopher tortoise and habitat studies for species/burrow densities and associated flora and fauna.

**Objective 1.5.c: Pinckney Island NWR – Other Fish, Wildlife, and Plants:** Over the 15-year life of this CCP, establish a comprehensive inventorying and monitoring program for other fish, wildlife, and plants.

*Strategies:*

- Complete baseline surveys of flora and fauna by 2020.
- Coordinate with SCDNR on South Carolina Wildlife Action Plan.
- Assess research needs for other fish, wildlife, and plants and facilitate research requests, where applicable

**Objective 1.5.d: Savannah NWR – Other Fish, Wildlife, and Plants:** Over the 15-year life of this CCP, establish a comprehensive inventorying and monitoring program for other fish, wildlife, and plants.

*Strategies:*

- Repeat Southeast Amphibian Research and Monitoring Initiative sampling scheme/protocol at survey points across the refuge at 5- to 10-year intervals.
- Complete baseline surveys of flora and fauna by 2020.

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- Coordinate with SCDNR and GADNR on state wildlife action plans.
  - Assess research needs for other fish, wildlife, and plants and facilitate research requests, where applicable.

**Objective 1.5.e: Wassaw NWR – Other Fish, Wildlife, and Plants:** Over the 15-year life of this CCP, establish a comprehensive inventorying and monitoring program for other fish, wildlife, and plants.

*Strategies:*

- Complete baseline surveys of flora and fauna by 2020.
- Coordinate with GADNR on Georgia Wildlife Action Plan.

### **Climate Change/Sea Level Rise**

*Discussion:* Global climate change poses risks to human health and to terrestrial and aquatic ecosystems by significantly affecting weather and rainfall patterns, decreasing snow and ice cover, and in rising sea levels that are changing entire ecosystems, especially those in the coastal regions. Important economic resources, such as agriculture, forestry, fisheries, and water, may be affected. For the coastal region of the southeastern United States, this can result in more extreme precipitation events, greater likelihood of hotter and drier summers, and wetter and warmer winters.

Additional factors such as population growth, landscape-level changes in land use, and pollution exacerbate these environmental changes especially within the coastal regions. For example, a recent study of the effects of climate change on eastern United States' bird species concluded that as many as 78 bird species could decrease by at least 25 percent while as many as 33 species could increase in abundance by at least 25 percent due to climate and habitat changes (Matthews et al. 2004).

**Objective 1.6.a: Blackbeard Island NWR – Climate Change/Sea Level Rise:** Establish active partnerships to monitor and model the potential effects of climate change and sea level rise on wildlife populations, especially threatened and endangered species.

*Strategies:*

- Monitor changes in population characteristics potentially associated with climate change/sea level rise through surveys of key population parameters.
- Initiate modeling of potential effects of climate change and sea level rise to the vulnerability and risk of species via partnerships with USGS Climate Change and Wildlife Science Center; universities; and other local, state, and federal partners.
- Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.
- Evaluate the relationship between marsh restoration and carbon sequestration.

**Objective 1.6.b: Harris Neck NWR – Climate Change/Sea Level Rise:** Establish active partnerships to monitor and model the potential effects of climate change and sea level rise on wildlife populations, especially threatened and endangered species.

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*Strategies:*

- Monitor changes in population characteristics potentially associated with climate change/sea level rise through surveys of key population parameters.
- Initiate modeling of potential effects of climate change and sea level rise to the vulnerability and risk of species via partnerships with USGS Climate Change and Wildlife Science Center; universities; and other local, state, and federal partners.
- Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.
- Evaluate the relationship between marsh restoration and carbon sequestration.

**Objective 1.6.c: Pinckney Island NWR – Climate Change/Sea Level Rise:** Establish active partnerships to monitor and model the potential effects of climate change and sea level rise on wildlife populations, especially threatened and endangered species.

*Strategies:*

- Monitor changes in population characteristics potentially associated with climate change/sea level rise through surveys of key population parameters.
- Initiate modeling of potential effects of climate change and sea level rise to the vulnerability and risk of species via partnerships with USGS Climate Change and Wildlife Science Center; universities; and other local, state, and federal partners.
- Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.
- Evaluate the relationship between marsh restoration and carbon sequestration.

**Objective 1.6.d: Savannah NWR – Climate Change/Sea Level Rise:** Establish active partnerships to monitor and model the potential effects of climate change and sea level rise on wildlife populations, especially threatened and endangered species.

*Strategies:*

- Monitor changes in population characteristics potentially associated with climate change/sea level rise through surveys of key population parameters.
- Initiate modeling of potential effects of climate change and sea level rise to the vulnerability and risk of species via partnerships with USGS Climate Change and Wildlife Science Center; universities; and other local, state, and federal partners.
- Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.
- Evaluate the relationship between marsh restoration and carbon sequestration.

**Objective 1.6.e: Tybee NWR – Climate Change/Sea Level Rise:** Establish active partnerships to monitor and model the potential effects of climate change and sea level rise on wildlife populations, especially threatened and endangered species.

*Strategies:*

- Monitor changes in population characteristics potentially associated with climate change/sea level rise through surveys of key population parameters.

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- Initiate modeling of potential effects of climate change and sea level rise to the vulnerability and risk of species via partnerships with USGS Climate Change and Wildlife Science Center; universities; and other local, state, and federal partners.
  - Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.
  - Evaluate the relationship between marsh restoration and carbon sequestration.

**Objective 1.6.f: Wassaw NWR – Climate Change/Sea Level Rise:** Establish active partnerships to monitor and model the potential effects of climate change and sea level rise on wildlife populations, especially threatened and endangered species.

*Strategies:*

- Monitor changes in population characteristics potentially associated with climate change/sea level rise through surveys of key population parameters.
- Initiate modeling of potential effects of climate change and sea level rise to the vulnerability and risk of species via partnerships with USGS Climate Change and Wildlife Science Center; universities; and other local, state, and federal partners.
- Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.
- Evaluate the relationship between marsh restoration and carbon sequestration.

**HABITAT MANAGEMENT**

**Goal 2.** Protect, maintain, enhance, and where appropriate, restore suitable habitat for the conservation and management of migratory and resident fish, wildlife, and native plants, including all federal and state threatened and endangered species endemic to the region. Preserve and enhance wilderness values of designated Wilderness, consistent with the establishing purposes.

*Discussion:* The Complex is located in the Southern Coastal Plain Ecoregion. This ecoregion is lower in elevation with less relief and wetter soils than the more inland, adjacent Southeastern Plains Ecoregion. This area represents some of the most important estuarine river systems in the southeastern United States. It is characterized by extensive salt, brackish, and freshwater wetlands, supporting one of the most biologically productive systems in the world. The primary threat to this region is urban development, which contributes to increased storm water runoff, pollution, and sedimentation of these important habitats.

This region was once covered by a variety of forest communities that included longleaf pine, slash pine, pond pine, beech-magnolia, and mixed upland hardwoods; land cover in the region is now predominantly slash and loblolly pine plantations with cypress-gum, bay swamp, and bottomland hardwoods in low-lying areas (GADNR 2005).

The habitat types within the Complex, characterized by beaches, wetlands, open water, forests, scrub/shrub, and grasslands are managed primarily for the conservation, enhancement, and restoration of forested habitats; moist-soil management; and endangered species protection. The ecosystem approach guides the Service's efforts to enhance, restore, and conserve the natural functional processes and habitat types, while maintaining economic productivity and recreational opportunities.



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## Habitat Management Plan

*Discussion:* The need to develop and implement a habitat management plan was identified in the scoping stage of the comprehensive conservation planning process. This management plan will identify resource needs and establish habitat restoration and management programs based on goals, objectives, and strategies identified in this CCP.

**Objective 2.1.a: Blackbeard Island NWR – Habitat Management Plan:** Develop and implement a habitat management plan by 2015.

*Strategy:*

- Designate staff to develop and implement a habitat management plan. This plan should be completed by the year 2015.

**Objective 2.1.b: Harris Neck NWR – Habitat Management Plan:** Develop and implement a habitat management plan by 2015.

*Strategy:*

- Designate staff to develop and implement a habitat management plan. This plan should be completed by the year 2015.

**Objective 2.1.c: Pinckney Island NWR – Habitat Management Plan:** Develop and implement a habitat management plan by 2015.

*Strategy:*

- Designate staff to develop and implement a habitat management plan. This plan should be completed by the year 2015.

**Objective 2.1.d: Savannah NWR – Habitat Management Plan:** Develop and implement a habitat management plan by 2015.

*Strategy:*

- Designate staff to develop and implement a habitat management plan. This plan should be completed by the year 2015.

**Objective 2.1.e: Tybee NWR – Habitat Management Plan:** Develop and implement a habitat management plan by 2015.

*Strategy:*

- Designate staff to develop and implement a habitat management plan. This plan should be completed by the year 2015.

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**Objective 2.1.f: Wassaw NWR – Habitat Management Plan:** Develop and implement a habitat management plan by 2015.

*Strategy:*

- Designate staff to develop and implement a habitat management plan. This plan should be completed by the year 2015.

**Wilderness**

*Discussion:* The Wilderness Act of 1964 established the National Wilderness Preservation System and a process for federal land managing agencies to recommend wilderness areas to Congress. Wilderness, as defined by the Wilderness Act, is untrammeled (free from man's control), undeveloped, and natural, and offers outstanding opportunities for solitude and primitive recreation. The Refuge System manages refuge wilderness to secure an enduring resource of wilderness and to accomplish refuge purposes in a way that preserves wilderness character.

The Wilderness Area on Blackbeard Island NWR is open to public use, and there is currently very little active management within the Wilderness. Nevertheless, the need for increased active management may occur in the future to control invasive species, or if necessary to 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 air quality standards. Wildfire occurring within the Wilderness Area will be assessed and procedures for appropriate management response will be implemented as outlined in the Complex's Fire Management Plan.

**Objective 2.2.a: Blackbeard Island NWR – Wilderness:** Within 5 years of the date of this CCP, enhance protection of and expand management activities for Blackbeard Island NWR Wilderness in accordance with 610 FW 1 Wilderness Stewardship Policy.

*Strategies:*

- Prepare a Wilderness Stewardship Plan (WSP) by 2016.
- Conduct a Minimum Requirement Analysis for proposed management activities within Wilderness Area.
- Monitor for spread of invasive species.
- Continue to evaluate air quality data.
- Restrict/close sensitive wildlife/wilderness areas seasonally to protect wildlife (i.e., Cabretta Inlet).

**Managed Impoundments, Marshes, and Other Wetlands**

*Discussion:* Savannah NWR contains approximately 6,000 acres of impounded freshwater wetlands. These impoundments were formerly plantation rice fields, which date back to the mid- or late-1700s. Approximately 3,000 acres of former fields are within 16 managed impoundments, providing sanctuary for waterfowl, shorebirds, wading birds, and other wildlife. The remaining 3,000 acres are in the East Marsh Unit. This aquatic unit is dominated by woody and scrub/shrub wetland habitats.

The managed freshwater impoundments are the most important managed habitat within the refuge. The impoundments are managed for a diverse array of wildlife and fish throughout the year. Specifically, they are the primary means of meeting one of the refuge's objectives of providing high-

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quality migrating and wintering habitat for waterfowl. Up to 22 species of waterfowl are known to use the impoundments in any given year. The freshwater plant communities within the impoundments are diverse and complex, making them ideal habitat for a diversity of wetland-dependent birds. The primary means of management is dependable water level control using rice trunks and stop-log riser water control structures, as well as a 9-mile diversion canal associated with this system. In addition to water level manipulations, prescribed fire, mechanical, and chemical treatments are used to manipulate plant succession and regulate undesirable and noxious plants.

Harris Neck NWR is embedded with a variety of impounded waters, low-lying wet areas, and tidal marshes. Several of these areas (Snipe, Goose, and Greenhead Ponds) have been enhanced by management activities to provide better foraging habitat for wood storks and other wading birds. These management activities include: sub-dividing Snipe Pond to create smaller, more manageable habitats, maintaining/establishing water control structures (riser boards, rice trunk, etc.), seasonally adding water pumped through an aeration tower to enhance production of aquatic prey, mechanically contouring the impoundment floor to “pool” or hold water (and prey) longer during seasonal draw-downs, and adding prey (fish) to impoundments.

Addition of fish to some of the impoundments occurred via purchasing from the Service’s National Hatchery System and occasionally receiving excess fish (typically bluegill or redbreast sunfish) from the same system. Fall/winter released fish were placed in impoundments that were later partially drained to provide forage for storks during or near the end of the breeding season. Timing of the draw down was determined by refuge personnel’s assessment of the local environmental conditions (wet or dry year) and the need to provide food earlier during the breeding season (to assist with fledging rate) or later in the breeding season (to provide habitat for the recently fledged young). In either scenario, the impoundments were typically “fished-out.”

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 that live in them may be highly concentrated. The wide variety of organisms supported by estuarine marshes is linked to the range of salinities that occur. When rain falls upstream in rivers, drainage then flows downstream and discharges into the estuaries. This freshwater pulse temporarily lowers the salinity in the estuaries, making them habitable for organisms that prefer fresher water. Alternatively, when rainfall is limited and salinity levels rise in the estuaries, more saline tolerant species can move in from the Atlantic Ocean and those intolerant of high salinity migrate upstream into the river system.

The diversity and abundance of aquatic fish and invertebrates in the estuary are very important for shorebirds and waterbirds. Terns, gulls, and skimmers forage in the top centimeters or meters of the water column of tidal creeks and wetland edges, looking for small fishes or shrimp. Pelicans also use these resources but may dive deeper as do loons and grebes. Shorebirds utilize shallowly flooded or exposed mudflats, especially in the interior of the marsh at low tide. During higher tides, these areas are flooded and available for fish-eating birds such as wading birds, terns, and skimmers. The constantly changing environment of the coastal islands and their associated wetlands support a diversity of aquatic organisms, representing one of the most productive habitat types in the world.

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**Objective 2.3.a: Blackbeard Island NWR – Managed Impoundments, Marshes, and Other**

**Wetlands:** Within 5 years of the date of this CCP, evaluate management options for impoundments for priority species, and over the 15-year life of this CCP, protect and maintain marshes and other wetlands.

*Strategies:*

- Evaluate the effectiveness of current water control structures and the hydrology associated with structures to restore habitat for priority species.
- Control invasive species within ponds using chemical and mechanical techniques and prescribed fire.
- Monitor marsh “die-off” effects and map affected areas when necessary.

**Objective 2.3.b: Harris Neck NWR – Managed Impoundments, Marshes, and Other Wetlands:**

Within 5 years of the date of this CCP, evaluate management of impoundments for priority species, and over the 15-year life of this CCP, protect and maintain marshes and other wetlands.

*Strategies:*

- Rehabilitate the wood duck banding site on Bluebill Pond.
- Refine water management capabilities.
- Conduct vegetation transects in July-October each year.
- Continue monitoring water quality to ensure salinity levels do not impact managed wetlands.
- Control invasive species within ponds using chemical and mechanical techniques and prescribed fire.

**Objective 2.3.c: Pinckney Island NWR – Marshes and Other Wetlands:** Over the 15-year life of this CCP, protect and maintain refuge marshes and wetlands.

*Strategies:*

- Evaluate management capabilities and priorities for the freshwater ponds/marshes.
- Monitor potential changes in water quality due to possible increases in salinity levels from various sources.
- Control invasive species within ponds using chemical and mechanical techniques and prescribed fire.

**Objective 2.3.d: Savannah NWR – Managed Impoundments, Marshes, and Other Wetlands:**

Within 3 years of the date of this CCP, improve active management of the 3,000-acre impoundment system by completing annual vegetation transects to assess habitat quality and response to management actions. Expand active management to the 3,000-acre East Marsh.

*Strategies:*

- Conduct vegetation transects in July-October each year.
- Continue monitoring water quality to ensure salinity levels do not impact managed wetlands.
- Work with Ecological Service office in Charleston to design and implement monitoring program by 2012 to sample for contaminants (e.g., heavy metals).
- Oversee monitoring to determine impacts of harbor modifications to tidal marsh.
- Control invasive species within ponds, using chemical and mechanical techniques and prescribed fire.

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- Work closely with the USACE to ensure the long-term integrity of the fresh water diversion canal on the Savannah NWR.

**Objective 2.3.d: Wassaw NWR – Marshes and Other Wetlands:** Over the 15-year life of this CCP, protect and maintain marshes and other wetlands.

*Strategy:*

- Monitor marsh “die off” effects and map affected areas annually.

### **Scrub/Shrub**

*Discussion:* Historically, maritime scrub/shrub encompassed 1.6 million acres in the southeastern United States. Presently, these habitats occupy less than 10 percent of their historic range and are largely restricted to the Atlantic coast, especially on the sea islands. The maritime scrub/shrub community is composed primarily of yaupon holly, wax myrtle, and satal palmetto growing in dense thickets. These habitats are relatively resistant to salt spray, sun, wind, drought, and nutrient-poor soils. Along with maritime forest, maritime scrub/shrub represents the most important habitat for migratory land birds moving to and from their wintering grounds.

Early successional habitat is currently being provided in support of the highest priority scrub/shrub breeding species, including painted bunting and prairie warbler. However, other refuge areas have the potential to be maintained in an early successional condition, possibly with the use of prescribed fire, on a 5- to 10-year rotation. Harris Neck NWR is one of the refuges that currently has an extensive scrub/shrub edge component between grasslands and forest, in addition to the under/mid story component of the forest itself. Buffer strips along forest-field edges and crop fields and narrow corridor linkages between forest patches should be managed as scrub/shrub habitat. This would benefit the highest priority scrub/shrub species as well as other important species including field sparrow, orchard oriole, white-eyed vireo, and northern bobwhite.

**Objective 2.4.a: Harris Neck NWR – Scrub/shrub:** Over the 15-year life of this CCP, monitor, maintain, and investigate species composition in the native scrub/shrub community.

*Strategies:*

- Maintain the early successional community with rotational prescribed burns and evaluate effectiveness related to refuge goals.
- Evaluate the removal of old runway for habitat restoration.

### **Grasslands**

*Discussion:* All native temperate grasslands have experienced major losses from agriculture, range management, and urban development. In addition, habitat fragmentation and degradation have been severe. Habitat loss is most frequently viewed when grassland is converted to cropland or other uses, but loss of habitat also includes more subtle degradation such as unnatural grazing regimes, planting of exotic grasses, and the succession of grassland to shrubland. These less-obvious changes have resulted in the extirpations of many local bird populations. The highest priority should therefore be conservation and appropriate management of the largest tracts of existing native grasslands to avoid habitat fragmentation and degradation.



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Unfortunately, refuges have defined boundaries containing many different types of habitats and large tracts of grassland are not always available. Also, intense human disturbances occurring on the land prior to it being acquired by the Service can also be an issue. Harris Neck NWR, for example had land cleared, farmed, and grazed, and housed an airfield. Miles of roads and runways were paved with asphalt, and exotic plants, including grasses, were introduced. The only remaining warm season bunch grasses identified by the staff are in the genera *Andropogon*, but a complete plant inventory of the refuge is needed.

Native warm season grasses (NWSG) are planted primarily for wildlife cover and food. Because NWSG grow in bunches and vary in height, this creates open space on the ground around individual plants for animals to move while being concealed under the plants cover. This provides excellent protection from predators for foraging and nesting. Many species of animals utilize the NWSG for food with seeds available from late summer to late winter and insects found from spring to early winter. Species inhabiting NWSG fields at Harris Neck are: White-tailed deer, bobwhite quail, turkey, small mammals, reptiles, invertebrates, Henslow's and LeConte's sparrows, and many other songbirds including painted buntings. If the fields are planted near a pine/oak stand with a scrub/shrub component along the edge, the area can support a host of wildlife, but each habitat will need a different prescribed fire regime. If the field is isolated from other habitats as may occur within the runway at Harris Neck, some small scrub/shrub component within the field may increase animal attraction.

Presently, the staff has been clearing open fields at Harris Neck NWR to bare ground (i.e., mowing, burning, and herbiciding) and either planting NWSG or allowing the natural seed bank to respond. The species of grasses are: big bluestem, little bluestem, switch grass, Indian grass, and the forb Black-eyed Susan. These grasses need an early season growth "spring green up" and a burn regime every year for the first 5 years after planting. Then a 3-year rotation should be established for maintaining a healthy and desirable field. The fields will have to be monitored closely, especially for the first 5 years, to monitor greenbrier intrusion in the fields. When a 3-year rotation is established, only one-third of all fields should be burned in a given year allowing two-thirds of all other fields to remain for wildlife food and cover.

**Objective 2.5.a: Harris Neck NWR – Grasslands:** Over the 15-year life of this CCP, establish, maintain, and monitor native grasses, where applicable.

*Strategies:*

- Evaluate the need for establishment of native grasses for priority species.
- Continue research into reduction of greenbrier by using mechanical and chemical methods and prescribed fire.

**Dune, Beach, and Sand Bars**

*Discussion:* South Carolina and Georgia's coastal beaches and dunes represent critical habitats for sea turtles and shorebirds. Dunes, beaches, and sand bars are critical for migratory birds as nesting, feeding, loafing, and roosting habitat. Shorebirds depend on the invertebrate prey populations these habitats support to complete their migration. Intertidal sand beaches provide foraging habitat for a great number of shorebirds, including sandpipers, plovers, sanderlings, turnstones, and dowitchers. These birds feed on the abundant invertebrate fauna of intertidal areas and nest among the sparsely vegetated dunes and beach wrack. Sea turtles nest on barrier island beaches and feed in offshore waters and several rare plants are found in interdune or rear dune/bluff habitats.

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Lack of sand, as a result of dams and dredged harbors, is having a negative impact on these habitats. Because of dredging operations in the Savannah River delta, the barrier islands in coastal Georgia have become sand starved. Littoral drift occurs from north to south; therefore, sand historically came out of the mouth of the Savannah River and drifted south to deposit along the barrier islands including Blackbeard and Wassaw. This sand is now dredged from the river and deposited on upland disposal sites, robbing the system of its sand supply. Currently, the refuges' beaches are eroding, especially at the north and middle sections of the islands.

Beachfront property is perhaps the most highly prized real estate for residential development and recreation. Human activities have resulted in a wide variety of direct and indirect impacts to these important habitats. Impoundment of major rivers has reduced sediment input to the coastal sand-sharing system. In addition, construction of sea walls and jetties and dredging of tidal river channels have altered natural sand movement patterns along the coast, resulting in increased erosion of some beaches. Other activities impacting coastal beach and dune habitats include residential and commercial development, vehicular traffic, excessive herbivory (e.g., by feral horses), excessive predation (e.g., from feral hogs, raccoons, dogs, or cats), littering, artificial lighting, and unmanaged recreational use. Protection of these important habitats will require a concerted effort involving state, federal, and local governments, as well as local residents, educational groups, and civic organizations.

**Objective 2.6.a: Blackbeard Island NWR – Dune, Beach, and Sand Bars:** Over the 15-year life of this CCP, protect, maintain, and enhance dune, beach, and sand bar habitat through active management and monitoring.

*Strategies:*

- Work with Corps of Engineers to change deposition sites from confined disposal areas and ocean disposal sites to nearshore, or onshore disposal sites to increase the amount of sand traveling down the coast.
- Work with partners to procure funding to monitor impacts of near shore placement of dredge material on Georgia barrier island beaches.
- Install sand fencing on beach for dune sand accretion.
- GPS dune line annually and after major weather events.
- Work with partners to clean up derelict fishing line, crab pots, etc., from refuge beaches and waters.

**Objective 2.6.b: Wassaw NWR – Dune, Beach, and Sand Bars:** Over the 15-year life of this CCP, protect, maintain, and enhance dune, beach, and sand bar habitat through active management and monitoring.

*Strategies:*

- Work with partners to influence Corps of Engineers to change deposition sites from confined disposal areas and ocean disposal sites to nearshore, or onshore disposal sites to increase the amount of sand traveling down the coast.
- Install sand fencing on beach for dune sand accretion.
- Work with partners to procure funding to monitor impacts of nearshore placement of dredge material on Georgia's barrier island beaches.
- GPS dune line annually and after major weather events
- Work with partners to clean up derelict fishing line, crab pots, etc., from refuge beaches and waters.

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## Habitat Management - Waterfowl

*Discussion:* The Southern Coastal Plain ecoregion is important for migrating and wintering waterfowl in North America. Savannah NWR provides vital foraging and resting (sanctuary) habitats within the Southern Coastal Plain for waterfowl and serves an integral role in a large, cooperative planning and habitat management effort known as the North American Waterfowl Management Plan (NAWMP).

Concern over waterfowl population declines in the 1980s resulted in establishment of the NAWMP, which focused the attention of federal, state, and private conservation groups on critical wintering and breeding areas. The NAWMP is an international agreement among the United States, Canada, and Mexico to increase waterfowl populations by restoring critical wetland habitats across the continent. The Complex provides important habitat throughout the year for waterfowl with its expanse of impoundments and coastal wetlands and plays a role in the large, cooperative planning and habitat management effort of the NAWMP. As a result, the refuges are included in the Atlantic Coast Joint Venture (ACJV), a public-private partnership established under the auspices of the NAWMP to implement habitat conservation and restoration within important geographic areas for waterfowl. The ACJV has identified focus areas for South Carolina and Georgia along with associated waterfowl habitat and populations goals. In the South Carolina Low Country focus area the habitat goals are to protect 20,000 additional acres and enhance an additional 10,000 acres. In the Savannah River region of Georgia, the habitat goal is to protect, enhance, and restore 126,000 additional acres to benefit priority waterfowl species.

Wood ducks are year-round residents of the southern United States. Preferred habitats include forested wetlands, wooded and shrub swamps, tree-lined rivers, streams, sloughs, and beaver ponds. Wood ducks seek food in the form of acorns, other soft and hard mast, weed seeds, and invertebrates found in shallow flooded timber, shrub swamps, and along stream banks. They loaf and roost in more secluded areas and dense shrub swamps. Wood ducks are cavity nesters, seeking cavities in trees within a mile of water. Brood survival is higher in situations where nests are close to water. Due to conversion of forest lands to urban sprawl, agriculture, some forestry practices, and competition for nest sites from a host of other species, the lack of natural cavities is known to limit reproduction. Nest boxes are commonly used to supplement natural cavities and increase local production of wood ducks. However, box programs are not an end to all nesting problems and in some cases can actually limit the breeding success of local populations. Wood duck nest boxes should be cleaned and repaired at least annually. Production can be increased by more frequent checks and cleaning of boxes, but this must be weighed with other time constraints. Refuges with active volunteer programs are often best equipped to adequately manage nest box programs through the use of volunteer man-power (USFWS 2008).

**Objective 2.7.a: Savannah NWR – Habitat Management - Waterfowl:** Over the 15-year life of this CCP, manage impoundments to provide moist-soil vegetation or emergent and floating leafed vegetation to provide life-cycle needs during the migration and wintering periods to support 10-15 percent of South Carolina's total wintering dabbling and diving duck population.

### *Strategies:*

- Actively manage 3,000 acres of impounded wetlands in semi-permanent flooded and/or moist-soil conditions to annually meet the current wintering population goals for waterfowl.
- Maintain adequate open water to vegetation ratio in semi-permanently flooded impoundments.
- Maintain and improve existing bottomland habitat in lieu of expanding or eliminating the current wood duck nest box program.

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## Habitat Management – Non-game birds

**Objective 2.8.a: Blackbeard Island NWR – Habitat Management - Non-game birds:** Over the 15-year life of this CCP, provide through restoration and/or management a diversity of habitats to support priority species in the Southeastern Atlantic Coastal Plain.

*Strategies:*

- Evaluate and maintain and/or increase priority non-game bird breeding, migrating, and wintering habitat.
- Reduce mowing on levees to allow grasses to go to seed and confine mowing activities to late March.
- Evaluate role of fire in managing habitats for priority non-game species.
- Work with partners and/or volunteers to evaluate the effect of habitat management activities (i.e., increased surveys).

**Objective 2.8.b: Harris Neck NWR – Habitat Management - Non-game birds:** Over the 15-year life of this CCP, provide through restoration and/or management a diversity of habitats to support priority species in the Southeastern Atlantic Coastal Plain.

*Strategies:*

- Evaluate and maintain and/or increase priority non-game bird breeding, migrating, and wintering habitat.
- Evaluate role of fire in managing habitats for priority non-game species.
- Work with partners and/or volunteers to evaluate the effect of habitat management activities (i.e., increased surveys).

**Objective 2.8.c: Pinckney Island NWR – Habitat Management - Non-game birds:** Over the 15-year life of this CCP, provide through restoration and/or management a diversity of habitats to support priority species in the Southeastern Atlantic Coastal Plain.

*Strategies:*

- Evaluate and maintain and/or increase priority non-game bird breeding, migrating, and wintering habitat.
- Evaluate role of fire in managing habitats for priority non-game species.
- Work with partners and/or volunteers to evaluate the effect of habitat management activities (i.e., increased surveys).

**Objective 2.8.d: Savannah NWR – Habitat Management - Non-game birds:** Over the 15-year life of this CCP, provide through restoration and/or management a diversity of habitats to support priority species in the Southeastern Atlantic Coastal Plain.

*Strategy:*

- Maintain existing or improve bottomland hardwood forest conditions that support priority species.

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**Objective 2.8.e: Tybee NWR – Habitat Management - Non-game birds:** Over the 15-year life of this CCP, protect and enhance maritime forest and scrub/shrub-dominated habitat for non-game birds.

*Strategies:*

- Assess and quantify current maritime scrub/shrub habitat.
- Maintain and improve quality maritime scrub/shrub habitat by using fire and/or other means to control invasive species.

**Objective 2.8.f: Wassaw NWR – Habitat Management - Non-game birds:** Over the 15-year life of this CCP, provide through restoration and/or management a diversity of habitats to support priority species in the Southeastern Atlantic Coastal Plain.

*Strategies:*

- Evaluate and maintain and/or increase priority non-game bird breeding, migrating, and wintering habitat.
- Reduce mowing on and adjacent to roads to increase grass seed production; confine mowing activities to late March.
- Evaluate the use of prescribed fire to manage habitat for painted buntings and other neotropical migratory and resident scrub/shrub birds.

### **Habitat Management – Wetland-dependent Birds**

**Objective 2.9.a: Pinckney Island NWR – Habitat Management - Wetland-dependent Birds:** Within 5 years of the date of this CCP, evaluate and expand habitat management for priority wading bird species.

*Strategies:*

- Restore/improve habitat in wetlands and ponds for priority wading birds.
- Seasonally close nesting areas, as necessary, to prevent disturbance during April-August.

**Objective 2.9.b: Savannah NWR – Habitat Management - Wetland-dependent Birds:** Within 5 years of the date of this CCP, provide a mix of suitable habitat annually to meet the needs for wetland-dependent birds during critical life stages.

*Strategies:*

- Provide adequate shorebird habitat during north- and south-bound migration within managed impoundments.
- Annually meet/discuss with the Corps of Engineers its management plans to target dredging operations to provide suitable beach nesting habitat.
- Provide additional habitat for other wetland-dependent birds during appropriate seasons.
- Pursue completing a memorandum of agreement (MOA) with the Corps of Engineers to specify special use permit conditions and opportunities to place spoil on islands to maintain and enhance nesting habitat for this group of birds.



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**Objective 2.9.c: Tybee NWR – Habitat Management - Wetland-dependent Birds:** Over the 15-year life of this CCP, in partnership with the Corps of Engineers, protect and/or create nesting areas and high-tide roost areas.

*Strategy:*

- Pump dredge sand to create new nesting habitat in coordination with the Corps of Engineers.

**Habitat Management –Threatened and Endangered Species**

**Objective 2.10.a: Blackbeard Island NWR – Habitat Management - Threatened and Endangered Species:** Over the 15-year life of this CCP, expand management activities that contribute to the recovery of threatened and endangered species and state-listed species of special concern sufficient to discern population trends and effects of habitat management.

*Strategies:*

- Enhance existing wood stork habitat and explore rehabilitating impoundments to establish nesting colonies.
- Evaluate methods to decrease dune erosion to provide optimum nesting habitat for loggerhead sea turtles.
- Identify and manage, if appropriate, habitat for other federal- or state-listed species.

**Objective 2.10.b: Harris Neck NWR – Habitat Management - Threatened and Endangered Species:** Within 5 years of the date of this CCP, expand management activities that contribute to the recovery of threatened and endangered species and state-listed species of special concern sufficient to discern population trends and effects of habitat management.

*Strategies:*

- Continue to establish cypress stands for nesting purposes and supplement with artificial nesting platforms for wood storks.
- Identify, maintain, and improve potential habitat for gopher tortoise and associated species by appropriate management techniques.
- Identify and manage, where appropriate, habitat for other federal- or state-listed species.

**Objective 2.10.c: Savannah NWR – Habitat Management - Threatened and Endangered Species:** Over the 15-year life of this CCP, expand management activities that contribute to the recovery of threatened and endangered species and state-listed species of special concern sufficient to discern population trends and effects of habitat management.

*Strategies:*

- Provide nesting and roosting habitat to benefit Rafinesque's big-eared bats (state endangered) by maintaining large cavity trees and minimizing human disturbance.
- Protect feeding areas for manatees by posting signs along the refuge access points in the Savannah River to make the public/boaters aware of manatees in the area.
- Work with Georgia Port Authority (GPA) and local industries to manage effluent to prevent "thermally trapping" manatees in the Savannah River.
- Continue to improve foraging habitat for wood stork.

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- Continue to work with GPA and Corps of Engineers to protect federally endangered short-nose sturgeon spawning habitat.
  - Identify and manage, where appropriate, habitat for other federal- or state-listed species.

**Objective 2.10.d: Wassaw NWR – Habitat Management - Threatened and Endangered Species:**

Over the 15-year life of this CCP, expand management activities that contribute to the recovery of threatened and endangered species and state-listed species of special concern sufficient to discern population trends and effects of habitat management.

*Strategies:*

- Enhance existing wood stork foraging habitat.
- Evaluate methods to decrease dune erosion to provide optimum nesting habitat for loggerhead sea turtles.
- Identify and manage, where appropriate, habitat for other federal- or state-listed species.

**Habitat Management - Other Fish, Wildlife, and Plants**

*Discussion:* The habitats of the Complex support a variety of mammals, including game species such as white-tailed deer and squirrels. Other non-game mammals include raccoon, beaver, opossum, striped skunk, coyote, bobcat, river otter, and gray fox. Other mammals are more rarely recorded on refuge lands but can be expected to include several species of rodents and bats. Several priority species “Species of Greatest Conservation Need” recognized by the States of South Carolina and Georgia are known to, or may, inhabit refuge lands.

Deer utilize a wide range of habitats, and most Complex forest management actions aimed at priority species, such as migratory birds, will provide direct benefits to deer by increasing the quality of deer habitat. Such active management will provide a diversity and abundance of understory, midstory, and overstory stand components (i.e., complex forest stand structure) to meet the needs of a variety of non-game forest birds and resident wildlife, including deer. Bottomland forests provide ideal habitat for many species of mammals. Food and cover are abundant and diverse, and a variety of mammalian species is present.

With the great variety of reptile and amphibian species, it is challenging to address all species with similar recommendations. However, common management concepts can provide benefits for many species in this group. Many reptile and amphibian species use multiple habitats for foraging, reproduction, hibernation, or dispersal and require connectivity between habitat types (e.g., shallow lakes and adjacent bottomland hardwood forests, cypress brakes, bottomland hardwood forests and adjacent uplands, temporary wetlands and adjacent uplands) to meet distinct life cycle habitat needs. Connectivity allows for important migration and dispersal corridors. Construction of barriers to aquatic and terrestrial wildlife such as improved roads should be discouraged and other alternatives such as road underpasses sought.

Many reptiles and all amphibians are closely linked to aquatic habitats and respond positively to various inundation conditions. Wetland management should mimic natural hydrologic patterns, with year-to-year variation in rates, periods, and depths of inundation. Resident reptiles and amphibians should respond well through time as this (managed) natural cycle varies to create conditions that benefit a variety of species needs. Within upland sites, isolated seasonal wetlands are a particularly important and rare habitat type for reptiles and amphibians. Isolated seasonal wetlands are fish-free, and have high amphibian productivity when surrounded by complementary upland habitats. These features should be noted and protected, or alternatively restored as appropriate upland sites are acquired within refuge lands.

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**Objective 2.11.a: Blackbeard Island NWR – Habitat Management - Other Fish, Wildlife, and Plants:** Over the 15-year life of this CCP, evaluate and expand, if appropriate, management activities to provide healthy habitats for other fish, wildlife, and plants.

*Strategies:*

- Continue to remove feral hog populations.
- Maintain or reduce deer herd density through public hunting program to ensure herd health and to maintain habitat quality for other wildlife species.
- Protect and/or restore habitat important to amphibian and reptile populations on the refuge by implementing recommended management guidelines and BMPs (see Southeast Partners in Amphibian and Reptile Conservation, Habitat Management Guidelines).

**Objective 2.11.b: Harris Neck NWR – Habitat Management - Other Fish, Wildlife, and Plants:** Over the 15-year life of this CCP, evaluate and expand, if appropriate, management activities to provide healthy habitats for other fish, wildlife, and plants.

*Strategies:*

- Evaluate the need and feasibility of creating more ephemeral ponds to address the needs of priority amphibians and reptiles.
- Remove or control feral hog populations.
- Maintain or reduce deer herd density through a public hunting program to ensure herd health and to maintain habitat quality for other wildlife species.
- Protect and/or restore habitat important to amphibian and reptile populations on the refuge by implementing recommended management guidelines and BMPs (see Southeast Partners in Amphibian and Reptile Conservation, Habitat Management Guidelines).

**Objective 2.11.c: Pinckney Island NWR – Habitat Management - Other Fish, Wildlife, and Plants:** Over the 15-year life of this CCP, evaluate and expand, if appropriate, management activities to provide healthy habitats for other fish, wildlife, and plants.

*Strategies:*

- Maintain or reduce deer herd density through public hunting program to ensure herd health and to maintain habitat quality for other wildlife species.
- Protect and/or restore habitat important to amphibian and reptile populations on the refuge by implementing recommended management guidelines and BMPs (see Southeast Partners in Amphibian and Reptile Conservation, Habitat Management Guidelines).

**Objective 2.11.d: Savannah NWR – Habitat Management - Other Fish, Wildlife, and Plants:** Over the 15-year life of this CCP, evaluate and expand, if appropriate, management activities to provide healthy habitats for other fish, wildlife, and plants.

*Strategies:*

- Maintain or reduce deer herd density at a level to ensure herd health and to maintain habitat quality.

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- Consider partnership opportunities that might develop via the Southeast Bat Conservation Initiative to help meet the management goals for bat species listed in the South Carolina/Georgia Wildlife Action Plans.
  - Provide habitat protection of amphibian and reptile populations through annual monitoring of water quality and preventing the loss of seeps.
  - Control feral hog populations with special emphasis on Solomon Tract and Dodge Tram Road.
  - Protect and/or restore habitat important to amphibian and reptile populations on the refuge by implementing recommended management guidelines and BMPs (see Southeast Partners in Amphibian and Reptile Conservation, Habitat Management Guidelines).

**Objective 2.11.e: Wassaw NWR – Habitat Management - Other Fish, Wildlife, and Plants:** Over the 15-year life of this CCP, evaluate and expand, if appropriate, management activities to provide healthy habitats for other fish, wildlife, and plants.

*Strategies:*

- Continue to remove feral hog populations.
- Maintain or reduce deer herd density through public hunting program to ensure herd health and to maintain habitat quality for other wildlife species.

### **Habitat Management - Invasive Species**

*Discussion:* According to 2006 Refuge Annual Performance Planning (RAPP) data, 2 million acres of Refuge System lands are infested with invasive plants and 4,471 invasive animal species have been recorded. The Complex staff has been working to control invasive species on the refuges; however, at present only a small percentage of infested acres have been treated on most refuges. “Early detection, rapid response” is the key phrase used today when describing the need for action in control of these species. For example, the exotic ambrosia beetle with its associated fungus can kill a mature red bay tree in a matter of weeks. The beetle arrived in 2002 in a shipment at the Port of Savannah and the invasion was rapid. By 2004, refuges were most likely already infested 45 miles away from point of entry, and at present most, if not all, red bay trees are dead. The lethal affect of the beetles’ fungus to species in the Laurel family has been termed “Laurel Wilt.” Early detection of the beetle may not have helped in this case due to the rapid speed of infestation and no obvious means to control it as of today, but education and training is needed for the more detectable exotic species. It is important for the Complex staff to be trained in coastal Georgia’s most detrimental exotics and the best means to control them.

The Complex has several documented native and non-native invasive plant species. These invasive species impact the refuge’s ability to carry out desired wildlife and habitat management objectives and at times also reduce the range of visitor service activities. Many invasive plant species are difficult to control without applying chemical treatments. The moist-soil conditions conducive to providing quality habitat for migratory waterfowl management frequently encourage germination of those invasive species.

Intrusion of invasive plants can displace native plant and animal species and change habitat productivity through changes such as vegetative community, insect community, and structural environment.

Native plants can be classified as invasive when high enough densities suppress all other plant growth and a mono-specific composition prevails. Cattails, *Sesbania*, and other emergent aquatic plants have the potential to choke most ponds. Eradication is not the goal, but control is necessary to keep open water in the impoundments.

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At Harris Neck NWR, the wood stork rookery and associated ponds require open water for the birds to nest and feed. This open water habitat also benefits numerous other water birds and animals. Leaving some emergent vegetation along the pond edge is also important for other refuge residents like redwing blackbirds, rails, etc. In 2005 and 2006, the refuge staff used chemical, mechanical, or a combination of to attempt to reduce the prevalent vegetation in different ponds. The best results were with a combination of both aquatic herbicide and using a marsh master to push or mow down the dead vegetation. There was over a 50 percent reduction of cattails in Woody Pond, resulting in open water with cattails around the edge. In Snipe Pond the vegetation composition went from 90 percent *Sesbenia* cover to 75 percent mixed flora that was beneficial to waterfowl and other fauna. The other ponds where only one method was used had a reduction in noxious unwanted plants but to a much lesser degree.

Another native plant that has become invasive to Harris Neck NWR is greenbrier (*Smilax* sp.). A 3-year prescribed fire regime on most open fields, particularly within and around the runway, resulted in fields composed of almost entirely *Smilax*. The dormant season burns set back other vegetation but did not harm the extensive tuberous root system of *Smilax*. With the reduced competition from most other plants, *Smilax* flourished the fourth spring. Although some species like rabbits may utilize the habitat and deer and gopher tortises will feed on it, the diversity of plant species in the fields was greatly reduced.

Chinese tallow is a common invasive plant species throughout the Complex. It invades wet areas such as stream banks and ditches but can also grow in drier upland sites. It can tolerate salty soils, flooding, and shady environments. Chinese tallow tree is a serious threat because of its ability to invade high-quality undisturbed forests and marsh. Seed is dispersed both by birds and by water. Chinese tallow can displace native vegetation as well and alters the soil conditions due to the high amount of tannins present in its leaf litter. Control of this invasive plant needs to begin as soon as possible, before the ability to control it is lost and it severely impacts this delicate environment.

Cogon grass, which is sold in nurseries as "Japanese Blood Grass" or "Red Baron," has been described as an even greater threat to native habitats than kudzu. The Georgia Forestry Commission is committed to keeping cogon grass out of Georgia. Neighboring states, including Alabama, Mississippi, and Florida, already are experiencing major infestations of this pest plant. Cogon grass spreads easily because the seeds are extremely fluffy and easily windblown. In addition, the seeds attach readily to machinery, such as mowers and harrows, so that when the equipment is moved to another area, seeds can disperse and the plant invades new habitat. Moving equipment from an area where cogon grass is present to barrier islands without completely cleaning equipment is very dangerous. Also, the plant burns extremely hot and wildfires could result in catastrophic damage to native vegetation.

Nuisance animal species can also be a problem for the refuges within the Complex, as they are known to cause significant negative impacts on native populations through direct predation, disturbance, or destruction of site-specific plant communities (e.g., seasonal wetlands) and soil conditions. The spread of feral hogs to almost all habitats in the southeast constitutes a significant threat to wildlife habitat including the refuges of the Complex. This exotic threat to wildlife habitat is now common throughout the southeastern United States., continues to increase in range and intensity, and should be countered aggressively to keep population numbers severely reduced.

**Objective 2.12.a: Blackbeard Island NWR – Habitat Management - Invasive Species:** Within 5 years of completion of the date of this CCP, prioritize the need for the removal or control of nuisance/exotic/invasive plants and animals on the refuge that are hindering the ability to meet habitat/population objectives.



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*Strategies:*

- Write an Integrated Pest Management Plan by 2016.
- Complete a baseline inventory of all nuisance/exotic/invasive plant/animals by 2013.
- Conduct annual inspections of the forest community for the presence of exotic or invasive species.
- Develop a GIS layer of all invasive plant occurrences on the refuge by 2013.
- Train refuge staff and volunteers in the detection, identification, and treatment of invasive species.
- Systematically remove invasive species by mechanical and chemical methods and prescribed burning.
- Support proposed research on invasive species.

**Objective 2.12.b: Harris Neck NWR – Habitat Management - Invasive Species:** Within 5 years of the date of this CCP, prioritize the need for the removal or control of nuisance/exotic/invasive plants and animals on the refuge that are hindering the ability to meet habitat/population objectives.

*Strategies:*

- Write an Integrated Pest Management Plan by 2016.
- Complete a baseline inventory, including a GIS layer, of all nuisance/ exotic/invasive plants/animals by 2013.
- Conduct annual inspections of the forest community for the presence of exotic or invasive species.
- Train refuge staff and volunteers in the detection, identification, and treatment of invasive species.
- Systematically remove invasive species by mechanical and chemical means and by prescribed burning.
- Support proposed research on invasive species.

**Objective 2.12.c: Pinckney Island NWR – Habitat Management - Invasive Species:** Within 3 years of the date of this CCP, prioritize the need for the removal or control of nuisance/exotic/invasive plants and animals on the refuge that are hindering the ability to meet habitat/population objectives.

*Strategies:*

- Complete a baseline inventory of all nuisance/exotic/invasive plants/animals by 2012.
- Develop a GIS layer of all invasive plants by 2012.
- Write an Integrated Pest Management Plan by 2016.
- Conduct annual inspections of the forest community for the presence of exotic or invasive species.
- Systematically remove/control invasive species by mechanical and chemical means, and by prescribed burning.
- Support proposed research on invasive species.

**Objective 2.12.d: Savannah NWR – Habitat Management - Invasive Species:** Within 5 years of the date of this CCP, prioritize the need for the removal or control of nuisance/exotic/invasive plants and animals on the refuge that are hindering the ability to meet habitat/population objectives.

*Strategies:*

- Write an Integrated Pest Management Plan by 2016.
- Complete a baseline inventory of all nuisance/exotic/invasive plants/animals by 2013.

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- Conduct annual inspections of the forest community for the presence of exotic or invasive species.
  - Develop a GIS layer of all invasive plant occurrences by 2013.
  - Systematically control invasive species by mechanical and chemical means, and by prescribed burning.
  - Support research on invasive species.

**Objective 2.12.e: Tybee NWR – Habitat Management - Invasive Species:** Within 5 years of the date of this CCP, prioritize the need for the removal or control of nuisance/exotic/invasive plants and animals on the refuge that are hindering the ability to meet habitat/population objectives.

*Strategies:*

- Complete a baseline inventory of all nuisance/exotic/invasive plant/animals on the refuge by 2011.
- Develop a GIS layer of all invasive plant occurrences on the refuge by 2011.
- Initiate phased removal of existing invasive species.

**Objective 2.12.f: Wassaw NWR – Habitat Management - Invasive Species:** Within 5 years of the date of this CCP, prioritize the need for the removal or control of nuisance/exotic/invasive plants and animals on the refuge that are hindering the ability to meet habitat/population objectives.

*Strategies:*

- Write an Integrated Pest Management Plan by 2016.
- Complete a baseline inventory of all nuisance/exotic/invasive plants/animals by 2013.
- Conduct annual inspections of the forest community for the presence of exotic or invasive species.
- Develop a GIS layer of all invasive plants by 2013.
- Train refuge staff and volunteers in the detection, identification, and treatment of invasive species.

## **Wildlife Disease**

*Discussion:* Wildlife, domestic animals, and humans share a large and increasing number of infectious diseases. The continued globalization of society, human population growth, and associated landscape changes will further enhance interfaces between wildlife, domestic animals, and humans, thereby facilitating potential emergence of infectious disease. The wildlife component of this triad has received inadequate focus in the past to effectively protect human health as evidenced by such contemporary diseases as SARS, Lyme disease, West Nile Fever, and a host of other emerging diseases. Further, habitat loss and other factors associated with human-induced landscape changes have reduced past ability for many wildlife populations to overcome losses due to various causes. This disease emergence and resurgence has reached unprecedented importance for the sustainability of desired population levels for many wildlife populations and for the long-term survival of some species (USGS 2009). The need to develop and implement a Complex-wide disease contingency/response plan was identified in the scoping stage of the CCP process. This management plan will identify actions and proper response procedures in the case of a wildlife disease outbreak.

**Objective 2.13.a: Blackbeard Island NWR – Wildlife Disease:** Over the 15-year life of this CCP, plan for and appropriately respond to all wildlife disease threats.

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*Strategies:*

- Write a Complex-wide Refuge Disease Plan by 2016.
- Enlist the services of the Southeastern Cooperative Wildlife Disease Study Group to evaluate deer herd health once every 5 years.

**Objective 2.13.b: Harris Neck NWR – Wildlife Disease:** Over the 15-year life of this CCP, plan for and appropriately respond to all wildlife disease threats.

*Strategies:*

- Write a Complex-wide Refuge Disease Plan by 2016.
- Enlist the services of the Southeastern Cooperative Wildlife Disease Study Group to evaluate deer herd health once every 5 years.

**Objective 2.13.c: Pinckney Island NWR – Wildlife Disease:** Over the 15-year life of this CCP, plan for and appropriately respond to all wildlife disease threats.

*Strategies:*

- Write a Complex-wide Refuge Disease Plan by 2016.
- Enlist the services of the Southeastern Cooperative Wildlife Disease Study Group to evaluate deer herd health once every 5 years.

**Objective 2.13.d: Savannah NWR – Wildlife Disease:** Over the 15-year life of this CCP, plan for and appropriately respond to all wildlife disease threats.

*Strategies:*

- Write a Complex-wide Refuge Disease Plan by 2016.
- Enlist the services of the Southeastern Cooperative Wildlife Disease Study Group to evaluate deer herd health once every 5 years.
- Participate in Avian Influenza monitoring when duck banding, or during waterfowl hunts.

**Objective 2.13.e: Tybee NWR – Wildlife Disease:** Over the 15-year life of this CCP, plan for and appropriately respond to all wildlife disease threats.

*Strategy:*

- Write a Complex-wide Refuge Disease Plan by 2016.

**Objective 2.13.f: Wassaw NWR – Wildlife Disease:** Over the 15-year life of this CCP, plan for and appropriately respond to all wildlife disease threats.

*Strategies:*

- Write a Complex-wide Refuge Disease Plan by 2016.
- Enlist the services of the Southeastern Cooperative Wildlife Disease Study Group to evaluate deer herd health once every 5 years.
- Participate in Avian Influenza monitoring when duck banding, or during waterfowl hunts.

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## Fire Management

*Discussion:* Fire is a natural process that historically shaped the habitats of the Complex. Pine forest and grassland vegetation communities evolved in the presence of natural fire and Native American use of fire. These fire-dependent and fire-adapted habitats require this type of disturbance to complete their life cycle. This natural fire cycle has been interrupted largely due to human activities and as a result, many vegetative communities have moved away from their historical succession.

All landscapes have a natural burn regime; the variance is in the return interval, or how frequently an area naturally burns. Southeastern forests, consisting largely of fire-dependent or fire-adapted plants, grasses and trees, have relatively short fire return intervals. This is especially true of pine-dominated forests. Oak-dominated forests have longer fire return intervals and generally have less tolerance than pines for fire intensity and duration. The Complex has some unique challenges in that generally less is known about natural fire frequencies on barrier and back barrier islands. Research in like habitats are currently being conducted on- and off-refuge properties to assist in gaining a better understanding. Data collected from refuge wildfires occurring within the past 30 years confirm that coastal islands do indeed burn, and can burn with surprising intensity. On the Complex, fire is viewed as an essential ecological process that aids in the maintenance and improvement of habitat conditions.

**Objective 2.14.a: Blackbeard Island NWR – Fire Management:** Within 5 years of date of this CCP, maintain wildfire response programs and evaluate the use of prescribed fire to achieve healthy habitats and reduce fuels.

*Strategies:*

- Develop a fuels monitoring plan by 2015.
- Annually monitor management units that were burned to evaluate habitat and wildlife response.
- Evaluate and use prescribed fire, where appropriate, to accomplish annual wildlife habitat management objectives.
- In accordance with Service policy (610 FW 1) and the Complex's Wilderness Plan, develop MRA for wildfire suppression strategies in wilderness.

**Objective 2.14.b: Harris Neck NWR – Fire Management:** Within 5 years of the date of this CCP, maintain wildfire response programs and evaluate the use of prescribed fire to achieve healthy habitats and reduce fuels.

*Strategies:*

- Develop a fuels monitoring plan by 2015.
- Annually monitor management units that were burned to evaluate habitat and wildlife response.
- Evaluate and use prescribed fire, where appropriate, to accomplish annual wildlife habitat management objectives for forest (particularly pine forests), grasslands, old fields, and marsh (managed and natural) habitats.
- Respond appropriately to all wildfires on refuge due to close proximity of highways and communities.

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**Objective 2.14.c: Pinckney Island NWR – Fire Management:** Within 5 years of the date of this CCP, maintain wildfire response programs and evaluate the use of prescribed fire to achieve healthy habitats and reduce fuels.

*Strategies:*

- Develop a fuels monitoring plan by 2015.
- Evaluate and use, where appropriate, prescribed fire to accomplish annual wildlife habitat management objectives.
- Annually monitor management units that were burned to evaluate habitat and wildlife response.
- Respond appropriately to all wildfires on refuge due to close proximity of highways and communities.

**Objective 2.14.d: Savannah NWR – Fire Management:** Within 5 years of the date of this CCP, maintain wildfire response programs and evaluate the use of prescribed fire to achieve healthy habitats and reduce fuels.

*Strategies:*

- Develop a fuels monitoring plan by 2015.
- Annually monitor management units that were burned to evaluate habitat and wildlife response.
- Evaluate and use, where appropriate, prescribed fire to accomplish annual wildlife habitat management objectives.
- Respond appropriately to all wildfires on refuge due to close proximity of highways and communities.
- Research impacts of burning tidal marsh.

**Objective 2.14.e: Wassaw NWR – Fire Management:** Within 5 years of the date of this CCP, manage and maintain prescribed fire and wildfire response programs to achieve healthy habitats and reduce fuels.

*Strategies:*

- Develop a fuels monitoring plan by 2015.
- Annually monitor management units that were burned to evaluate habitat and wildlife response.
- Evaluate the potential for Appropriate Management Response to reduce fuel loads in areas that could benefit from fire.
- Use photo points and vegetative transects to monitor annual changes in the vegetation since the 2007 wildfire.
- Conduct tree mortality surveys in the area burned by the 2007 wildfire.
- Support research through partnerships to determine benefits and effectiveness of burning salt marshes for wildlife management.
- Maintain the permanent firebreak using mechanical methods such as mowing and disking.
- Evaluate and use, where appropriate, prescribed fire to accomplish annual wildlife habitat management objectives.



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## Forest Management

*Discussion:* In the midst of the meandering bayous and rivers of the southern United States are extensive stands of bottomland hardwood and longleaf pine forests. From the rare yellow fringed orchid to the colorful cerulean warbler, the magnificent Southern Coastal Plain Forests teem with unique plants and wildlife, including more than 300 rare or endangered species (The Nature Conservancy 2009).

The iconic trees that make up the Southern Coastal Plain Forests — such as longleaf pine, bald cypress, tupelo gum, and cherrybark oak — provide natural flood protection and resilience to climate change while sustaining migratory birds and rare animals like the gopher tortoise and Bachman's sparrow.

Throughout the Southern Coastal Plain, areas that can sustain bottomland hardwood forests have been reduced by 90 percent, and longleaf pine forests have been reduced by more than 95 percent. Unsustainable forest management, agriculture, development, and the suppression of fire have diminished and degraded the south's once extensive forests, putting wildlife and people at immediate risk. For the last decade, forest product companies have sold tens of millions of acres of land, threatening sustainable management of these forests and putting land at risk for development and fragmentation (The Nature Conservancy 2009).

Forest stand quality can be improved or maintained through the use of appropriate silvicultural treatments. Many breeding forest birds and migratory species are dependent upon dense understory and ground vegetation for nesting and foraging. Thus, desired future conditions in much of the existing mature forest stands would emphasize increasing structural diversity by providing a more open canopy to allow sunlight to reach the ground in support of increased ground and understory cover. In addition, to provide benefits to various priority forest birds, where possible, forest stand treatments should encourage development of emergent trees that rise above the predominant forest canopy, retain large diameter class trees, provide large standing, dead or dying trees, contribute coarse woody debris to the forest floor, and retain small diameter cavity trees. Forest management would provide benefits to priority PIF forest birds as well as a suite of priority wildlife species dependent upon forests.

In addition to managing existing forests, there may be opportunity for forest restoration. Forest restoration in areas adjacent to forest blocks increases block size to benefit more area sensitive breeding birds and might reduce potential implications of depredation and parasitism by brown-headed cowbirds. If forest restoration is considered, placement adjacent to current blocks would provide, for a window of time, habitat for early successional forest species such as prairie warbler and for forest edge species such as painted buntings. Over time, restoration would increase the contiguous forest block size.

**Objective 2.15.a: Blackbeard Island NWR – Forest Management:** Over the 15-year life of this CCP, expand active management of forests through the development of a forest management plan.

### *Strategies:*

- Within 5 years of the date of this CCP, develop and implement a forest management plan.
- Work with Georgia Forestry Commission to cooperate/coordinate forest management activities.

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**Objective 2.15.b: Harris Neck NWR – Forest Management:** Over the 15-year life of this CCP, expand active management of forests as outlined in a forest management plan.

*Strategies:*

- Within 5 years of the date of this CCP, develop and implement a forest management plan.
- Work with Georgia Forestry Commission to cooperate/coordinate forest management activities.

**Objective 2.15.c: Pinckney Island NWR – Forest Management:** Over the 15-year life of this CCP, expand active management of forests as outlined in a forest management plan.

*Strategies:*

- Within 5 years of the date of this CCP, develop and implement a forest management plan.
- Work with South Carolina Forestry Commission to cooperate/coordinate forest management activities.

**Objective 2.15.d: Savannah NWR – Forest Management:** Over the 15-year life of this CCP, expand active management of forests as outlined in a forest management plan.

*Strategies:*

- Within 5 years of the date of this CCP, develop and implement a forest management plan.
- Work with South Carolina Forestry Commission and Georgia Forestry Commission to cooperate/coordinate forest management activities.

**Objective 2.15.e: Wassaw NWR – Forest Management:** Over the 15-year life of this CCP, expand active management of forests as outlined in a forest management plan.

*Strategies:*

- Within 5 years of the date of this CCP, develop and implement a forest management plan.
- Work with Georgia Forestry Commission to cooperate/coordinate forest management activities.

## **Habitat Management – Climate Change/Sea Level Rise**

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

### **Georgia**

[EPA, September 1997, "Climate Change in Georgia"]

Over the next century, climate in Georgia could experience changes. For example, based on projections made by the Intergovernmental Panel on Climate Change and results from the United Kingdom Hadley Centre's climate model (HadCM2), a model that accounts for both greenhouse gases and aerosols, by 2100 temperatures in Georgia could increase by about 2°F in summer (with a

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range of 1-4°F), 3°F in winter and spring (with a range of 1-7°F), and 4°F in fall (with a range of 2-9°F). Precipitation is estimated to increase by about 10% in winter and spring and by 15-40% in summer and fall. Other climate models may show different results, with winter precipitation increasing more than summer precipitation. In summer and fall, the amount of precipitation on extreme wet days is likely to increase. The frequency of extreme hot days in summer would increase because of the general warming trend. Although it is not clear how severe storms such as hurricanes would change, an increase in the frequency and intensity of summer thunderstorms is possible.

Sea level rise could lead to flooding of low-lying property, loss of coastal wetlands, erosion of beaches, saltwater contamination of drinking water, and decreased longevity of low-lying roads, causeways, and bridges. In addition, sea level rise could increase the vulnerability of coastal areas to storms and associated flooding.

Georgia's coastline, only about 100 miles long, has a barrier island system that includes 14 islands — The Golden Isles of Georgia. The barrier islands play a vital role in protecting the mainland from storm surges and tidal action. Behind the barrier islands of the Georgia coast lie extensive salt marshes dominated by smooth cordgrass. These 375,000 acres of salt marshes make up one-fourth of the remaining salt marshes in the eastern United States. The highly productive marshes provide homes for oysters and clams and serve as nursery grounds for young shrimp, crab, and fish. The marshes protect the shorelines from erosion and also act as a purification system by filtering out many pollutants added to the waters by human activities. Five major river systems drain into Georgia's small coastal area. At Fort Pulaski, sea level already is rising by 13 inches per century, and it is likely to rise another 25 inches by 2100 (EPA September 1997). Wetlands along the low-lying coasts of Georgia are subsiding and may be either flooded or washed away as sea levels rise. Possible responses to sea level rise include building walls to hold back the sea, allowing the sea to advance and adapting to it, and raising the land (e.g., by replenishing beach sand, elevating houses and infrastructure). Each of these responses will be costly, either in out-of-pocket costs or in lost land and structures. For example, the cumulative cost of sand replenishment to protect the coast of Georgia from a 20-inch sea level rise by 2100 is estimated at \$154 million to \$1.3 billion (EPA September 1997).

Water resources are affected by changes in precipitation as well as by temperature, humidity, and wind. Changes in stream flow tend to magnify changes in precipitation. Water resources in drier climates tend to be more sensitive to climate changes. Because evaporation is likely to increase with warmer climate, it could result in lower river flow and lower lake levels, particularly in the summer. If stream flow and lake levels drop, groundwater also could be reduced. In addition, more intense precipitation could increase flooding. Rivers in Georgia drain into the Gulf of Mexico and the Atlantic Ocean. The Apalachicola-Chattahoochee-Flint River System flows south into the Gulf; those draining east into the Atlantic include the Savannah, the Altamaha, and several smaller rivers. Atlanta's water supply is provided by Lake Lanier, a large reservoir in the upper Chattahoochee River basin. Several large reservoirs in the Savannah River basin along the Georgia-South Carolina border provide flood control, recreation, and hydropower for the region. The major effects of climate change in these river systems would result from precipitation changes rather than increased evaporation from warmer temperatures. Significant increases in precipitation could increase flood risk, whereas significant decreases could adversely affect power production, navigation, and recreation.

Ecosystems in Georgia consist largely of extensive forests and diverse wetlands, including the Okefenokee Swamp, extensive coastal tidal marshes, tidal creeks, and riparian forests, all of which are sensitive to changes in climate, especially changes in rainfall. Many species in Georgia's ecosystems are already near their range limits; given extensive human activity in the state, climate change could harm many of them. These include several endangered or threatened species such as

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the wood stork, loggerhead sea turtle, piping plover, alligator, and manatee. Changes in rainfall would alter stream flow and flooding patterns of wetlands, which are very sensitive to fairly small changes in water levels. Some warm water species that are sensitive to water temperature, such as the black crappie, could lose much of their habitat.

Trees and forests are adapted to specific climate conditions, and as climate warms, forests will change. Changes in tree species, geographic range, and the health and productivity of forests can be expected with a warmer climate. If conditions also become drier, the current range of forests could be reduced and replaced by grasslands and pasture. Even a warmer and wetter climate could lead to changes; trees that are better adapted to warmer conditions, such as tropical evergreens, would prevail over time. Under these conditions, forests could become denser. These changes could occur during the lifetimes of today's children, particularly if change is accelerated by other stresses such as fire, pests, and diseases. Some of these stresses would themselves be worsened by a warmer and drier climate.

In Georgia, longleaf and slash pine forests are likely to expand northward, and they could replace some of the forests currently dominated by loblolly and shortleaf pines. Wetter conditions would favor expansion of oak and hickory deciduous forests and the gum and cypress forests found along the southeastern seaboard. In contrast, under drier conditions, 10-15 percent of current forested areas in the west-central area of the state could be replaced by grasslands (EPA September 1997).

### **South Carolina**

[EPA 1998, "Climate Change in South Carolina"]

Over the last century, the average temperature in Columbia, South Carolina, has increased 1.3°F, and precipitation has increased by up to 20 percent in many parts of the state. These past trends may or may not continue into the future. Over the next century, climate in South Carolina may change even more. For example, based on projections made by the Intergovernmental Panel on Climate Change and results from the United Kingdom Hadley Centre's climate model (HadCM2), a model that accounts for both greenhouse gases and aerosols, by 2100 temperatures in South Carolina could increase by 3°F (with a range of 1-5°F) in all seasons (slightly less in winter and summer, slightly more in spring and fall). Precipitation is estimated to increase by 15 percent (with a range of 5-30 percent) in spring, slightly more in summer and fall, and slightly less in winter. Other climate models may show different results, especially regarding estimated changes in precipitation. The impacts described in the sections that follow take into account estimates from different models. The frequency of extreme hot days in summer would increase because of the general warming trend. It is not clear how the severity of storms such as hurricanes might be affected, although an increase in the frequency and intensity of summer thunderstorms is possible.

Sea level rise could lead to flooding of low-lying property, loss of coastal wetlands, erosion of beaches, saltwater contamination of drinking water, and decreased longevity of low-lying roads, causeways, and bridges. In addition, sea level rise could increase the vulnerability of coastal areas to storms and associated flooding. There are 2,876 miles of tidally influenced shoreline in South Carolina. Historical rates of accretion and erosion vary considerably across the state's coastline — erosion has been most severe on a 20-mile section of the Grand Strand and parts of the Santee delta, while Kiawah Island is accreting at a rate of 9 feet per year. Erosion is likely to increase under a 1- 3-foot rise in sea level. The potential for increased storm damage as a result of sea level rise is particularly high along the densely developed Grand Strand. At Charleston, sea level already is rising by 9 inches per century, and it is likely to rise another 19 inches by 2100. The cumulative cost of sand replenishment to protect the coast of South Carolina from a 20-inch sea level rise by 2100 is

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estimated at \$1.2-\$9.4 billion. However, sand replenishment may not be cost-effective for all coastal areas in the state, and therefore some savings could be possible.

Along the Coastal Plain, increased groundwater pumping in areas such as Hilton Head-Beaufort and Myrtle Beach has resulted in saltwater intrusion into freshwater aquifers. Increased use of groundwater for irrigated agriculture in the Coastal Plain also has resulted in declining groundwater levels and may have accelerated the formation of sinkholes in the region's limestone terrain.

These conditions, particularly if accompanied by sea level rise, could be exacerbated by warmer, drier conditions. Lower flows and higher temperatures could worsen current water quality concerns such as the excessive growth of aquatic weeds in lakes and the impacts of wastewater discharges on shellfish harvests and recreation. Higher rainfall could mitigate these effects, but would contribute to local flooding. Higher rainfall also could increase erosion and exacerbate levels of pesticides and fertilizers in runoff from agricultural areas. It also could increase pollution in runoff from urban areas. The effect of buried hazardous wastes on groundwater quality, particularly in Barnwell County and near the Savannah River Plant, is a concern in South Carolina. Although the effects of climate change on the movement of pollutants are not well understood, changes in infiltration rates could affect the rate at which pollutants migrate throughout an aquifer. Increased precipitation could contribute to groundwater contamination by increasing the inflow of contaminants into nearby aquifers.

South Carolina is dominated by coastal ecosystems that provide critically important habitat for threatened and endangered species such as the American alligator, Bachman's warbler, loggerhead sea turtle, piping plover, red-cockaded woodpecker, shortnose sturgeon, and wood stork. Important wetland habitats include Carolina bays and pocosins, both of which contain a number of endangered plants, many with restricted ranges. Terrestrial habitats include large areas of oak-hickory-pine forest and the extreme southern part of the Appalachian highlands.

Sea level rise under a changed climate could threaten many low-lying coastal ecosystems. A study at the Cape Romain National Wildlife Refuge revealed that at the current rate of sea level rise (9 inches per century), the refuge's marshlands and barrier islands could be reduced in size by as much as 58 percent by 2100 (EPA 1998). Changes in climate could increase this rate. Endangered birds such as the Bachman's warbler and red-cockaded woodpecker will lose more than 50 percent of their habitat. The intrusion of seawater from rising seas also will threaten the viability of freshwater systems. Extensive human coastal development is an impenetrable barrier to the landward migration of coastal wetland habitats. Habitat for warm water fish could also be reduced by hotter temperatures. In the forests of the western part of the state, pine seeds and seedlings, able to tolerate extreme environmental conditions, may come to dominate hardwood stands at the expense of oak and hickory.

Trees and forests are adapted to specific climate conditions, and as climate warms, forests will change. These changes could include changes in species composition, geographic range, and health and productivity. If conditions also become drier, the current range of forests could be reduced and replaced by grasslands and pasture. Even a warmer and wetter climate could lead to changes; trees that are better adapted to warmer conditions, such as subtropical evergreens, would prevail over time. Under these conditions, forests could become denser. These changes could occur during the lifetimes of today's children, particularly if the change is accelerated by other stresses such as fires, pests, and diseases. Some of these stresses would themselves be worsened by a warmer and drier climate. Commercial timber production could also be affected by resulting changes in growth rates, plantation acreage and management, and market conditions. In South Carolina, longleaf and slash pine forests are likely to expand northward, and could replace some of the forests currently dominated by loblolly and shortleaf pines. Wetter conditions would favor expansion of oak and hickory deciduous forests as well as the gum and cypress forests found along the southeastern seaboard. In contrast, under drier



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conditions, 10-15 percent of the forested areas in the northwestern part of the state could be replaced by grasslands and pasture. Maritime forests, important for their recreational and aesthetic value and for their role in coastal hydrology, could be affected adversely by changes in the frequencies of large storms associated with climate change (hurricanes in the late summer and fall, nor'easters in the winter and spring). Warmer and drier conditions could increase the frequency and intensity of fires, and result in increased losses to important commercial timber areas. Even warmer and wetter conditions could stress forests by increasing the winter survival of insect pests.

**Objective 2.16.a: Blackbeard Island NWR – Climate Change/Sea Level Rise:** Monitor and evaluate the effects of climate change and sea level rise on habitats through active surveys and partnerships.

*Strategies:*

- Develop partnerships with USGS Climate Change and Wildlife Science Center and other climate change-oriented research entities such as universities and local, state, and federal partners in developing and refining models to predict potential short- and long-term changes to habitats from climate change/sea level rise on coastal ecosystems.
- Monitor changes in local climate and hydrologic metrics through installation of weather stations and monitoring wells.
- Develop adaptive management approaches to priority habitats that mitigate the long-term effects of climate change and sea level rise.
- Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.

**Objective 2.16.b: Harris Neck NWR – Climate Change/Sea Level Rise:** Monitor and evaluate the effects of climate change and sea level rise on habitats through active surveys and partnerships.

*Strategies:*

- Develop partnerships with USGS Climate Change and Wildlife Science Center and other climate change-oriented research entities such as universities and local, state, and federal partners in developing and refining models to predict potential short- and long-term changes to habitats from climate change/sea level rise on coastal ecosystems.
- Monitor changes in local climate and hydrologic metrics through installation of weather stations and monitoring wells.
- Develop adaptive management approaches to priority habitats that mitigate the long-term effects of climate change and sea level rise.
- Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.

**Objective 2.16.c: Pinckney Island NWR – Climate Change/Sea Level Rise:** Monitor and evaluate the effects of climate change and sea level rise on habitats through active surveys and partnerships.

*Strategies:*

- Develop partnerships with USGS Climate Change and Wildlife Science Center and other climate change-oriented research entities such as universities and local, state, and federal partners in developing and refining models to predict potential short- and long-term changes to habitats from climate change/sea level rise on coastal ecosystems.

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- Monitor changes in local climate and hydrologic metrics through installation of weather stations and monitoring wells.
  - Develop adaptive management approaches to priority habitats that mitigate the long-term effects of climate change and sea level rise.
  - Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.

**Objective 2.16.d: Savannah NWR – Climate Change/Sea Level Rise:** Monitor and evaluate the effects of climate change and sea level rise on habitats through active surveys and partnerships.

*Strategies:*

- Develop partnerships with USGS Climate Change and Wildlife Science Center and other climate change-oriented research entities such as universities and local, state, and federal partners in developing and refining models to predict potential short- and long-term changes to habitats from climate change/sea level rise on coastal ecosystems.
- Monitor changes in local climate and hydrologic metrics through installation of weather stations and monitoring wells.
- Develop adaptive management approaches to priority habitats that mitigate the long-term effects of climate change and sea level rise.
- Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.

**Objective 2.16.e: Tybee NWR – Climate Change/Sea Level Rise:** Monitor and evaluate the effects of climate change and sea level rise on habitats through active surveys and partnerships.

*Strategies:*

- Develop partnerships with USGS Climate Change and Wildlife Science Center and other climate change-oriented research entities such as universities and local, state, and federal partners in developing and refining models to predict potential short- and long-term changes to habitats from climate change/sea level rise on coastal ecosystems.
- Monitor changes in local climate and hydrologic metrics through installation of weather stations and monitoring wells.
- Develop adaptive management approaches to priority habitats that mitigate the long-term effects of climate change and sea level rise.
- Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.

**Objective 2.16.f: Wassaw NWR – Climate Change/Sea Level Rise:** Monitor and evaluate the effects of climate change and sea level rise on habitats through active surveys and partnerships.

*Strategies:*

- Develop partnerships with USGS Climate Change and Wildlife Science Center and other climate change-oriented research entities such as universities and local, state, and federal partners in developing and refining models to predict potential short- and long-term changes to habitats from climate change/sea level rise on coastal ecosystems.
- Monitor changes in local climate and hydrologic metrics through installation of weather stations and monitoring wells.

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- Develop adaptive management approaches to priority habitats that mitigate the long-term effects of climate change and sea level rise.
  - Monitor potential changes in floral and faunal characteristics through appropriate systematic and periodic surveys.

## VISITOR SERVICES

**Goal 3.** Where appropriate and compatible, provide environmental education, wildlife interpretation, and wildlife-dependent recreational opportunities. Public use will be consistent with the Refuge System mission and provide visitors a greater understanding and enjoyment of fish, wildlife, and their habitats on the Complex.

*Discussion:* The Improvement Act states that compatible wildlife-dependent recreational uses are the priority public uses of the Refuge System (e.g., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) and will receive enhanced consideration over the other general public uses. The Service will permit other uses only when they have been proven to be both appropriate and compatible (See 605 FW 1, General Guidance, and 603 FW 1, Appropriate Refuge Uses).

A variety of public use opportunities are available on the Complex. Tybee NWR is the only refuge in the Complex (covered in this CCP) that is closed to all public use.

Blackbeard Island NWR (over half of which is a designated Wilderness Area) is accessible only by boat. There are approximately 11,000 visitors to the refuge annually. About 90 percent of total visitation occurs during weekends on the north and south beaches. The beaches, sea breeze, and remote, pristine setting are the primary visitor attraction.

There are approximately 90,000 visitors to Harris Neck NWR annually, with the primary public use being wildlife observation and photography. Visitor facilities include a Wildlife Drive, trails, fishing docks, and interpretive signs and kiosks. There is a small visitor contact area in the lobby of the office which has a few portable exhibits. The information desk is usually staffed from 10 a.m. to 4 p.m. by volunteers. There is a continuing effort to recruit, build, and maintain a volunteer program at Harris Neck NWR.

Pinckney Island NWR, adjacent to Hilton Head, South Carolina, is an island of wildlife habitat surrounded by a "sea of development." There are approximately 200,000 visitors to Pinckney Island NWR annually, the most of any of the seven refuges in the Complex. The island is used exclusively as a nature and forest preserve. Studying, viewing, and photographing the island's wildlife and scenery are the most popular activities throughout the year. Visitor facilities at Pinckney Island NWR include a kiosk with information/interpretive panels, wayside exhibits, parking area, and trails.

The Savannah NWR has approximately 170,000 visitors annually. There are over 38 miles of river and 25 miles of streams and creeks within the refuge. Visitors have access to a 4-mile wildlife drive (Laurel Hill Wildlife Drive) and two trails, as well as over 30 miles of levees for hiking. The refuge offers seven different hunting events annually. A new visitor center is located off of U.S. Highway 17, 6 miles north of the city of Savannah.

There are approximately 15,000 visitors to Wassaw NWR each year, with most visits occurring on weekends and holidays during the summer. Wassaw Island has remained largely undisturbed and unspoiled as a result of the island's inaccessibility and protection efforts. Access to the refuge is only by boat, and most visitors anchor their boats off the north or south ends of the island. The refuge has

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a boat dock at the small headquarters office on Wassaw Creek. The public is welcome to load or unload passengers at the dock to access trails or obtain visitor information; however, due to the small size of the dock, only temporary mooring is allowed.

### **Visitor Services Plan**

*Discussion:* The need to develop and implement a visitor services management plan was identified in the visitor services review, held in the scoping stage of the CCP process. This management plan will identify resource needs and establish visitor service programs based on goals, objectives, and strategies identified in this CCP.

**Objective 3.1.a: Blackbeard Island NWR – Visitor Services Plan:** Develop and implement a visitor services plan by 2016.

*Strategy:*

- Designate staff to develop and implement a visitor services plan. This plan should be completed by the year 2016.

**Objective 3.1.b: Harris Neck NWR – Visitor Services Plan:** Develop and implement a visitor services plan by 2016.

*Strategy:*

- Designate staff to develop and implement a visitor services plan. This plan should be completed by the year 2016.

**Objective 3.1.c: Pinckney Island NWR - Visitor Services Plan:** Develop and implement a visitor services plan by 2016.

*Strategy:*

- Designate staff to develop and implement a visitor services plan. This plan should be completed by the year 2016.

**Objective 3.1.d: Savannah NWR – Visitor Services Plan:** Develop and implement a visitor services plan by 2016.

*Strategy:*

- Designate staff to develop and implement a visitor services plan. This plan should be completed by the year 2016.

**Objective 3.1.e: Wassaw NWR – Visitor Services Plan:** Develop and implement a visitor services plan by 2016.

*Strategy:*

- Designate staff to develop and implement a visitor services plan. This plan should be completed by the year 2016.

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## Interpretation

*Discussion:* Interpretive opportunities communicate important fish, wildlife, habitat, and other resource issues to visitors of all ages and abilities. The Refuge System tailors messages and delivery methods to specific audiences, presents them in appropriate locations, and encourages visitors to take positive actions supporting refuge goals and the Refuge System mission (See 605 FW 7, Interpretation). The Complex offers a diverse slate of guided and unguided interpretive trails, bike paths, wildlife drives, and kiosks. Interpretive tours of Harris Neck, Savannah, and Pinckney Island NWRs are available for school, civic, and conservation groups by appointment only. These tours are generally given by either staff or trained refuge volunteers and require a minimum of 2-weeks' notice. Guided interpretive tours for individuals and families are available for all of the refuges except for Tybee NWR and can also be arranged through the special use permit holders (fees may apply.) These are private, commercial, or non-profit organizations that maintain a permit with the Service to conduct business on the refuge. A number of outfits currently hold permits for conducting guided interpretive tours on each refuge.

**Objective 3.2.a: Blackbeard Island NWR – Interpretation:** Over the 15-year life of this CCP, maintain and where possible expand interpretive opportunities.

### *Strategies:*

- Add interpretation about cultural resources and Wilderness to kiosk, printed materials, and website.
- Integrate interpretive plans and themes that reflect wilderness significance to the refuge and the Refuge System.
- Provide wilderness ethics information to visitors using the refuge for the designated Wilderness Area.
- Include a section about “What Makes Blackbeard Island NWR Unique” to hunting/fishing brochure.
- Develop a trail guide/map.
- Develop a wayside exhibit at Barbour River Landing to interpret key resources.
- Develop portable exhibit.
- Develop video, PowerPoint, and virtual tour programs.
- Develop and implement interpretive programs and provide increased visitor contacts on holiday weekends.
- Provide standard refuge-specific messages to commercial guides and other groups, and ensure that those messages are included in the programs they offer.

**Objective 3.2.b: Harris Neck NWR – Interpretation:** Over the 15-year life of this CCP, maintain and where possible, expand interpretive opportunities.

### *Strategies:*

- Develop wayside exhibits and interpretive fact sheets related to cultural and/or natural resources.
- Plan for the development of Visitor Center/Environmental Education facility at Harris Neck NWR entrance.
- Include a section about “What Makes Harris Neck NWR Unique” to hunting/fishing brochure.
- Develop portable exhibit.



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- Provide standard refuge-specific messages to commercial guides and other groups, and ensure that those messages are included in the programs they offer.

**Objective 3.2.c: Pinckney Island NWR - Interpretation:** Over the 15-year life of this CCP, maintain and where possible, expand interpretive opportunities.

*Strategies:*

- Update the interpretive exhibits at the parking lot kiosk.
- Provide additional wayside exhibits at the most popular spots on the trail system.
- Form a group of volunteers to provide regularly scheduled interpretive tours.
- Create a select team of volunteers to function as “roving interpreters” during the peak visitation periods.
- Include a section about “What Makes Pinckney NWR Unique” to hunting/fishing brochure.
- Plan for the development of Visitor/Welcome Center at Last End Point.
- Evaluate impacts from current visitor use levels.
- Develop portable exhibit.
- Provide standard refuge-specific messages to commercial guides and other groups, and ensure that those messages are included in the programs they offer.

**Objective 3.2.d: Savannah NWR – Interpretation:** Over the 15-year life of this CCP, maintain, and where possible, expand interpretive opportunities.

*Strategies:*

- Install wayside exhibit about neotropical migratory songbirds at the Cistern and Tupelo Trails.
- Offer volunteer-led interpretive tours on wildlife drive.
- When visitor center is open, add an environmental educator to the staff with additional duties to include development and presentation of interpretive programs.
- Develop additional interpretive materials.
- Develop portable exhibit.
- For consistency, use the themes developed for the visitor center exhibits for other interpretive displays throughout the refuge.
- Provide standard refuge-specific messages to commercial guides and other groups, and ensure that those messages are included in the programs they offer.
- Include a section about “What Makes Savannah NWR Unique” to hunting/fishing brochure.

**Objective 3.2.e: Wassaw NWR – Interpretation:** Over the 15-year life of this CCP, maintain, and where possible, expand interpretive opportunities.

*Strategies:*

- Add interpretation about barrier island ecology to kiosk, printed materials, and website.
- Include a section about “What Makes Wassaw NWR Unique” to hunting/fishing brochure to communicate non-consumptive messages.
- Develop a trail guide/map.
- Develop portable exhibit.
- Develop a Wassaw NWR interpretive exhibit for the Savannah NWR Visitor Center.
- Develop a video, PowerPoint, and virtual tour program for Wassaw NWR.

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- Provide standard refuge-specific messages to commercial guides and other groups, and ensure that those messages are included in the programs they offer.

## **Environmental Education**

*Discussion:* The Complex conducts limited environmental education programs with partners (e.g., non-profit organizations and educational institutions). Staff and/or volunteers address all environmental education programming requests on a case-by-case basis, developing individual programs as needed. Environmental education programs are developed with minimal staff involvement; however, refuge staff conducts an annual Complex-wide refuge orientation/educational program for all special use permit holders.

Blackbeard Island NWR accommodates few environmental education programs and activities on the refuge due to limited staffing and the lack of reliable, affordable transportation of groups to the refuge. However, a partnership with the University of Georgia's Marine Education Center and Aquarium provides instructors and transportation for classes on Wassaw NWR.

Currently, Harris Neck NWR does not have an established environmental education plan, nor are the on-site environmental education programs based entirely on Georgia State Curriculum Standards. Staff does work with area educators to accommodate site-visits and/or arrange to send a volunteer to the school for off-site programming.

Pinckney NWR relies on partners to conduct environmental education programs. Currently, the Coastal Discovery Museum has a partnership with the state to develop curriculum-based environmental education programs and brings several school groups to the refuge annually. While the refuge is an ideal outdoor classroom, there are no public restrooms or environmental education facilities to support classes of more than a few hours duration.

Most of the formal environmental education programming on the Savannah NWR is conducted by Wilderness Southeast by special use permit. Wilderness Southeast brings selected middle school classes from Chatham County to the refuge amounting to approximately 10 classes per year. The children, mostly inner city, are taken on a pontoon boat tour in the Savannah River and are taught about the value of tidal freshwater marshes to the coastal Georgia ecosystem. Being a nonprofit organization, Wilderness Southeast relies entirely on grants for all its environmental education programming and the refuge staff collaborates with Wilderness Southeast to secure grants from refuge partners, such as the National Fish and Wildlife Foundation.

**Objective 3.3.a: Blackbeard Island NWR – Environmental Education:** Over the 15-year life of this CCP, maintain, and where possible, expand environmental education opportunities.

### *Strategies:*

- Develop environmental education materials that support state curriculum standards and can be downloaded from refuge website.
- Expand partnerships with university and other educational organizations to provide programs and internships.
- Recruit and train volunteers to provide educational programs.
- Acquire grants through Friends group and partners to provide online educational materials, student field trips, and onsite teacher workshops.
- Develop an environmental education shelter near headquarters.

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**Objective 3.3.b: Harris Neck NWR – Environmental Education:** Over the 15-year life of this CCP, maintain, and where possible, expand current environmental education opportunities.

*Strategies:*

- Expand the use of volunteers to provide on- and off-site environmental education programs.
- Develop 2-3 refuge-specific programs.
- Expand/strengthen current educational partnerships.
- Recruit and train volunteers to provide environmental education programs.
- Provide downloadable environmental education materials on the refuge website about the wildlife and habitats that correspond to state curriculum standards.
- Plan for the development of Visitor Center/Environmental Education facility at Harris Neck NWR entrance.
- Develop collaborative environmental education programs with area county schools that have a laboratory/classroom component utilizing the facilities of the new visitor center.

**Objective 3.3.c: Pinckney Island NWR – Environmental Education:** Over the 15-year life of this CCP, maintain, and where possible, expand current environmental education opportunities.

*Strategies:*

- Develop 2 to 3 refuge-specific environmental education programs.
- Recruit and train volunteers to provide environmental education programs.
- Develop an environmental education pavilion near Nini Chapin Pond.
- Plan for the development of Visitor/Welcome Center at Last End Point that will include classroom facilities.
- Provide downloadable environmental education materials on the refuge website about the wildlife and habitats that correspond to State Curriculum Standards.

**Objective 3.3.d: Savannah NWR – Environmental Education:** Over the 15-year life of this CCP, maintain, and where possible, expand environmental education opportunities.

*Strategies:*

- Develop refuge-specific environmental education programs to conduct on request.
- Construct an environmental education classroom/laboratory facility.
- Recruit and train volunteers to provide environmental education programs.
- Provide downloadable environmental educational materials on the refuge website about the wildlife and habitats that correspond to State Curriculum Standards.

**Objective 3.3.e: Wassaw NWR – Environmental Education:** Over the 15-year life of this CCP, maintain, and where possible, expand environmental education opportunities.

*Strategies:*

- Evaluate and determine the effectiveness of all environmental education activities.
- Provide downloadable environmental educational materials on the refuge website about the wildlife and habitats that correspond to State Curriculum Standards.
- Expand educational partnerships. Include information about barrier island ecology.
- Recruit and train volunteers to provide educational programs.

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- Acquire grants through Friends group and partners to provide online educational materials, student field trips, and on-site teacher workshops.
  - Develop an environmental education shelter near headquarters.

## **Wildlife Observation and Photography**

*Discussion:* Wildlife observation and wildlife photography (reference 605 FW 4, Wildlife Observation, and 605 FW 5, Wildlife Photography) are appropriate wildlife-dependent recreational uses of refuge lands, when compatible.

At Blackbeard Island NWR a diversity of wildlife is available to observe and photograph, including wading birds, songbirds, mammals, and reptiles. Since the refuge is over 50 percent wilderness and accessible only by boat, traditional structures, such as driving tours, observation towers, and boardwalks, are not suitable and therefore not provided for the public. Access to the various areas of the refuge for wildlife observation and photography is by foot, bicycle, and boat. Typical visitors spend most or all of their time on the beach. Birdwatchers and nature photographers hike on the trails in the interior of the island, primarily in cooler months of spring and autumn. The approximate 20 miles of roads and trails are open to the public year-round, unless posted as closed and during hunts. Most visitors use a small percentage of the trails, mainly to access the beach from the dock on Blackbeard Creek.

Currently, visitors to Harris Neck NWR have excellent wildlife observation opportunities on over 15 miles of paved roads and trails. Wildlife photography opportunities are good even without improved facilities, such as photo blinds. The 4-mile wildlife drive is accessible by either automobile or bicycle and provides visitors easy access to wildlife observation areas. From the wildlife drive visitors can park and access five trails, by foot or bike, which includes three unimproved levee observation areas. There are three trails, totaling 6 miles, further along the wildlife drive on the remnant roads and runways of the former army air base that are open to both foot and bicycle traffic. The wildlife drive intersects all three of these trails, which allows visitors a great deal of flexibility in parking and exploring these areas. Snipe Pond Loop (2 miles), Airfield Perimeter Route (2.7 miles), and Goose Pond Loop (1.3 miles) all provide observation and photography opportunities for wading birds, shorebirds, waterfowl, and songbirds.

Pinckney Island NWR has over 9 miles of trails open to hiking and biking. All of the trail surfaces are sand, gravel, or grass; none are wheelchair accessible. Visitors on these trails can see a variety of wading birds, shorebirds, and songbirds as well as alligator, deer, and squirrels. Several of the freshwater ponds provide nesting areas for herons, egrets, and ibis.

The focal point of wildlife viewing at Savannah NWR is the Laurel Hill Wildlife Drive located off South Carolina Highway 170. The one-way drive is 4 miles long. It is open sunrise to sunset and has an electronic gate. Visitors traveling the wildlife drive can see a variety of ducks, shorebirds, wading birds, songbirds, alligators, raptors, and mammals.

All levees within the impoundment area north of South Carolina Highway 170 are open for walking and biking except from December 1 through February. During this 3-month period, the northern impoundments are closed to reduce disturbance to wintering waterfowl. However, the levees leading from South Carolina Highway 170, across from the wildlife drive exit, to the Tupelo Trail remain open. Cistern Trail, Tupelo Trail, and all levees and dikes are open year-round for visitors to walk and view wildlife.

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On Wassaw NWR, a 20-mile system of dirt roads and trails provides excellent opportunities for visitors to observe and photograph a diversity of wildlife. Access to the various areas of the refuge for wildlife observation and photography is by foot, bicycle, and boat. Most visitations occur at the north end of the island along the beach, due to the difficulty of access on the south end. Along the 7 miles of undeveloped beach, the tracks of nesting, threatened loggerhead sea turtles can sometimes be observed from May through June. A variety of shorebirds also feed and loaf here throughout the year. Egret and heron rookeries, along with resident and migratory songbirds, can be observed from the inland forest roads and trails.

**Objective 3.4.a: Blackbeard Island NWR – Wildlife Observation and Photography:** Over the 15-year life of this CCP, maintain, and where possible, expand wildlife observation and photography opportunities.

*Strategies:*

- Identify wildlife viewing areas and make information available on the refuge website and publications
- Work with partners to provide photography workshops and photography competitions.
- Develop wildlife checklist.

**Objective 3.4.b: Harris Neck NWR – Wildlife Observation and Photography:** Over the 15-year life of this CCP, maintain, and where possible, expand walking, driving, and boating access for wildlife observation and photography.

*Strategies:*

- Establish trailhead kiosks (one panel) at start of each trail that provides information about the trail.
- Build a two-tiered observation platform (first tier ADA accessible) for viewing of managed impoundments.
- Install spotting scopes on observation deck at ADA accessible walkway at Woody Pond.
- Identify wildlife viewing areas and make information available on the refuge website and publications
- Work with partners to provide photography workshops and photography competitions.

**Objective 3.4.c: Pinckney Island NWR – Wildlife Observation and Photography:** Over the 15-year life of this CCP, maintain, and where possible, expand walking and bicycling access for wildlife observation and photography.

*Strategies:*

- Create opportunities for wildlife observation around some of the ephemeral ponds.
- Cut some of the vegetation to provide access and/or viewing windows along trails.
- Plan for the development of a concessionaire operated transport system to increase wildlife observation/photography opportunities.
- Plan for the development of Visitor/Welcome Center and observation tower at Last End Point to increase wildlife observation opportunities, environmental education, interpretation, and photography.
- Plan for wildlife photography classes.



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- Identify wildlife viewing areas and make information available on the refuge website and publications.
  - Work with partners to provide photography workshops and photography competitions.

**Objective 3.4.d: Savannah NWR - Wildlife Observation and Photography:** Within 5 years of completion of this CCP, maintain, and where possible, expand walking, driving and boating access for wildlife observation and photography.

*Strategies:*

- Promote the Cistern Trail as a neotropical migratory songbird observation and photo opportunity.
- Consider developing spur kayak trails onto the refuge from the Savannah River between Beck's Ferry and Mill Stone Landing. Partner with counties to develop kiosks with kayak trail information at Beck's Ferry and Mill Stone Landings.
- Explore options for a permanent photo blind.
- Construct two-tiered observation tower on wildlife drive with lower tier ADA accessible.
- Establish a user fee for wildlife drive with staffed fee booth during peak use; honor system rest of year. Hire seasonal fee collectors.
- Expand existing trail system.
- Identify wildlife viewing areas and make information available on the refuge website and publications.
- Work with partners to provide photography workshops and photography competitions.

**Objective 3.4.e: Wassaw NWR – Wildlife Observation and Photography:** Within 5 years of completion of this CCP, maintain, and where possible, expand wildlife observation and photography opportunities.

*Strategies:*

- Identify prime wildlife viewing areas and make information available on the refuge website and in all publications.
- Work with partners to provide photography workshops and photography competitions on the refuge or at a partner's facility.
- Create a species checklist.

## **Fishing**

*Discussion:* Fishing (including crabbing and cast netting) is an appropriate use of wildlife resources on units of the Refuge System, when compatible. Fishing programs will be quality programs, conducted in a safe and cost-effective manner, and to the extent practicable, carried out in accordance with state regulations (See 605 FW 3, Fishing).

Blackbeard Island NWR is composed of 2,000 acres of brackish creeks, tidal waters, and salt marsh and these areas are open to fishing year-round. Visitors also use nets and traps to shrimp and crab during open seasons. Freshwater fishing has not occurred since 2001 when the effects of prolonged drought rendered the ponds inaccessible by boat. At one time, artesian wells supplied the impoundments on the refuge with freshwater. Unfortunately, mainland industrial development, and its demand for freshwater from the aquifer, has depleted the wells, leaving rain as the sole source of

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freshwater for the impoundments. Flag Pond is now mostly filled with cattails, willows, and other nuisance vegetation and no longer supports fishing.

Harris Neck NWR allows sport fishing, including saltwater fishing, pier crabbing and cast netting in designated areas of the refuge based on the following:

- Anglers may fish in estuarine waters year-round from sunrise to sunset.
- Bank fishing in the Barbour River, adjacent to the boat-tramp, is permitted from sunrise to sunset.
- Anglers may use Barbour River boat ramp year-round from 4 a.m. to midnight daily. A separate dock is maintained by the refuge for the Barbour River Watermen's Association (BRWA). This dock is reserved for permitted members of the BRWA only (through a special use permit); the public is not allowed access to it.
- Two wooden fishing piers on the Harris Neck Creek have been provided near the refuge entrance for public use. Fishing, crabbing, and/or cast-netting are permitted from sunrise to sunset.
- A short, cemented boat-ramp is located on Harris Neck Creek near the two wooden fishing piers. This ramp can accommodate small boats, canoes, and kayaks.
- Fishing is prohibited in all the freshwater ponds (Bluebill, Woody, Snipe, Teal, Greenhead, and Goose Ponds).

Freshwater fishing is not permitted on Pinckney Island NWR. There is currently a high volume of saltwater fishing that takes place within waters adjacent to the refuge from anglers entering the area from the C.C. Haigh, Jr., Landing, a county managed boat launch facility located within the refuge boundary. The refuge has a trail guide that identifies the boat launch area and specifies that saltwater fishing and shell fishing are permitted by boat only. A fishing plan for Pinckney Island NWR is not required since state regulations govern fishing in tidal waters.

Fishing opportunities on Savannah NWR are not heavily promoted as a major public use. The refuge offers freshwater fishing opportunities in designated areas. There are four county owned and maintained boat launch facilities immediately outside the refuge boundaries, which provide access to fishing the navigable waterways within the refuge. The refuge has a combined hunting and fishing regulations brochure specifically for Savannah NWR, which provides general fishing regulation information. An up-to-date fishing plan for Savannah NWR does not exist.

At Wassaw NWR, all brackish creeks, tidal waters, and salt marsh areas within the refuge are open to fishing year-round. Wassaw NWR is bordered on the east by the Atlantic Ocean where surf fishing is permitted year-round as well. Visitors also use nets and traps to shrimp and crab during open seasons. There are no freshwater fishing opportunities on Wassaw NWR. Mainland boat ramps available to visitors include: Coffee Bluff, Delegal, Skidaway Narrows, Isle of Hope, Bull River, and Fort McAllister.

**Objective 3.5.a: Blackbeard Island NWR – Fishing:** Over the 15-year life of this CCP, maintain, and where possible, expand current fishing opportunities.

*Strategies:*

- Add species list and state website for saltwater regulations to refuge brochure.
- Partner with Friends and other organizations to conduct a Youth Fishing Clinic for the Complex to promote recreational fishing.

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**Objective 3.5.b: Harris Neck NWR – Fishing:** Over the 15-year life of this CCP, maintain, and where possible, expand current saltwater fishing opportunities.

*Strategies:*

- Redesign and reconstruct fishing piers at Harris Neck Creek.
- Explore the design and construction of a fishing pier on the Barbour River.
- Partner with Friends and other organizations to conduct a Youth Fishing Clinic for the Complex to promote recreational fishing.

**Objective 3.5.c: Pinckney Island NWR – Fishing:** Over the 15-year life of this CCP, maintain, and where possible, expand current saltwater fishing opportunities.

*Strategies:*

- Collaborate with SCDNR to modify its fishing publications and website to include information specific to shell fishing within refuge waters.
- Partner with Friends and other organizations to conduct a Youth Fishing Clinic for the Complex to promote recreational fishing.

**Objective 3.5.d: Savannah NWR – Fishing:** Over the 15-year life of this CCP, maintain, and where possible, expand current fishing opportunities.

*Strategies:*

- Install kiosk at the Clydesdale Creek fishing site to provide refuge fishing information.
- Consider starting a youth fishing clinic/event to promote recreational fishing.
- Partner with counties to install refuge fishing information kiosks at main boat launches (Abercorn, Mill Stone, Beck's Ferry, and Houlihan Landing.) Include kayak trail info at Beck's Ferry and Mill Stone.
- Partner with Friends and other organizations to conduct a Youth Fishing Clinic for the Complex to promote recreational fishing.

**Objective 3.5.e: Wassaw NWR – Fishing:** Over the 15-year life of this CCP, maintain, and where possible, expand current saltwater fishing opportunities.

*Strategies:*

- Add species list and state website for saltwater regulations to refuge brochure.
- Partner with Friends and other organizations to conduct a Youth Fishing Clinic for the Complex to promote recreational fishing.

## **Hunting**

*Discussion:* Public hunting is used as a tool to help manage the game species populations to accomplish refuge wildlife and habitat management objectives. These carefully managed hunts attempt to maintain populations at a level deemed compatible for the natural environment, while providing recreational opportunities for a segment of the visiting population.

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On Blackbeard Island NWR, two 3-day archery hunts for deer and feral hogs are conducted each year. An easy to understand hunt brochure that includes regulations and other pertinent information is available at the Complex contact stations, the refuge website, and by mail. These hunts are not accessible to hunters in wheelchairs due to the rugged conditions of the island. However, a wheelchair accessible hunt is offered at nearby Savannah NWR.

Harris Neck NWR allows hunting of white-tailed deer and feral hogs on designated areas of the refuge in accordance with state hunting regulations. The refuge administers two types of big game hunts, a 3-day bow hunt and a 1-day gun hunt, which has a quota. An easy to understand hunt brochure that includes regulations and other pertinent information is available at the refuge complex contact stations, the refuge website, and by mail.

Pinckney Island NWR allows gun hunting of white-tailed deer only within designated areas of the refuge in accordance with state hunting regulations. The refuge offers a 1-day quota gun hunt for deer in November and when necessary for management purposes, an additional 1-day hunt may be held in December. An easy to understand hunt brochure that includes regulations and other pertinent information is available at the Complex contact stations, the refuge website, and by mail.

Savannah NWR offers seven different hunts annually. The species hunted are deer, feral hog, squirrel, turkey, and waterfowl. Each hunt is allowed in designated areas of the refuge in accordance with state hunting regulations. An easy to understand hunt brochure that includes regulations and other pertinent information is available at the Complex contact stations, the refuge website, and by mail.

At Wassaw NWR, one 3-day primitive weapons hunt and one 3-day gun hunt for deer and feral hogs are conducted each year. An easy to understand hunt brochure that includes regulations and other pertinent information is available at the Complex contact stations, the refuge website, and by mail. These hunts are not accessible to hunters in wheelchairs due to the rugged conditions of the island. However, a wheelchair accessible hunt is offered at nearby Savannah NWR.

**Objective 3.6.a: Blackbeard Island NWR – Hunting:** Over the 15-year life of this CCP, maintain, and where possible, expand current hunting opportunities.

*Strategies:*

- Review and update hunt plan annually.
- Evaluate the option of allowing the use of crossbows in hunts on the refuge.

**Objective 3.6.b: Harris Neck NWR – Hunting:** Over the 15-year life of this CCP, maintain, and where possible, expand current hunting opportunities.

*Strategies:*

- Review and update hunt plan annually.
- Investigate ways to streamline quota hunt process by providing online notification and distribute permits at check-in the morning of the hunt. Offer standby opportunity.
- Explore the possibility of having a youth deer hunt.
- Evaluate the option of allowing the use of crossbows during refuge hunts.

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**Objective 3.6.c: Pinckney Island NWR – Hunting:** Over the 15-year life of this CCP, maintain, and where possible, expand current hunting opportunities.

*Strategies:*

- Review and update hunt plan annually.
- Explore the possibility of having a youth deer hunt.
- Investigate ways to streamline quota hunt process by providing online notification and distributing permits at check-in the morning of the hunt. Offer stand-by opportunity.
- Evaluate the option of allowing the use of crossbows during refuge hunts.

**Objective 3.6.d: Savannah NWR – Hunting:** Over the 15-year life of this CCP, maintain, and where possible, expand current hunting opportunities.

*Strategies:*

- Review and update hunt plan annually.
- Include the Solomon Tract in the hunt program as youth small game hunt area.
- Utilize the visitor center as site for youth hunter education course.
- Evaluate the option of allowing the use of crossbows during refuge hunts

**Objective 3.6.e: Wassaw NWR – Hunting:** Over the 15-year life of this CCP, maintain, and where possible, expand current hunting opportunities.

*Strategies:*

- Review and update hunt plan annually.
- Evaluate the option of allowing the use of crossbows during refuge hunts.

## **Volunteer Program and Friends Group**

### *Discussion: Volunteer Program*

The Complex has a diverse and active volunteer corps; however, there is not a dedicated volunteer coordinator on staff. Potential volunteers complete an application packet and are interviewed by the staff to ensure that individuals selected match refuge program needs. Most volunteers find out about the program from other volunteers, the volunteer page on the website, and on the Internet site: [volunteer.gov](http://volunteer.gov). Orientation and training is provided by designated staff at specific sites and may vary according to the assignments. Each refuge spends part of its annual volunteer budget on volunteer travel and training. The rest of the budget goes towards volunteer uniforms and recognition items. The Complex holds an annual Volunteer Recognition Day, with a cook-out and awards ceremony.

On Blackbeard Island NWR, volunteers assist staff in preparing for the island archery hunts, repairing restrooms, shop, dock, dikes, and trails. Three interns are recruited each year for 12 weeks to conduct the sea turtle project. In Fiscal Year 2008, 13 volunteers contributed a total of 2,984 hours of service to the refuge.

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Two trailer pads at Harris Neck NWR allow the refuge to host resident volunteers, who stay for at least one month and may work at Blackbeard Island in addition to Harris Neck. The volunteer program at Harris Neck NWR revolves around the visitor services and natural resource management programs. In Fiscal Year 2008, 27 volunteers contributed a total of 3,463 hours of service to the refuge.

The volunteer program at Pinckney Island NWR is centered on visitor services and natural resource management. In Fiscal Year 2008, 47 volunteers contributed a total of 1,380 hours of service to the refuge.

The volunteer program at Savannah NWR is centered on visitor services and natural resource management. In Fiscal Year 2008, 10 volunteers contributed a total of 621 hours of service to the refuge.

On Wassaw NWR, volunteers assist staff in preparing for and administering the island hunts, conducting bird surveys, clearing trails, general maintenance, and conducting environmental education programs and interpretive tours. In Fiscal Year 2008, there were 10 volunteers on Wassaw NWR who donated a total of 1,037 hours.

### **Friends Group**

The Friends of the Savannah Coastal Wildlife Refuges, Inc. (FOSCWR) is the official friends group for the Complex. Newly formed in 2008, the group will provide support through advocacy, fundraising, and providing volunteers to assist with refuge programs and projects for all refuges within the Complex. The group will operate a small sales outlet located within the Savannah NWR Visitor Center, which will be its primary means of fundraising.

Although not official friends groups, the Ogeechee, Hilton Head, and Coastal Georgia Audubon Societies have served as refuge support groups for many years, and will likely continue relations with the Complex alongside the FOSCWR.

### **Partnerships**

Clean Coast, a non-profit Savannah-based conservation organization, renews a special use permit annually to sponsor beach clean-ups on Blackbeard Island and Wassaw NWRs.

The University of Georgia's Marine Education Center and Aquarium (UGA-MECA) is an excellent environmental education partner. Most of the field trips are to Wassaw NWR, but several are conducted each year to Blackbeard Island NWR as well.

Refuge staff attend meetings of the Georgia Coastal Education Group, a consortium of mostly state and federal agencies that works together to promote environmental education opportunities in coastal Georgia.

**Objective 3.7.a: Blackbeard Island NWR – Volunteer Program and Friends Group:** Over the 15-year life of this CCP, expand volunteer program to enhance all aspects of refuge management.

#### *Strategies:*

- Establish a Complex volunteer coordinator position to work with staff to develop and manage the volunteer program.
- Develop a refuge orientation and training program with handbook and provide to all volunteers.
- Continue to support the newly organized FOSCWR.



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**Objective 3.7.b: Harris Neck NWR – Volunteer Program and Friends Group:** Over the 15-year life of this CCP, expand volunteer program to enhance all aspects of refuge management.

*Strategies:*

- Establish a Complex volunteer coordinator position to work with staff to develop and manage the volunteer program.
- Develop a refuge orientation and training program with handbook and provide to all volunteers.
- Continue to support the newly organized FOSCWR.
- Train a group of volunteers to function as roving interpreters along the wildlife drive during high use times.
- Establish a volunteer corps to serve as visitor aides at visitor contact station/office and any new facilities.

**Objective 3.7.c: Pinckney Island NWR – Volunteer Program and Friends Group:** Over the 15-year life of this CCP, maintain and expand an active volunteer program and friends group to enhance all aspects of refuge management.

*Strategies:*

- Establish a Complex volunteer coordinator position to work with staff to develop and manage the volunteer program.
- Develop a refuge orientation and training program with handbook and provide to all volunteers.
- Develop recreational vehicle pads in conjunction with a welcome/visitor center at Last End Point to accommodate resident volunteers.
- Continue to support the newly organized FOSCWR.

**Objective 3.7.d: Savannah NWR – Volunteer Program and Friends Group:** Over the 15-year life of this CCP, maintain and expand an active volunteer program and friends group to enhance all aspects of refuge management.

*Strategies:*

- Establish a Complex volunteer coordinator position to work with staff to develop and manage the volunteer program.
- Train a group of volunteers to function as roving interpreters along the wildlife drive during high use times.
- Establish a volunteer corps to serve as visitor aides at the visitor center.
- Develop a refuge orientation and training program with handbook and provide to all volunteers.
- Continue to support the newly organized FOSCWR.
- Support friends group with management of the visitor center sales outlet, providing their volunteers with an orientation to the Complex.

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**Objective 3.7.e: Wassaw NWR – Volunteer Program and Friends Group:** Over the 15-year life of this CCP, maintain and expand an active volunteer program and friends group to enhance all aspects of refuge management.

*Strategies:*

- Establish a Complex volunteer coordinator position to work with staff to develop and manage the volunteer program.
- Develop a refuge orientation and training program with handbook and provide to all volunteers.
- Continue to support the newly organized FOSCWR.

**Outreach**

*Discussion:* None of the Complex refuges currently have approved outreach plans. These plans need to be developed and updated annually.

Media outreach has occurred in the form of press releases, radio and television interviews, and phone contacts. Complex staff has maintained good working relationships with most local media sources, and a number of articles is printed each year covering various refuge topics. Special events and interpretive programs have also been subjects of press releases and newspaper stories.

Complex staff and volunteers are invited to attend/participate in a number of outreach events (i.e., special events, festivals, and workshops) each year. All requests are considered with actual participation based on staff schedules and availability, as well as budget considerations for the cost associated with participation; however staff has been featured speakers for various organizations. Over the years, the Complex has typically participated in at least two or three major outreach events each year including the Southeastern Wildlife Exposition in Charleston, South Carolina; Georgia's Colonial Coast Birding and Nature Festival in Jekyll Island, Georgia; Coast Fest in Brunswick, Georgia; and an annual Earth Day celebration held in Savannah, Georgia. Budget and time considerations have restricted staff participation in some of these events over the past couple of years. In the future, we hope to be able to have at least a minimal presence at all of these major outreach events. Most, if not all, off-site outreach activities support the entire Complex, not one specific refuge.

**Objective 3.8.a: Blackbeard Island NWR – Outreach:** Over the 15-year life of this CCP, increase public outreach to emphasize resource management practices and promote the six priority public uses of the Refuge System.

*Strategies:*

- Seek opportunities to participate in special events.
- Develop a portable exhibit for the Complex.
- Explore new partnerships that would expand outreach opportunities, particularly those that would promote Wilderness awareness.
- Annually review and modify media/outreach plan.

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**Objective 3.8.b: Harris Neck NWR – Outreach:** Over the 15-year life of this CCP, increase public outreach to emphasize resource management practices and promote the six priority public uses of the Refuge System.

*Strategies:*

- Develop a refuge-specific rack card to distribute at appropriate off-site locations.
- Evaluate opportunities to participate in special events.
- Continue working with partners to provide National Wildlife Refuge Week events and explore new partnerships that would expand outreach opportunities.
- Annually review and modify media/outreach plan.
- Look for opportunities to host congressional and media field days.
- Develop a portable exhibit for the Complex.

**Objective 3.8.c: Pinckney Island NWR – Outreach:** Over the 15-year life of this CCP, increase public outreach to emphasize resource management practices and promote the six priority public uses of the Refuge System.

*Strategies:*

- Develop a refuge-specific rack card to distribute at appropriate off-site locations.
- Evaluate opportunities to participate in special events.
- Continue working with partners to provide National Wildlife Refuge Week events and explore new partnerships that would expand outreach opportunities.
- Annually review and modify media/outreach plan.
- Develop a portable exhibit for the Complex.

**Objective 3.8.d: Savannah NWR – Outreach:** Over the 15-year life of this CCP, increase public outreach to emphasize resource management practices and promote public use opportunities.

*Strategies:*

- Develop a refuge-specific rack card to distribute at appropriate off-site locations.
- Evaluate opportunities to participate in special events.
- Continue working with partners to provide National Wildlife Refuge Week events and explore new partnerships that would expand outreach opportunities.
- Annually review and modify media/outreach plan.
- Host a congressional and media field day.
- Develop a portable exhibit for the Complex.

**Objective 3.8.e: Tybee NWR – Outreach/Education:** Over the 15-year life of this CCP, employ outreach actions, including productions of educational exhibits and materials, to ensure compliance with refuge regulations.

*Strategy:*

- Develop partnership with Fort Pulaski National Monument for installation of wayside exhibits at the Fort identifying the refuge.

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**Objective 3.8.f: Wassaw NWR – Outreach:** Over the 15-year life of this CCP, increase public outreach to emphasize resource management practices and promote the six priority public uses of the Refuge System.

*Strategies:*

- Evaluate opportunities to participate in special events.
- Explore new partnerships that would expand outreach opportunities.
- Develop a portable exhibit for the Complex.
- Annually review and modify media/outreach plan.

**Welcome and Orient Visitors**

*Discussion:* Each refuge in the Complex has various ways to welcome and orient visitors, including facilities, signs, brochures, and other publications. Two refuges currently have facilities where the public can directly communicate with either staff or volunteers to receive information: Harris Neck NWR has a Visitor Contact Station located within the refuge office building, and Savannah NWR has a Visitor Center with Complex headquarters staff offices located within. Both facilities utilize trained volunteers to provide visitors with information. Although signs and publications are updated and replaced as needed, there are currently no approved sign plans for any of the refuges in the Complex. Each refuge needs to develop and/or update a sign plan, maintain a stock of updated publications, and add infrastructure upgrades, as needed, to better accommodate visitors.

**Objective 3.9.a: Blackbeard Island NWR – Welcome and Orient Visitors:** Over the 15-year life of this CCP, improve programs to welcome and orient visitors through directional and entrance signs, design and upkeep of facilities, and the provision of information regarding programs and facilities.

*Strategies:*

- Develop and implement a sign plan by 2013.
- Expand refuge website to include informational videos and a virtual tour of the refuge.
- Develop a refuge-specific rack card to distribute at Interstate and community welcome/visitor centers.
- Develop map/trail guide.
- Regularly update and post information on the website about any refuge closures.
- Explore option for public boat transportation provided by concessionaire.
- Work with local marinas and the boating community to provide information about the refuge.
- Develop more prominent information about the Wilderness Area in the current refuge brochure, web site, and visitor contact areas. Make “Leave No Trace” materials available to visitors.

**Objective 3.9.b: Harris Neck NWR – Welcome and Orient Visitors:** Over the 15-year life of this CCP, improve program to welcome and orient visitors through directional and entrance signs, design and upkeep of facilities, and the provision of information regarding programs and facilities.

*Strategies:*

- Develop and implement a sign plan by 2013.
- Expand refuge website to include informational videos and a virtual tour of the refuge.
- Develop a refuge-specific rack card to distribute at Interstate and community welcome/visitor centers.

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- Redesign the map and trail guide.
  - Develop Harris Neck NWR general brochure.
  - Install an electric gate at entrance road to Barbour River Landing.
  - Evaluate participating in the entrance fee program.
  - Place a welcome and orient kiosk at the Barbour River parking area.
  - Design and construct a visitor center/environmental education center and retain the existing visitor contact station as an administrative building.
  - Regularly update and post information on the website about any refuge closures.

**Objective 3.9.c: Pinckney Island NWR – Welcome and Orient Visitors:** Over the 15-year life of this CCP, improve programs to welcome and orient visitors through directional and entrance signs, design and upkeep of facilities, and the provision of information regarding programs and facilities.

*Strategies:*

- Develop and implement a sign plan by 2013.
- Evaluate participating in the entrance fee program.
- Place a welcome and orient kiosk outside the electric gate for after-hours information.
- Provide ADA accessible parking spots and trail near the kiosk.
- Plan for development of welcome/visitor center at Last End Point and concessionaire operated transport system.
- Regularly update and post information on the website about any refuge closures.
- For all main trails, develop standard trail head kiosk with information about the trails.
- Make the trail from parking lot to Ibis Pond ADA accessible.
- Work with Department of Transportation to create safer acceleration/ deceleration lanes at the Highway 278 entrance and an underpass linking Last End Point to the entrance.
- Expand refuge website to include informational videos and a virtual tour of the refuge.
- Develop a refuge-specific rack card to distribute at Interstate and community welcome/visitor centers.
- Coordinate with Deed of Donation.

**Objective 3.9.d: Savannah NWR – Welcome and Orient Visitors:** Over the 15-year life of the CCP, improve program to welcome and orient visitors through directional and entrance signs, design and upkeep of facilities, and the provision of information regarding programs and facilities.

*Strategies:*

- Develop and implement a sign plan by 2013.
- Expand refuge website to include informational videos and a virtual tour.
- Develop a refuge-specific rack card to distribute at Interstate and community welcome/visitor centers.
- Partner with South Carolina Department of Transportation and Federal Highway Administration to improve safety at the wildlife drive entrance/exit on South Carolina Highway 170 and establish safe parking for access to the hiking trails north of South Carolina Highway 170.
- Establish a user fee for wildlife drive with staffed fee booth during peak use; honor system rest of year.
- Regularly update and post information on the website about any refuge closures.
- Develop refuge map/trail guide.

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**Objective 3.9.e: Wassaw NWR – Welcome and Orient Visitors:** Over the 15-year life of this CCP, improve programs to welcome and orient visitors through directional and entrance signs, design and upkeep of facilities, and the provision of information regarding programs and facilities.

*Strategies:*

- Develop and implement a sign plan by 2013.
- Expand refuge website to include informational videos and a virtual tour of the refuge.
- Develop a refuge-specific rack card to distribute at Interstate and community welcome/visitor centers.
- Develop map/trail guide.
- Work with local marinas and the boating community to provide information about the refuge.
- Regularly update and post information on the website about any refuge closures.
- Explore option for public boat transportation provided by concessionaire.

*RESOURCE PROTECTION*

**Goal 4.** Identify, conserve, and protect natural and cultural resources through partnerships, land protection programs, and law enforcement. Ensure a safe and secure environment for the visiting and Service personnel.

*Discussion:* Protecting the natural and cultural resources of all of the refuges within the Complex and ensuring the safety of all refuge visitors are fundamental responsibilities of the Refuge System. Because of the extensive distance between some refuges and remote location of the barrier island refuges, it is difficult to share resources. Providing adequate law enforcement is essential and necessary to protect refuge resources including wildlife, habitat, and cultural resources. To ensure this mandated requirement is met, additional staff will be required.

**Archaeological and Historical Site Protection**

*Discussion:* The Service values and protects its archaeological and historical resources as defined in the National Historic Preservation Act of 1966 (NHPA), the Native American Grave Protection and Repatriation Act of 1990, and the Archaeological Resources Protection Act of 1979 (ARPA). The Complex has cultural sites relating to human settlement that date back as far as 4,000 years ago. Several archaeological investigations have been performed and have produced artifacts and evidence that range from 500 A.D. to post Civil War. Most of these resources are not featured as public use areas due to the likelihood of theft and other adverse affects. It is unlikely that these areas will be open to the public. However, with the increased demand for public recreation and the economic value of artifacts, it may be necessary to increase law enforcement efforts in these areas.

**Objective 4.1.a: Blackbeard Island NWR – Archaeological and Historical Site Protection:** Over the 15-year life of this CCP, protect all archaeological sites on the refuge from illegal take or damage in compliance with the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, the National Historic Preservation Act, and all other applicable federal and state laws.



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*Strategies:*

- Continue, and where possible, increase law enforcement patrols on all known sites to inspect for disturbances and illegal digging and or looting.
- Conduct archaeological survey.
- Develop and implement a Cultural Resources Plan by 2016.

**Objective 4.1.b: Harris Neck NWR – Archaeological and Historical Site Protection:** Over the 15-year life of this CCP, protect all archaeological sites on the refuge from illegal take or damage in compliance with the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, the National Historic Preservation Act, and all other applicable federal and state laws.

*Strategies:*

- Continue, and where possible, increase law enforcement patrols on all known sites to inspect for disturbances and illegal digging and or looting.
- Conduct archaeological survey.
- Develop and implement a Cultural Resources Plan by 2016.

**Objective 4.1.c: Pinckney Island NWR – Archaeological and Historical Site Protection:** Over the 15-year life of this CCP, protect all archaeological sites on the refuge from illegal take or damage in compliance with the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, the National Historic Preservation Act, and all other applicable federal and state laws.

*Strategies:*

- Continue, and where possible, increase law enforcement patrols on all known sites to inspect for disturbances and illegal digging and or looting.
- Conduct archaeological survey.
- Develop and implement a Cultural Resources Plan by 2016.

**Objective 4.1.d: Savannah NWR – Archaeological and Historical Site Protection:** Over the 15-year life of this CCP, protect all archaeological sites on the refuge from illegal take or damage in compliance with the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, the National Historic Preservation Act, and all other applicable federal and state laws.

*Strategies:*

- Continue, and where possible, increase law enforcement patrols on all known sites to inspect for disturbances and illegal digging and or looting.
- Conduct archaeological survey.
- Develop and implement a Cultural Resources Plan by 2016.

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**Objective 4.1.e: Tybee NWR – Archaeological and Historical Site Protection:** Over the 15-year life of this CCP, protect all archaeological sites on the refuge from illegal take or damage in compliance with the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, the National Historic Preservation Act, and all other applicable federal and state laws.

*Strategies:*

- Continue, and where possible, increase law enforcement patrols on all known sites to inspect for disturbances and illegal digging and or looting.
- Conduct archaeological survey.
- Develop and implement a Cultural Resources Plan by 2016.

**Objective 4.1.f: Wassaw NWR – Archaeological and Historical Site Protection:** Over the 15-year life of this CCP, protect all archaeological sites on the refuge from illegal take or damage in compliance with the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, the National Historic Preservation Act, and all other applicable federal and state laws.

*Strategies:*

- Continue, and where possible, increase law enforcement patrols on all known sites to inspect for disturbances and illegal digging and or looting.
- Conduct archaeological survey.
- Develop and implement a Cultural Resources Plan by 2016.

**Maintain Marked Refuge Boundary**

*Discussion:* Because of frequent damage and vandalism, maintaining the current refuge boundaries through sign replacement is a continuous need. This need is also perpetuated by funding constraints and active land acquisition within some refuge acquisition boundaries. The refuge would like to initiate an annual monitoring program to evaluate the need for boundary and directional signs on the refuge.

**Objective 4.2.a: Blackbeard Island NWR – Maintain Marked Refuge Boundary:** Over the 15-year life of this CCP, maintain refuge boundary and identify unmarked areas.

*Strategies:*

- Maintain existing refuge boundary signs at a rate of 10 percent per year.
- Maintain existing Wilderness Area boundary signs.

**Objective 4.2.b: Harris Neck NWR – Maintain Marked Refuge Boundary:** Over the 15-year life of this CCP, maintain refuge boundary and identify unmarked areas

*Strategy:*

- Maintain existing refuge boundary signs at a rate of 10 percent per year.

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**Objective 4.2.c: Pinckney Island NWR – Maintain Marked Refuge Boundary:** Over the 15-year life of this CCP, maintain refuge boundary and identify unmarked areas.

*Strategy:*

- Maintain existing refuge boundary signs at a rate of 10 percent per year.

**Objective 4.2.d: Savannah NWR – Maintain Marked Refuge Boundary:** Over the 15-year life of this CCP, maintain refuge boundary and identify unmarked areas.

*Strategy:*

- Maintain existing refuge boundary signs at a rate of 10 percent per year.

**Objective 4.2.e: Tybee NWR – Maintain Marked Refuge Boundary:** Over the 15-year life of this CCP, maintain refuge boundary and identify unmarked areas.

*Strategy:*

- Maintain existing refuge boundary signs at a rate of 100 percent per year.

**Objective 4.2.f: Wassaw NWR – Maintain Marked Refuge Boundary:** Over the 15-year life of this CCP, maintain refuge boundary and identify unmarked areas.

*Strategy:*

- Maintain existing refuge boundary signs at a rate of 10 percent per year.

## **Law Enforcement**

*Discussion:* Because of the urban location of some of the Complex refuges, law enforcement is essential and necessary to protect refuge resources including wildlife, habitat, and cultural resources. The safety and protection of refuge visitors are also priorities.

With two full-time law enforcement officers and one collateral duty officer for the entire Complex and the distance between the refuges, it is extremely challenging to ensure visitor safety and resource integrity. In addition to the protection of wildlife and cultural resources, the law enforcement personnel must also deal with illegal drugs, vandalism, illegal dumping, and the safety of visitors. Additional law enforcement presence is essential to meeting this increasing demand.

**Objective 4.3.a: Blackbeard Island NWR – Law Enforcement:** Over the 15-year life of this CCP, provide visitor safety, protect resources, and ensure public compliance with refuge regulations.

*Strategies:*

- Develop and implement a Law Enforcement Plan by 2015.
- Develop and work cooperatively with local, state, and other federal law enforcement agencies to supplement resource protection.
- Provide educational and outreach programs in local communities as part of preventive law enforcement effort to encourage voluntary compliance.

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**Objective 4.3.b: Harris Neck NWR – Law Enforcement:** Over the 15-year life of this CCP, provide visitor safety, protect resources, and ensure public compliance with refuge regulations.

*Strategies:*

- Develop and implement a Law Enforcement Plan by 2015.
- Develop and work cooperatively with local, state, and other federal law enforcement agencies to supplement resource protection.
- Provide educational and outreach programs in local communities as part of preventive law enforcement effort to encourage voluntary compliance.

**Objective 4.3.c: Pinckney Island NWR – Law Enforcement:** Over the 15-year life of this CCP, provide visitor safety, protect resources, and ensure public compliance with refuge regulations.

*Strategies:*

- Develop and implement a Law Enforcement Plan by 2015.
- Develop and work cooperatively with local, state, and other federal law enforcement agencies to supplement resource protection.
- Provide educational and outreach programs in local communities as part of preventive law enforcement effort to encourage voluntary compliance.

**Objective 4.3.d: Savannah NWR – Law Enforcement:** Over the 15-year life of this CCP, provide visitor safety, protect resources, and ensure public compliance with refuge regulations.

*Strategies:*

- Develop and implement a Law Enforcement Plan by 2015.
- Develop and work cooperatively with local, state, and other federal law enforcement agencies to supplement resource protection.
- Provide educational and outreach programs in local communities as part of preventive law enforcement effort to encourage voluntary compliance.

**Objective 4.3.e: Tybee NWR – Law Enforcement:** Over the 15-year life of this CCP, provide visitor safety, protect resources, and ensure public compliance with refuge regulations.

*Strategies:*

- Develop and implement a Law Enforcement Plan by 2015.
- Develop and work cooperatively with local, state, and other federal law enforcement agencies to supplement resource protection.
- Provide educational and outreach programs in local communities as part of preventive law enforcement effort to encourage voluntary compliance.

**Objective 4.3.f: Wassaw NWR – Law Enforcement:** Over the 15-year life of this CCP, provide visitor safety, protect resources, and ensure public compliance with refuge regulations.

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*Strategies:*

- Develop and implement a Law Enforcement Plan by 2015.
- Develop and work cooperatively with local, state, and other federal law enforcement agencies to supplement resource protection.
- Provide educational and outreach programs in local communities as part of preventive law enforcement effort to encourage voluntary compliance.

## **Land Acquisition**

*Discussion:* Not all of the lands within the approved acquisition boundary for Savannah NWR have been obtained by the Service. If funds and willing sellers become available, the Complex will attempt to acquire these lands in accordance with current Service policy. A major expansion plan should be evaluated for Harris Neck NWR. These efforts would enhance management opportunities for wildlife and the public.

**Objective 4.4.a: Harris Neck NWR – Land Acquisition:** Over the 15-year life of this CCP, increase focus on acquiring lands that provide resource and public use values from willing sellers by any viable means.

*Strategies:*

- Investigate expanding existing acquisition boundary.
- Work with local land trusts, non-governmental organizations, and other federal and state agencies to identify willing sellers to acquire and/or protect additional lands, especially upland buffers.
- Explore opportunities to place easements on lands near the refuge that will compliment refuge objectives.
- Develop and annually update priority list for land acquisitions.

**Objective 4.4.b: Savannah NWR – Land Acquisition:** Over the 15-year life of this CCP, increase focus on acquiring lands that provide resource and public use values from willing sellers by any viable means.

*Strategies:*

- Investigate expanding existing acquisition boundary.
- Annually update priority list for land acquisitions.
- Work with local land trusts, non-governmental organizations, and other federal and state agencies to identify willing sellers to acquire and/or protect additional refuge lands, especially upland buffers.
- Explore opportunities to place easements on lands near the refuge that will compliment refuge objectives.
- Continue larger landscape conservation planning efforts (partnerships) to help guide acquisitions, easements, and habitat linkages.

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## Private Lands Program

Discussion: The Refuge System could never acquire enough land to meet the habitat needs of all resident and migratory wildlife; over 90 percent of Georgia is held in private ownership (USFWS Partners for Fish and Wildlife Strategic Plan 2007). Resident and migratory species, including threatened and endangered species, are dependent on lands in private ownership, in addition to public lands. While the refuges do have some landowners that actively manage all or a portion of their lands for wildlife, many others rely on their land to produce an income. Because government-based financial resources are scarce, efforts to restore habitat will be prioritized for areas of greatest need.

**Objective 4.5.a: Harris Neck NWR – Private Lands Program:** Over the 15-year life of this CCP, expand opportunities to work with private landowners near the refuge to promote refuge goals and objectives.

*Strategies:*

- Annually coordinate with the Service's Partners for Fish and Wildlife Program (PFW) in the Ecological Services Field Office to identify opportunities to enter into Cooperative Wildlife Management Agreements with private landowners adjacent to or near the refuge in the PFW Georgia Coastal focus area.
- Explore opportunities to improve habitat management on neighboring lands through farm bill programs, forest stewardship program, etc.
- Work with district conservationists, Cooperative Extension Service, GADNR Technical Guidance Biologists, Service's Partners Biologist, and others to prioritize lands surrounding the refuge suitable for restoration or enhancement for wildlife.

**Objective 4.5.b: Savannah NWR – Private Lands Program:** Over the 15-year life of this CCP, expand opportunities to work with private landowners near the refuge to promote refuge goals and objectives.

*Strategies:*

- Annually coordinate with the Service's PFW Program in the Ecological Services Field Office to identify opportunities to enter into Cooperative Wildlife Management Agreements with private landowners near the refuge in the PFW focus areas.
- Explore opportunities to improve habitat management on neighboring lands through farm bill programs, forest stewardship program, etc.
- Work with district conservationists, Cooperative Extension Service, DNR Technical Guidance Biologists, Service's Partners Biologist, and others to prioritize lands surrounding the refuge suitable for restoration or enhancement for wildlife.

## Partnerships

Discussion: Opportunities to work in partnership with private landowners, federal and state agencies, and non-governmental organizations are increasingly beneficial. Working with partners to link habitat restoration and management projects can increase ecosystem management of lands located inside and outside refuge boundaries. Although a large portion of lands inside current acquisition boundaries have been acquired, partnerships are needed to meet habitat objectives, reduce off-refuge impacts, and protect unique habitats.



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**Objective 4.6.a: Partnerships:** Over the 15-year life of this CCP, continue to maintain current relationships with partners and develop coordination and cooperation through new partnerships.

#### *REFUGE ADMINISTRATION*

**Goal 5.** Provide sufficient funding, staffing, facilities, and infrastructure to fulfill the Complex's purposes, goals, and objectives.

*Discussion:* The administrative functions associated with the Complex include a wide range of activities that are critical to the mission of the Refuge System and the purpose(s) of each refuge. These functions include staffing, training, budgeting, planning, facility and infrastructure management, community relations, partnering, and equipment maintenance. To carry out these functions, each refuge must have the appropriate level of staffing and resources available.

#### **Maintain Capitalized Equipment, Facilities, and Infrastructure for the Complex**

*Discussion:* The Complex has a good base of facilities and equipment to support management operations for the 56,000 acres that span the seven refuges. Funding is received as part of the Complex funding allocation. In fiscal year 2008, the budget for the Complex totaled \$3,500,000. Complex facilities and equipment to support management operations on the seven refuges include: Visitor Center/Office at Savannah NWR; Visitor Contact Station/Office at Harris Neck NWR; and maintenance shop facilities and associated storage buildings and outbuildings located on Savannah, Harris Neck, Pinckney Island, Blackbeard Island and Wassaw NWRs. There is a public boat ramp and parking lot at Harris Neck NWR along with a commercial dock under lease to local watermen. At Pinckney Island NWR there is a public boat ramp and associated parking area managed under agreement with Beaufort County, South Carolina.

**Objective 5.1.a: Savannah Coastal Refuges Complex – Maintain Capitalized Equipment, Facilities, and Infrastructure:** Over the 15-year life of this CCP, acquire and maintain equipment, facilities, and infrastructure used as a part of Complex management.

#### *Strategies:*

- Maintain more than \$5,000,000 worth of capitalized equipment, facilities, and infrastructure used in all aspects of refuge management such as habitat, wildlife, public use, and protection.
- Develop an equipment maintenance schedule for heavy equipment and water craft.
- Ensure replacement work orders are in Service Asset Maintenance Management System (SAMMS) for all existing heavy equipment needs.
- Ensure deficiencies of all facilities and infrastructure are identified in SAMMS.

**Objective 5.1.b: Blackbeard Island NWR – Maintain Capitalized Equipment, Facilities, and Infrastructure:** Over the 15-year life of this CCP, acquire and maintain equipment, facilities, and infrastructure used as a part of Complex management.

#### *Strategy:*

- Develop environmental education shelter near headquarters.

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**Objective 5.1.c: Pinckney Island NWR – Maintain Capitalized Equipment, Facilities, and Infrastructure:** Over the 15-year life of this CCP, acquire and maintain equipment, facilities, and infrastructure used as a part of Complex management.

*Strategy:*

- Plan for development of welcome/visitor center at Last End Point and concessionaire operated transport system.

**Objective 5.1.d: Wassaw NWR – Maintain Capitalized Equipment, Facilities, and Infrastructure:** Over the 15-year life of this CCP, acquire and maintain equipment, facilities, and infrastructure used as a part of Complex management.

*Strategy:*

- Develop environmental education shelter near headquarters.

### **Staffing Needs**

*Discussion:* The Complex currently has a combined staff of 30 full-time employees. Five of the seven Complex refuges do not have permanently assigned staff; however, management and law enforcement are conducted on all refuges in the Complex. Additional staff would be required to accomplish the goals of this CCP. Personnel priorities would include employing an environmental education coordinator, law enforcement officers/park rangers, a volunteer coordinator, biological technicians, maintenance workers, refuge managers, assistant refuge managers, and a GIS specialist. Increased budgets and staffing levels would better enable the Complex to meet the obligations of wildlife stewardship, habitat management, and public use.

**Objective 5.2.a: Savannah Coastal Refuges Complex – Staffing Needs:** Within 10 years of the date of this CCP, increase Complex budget and bring staffing levels up to RONS request to better meet the obligations of wildlife stewardship, habitat management, and public use.

*Strategies:*

- Hire an additional law enforcement officer for the Complex.
- Hire a volunteer coordinator for the Complex.
- Hire an environmental education coordinator for the Complex.
- Hire a facility manager for the Complex.
- Hire a biological technician for the Complex.
- Hire a GIS specialist for the Complex.
- Hire a forester for the Complex.
- Hire a forestry technician for the Complex.

**Objective 5.2.b: Blackbeard Island NWR – Staffing Needs:** Within 10 years of the date of this CCP, increase Complex budget and bring staffing levels up to RONS request to better meet the obligations of wildlife stewardship, habitat management, and public use.

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*Strategies:*

- Hire a refuge manager for Blackbeard Island NWR.
- Hire a maintenance worker for Blackbeard Island NWR.
- Hire two biological technicians to support Blackbeard Island NWR.
- Hire a wildlife biologist to support Harris Neck and Blackbeard Island NWRs.
- Hire an administrative assistant to perform the administrative duties for Blackbeard Island, Harris Neck, and Wolf Island NWRs.

**Objective 5.2.c: Harris Neck NWR – Staffing Needs:** Within 10 years of CCP completion, increase Complex budget and bring staffing levels up to RONS request to better meet the obligations of wildlife stewardship, habitat management, and public use.

*Strategies:*

- Hire assistant refuge manager for Harris Neck NWR.
- Hire a park ranger for Harris Neck NWR.
- Hire a wildlife biologist to support Harris Neck and Blackbeard Island NWRs.
- Hire a biological technician to support Harris Neck NWR.
- Hire a maintenance worker for Harris Neck NWR.
- Hire a boat mechanic for Harris Neck NWR.
- Hire an administrative assistant to perform the administrative duties for Blackbeard Island, Harris Neck, and Wolf Island NWRs.

**Objective 5.2.d: Pinckney Island NWR – Staffing Needs:** Within 10 years of the date of this CCP, increase Complex budget and bring staffing levels up to RONS request to better meet the obligations of wildlife stewardship, habitat management, and public use.

*Strategies:*

- Hire a refuge manager for Pinckney Island NWR.
- Hire two park rangers for Pinckney Island NWR.
- Hire two maintenance workers for Pinckney Island NWR.
- Hire a biological technician for Pinckney Island NWR.

**Objective 5.2.e: Savannah NWR – Staffing Needs:** Within 10 years of the date of this CCP, increase Complex budget and bring staffing levels up to RONS request to better meet the obligations of wildlife stewardship, habitat management, and public use.

*Strategies:*

- Hire a refuge operations specialist (assistant refuge manager) for Savannah NWR.
- Hire a biological technician for Savannah NWR.
- Hire two maintenance workers for Savannah NWR.
- Hire a park ranger for Savannah NWR.

**Objective 5.2.f: Tybee NWR – Staffing Needs:** Within 10 years of CCP completion, increase Complex budget and bring staffing levels up to RONS request to better meet the obligations of wildlife stewardship, habitat management, and public use.

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*Strategy:*

- Hire a biological technician for Tybee NWR.

**Objective 5.2.g: Wassaw NWR – Staffing Needs:** Within 10 years of the date of this CCP, increase Complex budget and bring staffing levels up to RONS request to better meet the obligations of wildlife stewardship, habitat management, and public use.

*Strategies:*

- Hire refuge manager for Wassaw NWR.
- Hire two maintenance workers for Wassaw NWR.
- Hire a biological technician for Wassaw NWR.



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## V. Plan Implementation

### INTRODUCTION

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

To accomplish the purpose, vision, goals, and objectives contained in this CCP for the Complex, this section identifies projects, funding and personnel needs, volunteers, partnership opportunities, step-down management plans, a monitoring and adaptive management plan, and plan review and revision.

### PROPOSED PROJECTS

Listed below are the proposed project summaries and their associated costs for fish and wildlife population management, habitat management, resource protection, visitor services, and refuge administration over the next 15 years. This proposed project list reflects the priority needs identified by the public, planning team, and 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.

#### **Project 1: Wildlife inventorying and monitoring program**

Inventorying and monitoring of plant and animal populations are critical to ensuring the biological integrity of national wildlife refuges. Information collected will serve as the basis for developing habitat management plans and will influence all management activities. A scientifically based inventorying and monitoring program will enable the Complex to make informed management decisions and valuable long-term contributions to national and regional objectives for waterfowl, shorebirds, wading birds, nongame birds, threatened and endangered species, and other resident wildlife. Standardized census and survey techniques will be employed and all data compiled into databases, including GIS for spatial analysis. All data will be shared with appropriate state and federal partners in an effort to further strategic habitat conservation and adaptive management. (Linkages: Goal 1, Objectives 1.1.a-f; 1.2.a-e; 1.3.a-e; 1.4.a-k; 1.5.a-e; 1.6.a-f; Goal 2, Objectives 2.2.a; 2.3.a-e; 2.4.a; 2.5.a; 2.6.a-b; 2.7.a; 2.8.a-f; 2.9.a-c; 2.10.a-d; 2.11.a-e; 2.12.a-f; 2.13.a-f; 2.14.a-e; Goal 5, Objectives 5.2 a-g)

#### **Project 2: Climate change and sea level rise**

Global climate change poses risks to human health and to terrestrial and aquatic ecosystems. This project would provide funding to work with research partners to conduct research and develop models and monitoring protocols to evaluate the potential effects of climate change and sea level rise on wildlife populations and habitats. Results and recommendations would be used to help the South Atlantic Landscape Conservation Cooperative with management decisions to minimize or mitigate potential impacts.

(Linkages: Goal 1, Objectives 1.2.a-e; 1.4.a-c, h-j; 1.6.a-f; Goal 2, Objectives 2.3.a-e; 2.6.a-b; 2.10.a-d; 2.12.a-f; 2.14.a-e; 2.16.a-f; Goal 5, Objectives 5.2 a-g)



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### **Project 3: Mapping (GIS)**

The use of geographic information systems (GIS) has become widespread as a valuable tool in developing and implementing habitat management plans. To better organize, understand, and make inferences regarding habitat management, a comprehensive GIS database is needed. Once established the geographic layers will incorporate all refuge programs. This will help ensure compatibility and productivity. This project will develop a data management, storage, and retrieval system; obtain spatial information from appropriate sources; develop geographical layers for refuge management programs; and facilitate spatial analysis and creation of maps.

(Linkages: Goals 1 and 2, all objectives; Goal 3, Objectives 3.1a-e, 3.2a-e, 3.4a-e, 3.5a-e, 3.6a-e, and 3.9a-e; Goal 4, Objectives 4.1a-f, and 4.2a-f, 4.4a and b, 4.5a and b; Goal 5, Objective 5.2a)

### **Project 4: Impoundment management**

Managed freshwater impoundments are one of the most important managed habitats within the Complex. Impoundments (often referred to as pools) are managed for a diverse array of wildlife and fish throughout the year. The freshwater plant communities within the units are extremely diverse and compositionally complex. This diversity makes impounded areas ideal habitat for a myriad of wildlife species. Most of the pools are located at the Savannah NWR and are the principle means of meeting one of the refuge's primary objectives of providing habitat and sanctuary for migrating and wintering waterfowl. Additional managed units are found on Harris Neck NWR. Historically, Blackbeard Island NWR had approximately 800 acres under some type of water level management. However, because of increases in residential and industrial water demands, the management capability of these wetlands has been lost. This project would allow management, through various techniques, to: plant successional stages, regulate undesirable and noxious plants, and maintain water control structures.

(Linkages: Goal 1, Objectives 1.1.f; 1.2.c; 1.4.d,g; 1.6.c-d; Goal 2, Objectives 2.1.a-f; 2.3.a-d; 2.7.a; 2.9.b; 2.10.b-c; 2.11.b-d; 2.12.d; Goal 5, Objectives 5.2 a-g)

### **Project 5: Refuge marshes and wetlands**

The Complex is composed of a number of different types of wetlands outside the managed impoundments. Wetland types include tidal and non-tidal freshwater wetlands, both emergent and forested, and estuarine wetlands associated with the barrier islands. All these different types are valuable habitat for a diversity of species. Tidal freshwater wetlands are one of the rarest types of wetlands in the world and the most productive. The Savannah NWR once contained over 6,000 acres of tidal freshwater wetlands but through continued expansion of the Savannah harbor, the amount has been reduced to less than 3,000 acres. Bottomland hardwoods make up a large portion of the wetlands on the Savannah NWR. These areas provide valuable nesting, migrating, and wintering habitat for a number of high-priority species such as the swallow-tailed kite. Other freshwater emergent, scrub/shrub, and forested wetlands are located within the Complex and provide valuable habitat for not only migratory birds, but other species as well. This especially holds true for those freshwater wetlands on the barrier islands. Estuarine wetlands are very important as nursery habitat for juvenile fish, crabs, and shrimp that take refuge among the vegetation for protection from predators. Intertidal pools and panes provide excellent foraging opportunities for birds. The diversity and abundance of aquatic fish and invertebrates in the estuary are very important for shorebirds and fish eating waterbirds. This project would provide a community assessment for plants, invertebrates, fisheries, reptiles, and amphibians on refuge marsh lands.

(Linkages: Goal 1, Objectives 1.1.a-f; 1.2.a-e; 1.3.a-e; 1.4.d and g; 1.5.a-e; 1.6.a-f; Goal 2, Objectives 2.3.a-e; 2.7a; 2.8.a-e and f; 2.9.a-c; 2.10.a-c; 2.11.b-d; Goal 5, Objectives 5.2 a-g)

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### **Project 6: Dune, beach, and sand bar habitat on Blackbeard Island NWR and Wassaw NWR**

Dunes, beaches, and sand bars are critical for migratory birds as nesting, feeding, loafing, and roosting habitat. Even more critical for shorebirds are the invertebrate prey populations these habitats support. Sea turtles nest on barrier island beaches and feed in offshore waters.

Protection of these important habitats will require a concerted effort involving state, federal, and local governments, as well as local residents, educational groups, and civic organizations. This project provides funding to map dune lines annually, monitor beach dynamics (erosion and accretion), develop and implement management actions to enhance beach habitat, monitor invasive species, and work with partners to educate the public using beaches on the importance of these habitats. (Linkages: Goal 1, Objective 1.2.a and e; 1.4.a- b and i-j; 1.6.a and f: Goal 2, Objectives 2.6.a-b; 2.10.a-b; 2.12.a and f; Goal 5, Objectives 5.2 b and g)

### **Project 7: Control and removal of nuisance/exotic/invasive plants and animals**

The Complex has several documented native and nonnative invasive and exotic plant species. These invasive species impact the refuges' ability to carry out desired wildlife and habitat management objectives and at times also reduce the range of visitor service activities. Many invasive plant species are difficult to control without applying chemical treatments. The moist-soil conditions conducive to providing quality habitat for migratory waterfowl management frequently encourages germination of those invasive species.

Intrusion of invasive plants can displace native plant and animal species and change habitat productivity through changes such as vegetative community, insect community, and structural environment. Nuisance animal species can also be a problem for the refuges within the Complex, as they are known to cause significant negative impacts on native populations through direct predation, disturbance, or destruction of site-specific plant communities (e.g., seasonal wetlands) and soil conditions. The spread of feral hogs to almost all habitats in the southeast constitutes a significant threat to wildlife habitat including that of refuges of the Complex. This exotic threat to habitat is now common throughout the southeastern United States, continues to increase in range and intensity, and should be countered aggressively to keep population numbers severely reduced.

(Linkages: Goal 1, Objectives 1.5.a-e; 1.6.a-f; Goal 2, Objectives 2.3.a-d; 2.12.a-f; Goal 5, Objectives 5.2 a-g)

### **Project 8: Forest management**

Forest stand quality can be improved or maintained through the use of appropriate silvicultural treatments. Many breeding forest birds and migratory species are dependent upon dense understory and ground vegetation for nesting and foraging. Thus, desired future conditions in much of the existing forest stands would emphasize increasing structural diversity by providing a more open overstory canopy to allow sunlight to reach the ground in support of increased ground and understory cover. This project would provide funding to develop a forest management plan, timber prescriptions, and an updated timber cruise.

(Linkages: Goal 2, Objectives 2.15.a-e; Goal 5, Objectives 5.2 a-g)

### **Project 9: Maintain and expand environmental education and interpretation, wildlife observation, wildlife photography, outreach, hunting, and fishing opportunities**

The Complex hosts around 500,000 visitors per year at the five refuges that are open to public use (Blackbeard Island, Harris Neck, Pinckney Island, Savannah, and Wassaw NWRs). Wildlife-dependent recreation opportunities are offered at each of these refuges, although some opportunities

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are limited due to resource constraints. A few of the refuges within the Complex lie in close proximity to heavily populated, urban areas. It is important to consider this when planning for public use to ensure quality in all recreational programs. Balancing visitor use with our mission to protect wildlife and habitat should be central to all decisions regarding expanding recreation opportunities.

This project includes developing wildlife checklists, photography workshops, additional photo blinds and observation towers, as well as expanding the trail system for more wildlife observation and photography opportunities. It includes developing portable exhibits for special events, refuge videos, trail guide/maps, additional interpretive exhibits, environmental education shelters and classrooms, and refuge-specific educational and interpretive programs. The project also includes developing a youth fishing clinic and repairing and expanding fishing facilities, as well as developing additional youth hunts and youth hunter education programs. Four additional park rangers (one stationed at Harris Neck/Blackbeard Island NWRs, one stationed at Savannah NWR, and two stationed at Pinckney Island NWR) and one environmental education specialist would be employed to assist in implementing this project.

(Linkages: Goal 3, Objectives 3.1a-e, 3.2a-e, 3.3a-e, 3.4a-e, 3.5a-e, 3.6a-e, 3.7a-e, and 3.8a-f; Goal 5, Objectives 5.2a-g)

#### **Project 10: Improve programs to welcome and orient visitors**

The refuges within the Complex employ various ways to welcome and orient visitors, including signs, facilities, brochures, and other publications. This project includes the development of a sign plan; maps/trail guides and/or general brochures for each refuge; rack-cards for distribution at off-site locations; welcome/orient kiosks in high-use areas that don't currently have them; and the development of visitor centers/contact stations at both Harris Neck and Pinckney Island NWRs. Refuge web sites would also be enhanced to include current information updates and more dynamic content. Visitor safety is a major concern, and this project would attempt to address a few major issues, mainly regarding visitors safely entering and exiting the refuges. The project also includes determining the feasibility of establishing entrance fees at Harris Neck, Savannah, and Pinckney Island NWRs. Four additional park rangers (one stationed at Harris Neck/Blackbeard Island NWRs, one stationed at Savannah NWR, and two stationed at Pinckney Island NWR) would be employed to assist in implementing this project. (Linkages: Goal 3, Objectives 3.1a-e, 3.2a-e, 3.4a-e, 3.7a-e, 3.8a-f, and 3.9a-e; Goal 4, Objectives 4.2a-f and 4.3a-f; Goal 5, Objectives 5.2a-g)

#### **Project 11: Expand volunteer program and strengthen Friends group partnership**

The Complex has a diverse and active cadre of volunteers who work primarily on Savannah, Pinckney Island, and Harris Neck NWRs. A newly formed Friends group supports all seven of the refuges in the Complex through advocacy, outreach, fundraising, and volunteer services. This project includes developing and providing better training materials and opportunities for refuge volunteers. With refuge staff support, more and varied opportunities for volunteers will be created. The project also provides continuing support for the Friends group, including cooperatively managing a sales outlet within the Savannah NWR Visitor Center. A volunteer coordinator for the Complex would be employed to assist in implementing this project. (Linkages: Goal 1, Objectives 1.1a-f, 1.2a-e, 1.3a-e, 1.4a-d, g, i, and j, and 1.5a-e; Goal 2, Objectives 2.2a, 2.3a-d, 2.6a-b, 2.8a-d and f, 2.11a-e, and 2.12a-f; Goal 3, Objectives 3.1a-e, 3.2a-e, 3.3a-e, 3.4a-e, 3.5a-e, 3.6a-e, 3.7a-e, 3.8a-f, and 3.9a-e; Goal 4, Objectives 4.2a-f and 4.4a-b; Goal 5, Objectives 5.1a-d and 5.2a-g)

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### **Project 12: Visitor safety and resource protection**

With three law enforcement officers for the entire Complex and the distance between the refuges, it makes it extremely challenging to ensure visitor safety and facility integrity. In addition to the protection of wildlife and cultural resources, the law enforcement personnel must also deal with illegal drugs, vandalism, poaching, illegal dumping, and the safety of visitors. This project would provide for additional law enforcement and the development of educational outreach programs to local communities. (Linkages: Goal 4, Objectives 4.1a-f, 4.2a-f, and 4.3a-f; Goal 5, Objectives 5.2a-g)

### **Project 13: Administrative support**

The Complex currently has a combined staff of 30 full-time members. Five of the Complex refuges do not have permanently assigned staff; however, management and law enforcement are conducted on all refuges in the Complex. This project would provide for additional staff to accomplish the goals of this CCP. Personnel priorities would include employing an environmental education coordinator, law enforcement officers/ park rangers, a volunteer coordinator, biological technicians, maintenance workers, refuge managers, refuge assistant managers, and a geographic information systems specialist. These increases in budget and staffing levels would better enable the Complex to meet its obligations of wildlife stewardship, habitat management, and public use. (Linkages: Goals 1-5, all objectives)

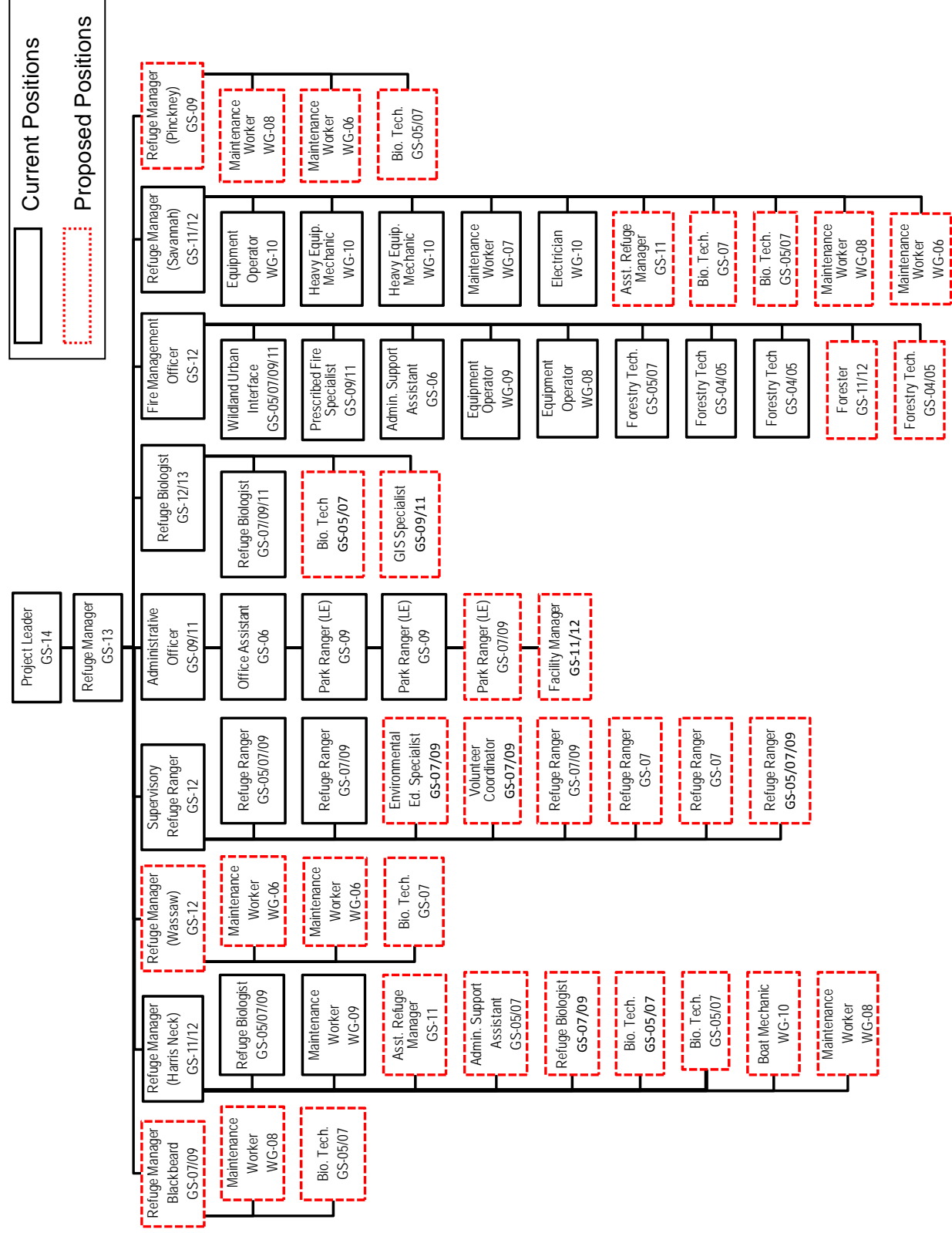
### **Project 14: Facility support**

The Complex has basic facilities and equipment to support management operations for the 56,000 acres that comprise the seven refuges. This project will identify new infrastructure and equipment needed to efficiently operate the Complex. The project will also provide annual costs for utilities, fuel, and other annual operating expenses. (Linkages: Goals 1-5, all objectives)

## **FUNDING AND PERSONNEL**

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

**Figure 32. Proposed organization structure for the management of the Complex -- current and proposed positions**



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**Table 13. Summary of projects for the Complex**

PROJECT NUMBER	PROJECT TITLE	FIRST YEAR COST	RECURRING ANNUAL COST	STAFF (FTE'S)
1	INVENTORYING AND MONITORING	1,500,000	48,677	4
2	CLIMATE CHANGE AND SEA LEVEL RISE	175,000	75,000	3
3	MAPPING (GIS)	167,439	127,439	1
4	IMPOUNDMENT MANAGEMENT	375,000	170,000	3
5	MARSHES AND WETLANDS	347,000	175,000	1
6	BEACH AND SAND BAR HABITAT	125,000	45,000	1
7	NUISANCE/EXOTIC/INVASIVE PLANTS AND ANIMALS	573,000	172,000	3
8	FOREST MANAGEMENT	75,000	25,000	2
9	EXPAND WILDLIFE-DEPENDENT RECREATION	890,000	55,000	2
10	WELCOME AND ORIENT VISITORS	3,500,000	85,000	2
11	VOLUNTEER PROGRAM AND FRIENDS GROUP	75,000	25,000	1
12	VISITOR SAFETY AND RESOURCE PROTECTION	150,000	22,000	2
13	ADMINISTRATIVE SUPPORT	225,000	200,000	3
14	FACILITY SUPPORT	750,000	500,000	5



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## **PARTNERSHIP/VOLUNTEERS OPPORTUNITIES**

A key element of this CCP is to establish partnerships with local volunteers, landowners, private organizations, and state and federal natural resource agencies. Partnerships are critical for refuges to fulfill their purposes; achieve their goals, objectives, and strategies; leverage funds; minimize costs; and bridge relationships. The Complex has historically partnered with many other agencies and organizations to enhance management of the refuges. It is anticipated that these partnerships will continue and opportunities to develop additional partnerships will be pursued.

The Complex has cooperated with the following federal agencies: U.S. Geological Survey, USDA Forest Service, U.S. Coast Guard, U.S. Army Corp of Engineers, National Oceanic and Atmospheric Administration, National Weather Service, National Park Service, Natural Resources Conservation Service, Sapelo Island National Estuarine Research Reserve, U.S. Environmental Protection Agency, Federal Aviation Administration, and the Federal Highway Administration.

The Complex has cooperated with the following state agencies: Georgia Department of Natural Resources; South Carolina Department of Natural Resources; South Carolina Department of Transportation; Georgia Department of Transportation; Georgia Forestry Commission; South Carolina Forestry Commission; Georgia Department of Economic Development; South Carolina Department of Parks, Recreation, and Tourism; and the Georgia Ports Authority.

The Complex has cooperated with the following local governments and agencies: Hardeeville, SC; Hilton Head, SC; Bluffton, SC; Port Wentworth, GA; Savannah, GA; Law enforcement for Effingham, Chatham, and McIntosh Counties, GA; and Jasper and Beaufort Counties, SC; GA and SC Highway Patrols; and Chambers of Commerce for Savannah, Port Wentworth, and Darien, GA; and Hardeeville and Hilton Head Island, SC. There are partnerships and local mutual aid agreements in place with the following fire departments: Ridgeland, Bluffton, Hardeeville, Levy, Port Wentworth, and McIntosh County Substation #5 (Harris Neck).

The Complex has cooperated with the following universities: University of Georgia, University of South Carolina – Beaufort, University of Florida, University of New Orleans, Georgia Southern University, University of Tennessee, Mississippi State University, Armstrong-Atlantic State University, and the Savannah College of Art and Design.

The Complex has cooperated with the following non-governmental organizations/agencies: Ogeechee Audubon Society, Hilton Head Island Audubon Society, Coastal Georgia Audubon Society, The Nature Conservancy, Sierra Club (Savannah, GA and Hilton Head Island, SC Chapters), Georgia Wildlife Federation, South Carolina Wildlife Federation, Georgia Conservancy, Coastal Conservation Association of Georgia, South Low Country Task Force (ACJV), South Carolina Prescribed Fire Council, Low Country Wildland Urban Interface Council, The Sanctuary on Sapelo, Trust for Public Lands, Wassaw Island LLC, Caretta Research Project, Skidaway Institute of Oceanography, National Wildlife Refuge Association, National Fish and Wildlife Foundation, Little St. Simons Island, Ducks Unlimited, Wild Turkey Federation, Bass Pro Shops, The Southern Company, R.B. Baker Construction, Yancey Caterpillar, Wilderness Southeast, Clean Coast, Coastal Discovery Museum of Hilton Head Island, Water-Dog Outfitters, Hilton Head Island's Disney Resort, and Swamp Girls Kayak Tours.

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Friends of the Savannah Coastal Wildlife Refuges, Inc., serves as the Friends group for the Complex. Established in 2008, the group supports all refuges within the Complex through advocacy, fundraising, and volunteer assistance on and off the refuges.

## **STEP-DOWN MANAGEMENT PLANS**

A CCP is a strategic plan that guides the direction of the refuge. A step-down management plan provides specific guidance on activities, such as habitat, fire, and visitor services. Step-down plans (Table 14) are also developed in accordance with the National Environmental Policy Act, which requires the identification and evaluation of alternatives and public review and involvement prior to their implementation.

**Table 14. National wildlife refuge step-down management plans related to the goals and objectives of this CCP**

<b>Step-down Plan</b>	<b>Completion Date</b>
Habitat Management Plan	2015
Inventorying and Monitoring Plan	2016
Forest Management Plan	2016
Visitor Services Plan	2016
Sign Plan	2013
Integrated Pest Management Plan (Nuisance Animal Control, Exotic Plant Control)	2016
Fire Management Plan (update)	2015
Fuels Monitoring Plan	2015
Law Enforcement Plan	2015
Cultural Resources Management Plan	2016
Safety/Contingency Plan (update)	2015
Refuge Disease Contingency/Response Plan	2016
Wilderness Stewardship Plan	2016

## **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.

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

## **PLAN REVIEW AND REVISION**

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

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## APPENDICES

### *Appendix A. Glossary*

<b>Adaptive Management:</b>	Refers to a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in a management plan. Analysis of results helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.
<b>Alluvial:</b>	Sediment transported and deposited in a delta or riverbed by flowing water.
<b>Alternative:</b>	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).
<b>Anadromous:</b>	Migratory fishes that spend most of their lives in the sea and migrate to fresh water to breed.
<b>Aquifer</b>	An underground bed or layer of earth, gravel, or porous stone that yields water.
<b>Barrier Island</b>	A long, relatively narrow island running parallel to the mainland, built up by the action of waves and current and serving to protect the coast from erosion by surf and tidal surges.
<b>Biological Diversity:</b>	The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (Service Manual 052 FW 1. 12B). The System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as biodiversity.
<b>Brackish Marsh</b>	Salt marsh where a significant freshwater influx dilutes the seawater to brackish levels of salinity.
<b>Carrying Capacity:</b>	The maximum population of a species able to be supported by a habitat or area.
<b>Categorical Exclusion:</b>	A category of actions that does not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).
<b>CFR:</b>	Code of Federal Regulations.

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<b>Compatible Use:</b>	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.
<b>Comprehensive Conservation Plan:</b>	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).
<b>Concern:</b>	See Issue
<b>Cover Type:</b>	The present vegetation of an area.
<b>Cultural Resource Inventory:</b>	A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).
<b>Cultural Resource Overview:</b>	A comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from a field office's background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).
<b>Cultural Resources:</b>	The remains of sites, structures, or objects used by people in the past.
<b>Demographics</b>	The physical characteristics of a population such as age, sex, marital status, family size, education, geographic location, and occupation.
<b>Designated Wilderness Area:</b>	An area designated by the U.S. Congress to be managed as part of the National Wilderness Preservation System (Draft Service Manual 610 FW 1.5).
<b>Disking</b>	Pulling an offset disk over a site to control vegetation, correct soil compaction, or till the soil before seeding or planting.

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<b>Disturbance:</b>	Significant alteration of habitat structure or composition. May be natural (e.g., fire) or human-caused events (e.g., aircraft overflight).
<b>Dredging</b>	An excavation activity or operation usually carried out at least partly underwater, in shallow seas on fresh water areas with the purpose of gathering up bottom sediments and disposing of them at a different location.
<b>Ecosystem:</b>	A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.
<b>Ecosystem Management:</b>	Management of natural resources using system-wide concepts to ensure that all plants and animals in ecosystems are maintained at viable levels in native habitats and basic ecosystem processes are perpetuated indefinitely.
<b>Endangered Species (Federal):</b>	A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.
<b>Endangered Species (State):</b>	A plant or animal species in danger of becoming extinct or extirpated in the state within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.
<b>Environmental Assessment (EA):</b>	A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).
<b>Environmental Impact Statement (EIS):</b>	A detailed written statement required by section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).
<b>Estuary:</b>	A partially enclosed embayment where fresh water and sea water intermix and where tidal action is an important physical regulator and energy subsidy (Odom et. al 2005).
<b>Finding of No Significant Impact (FONSI):</b>	A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).



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<b>Goal:</b>	Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Service Manual 620 FW 1.6J).
<b>Groundwater</b>	Water that exists beneath the earth's surface in underground streams and aquifers.
<b>Habitat:</b>	Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.
<b>Habitat Restoration:</b>	Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy ecosystems.
<b>Habitat Type:</b>	See Vegetation Type.
<b>Hydrology</b>	The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.
<b>Improvement Act:</b>	The National Wildlife Refuge System Improvement Act of 1997.
<b>Informed Consent:</b>	The grudging willingness of opponents to “go along” with a course of action that they actually oppose (Bleiker).
<b>Invasive Species</b>	A species that is non-native (or alien) to the ecosystem under consideration, and whose interdiction causes or is likely to cause economic harm, environmental harm or harm to human health. These species are normally introduced by direct or inadvertent human actions.
<b>Issue:</b>	Any unsettled matter that requires a management decision [e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or other presence of an undesirable resource condition (Service Manual 602 FW 1.6K)].
<b>Management Alternative:</b>	See Alternative
<b>Management Concern:</b>	See Issue
<b>Management Opportunity:</b>	See Issue
<b>Migration:</b>	The seasonal movement from one area to another and back.
<b>Mission Statement:</b>	Succinct statement of the unit’s purpose and reason for being.
<b>Monitoring:</b>	The process of collecting information to track changes of selected parameters over time.

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<b>National Environmental Policy Act of 1969 (NEPA):</b>	Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision-making (40 CFR 1500).
<b>National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57):</b>	Under the Refuge Improvement Act, the Fish and Wildlife Service is required to develop 15-year comprehensive conservation plans for all national wildlife refuges outside Alaska. The Act also describes the six public uses given priority status within the Refuge System (i.e., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation).
<b>National Wildlife Refuge System Mission:</b>	The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.
<b>National Wildlife Refuge System:</b>	Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; game ranges; wildlife management areas; or waterfowl production areas.
<b>National Wildlife Refuge:</b>	A designated area of land, water, or an interest in land or water within the Refuge System.
<b>Native Species:</b>	Species that normally live and thrive in a particular ecosystem.
<b>Noxious Weed:</b>	A plant species designated by federal or state law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States. According to the Federal Noxious Weed Act (P.L. 93-639), a noxious weed is one that causes disease or had adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.
<b>Objective:</b>	A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Making objectives attainable, time-specific, and measurable (Service Manual 602 FW 1.6N).

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<b>Plant Association:</b>	A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.
<b>Plant Community:</b>	An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community.
<b>Preferred Alternative:</b>	This is the alternative determined (by the decision-maker) to best achieve the refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management.
<b>Prescribed Fire:</b>	The application of fire to wildland fuels to achieve identified land use objectives (Service Manual 621 FW 1.7). May occur from natural ignition or intentional ignition.
<b>Priority Species:</b>	Fish and wildlife species that require protective measures and/or management guidelines to ensure their perpetuation. Priority species include the following: (1) State-listed and candidate species; (2) species or groups of animals susceptible to significant population declines within a specific area or statewide by virtue of their inclination to aggregate (e.g., seabird colonies); and (3) species of recreation, commercial, and/or tribal importance.
<b>Public Involvement Plan:</b>	Broad long-term guidance for involving the public in the comprehensive conservation planning process.
<b>Public Involvement:</b>	A process that offers impacted and interested individuals and organizations an opportunity to become informed about and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.
<b>Public:</b>	Individuals, organizations, and groups; officials of federal, state, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in service issues and those who do or do not realize that Service decisions may affect them.
<b>Purposes of the Refuge:</b>	“The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge sub-unit.” For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge (Service Manual 602 FW 106 S).

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<b>Recommended Wilderness:</b>	Areas studied and found suitable for wilderness designation by both the Director of the Fish and Wildlife Service and the Secretary of the Department of the Interior, and recommended for designation by the President to Congress. These areas await only legislative action by Congress in order to become part of the Wilderness System. Such areas are also referred to as “pending in Congress” (Draft Service Manual 610 FW 1.5).
<b>Record of Decision (ROD):</b>	A concise public record of decision prepared by the federal agency, pursuant to NEPA, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).
<b>Refuge Goal:</b>	See Goal
<b>Refuge Purposes:</b>	See Purposes of the Refuge
<b>Sea Level Rise</b>	A rise in the surface of the sea due to increased water volume of the ocean and/or sinking of the land.
<b>Scrub/shrub Habitat</b>	Areas dominated by woody vegetation less than 20 feet tall, including true shrubs, young trees, and trees or shrubs that may be stunted because of environmental conditions; these areas are sometimes referred to as early successional communities.
<b>Socioeconomic</b>	Involving social as well as economic factors.
<b>Songbirds:</b> (Also Passerines)	A category of birds that is medium to small, perching landbirds. Most are territorial singers and migratory.
<b>Step-down Management Plan:</b>	A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, and safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives (Service Manual 602 FW 1.6 U).
<b>Strategy:</b>	A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 602 FW 1.6 U).
<b>Study Area:</b>	The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this CCP, the study area includes the lands within the currently approved refuge boundary and potential refuge expansion areas.

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<b>Threatened Species (Federal):</b>	Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
<b>Threatened Species (State):</b>	A plant or animal species likely to become endangered in the state within the near future if factors contributing to population decline or habitat degradation or loss continue.
<b>Tiering:</b>	The coverage of general matters in broader environmental impact statements with subsequent narrower statements of environmental analysis, incorporating by reference, the general discussions and concentrating on specific issues (40 CFR 1508.28).
<b>U.S. Fish and Wildlife Service Mission:</b>	The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.
<b>Unit Objective:</b>	See Objective
<b>Vegetation Type, Habitat Type, Forest Cover Type:</b>	A land classification system based upon the concept of distinct plant associations.
<b>Vision Statement:</b>	A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes, and other mandates. We will tie the vision statement for the refuge to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates (Service Manual 602 FW 1.6 Z).
<b>Watershed</b>	The total land area from which water drains into a single stream, lake, or ocean.
<b>Wetland</b>	Lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface.

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**Wilderness Study Areas:**

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

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

**Wilderness:**

See Designated Wilderness

**Wildfire:**

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

**Wildland Fire:**

Every wildland fire is either a wildfire or a prescribed fire (Service Manual 621 FW 1.3)



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## ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
AQI	Air Quality Index
ADA	Americans with Disabilities Act
ACJV	Atlantic Coast Joint Venture
ARK	Audubon Refuge Keeper
BCR	Bird Conservation Region
BCC	Birds of Conservation Concern
BRT	Biological Review Team
CAA	Clean Air Act
CWA	Clean Water Act
CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
CRC	Coastal Georgia Regional Development Commission
CWCS	Comprehensive Wildlife Conservation Strategy
cfs	cubic feet per second
DOI	Department of the Interior
DU	Ducks Unlimited
EA	Environmental Assessment
EE	environmental education
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EPD	Environmental Protection Division
ESA	Endangered Species Act
FR	Federal Register
FTE	full-time equivalent
FY	Fiscal Year
GADNR	Georgia Department of Natural Resources
GAFC	Georgia Forestry Commission
GCM	Global Climate Models
GPA	Georgia Port Authority
GIS	Global Information System
IBA	Important Bird Area
LCWF	Land and Water Conservation Fund
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
NRI	Nationwide Rivers Inventory
NWSG	Native Warm Season Grasses
NABCI	North American Bird Conservation Initiative
NAWCP	North American Waterbird Conservation Plan
NAWMP	North American Waterbird Management Plan
OAS	Ogeechee Audubon Society
PIF	Partners-In-Flight
PFT	Permanent Full Time

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PUNA	Public Use Natural Area
RAPP	Refuge Annual Performance Planning
RM	Refuge Manual
RNA	Research Natural Area
ROD	Record of Decision
RONs	Refuge Operating Needs System
RRP	Refuge Roads Program
RHPO	Regional Historic Preservation Officer
SCRC	Savannah Coastal Refuge Complex
SLAMM	Sea Level Affecting Marshes Model
SLR	Sea Level Rise
SAMBI	South Atlantic Migratory Bird Initiative
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SCFC	South Carolina Forestry Commission
SE ARMI	Southeast Amphibian Research and Monitoring Initiative
SARP	Southeast Aquatic Resources Partnership
SRES	Special Report on Emissions Scenarios
SHPO	State Historic Preservation Officer
SWG	State Wildlife Grants Program (Georgia)
OCRM	The Office of Ocean and Coastal Resource Management
FWS	U.S. Fish and Wildlife Service (also Service)
USSCP	U.S. Shorebird Conservation Plan
TFT	Temporary Full Time
TNC	The Nature Conservancy
T&E	Threatened and Endangered
USACE	United States Army Corps of Engineers
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USC	United States Code
USDA	United States Department of Agriculture
USGS	United States Geological Survey
USSCP	U.S. Shorebird Conservation Plan
WRD	Wildlife Resources Division



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## Appendix C. Relevant Legal Mandates and Executive Orders

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

STATUTE	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, conservation of natural resources and protection of fish and wildlife. Some early refuges and hatcheries were established under authority of this Act.
Cave Resources Protection Act of 1988	Established requirements for the management and protection of caves and their resources on federal lands, including allowing the land managing agencies to withhold the location of caves from the public, and requiring permits for any removal or collecting activities in caves on federal lands.
Clean Air Act of 1970	Regulates air emissions from area, stationary, and mobile sources. This Act and its amendments charge federal land managers with direct responsibility to protect the “air quality and related values” of land under their control. These values include fish, wildlife, and their habitats.
Clean Water Act of 1974, as amended	This Act and its amendments have as its objective the restoration and maintenance of the chemical, physical, and biological integrity of the Nation’s waters. Section 401 of the Act requires that federally permitted activities comply with the Clean Water Act standards, state water quality laws, and any other appropriate state laws. Section 404 charges the U.S. Army Corps of Engineers with regulating discharge of dredge or fill materials into waters of the United States, including wetlands.
Coastal Barrier Resources Act of 1982 (CBRA)	Identifies undeveloped coastal barriers along the Atlantic and Gulf Coasts and included them in the John H. Chafee Coastal Barrier Resources System (CBRS). The objectives of the act are to minimize loss of human life, reduce wasteful federal expenditures, and minimize the damage to natural resources by restricting most federal expenditures that encourage development within the CBRS.
Coastal Barrier Improvement Act of 1990	Reauthorized the Coastal Barrier Resources Act (CBRA), expanded the CBRS to include undeveloped coastal barriers along the Great Lakes and in the Caribbean, and established “Otherwise Protected Areas (OPAs).” The Service is responsible for maintaining official maps, consulting with federal agencies that propose spending federal funds within the CBRS and OPAs, and making recommendations to Congress about proposed boundary revisions.
Coastal Wetlands Planning, Protection, and Restoration (1990)	Authorizes the Director of the Fish and Wildlife Service to participate in the development of a Louisiana coastal wetlands restoration program, participate in the development and oversight of a coastal wetlands conservation program, and lead in the implementation and administration of a national coastal wetlands grant program.

STATUTE	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 Research Reserve System, guidelines for estuarine research, and financial assistance for land acquisition.
Emergency Wetlands Resources Act of 1986	This Act authorized the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. The Act requires the Secretary to establish a National Wetlands Priority Conservation Plan, required the states to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund amounts equal to import duties on arms and ammunition. It also established entrance fees at national wildlife refuges.
Endangered Species Act of 1973, as amended	Provides for the conservation of threatened and endangered species of fish, wildlife, and plants by federal action and by encouraging the establishment of state programs. It provides for the determination and listing of threatened and endangered species and the designation of critical habitats. Section 7 requires refuge managers to perform internal consultation before initiating projects that affect or may affect endangered species.
Environmental Education Act of 1990	This Act established the Office of Environmental Education within the U.S. Environmental Protection Agency to develop and administer a federal environmental education program in consultation with other federal natural resource management agencies, including the Fish and Wildlife Service.
Estuary Protection Act of 1968	Authorized the Secretary of the Interior, in cooperation with other federal agencies and the states, to study and inventory estuaries of the United States, including land and water of the Great Lakes, and to determine whether such areas should be acquired for protection. The Secretary is also required to encourage state and local governments to consider the importance of estuaries in their planning activities relative to federal natural resource grants. In approving any state grants for acquisition of estuaries, the Secretary was required to establish conditions to ensure the permanent protection of estuaries.

STATUTE	DESCRIPTION
Estuaries and Clean Waters Act of 2000	This law creates a federal interagency council that includes the Director of the Fish and Wildlife Service, the Secretary of the Army for Civil Works, the Secretary of Agriculture, the Administrator of the Environmental Protection Agency and the Administrator for the National Oceanic and Atmospheric Administration. The council is charged with developing a national estuary habitat restoration strategy and providing grants to entities to restore and protect estuary habitat to promote the strategy.
Food Security Act of 1985, as amended (Farm Bill)	The Act contains several provisions that contribute to wetland conservation. The Swampbuster provisions state that farmers who convert wetlands for the purpose of planting after enactment of the law are ineligible for most farmer program subsidies. It also established the Wetland Reserve Program to restore and protect wetlands through easements and restoration of the functions and values of wetlands on such easement areas.
Farmland Protection Policy Act of 1981, as amended	The purpose of this law is to minimize the extent to which federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. Federal programs include construction projects and the management of federal lands.
Federal Advisory Committee Act (1972), as amended	Governs the establishment of and procedures for committees that provide advice to the federal government. Advisory committees may be established only if they will serve a necessary, nonduplicative function. Committees must be strictly advisory unless otherwise specified and meetings must be open to the public.
Federal Coal Leasing Amendment Act of 1976	Provided that nothing in the Mining Act, the Mineral Leasing Act, or the Mineral Leasing Act for Acquired Lands authorized mining coal on refuges.
Federal-Aid Highways Act of 1968	Established requirements for approval of federal highways through national wildlife refuges and other designated areas to preserve the natural beauty of such areas. The Secretary of Transportation is directed to consult with the Secretary of the Interior and other federal agencies before approving any program or project requiring the use of land under their jurisdiction.
Federal Noxious Weed Act of 1990, as amended	The Secretary of Agriculture was given the authority to designate plants as noxious weeds and to cooperate with other federal, State and local agencies, farmers' associations, and private individuals in measures to control, eradicate, prevent, or retard the spread of such weeds. The Act requires each Federal land-managing agency, including the Fish and Wildlife Service, to designate an office or person to coordinate a program to control such plants on the agency's land and implement cooperative agreements with the states, including integrated management systems to control undesirable plants.

STATUTE	DESCRIPTION
Fish and Wildlife Act of 1956	Establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry but also includes the inherent right of every citizen and resident to fish for pleasure, enjoyment, and betterment and to maintain and increase public opportunities for recreational use of fish and wildlife resources. Among other things, it authorizes the Secretary of the Interior to take such steps as may be required for the development, advancement, management, conservation, and protection of fish and wildlife resources including, but not limited to, research, development of existing facilities, and acquisition by purchase or exchange of land and water or interests therein.
Fish and Wildlife Conservation Act of 1980, as amended	Requires the Service to monitor non-gamebird species, identify species of management concern, and implement conservation measures to preclude the need for listing under the Endangered Species Act.
Fish and Wildlife Coordination Act of 1958	Promotes equal consideration and coordination of wildlife conservation with other water resource development programs by requiring consultation with the Fish and Wildlife Service and the state fish and wildlife agencies where the “waters of a stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted...or otherwise controlled or modified” by any agency under federal permit or license.
Improvement Act of 1978	This act was passed to improve the administration of fish and wildlife programs and amends several earlier laws, including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out volunteer programs.
Fishery (Magnuson) Conservation and Management Act of 1976	Established Regional Fishery Management Councils comprised of federal and state officials, including the Fish and Wildlife Service. It provides for regulation of foreign fishing and vessel fishing permits.
Freedom of Information Act, 1966	Requires all federal agencies to make available to the public for inspection and copying administrative staff manuals and staff instructions; official, published and unpublished policy statements; final orders deciding case adjudication; and other documents. Special exemptions have been reserved for nine categories of privileged material. The Act requires the party seeking the information to pay reasonable search and duplication costs.
Geothermal Steam Act of 1970, as amended	Authorizes and governs the lease of geothermal steam and related resources on public lands. Section 15 c of the Act prohibits issuing geothermal leases on virtually all Service-administrative lands.



STATUTE	DESCRIPTION
Lacey Act of 1900, as amended	Originally designed to help states protect their native game animals and to safeguard U.S. crop production from harmful foreign species, this Act prohibits interstate and international transport and commerce of fish, wildlife or plants taken in violation of domestic or foreign laws. It regulates the introduction to America of foreign species.
Land and Water Conservation Fund Act of 1948	This Act provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources for land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for outdoor recreation projects and for land acquisition by various federal agencies, including the Fish and Wildlife Service.
Marine Mammal Protection Act of 1972, as amended	The 1972 Marine Mammal Protection Act established a federal responsibility to conserve marine mammals with management vested in the Department of the Interior for sea otter, walrus, polar bear, dugong, and manatee. The Department of Commerce is responsible for cetaceans and pinnipeds, other than the walrus. With certain specified exceptions, the Act establishes a moratorium on the taking and importation of marine mammals, as well as products taken from them.
Migratory Bird Conservation Act of 1929	Established a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. The role of the commission was expanded by the North American Wetland Conservation Act to include approving wetlands acquisition, restoration, and enhancement proposals recommended by the North American Wetlands Conservation Council.
Migratory Bird Hunting and Conservation Stamp Act of 1934	Also commonly referred to as the "Duck Stamp Act," requires waterfowl hunters 16 years of age or older to possess a valid federal hunting stamp. Receipts from the sale of the stamp are deposited into the Migratory Bird Conservation Fund for the acquisition of migratory bird refuges.
Migratory Bird Treaty Act of 1918, as amended	This Act implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Except as allowed by special regulations, this Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export or import any migratory bird, part, nest, egg, or product.
Mineral Leasing Act for Acquired Lands (1947), as amended	Authorizes and governs mineral leasing on acquired public lands.

STATUTE	DESCRIPTION
Minerals Leasing Act of 1920, as amended	Authorizes and governs leasing of public lands for development of deposits of coal, oil, gas, and other hydrocarbons; sulphur; phosphate; potassium; and sodium. Section 185 of this title contains provisions relating to granting rights-of-way over federal lands for pipelines.
Mining Act of 1872, as amended	Authorizes and governs prospecting and mining for the so-called “hardrock” minerals (i.e., gold and silver) on public lands.
National and Community Service Act of 1990	Authorizes several programs to engage citizens of the U.S. in full- and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Among other things, this law establishes the American Conservation and Youth Service Corps to engage young adults in approved human and natural resource projects, which will benefit the public or are carried out on federal or Indian lands.
National Environmental Policy Act of 1969	Requires analysis, public comment, and reporting for environmental impacts of federal actions. It stipulates the factors to be considered in environmental impact statements, and requires that federal agencies employ an interdisciplinary approach in related decision-making and develop means to ensure that unqualified environmental values are given appropriate consideration, along with economic and technical considerations.
National Historic Preservation Act of 1966, as amended	It establishes a National Register of Historic Places and a program of matching grants for preservation of significant historical features. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register.
National Trails System Act (1968), as amended	Established the National Trails System to protect the recreational, scenic, and historic values of some important trails. National recreation trails may be established by the Secretaries of Interior or Agriculture on land wholly or partly within their jurisdiction, with the consent of the involved state(s), and other land managing agencies, if any. National scenic and national historic trails may only be designated by Congress. Several national trails cross units of the National Wildlife Refuge System.
National Wildlife Refuge System Administration Act of 1966	Prior to 1966, there was no single federal law that governed the administration of the various national wildlife refuges that had been established. This Act defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of a refuge provided such use is compatible with the major purposes(s) for which the refuge was established.

STATUTE	DESCRIPTION
National Wildlife Refuge System Improvement Act of 1997	This Act amends the National Wildlife Refuge System Administration Act of 1966. This Act defines the mission of the National Wildlife Refuge System, establishes the legitimacy and appropriateness of six priority wildlife-dependent public uses, establishes a formal process for determining compatible uses of Refuge System lands, identifies the Secretary of the Interior as responsible for managing and protecting the Refuge System, and requires the development of a comprehensive conservation plan for all refuges outside of Alaska.
Native American Graves Protection and Repatriation Act of 1990	Requires federal agencies and museums to inventory, determine ownership of, and repatriate certain cultural items and human remains under their control or possession. The Act also addresses the repatriation of cultural items inadvertently discovered by construction activities on lands managed by the agency.
Neotropical Migratory Bird Conservation Act of 2000	Establishes a matching grant program to fund projects that promote the conservation of neotropical migratory birds in the United States, Latin America, and the Caribbean.
North American Wetlands Conservation Act of 1989	Provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, the United States, and Mexico. The North American Wetlands Conservation Council was created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. Available funds may be expended for up to 50 percent of the United States' share cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands).
Refuge Recreation Act of 1962, as amended	This Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife-oriented recreational development or protection of natural resources. It also authorizes the charging of fees for public uses.
Partnerships for Wildlife Act of 1992	Establishes a Wildlife Conservation and Appreciation Fund to receive appropriated funds and donations from the National Fish and Wildlife Foundation and other private sources to assist the state fish and game agencies in carrying out their responsibilities for conservation of non-game species. The funding formula is no more than 1/3 federal funds, at least 1/3 foundation funds, and at least 1/3 state funds.
Refuge Revenue Sharing Act of 1935, as amended	Provided for payments to counties in lieu of taxes from areas administered by the Fish and Wildlife Service. Counties are required to pass payments along to other units of local government within the county, which suffer losses in tax revenues due to the establishment of Service areas.

STATUTE	DESCRIPTION
Rehabilitation Act of 1973	Requires nondiscrimination in the employment practices of federal agencies of the executive branch and contractors. It also requires all federally assisted programs, services, and activities to be available to people with disabilities.
Rivers and Harbors Appropriations Act of 1899, as amended	Requires the authorization by the U.S. Army Corps of Engineers prior to any work in, on, over, or under a navigable water of the United States. The Fish and Wildlife Coordination Act provides authority for the Service to review and comment on the effects on fish and wildlife activities proposed to be undertaken or permitted by the Corps of Engineers. Service concerns include contaminated sediments associated with dredge or fill projects in navigable waters.
Sikes Act (1960), as amended	Provides for the cooperation by the Departments of Interior and Defense with state agencies in planning, development, and maintenance of fish and wildlife resources and outdoor recreation facilities on military reservations throughout the United States. It requires the Secretary of each military department to use trained professionals to manage the wildlife and fishery resource under his jurisdiction, and requires that federal and state fish and wildlife agencies be given priority in management of fish and wildlife activities on military reservations.
Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948	This Act provides that upon determination by the Administrator of the General Services Administration, real property no longer needed by a federal agency can be transferred, without reimbursement, to the Secretary of the Interior if the land has particular value for migratory birds, or to a state agency for other wildlife conservation purposes.
Transportation Equity Act for the 21st Century (1998)	Established the Refuge Roads Program, requires transportation planning that includes public involvement, and provides funding for approved public use roads and trails and associated parking lots, comfort stations, and bicycle/pedestrian facilities.
Uniform Relocation and Assistance and Real Property Acquisition Policies Act (1970), as amended	Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. The Act requires that any purchase offer be no less than the fair market value of the property.
Water Resources Planning Act of 1965	Established Water Resources Council to be composed of Cabinet representatives including the Secretary of the Interior. The Council reviews river basin plans with respect to agricultural, urban, energy, industrial, recreational and fish and wildlife needs. The act also established a grant program to assist States in participating in the development of related comprehensive water and land use plans.

STATUTE	DESCRIPTION
Wild and Scenic Rivers Act of 1968, as amended	This Act selects certain rivers of the nation possessing remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values; preserves them in a free-flowing condition; and protects their local environments.
Wilderness Act of 1964, as amended	This Act directs the Secretary of the Interior to review every roadless area of 5,000 acres or more and every roadless island regardless of size within the National Wildlife Refuge System and to recommend suitability of each such area. The Act permits certain activities within designated wilderness areas that do not alter natural processes. Wilderness values are preserved through a “minimum tool” management approach, which requires refuge managers to use the least intrusive methods, equipment, and facilities necessary for administering the areas.
Youth Conservation Corps Act of 1970	Established a permanent Youth Conservation Corps (YCC) program within the Departments of Interior and Agriculture. Within the Service, YCC participants perform many tasks on refuges, fish hatcheries, and research stations.

EXECUTIVE ORDERS	DESCRIPTIONS
EO 11593, Protection and Enhancement of the Cultural Environment (1971)	States that if the Service proposes any development activities that may affect the archaeological or historic sites, the Service will consult with Federal and State Historic Preservation Officers to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.
EO 11644, Use of Off-road Vehicles on Public Land (1972)	Established policies and procedures to ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.

EXECUTIVE ORDERS	DESCRIPTIONS
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.
EO 12906, Coordinating Geographical Data Acquisition and Access (1994), Amended by EO 13286 (2003). Amendment of EOs and other actions in connection with transfer of certain functions to Secretary of DHS.	Recommended that the executive branch develop, in cooperation with state, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data. Of particular importance to comprehensive conservation planning is the National Vegetation Classification System (NVCS), which is the adopted standard for vegetation mapping. Using NVCS facilitates the compilation of regional and national summaries, which in turn, can provide an ecosystem context for individual refuges.
EO 12962, Recreational Fisheries (1995)	Federal agencies are directed to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities in cooperation with states and tribes.

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



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## *Appendix D. Public Involvement*

### **SUMMARY OF PUBLIC SCOPING COMMENTS**

Public input for the development of this CCP was obtained, in part, through three public scoping meetings held in the vicinity of the refuges. These meetings were held during June 2008 and were attended by approximately 42 people. The public meetings were held in an open house format with table top displays of each Complex refuge. The public was invited to talk with refuge staff, ask questions, and review maps and information on the refuges. A presentation on the CCP process was available for interested stakeholders, and both written and verbal comments were received. The dates and locations of these meetings are listed below:

June 2, 2008 - Mighty Eighth Air Force Museum - Pooler, GA (13 members of the public attended)

June 3, 2008 - Hilton Garden Inn, Bluffton, SC (12 members of the public attended)

June 5, 2008 - Eulonia Senior Center, Eulonia, GA (17 members of the public attended)

In addition to the public meetings, the Complex sent out written notices to local, state, and federal agencies to invite input in the comprehensive planning process. Several letters or comments were received in response to this intergovernmental scoping letter.

The Complex issued news releases to: The Island Packet (Hilton Head Island, SC) - printed article, The Savannah Morning News (Savannah, GA) - printed article, The Darien News (Darien, GA) - printed article, The Spirit Newspapers (Garden City, GA) - printed article, Coastal Empire News (Savannah, GA), The Pooler News (Pooler, GA), Georgia Times-Union (Brunswick, GA), The Brunswick News (Brunswick, GA), and Bluffton Today (Bluffton, SC), and the meetings were announced on local radio stations and posted on the Complex's CCP web page.

The planning team expanded its list of issues and concerns to include those generated by the agencies, organizations, businesses, and citizens from the local communities. These issues and concerns formed the basis for the development and comparison of objectives in the three alternatives described in the EA. The following is a summary of comments from the three public meetings:

#### **Blackbeard Island NWR Public Comments**

Regulations prohibiting tying a boat up to the dock overnight and requiring stream anchoring during the bow hunt are unsafe and should be changed.

There is a need for a longer dock for recreational boat use and more access for the elderly, the handicapped, and women and children. Requesting funding to add a 200-foot addition to the dock should be a priority.

Using screw in step while hunting should be allowed. They are safe.

Access to refuge for non-boat owners

See Complex-wide Public Issues for more details.

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### **Harris Neck NWR Public Comments**

Need to buy more land around Harris Neck NWR to buffer development.

Concern that the creation of new wells to support a large development may impact the refuge's ability to maintain water levels critical to wood stork nesting areas on Harris Neck NWR.

With the planning of a major development on Harris Neck NWR, refuge visitation rates could increase at both Harris Neck and Black Beard Island NWRs and the Cabretta Inlet area; resulting in increase in vehicular traffic, boat docks, and water and air quality impacts.

See Complex-wide Public Issues for more details.

### **Pinckney Island NWR Public Comments**

Remote fields need to be cut shorter to provide natural food plots for deer and turkey.

Remove invasive plant species to promote bird nesting and feeding areas.

Increase interpretive opportunities by adding more signage and establishing various tours.

Increase signage.

Add drinking fountains and restrooms.

See Complex-wide Public Issues for more details.

### **Savannah NWR Public Comments**

Need better map of Savannah NWR.

Locate an office/welcome center on the refuge.

The new visitor center should have a meeting place (a pavilion) that could be used as a classroom.

The refuge should focus on introducing children to refuges and protecting wildlife as great opportunities for developing good stewards of our environment.

See Complex-wide Public Issues for more details.

### **Tybee NWR Public Comments**

Tybee NWR is closed to the public and no public comments were received specifically related to this refuge. Please see Complex-wide Issues for more Complex comment details and issues.

### **Wassaw NWR Public Comments**

Refuge regulations regarding "no dogs" and beach access should be better enforced.

Continue hunting on refuge.

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Increase signage.

Access to refuge for non-boat owners.

See Complex-wide Public Issues for more details.

### **Complex-wide Public Issues**

Habitat Conservation and Management:

Satisfied with current habitat management programs (2).

Sea level rise is an important issue that should be considered in the CCP.

Saltwater intrusion and dredging of the Savannah River are seen as importing issues.

The rapid development of lands around the refuge should be considered in the CCP.

It would be beneficial to develop sediment management plans for the refuges that comprise part of the ocean shoreline.

Keep people out if you want to protect flora and fauna.

Coastal property development by large corporations should be promoted. They will comply with zoning and building standards and have a positive economic impact.

Concern over maintenance of refuges such as controlled burns and pond dredging.

Control of invasive species should increase.

Restoration efforts for degraded or impacted refuge lands, such as former maritime forests and wetlands, should be conducted. Restoration of Complex lands and water should be based on analysis of the ecosystem, including source threats which may originate beyond the Complex boundary. In addition, efforts should be made to reduce beach erosion using alternative/natural methods.

Use of coordinated fire management program for the Complex is encouraged.

The biota should be inventoried periodically so that everyone knows what is being protected and conserved.

The Service should control feral animals (cats and dogs) that destroy the natural biota being conserved.

The Service should control exotic plants where possible.

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## Visitor and Education Services

Include hunting rights in CCP.

All recreational activities that do not disturb wildlife should be allowed (i.e., hunting, fishing, picnicking).

Please plan to maximize hunting opportunities on the refuges and also make the opportunities affordable to all.

Open Complex completely to hunters.

Refuges should be wildlife sanctuaries. Do not allow hunting.

Trails need better signage.

Using screw in step while hunting should be allowed. They are safe and do less damage to trees.

The requirement for a \$100,000 liability insurance policy for guides on refuges is unreasonable and excessively expensive. The dangers that visitors face at the refuges do not approach this amount.

Need to continue to make changes to ensure refuges more accessible to public.

Raise funds with overnight campouts (rustic for children and romantic for couples). Include interpretive tours with campout.

Provide a mobile safari for Savannah's elite as a fundraiser.

Have a scheduled program for birding during specific migratory seasons.

Consider equestrian trails at the refuges including equestrian trails on the beach.

Need more outreach for awareness and public support.

Need volunteer days to help maintain refuges.

Develop allies such as CCL, Sierra Club, and nearby towns.

Facilities and grounds associated with the refuges should be clean, orderly, and protected.

The staff should be knowledgeable about the refuges in their charge.

The refuges should have reasonable hours and access, except for those refuges where access must be limited to protect visitors and organisms.

The Service should conduct safe hunts and provide safe places for fishing.

The refuges should be kept safe for visitors. When conditions are not safe, visitors should be informed or kept out of the refuge.

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## **Resource Protection**

There is concern that pollution (i.e., litter, air) will be generated when new port is built.

## **Refuge Administration**

There is concern about staffing and personnel cutbacks. The Refuge System is understaffed and underfunded.

Supports and advises fundraising in new inventive ways to raise funds.

Enforce current regulations.

Need larger budget.

Public needs to be more informed about options pertaining to the expanded port near HHI.

There is concern over port development at Savannah and Harris Neck NWRs.

Because Savannah is a port city, government agencies need to work together to help resolve development (growth) issues.

Keep the refuges as they are now.

Need increase in refuge staff.

Expand existing refuges or create new ones to offset development.

Land acquisition and resource protection: TNC strongly recommends increasing land acquisition, conservation easement, and protection for Harris Neck NWR and in-holdings of the Savannah NWR of Fife Plantation and Dixie Plywood track at Abercorn Creek in Effingham County.

Service staff should continue to work with partners to manage and improve habitats within the ecosystem as well as explore opportunities with partners to expand land and habitat protection efforts.

Significant problems that may adversely affect the population and habitat of fish, wildlife, and plants within the Complex may originate from development practices in the surrounding areas. Direct destruction of habitat and higher visitation rates may impact the health of plants and animals under the protection of the refuge. TNC strongly recommends considering these impacts and working towards protecting the Complex and surrounding lands and waters.

## **DRAFT CCP/EA COMMENTS AND SERVICE RESPONSES**

This section summarizes all comments that were received on the Draft CCP/EA for Savannah, Tybee, Pinckney Island, Wassaw, Harris Neck, and Blackbeard Island National Wildlife Refuges. Public comments were accepted from September 15 to October 15, 2010.

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A total of 14 individuals, organizations, and government agencies responded on the Draft CCP/EA by mail, fax, or e-mail. Comments were received from six individuals, one county agency, and one federal agency. Four agencies within the State of Georgia sent form letters through the Georgia Office of Planning and Budget, Georgia State Clearinghouse, concurring with the Draft CCP/EA and providing no additional comments. These were the Georgia Department of Natural Resources, Historic Preservation Division; Georgia Forestry Commission; Chatham-Savannah Metro Planning Commission; and the Coastal Regional Development Commission of Georgia. Comments were also received from the South Carolina Department of Natural Resources.

The following summarizes the comments received on the Draft CCP/EA and provides the Service's response to each concern or comment.

### **Blackbeard Island NWR Public Comments**

**Comment:** South Atlantic Quarantine Station – there are important archaeological sites on both the south and north ends of the island. I believe these sites need to be investigated and documented to better understand 30 years of the island history.

**Service Response:** Comment noted. These are addressed in Objective 4.1a. They will be addressed further in the Cultural Resources Management Plan.

**Comment:** Spanish American War Gun Mount – in April of 1977 an application was filed with the Park Service – National Register of Historic Places. I do not know if the application was approved. However, I believe this site should be investigated and documented.

**Service Response:** Comment noted. The Gun Mount was moved to Fort Pulaski and is no longer eligible for inclusion on the National Register of Historic Places.

See Complex-wide Public Issues for more details.

### **Harris Neck NWR Public Comments**

**Comment:** Ecological Threats and Problems section on page 34: The wood stork rookery at Harris Neck is the state's largest, not "one of the largest." In addition, I recommend adding a fourth threat as follows: The McIntosh County Commissioners have recently recommended transferring the land occupied by the refuge to a group of former landowners for development as a residential and resort community. Such action, if taken, would have a very significant negative impact on refuge wildlife.

**Service Response:** Comment noted. The sentence has been changed to reflect comment for wood stork rookery. The Service currently has no plans to return the land to the descendents of the former landowners.

**Comment:** Biological Resources for Harris Neck, page 57: In paragraph 1, artificial nesting structures are cited as support for the breeding wood stork colony. Although these structures are still in place, they are in general disrepair and are no longer used by the storks, which nest instead in cypress trees that were planted years ago by refuge staff. In addition, ponds are no longer maintained as foraging areas for wood storks.

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**Service Response:** Comment noted. Nesting structures are being refurbished and although ponds are no longer stocked with fish, they are still used as foraging areas for wood storks.

**Comment:** Cultural Resources for Harris Neck, page 75: In paragraph 1, delete the reference to Harris Neck's "at times controversial history." Most refuges had controversies that arose in the past, whether it was use of slave labor at Savannah NWR before it became a refuge, undignified treatment of yellow fever victims on Blackbeard, etc. There is no reason to single out Harris Neck.

In paragraph 2, are we sure that the pre-World War II community "thrived?" Is there documentation for this assertion? If not, it might be better to say the community "continued" until the advent of the war.

**Service Response:** Comment noted. The following sentence was added to the document. "The Gullah-Geechee community of Harris Neck emerged from a small group of former slaves that had returned to Thomas' Peru Plantation following the American Civil War. The community consisted of primarily commercial watermen, who harvested oysters, crabs, and fish from the nearby waters, and small-scale farmers."

"Thrived" was replaced with "continued" in the document.

**Comment:** Waterfowl and Nongame Birds, page 111: Although it is true that waterfowl do not utilize the inland areas of Blackbeard and Wassaw, extremely large numbers of wintering waterfowl and shorebirds can be found in the surrounding salt marshes, oyster rakes, mud and sand flats, and offshore shoals. For example, rafts of more than 5,000 lesser scaup were seen last winter just off the Blackbeard beach. I believe that the relatively undisturbed nature of the waters and marshes surrounding the refuges attract these birds to the area.

**Service Response:** Comment noted.

**Comment:** Fish and Wildlife Population Management, page 118: In the discussion of Goal 1, mention is made of the specific habitat needs of each species. Would it be appropriate to add that each species also has specific threats to its survival and that, in some cases, management of those threats will benefit the species in significant ways?

**Service Response:** Comment noted. Ecological threats are detailed in Chapter I of this CCP and will be further detailed in a Habitat Management Plan. Further discussions for endangered species will be addressed in a recovery plan.

**Comment:** Waterfowl and Water-dependent Birds, page 119: In paragraph 2, add Harris Neck NWR to the list of refuges that hosts wading bird rookeries. The rookery there is by far the largest in the Complex.

**Service Response:** Comment noted. Changes made in document.

**Comment:** Shorebirds section, page 121: Why is there no objective for Harris Neck? Shorebirds use the impoundments there during seasonal drawdowns of the water levels.

**Service Response:** Comment noted. Objective 1.2.b has been added to reflect comment.



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**Comment:** Nongame Birds, page 123: Should loggerhead shrike be added to the list of high-priority species?

The second paragraph states that the majority of refuges in the Complex conduct Christmas Bird Counts. But only three refuges (Savannah, Pinckney and Harris Neck) out of seven participate -- that's not a majority in my book.

**Service Response:** Comments noted. Loggerhead shrike was added to the list in the document. Changes concerning the Christmas Bird Count were made in the document.

**Comment:** Threatened and Endangered Species, page 124: The third paragraph discusses the endangered wood stork. Please add that a major threat to this species is the proposed transfer of refuge lands into private ownership.

**Service Response:** Comment noted.

**Comment:** Visitor Services, page 162: To be consistent with the other summaries, the Harris Neck section should mention that visitor facilities include a wildlife drive, trails, fishing docks, and interpretive signs and kiosks.

**Service Response:** Comment noted. These comments were added to the document.

**Comment:** Objective 3.5, pages 172-173: I recommend that FWS partner with both the Friends group and other organizations (such as the Coastal Conservation Association) to offer Youth Fishing Clinics.

**Service Response:** Comment noted. This recommendation was added to the document.

**Comment:** Outreach, page 178: In addition to attending special events, refuge staff members have been featured speakers for organizations such as Audubon societies, the Sierra Club, Rotary, Kiwanis, etc.

**Service Response:** Comment noted. Change made in document.

**Comment:** Need to recheck boundary line of all Harris Neck maps - not sure if correct.

**Service Response:** Comment noted. The refuge is working with the Regional Office, Realty Division, to verify the boundary.

**Comment:** Page 135: Third paragraph: discussion on rice trunks on Harris Neck NWR... there are no rice trunks on Harris Neck NWR

**Service Response:** Comment noted. There is one rice trunk at Harris Neck in Bluebill Pond.

See Complex-wide Public Issues for more details.

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## **Pinckney Island NWR Public Comments**

**Comment:** Installation of platforms, trails, and towers - The most intensively populated wildlife habitats on Pinckney Island, I believe, are quite visible from the 12 miles of maintained trails. Further intrusion would not be advantageous.

**Service Response:** Comment noted. Any new wildlife observation facilities would be located on Last End Point.

**Comment:** Objective 3.7.c. - A visitor center at Last End Point would involve considerable cost to make the main area of Pinckney Island accessible to such a center. An underpass for U.S. 278 or extensive destruction of currently off-limits habitat would be required. Last End Point is a highly used boat ramp and is hazardous to reach from either direction travelling U.S. 278.

**Service Response:** Comment noted. Any development on Last End Point would be contingent on providing safe access.

**Comment:** Objective 3.8.c - A portable exhibit for the Complex would in most cases answer the need for a visitor center as proposed in 3.7.c.

**Service Response:** Comment noted. Portable exhibits are used for off-refuge programs.

**Comment:** Objective 3.9.c. - Have never noticed any afterhours traffic approach the Pinckney Island gate.

**Service Response:** Comment noted.

**Comment:** Former refuge manager, John Davis, wrote an agreement with the landowners of Pinckney Island. This agreement should be found and referenced with regards to the public activities allowed on the refuge. Also, agreement was signed with the state that gives all marshes and interests of the marshes (they conveyed their rights not fee title) on the refuge to the FWS. This agreement needs to be referenced in this document.

**Service Response:** Comment noted. Easement Exchange Agreement and Deed of Donation are referenced in the document.

**Comment:** Page 82 Pinckney Island - Need to look at covenant in deed for restrictions of public use.

**Service Response:** Comment noted.

See Complex-wide Public Issues for more details.

## **Savannah NWR Public Comments**

**Comment:** Table 24. Comparison of alternatives by management issues for Savannah NWR- Habitat Management, fishing, Alternative B - Please consider expanding the items in this section to also include "create fish habitat" to support the goal of expanding fishing opportunities. Adding such language would allow the Service to take advantage of low- to zero-cost opportunities to increase the quality of fish habitat within the refuge. Once installed/created, the new habitat would likely require little management or maintenance costs.

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**Service Response:** Comment noted.

See Complex-wide Public Issues for more details.

### **Tybee NWR Public Comments**

**Comment:** Page 104: Tybee NWR: ...there are no Service personnel or staff assigned to the refuge...Need to state that law enforcement is present on the refuge!! Same for Wassaw NWR.

**Service Response:** Comment noted. Law enforcement is present on all refuges in the Complex.

See Complex-wide Public Issues for more details.

### **Wassaw NWR Public Comments**

**Comment:** Battery Henry Sims Morgan, officially named by the Georgia DNR Board on 9/27/06 played an important role in Wassaw's history. The remains will soon be claimed by the sea. Hans Neuhauser with the Georgia Land Trust Service should be consulted as he is truly an expert on this site.

**Service Response:** Comment noted. The background section is a brief overview of the refuge's history. More detailed historical accounts will be captured in the cultural resources overview and Cultural Resources Management Plan for each refuge.

**Comment:** Parson family trust - the island was purchased by the Parson family in 1866. I believe the role this family played in the island's history should be investigated and documented.

**Service Response:** Comment noted. The background sections are brief overviews of the refuge's history. More detailed historical accounts will be captured in the cultural resources overview and Cultural Resources Management Plan for each refuge.

**Comment:** Anthony Odingsell - purchased Little Wassaw in 1834. I believe other than coastal Indians he may be the only permanent resident to live on the island. What is known about the Odingsell family should be investigated and documented.

**Service Response:** Comment noted. The background sections are brief overviews of the refuge's history. More detailed historical accounts will be captured in the cultural resources overview and Cultural Resource Management Plan for each refuge.

**Comment:** Page 104: Tybee NWR: ...there are no Service personnel or staff assigned to the refuge...Need to state that law enforcement is present on the refuge!! Same for Wassaw NWR.

**Service Response:** Comment noted. Law enforcement is present on all refuges in the Complex.

See Complex-wide Public Issues for more details.

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## Complex-wide Public Issues

### Habitat Conservation and Management

**Comment:** Page 137: Objective 2.3d: Should add a strategy to work with the COE.

**Service Response:** Comment noted. The strategy to work closely with the COE for the long-term integrity of the freshwater diversion canal and ensure adequate freshwater availability was added to Objective 2.3d.

**Comment:** Page 145: Habitat Managements-Other Fish, Wildlife... third paragraph: What is a floodplain forest? This should be removed if not applicable to Complex.

**Service Response:** Comment noted. "Floodplain forest" was replaced with "bottomland hardwood" in the document.

**Comment:** Page 159 first paragraph...should include St. Mary's along with Hilton Head and Myrtle Beach.

**Service Response:** Comment noted. St. Mary's is not located in South Carolina.

**Comment:** Page 159 fourth paragraph: Need citation for Cape Romain Sea Level study.

**Service Response:** Comment noted. The citation was added to the document.

**Comment:** "Dredging associated with the maintenance of harbors and inland waterways ... results in... shoreline erosion and sediment deposition (not to mention the direct loss of marshlands by the dredging activities per se). ...increases the silt load and turbidity... benthic can be buried by silt and fisheries impacted by the anoxia..."

Shoreline erosion and deposition is a natural process driven by wind water and currents, whether they be longshore drift, tidal, etc. Dredging may alter the natural process, but the wording infers that, in the absence of dredging, there would be no sediment movement or shoreline erosion. All COE dredging operations are conducted in accordance with Section 404 of Clean Water Act requirements, including turbidity. Maintenance dredging activities do not result in the direct loss of marshlands. Although maintenance dredging does temporarily impact benthic communities, surveys have shown substantial populations within O&M sediments, indicating that the benthic population quickly re-establish themselves. Low dissolved oxygen levels are known to occur in Savannah Harbor and other southeast coastal rivers each summer. Although such hypoxia occurs each year, we are not aware that any periods of anoxia (without oxygen) have occurred.

**Service Response:** Comment noted. In the document, wording was changed to: "Dredging associated with the expansion and maintenance of harbors and inland waterways..."

**Comment:** "Dredging activities in the Savannah area have also raised concerns that the deeper dredging might crack or weaken the rocky barrier of the freshwater aquifer that keeps sea water out." This statement is incorrect from a geological and hydrological perspective. We suggest omitting the paragraph. The natural "barrier" is a compacted silty-sand unit of sediments known as the Miocene confining unit. In the area from Savannah NWR to Tybee NWR, it varies in thickness from 50 to 150 feet. The impacts of dredging on the Upper Floridan aquifer have been studied extensively and those

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studies have shown that deepening the harbor would have negligible impact in the rate of downward groundwater saltwater intrusion rates in the Savannah area. The present rate of such intrusion is driven by the amount of pumping/removal of groundwater, primarily within the city of Savannah. We suggest distinguishing groundwater saltwater intrusion terminology from surface saltwater encroachment throughout the report.

**Service Response:** Comment noted. Change made in document. “Rocky barrier” was changed to “compacted silty-sand.”

**Comment:** “Dredging activities in the Savannah River delta have interrupted this natural southward transport of sand ... robbing the Georgia barrier islands of their sand supply. The result is that barrier islands in coastal Georgia are sand starved.” While there are evidence and technical reports that show maintenance of the Savannah Harbor affects the sand supply immediately south of the channel, there is no evidence that demonstrates that such removal affects ALL the barrier islands of Georgia.

**Service Response:** Comment noted.

**Comment:** “Impacts of Savannah River dredging and harbor deepening activities (from a 42-foot to a 48-foot depth to accommodate mega ships) threaten aquatic habitats, especially those of the endangered shortnose sturgeon and the striped bass, due to lowered dissolved oxygen (DO) levels. In particular, DO concentrations are measurably lower in the Kings Island Turning Basin, which the sturgeon uses as a nursery and foraging habitat. Prior to 2005, striped bass fishing in the Savannah River system was closed for 16 years due to low recruitment of young fish caused by harbor modifications and higher salinities in traditional spawning areas of the river.” The most recent studies have not found sturgeon use the Kings Island Turning Basin for nursery or forage habitat.

**Service Response:** Comment noted. Change made in document. “In particular, DO concentrations are measurably lower in the Kings Island Turning Basin, which the sturgeon uses as a nursery and as foraging habitat” has been removed from the paragraph.

**Comment:** “The surface streams and rivers are interconnected with the aquifer and form a single hydrologic entity that is stressed by natural hydrologic and climatic factors (viz. drought) and anthropogenic factors.” Suggest adding “surficial” in front of aquifer. In the coastal area the Upper Floridan aquifer is not responsive to drought because the recharge zone is located over a hundred miles away (at the fall line), and travel times are on the order of thousands of years. The Upper Floridan Aquifer is confined in the coastal area and is responsive to pumping as noted in the paragraph above. The surficial aquifer, however, is responsive to drought.

**Service Response:** Comment noted. Change made in document.

### **Visitor and Education Services**

**Comment:** Team Development - The USFWS and the Savannah District should develop a working level team to discuss operational issues of common interest to Tybee NWR and the Savannah NWR. Common issues include dredging effects such as dissolved oxygen and turbidity, invasive species integrated management plan, annual bird monitoring, and prescribed fire.

**Service Response:** Comment noted. The Complex would like to coordinate an annual meeting to discuss mutual issues related to Tybee and Savannah spoil areas. See Objective 4.6.a.

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**Comment:** Pages 162 and 274 need to reference the Improvement Act (Goal 3 Discussion) and the public law.

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 170, Objective 3.4c: Building a Visitor Center on Pinckney may not be possible with deed restrictions. Need to review the deed!

**Service Response:** Comment noted. The deed specifically prohibits: "The construction of any facilities or the construction or paving of any vehicle parking areas, roads, paths or ways, other than exclusively for the observation of birds, fowl, and other wildlife by the public." The Visitor Center would be used for wildlife observation and education.

**Comment:** Page 172, first paragraph....A fishing plan for Pinckney Island is not required since state regulations govern fishing in tidal waters....this is wrong since the state has no rights on marshes within the Pinckney Island NWR boundary.

**Service Response:** Comment noted.

**Comment:** Page 181, Objective 3.9c - coordinate with deed restrictions for Pinckney Island. (As well as Objective 5.1c planning a welcome center).

**Service Response:** Comment noted. A strategy was added to Objective 3.9.c to coordinate with the deed of donation.

### **Resource Protection**

**Comment:** Sea level rise is identified as possibly having a profound effect on the Complex due to habitat loss. If this potential effect would be profound, shouldn't the Final CCP address ways to minimize the effects? Since the Service has stated that the tidal freshwater habitats are some of the most valued habitats within the Savannah NWR, the CCP should clearly identify the effects of sea level rise on the ability of the refuge to continue to provide those habitats and their inherent ecological values/services.

**Service Response:** Comment noted. Sea Level rise will be further addressed in Habitat Management Plan.

### **Refuge Administration**

**Comment:** Cost of Capitalized Facilities - The cost should be updated when the freshwater control system is repaired.

**Service Response:** Comment noted.

**Comment:** Page 82, Refuge administration and Management: Need to add Wolf Island with reference to the separate CCP!!

**Service Response:** Comment noted. Change made in document. Reference to Wolf Island NWR was added to cover and introduction.

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**Comment:** Page 191, Staffing needs: Four of the Complex refuges are unstaffed needs to be reworded to include that law enforcement is done on these refuges. There are over 100 miles of coast to enforce so need to request more law enforcement officers than the plan states (Figure 32 on page 201).

**Service Response:** Comment noted. These refuges are managed by limited Complex staff and volunteers. The wording “unstaffed” has been addressed throughout the document. Five out of the seven refuges do not have permanently assigned staff; however, management and law enforcement are conducted on all refuges in the Complex.

**Comment:** Quantify Refuge Boundary marking - should be 15 percent each year. The boundary should be checked at least twice a year (pages 257, 368, and throughout document)

**Service Response:** Comment noted. Refer to “Maintain Marked Refuge Boundary” objective. Due to reductions of staff and budget over the years, 15 percent may not be achievable.

### **Comments on Document**

**Comment:** “the plantation era on the Georgia coast was marked by a sophisticated level of land management.” I would disagree with the word “sophisticated” - does the use of slaves as an integral part of their land management deserve that word?

**Service Response:** Comment noted. The word “sophisticated” is used to describe only the land management techniques.

**Comment:** “Plantation owners were well-educated and included some of the most advanced agriculturalists in the nation, employing practices generally attributed to a much later age.” Again, there is another word that almost seems to praise the former slaveowners “advanced.” Although they may have used some newer method to increase production, it was the use of the free labor (slaves) that made plantations profitable.

**Service Response:** Comment noted. The word “advanced” is used to describe the land management techniques (i.e., irrigation, drainage, liming).

**Comment:** “the war for southern independence and the ensuing abolition of slavery marked the beginning of the end for the plantations and for prosperity and a way of life.” Do I sense certain nostalgia here? Only a few people (namely plantation owners) prospered, while the majority of the people (including slaves) were not doing very well. I would hardly call that “prosperity.” Also, “the end... a way of life” - it can be construed as regretting something lost?

**Service Response:** Comment noted. The sentence was revised in the document to state, “The Civil War and the ensuing abolition of slavery signaled the end of the Plantation Era.”

**Comment:** “Survivors of the war returned to their devastated lands and attempted to restore the plantation system with paid labor, but the freed slaves and imported Irish and Chinese laborers proved to be undependable sources of labor and the plantations were soon abandoned.” It says that Irish, Chinese, and freed slaves were undependable sources of labor. This remark seems inaccurate and could be construed as racist. Are these ethnic groups somehow not good workers? Also, why would freed slaves want to work for their former masters? I think that the plantations failed (and were subsequently abandoned) because without free labor (slaves) they were no longer economically viable. I believe the statement needs to be rewritten or removed.



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**Service Response:** Comment noted. Citation of historical record was added to the document.

**Comment:** “Thus, within a few years, the coastal area changed from one of the most prosperous regions in the nation to one of the poorest.” Again, most people did not prosper during slavery, certainly not the slaves!

**Service Response:** Comment noted.

**Comment:** Although I certainly doubt that these sections were deliberately written with racial overtones, I hope you see that they are certainly not politically/economically correct and could be misconstrued.

**Service Response:** Comment noted. Citation of historical record was added to the document.

**Comment:** Section II Introduction - Paragraph 3 on page 9 lists transient birds that visit the area during migration. I find the species mentioned as examples to be peculiar, since most of them (magnolia and blackpoll warblers and pectoral, white-rumped and buff-breasted sandpipers) are uncommon even during migration. Much more common migrants include American redstarts, black-throated blue warblers, whimbrels, semipalmated sandpipers, and short-billed dowitchers, among others.

**Service Response:** Comment noted. Recommended species were added to the document.

**Comment:** An EIS should be prepared under NEPA, not an EA, which is a lazy wasteful way to truly investigate environmental concerns.

**Service Response:** Comment noted. NEPA requires that decisions be made with public involvement in a transparent way and provides us three different venues through which we can make those decisions: categorical exclusion from further NEPA documentation with an Environmental Action Statement, Environmental Assessment, and Finding of No Significant Impact where impacts are determined to not be significant, or an Environmental Impact Statement and a Record of Decision to analyze significant impacts. We have fully complied with NEPA and considered a reasonable range of alternatives in accordance with Service policy [602 FW 3 (<http://www.fws.gov/policy/602fw3.html>) and 602 FW 3 Exhibit 1], specifically citing 602 FW 3.4(b), which states:

Each CCP will comply with the provisions of the National Environmental Policy Act (NEPA) through the concurrent preparation of an Environmental Assessment (EA) or Environmental Impact Statement (EIS) that will accompany or be integrated with the CCP. We have integrated NEPA compliance requirements directly into the CCP process. When preparing an EA, consider integrating it into the Draft CCP. When preparing an EIS with a CCP, integrate the documents. Following completion of the final CCP/NEPA document, the product of the planning process will be a stand-alone CCP, separate from the EA or EIS.

**Comment:** The employees would choose B because they want to guarantee they have jobs and they are looking for increase in tax dollars to get more money. That is not what taxpayers want. The employees are making decisions based on their own self interest - Which is how skanky Federal bureaucracies work these days. It's what they want that seems to be all they care about these days. We see this non-responsiveness to the public constantly at every level of government. The tax payers are fed up with it.

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**Service Response:** Comment noted. The Service evaluated three management alternatives in the Environmental Assessment (EA). Based upon the analysis of the EA, Alternative B was determined to best serve the purpose, vision, and goals of the Complex and the mission of the Refuge System.

**Comment:** The public thinks this agency is crap these days. You only respond to the big money of the NRA. You don't care that your mission should be to protect wildlife. You grow it so it can be killed. That is all you do. It's as if it's a crop - grow it to kill it. Allow deranged pathological wildlife murdering gun wackos to run wild and kill all they want.

**Service Response:** Comment noted. The mission of the U.S. Fish and Wildlife Service is found in the Background section of Chapter I of the document.

**Comment:** Don't tell the public you are managing for healthy wildlife. The fact is and research proves that hunted species are being hunted into extinction. The big animals are the trophy animals that these deranged pathological wildlife gun wacko hunters want, and that is what they kill. Those animals are the healthiest. What are left after hunting are animals that are weaker, less healthy, less large - so when you allow hunting you are in fact hurting the species. You have seen the research; stop publishing lies to the public in your proposals.

**Service Response:** Comment noted. Hunting is one of the six priority public uses established in the National Wildlife Refuge System Improvement Act of 1997. A compatibility determination for hunting was prepared and is included in this CCP in Appendix F.

**Comment:** This agency allowed the gulf oil rig to kill marine wildlife by the score in letting them get by with an EA instead of the required EIS. That is the same kind of crap you are into with this proposal.

**Service Response:** Comment noted. NEPA requires that decisions be made with public involvement in a transparent way and provides us three different venues through which we can make those decisions: categorical exclusion from further NEPA documentation with an Environmental Action Statement, Environmental Assessment and Finding of No Significant Impact where impacts are determined to not be significant, or an Environmental Impact Statement and a Record of Decision to analyze significant impacts. We believe we have fully complied with NEPA and considered a reasonable range of alternatives in accordance to FWS CCP policy [602 FW 3 (<http://www.fws.gov/policy/602fw3.html>) and 602 FW 3 Exhibit 1], specifically citing 602 FW 3.4(b), which states:

Each CCP will comply with the provisions of the National Environmental Policy Act (NEPA) through the concurrent preparation of an Environmental Assessment (EA) or Environmental Impact Statement (EIS) that will accompany or be integrated with the CCP. We have integrated NEPA compliance requirements directly into the CCP process. When preparing an EA, consider integrating it into the draft CCP. When preparing an EIS with a CCP, integrate the documents. Following completion of the final CCP/NEPA document, the product of the planning process will be a stand-alone CCP, separate from the EA or EIS.

**Comment:** You allow these wildlife murdering gun wacko hunters to use lead shot. Such lead shot deteriorates in air/water and soil and causes red blood cells and brain cells to die and hurts particularly our kids. Such lead shot also stays in the animal so that when the gun wacko takes his meat home to feed his kids, they get a shot of lead to eat too. How is that helping America? You are such crud in this agency feeding the public lies instead of being honest.

---

**Service Response:** Comment noted. Lead shot is not allowed on any of the refuges for waterfowl hunting.

**Comment:** I oppose all hunting and trapping. I believe the management outlined is hurting the sites owned by national taxpayers. Plans A and B are wildlife slaughter. I oppose crossbows coming in. Hunting is not compatible with any peaceful use by the 99% of the American population that does not hunt. It is not a compatible activity since these wildlife murderers slaughter people all of the time.

**Service Response:** Comment noted: Hunting is one of the six priority public uses established in the National Wildlife Refuge System Improvement Act of 1997. A compatibility determination for hunting was prepared and is included in this CCP in Appendix F. The Service evaluated three management alternatives in the Environmental Assessment (EA). Based upon the analysis of the EA, Alternative B was determined to best serve the purpose, vision, and goals of the Complex and the mission of the Refuge System. Recreational trapping is prohibited on the Complex.

**Comment:** As a matter of public record, I would like the management team and employees of this site to identify whether they are or are not wildlife murdering hunters. Please give names and whether you are a hunter or not. Because whether you are or are not shows how this plan became biased. It is biased toward killing wildlife, when the intention of the site was to protect them. Plan C may be okay, but it is clear that wildlife murderers sneak in killing sometimes. I would not like such sneakiness to take place in a federal document.

**Service Response:** Comment noted: Hunting is one of the six priority public uses established in the National Wildlife Refuge System Improvement Act of 1997. A compatibility determination for hunting was prepared and is included in this CCP in Appendix F. The Service evaluated three management alternatives in the Environmental Assessment (EA). Based upon the analysis of the EA, Alternative B was determined to best serve the purpose, vision, and goals of the Complex and the mission of the Refuge System.

**Comment:** All references of Savannah Coastal Complex should include Wolf Island with a note that the Wolf Island CCP was completed separate from this CCP. This will be confusing to the public if Wolf Island is not mentioned. Maybe should put Wolf Island CCP in document appendix (also pages 283, 287, 405, and 521)

**Service Response:** Comment noted. Comment addressed in document.

**Comment:** Page 3 - Recognize that wildlife-dependent recreation activities... and provide refuge managers...

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 255. Disagree that fishing brochure should be bilingual.

**Service Response:** Comment noted.

**Comment:** Page 346 - If boundary is not currently maintained, in Alternative A, continue...will you continue to not maintain the refuge boundary??

**Service Response:** Comment noted. Under Alternative A, the refuge will continue to manage refuge boundary.

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**Comment:** Need funding and manpower to achieve Alternative B!

**Service Response:** Comment noted. This is addressed in chapters 4 and 5 of the document.

**Comment:** Page 367- Do not support having a fee program.

**Service Response:** Comment noted.

**Comment:** Page 462 - Refuge staff need to rethink Beach Use Appropriate Use Form (i) and (j).

**Service Response:** Comment noted.

**Comment:** Page 473 - Need to ask solicitor's office what purpose of refuge means...future use in navigation.

**Service Response:** Comment noted.

**Comment:** Page 475 - Should state no dogs allowed on beach.

**Service Response:** Comment noted. Compatibility determination was clarified to reflect comment.

**Comment:** Page 486 - May want to reconsider rewording "closed to motorized boats."

**Service Response:** Comment noted. Compatibility determination clarified to reflect comment.

**Comment:** Page 493 - Closed areas should be closed to all uses

**Service Response:** Comment noted. Compatibility determination clarified to reflect comment.

**Comment:** Page 495 - Reword listed two types of chemical with only one being allowed on the refuge. Statement is confusing to the public.

**Service Response:** Comment noted. Sentence clarified.

**Comment:** Page 502 - How are you going to remove salvaged timber from some of these refuges?

**Service Response:** Comment noted. Details of timber salvage removal will be addressed as needed.

### **Comments Grammatical Errors Including Typos**

**Comment:** Page 255 - Edit: Page 259 - Need a period at the end of Goal 1.

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 287, first paragraph, first bullet, change....may have adverse impacts to will have adverse impacts.

**Service Response:** Comment noted.

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**Comment:** Page 22, par. 4: "Coastal" is misspelled for Site 235.

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 24, par. 1: In third to last sentence, delete "and" after "late 1700s and 1800s."

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 37, 2nd bullet point for Wassaw NWR: Has there really been a MAPS station operating for 70 years on Wassaw, or is this a typo?

**Service Response:** Comment noted. This sentence was corrected to MAPS station operating for 10 years on Wassaw.

**Comment:** Page 71, par. 2: The correct species name is "green heron," not "green-backed heron." Cattle egrets and common moorhens should be added to the list of wading birds that use the refuge. Mississippi kite is a summer visitor, not a year-round resident. Bald eagle is a year-round resident, not a seasonal visitor.

**Service Response:** Comment noted. Changes made in document.

**Comment:** Page 104, par. 4: Under the Wassaw NWR section, "permanent" is misspelled in the first sentence.

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 108, par. 2: Capitalize "Kirtland's."

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 109, par. 4: In the Invasive and Nuisance Species section, the word "interdiction" is used incorrectly. Interdiction means "prohibition or exclusion." Perhaps the word "introduction" was intended?

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 110, par. 4: In the Migratory and Resident Birds Section, replace the semi-colon in the first sentence with a full colon.

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 113, par. 4: In the third sentence, place a comma between "loons" and "grebes."

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 125, par. 5: "Lakes" in "Great Lakes" should be capitalized.

**Service Response:** Comment noted. Change made in document.

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**Comment:** Page 144, par. 4: "Improved" is misspelled in the second bullet point.

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 172, par. 2: The word "use" is missing from the end of the first sentence. In the third sentence, remove the apostrophe from the word "regulations."

**Service Response:** Comment noted. Change made in document.

**Comment:** Page. 185, Maintain Marker Boundary section: I believe the correct word in the first sentence is "continual" or "continuing," not "continuous."

**Service Response:** Comment noted.

**Comment:** Page 186, par. 3: Should "collateral duty office" be changed to "collateral duty officer?"

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 196, last Par.: In the first sentence, insert a space after the word "composed."

**Service Response:** Comment noted. Change made in document.

**Comment:** Should Objective 4.2.e read "10 percent per year" rather than "100 percent?"

**Service Response:** Comment noted. Objective 4.2.e is correct as written.

**Comment:** The thrust of the document seemed to be the comparison and analysis of the three Management Systems - Current, Proposed, and Minimal Intervention, shown in Tables 15-26. The three alternatives are defined in the text. Tables 19 and 25 include three other management alternatives - Targeted Increased Management, Comprehensive Increased Management and Comprehensive Biological Management that were not defined. Tables 21 - 26 seem to be a duplicate of Tables 15 - 20.

**Service Response:** Comment noted. Tybee NWR required a different set of management alternatives than the other 5 refuges in the Complex. Tables 21 through 26 analyze the environmental effects of alternatives outlined in tables 15 through 20.

**Comment:** The text describing Pinckney Island staffing needs and the organizational chart depicting the staffing needs on page 201 do not match up.

**Service Response:** Comment noted. The organizational chart reflects positions shared throughout the Complex. Positions are listed under supervisor, not refuges.

**Comment:** All acronyms should be spelled out. Make sure all acronyms in document are listed in Appendix.

**Service Response:** Comment noted. Appendix A has been updated to reflect acronyms used throughout the document.

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**Comment:** Edit: page 11 Paragraph 4: This variety known as Sea Island cotton, was far superior to upland cotton and sold for two to five times the price of the latter.

**Service Response:** Comment noted. Changes were made in document.

**Comment:** Edit: Page 22 - Under Georgia designated waters, should read Savannah River, Coastal Site 235 not Costal Site 235

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 34 Bullet 2 of first paragraph: “astronomical proportions” is not a good statement for this document.

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 40: bullet 2: Possible responses to sea level rise....CITATION?? Bullet 4: By 2100, temperatures in South Carolina....CITATION??? Bullet 6: At Charleston, sea level....CITATION???

**Service Response:** Comment noted. Citation added to document.

**Comment:** Edit: Page 45, first paragraph - reclit should be relic

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 48, second paragraph: the Floridan aquifer...CITATION???

**Service Response:** Comment noted. Citation added to document.

**Comment:** Page 53, second paragraph: Blackbeard Island: These habitats provide for one of the highest breeding concentrations of painted buntings on the east coast...CITATION??

**Service Response:** Comment noted. Change made in document.

**Comment:** Edit page 73, paragraph 3, first sentence: Northern subpopulation not Notheren.

**Service Response:** Comment noted. Change made in document.

**Comment:** Page 118, first paragraph: These six refuges....should be 7 with Wolf Island (also page 205).

**Service Response:** Comment noted. Comment addressed in document.

**Comment:** Page 121, Shorebirds Discussion: CITATION???

**Service Response:** Comment noted. Citation added to document.

**Comment:** Page 415, Savannah NWR Bio Review Team Roster - Typographical errors: Steve Calver (not Carver), Corps (not Corp), Savannah, GA (not Charleston); Ed EuDaly has retired from the Charleston ES Office; John Robinette no longer works at the Savannah NWR.

**Service Response:** Comment noted. Change made in document.





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## *Appendix E. Appropriate Use Determinations*

### **Savannah Coastal Refuge Complex Appropriate Use Determinations**

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

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

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

### **Statutory Authorities for this policy:**

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

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

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

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

#### **Definitions:**

##### *Appropriate Use*

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

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

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

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

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

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

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

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

# FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Savannah Coastal Refuges Complex

Use: Beach Use

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

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(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?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 6C3 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

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

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

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 ☒

Refuge Manager: Jane M. Gries

Date: 4/13/11

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: Brett E. Hunter

Date: 5/17/11

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

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02/06



# FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Savannah Coastal Refuges Complex

Use: Bicycling

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

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(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?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 6C3 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

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

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

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 ☒

Refuge Manager: Jane M. Gries

Date: 4/13/11

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: Brett E. Hunter

Date: 5/17/11

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

FWS Form 3-2319  
02/06

# FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Savannah Coastal Refuges Complex

Use: Commercial Guiding for Wildlife/Wildlands Observation

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?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(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?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 6C3 FW 1, for description); compatible, wildlife-dependent recreation into the future?	✓	

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

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

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 ☒

Refuge Manager: Jane M. Giness

Date: 4/13/11

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: Brett E. Hunter

Date: 5/17/11

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

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02/06



# FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Savannah Coastal Refuges Complex

Use: Hiking

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?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(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?	✓	
(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?	✓	

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

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

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 ☒

Refuge Manager: Jane M. Griess

Date: 4/13/11

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: Brett E. [Signature]

Date: 5/17/11

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

FWS Form 3-2319  
02/06

# FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Savannah Coastal Refuges Complex

Use: Mosquito 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?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(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?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 6C3 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

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

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

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 ☒

Refuge Manager: Jane M. Gries

Date: 4/13/11

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: Brett E. Gandy

Date: 5/17/11

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

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# FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Savannah Coastal Refuges Complex

Use: Scientific Research

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

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(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?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 6C3 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

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

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

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 ☒

Refuge Manager: Jane M. Griess

Date: 4/13/11

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: Brett E. [Signature]

Date: 5/17/11

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

FWS Form 3-2319  
02/06

# FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Savannah Coastal Refuges Complex

Use: Timber Harvest

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

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(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?	✓	
(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?	✓	

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

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

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 ☒

Refuge Manager: Jane M. Gries

Date: 4/13/11

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: Brett E. Runkle

Date: 5/17/11

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

FWS Form 3-2319  
02/06



# FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Savannah Coastal Refuges Complex

Use: Salvage Timber Harvest and Sale

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?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(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?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 6C3 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

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

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

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 ✓

Refuge Manager: Jane M. Gries

Date: 4/12/11

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: Brett E. Hunter

Date: 5/17/11

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

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02/06

# FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Savannah Coastal Refuges Complex

Use: Utility Right-of-Way

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?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(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?	✓	
(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?	✓	

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

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

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 ☒

Refuge Manager: Jane M. Giness

Date: 4/13/11

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: Brett E. Hunter

Date: 5/17/11

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

FWS Form 3-2319  
02/06

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## *Appendix F. Compatibility Determinations*

### **Savannah Coastal Refuges Complex Compatibility Determinations**

**Uses:** The following uses were found to be appropriate and evaluated to determine their compatibility with the mission of the Refuge System and the purposes of the refuge.

1. Beach Use
2. Bicycling
3. Commercial Guiding for Wildlife-Wildland Observation
4. Environmental Education and Interpretation
5. Recreational Fishing
6. Hiking
7. Public Hunting
8. Mosquito Control
9. Scientific Research
10. Timber Harvest
11. Salvage Timber Harvest and Sale
12. Utility Right-Of-Way
13. Wildlife Observation and Photography

**Refuge Name:** Blackbeard Island National Wildlife Refuge.

**Date Established:** February 5, 1924.

**Establishing and Acquisition Authorities:**

Executive Order 4512 -- (dated September 20, 1926)

[16 U.S.C. 715d]

Migratory Bird Conservation Act -- (February 18, 1929)

[16 U.S.C. 667b]

Real Property Transfer Act, PL 80-537 -- (May 19, 1948)

[16 U.S.C. 742]

Fish and Wildlife Act of 1956 -- (August 8, 1956)

[16 U.S.C. 1131-1136]

The Wilderness Act of 1964, PL 88-577 -- (September 3, 1964)

[16 U.S.C. 460]

Refuge Recreation Act, and amendments -- (September 28, 1962) and PL 93-205 (December

Public Law 93-632, January 3, 1975

Section 1 (Wilderness Act)

**Refuge Purpose:**

“for use as a bird refuge and as an experiment station for acclimatization of certain foreign game birds” (Executive Order 4512, September 20, 1926); and, “for use as an inviolate sanctuary, or for any other management purpose for migratory birds” (16 U.S.C. 715d, Migratory Bird Conservation Act)



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**Refuge Name:** Harris Neck National Wildlife Refuge.

**Date Established:** May 25, 1962.

**Establishing and Acquisition Authorities:**

[16 U.S.C. 715d]  
Migratory Bird Conservation Act -- (February 18, 1929)  
[16 U.S.C. 667b]  
Real Property Transfer Act, PL 80-537 -- (May 19, 1948)  
[16 U.S.C. 742]  
Fish and Wildlife Act of 1956 -- (August 8, 1956)  
[16 U.S.C. 460k]  
Refuge Recreation Act, and amendments -- (September 28, 1962) and PL 93-205  
December 28, 1973)  
[16 U.S.C. 3901(b), 100 Stat. 3583]  
Emergency Wetlands Resources Act of 1986

**Refuge Purpose:**

“particular value in carrying out the national migratory bird management program” (16 U.S.C. 667b, An Act Authorizing the Transfer of Certain Real Property for Wildlife, or other purposes); “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (16 U.S.C. 715d, Migratory Bird Conservation Act); and, for “the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various treaties and conventions” (16 U.S.C. 3901(b), 100 Stat. 3583, Emergency Wetlands Resources Act of 1986).

**Refuge Name:** Pinckney Island National Wildlife Refuge.

**Date Established:** December 4, 1975.

**Establishing and Acquisition Authorities:**

Deed of Donation, dated December 4, 1975  
[16 U.S.C. 715d]  
Migratory Bird Conservation Act -- (February 18, 1929)

**Refuge Purpose:**

established “as a wildlife refuge and as a nature and forest preserve for aesthetic and conservation purposes, without disturbing the habitat of the plant and animal populations except as such disturbance may be necessary to preserve the use of the real property for the purposes above mentioned” (Deed of Donation, December 4, 1975); and “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (16 U.S.C. 715d, Migratory Bird Conservation Act)

**Refuge Name:** Savannah National Wildlife Refuge.

**Date Established:** April 6, 1927.

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**Establishing and Acquisition Authorities:**

Executive Order # 4626, dated April 6, 1927  
Executive Order # 5748, dated Nov 12, 1931  
Executive Order # 7391, dated June 16, 1936  
[16 U.S.C. 715d]  
Migratory Bird Conservation Act -- (February 18, 1929)  
[16 U.S.C. 742f(b)(1)]  
Fish and Wildlife Act of 1956 -- (August 8, 1956)  
[16 U.S.C. 460k-1]  
Refuge Recreation Act, and amendments -- (September 28, 1962)  
[16 U.S.C. 460k-2]  
PL 93-205 -- (December 28, 1973)  
16 U.S.C. 3901(b), 100 Stat. 3583  
(Emergency Wetlands Resources Act of 1986)

**Refuge Purpose:**

“as a refuge and breeding ground for birds and wild animals subject to future use in navigation if necessary and to valid existing rights if any” (Executive Order 5748, April 6, 1927); for lands acquired under the Migratory Bird Conservation Act “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (16 U.S.C. 715d); for lands acquired under the Refuge Recreation Act for “(1) Incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species” (16 U.S.C. 460k); for “the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions” (16 U.S.C. 3901(b), 100 Stat. 3583, Emergency Wetlands Resources Act of 1968); “for the development, advancement, management, conservation, and protection of fish and wildlife resources” (16 U.S.C. 742f(a)(4)); and, “for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude” (16 U.S.C. 742f(b)(1), Fish and Wildlife Act of 1956)

**Refuge Name:** Tybee National Wildlife Refuge.

**Date Established:** May 9, 1938.

**Establishing and Acquisition Authorities:**

Executive Order # 7882, dated May 9, 1938  
[16 U.S.C. 715d]  
Migratory Bird Conservation Act -- (February 18, 1929)

**Refuge Purpose:**

- “Effectuate further the purposes of the Migratory Bird Conservation Act.”

**Refuge Name:** Wassaw National Wildlife Refuge.

**Date Established:** October 20, 1969.

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## **Establishing and Acquisition Authorities:**

Deed of Donation, dated October 20, 1969  
[16 U.S.C. 715d]  
Migratory Bird Conservation Act -- (February 18, 1929)

## **Refuge Purpose:**

“for the purpose of creating a fish and wildlife refuge to be maintained as nearly as practicable in its natural state” (Deed of Donation, October 20, 1969); and, “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (16 U.S.C. 715d, Migratory Bird Conservation Act)

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

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

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

## **Other Applicable Laws, Regulations, and Policies:**

Antiquities Act of 1906 (34 Stat. 225)  
Migratory Bird Treaty Act of 1918 (15 U.S.C. 703-711; 40 Stat. 755)  
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715r; 45 Stat. 1222)  
Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-178h; 48 Stat. 451)  
Criminal Code Provisions of 1940 (18 U.S.C. 41)  
Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d; 54 Stat. 250)  
Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)  
Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)  
Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)  
Wilderness Act (16 U.S.C. 1131; 78 Stat. 890)  
Land and Water Conservation Fund Act of 1965  
National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et seq.; 80 Stat. 915)  
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd, 668ee; 80 Stat. 927)  
National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq; 83 Stat. 852)  
Use of Off-Road Vehicles on Public Lands  
(Executive Order 11644, as amended by Executive Order 10989)  
Endangered Species Act of 1973 (16 U.S.C. 1531 et seq; 87 Stat. 884)  
Refuge Revenue Sharing Act of 1935, as amended in 1978 (16 U.S.C. 715s; 92 Stat. 1319)  
National Wildlife Refuge Regulations for the Most Recent Fiscal Year  
(50 CFR Subchapter C; 43 CFR 3101.3-3)  
Emergency Wetlands Resources Act of 1986 (S.B. 740)  
North American Wetlands Conservation Act of 1990  
Food Security Act (Farm Bill) of 1990 as amended (HR 2100)  
The Property Clause of the U.S. Constitution Article IV 3, Clause 2  
The Commerce Clause of the U.S. Constitution Article 1, Section 8  
The National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, USC668dd)  
Executive Order 12996, Management and General Public Use of the  
National Wildlife Refuge System. March 25, 1996

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Title 50, Code of Federal Regulations, Parts 25-33  
Archaeological Resources Protection Act of 1979  
Native American Graves Protection and Repatriation Act of 1990

**Public Review and Comment:**

A notice of availability of the Draft CCP/EA for the Savannah Coastal Refuges Complex was published in the *Federal Register* on September 15, 2010 (75 FR 56133), announcing a 30-day public review and comment period. Other methods used to solicit public review and comment included posted notices at Complex headquarters and area locations; copies of the Draft CCP/EA were distributed to adjacent landowners, the public, and local, state, and federal agencies; copies were made available at public meetings; and news releases were sent to area newspapers and to local radio stations. A copy of the Draft CCP/EA was posted on the Fish and Wildlife Service's Internet site. Appendix D summarizes the public comments.

Compatibility determinations for each description listed were considered separately. Although for brevity, the preceding sections from "Uses" through "Public Review and Comment" and the succeeding section, "Approval of Compatibility Determinations" are only written once within the comprehensive conservation plan, they are part of each descriptive use and become part of that compatibility determination if considered outside of the comprehensive conservation plan.

**Use:** Beach Use

**Refuge Name:** Wassaw and Blackbeard Island NWRs

**Counties:** Chatham and McIntosh Counties, Georgia

**Description of Use:**

Beach uses, such as sunbathing, shell collecting, swimming, surf fishing, seining, picnicking, and nature watching, are existing uses on Wassaw and Blackbeard Island NWRs. With the exceptions of fishing, seining, and shell collecting, most beach use is nonconsumptive. Vehicular access is non-existent on these refuges. Visitors must travel to the refuges via boat. On Blackbeard Island NWR, some visitors walk across the sand flats between Sapelo and Blackbeard Islands during low tide. Public use on these two refuges is limited to day use activities; however, beaches are open seven days a week, year-round. Primary use occurs during the summer months.

On both island refuges, there are 7 miles of beach. The majority of visitors to these refuges remain on the beaches to enjoy Atlantic breezes, abundant sunshine, and pristine, uncrowded beaches. No open fires or camping are permitted. Additionally, no pets are allowed on the beach. Many other beaches along the Georgia coastline are available to public access. However, refuge beaches are unique in that they are undeveloped and attract a relatively low density of people compared to beaches near populated areas.

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**Availability of Resources:**

As this use supports wildlife observation, fishing and photography, no additional resources above those needed to facilitate these priority public uses are needed to manage this use. Additionally, there is no special equipment, facilities, or improvements needed to support this use, and no associated maintenance or monitoring costs.

**Anticipated Impacts of the Use:**

Short-term impacts: Mechanized forms of recreation can have the greatest impact on wildlife, causing habitat destruction, disturbance, and disruption of animal behavior, noise pollution, and even direct mortality (Boyle and Samson 1983, Boyle and Samson 1985). Hiking and camping can be responsible for these same impacts, as well as for the displacement of animals, the accumulation of litter and trash dumps and increased air and water pollution (Boyle and Samson 1985). Since the public is not permitted to camp on the refuge, the primary disturbance factor may be the size of groups participating in various beach activities.

Of particular concern at Blackbeard Island and Wassaw NWRs is disturbance to beach nesting birds such as gulls, terns, and other shorebirds. Large numbers of shorebirds congregate for the purposes of breeding, feeding, loafing, nesting, and wintering during various seasons throughout the year. Beach use may disturb these activities. Additionally, dune vegetation may be trampled. Other impacts involve violation of refuge regulations (e.g., harassing wildlife; removing animals, plants, or live shells; littering; and vandalism).

There are no anticipated long-term or cumulative impacts.

**Determination (Check One Below):**

- ☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

**Stipulations Necessary to Ensure Compatibility:**

Law enforcement patrol of the beach would continue to minimize impacts. Existing regulations which limit public use to day use only would be maintained; this restriction alone provides the greatest protection to nesting sea turtles. Beach use at the dune level will be regulated as needed by closure of specific areas (e.g., loggerhead turtle nesting areas and/or shorebird nesting areas). Beach use from the high water to the low water marks would be regulated through enforcement of Title 50 CFR.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- ☐ 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

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**Justification:**

Due to the remoteness of these island refuges and their accessibility by boat only, public use is limited. In 2004, Blackbeard Island NWR hosted 11,000 visitors, while Wassaw NWR hosted 23,000 visitors. Of these visitors, approximately 30 to 50 percent came ashore.

Since beach access is not limited to designated areas, a precise count of visitors engaged in beach uses is not attainable. However, on Wassaw NWR, most use is concentrated within 1 mile of the north end and 1 mile of the south end of the refuge's 7-mile stretch of beach. On Blackbeard Island NWR, most use is concentrated on the south end of the 7-mile beach, near Cabretta Inlet, and regular surveys of this area indicate that refuge visitors are using the beach for a variety of consumptive and nonconsumptive recreational pursuits. Since beach use is concentrated in specific areas, crowd control is facilitated.

No visitor facilities are available for beach users; therefore, beach activities are generally of a short duration. No facilities such as picnic tables and shelters are planned. Beach use requires minimal management, mainly law enforcement support, which would be provided regardless of recreational activities permitted on the refuge. The majority of beach users engage mainly in wildlife-oriented activities such as photography, nature watching, wildlife observation, shell collecting, and hiking.

**Mandatory 10-Year Re-evaluation Date: 06/17/2021**

**Literature Cited**

Boyle, S. A. and F. B. Samson. 1983. Nonconsumptive outdoor recreation: An annotated bibliography of human-wildlife interactions. Special Scientific Re.-Wildl. No. 252, USDI, Washington, D.C. 113 pp.

Boyle, S. A. and F. B. Samson. 1985. Effects of nonconsumptive outdoor recreation of wildlife: A review. Wildl. Soc. Bull. 13(2):110-116.

**Use:** Bicycling

**Refuge Name:** Pinckney Island, Savannah, Wassaw, Harris Neck, and Blackbeard Island NWRs

**Counties:** Chatham, Effingham, and McIntosh Counties, Georgia; Jasper and Beaufort Counties, South Carolina.

**Description of Use:**

Bicycling is an existing use on Pinckney Island, Savannah, Wassaw, Harris Neck, and Blackbeard Island NWRs. Vehicular access is non-existent or limited on these refuges and bicycling and hiking are the primary means by which wildlife-dependent activities such as wildlife observation and photography are conducted. Public use on all refuges is limited to day use activities.

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On Pinckney Island NWR, foot and bicycle traffic are permitted on all refuge roads and trails, other than roadways within the manager's residence, which are closed to public access. Motorized vehicles are restricted to the refuge entrance road and the paved parking area.

On Savannah NWR, foot and bicycle travel is permitted on all refuge roads and dikes other than the maintenance shop entrance road, north of U.S. 17 between impoundments #6 and #7. Access to all impoundments (#31-39), via the dike network north of U.S. 17, is closed to the general public from November 1 through March 14, to reduce disturbance to wintering waterfowl. The Laurel Hill Wildlife Drive, a 1-way, unpaved 4.5-mile-long drive through the refuge's impoundment system south of U.S. 17, is open to vehicular, foot, and bicycle traffic. The 1-mile Tupelo Swamp Trail is open to foot traffic only. The Cistern Walk is also restricted to foot travel.

On Wassaw NWR, bicycling is permitted along the 40 miles of primitive roads and 7 miles of beach. Only foot travel is permitted on Pine Island, one of the units of the refuge. Other islands within this refuge are closed to public entry. Additionally, 180 acres of a private inholding are closed to public entry except along the Main Road and the Avenue, roads that intersect the property.

On Harris Neck NWR, all refuge roads and trails are open to foot and bicycle travel unless the area is posted as closed.

On Blackbeard Island NWR, all roads, trails, and levees are open to foot and bicycle travel. There is no vehicular access on this offshore island. Additionally, bicycling is permitted along 7 miles of beach. Only a small percentage of the refuge's visitors venture off the beach into the trail system and very few bicycle as roadways are composed of deep sand.

#### **Availability of Resources:**

As this use supports wildlife observation and photography, no additional resources above those needed to facilitate these priority public uses are needed to manage this use. Additionally, there is no special equipment, facilities, or improvements needed to support this use, and no associated maintenance or monitoring costs.

#### **Anticipated Impacts of the Use:**

Short-term impacts: Mechanized forms of recreation can have the greatest impact on wildlife, causing habitat destruction, disturbance, and disruption of animal behavior, noise pollution, and even direct mortality (Boyle and Samson 1983, Boyle and Samson 1985). Since motorized vehicles are not permitted on three of the refuges, the primary disturbance factor may be the size of groups participating in various activities, such as bicycling.

Of particular concern at Blackbeard Island NWR and Wassaw NWR is disturbance to beach nesting birds such as gulls, terns, and other shorebirds. Large numbers of shorebirds congregate for the purposes of breeding, feeding, loafing, nesting, and wintering during various seasons throughout the year. Bicycling may disturb these activities. Additionally, bicycling may destroy vegetation. Other impacts involve violation of refuge regulations (e.g., harassing wildlife, removing animals and plants, littering, and vandalism).

On other refuges, disturbance will primarily occur along the wildlife drives and trails and the dikes that intersect these drives.

There are no anticipated long-term or cumulative impacts.



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**Determination (Check One Below):**

- ☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

**Stipulations Necessary to Ensure Compatibility:**

Pinckney Island NWR: The refuge's road and trail system will be open during daylight hours to foot and bicycle travel. No motorized vehicles will be permitted beyond the public parking area. Access to trails adjacent to freshwater ponds will be prohibited during periods of high concentrations of nesting wading birds. Law enforcement patrol will minimize impacts from violations. Outlying islands within the refuge (Big Harry, Little Harry, Corn, and Buzzard Islands) will remain closed to the public.

Savannah NWR: Refuge roads and trails will be open during daylight hours only. Only foot and bicycle travel will be permitted on refuge dikes. The Tupelo Swamp and Cistern trails will be open for foot traffic only. Access to dikes north of U. S. 17 will be closed to public access from November 1 through March 14, to prevent disturbance to wintering waterfowl. Law enforcement patrol will continue in an effort to minimize impacts from violations.

Wassaw NWR: Law enforcement patrol of the beach and roadways will continue in order to minimize impacts. Current regulations which limit public use to day-use only will be maintained. In addition, roads and trails leading to freshwater ponds that support wading bird rookeries or roosts will be closed when these sites are active. Beach use at the dune level will be regulated as needed by closure of specific areas (e.g., loggerhead turtle nesting areas and or shorebird nesting areas). Beach use from the high water to the low water marks would be regulated through enforcement of Title 50 CFR.

Harris Neck NWR: The public access route of the refuge will remain open during daylight hours. During the wood stork and wading bird nesting season, rookery sites will be closed to the public. Other sensitive areas, such as the wood duck banding site at Bluebill Pond, will be closed seasonally to prevent disturbance.

Blackbeard Island NWR: Law enforcement patrol of the beach and roadways will continue to minimize impacts. Current regulations of day use only will be maintained. In addition, Flag Pond and adjacent levees will be closed March 1 to August 31, to protect sensitive stork and wading bird rookeries from disturbance. Other rookery sites will be seasonally closed, as well. Beach use at the dune level will be restricted during sea turtle nesting season (May 1 through October 30).

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- ☐ 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

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**Justification:**

On the five refuges within the Complex where this activity will be permitted, bicyclers account for a relatively small percentage of visitors (Pinckney Island NWR, 3 percent; Savannah NWR, 20 percent; Wassaw NWR, 1 percent; Harris Neck NWR, 12 percent; and Blackbeard Island NWR, 1 percent). Bicycling is a low impact and a low cost activity to manage. No special roads or trails are developed or maintained specifically for this activity. The refuges' existing road and dike systems, maintained for management purposes, is ideally suited for this activity. Additionally, two of the refuges are island refuges accessible by boat only. Bicycling supports wildlife observation and photography, two of the six priority public uses as identified in the Improvement Act. It facilitates the public's ability to experience and appreciate wildlife on the refuges.

**Mandatory 10-Year Re-evaluation Date: 06/17/2021**

**Literature Cited**

- Boyle, S. A. and F. B. Samson. 1983. Nonconsumptive outdoor recreation: An annotated bibliography of human-wildlife interactions. Special Scientific Re.-Wildl. No. 252, USDI, Washington, D.C. 113 pp.
- Boyle, S. A. and F. B. Samson. 1985. Effects of nonconsumptive outdoor recreation of wildlife: A review. Wildl. Soc. Bull. 13(2):110-116.

**Use:** Commercial Guiding for Wildlife/Wildlands Observation

**Refuge Name:** Pinckney Island, Savannah, Tybee, Wassaw, Harris Neck, Blackbeard Island, and Wolf Island NWRs

**Counties:** Chatham, Effingham, and McIntosh Counties, Georgia; Jasper and Beaufort Counties, South Carolina

**Description of Use:**

The refuges will authorize commercially guided wildlife and wildlands observation and regulate such use through the implementation of a commercial wildlife guide management program, including issuance of special use permits with conditions. Commercial means that clients pay a fee for the program and the intent of the permittee is to generate profit. Guiding also includes outfitting operations which may not provide an accompanying guide. Guiding does not include "no fee" or "not-for-profit" guided tours conducted by non-profit groups, schools and colleges, or other agencies. This use is covered under the general wildlife observation compatibility determination.

This activity provides recreational and often educational opportunities for the paying public who desire a successful, quality experience, but who may lack the necessary equipment, skills, or knowledge to observe wildlife or otherwise experience the expansive river, marsh, and upland environment of the refuges. Commercial guiding for wildlife or other observation is an existing activity on the refuges.

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Guiding operations will generally be allowed throughout the approximately 56,949 acres of the Complex throughout the year, subject to seasonal closures in impoundments, administrative “No Hunting” zones, and in the vicinity of sensitive bird areas such as wood stork rookeries. Tours tend to travel to and through backwater areas including smaller side channels of the river, marshes, and shallow ponds. These areas are preferred by many wildlife species, and thus present better opportunities for wildlife observation. Also, the quiet, secluded, and scenic bottomland forest of the backwaters and the freshwater and saltwater marshes is a setting preferred by many clients.

Guided wildlife observation typically involves transport of clients by power boats from public or private boat landings to selected sites or routes. Often guides and clients use the same site or route or one of several locations selected by the guide. Some guided programs may walk to sites/routes from parking lots or road sides. Guided wildlife viewing operations have typically used existing refuge or other public observation sites, though some seasonal observation or photography blinds may be requested by guides as demand increases. In addition to the observation activities, guides and clients may use refuge shoreline areas for breaks, lunch, or other activities during the outing, and in accordance with refuge regulations.

The total number of wildlife observation guides and clients using the refuges is not known. A first step in establishing a commercial guiding program will be to identify existing guides and outfitting businesses. It is anticipated that a significant number of the public is willing to pay for the expertise and local knowledge provided by commercial businesses and guides. The refuges provide excellent populations of watchable wildlife in a wild and scenic setting, and the expanse of backwater areas and bottomland forests along the Savannah River, combined with the tidal marshes of Wassaw, Pinckney Island, Blackbeard Island, and Wolf Island NWRs, provides a unique opportunity. It is expected that demand for guided wildlife/wildland observation will continue to increase, and with it, the number of interested commercial operators.

Administration of commercially guided wildlife/wildland activities will be conducted in accordance with commercial guide use stipulations (attached) developed to ensure consistency throughout the refuges; provide a safe, quality experience; protect resources; and to ensure compliance with pertinent Refuge System regulations and policies. The guide use stipulations will address all aspects of the guided programs including the number of permits to be issued, guide qualifications, permit cost, and selection methods. These stipulations are considered draft and will be fine-tuned as the process unfolds.

### **Availability of Resources:**

This program will increase overall costs of refuge operations, including but not limited to, development and review of policy and procedure, yearly administration of permits (inquiries, screening and selecting applicants, issuing permits), and enforcement of permit conditions. In the short-term, existing staff is adequate if shifts in priorities and assignments are made to accommodate a modest guiding program. However, the size and scope of the guiding program, and the number of permits that will be available, will have to be limited in balance with permit fees received. In the long-term, a comprehensive guiding program, when combined with other new initiatives requiring permits, will require additional administrative and/or other personnel as identified in the CCP. Existing facilities (launch ramps) and other infrastructure are currently sufficient to accommodate this use.

Fees for special use permits will be determined annually, based on fair market value of the service.

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**Anticipated Impacts of the Use:**

Species that may be affected by guided tours include many of the species that use aquatic, marsh, and floodplain habitat. Disturbance of wildlife is the primary concern regarding this use. Visitors could cause disturbance to waterfowl, waterbirds, alligators, and other wildlife. While field trip routes and observation sites are usually located in areas open to the general public, disturbance caused by group tours could be more intense because the number of people, and desire to get close to wildlife, may be greater than normally occurs during general public activities. This disturbance will displace individual animals to adjacent areas of the refuge. However, the level of disturbance, through control of areas used and seasons of use, should limit the disturbance during critical feeding, resting, and breeding periods and not measurably affect overall refuge populations.

Guided tour activities may also conflict with other refuge users. For example, commercial tours will most likely use the same areas as the independent wildlife viewer, kayakers and canoeists, and hunters and anglers during open seasons. Unregulated or inadequately regulated commercial guiding operations may adversely affect the safety of other refuge users, the quality of their experience, and the equity of opportunity. Stipulations proposed should mitigate these concerns by volume and space restraints for commercial operators.

Guide operations may increase use of some refuge facilities, such as boat launch ramps, and wildlife auto tour routes but, if regulated, this increase would not be significant compared to overall use.

**Determination (Check One Below):**

- ☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

**Stipulations Necessary to Ensure Compatibility:**

Issuance of special use permits would be determined on an annual basis; special conditions will be formulated based on current conditions and demand. Any impacts observed would be considered before the issuance of the next year's special use permit.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- ☐ 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

**Justification:**

The issuance of special use permits for commercial guiding for wildlife/wildlands observation does not significantly impact biological resources for which the refuge was established and requires no additional facilities. The administrative requirement is minimal. In fact, this activity has a positive

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effect on the overall interpretive, environmental education, and wildlife observation programs of the refuge, facilitating the message to reach a much larger audience.

This use would contribute to the mission of the refuge by increasing the audience that receives the message of the Service, producing a greater appreciation of wildlife resources in participants, and building relationships between the refuge and area businesses.

Allowing commercially guided wildlife and wildlands observation on the refuge will not materially interfere with the purposes of the refuge or the mission of the Refuge System because:

1. Existing federal and state agency oversight and regulation of affected species and habitat is sufficient to ensure healthy populations. Disturbance to fish and wildlife will be local, short-term, and not adversely impact overall populations.
2. Qualifying standards for commercial operators will help ensure that the public is guided by competent individuals.
3. Restricting the number of guides and managing how guided activities are conducted will reduce adverse habitat effects, conflicts between competing guide services, and conflicts between guided operations and other refuge users.
4. Designated areas of operation (Guide Use Areas), operating requirements, and other regulation of guided activities will minimize conflicts with other refuge users.
5. Administrative (application) and special use permit fees will help off-set costs to administer and provide oversight to this use.
6. Regulating and limiting the number of commercial operators as stated in the refuge commercial guide program stipulations will provide a safe, quality experience to individuals who want to enjoy the resources of the refuge. It will also increase opportunities for those who wish to observe wildlife and experience the scenic and wild nature of the refuge, but may lack the required equipment, knowledge, or expertise.

**Mandatory 10-Year Re-evaluation Date: 06/17/2021**

**Use:** Environmental Education and Interpretation

**Refuge Name:** Pinckney Island, Savannah, Tybee, Wassaw, Harris Neck, and Blackbeard Island NWRs

**Counties:** Chatham, Effingham, and McIntosh Counties, Georgia; Jasper and Beaufort Counties, South Carolina.

**Description of Use:**

Currently, environmental education and interpretation activities contribute nearly 5,000 visits each year to the Complex. Use occurs year-round, but increases between September and June, with the addition of individual school classes and large groups during educational field days. Environmental

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education programs focus on issues including wildlife, history, archaeology, culture, and habitats. Wildlife ecology programs address a number of wildlife conservation issues including wetland and freshwater marsh conservation, migratory bird management, and endangered species conservation. Although these activities do not require a special use permit, they are most often closely coordinated with the refuge manager and park rangers. Programs also involve development of outdoor skills which enhance appreciation of wildlife and their habitats. The refuges have become increasingly popular as outdoor classrooms for several universities.

The refuges provide public facilities which support environmental education and interpretation including visitor contact stations, observation areas, hiking trails, biking trails, canoe trails, and two auto tour routes. The visitor center contains a number of interpretive displays and exhibits, a theater, an interactive computer, and a nature store sponsored by the Friends of the Savannah Coastal Refuges Complex

The comprehensive conservation plan recommends additional staffing and facilities and an expanded environmental education and interpretation programs for several of the refuges within the Complex. With additional full-time visitor services specialists, more students will be given an opportunity for environmental education. Additional staff will be able to provide more teacher workshops and orientations, and help develop site-specific curricula, materials, activities, and interpretive exhibits. Additional field trip assistance would be available to enhance learning in an outdoor setting. Students and teachers would also be able to participate in coordinated restoration, and monitoring programs through long-term monitoring studies

#### **Availability of Resources:**

Currently, there are three full-time visitor services staff members for the entire Complex. The staff for coordinating the current level of environmental education and interpretation is available but limits the number and depth of programs and amount of assistance to educators. Maintaining the public use facilities which support environmental education and interpretation is part of routine management duties and staff and funding is available. Additional facilities and visitor services specialists as outlined in the refuges' CCP will enhance opportunities for environmental education and interpretation and improve the quality and quantity of programs.

#### **Anticipated Impacts of the Use:**

There is some temporary disturbance to wildlife due to environmental education activities. However, the disturbance is local, temporary, and generally not detrimental to individual animals or populations. Some habitat is disturbed during activities, but of little long-term consequence. Future increases in facilities and participants would cause some displacement of habitat and increase in disturbance, but this is negligible given the controlled nature of environmental education and the size of the Complex. Control of areas used by groups would avoid or minimize intrusion into sensitive habitats or wildlife areas.

#### **Determination (Check One Below):**

- ☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

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**Stipulations Necessary to Ensure Compatibility:**

1. Environmental education activities not lead by refuge staff will require, at a minimum, verbal approval by the respective refuge manager or visitor services specialist to minimize conflicts with other groups, safeguard students and resources, and to allow tracking of use levels. Refuge managers may require special use permits at their discretion.
2. Environmental education (including refuge-conducted) will not be allowed in closed areas when closed to hunting, or administrative closed areas.
3. Students and teachers will continue to be instructed on the best ways to view wildlife with minimal disturbance.
4. Educational groups are required to have a sufficient number of adults to supervise their groups, a minimum of 1 adult per 30 students.
5. Increased communication with teachers conducting their own activities on the refuge will help educate about minimizing wildlife disturbance.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

\_\_\_\_\_ Categorical Exclusion without Environmental Action Statement

\_\_\_\_\_ Categorical Exclusion and Environmental Action Statement

  X   Environmental Assessment and Finding of No Significant Impact

\_\_\_\_\_ Environmental Impact Statement and Record of Decision

**Justification:**

Environmental education and interpretation are used to foster an understanding in citizens of all ages to act responsibly in protecting a healthy ecosystem. They are tools to use in building land ethic, developing support of the Refuge System, and decreasing wildlife violations. Environmental education and interpretation increases visibility in the community and improves the image of the Refuge System and the Service.

Environmental education and interpretation are important and provide visitors with an awareness of refuge-specific issues such as wetland ecology, migratory bird management, and issues relating to the entire Refuge System. Environmental education is expected to increase while ensuring compatibility with the purpose for which the refuge was established.

Most environmental education and interpretation will occur at, or be directed to, existing and future facilities in strategic locations providing quality opportunities while limiting wildlife and habitat disturbance. Disturbance to wildlife is also limited by the size and remote nature of large parts of the refuges. Many species have also grown more tolerant of human presence due to railroads, highways, and river traffic adjacent to or through the refuges. Disturbance is also generally short-term and only temporarily displaces wildlife, and adequate adjacent habitat is usually available for wildlife. The approval process for groups will limit disturbance to wildlife and ensure avoidance of sensitive areas. Numerous other stipulations will be in place to facilitate these uses while reducing direct and indirect impacts.



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As two of the six priority public uses of the Refuge System, these uses are to be encouraged when compatible with the purposes of the refuges. The refuges provide outstanding environmental education and interpretation opportunities due to the diversity of wildlife and habitat, and the range of environmental issue. For example, increasing concerns with invasive species provide a subject for environmental education exploration and interpretation. The extensive education community bordering the refuges desires more opportunities for hands-on experiential learning. Educating students of all ages about the resources and challenges of the Refuge System is an important way to influence the future well-being of this Complex of refuges. Only through understanding and appreciation will people be moved to personal and collective action to ensure a healthy refuge for the future.

**Mandatory 15-Year Re-evaluation Date: 06/17/2026**

**Use:** Recreational Fishing

**Refuge Name:** Pinckney Island, Savannah, Tybee, Wassaw, Harris Neck, and Blackbeard Island NWRs

**Counties:** Chatham, Effingham, and McIntosh Counties, Georgia; Jasper and Beaufort Counties, South Carolina

**Description of Use:**

The refuges allow public recreational fishing in accordance with state regulations and seasons and applicable refuge regulations. The refuge offers a variety of fishing opportunities throughout the year. However, areas open to fishing vary seasonally to avoid conflicts with other management activities. Fishing is one of the most popular activities on the Complex, with almost 79,000 fishing visits reported in 2008.

With the exception of Tybee and Wolf Island NWRs, refuges are open to fishing year-round as outlined in the comprehensive conservation plan. Savannah NWR has a seasonal closure on the managed impoundments during the times that wintering waterfowl are on the refuge, from December 1 - February 28.

All fish species allowed by the South Carolina and Georgia Departments of Natural Resources will be permitted for harvest. Harvest methods may be more restrictive than state regulations permit. Closed areas may be established in the future if refuge personnel determine that wildlife species are negatively impacted by fishing activity. Only non-motorized boats or boats with electric motors are allowed in freshwater areas of the refuges that are open to fishing. Anglers can access the refuge via the main refuge road or by boat for the island refuges.

**Availability of Resources:**

Anglers use the existing network of roads to access the various areas of the Complex for fishing. Harris Neck NWR provides a boat ramp, fishing pier, signs, and other facilities to assist anglers. The refuge provides staff to maintain facilities, disseminate information to visitors, and enforce regulations. No fisheries management is conducted on any of the refuges within the Complex.

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Adequate resources are available to manage the existing fishing program at the current level of participation. However, funding for law enforcement staff time and printing of the Hunting and Fishing Regulations brochure is lacking some years, calling for a redirection of existing refuge funding. This redirection is often at the expense of other refuge programs such as monitoring, maintenance, and other public use programs.

Proposals in the comprehensive conservation plan should help address these funding concerns. As funding becomes available, additional parking, information kiosks, fishing piers, boat ramps, docks, and piers may be added.

### **Anticipated Impacts of the Use:**

Recreational fishing should not adversely affect the fisheries resource, wildlife resource, or any other natural resources of any of the five refuges open to the public. There may be some limited disturbance to certain species of wildlife and some trampling of vegetation; however, this should be short-lived and relatively minor and would not negatively impact wetland values of the refuge. Known bird rookery sites do not occur at locations currently popular for fishing activities; therefore, disturbance should not be a problem. If disturbance at these sites is identified as a problem in future years, closed areas would be established during the nesting season.

Time and space zoning of refuge use would be utilized as necessary to minimize wildlife disturbance. Problems associated with littering and illegal take of fish would be controlled through law enforcement activities. Providing information to refuge visitors about rules and regulations, along with increased law enforcement patrol, would keep these negative impacts to a minimum.

Based on available information, threatened and/or endangered species documented on the refuges include wood stork, manatee, sea turtles, and piping plover. It is anticipated that expected levels of fishing or other wildlife-dependent recreation activities would not directly, indirectly, or cumulatively impact any listed, proposed, or candidate species or designated/proposed critical habitat. Data gathered from future biological surveys regarding the importance or potential importance of the refuge to threatened or endangered species or critical habitat (or proposed threatened, endangered, or critical habitat), could result in changes to public use activities in the future; however, these changes would have no effect on listed species. Accommodating this wildlife-dependent use is expected to result in minimal impacts.

All motor vehicle use associated with fishing is restricted to designated roads, trails, and parking areas which reduces disturbance to wildlife. Disturbance to habitat is minimal. Undoubtedly some shoreline erosion would be caused by boat wakes, but it is relatively minor compared to that caused by high water events and wind driven wave action.

### **Determination (Check One Below):**

- ☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

### **Stipulations Necessary to Ensure Compatibility:**

To ensure compatibility with refuge purposes and the mission of the Refuge System, recreational fishing can occur on the refuges if the following stipulations are met:

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1. This use must be conducted in accordance with state and federal regulations, and applicable special refuge regulations published in the Public Use Regulations brochure.
  2. Closed areas and no motors allowed limit disturbance to large numbers of resting and feeding waterfowl.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

\_\_\_\_\_ Categorical Exclusion without Environmental Action Statement

\_\_\_\_\_ Categorical Exclusion and Environmental Action Statement

  X   Environmental Assessment and Finding of No Significant Impact

\_\_\_\_\_ Environmental Impact Statement and Record of Decision

**Justification:**

Recreational fishing is one of the six priority public uses made available on national wildlife refuges as indicated by the Improvement Act. This use will allow the visiting public to safely enjoy quality fishing on public land while other visitors enjoy wildlife observation, photography, hiking, or learning about the natural resources of the area.

Fishing seasons and limits are established by the states and adopted by the refuge. These restrictions ensure the continued well-being of overall populations of fish. Fishing does result in the taking of many individuals within the overall population, but restrictions are designed to safeguard adequate population and recruitment from year-to-year. Specific refuge regulations address equity and quality of opportunity for anglers, and help safeguard refuge habitat. Disturbance to other fish and wildlife does occur, but this disturbance is generally short-term and adequate habitat occurs in adjacent areas.

Conflicts between anglers are localized and addressed through law enforcement, public education, and continuous review and updating of state and refuge regulations. Allowing this use also furthers the mission of the Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the refuge. Fishing seasons and limits are established by the states and adopted by the refuge. These restrictions ensure the continued well-being of overall populations of fish.

Allowing this use also furthers the mission of the Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the refuges.

**Mandatory 15-Year Re-evaluation Date: 06/17/2026**

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**Use:** Hiking

**Refuge Name:** Pinckney Island, Savannah, Wassaw, Harris Neck, and Blackbeard Island NWRs

**Counties:** Chatham, Effingham, and McIntosh Counties, Georgia; Jasper and Beaufort Counties, South Carolina

**Description of Use:**

Hiking is an existing use on Pinckney Island, Savannah, Wassaw, Harris Neck, and Blackbeard Island NWRs. Vehicular access is non-existent or limited on these refuges and bicycling and hiking are the primary means by which wildlife-dependent activities such as wildlife observation and photography are conducted. Public use on all refuges is limited to day use activities.

On Pinckney Island NWR, foot and bicycle traffic are permitted on all refuge roads and trails, other than roadways within the manager's residence which are closed to public access. Motorized vehicles are restricted to the refuge entrance road and the paved parking area.

On Savannah NWR, foot and bicycle travel is permitted on all refuge roads and dikes other than the maintenance shop entrance road, north of U.S. 17 between impoundments #6 and #7. Access to all impoundments (#31-39) via the dike network north of U.S. 17 is closed to the general public from November 1 through March 14 to reduce disturbance to wintering waterfowl. The Laurel Hill Wildlife Drive, a 1-way, unpaved, 4.5-mile-long drive through the refuge's impoundment system south of U.S. 17, is open to vehicular, foot, and bicycle traffic. The 1-mile Tupelo Swamp Trail is open to foot traffic only. The Cistern Walk is also restricted to foot travel.

On Wassaw NWR, hiking and bicycling is permitted along the 40 miles of primitive roads and 7 miles of beach. Only foot travel is permitted on Pine Island, one of the units of the refuge. Other islands within this refuge are closed to public entry. Additionally, 180 acres of a private inholding are closed to public entry except along the Main Road and the Avenue, roads that intersect the property.

On Harris Neck NWR, all refuge roads and trails are open to foot and bicycle travel unless the area is posted as closed.

On Blackbeard Island NWR, all roads, trails, and levees are open to foot and bicycle travel. There is no vehicular access on this offshore island. Additionally, hiking and bicycling is permitted along 7 miles of beach. Only a small percentage of refuge visitors venture off the beach onto the trail system.

**Availability of Resources:**

As this use supports wildlife observation and photography, no additional resources above those needed to facilitate these priority public uses are needed to manage hiking.

At Savannah NWR, two trails (the Tupelo Swamp and Cistern Walk) were developed specifically for foot traffic. Maintenance costs for these primitive trails are less than \$1,000 annually as they are only periodically maintained.

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**Anticipated Impacts of the Use:**

Short-term impacts: Mechanized forms of recreation can have the greatest impact on wildlife, causing habitat destruction, disturbance, and disruption of animal behavior, noise pollution, and even direct mortality (Boyle and Samson 1983, Boyle and Samson 1985). Since motorized vehicles are not permitted on three of the refuges, the primary disturbance factor may be the size of groups participating in various activities, such as hiking.

Of particular concern at Blackbeard Island and Wassaw NWRs is disturbance to beach nesting birds such as gulls, terns, and other shorebirds. Large numbers of shorebirds congregate for the purposes of breeding, feeding, loafing, nesting, and wintering during various seasons throughout the year. Hiking may disturb these activities. Additionally, hiking may destroy vegetation. Other impacts involve violation of refuge regulations (e.g., harassing wildlife, removing animals and plants, littering, and vandalism).

On other refuges, disturbance will primarily occur along the wildlife drives and trails and the dikes that intersect these drives.

There are no anticipated long-term or cumulative impacts.

**Determination (Check One Below):**

☐ Use is not compatible.

☒ Use is compatible with the following stipulations.

**Stipulations Necessary to Ensure Compatibility:**

Pinckney Island NWR: The refuge's road and trail system will be open during daylight hours to foot and bicycle travel. No motorized vehicles will be permitted beyond the public parking area. Access to trails adjacent to freshwater ponds will be prohibited during periods of high concentrations of nesting wading birds. Law enforcement patrol will minimize impacts from violations. Outlying islands within the refuge (Big Harry, Little Harry, Corn and Buzzard Islands) will remain closed to the public.

Savannah NWR: Refuge roads and trails will be open during daylight hours only. Only foot and bicycle travel will be permitted on refuge dikes. The Tupelo Swamp and Cistern trails will be open for foot traffic only. Access to dikes north of U.S. 17 will be closed to public access from November 1 through March 14, to prevent disturbance to wintering waterfowl. Law enforcement patrol will continue in an effort to minimize impacts from violations.

Wassaw NWR: Law enforcement patrol of the beach and roadways will continue to minimize impacts. Current regulations which limit public use to day use only will be maintained. In addition, roads and trails leading to freshwater ponds that support wading bird rookeries or roosts will be closed when these sites are active. Beach use at the dune level will be regulated as needed by closure of specific areas (e.g., loggerhead turtle nesting areas and or shorebird nesting areas). Beach use from the high-water to the low-water marks will be regulated through enforcement of Title 50 CFR.

Harris Neck NWR: The public access route of the refuge will remain open during daylight hours. During wood stork and wading bird nesting season, rookery sites will be closed to the public. Other sensitive areas, such as the wood duck banding site at Bluebill Pond, will be closed seasonally to prevent disturbance.

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Blackbeard Island NWR: Law enforcement patrol of the beach and roadways will continue to minimize impacts. Current regulations of day-use only will be maintained. In addition, Flag Pond and adjacent levees will be closed March 1 to August 31 to protect sensitive stork and wading bird rookeries from disturbance. Other rookery sites will be seasonally closed, as well. Beach use at the dune level will be restricted during sea turtle nesting season (May 1 through October 30).

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

\_\_\_\_\_ Categorical Exclusion without Environmental Action Statement

\_\_\_\_\_ Categorical Exclusion and Environmental Action Statement

  X   Environmental Assessment and Finding of No Significant Impact

\_\_\_\_\_ Environmental Impact Statement and Record of Decision

**Justification:**

On the five refuges within the Complex where this activity will be permitted, hikers account for a small percentage of visitors (Pinckney Island NWR, 30 percent; Savannah NWR, 20 percent; Wassaw NWR, 30 percent; Harris Neck NWR, 12 percent; and Blackbeard Island NWR, 40 percent). Hiking is a low-impact and low-cost activity to manage. Only two trails have been developed to specifically facilitate this activity. The refuges' existing road and dike systems, maintained for management purposes, are ideally suited for this activity. Additionally, two of the refuges are island refuges accessible by boat only. Hiking supports wildlife observation and photography, two of the six priority public uses of the Refuge System and facilitates the public's ability to experience and appreciate wildlife on the refuges.

**Mandatory 10-Year Re-evaluation Date: 06/17/2021**

**Literature Cited**

Boyle, S. A. and F. B. Samson. 1983. Nonconsumptive outdoor recreation: An annotated bibliography of human-wildlife interactions. Special Scientific Re.-Wildl. No. 252, USDI, Washington, D.C. 113 pp.

Boyle, S. A. and F. B. Samson. 1985. Effects of nonconsumptive outdoor recreation of wildlife: A review. Wildl. Soc. Bull. 13(2):110-116.

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**Use:** Public Hunting

**Refuge Name:** Pinckney Island, Savannah, Tybee, Wassaw, Harris Neck, Blackbeard Island, and Wolf Island NWRs

**Counties:** Chatham, Effingham, and McIntosh Counties, Georgia; Jasper and Beaufort Counties, South Carolina

**Description of Use:**

Allow public hunting for big-game (white-tailed deer, wild turkey, and hogs), upland/small game, and waterfowl. About 60 percent of the Complex is open to hunting for these species. Season dates, bag limits, and harvest methods are generally consistent with state regulations, with a few refuge-specific regulations. To increase wildlife observation opportunities during the hunting season or to minimize conflict between user groups, several “No Hunting” zones have been designated. A Hunting Regulations brochure is available to inform the public of hunting opportunities and refuge regulations.

**Availability of Resources:**

The designated areas open to public hunting are open in accordance with state and refuge regulations and do not require preparation and administration of special hunts. An estimated 2,037 visits for hunting were made to the refuges in 2008. Except for 1-day quota firearms hunts for deer, crowding has not been an issue as sufficient resources appear to exist to accommodate the current level of participation and provide a quality hunting experience.

Hunters use the existing network of roads to access areas open to hunting. Parking lots, boat ramps, restrooms, docks, leaflets, information kiosks, and signs are provided by the refuge for use by hunters. The refuge also provides staff and volunteers to maintain these facilities and disseminate information to visitors. Additional parking lots and boat ramps are provided by other agencies, local units of government, or private interests. Hunters residing next to the refuge boundary are often able to access open hunting areas from their property. Refuge law enforcement officers, Service special agents, and state conservation officers and wardens enforce state and refuge hunting regulations. Adequate resources are available to manage the existing hunting program at the current level of participation. However, funding for law enforcement staff time and printing of the Hunting Regulations brochure is lacking some years, calling for a redirection of existing refuge funding. This redirection is often at the expense of other refuge programs such as monitoring, maintenance, and other public use programs. Proposals in the comprehensive conservation plan should help address these funding concerns.

**Anticipated Impacts of the Use:**

Accommodating this wildlife-dependent use is expected to result in minimal impacts. Although hunting causes mortality to wildlife, season dates and bag limits are set with the long-term health of populations in mind. Populations of certain species (e.g., white-tailed deer) are monitored by refuge staff. Survey information indicates that a limited harvest will not adversely affect the overall deer population level. Without harvests, deer will quickly overpopulate an area causing degradation to the quality and quantity of vegetation. Therefore, deer hunting promotes a healthier, more robust, and diverse refuge plant community. Deer hunting may also reduce the number of deer/car collisions on adjacent highways.



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Disturbance to wildlife may also result from hunting activity. This disturbance is expected to be limited in scope and duration. Because hunting is not permitted in refuge "No Hunting" zones during the duck hunting season, this use is not a source of disturbance to waterbirds concentrated in these areas. All motor vehicle use is restricted to designated roads, trails, and parking areas which reduces disturbance to wildlife. Disturbance to habitat is minimal given the nature of this hunting and restriction of vehicle use. Hunting is prohibited on the Complex when seasons are closed. This regulation reduces the potential for conflicts between the various refuge user groups. Hunters occasionally violate regulations, such as exceeding the daily bag limit, using permanent tree stands, or hunting in the wrong area. However, these incidents usually have only minor impacts to wildlife populations or refuge resources. Positive impacts will occur from the removal of feral hogs.

**Determination (Check One Below):**

- ☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

**Stipulations Necessary to Ensure Compatibility:**

To ensure compatibility with refuge purposes and the mission of the Refuge System, hunting can occur on the refuge if the following stipulations are met:

1. This use must be conducted in accordance with state and federal regulations, and special refuge regulations published in the Hunting Regulations and Public Use Regulations brochures.
2. Administrative closed areas are closed to all hunting and reduce conflicts between hunting and non-hunting users groups. Closed areas, by default, also reduce conflicts since they are closed to hunting during waterfowl seasons but open to most other public uses, although the public is asked to avoid the areas.
3. To minimize potential conflicts between user groups, no hunting should occur on the refuge prior to September 1 of each year and all hunting should end March 15, except for spring wild turkey hunting.
4. This use is subject to modification if on-site monitoring by refuge personnel or other authorized personnel results in unanticipated negative impacts to natural communities, wildlife species, or their habitats.
5. Changes outlined in the comprehensive conservation plan, if approved, could have some effect on hunting covered in this determination. Changes will be incorporated in a new Hunt Plan and a new compatibility determination will be prepared at that time.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- ☐ 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

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**Justification:**

Hunting seasons and bag limits are established by the states and generally adopted by the refuge. These restrictions ensure the continued well-being of overall populations of game animals. Hunting does result in the taking of many individuals within the overall population, but restrictions are designed to safeguard adequate breeding populations from year-to-year. Specific refuge regulations address equity and quality of opportunity for hunters, and help safeguard refuge habitat. Disturbance to other fish and wildlife does occur, but this disturbance is generally short-term and adequate habitat occurs in adjacent areas. Loss of plants from boat or foot traffic is minor, or temporary, since hunting occurs mainly after the growing season. Conflicts between hunters are localized and are addressed through law enforcement, public education, and continuous review and updating to state and refuge hunting regulations. Conflicts between other various user groups are minor given the season of the year for hunting, the location of most hunting away from public use facilities, and the system of closed areas.

Stipulations above will ensure proper control of the means of use and provide management flexibility should detrimental impacts develop. Allowing this use also furthers the mission of the Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on the refuge.

**Mandatory 15-Year Re-evaluation Date:** 06/17/2026

**Use:** Mosquito Control

**Refuge Name:** Savannah, Tybee, and Wassaw NWRs

**Counties:** Chatham and Effingham Counties, Georgia; Jasper County, South Carolina

**Description of Use:**

Chatham County Mosquito Control proposes the control of black salt marsh mosquitoes (*Aedes taeniorhynchus*) and brown salt marsh mosquitoes (*Aedes sollicitans*) on portions of three refuges. On Savannah NWR, the treatment area would include Onslow Island. On Tybee NWR, treatment would occur on the high salt marsh depressions and swales. On Wassaw NWR, 160 acres of marsh would be treated. This is a historic use that has occurred on these refuges since 1977. This Compatibility Determination is an interim determination to be in place until such time as an Integrated Pest Management Plan and Environmental Assessment can be completed for the mosquito control program on Savannah Coastal Refuges Complex.

Chatham County practices integrated pest management (IPM) which incorporates physical, biological, and chemical controls. Surveillance, the location and monitoring of mosquito-breeding sites, is essential for successful implementation of control strategies. Physical control occurs when known mosquito breeding sites are altered to reduce or eliminate immature mosquito populations. Physical control is the longest lasting and most economical strategy for mosquito control. It may reduce or eliminate the need for chemical controls. Biological controls, such as mosquito eating fish, are not used on refuges at this time. In the future, if there is a native, non-invasive fish species that can be utilized without causing irreparable harm, biological controls may be implemented.

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Currently, chemical control is the preferred method of treatment of the three refuges. Pesticide applications supplement physical controls. Chemicals used are registered by the Georgia Department of Agriculture and labeled by the U.S. Environmental Protection Agency. Pesticide applications are made only when needed and post-treatment inspections are conducted to measure effectiveness. Applications are not made in the absence of mosquitoes except in a limited number of known mosquito breeding sites. Chemical controls include both larviciding and adulticiding, but adulticiding is not permitted on any of the refuges within the Complex.

Larviciding is the application of pesticide to water for control of immature mosquitoes. Altosid, an insect growth regulator, is used on Savannah, Tybee, and Wassaw NWRs. Altosid blocks development of the mosquitoes into the adult stage, which prevents the emergence of breeding, biting adults without upsetting the food chain or impacting non-target species. The Altosid formulation contains methoprene, which is target-specific and will not affect fish, waterfowl, mammals or beneficial predatory insects. Altosid products also have the lowest toxicity rating of any larvicide; therefore, it is the preferred pesticide for sensitive areas.

Employees of Chatham County Mosquito Control are licensed by the Georgia Department of Agriculture or work under the supervision of licensed technical staff. All application equipment is regularly calibrated to ensure that correct amounts of pesticide are delivered.

#### **Anticipated Impacts of the Use:**

There are no anticipated short-term, long-term or cumulative impacts. Only non-phytotoxic chemicals may be used. The larvicide formulation contains methoprene, which is target-specific and will not affect fish, waterfowl, mammals, or beneficial predatory insects, and also has a low toxicity rating preferred for sensitive areas.

#### **Determination (Check One Below):**

- ☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

#### **Stipulations Necessary to Ensure Compatibility:**

1. A special use permit outlining the treatment areas, chemicals, application rates, and application methods will be issued each year treatment is required.
2. Only Georgia Department of Agriculture and EPA approved larvicides will be approved for application in sensitive salt marsh areas.
3. The permittees will obtain all required federal, state, and local permits. These permits shall be presented upon application for the special use permits.
4. Permits may be revoked for violations or noncompliance with the permit and/or federal, state, or local laws and regulations.

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5. Prior to any and all flights over refuge lands, permittee will notify the appropriate refuge staff as follows:

- a. Wassaw NWR – Peter Range (912) 652-4415, ext. 112; cell (912) 313-1364
- b. Savannah and Tybee NWRs – Russ Webb (843) 784-6758; cell (912) 313-1366

In the event that the appropriate staff cannot be contacted, please call Savannah Coastal Refuges Complex headquarters at (912) 652-4415 and request that the manager be contacted by radio and be notified of the flight schedule.

- 6. The portions of refuge lands to be inspected and treated include the dredge disposal areas within the Savannah NWR boundaries, all of Tybee NWR, and the marsh areas of Wassaw NWR, excluding the eagle nesting area on Flora hamock as described below.
- 7. The eagle nest located on Wassaw NWR, Flora Hammock, will be excluded from inspection flights during the breeding season from December 1 – May 15. The eagle nest will have a 1,500-foot no fly buffer zone in effect during this time. A prescribed flight path, designed to avoid possible disturbance to nesting eagles, was determined by staff from the refuge and Chatham County and is attached.
- 8. Pilots from Chatham County will phone in any illegal activity witnessed while in flight to Chatham County headquarters, who will then immediately notify Savannah Coastal Refuges Complex headquarters.
- 9. In the event of a potential outbreak of disease that could affect human health, Savannah Coastal Refuges Complex headquarters will be notified immediately.
- 10. Permittee, its successors and assigns, agree to protect, indemnify, defend and hold harmless the United States of America from any and all loss, damage, liability, claims, demands, or suits of any nature whatsoever asserted by employees of the permittee or by third persons for property damage or loss, personal injury or death, arising out of, in connection with, or incidental to activities conducted under the special use permit. This indemnity shall include, without limitation, costs, expenses, and attorney's fees occasioned by said loss, damage liability, claims, demands, or suits, as well as the full amount of any judgement rendered or compromise settlement made, plus court costs and interest. This indemnity shall inure to the benefit of agents, officers, and employees of the United States of America.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

\_\_\_\_\_ Categorical Exclusion without Environmental Action Statement

\_\_\_\_\_ Categorical Exclusion and Environmental Action Statement

  X   Environmental Assessment and Finding of No Significant Impact

\_\_\_\_\_ Environmental Impact Statement and Record of Decision

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**Justification:**

The black salt marsh mosquito and the brown salt marsh mosquito are the primary pest mosquitoes for coastal Georgia. These species breed in the high salt marsh areas flooded by rain or extreme tidal flooding. Their breeding sites are relatively small areas which allow a focused control response. The larvicide to be used is species specific and approved for application in sensitive salt marsh habitats. The larvicide is non-phytotoxic and does not enter the food chain or impact non-target species. The larvicide will not affect fish, waterfowl, mammals or beneficial predatory insects. Further, the larvicide used by Chatham County Mosquito Control has the lowest toxicity rating of commonly applied larvicides; therefore, it is the preferred pesticide for sensitive areas. Tybee NWR is close to high-density urban areas in the city of Savannah and Chatham County. Uncontrolled mosquito populations on all three refuges can make a significant impact on the quality and health of life of surrounding residents.

**Mandatory 10-Year Re-evaluation Date:** 06/17/2021

**Use:** Scientific Research

**Refuge Name:** Pinckney Island, Savannah, Tybee, Wassaw, Harris Neck, Blackbeard Island, and Wolf Island NWRs

**Counties:** Chatham, Effingham, and McIntosh Counties, Georgia; Jasper and Beaufort Counties, South Carolina

**Description of Use:**

Scientific research (including collecting and surveys) is an existing use of the refuges. While it is not one of the six priority public uses of the Refuge System, this use contributes to staff's knowledge concerning flora and fauna of the refuges, and often provides information that assists in habitat management.

Current projects include: tidal wetland study; population dynamics of short nose sturgeon; population monitoring and recovery of striped bass; population dynamics, feeding habits, and survivorship of loggerhead sea turtles; population monitoring of painted buntings; population monitoring of red knots and piping plovers; impacts of wetland restoration on plant and herptofauna communities; genetics, juvenile movement, mercury levels, and survivorship of wood storks; and, life history of Chinese tallow tree.

Research projects involve approximately 30 people annually, with work projects often spread over multiple refuges. The geographic position of seven coastal refuges affords researches the opportunity to form replicates of their studies to determine whether results are area specific or can be applied range wide. Long-term projects and surveys may occur year-round, while special surveys may be of a short duration. Typically, each researcher provides all the necessary personnel and equipment to conduct the project. Each project proposal is evaluated by station biologists on its individual merit through the special use permit process. Special conditions that are site-specific are attached to the permit. Additionally, projects that involve threatened and endangered species will be evaluated through the Section 7 Consultation Process with the Service's Ecological Services Division. It is important to note that not all research proposals are permitted and emphasis is placed on projects that will directly benefit refuge management programs.

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**Availability of Resources:**

Ancillary administrative and maintenance costs are associated with managing this use. Researchers typically provide their own equipment and personnel. Requests for the station to provide support for research projects in the form of personnel assistance, equipment, facilities, or maintenance of project sites, will be closely scrutinized during the project proposal and special use permit evaluation phases.

**Anticipated Impacts of the Use:**

Short-term impacts: Presence of researchers may cause temporary habitat destruction, disturbance, displacement, and disruption of animal behavior. The benefits of the findings from the research projects far outweigh any temporary negative effects. For threatened and endangered species, or species of concern or in decline, research designed to monitor, enhance, or sustain these populations will be emphasized. Habitat management projects with implications to enhance management on the refuges for particular species or suites of species will be encouraged. Each research proposal will be reviewed on an individual basis, with higher emphasis granted to research related to threatened and endangered species, priority habitats, and that support the purposes for which each refuge was established. Finally, research for the sake of pure research, with no application to management practice, will be scrutinized and discouraged.

There are no anticipated long-term or cumulative impacts.

**Determination (Check One Below):**

- ☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

**Stipulations Necessary to Ensure Compatibility:**

Suveys, research, and collecting will be evaluated on a case-by-case basis through project proposals, special use permits, Section 7 Consultations, and other documents. Refuge biologists and managers will review proposals and provide recommendations as to the appropriateness and value of each project. Special conditions governing time, location, and methodology will be attached to special use permits to ensure compatibility with each refuge's purpose.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- ☐ 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

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**Justification:**

Use of the refuges for scientific research, collection, and surveys is consistent with improving habitat conditions and enhancing wildlife and habitat management.

**Mandatory 10-Year Re-evaluation Date:** 06/17/2026

**Use:** Timber Harvest

**Refuge Name:** Pinckney Island, Savannah, Tybee, Wassaw, Harris Neck, Blackbeard Island, and Wolf Island NWRs.

**Counties:** Chatham, Effingham, and McIntosh Counties, Georgia; Jasper and Beaufort Counties, South Carolina

**Description of Use:**

Active forest management utilizing conversion of existing pine plantations, and implementing uneven-aged, selective timber harvest will be proposed in the Forest Habitat Management Plan for the Complex. This timber harvest would restore altered/degraded habitats through use of customary Service timber sale procedures. We would utilize common silvicultural actions (individual tree selection techniques designed to create uneven-aged, highly diverse stands) based on site-specific needs identified through review of current priority wildlife species habitat requirements. This alternative would be implemented utilizing timber sales with special conditions incorporated to achieve needed restoration, and would include gradual implementation of silvicultural actions across a 15-year cycle. Pine plantations would be converted to a mixed pine-hardwood condition through the use of prescribed fire and thinning within the plantations, allowing hardwood regeneration. This uneven-aged system would also be beneficial in the restoration and management of the longleaf pine ecosystem.

Some of these plantations are currently in a merchantable age class and are ready for a first thinning. This thinning should occur within the next 5 years, followed by a second thinning over the following 10 years. These plantations will be converted to a mixed pine-hardwood type during the 15-year cycle. Forest prescriptions will describe the specific management techniques proposed to accomplish refuge objectives on specific stands of forest habitat within the compartment. The prescription, with approval from the appropriate Ecological Services Office and Regional Office, will become a working plan to be used by field personnel to accomplish the proposed management objectives.

The forest management program on the Complex is designed to produce or maintain the desired wildlife habitat, focusing on threatened and endangered species, migratory forest birds, and resident wildlife in general. As long as commercial harvesting activities can be adapted to meet refuge objectives, they will be utilized to produce the desired habitat.

**Availability of Resources:**

Administrative and maintenance costs may be associated with managing the implementation of the timber harvest. Currently, there are no forest management staff based at this Complex; however, assistance will be sought from foresters within the Region to prepare compartment prescriptions.



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Monitoring of timber harvests to ensure compliance will be accomplished by refuge wildlife biologists and the prescribed fire specialist. Forest habitat management expenses will involve funding of any non-commercial treatments or other forestry operations, or improvements of roads for forest management. Operating expenses will include purchase of fuel, marking paints, computers, office supplies, and other miscellaneous expenses.

**Anticipated Impacts of the Use:**

The majority of anticipated impacts of the timber harvest are expected to be positive. These positive impacts include timber stand improvements, which, in turn, will provide better habitat for wildlife, and will improve the health and safety of the forest ecosystems.

Negative short-term impacts associated with forest thinning may include low productivity habitats, potential rutting and siltation, and wildlife disturbance through equipment use during the periods of timber harvest. Negative impacts associated with silvicultural treatments will be short-term and minimized through consideration and biological planning. There are no anticipated long-term or cumulative negative impacts associated with timber harvest as described.

**Determination (Check One Below):**

- ☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

**Stipulations Necessary to Ensure Compatibility:**

Before any timber harvest is conducted, a forest habitat management prescription on the compartment will be completed. Prescriptions will be written in accordance with the Service's Refuge Manual. All prescriptions will be submitted to the Regional Office for approval prior to harvest. All management activities (prescribed fire and timber management) will be in compliance with Section 106 of the National Historic Preservation Act.

Timber sales will be conducted according to established Service policy. Upon selection of a successful bidder by the refuge manager, a harvesting permit will be issued. The Harvesting Permit will include a special use permit, maps locating all sale units, and a copy of the conditions of sale applicable to the timber harvesting.

Close inspection and supervision of all timber sales will be necessary to ensure that harvesting operations meet the condition of the permit and refuge objectives. Once harvesting is complete, the refuge manager or designee will inspect the site for compliance with all requirements of the contract.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

- ☐ 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

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**Justification:**

Section 6 RM 3.2 of the Service's Refuge Manual states, "The policy of the Service is to manage forests in a manner that best meets the overall objectives of a particular refuge." The Complex's Forest Management Plan will adhere to the approved procedures, principles, and techniques listed in the Service's Refuge Manual. This timber harvest will allow refuge staff to conduct appropriate management actions to improve existing forest conditions to benefit a variety of wildlife species and communities. In addition, this plan allows for necessary thinning and fuels reduction that will greatly protect adjacent property and homeowners.

**Mandatory 10-Year Re-evaluation Date:** 06/17/2021

**Use:** Salvage Timber Harvest and Sale

**Refuge Name:** Pinckney Island, Savannah, Tybee, Wassaw, Harris Neck, Blackbeard Island, and Wolf Island NWRs

**Counties:** Chatham, Effingham, and McIntosh Counties, Georgia; Jasper and Beaufort Counties, South Carolina

**Description of Use:**

Salvage harvesting is the removal of dead trees or trees damaged or dying because of injurious agents other than competition (Helms 1998). Traditionally, salvage has been utilized to recover economic value that would otherwise be lost. In the context of the "wildlife first" mission of the Refuge System, salvage harvesting is used to contain the spread of damage agents such as insects (e.g., southern pine beetle, gypsy moth) and disease, and rehabilitate or restore ecological integrity degraded by these agents, as well as by hurricanes, tornados, ice storms, and wildfire.

Due to the wide range of potential injurious agents (e.g., storms, wildfire, insects, and disease) and the seasonality's of the different agents, the potential need for salvage harvesting exists year-round. Salvage harvesting on a refuge is utilizing an economic activity to achieve a biological objective. While the biological impacts of the activity may drive the decision whether or not to implement the activity, the economics determine its feasibility. Damaged timber degrades quickly, losing value rapidly:

Approximate timeline for timber to be salvaged to prevent degradation  
(NC Forest Service Division of Forest Resources 2000)

Product	Harvest Within:	Comments
Pine and hardwood veneer and appearance lumber	4-6 weeks	Blue stain prohibits use if left longer
Pine framing lumber	3-4 months	Should be kiln dried to prevent emergence of secondary insects

Product	Harvest Within:	Comments
Pine posts	4-6 weeks	Blue stain will affect toughness and preservative treatment
Pine and hardwood pulp, fiberboard, particle board, and OSB	8-12 months	As wood begins to decay, pulping process will be affected. Storm damaged wood should be mixed with sound wood

If it is determined that there is a biological need for a salvage harvest, but the timelines are ignored, the harvest could become economically unviable. Given the necessity of speed, these types of timber sales are not sold to the highest bidder. Instead, prospective bidders are contacted, prices for wood products negotiated, and a special use permit issued. While a Section 7 Endangered Species Consultation and a Section 106 Request for Cultural Resource Compliance are required, they are initiated after the salvage is implemented.

Storms such as hurricanes, tornados, and ice storms, wildfires, insects such as southern pine beetle and gypsy moth, and diseases such as annosum root rot, all have the potential to degrade refuge forests in terms of goals and objectives. Basically, the manager must use sound professional judgment to determine if the injurious agents have degraded the ecological integrity of the refuge. If so, and salvage harvesting would help restore ecological integrity, then its use is warranted. If not, then no salvage harvesting should occur.

While ecological integrity provides the basic guidance regarding salvage harvesting, other factors need to be considered. For example, dead timber from a stand-replacing wildfire increases the fuel load in the large diameter size classes. Fine fuels are the primary carrier of a fire, not the large diameter fuels from dead timber (Rothermel 1983). Fire severity, however, is dependent on the availability of surface and ground fuels, of which fallen dead timber is a part (Alexander 1982, Van Wagner 1972). Salvaging dead timber can reduce the total fuel load, possibly reducing fire severity. That said salvage harvest can increase the small and mid-sized fuel load, potentially increasing fire intensity. Ultimately, the question to ask is will the salvage activities result in conditions that, in the event of an unwanted ignition, reduce the possibility of a wildfire that is large, intense, or difficult to control.

This decision-making process must also consider the potential for future damaging agents initiated by the current damage. For example, current storm damaged stands that are not salvaged may cause future insect or disease epidemics:

Timeline for invasion of damaging insects and diseases after storm damage  
(NC Forest Service Division of Forest Resources 2000)

Species	Year One	Year Two
Pine	Bark beetles, ambrosia beetles, sawyers, blue stain fungi, soft rot fungi	Decay fungi
Oak and Hickory	Wood borers, ambrosia beetles, sawyers, soft rot fungi	Sapwood decay fungi
Other hardwoods	Wood borers, ambrosia beetles, sawyers, soft rot fungi	Sapwood and heartwood decay fungi

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## Anticipated Impacts of the Use:

### *Short-term impacts:*

Salvage harvesting disturbs the soil, causing concerns about non-point source pollution. Forestry Best Management Practices are the most appropriate or applicable forest practices or activities to attain a silvicultural goal while protecting the chemical, physical and biological integrity of waterways. Best Management Practices achieve this by minimizing non-point source pollution (i.e., erosion and stream sedimentation) from forestry practices such as salvage harvesting.

Damaged stands may be a source of injurious insect populations that can infest adjacent undamaged stands. Harvesting the damaged timber should reduce the likelihood of adjacent stand becoming infested.

Fallen dead timber increases the large diameter fuel load, increasing the severity of wildfires, especially during drought. However, salvage harvesting can increase the small and mid-sized fuel load, thus increasing the fire intensity. Salvage harvesting after wildfire should be integrated with prescribed fire to mitigate this negative effect.

### *Long-term impacts:*

Damage to existing stands has the potential to convert the current forest type to something else. Whether or not that conversion is desirable depends on refuge goals and objectives for those stands. If the conversion is undesirable, further management action will be necessary to ensure future stands that are compatible with refuge goals and objectives – for example, planting pine after a southern pine beetle epidemic to restore red-cockaded woodpecker habitat.

The potential exists for the damage agent to release invasive exotic plants that were suppressed by the overstory of the previous stand. Aggressive management action, from salvage harvesting to allow access to the site to integrated pest management as control measures, may be required to contain the exotic plants.

### *Cumulative impacts:*

Inappropriately utilizing salvage harvesting on a refuge (i.e., with an economic incentive) may degrade ecological integrity. Properly implementing salvage harvesting (i.e., with an eye towards maintaining or even improving ecological integrity) should have positive cumulative impacts on the refuge by restoring desirable forest conditions in accordance with refuge goals and objectives.

Salvage harvesting is a valuable tool in responding to and recovering from various damaging agents. Salvage can be used to contain a spreading insect or disease epidemic, and can aid in recovering from storm damage or an intense wildfire. Using sound professional judgment to determine, on a case-by-case basis, whether or not salvage harvesting is ecologically justified is a biologically sound and economically efficient approach to responding to unplanned events that impact the forest resources of the refuge.

The Code of Federal Regulations states, “We may only authorize public or private economic use of the natural resources of any national wildlife refuge ... where we determine that the use contributes to the achievement of the national wildlife refuge purposes or the National Wildlife Refuge System mission” (50 CFR 29.1). Salvage harvesting on a refuge is utilizing an economic activity to achieve a biological objective. The manager, using sound professional judgment, determines if the injurious

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agents have degraded the ecological integrity of the refuge. If so, and salvage harvesting would help restore ecological integrity, then its use is justified.

**Determination (Check One Below):**

- ☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

**Stipulations Necessary to Ensure Compatibility:**

Before any timber harvest is conducted, a forest habitat management prescription on the compartment will be completed. Prescriptions will be written in accordance with the Service's Refuge Manual. All prescriptions will be submitted to the Regional Office for approval prior to harvest. All management activities (prescribed fire and timber management) will be in compliance with Section 106 of the National Historic Preservation Act.

Timber sales will be conducted according to established Service policy. Upon selection of a successful bidder by the refuge manager, a harvesting permit will be issued. The harvesting permit will include a special use permit, maps locating all sale units, and a copy of the conditions of sale applicable to the timber harvesting.

Close inspection and supervision of all timber sales will be necessary to ensure that harvesting operations meet the condition of the permit and refuge objectives. Once harvesting is complete, the refuge manager or designee will inspect the site for compliance with all requirements of the contract.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

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

**Mandatory 10-Year Re-evaluation Date: 06/17/2021**

**References**

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- Helms, J., ed. 1998. *The dictionary of forestry*. The Society of American Foresters, Bethesda, MD.
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**Use:** Utility Right-of-Way

**Refuge Name:** Savannah NWR

**Counties:** Chatham County, Georgia; Jasper County, South Carolina

**Description of Use:**

Maintenance of two 30-inch O.D. underground natural gas pipelines over, across, in and upon lands administered by the Savannah NWR, and crossing under the Savannah Front River, approximately 1,800 feet north of the Houlihan Bridge, as described in the original special use permit application dated February 7, 1974.

Maintenance will include up to 200 tons of riprap to be placed within 100 feet of pipelines along 30-year rights-of-way granted to the Southern Natural Gas Company by the U.S. Fish and Wildlife Service on October 9, 1974. Maintenance may also include re-painting of signs and vegetation control along the pipeline right-of-way.

**Anticipated Impacts of the Use:**

There have been no long-term negative impacts to the refuge. However, there has been some short-term disturbance to wildlife as a result of increased human activity and noise during maintenance operations. This disturbance is minimal.

Positive impacts from laying of riprap has included a reduction in erosion along river banks caused by natural flow patterns around established pipeline structures, excessive tidal flows, and storm runoff, protection of pipelines from accidental rupture and the corresponding habitat degradation which would likely follow a gas spill, and the protection of pipelines from sabotage and vandalism.

Positive impacts from vegetation control and sign repainting have included additional safety from accidental pipeline rupture from dredging or shipping operations. In addition, mechanical vegetation control of rights-of-way may increase the biodiversity of the immediate area by establishing a wider diversity of plant species, creating divergent microhabitats, and producing additional edges, all of which promotes a greater usage by both plant and animal species. If the pipeline were to be removed, the environmental impacts and damage would be severe since it has been established on the refuge for 30 years.

**Determination (Check One Below):**

☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

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**Stipulations Necessary to Ensure Compatibility:**

1. All terms and conditions set forth in the original right-of-way permit as granted on October 9, 1974, and the amendment to this permit dated July 25, 1990, will be adhered to.
2. All general conditions as stated on the reverse of the special use permit will be in effect.
3. All vegetation removal along the pipeline rights-of-way will be accomplished by mechanical means only.
4. No pesticide, solvents, or fuel tanks are allowed on site.
5. Work areas will be kept clean at all times.
6. Firearms are not permitted.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

\_\_\_\_\_ Categorical Exclusion without Environmental Action Statement

\_\_\_\_\_ Categorical Exclusion and Environmental Action Statement

  X   Environmental Assessment and Finding of No Significant Impact

\_\_\_\_\_ Environmental Impact Statement and Record of Decision

**Justification:**

The basic entitlements of this special use permit fall within the provisions originally granted to the Southern Natural Gas Company by the right-of-way agreement signed October 9, 1974, and as amended July 25, 1990. The only divergence with the original permit is the width of the right-of-way where the pipeline intercepts the Savannah Front River. This enlargement was first approved by the Service's Regional Director in the July 25, 1990, amendment to the original right-of-way permit.

Enlargement of the right-of-way in this area has provided necessary safety to the pipeline and has vastly reduced the possibility of a fuel spill from human accidents or natural factors. This right-of-way enlargement has also been necessary for the Southern Natural Gas Company to affectively adhere to conditions stipulated in the original contract. Factors which influenced this need for change in right-of-way size were natural phenomenon, were not caused by Southern Natural Gas Company, and were beyond its control. Continuation of this maintenance program is in the best interest of the Service to provide for security of lands administered by the Service contained within the Savannah NWR.

**Mandatory 10-Year Re-evaluation Date: 06/17/2021**



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## References

Electromagnetic Fields. 1994. Consumer Reports. May, pp 354-359.

Shem, L.M., R.E. Zimmerman, S.D. Zellner, G.D. Van Dyke and J.R. Rastorfer. 1994. Regeneration of vegetation on wetland crossings for gas pipeline rights-of-way one year after construction. Argonne National Laboratory. 14 pp.

Wilkey, P. and R.E. Zimmerman. 1993. Research Summary: Natural Gas Pipeline Corridors through Wetlands. Argonne National Laboratory. 6 pp.

Zimmerman, R.E., G.D. Van Dyke, C.T. Hackney and E.D. Pentecost. 1991. Pipeline corridors through wetland – impacts on plant and avian diversity: boreal wetlands, Oconto County, Wisconsin, Gas Research Institute, Report GRI-91/0046, November.

Zimmerman, R.P., L.M. Shem and G.D. Van Dyke. 1994. Insights gained from studies of gas pipeline rights-of-way of varying ages through wetlands. Argonne National Laboratory. 3pp.

### **Use:** Wildlife Observation and Photography

**Refuge Name:** Pinckney Island, Savannah, Tybee, Wassaw, Harris Neck, Blackbeard Island, and Wolf Island NWRs

**Counties:** Chatham, Effingham, and McIntosh Counties, Georgia; Jasper and Beaufort Counties, South Carolina

### **Description of Use:**

Currently, wildlife observation and photography account for nearly 626,000 visits annually to the Complex. Typical use is by individuals, family groups, school groups, and large groups during refuge-sponsored special events. Wildlife observation and photography are becoming increasingly popular activities for visitors, and a source of economic growth for many communities. As two of the six priority public uses of the Refuge System, these uses are to be encouraged when compatible with the purposes of the refuge. The refuges provide outstanding wildlife viewing opportunities due to the abundance of ducks, warblers, pelicans, herons, and other birds that people find unique and interesting. The highway system that leads to the refuges provides easy access to the lands and waters, making the Complex one of the premier wildlife viewing and photography areas in Georgia and South Carolina. The public and communities desire more opportunities for these uses.

The Complex allows general public access during any time of the year to areas designated as open for observation and photography. The Complex provides some facilities to support wildlife observation and photography including wayside stops and overlooks, hiking trails, canoe, kayak and boat access, and auto tour routes. These facilities offer outstanding wildlife viewing opportunities.

The comprehensive conservation plan recommends adding a full-time volunteer coordinator, an environmental education specialist, a law enforcement officer, and additional facilities including: three new environmental education centers, three observation decks/overlooks/towers, photo blinds, one fishing pier, recreational vehicle pads for volunteers, additional wayside exhibits, and trail guides and maps.

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Guided Observation: Commercially guided observation is discussed in the compatibility determination for this economic use. However, various no-fee or not-for-profit tours are conducted by non-profit groups, schools and colleges, or other agencies. Unlike general public wildlife observation, this use does require a special use permit from the project leader due to the impacts that concentrated groups of people may have. Impacts can also be greater since these tours target backwater areas of the refuge, which often contain sensitive wildlife populations such as nesting colonies of herons and egrets. At present, many of these tours are likely occurring without refuge knowledge.

#### **Availability of Resources:**

Currently, there are three full-time visitor services staff members for the entire Complex. The needed staff for coordinating the wildlife observation and photography programs is available, but limits the number of guided or facilitated programs. Maintaining the public use facilities is part of routine management duties and staff and funding are available. Additional facilities and visitors services specialists will enhance public opportunities for these uses and improve the quality and quantity of programs. Administering special use permits for non-profit guided observation increases overall costs of refuge operations, including but not limited to, development and review of policy and procedure, yearly administration of permits (inquiries, screening applicants, issuing permits), and enforcement of permit conditions. In the short-term, existing staff is adequate. However, the number of permits issued will have to be limited in balance with staff resources. In the long-term, additional administrative and/or other personnel as identified in the comprehensive conservation plan will be needed.

#### **Anticipated Impacts of the Use:**

Disturbance of wildlife is the primary concern regarding these uses. Disturbance to wildlife, such as the flushing of feeding, resting, or nesting birds, is inherent to these activities. There is some temporary disturbance to wildlife due to boating and human activities on trails (canoe, hiking, and biking); however, the disturbance is temporary and generally localized. Increased facilities and visitation would cause some displacement of habitat and increase some disturbance to wildlife, although this is expected to be minor given the size of the refuge and by avoiding or minimizing intrusion into important wildlife locations and habitat.

Guided observation tours generally have impacts similar to the above, but have the potential for significant impacts to nesting colonies of wood storks and egrets, nesting bald eagles, or other species or sensitive habitats without proper restrictions and oversight. These impacts can include nest abandonment and/or separation of young from parents. Larger boats used in guided tours can also uproot plants and increase turbidity in shallow tidal marsh areas, negatively affecting habitat quality or displacing fish and other aquatic species. Guided tours also introduce more people into areas than would generally occur, with an overall increase in noise and visual disturbance to wildlife.

#### **Determination (Check One Below):**

- ☐ Use is not compatible.  
☒ Use is compatible with the following stipulations.

#### **Stipulations Necessary to Ensure Compatibility:**

1. Staff and volunteers will monitor use patterns and densities and make adjustments in timing, location, and duration as needed to limit disturbance.

- 
2. Use will be directed to public use facilities (both existing and in the future), which are not in or near sensitive areas.
  3. Personal portable photo or viewing blinds must be removed each day.
  4. Observation areas will provide wildlife viewing scopes to enhance viewing from a distance which reduces disturbance.
  5. Commercial and not-for-profit guiding operations will be regulated by permit with timing and spacing constraints to protect sensitive wildlife or habitat.
  6. Not-for-profit guiding requests will be considered without fee but under the applicable stipulations governing commercial guides (areas, licensing, insurance, record keeping and reporting, etc.)
  7. Interpretive, wildlife observation and photography activities (including refuge conducted) will be discouraged in closed areas or administrative closed areas.
  8. Trail layout and design will continue to ensure adequate adjacent cover for wildlife and avoid sensitive wildlife areas or habitat.
  9. Interpretive presentations and products will continue to include messages on minimizing disturbance to wildlife.

**NEPA Compliance for Refuge Use Decision:** *Place an X in appropriate space.*

\_\_\_\_\_ Categorical Exclusion without Environmental Action Statement

\_\_\_\_\_ Categorical Exclusion and Environmental Action Statement

  X   Environmental Assessment and Finding of No Significant Impact

\_\_\_\_\_ Environmental Impact Statement and Record of Decision

**Justification:**

Most uses will occur, or be directed to, existing and future facilities in strategic locations providing quality wildlife observation and photography opportunities while limiting wildlife and habitat disturbance. Disturbance to wildlife is limited by the size and remote nature of large parts of the Complex. Many species have grown more tolerant of human presence due to railroads, highways, and boat traffic adjacent to or through the refuge. Disturbance is also generally short-term and only temporarily displaces wildlife, and adequate adjacent habitat is usually available for wildlife. The permitting process for guided tours will limit disturbance to wildlife from larger groups and ensure avoidance of sensitive areas. Numerous other stipulations will be in place to facilitate these uses while reducing direct and indirect impacts.

**Mandatory 15-Year Re-evaluation Date:**   **06/17/2026**

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### Approval of Compatibility Determinations

The signature of approval is for all compatibility determinations considered within the Comprehensive Conservation Plan for the Savannah Coastal Refuges Complex. 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:

Jane M. Gries April 1, 2011  
(Signature/Date)

Regional Compatibility  
Coordinator:

Barbara Hawk May 25, 2011  
(Signature/Date)

Refuge Supervisor:

[Signature] 06/03/2011  
(Signature/Date)

*for* Regional Chief, National  
Wildlife Refuge System,  
Southeast Region:

[Signature] 6-8-11  
(Signature/Date)

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## Appendix G. Intra-Service Section 7 Biological Evaluation

### REGION 4

#### INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

[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:** Jane Griess

**Telephone Number:** 843-784-2468

**E-Mail:** Jane\_Griess@fws.gov

**Date:** 07/05/09

**PROJECT NAME (Grant Title/Number):** Savannah Coastal Refuges Complex (Savannah, Tybee, Pinckney, Wassaw, Harris Neck, and Blackbeard NWRs) Comprehensive Conservation Plan

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**I. Service Program:**

☐ Ecological Services

☐ Federal Aid

☐ Clean Vessel Act

☐ Coastal Wetlands

☐ Endangered Species Section 6

☐ Partners for Fish and Wildlife

☐ Sport Fish Restoration

☐ Wildlife Restoration

☐ Fisheries

☒ Refuges/Wildlife

**II. State/Agency:**

**III. Station Name: Savannah Coastal Refuges Complex**

- Pinckney NWR
- Savannah NWR
- Tybee NWR
- Wassaw NWR
- Blackbeard Island NWR
- Harris Neck NWR

**IV. Description of Proposed Action (attach additional pages as needed):**

The proposed action would result in the implementation of the Comprehensive Conservation Plan for Pinckney, Savannah, Tybee, Wassaw, Blackbeard Island, and Harris Neck NWRs, a 58,000-acre Complex spanning over 100 miles of coastline along South Carolina and Georgia. Approval and subsequent implementation of the CCP will direct management actions on the Complex for the next 15 years.

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**V. Pertinent Species and Habitat:**

**A. Include species/habitat occurrence map:**

**B. Complete the following table:**

SPECIES/CRITICAL HABITAT	STATUS <sup>1</sup>
Loggerhead Sea Turtle	T
West Indian Manatee	E
Wood Stork	E
Piping Plover	T, CH

<sup>1</sup>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:**

Pinckney, Tybee and Savannah NWRs – Ecoregion 33 – Savannah-Santee-Pee Dee Ecosystem

Wassaw, Harris Neck, and Blackbeard Island NWRs – Ecoregion 31 – Altamaha Ecosystem

**B. County and State:**

Pinckney, Tybee and half of Savannah NWRs – Jasper and Beaufort Counties, South Carolina

Wassaw, Harris Neck, half of Savannah, and Blackbeard Island – Chatham and McIntosh Counties, Georgia

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**C. Section, township, and range (or latitude and longitude):**

Pinckney – 80° 45' 41.9" 32° 15' 2.0"

Tybee – 80° 54' 57.1" 32° 2' 37.6"

Savannah – 81° 6' 17.6" 32° 10' 12.6"

Wassaw - 80° 59' 41.6" 31° 53' 46.1"

Harris Neck – 81° 16' 35.4" 31° 37' 50.84"

Blackbeard Island - 81° 12' 22.6" 31° 30' 19.7"

**D. Distance (miles) and direction to nearest town:**

Pinckney NWR – located approximately 6 miles from Bluffton, SC.

Tybee – Located approximately 10 miles from Savannah, GA

Savannah – Located approximately 1 mile from Savannah, GA

Wassaw – Located approximately 8 miles from Savannah, GA

Harris Neck – Located approximately 26 miles from Darien, GA

Blackbeard Island – Located approximately 35 miles from Darien, GA

**E. Species/habitat occurrence:**

**Loggerhead Sea Turtle** - habitat and species both occur - (Wassaw, Blackbeard).

**West Indian Manatee** - habitat and species both occur - (Savannah, Tybee, Pinckney, Harris Neck, Blackbeard, Wassaw).

**Wood stork** - habitat and species both occur (Savannah, Pinckney, Wassaw, Harris Neck, Blackbeard).

**Piping Plover** - habitat and species both occur (Blackbeard, Wassaw).

**American Alligator** - habitat and species both occur (Savannah, Pinckney, Harris Neck, Wassaw, Blackbeard).

**Shortnose Sturgeon** - habitat and species both occur (Savannah, Tybee, Harris Neck, Blackbeard, Wassaw).



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**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):**

<b>SPECIES/ CRITICAL HABITAT</b>	<b>IMPACTS TO SPECIES/CRITICAL HABITAT</b>
Loggerhead Sea Turtle	No impacts anticipated; may expect reduction in impacts through increased habitat monitoring, education, cooperation with partners and increased staff.
West Indian Manatee	Reduction in impacts through increased habitat monitoring, education, cooperation with partners and increased staff.
Wood Stork	No impacts anticipated on refuge lands; reduction in impacts through increased habitat monitoring, education, cooperation with partners and increased staff.
Piping Plover	Reduction in impacts through increased habitat monitoring, education, cooperation with partners and increased staff.

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

<b>SPECIES/ CRITICAL HABITAT</b>	<b>ACTIONS TO MITIGATE/MINIMIZE IMPACTS</b>
Loggerhead Sea Turtle	Additional staff to conduct surveys and increase law enforcement efforts. Increased outreach for education.
West Indian Manatee	Increased water quality monitoring efforts; additional staff to conduct surveys and increase law enforcement efforts.
Wood Stork	Increased water quality monitoring efforts; additional staff to conduct surveys and increase law enforcement efforts. Continue seasonal closure around colony.
Piping Plover	Additional staff to conduct surveys and increased law enforcement.

**VIII. Effect Determination and Response Requested:**

SPECIES/ CRITICAL HABITAT	DETERMINATION <sup>1</sup>			RESPONSE <sup>1</sup> REQUESTED
	NE	NA	AA	
Loggerhead Sea Turtle		X		
West Indian Manatee		X		
Wood Stork		X		
Piping Plover		X		

<sup>1</sup>DETERMINATION/RESPONSE REQUESTED:

*NE = no effect. This determination is appropriate when the proposed action will not directly, indirectly, or cumulatively impact, either positively or negatively, any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested is optional but a "Concurrence" is recommended for a complete Administrative Record.*

*NA = not likely to adversely affect. This determination is appropriate when the proposed action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources. Response Requested is a "Concurrence".*

*AA = likely to adversely affect. This determination is appropriate when the proposed action is likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested for listed species is "Formal Consultation". Response Requested for proposed or candidate species is "Conference".*

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Jane M. Gries      12/28/09  
Signature (originating station)      Date  
Project Leader  
Title

**IX. Reviewing Ecological Services Office Evaluation:**

A. Concurrence \_\_\_\_\_ Nonconcurrence \_\_\_\_\_

B. Formal consultation required \_\_\_\_\_

C. Conference required \_\_\_\_\_

D. Informal conference required \_\_\_\_\_

E. Remarks (attach additional pages as needed):

Melinda K. Bumli      2/23/2010  
Signature      Date  
Endangered Species Biologist      Charleston ES  
Title      Office

FWS Log No. 42410-2010-I-0165

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## *Appendix H. Wilderness Review*

The Wilderness Act of 1964 defines a wilderness area as an area of federal land that retains its primeval character and influence, without permanent improvements or human inhabitation, and is managed so as to preserve its natural conditions and which:

1. generally appears to have been influenced primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
2. has outstanding opportunities for solitude or primitive and unconfined types of recreation;
3. has at least 5,000 contiguous roadless acres or is of sufficient size to make practicable its preservation and use in an unimpeded condition; or is a roadless island, regardless of size;
4. does not substantially exhibit the effects of logging, farming, grazing, or other extensive development or alteration of the landscape, or its wilderness character could be restored through appropriate management at the time of review; and
5. may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

The lands within Blackbeard Island, Harris Neck, Pinckney Island, Savannah, Tybee, and Wassaw NWRs were reviewed for their suitability in meeting the criteria for wilderness, as defined by the Wilderness Act of 1964.

No additional lands in the refuges were found to meet these criteria. Therefore, the suitability of refuge lands for wilderness designation is not further analyzed in this plan.



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## Appendix I. Refuge Biota

### **BIRDS**

There are seven national wildlife refuges administered from the Savannah Coastal Refuges Complex office in Savannah, Georgia. The chain of coastal refuges composing the Complex extends from Pinckney Island NWR, near Hilton Head, South Carolina, to Wolf Island NWR, near Darien, Georgia. Between these lie Savannah, (the largest unit in the Complex), Wassaw, Tybee, Harris Neck, and Blackbeard Island NWRs. Together they span a 100-mile stretch of coastline and total over 54,019 acres.

The diversity of habitats within this acreage enhances the value of these coastal refuges to a great variety of migratory birds. Within the Complex there are freshwater and saltwater marshes, tidal rivers and creeks, bottomland hardwoods, maritime forests, barrier island beaches, and more.

The list of birds recorded on the seven coastal refuges includes 309 species, of which 25 are accidentals (species sighted less than 6 times over the last 20 years and outside of their normal range). The following legend indicates the refuge on which each species is found, as well as the relative abundance and seasonal occurrence of each. Birds known to nest are designated with an asterisk (\*) preceding the refuge abbreviation. Birds classified as threatened or endangered are in italics.

This list incorporates the common names for birds recommended by the 7th (1983) Edition of the A.O.U. Checklist and the 39th Supplement (1993). Species are also listed in the sequence set by the A.O.U.

### **REFUGE**

B ..... Blackbeard Island  
H..... Harris Neck  
P ..... Pinckney Island  
S ..... Savannah  
T ..... Tybee Island  
W..... Wassaw Island  
Wo ..... Wolf Island  
Complex ..... all refuges

### **RELATIVE ABUNDANCE**

C .... Common, seen in good numbers in appropriate habitat and season.  
FC .. Fairly common, seen in moderate numbers in appropriate habitat and season.  
U .... Uncommon, seen in small numbers and/or not seen every time in appropriate habitat and season.  
R .... Rare, seen in small numbers, between five and ten records over the past twenty years.

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### **SEASONAL OCCURRENCE**

PR ... Permanent resident, present year-round.

SR ... Summer resident, breeds.

SV ... Summer visitor, present in summer,  
but does not breed.

WV... Winter visitor, present in winter.

M..... Migrant, transient during spring/fall migration.

**Bird List Begins on Next Page.**



<u>BIRD SPECIES</u>	<u>REFUGES</u>	<u>ABUND.</u>	<u>SEASON</u>
<i>Loons</i>			
Red-throated Loon	B H P S T W Wo	FC	WV
Common Loon	Complex	C	WV
<i>Grebes</i>			
Pied-billed Grebe	Complex	C	PR
Horned Grebe	Complex	C	WV
Red-necked Grebe	Complex	R	WV
Eared Grebe	B H T W	R	WV
<i>Gannets</i>			
Northern Gannet	B P T W Wo	FC	WV
<i>Pelicans</i>			
Brown Pelican	Complex	FC	PR
<i>Cormorants</i>			
Double-crested Cormorant	Complex	FC	PR
<i>Anhingas</i>			
Anhinga	*B *H *P *S T W Wo	C	PR
<i>Hérons</i>			
American Bittern	Complex	U	WV
Least Bittern	*B *H *P *S *W Wo	FC	SR
Great Blue Heron	*B *H *P *S T *W Wo	C	PR
Great Egret	*B *H *P *S T *W Wo	C	PR
Snowy Egret	*B *H *P *S T *W Wo	C	PR
Little Blue Heron	*B *H *P *S T *W Wo	C	PR
Tricolored Heron	*B *H *P *S T *W Wo	C	PR
Cattle Egret	B *H P *S T W Wo	C	PR
Green-Heron	*B *H *P *S T *W Wo	C	SR
Black-crowned Night-Heron	*B *H *P *S T *W Wo	C	PR
Yellow-crowned-Night-Heron	*B *H *P *S T *W Wo	FC	PR
<i>Ibises</i>			
White Ibis	*B *H *P *S W Wo	C	PR
Glossy Ibis	Complex	FC	PR
<i>Storks</i>			
<b>Wood Stork</b>	*B *H P S W Wo	FC	SR
<i>Swans, Geese, Ducks</i>			
Black-bellied			
Fulvous Whistling-Duck	H S	R	WV
Tundra Swan	S	U	WV
Greater White-fronted Goose	H S	R	WV
Snow Goose	B H S T	U	WV
Brant	H S	R	WV
Canada Goose	B *H P S W	FC	WV
Wood Duck	*B *H *P *S T *W Wo	C	PR
Green-winged Teal	Complex	C	WV
American Black Duck	B H P *S T W Wo	U	PR
Mottled Duck	B H P *S T W Wo	FC	PR
Mallard	Complex	C	WV
Northern Pintail	Complex	C	WV
Blue-winged Teal	Complex	C	WV
Cinnamon Teal	Complex	R	WV

<u>BIRD SPECIES</u>	<u>REFUGES</u>	<u>ABUND.</u>	<u>SEASON</u>
<i>Swans, Geese, Ducks, Continued</i>			
Northern Shoveler	Complex	C	WV
Gadwall	Complex	C	WV
Eurasian Wigeon	S	R	WV
American Wigeon	Complex	C	WV
Canvasback	Complex	FC	WV
Redhead	Complex	U	WV
Ring-necked Duck	Complex	C	WV
Greater Scaup	Complex	U	WV
Lesser Scaup	Complex	C	WV
Long-tailed Duck	B P T W Wo	R	WV
Black Scoter	B P T W Wo	C	WV
Surf Scoter	B P T W Wo	C	WV
White-winged Scoter	B P T W Wo	U	WV
Common Goldeneye	S	U	WV
Bufflehead	Complex	C	WV
Hooded Merganser	B H P *S T W Wo	C	WV/PR
Common Merganser	Complex	R	WV
Red-breasted Merganser	Complex	C	WV
Ruddy Duck	Complex	C	WV
<i>Vultures</i>			
Black Vulture	*B H P *S T *W Wo	C	PR
Turkey Vulture	*B H P *S T *W Wo	C	PR
<i>Kites, Hawks, Eagles</i>			
Osprey	*B *H *P *S T *W Wo	C	PR
Am. Swallow-tailed Kite	B H P *S W	U	SR
Mississippi Kite	B H P *S T W Wo	U	SR
<b>Bald Eagle</b>	B H P *S T W Wo	FC	WV/M
Northern Harrier	Complex	C	WV
Sharp-shinned Hawk	Complex	U	PR
Cooper's Hawk	*B *H *P *S T *W Wo	U	PR
Red-shouldered Hawk	B *H *P *S T W Wo	FC	PR
Broad-winged Hawk	P S W	R	SV/M
Red-tailed Hawk	*B *H *P *S *T *W Wo	C	PR
Golden Eagle	P S R WV		
<i>Falcons</i>			
American Kestrel	Complex	C	WV
Merlin	Complex	U	WV
<b>Peregrine Falcon</b>	Complex	U	WV
<i>Quail, Allies</i>			
Wild Turkey	H P S	U	PR
Northern Bobwhite	*H *P *S	C	PR
<i>Rails, Allies</i>			
Yellow Rail	S	R	WV
Black Rail	B S W	R	SR
Clapper Rail	*B *H *P *T *W	C	PR
King Rail	*B *S	FC	PR
Virginia Rail	B H P S W	FC	WV
Sora	H S	FC	WV

<u>BIRD SPECIES</u>	<u>REFUGES</u>	<u>ABUND.</u>	<u>SEASON</u>
<i>Rails, Allies, Continued</i>			
Purple Gallinule	*B *H *S	FC	SR
Common Moorhen	*B *H P *S	C	PR
American Coot	B H P S W	C	PR
<i>Plovers</i>			
Black-bellied Plover	Complex	C	WV
American Golden-Plover	H T	R	M
Wilson's Plover	*B H P S T *W Wo	C	SR
Semipalmated Plover	Complex	C	PR
<b>Piping Plover</b>	B H P T W Wo	FC	WV
Killdeer	*P *S *T *W *Wo	C	PR
<i>Oystercatchers</i>			
Am. Oystercatcher	*B H *P *T *W *Wo	FC	PR
<i>Stilts, Avocets</i>			
Black-necked Stilt	H P *S W	U	SR
American Avocet	B H P S W	U	M
<i>Sandpipers, Allies</i>			
Greater Yellowlegs	Complex	C	WV
Lesser Yellowlegs	Complex	C	WV
Solitary Sandpiper	Complex	FC	M
Willet	*B *H *P S *T *W *Wo	C	PR
Spotted Sandpiper	Complex	C	M
Upland Sandpiper	P S T W Wo	R	M
Whimbrel	B H P T W Wo	U	M
Long-billed Curlew	H	R	WV
Marbled Godwit	B P	FC	WV
Ruddy Turnstone	B H P T W Wo	C	PR
Red Knot	B H P T W Wo	FC	WV
Sanderling	B H P T W Wo	FC	WV/M
Semipalmated Sandpiper	Complex	R	M
Western Sandpiper	B H P S W	C	PR
Least Sandpiper	B H P S W Wo	C	PR
White-rumped Sandpiper	P S W	U	M
Pectoral Sandpiper	B H P S T W Wo	FC	M
Purple Sandpiper	T F	U	WV
Dunlin	B H P S T W Wo	C	WV
Stilt Sandpiper	P S	U	M
Buff-breasted Sandpiper	S	R	M
Short-billed Dowitcher	Complex	C	M
Long-billed Bowitcher	B P S W Wo	U	M
Common Snipe	Complex	C	WV
Am. Woodcock	B H P S W	FC	WV
Wilson's Phalarope	P S	U	M
<i>Gulls, Terns, Skimmers, Allies</i>			
Parasitic Jaeger	B P W	R	WV
Laughing Gull	Complex	C	PR
Bonaparte's Gull	Complex	C	WV
Ring-billed Gull	Complex	C	PR
Herring Gull	Complex	C	PR

<u>BIRD SPECIES</u>	<u>REFUGES</u>	<u>ABUND.</u>	<u>SEASON</u>
<i>Gulls, Terns, Skimmers, Allies, Continued</i>			
Great Black-backed Gull	B P S T W Wo	U	WV
Gull-billed Tern	B H *P S T W Wo	FC	SR
Caspian Tern	Complex	U	SR
Royal Tern	B H P S T W Wo	C	PR
Sandwich Tern	Complex	FC	SR
Common Tern	Complex	U	M
Forster's Tern	Complex	C	PR
Least Tern	*Complex	C	SR
Sooty Tern	B P T W Wo	R	SV
Black Tern	Complex	FC	M
Black Skimmer	Complex	C	PR
<i>Pigeons, Doves</i>			
Rock Dove	B H P S T W	C	PR
Mourning Dove	*B *H *P *S T *W	C	PR
Common Ground-Dove	*B *H *P *S T *W	U	PR
<i>Cuckoos</i>			
Black-billed Cuckoo	S W	U	M
Yellow-billed Cuckoo	*B *H *P *S T *W	C	SR
<i>Owls</i>			
Common Barn Owl	*B H P *S W	U	PR
Eastern Screech Owl	*B *H *P *S *W	C	PR
Great Horned Owl	*B *H *P *S T *W	C	PR
Barred Owl	*B *H *P *S *W	C	PR
Long-eared Owl	P S	R	WV
Short-eared Owl	P S	U	WV
<i>Nightjars</i>			
Common Nighthawk	*B *H *P *S T *W Wo	C	SR
Chuck-will's widow	*B *H *P *S *W Wo	C	PR
Whip-poor-will	B H P S W	FC	M
<i>Swifts</i>			
Chimney Swift	*B H *P *S T W	C	SR
<i>Hummingbirds</i>			
Rudy-throated Hummingbird	*B *H *P *S T *W Wo	C	SR
<i>Kingfishers</i>			
Belted Kingfisher	B H *P *S *W Wo	C	PR
<i>Woodpeckers</i>			
Red-headed Woodpecker	*B *H P S W	FC	PR
Red-bellied Woodpecker	*B *H *P *S *W	C	PR
Yellow-bellied Sapsucker	B H P S W	FC	WV
Downy Woodpecker	*B *H *P *S *W	C	PR
Hairy Woodpecker	B H P S W	R	PR
<b>Red-cockaded Woodpecker</b> S		U	PR
Northern (yellow-shafted)			
Flicker	*B *H *P *S *W	C	PR
Pileated Woodpecker	*B *H *P *S T *W	C	PR
<i>Flycatchers</i>			
Eastern Wood-Pewee	*B *H *P *S *W	C	SR
Acadian Flycatcher	*B *P *S *W	C	SR

<b><u>BIRD SPECIES</u></b>	<b><u>REFUGES</u></b>	<b><u>ABUND.</u></b>	<b><u>SEASON</u></b>
<i>Flycatchers, Continued</i>			
Eastern Phoebe	B H P S W	C	WV
Great Crested Flycatcher	B *H *P *S *W	FC	SR
Eastern Kingbird	B *H *P *S *W	C	SR
Gray Kingbird P W U SV			
<i>Swallows</i>			
Purple Martin	*B H *P *S W	C	SR
Tree Swallow	B H P S W Wo	C	PR/M
Northern Rough-winged Swallow	B H P S W	C	SR
Bank Swallow	P S	U	M
Barn Swallow	B H P *S W	C	PR
<i>Jays, Crows</i>			
Blue Jay	B H *P *S *W	C	PR
Am. Crow	*B *H *P *S T *W Wo	C	PR
Fish Crow	*Complex	C	PR
<i>Chicadees, Titmice</i>			
Carolina Chickadee	*B *H *P *S *W	C	PR
Tufted Titmouse	B *H *P *S W	C	PR
<i>Nuthatches</i>			
Red-breasted Nuthatch	H P S W	U	WV
White-breasted Nuthatch	H P S W	FC	WV/SR
Brown-headed Nuthatch	B H *P *S W	C	PR
<i>Creepers, Wrens</i>			
Brown Creeper	B H P S W	U	WV
Carolina Wren	*H *P *S *W	C	PR
House Wren	B H P S W	C	WV
Winter Wren	B H P S W	U	WV
Sedge Wren	B H P S W Wo	C	WV
Marsh Wren	*Complex	C	PR
<i>Kinglets, Gnatcatchers</i>			
Golden-crowned Kinglet	B H P S W	FC	WV
Ruby-crowned Kinglet	B H P S W	C	WV
Blue-gray Gnatcatcher	*B *H *P *S *W	C	PR
<i>Bluebirds, Thrushes</i>			
Eastern Bluebird	*B *H *P *S W	C	

## MAMMALS

MAMMALS, Common Name	Scientific Name and Order
Bobcat	<i>Felis rufus</i> (Order: Carnivora)
White Tail Deer	<i>Odocoileus virginianus</i> (Order: Artiodactyla)
Opossum (Virginia Opossum)	<i>Didelphis virginiana</i> ( Order: Marsupialia)
Skunk, Striped Skunk	<i>Mephitis mephitis</i> (Order: Carnivora)
Skunk, Eastern Spotted Skunk	<i>Spilogale putorius</i> (Order: Carnivora)
Otter (River Otter)	<i>Lutra canadensis</i> (Order: Carnivora)
Beaver	<i>Castor canadensis</i> (Order: Rodentia)
Rabbit, Marsh Rabbit	<i>Sylvilagus palustris</i> (Order: Lagomorpha)
Rabbit, Eastern Cottontail	<i>Sylvilagus floridanus</i> (Order: Lagomorpha)
Rabbit, Swamp Rabbit	<i>Sylvilagus aquaticus</i> (Order: Lagomorpha)
Raccoon	<i>Procyon lotor</i> (Order: Carnivora)
Coyote	<i>Canis latrans</i> (Order: Carnivora)
Armadillo (Nine-banded Armadillo)	<i>Dasypus novemcinctus</i> (Order: Xenarthra)
Squirrel, Gray Squirrel	<i>Sciurus carolinensis</i> (Order: Rodentia)
Squirrel, Fox Squirrel	<i>Sciurus niger</i> (Order: Rodentia)
Squirrel, Southern Flying Squirrel	<i>Glaucomys volans</i> (Southern Flying Squirrel)
Fox, Red Fox	<i>Vulpes vulpes</i> (Order: Carnivora)
Fox, Gray Fox	<i>Urocyon cinereoargenteus</i> (Order: Carnivora)
Bat, Silver-haired Bat	<i>Lasionycteris noctivagans</i> (Order: Chiroptera)
Bat, Eastern Pipistrelle	<i>Pipistrellus subflavus</i> (Order: Chiroptera)
Bat, Big Brown Bat	<i>Eptesicus fuscus</i> (Order: Chiroptera)
Bat, Red Bat	<i>Lasiurus borealis</i> (Order: Chiroptera)
Bat, Seminole Bat	<i>Lasiurus seminolus</i> (Order: Chiroptera)
Bat, Hoary Bat	<i>Lasiurus cinereus</i> (Order: Chiroptera)
Bat, Northern Yellow Bat	<i>Lasiurus intermedius</i> (Order: Chiroptera)
Bat, Evening Bat	<i>Nycticeius humeralis</i> (Order: Chiroptera)
Bat, Rafinesque's Big-eared Bat	<i>Plecotus rafinesquii</i> (Order: Chiroptera)
Bat, Brazilian Free-tailed Bat	<i>Tadarida brasiliensis</i> (Order: Chiroptera)
Shrew, Southern Short-tailed Shrew	<i>Blarina carolinensis</i> (Order Insectivora)
Shrew, Least Shrew	<i>Cryptotis parva</i> (Order Insectivora)
Mouse, Eastern Harvest Mouse	<i>Reithrodontomys humulis</i> (Order: Rodentia)

<b>MAMMALS, Common Name</b>	<b>Scientific Name and Order</b>
<b>Mouse, Oldfield Mouse</b>	<i>Peromyscus polionotus</i> (Order: Rodentia)
<b>Mouse, Cotton Mouse</b>	<i>Peromyscus gossypinus</i> (Order: Rodentia)
<b>Mouse, Golden Mouse</b>	<i>Ochrotomys nuttali</i> (Order: Rodentia)
<b>Mouse, House Mouse I</b>	<i>Mus musculus</i> (Order: Rodentia)
<b>Rat, Marsh Rice Rat</b>	<i>Oryzomys palustris</i> (Order: Rodentia)
<b>Rat, Hispid Cotton Rat</b>	<i>Sigmodon hispidus</i> (Order: Rodentia)
<b>Rat, Eastern Woodrat</b>	<i>Neotoma floridana</i> (Order: Rodentia)
<b>Rat, Black Rat I</b>	<i>Rattus rattus</i> (Order: Rodentia)
<b>Rat, Norway Rat</b>	<i>Rattus norvegicus</i> (Order: Rodentia)
<b>Wild Hog, Feral Hog, or Wild Pig</b>	<i>Sus scrofa</i> (Order: Artiodactyla)
<b>Vole, Woodland Vole</b>	<i>Microtus pinetorum</i> (Order: Rodentia)
<b>Mink</b>	<i>Mustela vison</i> (Order: Carnivora)
<b>Weasel (Long-tailed Weasel)</b>	<i>Mustela frenata</i> (Order: Carnivora)
<b>Mole, Eastern Mole</b>	<i>Scalopus aquaticus</i> (Order: Talpidae)
<b>Mole, Star-nosed Mole</b>	<i>Condylura cristata</i> (Order: Talpidae)
<b>Myotis, Little Brown Myotis</b>	<i>Myotis lucifugus</i> (Order: Chiroptera)
<b>Myotis, Southeastern Myotis</b>	<i>Myotis austroriparius</i> (Order: Chiroptera)
<b>Manatee (West Indian Manatee)</b>	<i>Trichechus manatus</i> (Order: Sirenia)
<b>Dolphin (Bottlenosed Dolphin)</b>	<i>Tursiops truncatus</i> (Order: Tursiops)



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## REPTILES AND AMPHIBIANS

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

REPTILES AND AMPHIBIANS, Common Name	Scientific Name
<b>Alligators</b>	
American Alligator	<i>Alligator mississippiensis</i>
<b>Snapping Turtles</b>	
Common Snapping Turtle	<i>Chelydra serpentina</i>
<b>Mud Turtles</b>	
Mud Turtle	<i>Kinosternon subrubrum</i>
<b>Box and Water Turtles</b>	
Eastern Box Turtle	<i>Terrapene carolina</i>
Diamondback Terrapin	<i>Malaclemys terrapin</i>
Yellow-bellied Turtle	<i>Pseudemys scripta</i>
Gopher Tortoise	<i>Gopherus polyphemus</i>
Chicken Turtle	<i>Deirochelys reticularia</i>
<b>Sea Turtles</b>	
Loggerhead Sea Turtle	<i>Caretta caretta</i>
Ridley Turtle	<i>Lepidochelys kempi</i>
Green Turtle	<i>Chelonia mydas</i>
<b>Anoles and Fence Lizards</b>	
Green Anole	<i>Anolis carolinensis</i>
Northern Fence Lizard	<i>Sceloporus undulates hyacinthinus</i>
<b>Racerunners</b>	
Six-lined Racerunner	<i>Cnemidophorus sexlineatus sexlineatus</i>
<b>Skinks</b>	
Ground Skink	<i>Scincella lateralis</i>
Broadhead Skink	<i>Eumeces laticeps</i>
Five-lined Skink	<i>Eumeces fasciatus</i>
Southeastern Five-lined Skink	<i>Eumeces inexpectatus</i>
<b>Glass Lizards</b>	
Eastern Glass Lizard	<i>Ophisaurus ventralis</i>

<b>REPTILES AND AMPHIBIANS, Common Name</b>	<b>Scientific Name</b>
Island Glass Lizard	<i>Ophisaurus compressus</i>
<b>Snakes</b>	
Banded Water Snake	<i>Natrix fasciata</i>
Black Racer	<i>Coluber constrictor</i>
Garter Snake	<i>Thamnophis sirtalis</i>
Ribbon Snake	<i>Thamnophis sauritus</i>
Greenish Rat Snake	<i>Elaphe obsoleta quadrivittata</i>
Corn Snake	<i>Elaphe guttata</i>
King Snake	<i>Lampropeltis getulus</i>
Coachwhip	<i>Masticophis flagellum</i>
Scarlet Snake	<i>Cemophora coccinea</i>
Rough Green Snake	<i>Opheodrys aestivus</i>
<b>Vipers</b>	
Cottonmouth	<i>Agkistrodon piscivorus</i>
Diamondback Rattlesnake	<i>Crotalus adamanteus</i>
<b>Amphiumas</b>	
Two-toed Amphiuma	<i>Amphiuma means</i>
<b>Newts</b>	
Newt	<i>Notophthalmus viridescens</i>
<b>Toad</b>	
Eastern Spadefoot toad	<i>Scaphiopus holbrooki</i>
Oak Toad	<i>Bufo quercicus</i>
Southern Toad	<i>Bufo terrestris</i>
<b>Treefrogs and Peepers</b>	
Grass Frog	<i>Limnaoedus ocularis</i>
Southern Chorus Frog	<i>Pseudacris nigrita</i>
Pine Woods Tree Frog	<i>Hyla femoralis</i>
Green Treefrog	<i>Hyla cinerea</i>
Squirrel Treefrog	<i>Hyla squirella</i>
Barking Treefrog	<i>Hyla gratiosa</i>
<b>Narrowmouth Toads</b>	
Eastern Narrowmouth Toad	<i>Gastrophryne carolinensis</i>

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REPTILES AND AMPHIBIANS, Common Name	Scientific Name
True Frogs	
Pig Frog	<i>Rana grylio</i>
Southern Leopard Frog	<i>Rana Sphenocephala</i>

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## FISH

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

FISH, Common Name	Scientific Name
<b>Sharks</b>	
Bull Shark	<i>Carcharhinus leucus</i>
<b>Skates and Rays</b>	
Southern Stingray	<i>Dasyatis americana</i>
Roughtail Stingray	<i>Dasyatis centroura</i>
<b>Pike</b>	
Redfin Pickerel	<i>Esox americanus</i>
Chain Pickerel	<i>Esox niger</i>
<b>Sturgeons</b>	
Shortnose Sturgeon	<i>Acipenser brevirostrum</i>
Atlantic Sturgeon	<i>Acipenser oxyrhynchus</i>
<b>Gars</b>	
Longnose Gar	<i>Lepisosteus osseus</i>
Florida Gar	<i>Lepisosteus platyrhincus</i>
<b>Tarpons</b>	
Ladyfish	<i>Elops saurus</i>
Tarpon	<i>Megalops atlantica</i>
<b>Eels</b>	
American eel	<i>Anguilla rostrata</i>
<b>Herrings, Shads, and Related Species</b>	
Blueback Herring	<i>Alose aestivalis</i>
Hickory Shad	<i>Alosa mediocris</i>
American Shad	<i>Alosa sapidissima</i>
Yellowfin Menhaden	<i>Brevoortia smithi</i>
Atlantic Menhaden	<i>Brevoortia tyrannus</i>
Gizzard Shad	<i>Dorosoma cepedianum</i>
Threadfin Shad	<i>Dorosoma petenense</i>
Scaled Sardine	<i>Harengula pensacolatae</i>
Atlantic Thread Herring	<i>Opisthonema oglinum</i>

<b>FISH, Common Name</b>	<b>Scientific Name</b>
Spanish Sardine	<i>Sardinella anchovia</i>
<b>Lizardfish</b>	
Inshore Lizardfish	<i>Synodus foetens</i>
<b>Catfish</b>	
Channel Catfish	<i>Ictalurus punctatus</i>
Bullhead	<i>Ameiurus melas</i>
Blue	<i>Ictalurus furcatus</i>
<b>Toadfish</b>	
Oyster Toadfish	<i>Opsanus tau</i>
<b>Clingfish</b>	
Skilletfish	<i>Gobiesox strumosus</i>
<b>Frogfish</b>	
Singlespot frogfish	<i>Antennarius radiatus</i>
Sargassumfish	<i>Histrio histrio</i>
<b>Batfish</b>	
Longnose Batfish	<i>Ogcocephalus vespertilio</i>
<b>Needlefish</b>	
Flat Needlefish	<i>Ablennes hians</i>
Northern Needlefish	<i>Strongylura marina</i>
Houndfish	<i>Tylosurus crocodiles</i>
<b>Killifish</b>	
Sheepshead Killifish	<i>Cyprinodon variegatus</i>
Golden Topminnow	<i>Fundulus chrysotus</i>
Marsh Killifish	<i>Fundulus confluentus</i>
Mummichog	<i>Fundulus heteroclitus</i>
Striped killifish	<i>Fundulus majalis</i>
<b>Livebearers</b>	
Mosquitofish	<i>Gambusia affinis</i>
Lease Killifish	<i>Heterandria Formosa</i>
Sailfin Molly	<i>Poecilia latipinna</i>
<b>Silversides</b>	
Rough Silverside	<i>Membras martinica</i>

<b>FISH, Common Name</b>	<b>Scientific Name</b>
Tidewater Silverside	<i>Menidia beryllina</i>
Atlantic Silverside	<i>Menidia menidia</i>
<b>Sea Bass</b>	
Rock Sea Bass	<i>Centropristis philadelphica</i>
Black Sea Bass	<i>Centropristis striata</i>
Sand Perch	<i>Diplectrum formosum</i>
Aguavina	<i>Diplectrum radiale</i>
Striped bass	<i>Morone saxatilis</i>
<b>Sunfish</b>	
Flier	<i>Centrarchus macropterus</i>
Warmouth	<i>Lepomis gulosus</i>
Bluegill	<i>Lepomis macrochirus</i>
Largemouth bass	<i>Micropterus salmoides</i>
Black Crappie	<i>Pomoxis nigromaculatus</i>
White Crappie	<i>Pomoxis annularis</i>
<b>Grunts</b>	
Tomtate	<i>Haemulon aurolineatum</i>
Pigfish	<i>Orthopristis chrysoptera</i>
<b>Drums</b>	
Silver Perch	<i>Bairdiella chrysura</i>
Spotted Seatrout	<i>Cynoscion nebulosus</i>
Silver Seatrout	<i>Cynoscion nothus</i>
Weakfish	<i>Cynoscion regalis</i>
Spot	<i>Leiostomus xanthurus</i>
Southern Kingfish	<i>Menticirrhus americanus</i>
Atlantic Croaker	<i>Micropogon undulates</i>
Black Drum	<i>Pogonias cromis</i>
Red Drum	<i>Sciaenops ocellata</i>
<b>Porgies</b>	
Sheepshead	<i>Archosargus probatocephalus</i>
Whitebone Porgy	<i>Calamus leucosteus</i>
Pinfish	<i>Lagodon rhomboids</i>

<b>FISH, Common Name</b>	<b>Scientific Name</b>
Northern Porgy	<i>Stenotomus chrysops</i>
<b>Spadefish and Butterflyfish</b>	
Atlantic Spadefish	<i>Chaetodipterus faber</i>
Spotfin Butterflyfish	<i>Chaetodon ocellatus</i>
<b>Damselfish</b>	
Sergeant Major	<i>Abudefduf saxatilis</i>
<b>Mullet</b>	
Striped Mullet	<i>Mugil cephalus</i>
<b>Gobies</b>	
Lyre Goby	<i>Evorthodus lyricus</i>
Violet Goby	<i>Gobioides broussonneti</i>
Darter Goby	<i>Gobionellus boleosoma</i>
Sharp Tail Goby	<i>Gobionellus hastatus</i>
Freshwater Goby	<i>Gobionellus shufeldti</i>
Emerald Goby	<i>Gobionellus smaragdus</i>
Naked Goby	<i>Gobiosoma bosci</i>
Seaboard Goby	<i>Gobiosoma ginsburgi</i>
Green Goby	<i>Microgobius thalassinus</i>
<b>Butterfish</b>	
Southern Harvestfish	<i>Peprilus alepidotus</i>
Butterfish	<i>Peprilus triacanthus</i>
<b>Searobins</b>	
Northern Searobin	<i>Prionotus carolinus</i>
Leopard Searobin	<i>Prionotus scitulus</i>
Striped Searobin	<i>Prionotus evolans</i>
Bighead Searobin	<i>Prionotus tribulus</i>
<b>Lefteye Flounders</b>	
Gulf Flounder	<i>Paralichthys albigutta</i>
Summer Flounder	<i>Paralichthys dentatus</i>
Southern Flounder	<i>Paralichthys lethostigma</i>
<b>Soles</b>	
Hogchoker	<i>Trinectes maculatus</i>



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FISH, Common Name	Scientific Name
Puffer	
Smooth Puffer	<i>Lagocephalus laevigatus</i>
Northern Puffer	<i>Sphoeroides maculatus</i>
Florida Puffer	<i>Sphoeroides nephelus</i>

## PLANTS

PLANTS, Common Name	Scientific Name
<b>Brackish Marsh Plants</b>	
Soft-stem bulrush	<i>Scirpus validus</i>
Leafy three square	<i>Scirpus robustus</i>
Southern wild rice	<i>Zizaniopsis miliacea</i>
Smooth cordgrass	<i>Spartina alterniflora</i>
Big cordgrass	<i>Spartina cynosuroides</i>
Eastern baccharis	<i>Baccharis halimifolia</i>
<b>Tidal Freshwater Marsh Plants</b>	
Southern wild rice	<i>Zizaniopsis miliacea</i>
Wild rice	<i>Zizania aquatic</i>
Common cattail	<i>Typha latifolia</i>
Spider-lily	<i>Hymenocallis crassifolia</i>
Water hemlock	<i>Cicuta maculata</i>
Wapato	<i>Sagittaria lancifolia</i>
Eryngo	<i>Eryngium aquaticum</i>
Thalia	<i>Thalia dealbata</i>
Climbing hempweed	<i>Mikania scandens</i>
Swamp rose mallow	<i>Hibiscus moscheutos</i>
Seashore mallow	<i>Kosteletskyia virginica</i>
Dodder	<i>Cuscuta gronovii</i>
Bur-marigold	<i>Bidens laevis</i>
Tag alder	<i>Alnus serrulata</i>
Button-bush	<i>Cephalanthus occidentalis</i>
Water ash	<i>Fraxinus caroliniana</i>
Bald cypress	<i>Taxodium disticum</i>
Ground-nut	<i>Apios Americana</i>
Cardinal flower	<i>Lobelia cardinalis</i>
<b>Impounded Managed Wetlands Plants:</b>	
<b>Moist-soil plants</b>	
Large and Southern smartweeds	<i>Polygonum pensylvanicum and hydropiperoides</i>

<b>PLANTS, Common Name</b>	<b>Scientific Name</b>
Wild millet species	<i>Echinochloa crusgalli and walteri</i>
Redroot	<i>Lachnesthes caroliniana</i>
Giant foxtail	<i>Setaria magna</i>
Flatsedges	<i>Cyperus spp.</i>
Panicgrasses	<i>Panicum spp.</i>
Alligatorweed	<i>Alternanthera philoxeroides</i>
Southern wild rice	<i>Zizaniopsis miliacea</i>
Common cattail	<i>Typha latifolia</i>
Dwarf spikerush	<i>Eleocharis parvula</i>
Sesbania	<i>Sesbania exaltata</i>
<b>Aquatic plants</b>	
White waterlily	<i>Nymphaea odorata</i>
Coontail	<i>Ceratophyllum demersum</i>
Narrow-leaved pondweed	<i>Potamogeton spp.</i>
Bladderwort	<i>Utricularia inflata</i>
Southern wild rice	<i>Zizaniopsis miliacea</i>
Common cattail	<i>Typha latifolia</i>
Water-shield	<i>Brasenia schreberi</i>
American lotus	<i>Nelumbo lutea</i>
Water hyacinth	<i>Eichhornia crassipes</i>
Duckweed	<i>Spirodela polyrhiza</i>
<b>Oak Hammocks:</b>	
<b>Canopy Vegetation</b>	
Live Oak	<i>Quercus virginiana</i>
Laurel oak	<i>Quercus laurifolia</i>
Sugarberry	<i>Celtis laevigata</i>
Sweetgum	<i>Liquidambar styraciflua</i>
Chinaberry	<i>Melia azedarach</i>
Chinese tallow	<i>Sapium sebiferum</i>
Slash pine	<i>Pinus elliotii</i>
Long-leaf pine	<i>Pinus palustris</i>

PLANTS, Common Name	Scientific Name
<b>Understory Vegetation</b>	
Yaupon holly	<i>Illex vomitoria</i>
Cherry laurel	<i>Prunus caroliniana</i>
Red maple	<i>Acer rubrum</i>
Saw palmetto	<i>Serenoa repens</i>
Greenbrier	<i>Smilas spp.</i>
Mulberry	<i>Morus spp.</i>
Wax myrtle	<i>Myrica cerifera</i>
Beautyberry	<i>Callicarpa Americana</i>
Chinese parasol tree	<i>Firmiana simplex</i>
Big leaf periwinkle	<i>Vinca major</i>
<b>Bald Cypress-Tupelo Gum Swamp Forest</b>	
Water tupelo	<i>Nyssa aquatic</i>
Swamp tupelo	<i>Nyssa sylvatica</i>
Swamp bay	<i>Persea palustris</i>
Water elm	<i>Planera aquatic</i>
Arrow wood	<i>Viburnum dentatum</i>
Swamp dogwood	<i>Cornus foemina</i>
Lyonia	<i>Lyonia lucida</i>
Red maple	<i>Acer rubrum</i>
Possumhaw viburnum	<i>Viburnum nudum</i>
American elm	<i>Ulmus Americana</i>
Bald cypress	<i>Taxodium distichum</i>
Swamp willow	<i>Salix caroliniana</i>
Sweet bay	<i>Magnolia virginiana</i>
Tag alder	<i>Alnus serrulata</i>
Fetterbush	<i>Leucothoe racemosa</i>
Blue flag iris	<i>Iris viginica</i>
<b>Hardwood Bottoms</b>	
Overcup oak	<i>Quercus lyrata</i>
Swamp chestnut oak	<i>Quercus michauxii</i>

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PLANTS, Common Name	Scientific Name
Laurel oak	<i>Quercus laurifolia</i>
Cherry-bark oak	<i>Quercus falcata</i>
American sycamore	<i>Platanus occidentalis</i>
Ironwood	<i>Carpinus caroliniana</i>
Wild ginger	<i>Asarum canadense</i>
River oats	<i>Uniola latifolia</i>
Sweet-gum	<i>Liquidambar styraciflua</i>
Hop hornbeam	<i>Ostrya virginica</i>
Pawpaw	<i>Asimina triloba</i>
Dwarf palmetto	<i>Sabal minor</i>
Needle palm	<i>Rhapidophyllum hystrix</i>
River cane	<i>Arundinaria gigantea</i>



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## *Appendix J. Budget Requests*

The Complex's budget requests are contained in the Refuge Operating Needs System (RONS) and Service Asset and Maintenance Management System (SAMMS) databases that include a wide variety of new and maintenance refuge projects. The RONS and SAMMS lists are constantly updated and include priority projects. Contact the Complex or each individual refuge for the most current RONS and SAMMS lists. Please refer to Chapter V, Plan implementation, for the key budget requests associated with the proposed projects and staffing. Chapter V includes the proposed projects, which are linked to the applicable objectives, and Table 11, which identifies staff, first-year costs, and recurring costs for the outlined projects.





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## *Appendix K. List of Preparers*

### **Core Planning Team**

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

- Jane Griess, Savannah Coastal Refuges Complex, Planning Team Leader
- Shaw Davis, Savannah Coastal Refuges Complex, Deputy Project Leader
- Peter Range, Savannah Coastal Refuges Complex, Refuge Ranger
- Debra Barnard, Savannah Coastal Refuges Complex, Refuge Biologist
- Amy Ochoa, Savannah Coastal Refuges Complex, Refuge Ranger
- Randy Breland, Savannah Coastal Refuges Complex, Refuge Manager
- Russell Webb, Savannah Coastal Refuges Complex, Refuge Biologist
- Scott Gilje, Savannah Coastal Refuges Complex, Refuge Manager
- Patricia Metz, Savannah Coastal Refuges Complex, Complex Supervisory Refuge Ranger
- Terri Jenkins, Savannah Coastal Refuges Complex, Forest Management Officer
- Chuck Hayes, Savannah Coastal Refuges Complex, Complex Biologist
- Kimberly Hayes, Savannah Coastal Refuges Complex, Refuge Manager
- Evelyn Nelson, Writer/Editor, Southeast Regional Office
- Laura Housh, Regional Planner, Okefenokee NWR
- Rob Wood, Savannah Coastal Refuges Complex, Forest Management Officer
- Monica Harris, Savannah Coastal Refuges Complex, Visitor Services Manager

#### **Tennessee Valley Authority**

- Nannette Brodie, Contractor
- Chevales Williams, Contractor

#### **GIS Input for the Draft CCP/EA**

- Shawn Markus, Contractor
- Pat Hamlett, Contractor



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## Appendix L. Consultation and Coordination

### OVERVIEW

This appendix summarizes the consultation and coordination that occurred in the processes of identifying the issues, alternatives, and proposed alternative, which were presented in the Draft CCP/EA; during the period of time while the Draft CCP/EA was being prepared and distributed; and during the period of public review and comment on the Draft CCP/EA.

The following meetings, contacts, and presentations were undertaken by the Service during the preparation of the Draft CCP/EA:

### Core Planning Team

The Core Planning Team was composed exclusively of Service staff and the contractor. Personnel from the Complex that represented Blackbeard Island NWR, Harris Neck NWR, Pinckney Island NWR, Savannah NWR, Tybee NWR and Wassaw NWR were on the team. Key tasks of the team included defining and refining the refuges' visions; identifying, reviewing, and filtering the issues; defining the goals and objectives; outlining the alternatives; evaluating environmental consequences and impacts; and establishing project and budget details.

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

- Jane Griess, USFWS, Savannah Coastal Refuges Complex, Planning Team Leader
- Shaw Davis, USFWS, Savannah Coastal Refuges Complex, Deputy Project Leader
- Peter Range, USFWS, Savannah Coastal Refuges Complex, Refuge Ranger
- Debra Barnard, USFWS, Savannah Coastal Refuges Complex, Refuge Biologist
- Amy Ochoa, USFWS, Savannah Coastal Refuges Complex, Refuge Ranger
- Randy Breland, USFWS, Savannah Coastal Refuges Complex, Refuge Manager
- Russell Webb, USFWS, Savannah Coastal Refuges Complex, Refuge Biologist
- Scott Gilje, USFWS, Savannah Coastal Refuges Complex, Refuge Manager
- Patricia Metz, USFWS, Savannah Coastal Refuges Complex, Complex Supervisory Refuge Ranger
- Terri Jenkins, USFWS, Savannah Coastal Refuges Complex, Forest Management Officer
- Rob Wood, USFWS, Savannah Coastal Refuges Complex, Forest Management Officer
- Chuck Hayes, USFWS, Savannah Coastal Refuges Complex, Complex Biologist
- Kimberly Hayes, USFWS, USFWS, Savannah Coastal Refuges Complex, Refuge Manager
- Monica Harris, USFWS, Savannah Coastal Refuges Complex, Visitor Services Manager
- Evelyn Nelson, Writer/Editor, Southeast Regional Office
- Laura Housh, Regional Planner, Okefenokee National Wildlife Refuge
- Nannette Brodie, Contractor, Tennessee Valley Authority
- Chevales Williams, Contractor, Tennessee Valley Authority

#### GIS Input for the Draft CCP/EA

- Shawn Markus, Contractor, Tennessee Valley Authority
- Pat Hamlett, Contractor, Tennessee Valley Authority

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## **Alternatives Workshop**

The alternatives' workshop included members of the Core Planning Team. During the workshop held September 29 – October 3, 2008, the team reviewed issues identified at both the internal and public scoping meetings and identified a range of alternatives complete with objectives and strategies for the proposed alternative.

Members of the team are as follows:

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

- Jane Griess, USFWS, Savannah Coastal Refuges Complex, Planning Team Leader
- Shaw Davis, USFWS, Savannah Coastal Refuges Complex, Deputy Project Leader
- Peter Range, USFWS, Savannah Coastal Refuges Complex, Refuge Ranger
- Debra Barnard, USFWS, Savannah Coastal Refuges Complex, Refuge Biologist
- Amy Ochoa, USFWS, Savannah Coastal Refuges Complex, Refuge Ranger
- Randy Breland, USFWS, Savannah Coastal Refuges Complex, Refuge Manager
- Russell Webb, USFWS, Savannah Coastal Refuges Complex, Refuge Biologist
- Scott Gilje, USFWS, Savannah Coastal Refuges Complex, Refuge Manager
- Patricia Metz, USFWS, Savannah Coastal Refuges Complex, Complex Supervisory Refuge Ranger
- Terri Jenkins, USFWS, Savannah Coastal Refuges Complex, Forest Management Officer
- Chuck Hayes, USFWS, Savannah Coastal Refuges Complex, Complex Biologist
- Kimberly Hayes, USFWS, USFWS, Savannah Coastal Refuges Complex, Refuge Manager
- Evelyn Nelson, Writer/Editor, Southeast Regional Office
- Nannette Brodie, Contractor, Tennessee Valley Authority
- Chevales Williams, Contractor, Tennessee Valley Authority

### **GIS Input for the Draft CCP/EA**

- Pat Hamlett, Contractor, Tennessee Valley Authority

## **Bioreview Teams**

The Biological and Habitat Review Teams consisted of Service staff and invited participants. The invited participants included local and regional experts, researchers, and individuals with intimate knowledge of and expertise in the biological resources of the refuge. The Blackbeard Island and Wassaw NWRs review took place on August 27-31, 2007, the Harris Neck NWR review took place on June 11-14, 2007, and the Savannah, Pinckney Island, and Tybee NWRs review took place on May 7-10, 2008. Members of these review teams included:

### **Blackbeard Island NWR Bioreview Team**

Deb Barnard, USFWS, Savannah Coastal Refuges  
Greg Askins, USFWS, Savannah Coastal Refuges  
John Robinette, USFWS, Savannah Coastal Refuges  
Chuck Hunter, USFWS Regional Refuge Biologist  
Wilson Laney, USFWS, Regional Fishery Biologist  
Terri Jenkins, USFWS, Savannah Coastal Refuges  
Scott Gilje, USFWS, Savannah Coastal Refuges

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Jane Griess, USFWS, Savannah Coastal Refuges Complex  
Kathy Chapman, USFWS, Brunswick ES Office  
Stefani Melvin, USFWS, Regional Waterbird Coordinator  
Bill Wikoff, USFWS, Brunswick ES Office  
Peter Range, USFWS, Savannah Coastal Refuges  
Shaw Davis, USFWS, Savannah Coastal Refuges  
Dave Brownlie, USFWS, Regional Fire Ecologist  
Mark Dodd, Georgia Department of Natural Resources  
Brad Winn, Georgia Department of Natural Resources  
Jon Ambrose, Georgia Department of Natural Resources  
David Rostal, Georgia Southern University  
Jacob Tuttle, Georgia Southern University/ USFWS  
Paul Sykes, U.S. Geological Survey (retired)

#### **Harris Neck NWR Bioreview Team**

Deb Barnard, USFWS, Savannah Coastal Refuges  
Greg Askins, USFWS, Savannah Coastal Refuges  
John Robinette, USFWS, Savannah Coastal Refuges  
Janet Ertel, USFWS  
Larry Bryan, Savannah River Ecology Laboratory  
Scott Gilje, USFWS, Savannah Coastal Refuges  
Jane Griess, USFWS, Savannah Coastal Refuges

#### **Savannah, Pinckney Island, and Tybee NWRs Bioreview Team**

Jane Griess, Project Leader, Savannah Coastal Refuges Complex, Savannah, GA  
John Robinette, Wildlife Biologist, Savannah Coastal Refuges Complex, Savannah, GA  
Russell Webb, Wildlife Biologist, Savannah NWR, Savannah, GA  
Laura Housh, Wildlife Biologist, Okefenokee NWR, Folkston, GA  
John Stanton, Supervisory Wildlife Biologist, Migratory Bird Field Office, Columbia, NC  
Laurel Barnhill, Bird Conservation Coordinator, SCDNR, Columbia, SC  
Steve Bennett, Biologist, SCDNR  
Ed EuDaly, Fish and Wildlife Biologist, Charleston ES Office, Charleston, SC  
Randy Breland, Prescribed Fire Specialist, Savannah NWR, Savannah, GA  
Felicia Sanders, Biologist, SCDNR, Charleston, SC  
Dean Harrigal, Waterfowl Biologist, SCDNR, Green Pond, SC  
Greg Balkom, Waterfowl Biologist, GADNR, Fort Valley, GA  
Terri Jenkins, Fire Control Officer, Savannah Coastal Refuges Complex, Savannah, GA  
Steve Calver, Wildlife Biologist, Army Corps of Engineers, Savannah, GA

#### **Wassaw NWR Bioreview Team**

Deb Barnard, USFWS, Savannah Coastal Refuges  
Greg Askins, USFWS, Savannah Coastal Refuges  
John Robinette, USFWS, Savannah Coastal Refuges  
Chuck Hunter, USFWS, Regional Refuge Biologist  
Wilson Laney, USFWS, Regional Fishery Biologist  
Terri Jenkins, USFWS, Savannah Coastal Refuges  
Scott Gilje, USFWS, Savannah Coastal Refuges  
Jane Griess, USFWS, Savannah Coastal Refuges

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Kathy Chapman, USFWS, Brunswick ES Office  
Stefani Melvin, USFWS, Regional Waterbird Coordinator  
Bill Wikoff, USFWS, Brunswick ES Office  
Peter Range, USFWS, Savannah Coastal Refuges  
Shaw Davis, USFWS, Savannah Coastal Refuges  
Dave Brownlie, USFWS, Regional Fire Ecologist  
Mark Dodd, Georgia Department of Natural Resources  
Brad Winn, Georgia Department of Natural Resources  
Jon Ambrose, Georgia Department of Natural Resources  
David Rostal, Georgia Southern University  
Jacob Tuttle, Georgia Southern University/ USFWS  
Paul Sykes, U.S. Geological Survey (retired)

### **Visitor Services Review Teams**

The Visitor Services Review Teams consisted of staff from the Service's Southeast Regional Office and other Service staff. The Blackbeard Island NWR review took place in July 2007, Harris Neck NWR took place in May 2007, Pinckney Island NWR took place in January 2008, Savannah NWR took place in January 2008, and the Wassaw NWR review took place in July 2007. Members of the review teams included:

#### **Blackbeard Island NWR Visitor Services Review Team**

Deborah Jerome, USFWS, Visitor Services and Outreach  
Robin Will, St. Marks NWR  
Blaine Eckberg, Okefenokee NWR

#### **Harris Neck NWR Visitor Services Review Team**

Garry Tucker, USFWS, Visitor Services and Outreach  
Joanna Taylor, Pelican Island/Archie Carr NWRs  
Shawn Gillette, Okefenokee NWR

#### **Pinckney Island NWR Visitor Services Review Team**

Garry Tucker, USFWS, Visitor Services and Outreach  
Teresa Adams, Wheeler NWR  
Joanna Webb, Pelican Island NWR

#### **Savannah NWR Visitor Services Review Team**

Garry Tucker, USFWS, Visitor Services and Outreach  
Teresa Adams, Wheeler NWR  
Joanna Webb, Pelican Island NWR

#### **Wassaw NWR Visitor Services Review Team**

Deborah Jerome, USFWS, Visitor Services and Outreach  
Robin Will, St. Marks NWR  
Blaine Eckberg, Okefenokee NWR

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## *Appendix M. Finding of No Significant Impact*

### **INTRODUCTION**

The U.S. Fish and Wildlife Service will protect and manage certain fish and wildlife resources in Chatham, Effingham, and McIntosh Counties, Georgia, and Jasper and Beaufort Counties, South Carolina through the Savannah, Tybee, Pinckney Island, Wassaw, Harris Neck, and Blackbeard Island National Wildlife Refuges, located within the Savannah Coastal Refuges Complex (Complex). An Environmental Assessment was prepared to inform the public of the possible environmental consequences of implementing the Comprehensive Conservation Plan (CCP) for these six refuges (Wolf Island NWR is also contained within this Complex, for which a separate CCP was completed in 2008). A description of the alternatives, the rationale for selecting the preferred alternative, the environmental effects of the preferred alternative, the potential adverse effects of the action, and a declaration concerning the factors determining the significance of effects, in compliance with the National Environmental Policy Act of 1969, are outlined below. The supporting information can be found in the Environmental Assessment, which was Section B of the Draft Comprehensive Conservation Plan.

### **ALTERNATIVES**

In developing this CCP for the six refuges of the Complex (Savannah, Tybee, Pinckney Island, Wassaw, Harris Neck, and Blackbeard Island) the Service evaluated three alternatives for each refuge.

The Service adopted Alternative B (Increased Management) as the preferred alternative for guiding the direction of these six refuges for the next 15 years. The overriding concern reflected in this CCP is that wildlife conservation assumes first priority in refuge management; wildlife-dependent recreational uses are allowed if they are compatible with wildlife conservation. Wildlife-dependent recreation uses (e.g., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) will be emphasized and encouraged.

#### *ALTERNATIVE A. NO ACTION ALTERNATIVE*

This alternative is required by NEPA and is the “no-action” or “status quo” alternative in which no major management changes would be initiated by the Service. This alternative also provides a baseline to compare the current habitat, wildlife, and public use management to the two action alternatives (alternatives B and C).

Alternative A represents no change from current management of the Complex. Management emphasis would continue to focus on maintaining biological integrity of habitats found on each refuge. Under this alternative, the Service would protect and maintain all refuge lands, primarily focusing on the needs of threatened and endangered species, with additional emphasis on the needs of migratory birds and resident wildlife. The Service would continue mandated activities for protection of federally listed species. Conservation of federally listed threatened and endangered species would be continued through current habitat management and monitoring programs accomplished primarily through established partnership and research projects.

Current management of migratory birds would continue to provide suitable habitat for waterfowl, contributing to the objective of the North American Waterfowl Management Plan. Surveying, monitoring, and managing of colonial waterbirds, shorebirds, neotropical migratory birds, wading birds, marsh birds, and other resident birds would continue, with no additional managing or



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monitoring. The operation and management of the refuges that would provide for the basic needs of these species varies, but generally would include, feeding, resting, and breeding. Measures at some refuges include planting vegetation used for food, nesting, and cover, as well as moist-soil management.

Mostly opportunistic monitoring and management of resident wildlife would occur under this alternative. The main objective for game species management would be to sustain healthy populations through hunting programs and current habitat management. Only current refuge wildlife management programs would continue to be maintained and since little baseline biological information would be gathered on non-managed species or groups of species, any new management would not be likely.

Complex staff would continue habitat management of existing beaches, wetlands, open waters, forested habitats, scrub/shrub habitat, grasslands, and open lands. All ponds, levees, moist-soil water management units, water control structures, and pumps would continue to be maintained to provide critical habitat for threatened and endangered species, waterfowl, and wetland-dependent birds. Current water quality information would be addressed on an as-needed basis and would continue to be limited. All other habitat management programs would remain unchanged.

Control of invasive and exotic plant species would continue to be performed by Complex staff on an opportunistic basis as funding and staffing permitted. This limited control would be performed by chemical and/or mechanical means, but would remain intermittent. Thus habitats and wildlife may be at risk due to this limited control. Additionally, the Complex staff would continue efforts to control/remove invasive, exotic and/or nuisance wildlife on the refuges. These species tend to reproduce rapidly and can be especially destructive to habitats. Control would continue to be implemented by the take of these animals as part of hunting programs, offered on some of the refuges, and opportunistically by Complex staff.

The Service would maintain the current levels of wildlife-dependent recreation activities (hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation opportunities). The Complex has a good base of facilities and equipment to support management operations for the 56,000 acres that span the seven refuges. Complex facilities and equipment to support management operations on the seven refuges include: Complex Office (currently in GSA rental space in Savannah, Georgia, awaiting completion of the Visitors Center/Offices located on Savannah NWR); Office/visitor center at Harris Neck NWR; and maintenance shop facilities and associated storage buildings and outbuildings located on Savannah, Harris Neck, Pinckney Island, Blackbeard Island and Wassaw NWRs. There is a public boat ramp and parking lot at Harris Neck NWR along with a commercial dock under lease to local watermen. At Pinckney Island NWR there is a public boat ramp and associated parking area managed under agreement with Beaufort County, South Carolina. This extensive network of public use facilities would continue to be maintained. These facilities do not interfere substantially with or detract from the achievement of wildlife conservation. The Complex manages an extensive visitor services program, including an environmental education program without an environmental education coordinator. In addition, the Complex manages recreation programs, volunteers, friends, and outreach.

Land would be acquired from willing sellers within each refuge's current acquisition boundary and in accordance with current Service policy. Law enforcement on each refuge would continue at the current level with emphasis on resource protection and public safety. This includes being designated to uphold current regulations and for protection of wildlife, visitors, and cultural and historical resources. The Service would maintain the refuge as funding allows. The Complex would continue to include a combined staff of 30 full-time members. These staff positions would continue to specifically support the seven refuges that make up the Complex.

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## *ALTERNATIVE B.*

The preferred alternative, Alternative B, is considered to be the most effective management action for meeting the purposes of these six refuges of the Complex. Under Alternative B, the emphasis would be on restoring and improving refuge resources needed for wildlife and habitat management and providing enhanced appropriate and compatible wildlife-dependent public use opportunities, while addressing key issues and individual refuge mandates.

This alternative would focus on augmenting wildlife and habitat management to identify, conserve, and restore populations of native fish and wildlife species with an emphasis on migratory birds and threatened and endangered species. This would partially be accomplished by increased monitoring of waterfowl, other migratory and resident birds, and endemic species in order to assess and adapt management strategies and actions. Additionally, information gaps would be addressed by the initiation of baseline surveys, periodic monitoring, and ultimately the addition of adaptive habitat management.

Habitat management programs for impoundments, beaches, wetlands, open waters, forested habitats, scrub/shrub habitat, grasslands, and open lands would be reevaluated and step-down management plans would be developed to meet the foraging, resting, and breeding requirements of priority species. Additionally, monitoring and adaptive habitat management would be implemented to potentially counteract the impacts associated with long-term climate change and sea level rise.

The control of invasive and exotic plant species would be more aggressively managed by implementing a management plan, completing a baseline inventory, and supporting research and control with strategic mechanical and chemical means. Additionally, the Complex staff would utilize this management plan and monitoring to enhance efforts to control/remove invasive and exotic/nuisance wildlife on the refuges.

Alternative B enhances each refuge's visitor services opportunities (except for Tybee NWR which would remain closed to the public) by: improving the quality of fishing opportunities; streamlining quota hunt process and where possible evaluating the options of allowing the use of crossbows and creating additional hunting opportunities; maintaining and where possible expanding environmental education opportunities by developing refuge-specific environmental education programs, enhancing current partnerships and construction of new environmental education facilities; enhancing wildlife viewing and photography opportunities by expanding walking, bicycling, driving, and boating access for wildlife observation and photography by establishing trailhead kiosks, building observation platforms, installing spotting scopes, providing photography workshops and identifying additional wildlife viewing areas; developing and implementing a visitor services management plan, and enhancing personal interpretive and outreach opportunities. Volunteer programs and a "Friends of the Refuge" group would be expanded to enhance all aspects of refuge management and to increase resource availability. The Complex is also evaluating the possibility of utilizing a concessionaire at Pinckney NWR to implement a tram tour of the refuge. This would enable the refuge to provide access in a controlled manner that would allow participation from patrons with mobility issues.

Under this alternative, the priority of land acquisition at Harris Neck NWR would be to acquire lands that provide resource and public use values from willing sellers by: fee title purchase, donation, mitigation purchase and transfer, or other viable means. This would include an investigation into expanding the current acquisition boundary. At Savannah NWR, focus would be increased on acquiring lands that provide resource and public use values from willing sellers by any viable means.

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Law enforcement activities to protect archaeological and historical sites and provide visitor safety would be intensified. The allocation of an additional law enforcement officer for the Complex would provide security for cultural resources, but would also ensure visitor safety and public compliance with refuge regulations.

Administration plans would stress the need for increased maintenance of existing infrastructure and construction of new facilities. Funding for new construction projects would be balanced between habitat management and public use needs. Additional staff would be required to accomplish the goals of this alternative. Personnel priorities would include employing an environmental education coordinator, law enforcement officers/park rangers, a volunteer coordinator, biological technicians, maintenance workers, refuge managers, refuge assistant managers, and a geographic information systems specialist. The increased Complex budget and staffing levels would better enable the Complex to meet the obligations of wildlife stewardship, habitat management, and public use.

### *ALTERNATIVE C.*

Under Alternative C, the management of the refuge resources would be employed to allow natural succession to take place on the refuges, while maintaining the current slate of public use opportunities. All purposes of the refuges and mandated monitoring of federal trust species and archaeological resources would be continued, but other wildlife management would be mostly performed on an incidental basis.

This alternative would utilize a custodial habitat management strategy. Impoundments, beaches, wetlands, open waters, forested habitats, scrub/shrub habitat, grasslands, and open lands would not be actively managed and would allow natural disturbance to maintain succession, unless the habitats primarily focus on the needs of threatened and endangered species or the needs of priority species, such as migratory birds. Fire management would be reduced to include wildfire response only.

The Service would continue mandated activities for protection of federally listed species. Conservation of federally listed threatened and endangered species would be continued through current habitat management and monitoring programs accomplished primarily through established partnership and research projects.

Current management of migratory birds would continue to provide suitable habitat for waterfowl, contributing to the objective of the North American Waterfowl Management Plan. Climate control changes and sea level rise would continue to be monitored on an opportunistic basis with very little or no adaptive habitat management.

Control of invasive and exotic plant species would continue to be performed by Complex staff on an opportunistic basis as funding and staffing permitted. This limited control would be performed by chemical and/or mechanical means, but would remain intermittent. Additionally, the Complex staff would continue efforts to control/remove invasive, exotic and/or nuisance wildlife on the refuges.

The Service would maintain the current levels of wildlife-dependent recreation activities (hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation). Public use facilities would continue to be maintained, as would the current visitor services program.

No additional land acquisition would be pursued under this alternative. Only additional law enforcement staff would be added to the staff to increase emphasis on resource protection and public safety. This includes being designated to uphold current regulations and for protection of wildlife, visitors, and cultural and historical resources. The Service would maintain the refuge as funding allows.

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## ***Selection Rationale***

Alternative B is selected for implementation because it directs the development of programs to best achieve the Complex purpose and goals; emphasizes adaptive management; collects comprehensive habitat and wildlife data; promotes wildlife-dependent recreation and environmental education; and ensures long-term achievement of the Complex and Service objectives. These management actions provide balanced levels of compatible public use opportunities consistent with existing laws, Service policies, and sound biological principles. It provides the best mix of program elements to achieve desired long-term conditions.

Under this alternative, all lands of these six refuges under the management and direction of the Complex will be protected, maintained, and enhanced to best achieve national, ecosystem, and refuge-specific goals and objectives within anticipated funding and staffing levels. In addition, the action positively addresses significant issues and concerns expressed by the public.

## ***Environmental Effects***

Implementation of the Service's management action is expected to result in environmental, social, and economic effects as outlined in the comprehensive conservation plan. These effects are detailed, by refuge, as follows:

### **Blackbeard NWR**

- **Wildlife Population Management** – Alternative B increased monitoring, management, and restoration of habitat would positively impact wildlife populations, more effectively control invasive species, and would identify and protect threatened and endangered species, particularly the loggerhead sea turtle and piping plover.
- **Habitat Management** – Alternative B expanded forest management activities should increase native forest habitat populations; and, continued evaluation and use of prescribed fire as a management tool would provide for more diverse habitats (and reduce hazardous fuels). Expanded management and restoration of freshwater impoundments would positively impact wetland-dependent bird populations. Increased monitoring of wetlands and marshes would provide information, but would not likely result in a significant effect on marsh “die off.” Alternative B would partner with the Corps of Engineers and increase active management activities to reduce beach erosion. The development and implementation of a habitat management plan would provide guidance for management of habitats for trust species and species of concern as well as increase information and research to enable adaptive management to cope with long-term climate change and sea level rise.
- **Visitor Services** – An enhanced visitor services program would allow more opportunities for public participation in wildlife observation and interpretation, as well as expanded environmental education activities and public outreach events – all which would further Service policies and help support the local economy. Increased visitation may cause additional disturbance to wildlife and additional law enforcement and facilities maintenance issues.
- **Resource Protection** – Development and implementation of a law enforcement plan will provide better protection of archaeological and historical sites. Increase focus on neighboring mainland development and management of wilderness habitat would restrict sensitive areas and minimize human disturbances.

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- Refuge Administration – Alternative B would increase the Complex budget and staffing levels to better meet the obligations of wildlife stewardship, habitat management, and public use.

#### Harris Neck NWR

- Wildlife Population Management – Alternative B's increased monitoring, management, and restoration of habitat would positively impact wildlife populations, more effectively control invasive species, and would identify and protect threatened and endangered species, particularly wood stork populations.
- Habitat Management – Alternative B's expanded forest management activities should increase native forest habitat populations and continued evaluation and use of prescribed fire as a management tool would provide for more diverse habitats (and reduce hazardous fuels). Saltwater intrusion problems would continue to be a problematic issue under Alternative B. The development and implementation of a habitat management plan would provide guidance for management of habitats for trust species and species of concern as well as increase information and research to enable adaptive management to cope with long-term climate change and sea level rise.
- Visitor Services – An enhanced visitor services program would allow more opportunities for public participation in wildlife observation and interpretation, as well as expanded environmental education activities and public outreach events – all which would further help support Service policies and the local economy. However, increased visitation may cause additional disturbance to wildlife, as well as additional law enforcement and maintenance issues.
- Resource Protection – Conservation and protection of additional habitat would be accomplished through land acquisition, conservation easements, and the private lands program. Residential encroachment may have negative impacts on natural resources of the refuge. Under Alternative B, land that provides resource and public use values would be acquired from willing sellers by fee title purchase, donation, mitigation purchase and transfer, or other viable means. This would include an investigation into expanding the current acquisition boundary.
- Refuge Administration – Additional staff will improve both the refuge's and the Complex's ability to manage wildlife and habitat, maintain equipment and facilities, provide visitor services, and ensure public safety.

#### Pinckney Island NWR

- Wildlife Population Management – Alternative B's increased monitoring, management, and restoration of habitat would increase wildlife populations and significantly reduce invasive species.
- Habitat Management – Alternative B's expanded forest management activities should increase native forest habitat populations and continued evaluation and use of prescribed fire as a management tool would provide for more diverse habitats (and reduce hazardous fuels). The development and implementation of a habitat management plan would provide guidance for management of habitats for trust species and species of concern as well as increase information and research to enable adaptive management to cope with long-term climate change and sea level rise.
- Visitor Services – An enhanced visitor services program and potential development of a Visitor Center/concessions operation would allow more opportunities for public participation in wildlife observation and interpretation, as well as expanded environmental education activities and public outreach events – all which would further help support Service policies and the local economy. However, increased visitation may cause

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additional disturbance to wildlife, as well as additional law enforcement and maintenance issues.

- Resource Protection – Highway access to the refuge is a public safety concern (a DOT traffic study is underway). Current commercial and residential encroachment may have impacts on natural resources.
- Refuge Administration – Additional staff will improve both the refuge's and the Complex's ability to manage wildlife and habitat, maintain equipment and facilities, provide visitor services, and ensure public safety.

#### Savannah NWR

- Wildlife Population Management – Savannah NWR's Alternative B restored and expanded wetland management would positively support wintering waterfowl, migratory birds, and other wetland dependent birds. Increased monitoring and adaptive management projects would improve habitats and added research and increased surveys would positively affect biological foundation and fill data gaps.
- Habitat Management – An expanded focus on removal and/or control of invasive species would improve the overall habitat of native species. The development and implementation of a habitat management plan would provide guidance for management of habitats for trust species and species of concern, as well as increase information and research to enable adaptive management to cope with long-term climate change and sea level rise.
- Visitor Services – The addition of new facilities, staff, and programs would allow the refuge to enhance visitor interpretation, environmental education, and provide additional outreach opportunities to the community. The increased public use opportunities would positively support the local economy. However, increased visitation may cause additional disturbance to wildlife and additional law enforcement and facilities maintenance issues.
- Resource Protection – Under Alternative B, Savannah NWR would seek to acquire lands that provide resource and public use values from willing sellers by any viable means. The expansion of refuge lands would positively impact wildlife. Industrial and residential encroachment may have an impact on natural and cultural resources; however, increased partnerships of Alternative B would positively impact strategic landscape level conservation. Ongoing nearby industrial activities introduce unknown impacts to water, air, and soil; however, the increased monitoring activities of Alternative B should allow for earlier detection of spills and contamination. Highway access to the refuge is a public safety concern (a DOT traffic study is underway). Increased law enforcement patrols would help to protect populations from illegal take and disturbance.
- Refuge Administration – Additional staff will improve both the refuge's and the Complex's ability to manage wildlife and habitat, maintain equipment and facilities, provide visitor services, and ensure public safety.

#### Tybee NWR

- Wildlife Population Management – Increased monitoring and expanded bird monitoring information would allow adaptive management activities to improve habitat and contribute to the recovery of any threatened and endangered species.
- Habitat Management – The development and implementation of a habitat management plan would provide guidance for management of habitats for trust species and species of concern and provide for the removal of invasive species, resulting in an improvement of the overall habitat of native species. An increase in information and research would facilitate better adaptive management activities to cope with long-term climate change and sea level rise. In partnership with the Corps of Engineers, Alternative B would use dredge spoil to increase and support bird habitat.

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- Visitor Services – Tybee NWR is closed to the public.
  - Resource Protection – Increased law enforcement patrols would help to protect populations from illegal take and disturbance (disruption of nesting) and also allow for early detection of spills or contaminants – ongoing nearby industrial activities introduce unknown impacts to water, air, and soil.
  - Refuge Administration – Additional staff will improve both the refuge's and the Complex's ability to manage wildlife and habitat and maintain equipment and facilities.

#### Wassaw NWR

- Wildlife Population Management – Alternative B's increased monitoring, management, and restoration of habitat would positively impact wildlife populations, more effectively control invasive species, and would identify and protect threatened and endangered species, particularly the loggerhead sea turtle and piping plover.
- Habitat Management – Alternative B's expanded forest management activities should allow native forest habitat populations to thrive and continued evaluation and use of prescribed fire as a management tool would provide for more diverse habitats (and reduces hazardous fuels). Increased monitoring of wetlands and marshes would provide information, but would not likely result in a significant effect on marsh "die off." Alternative B would partner with the Corps of Engineers and increase active management activities to reduce beach erosion. The development and implementation of a habitat management plan would provide guidance for management of habitats for trust species and species of concern, as well as increase information and research to facilitate adaptive management strategies to cope with long-term climate change and sea level rise.
- Visitor Services – An enhanced visitor services program would allow more opportunities for public participation in wildlife observation and interpretation, as well as expanded environmental education activities and public outreach events – all which would further Service policies and help support the local economy. Increased visitation may cause additional disturbance to wildlife and additional law enforcement and facilities maintenance issues.
- Resource Protection – Development and implementation of a law enforcement plan will provide better protection of archaeological and historical sites. Alternative B would expand attention given to the impacts of neighboring mainland development on the natural resources of Wassaw NWR.
- Refuge Administration – Alternative B would increase the Complex budget and staffing levels to better meet the obligations of wildlife stewardship, habitat management, and public use.

### **Potential Adverse Effects and Mitigation Measures**

#### *Water Quality from Soil Disturbance and Use of Herbicides*

Soil disturbance and siltation due to water management activities; road and levee maintenance; and the construction of maintenance facilities, boat ramps, a visitor center, etc., is expected to be minor and of short duration. To further reduce potential impacts, the Complex would use Best Management Practices to minimize the erosion of soils into water bodies.

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

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

#### *Wildlife Disturbance*

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

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

#### *Vegetation Disturbance*

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

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

#### *User Group Conflicts*

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

#### *Effects on Adjacent Landowners*

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

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



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## Land Ownership and Site Development

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

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

## Coordination

The management action has been thoroughly coordinated with all interested and/or affected parties. Parties contacted include:

- All affected landowners
- Congressional representatives
- Governor of South Carolina and Georgia
- Georgia and South Carolina Forestry Commission
- U.S. Coast Guard
- U.S. Army Corps of Engineers
- Georgia and South Carolina Department of Natural Resources
- Georgia Ports Authority
- Georgia Department of Transportation
- National Park Service—Fort Pulaski National Monument
- Gray's Reef National Marine Sanctuary
- Armstrong Atlantic State University
- University of Georgia
- Local community officials
- Local Chamber of Commerce
- Interested citizens
- Conservation organizations
- Local business and outfitters

## Findings

It is my determination that the management action does not constitute a major federal action significantly affecting the quality of the human environment under the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969 (as amended). As such, an environmental impact statement is not required. This determination is based on the following factors (40 C.F.R. 1508.27), as addressed in the Environmental Assessment for Savannah, Tybee, Pinckney Island, Wassaw, Harris Neck, and Blackbeard Island National Wildlife Refuges:

1. Both beneficial and adverse effects have been considered and this action will not have a significant effect on the human environment. (Environmental Assessment, pages 275-411).

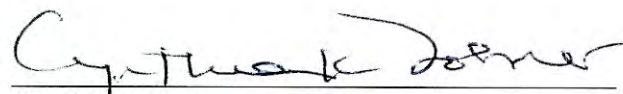
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2. The actions will not have a significant effect on public health and safety. (Environmental Assessment, pages 275-411).
  3. The project will not significantly affect any unique characteristics of the geographic area such as proximity to historical or cultural resources, wild and scenic rivers, or ecologically critical areas. (Environmental Assessment, pages 276-289, 309, 329, 346, 368, 379, 400, 409).
  4. The effects on the quality of the human environment are not likely to be highly controversial. (Environmental Assessment, pages 275-411).
  5. The actions do not involve highly uncertain, unique, or unknown environmental risks to the human environment. (Environmental Assessment, pages 275-411).
  6. The actions will not establish a precedent for future actions with significant effects nor do they represent a decision in principle about a future consideration. (Environmental Assessment, pages 275-411).
  7. There will be no cumulatively significant impacts on the environment. Cumulative impacts have been analyzed with consideration of other similar activities on adjacent lands, in past action, and in foreseeable future actions. (Environmental Assessment, pages 404-411).
  8. The actions will not significantly affect any site listed in, or eligible for listing in, the National Register of Historic Places, nor will they cause loss or destruction of significant scientific, cultural, or historic resources. (Environmental Assessment, pages 276-289, 309, 329, 346, 368, 379, 400, 409).
  9. The actions are not likely to adversely affect threatened or endangered species, or their habitats. (Environmental Assessment, pages 278-289, 292-294, 299, 313, 314, 320, 333, 351, 384-386, 390, 408).
  10. The actions will not lead to a violation of federal, state, or local laws imposed for the protection of the environment. (Environmental Assessment, pages 275-411).

## Supporting References

Fish and Wildlife Service. 2010. Draft Comprehensive Conservation Plan and Environmental Assessment for Savannah Coastal Refuge Complex -- Blackbeard Island, Harris Neck, Pinckney Island, Savannah, Tybee and Wassaw National Wildlife Refuges, Located in Chatham, Effingham and McIntosh Counties, Georgia and Jasper and Beaufort Counties, South Carolina. U.S. Department of the Interior, Fish and Wildlife Service, Southeast Region.

## Document Availability

The Environmental Assessment was Section B of the Draft Comprehensive Conservation Plan for Savannah, Tybee, Pinckney Island, Wassaw, Harris Neck, and Blackbeard Island National Wildlife Refuges and was made available in September and October of 2010. Additional copies are available by writing: Savannah Coastal Refuges Complex, 694 Beech Hill Lane, Hardeeville, SC 29927



Cynthia Dohner  
Regional Director, *Southeast Region*

6/17/2011  
Date

## **Savannah Coastal Refuges Complex**

**Blackbeard Island National Wildlife Refuge**

**Harris Neck National Wildlife Refuge**

**Pinckney Island National Wildlife Refuge**

**Savannah National Wildlife Refuge**

**Tybee National Wildlife Refuge**

**Wassaw National Wildlife Refuge**

**Jane Griess, *Project Leader***

**Russ Webb, *Refuge Manager***

**Savannah National Wildlife Refuge**

**c/o Savannah Coastal Refuges Complex**

**694 Beech Hill Lane**

**Hardeeville, SC 29927**

**Phone: (843) 784-2468**

**Fax: (843) 784-2465**

**Email: [savannahcoastal@fws.gov](mailto:savannahcoastal@fws.gov)**

**U.S. Fish & Wildlife Service**

**1 800/344 WILD**

**<http://www.fws.gov>**

**September 2011**

