
**DRAFT COMPREHENSIVE CONSERVATION PLAN
AND ENVIRONMENTAL ASSESSMENT**

GRAND BAY NATIONAL WILDLIFE REFUGE

Jackson County, Mississippi and Mobile County, Alabama

**U.S. Department of the Interior
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A. DRAFT COMPREHENSIVE CONSERVATION PLAN

I. Background

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has developed this Draft Comprehensive Conservation Plan for Grand Bay National Wildlife Refuge to guide the refuge's management actions and direction over the next 15 years. Fish and wildlife conservation will receive first priority in refuge management; wildlife-dependent recreation will be allowed and encouraged as long as it is compatible with, and does not detract from, the mission of the refuge or the purposes for which it was established.

A planning team developed a range of alternatives that best meet the goals and objectives of the refuge and that could be implemented within the 15-year planning period. This draft comprehensive conservation plan and environmental assessment describes the Service's proposed plan, as well as the other alternatives that were considered and their effects on the environment. This draft plan and environmental assessment is being made available to state and federal government agencies, conservation partners, and the general public for review and comment. All public comments will be considered in the development of the final plan.

PURPOSE AND NEED FOR THE PLAN

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

Specifically, the plan is needed to:

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

U.S. FISH AND WILDLIFE SERVICE

The 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 in the Department of Commerce and Labor in 1903.

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

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

The U.S. Fish and Wildlife Service is responsible for conserving, enhancing, and protecting fish and wildlife and their habitats for the continuing benefit of people through federal programs relating to wild birds, endangered species, certain marine mammals, inland sport fisheries, and specific fishery and wildlife research activities (142 DM 1.1).

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

NATIONAL WILDLIFE REFUGE SYSTEM

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

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

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

- fulfill the mission of the National Wildlife Refuge System;
- fulfill the individual purposes of each refuge;
- consider the needs of fish and wildlife first;
- fulfill the requirement of developing a comprehensive conservation plan for each unit of the Refuge System, and fully involve the public in the preparation of these plans;
- maintain the biological integrity, diversity, and environmental health of the Refuge System;
- recognize that wildlife-dependent recreation activities including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation are legitimate and priority public uses; and
- retain the authority of refuge managers to determine compatible public uses.

The following describes a few examples of the Service's national network of conservation lands. Pelican Island National Wildlife Refuge, the first refuge, was established in 1903 for the protection of colonial nesting birds in Florida, such as the snowy egret and the brown pelican. Western refuges were established for American bison (1906), elk (1912), prong-horned antelope (1931), and desert bighorn sheep (1936) after overhunting, competition with cattle, and natural disasters decimated the once-abundant herds. The drought conditions of the Dust Bowl during the 1930s severely depleted breeding populations of ducks and geese. Refuges established during the Depression focused on waterfowl production areas, 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 began to focus on establishing refuges for endangered species.

Approximately 38 million people visited national wildlife refuges in 2002, most to observe wildlife in their natural habitats. As the number of visitors grows, there are significant economic benefits to local communities. In 2001, 82 million people 16 years and older either fished, hunted, or observed wildlife, generating \$108 billion. In a study completed in 2002 on 15 refuges, visitation had grown 36 percent in 7 years. At the same time, the number of jobs generated in 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 that were identified for the 1995 study. Other findings also validate the belief that communities near refuges benefit economically. Expenditures on food, lodging, and transportation grew to \$6.8 million per refuge, up 31 percent from \$5.2 million in 1995. For each federal dollar spent on the Refuge System, the surrounding communities benefited with \$4.43 in recreation expenditures and \$1.42 in job-related income (Caudill and Laughland 2003).

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

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

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

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

LEGAL AND POLICY CONTEXT

LEGAL MANDATES, ADMINISTRATIVE AND POLICY GUIDELINES, AND OTHER CONSIDERATIONS

Administration of national wildlife refuges is guided by the mission and goals of the National Wildlife Refuge System, congressional legislation, presidential executive orders, and international treaties. Policies for management options of refuges are further refined by administrative guidelines established by the Secretary of the Interior and by policy guidelines established by the Director of the Fish and Wildlife Service. Please refer to Appendix III for a complete list of the relevant legal mandates.

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 Grand Bay National Wildlife Refuge and other partners such as the Grand Bay National Estuarine Research Reserve; the Mississippi Department of Wildlife, Fisheries, and Parks; the Mississippi Department of Marine Resources; Mississippi State University; the Alabama Department of Conservation and Natural Resources; and private landowners.

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

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

BIOLOGICAL INTEGRITY, DIVERSITY, AND ENVIRONMENTAL HEALTH POLICY

The National Wildlife Refuge System Improvement Act of 1997 directs the Service to ensure that the biological integrity, diversity, and environmental health of the refuges are maintained for the benefit of present and future generations of Americans. This policy is an additional directive for refuge managers to follow while achieving the purposes of the refuge and the mission of the System. It provides for the consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on the refuges and their associated ecosystems. When evaluating the appropriate management direction for refuges, refuge managers are required to use sound professional judgment to determine the refuges' contribution to biological integrity, diversity, and environmental health at multiple landscape scales. Sound professional judgment incorporates field experience, knowledge of refuge resources, the refuge's role within an ecosystem, applicable laws, and best available science, including consultation with others both inside and outside the Service.

NATIONAL AND INTERNATIONAL CONSERVATION PLANS AND INITIATIVES

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

This draft comprehensive conservation plan 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 (NABCI) 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 (NAWMP) 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 habitats. 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, nongovernmental organizations, private companies, and many individuals, all working towards achieving better wetland habitat for the benefit of migratory birds, other wetland-associated species and people. 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 East Gulf 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 nongame land birds. Nongame land birds have been vastly under-represented in conservation efforts, and many are exhibiting significant declines. This plan is voluntary and nonregulatory, and focuses on relatively common species in areas where conservation actions can be most effective, rather than the frequent local emphasis on rare and peripheral populations.

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 the awareness of shorebirds and the threats they face.

Northern American Waterbird Conservation Plan

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

RELATIONSHIP TO STATE WILDLIFE AGENCIES

A provision of the National Wildlife Refuge System Improvement Act of 1997, and subsequent agency policy, is that the Service shall ensure timely and effective cooperation and collaboration with other state fish and game agencies and tribal governments during the course of acquiring and managing refuges. State wildlife management areas and national wildlife refuges provide the foundation for the protection of species, and contribute to the overall health and sustainment of fish and wildlife species in the states of Mississippi and Alabama.

In Mississippi, two state conservation agencies—the Department of Marine Resources (MDMR) and the Department of Wildlife, Fisheries, and Parks (MDWFP)—regularly partner with the U.S. Fish and Wildlife Service in mutual efforts to conserve the state’s habitats and wildlife populations.

The Mississippi Legislature created the MDMR (www.dmr.state.ms.us) in 1994 as a separate governing agency to enhance, protect and conserve the state’s marine interests. Under the authority of the Commission on Marine Resources, the MDMR manages all marine life, public trust wetlands, adjacent uplands and waterfront areas in Mississippi. It also provides for the balanced commercial, recreational, educational, and economic uses of marine-related resources, consistent with environmental concerns and social changes (MDMR n.d.a). The MDMR and the Commission on Marine Resources play an important role in implementing and administering Mississippi Seafood Laws, the Mississippi Coastal Wetlands Protection Act, the Public Trust Tidelands Act, the Boat and Water Safety Act, the Derelict Vessel Act, the Non-point Source Pollution Act, the Magnuson Act, the Wallop-Breaux Sportfish Restoration Act, and Marine Litter Act, as well as other state and federal mandates (MDMR n.d.b). Among its various responsibilities, the MDMR operates Mississippi’s Coastal Preserves Program.

The MDWFP (<http://www.mdwfp.com>) is charged with enforcement responsibilities for migratory birds and endangered species, as well as managing the state’s natural resources. The total area owned or managed by the State of Mississippi in support of wildlife, recreation, and fisheries is 828,408 acres, including 42 wildlife management areas and 29 state parks encompassing 823,297 acres, and 21 lakes totaling 5,111 acres. The MDWFP directs the state’s wildlife conservation program and provides public recreation opportunities, including an extensive hunting and fishing program, on several WMAs and parks located near the refuge. Overall, a combined total of nearly 100 wildlife management areas and national wildlife refuge areas provide the foundation for the protection of

wildlife species throughout Mississippi, and contribute to the overall health and sustainability of the state's fish and wildlife (Southeastern Outdoors 2004).

The Alabama Department of Conservation and Natural Resources (ADCNR) (www.dnr.state.al.us) provides management and protection for the state's fish and wildlife resources through conservation enforcement officers in each county statewide and through fisheries and wildlife biologists. The ADCNR's major goal is to promote stewardship and enjoyment of Alabama's natural resources, both for present and future generations. It is responsible for freshwater fish, wildlife, marine resources, waterway safety, state lands, state parks, and other natural resources. The ADCNR manages 24 state parks, 23 fishing lakes, 3 fish hatcheries, 2 waterfowl refuges, 2 wildlife sanctuaries, 34 wildlife management areas, and a mariculture center. It has responsibility for more than 645,000 acres of trust lands set aside in Alabama for wildlife purposes.

The states' participation and contribution throughout this planning process will provide for ongoing opportunities and open dialogue to improve the ecological sustainment of fish and wildlife in the states of Mississippi and Alabama. An essential part of comprehensive conservation planning is the integration of common mission objectives where appropriate.

II. Refuge Overview

INTRODUCTION

Grand Bay National Wildlife Refuge is located in the coastal zone of Jackson County, Mississippi and Mobile County, Alabama, approximately 10 miles east of Pascagoula, Mississippi and about 20 miles west of Mobile, Alabama (Figures 1 and 2). It forms part of the Gulf Coast National Wildlife Refuge Complex, which also includes Mississippi Sandhill Crane National Wildlife Refuge to the west and Bon Secour National Wildlife Refuge to the east.

Habitats encompassed by the refuge include a riverine area on the west side containing a section of the Escatawpa River and a tributary, Black Creek; an area of coastal savanna in the central part of the refuge; and a large gopher tortoise colony at the northeast corner of the refuge.

The Grand Bay Refuge's cypress-tupelo swamps provide ideal habitat for wood ducks, other migratory birds, and many resident wildlife species, including white-tailed deer and wild turkey. The refuge's salt flats, tidal creeks, and brackish marshes are used extensively by wading birds, shorebirds, and waterfowl, including the mottled duck, a species of concern in Alabama and Mississippi. About 20 percent of the coastal waterfowl in Alabama and Mississippi winter in this area, the most prevalent species being lesser scaup, redhead, ring-necked duck, mallard, and American wigeon.

Other species that use the refuge's estuarine habitats include bald eagles, peregrine falcons, clapper rails, black rails, Gulf salt marsh water snakes, and Mississippi diamondback terrapins.

The fishery of the Escatawpa River system and its associated sloughs and lakes contain populations of species such as largemouth bass, bream, crappie, and catfish. Public fishing is popular along the river. More than 80 species of fish have been reported from the estuarine habitats of Grand Bay, including species such as Atlantic croaker, spot, menhaden, spotted sea trout, flounder, red drum, oysters, and several species of shrimp (USFWS 2005).

The Grand Bay Refuge provides a wide variety of habitats for migratory species. The northern portion of the refuge is composed of palustrine forested habitat, with mixed hardwoods and slash/loblolly pine as the most prevalent species types. This habitat supports a broad variety of neotropical migratory birds, as well as several species of waterfowl.

Further south within the refuge, a palustrine emergent ecosystem becomes more common, with increasing shrubs and bottomland hardwood stands. At the true coastal interface, the habitat transitions into a broad floodplain swamp ecosystem. The southernmost portions open to marine intertidal, estuarine subtidal, and estuarine intertidal emergents, and finally to palustrine unconsolidated shore. This portion supports various species of sandpipers, terns, and kites.

Endangered and threatened species that occur at or may visit this refuge include the threatened gopher tortoise, the threatened bald eagle, the endangered red-cockaded woodpecker, and the endangered brown pelican.

Figure 1. Vicinity map of Grand Bay National Wildlife Refuge.

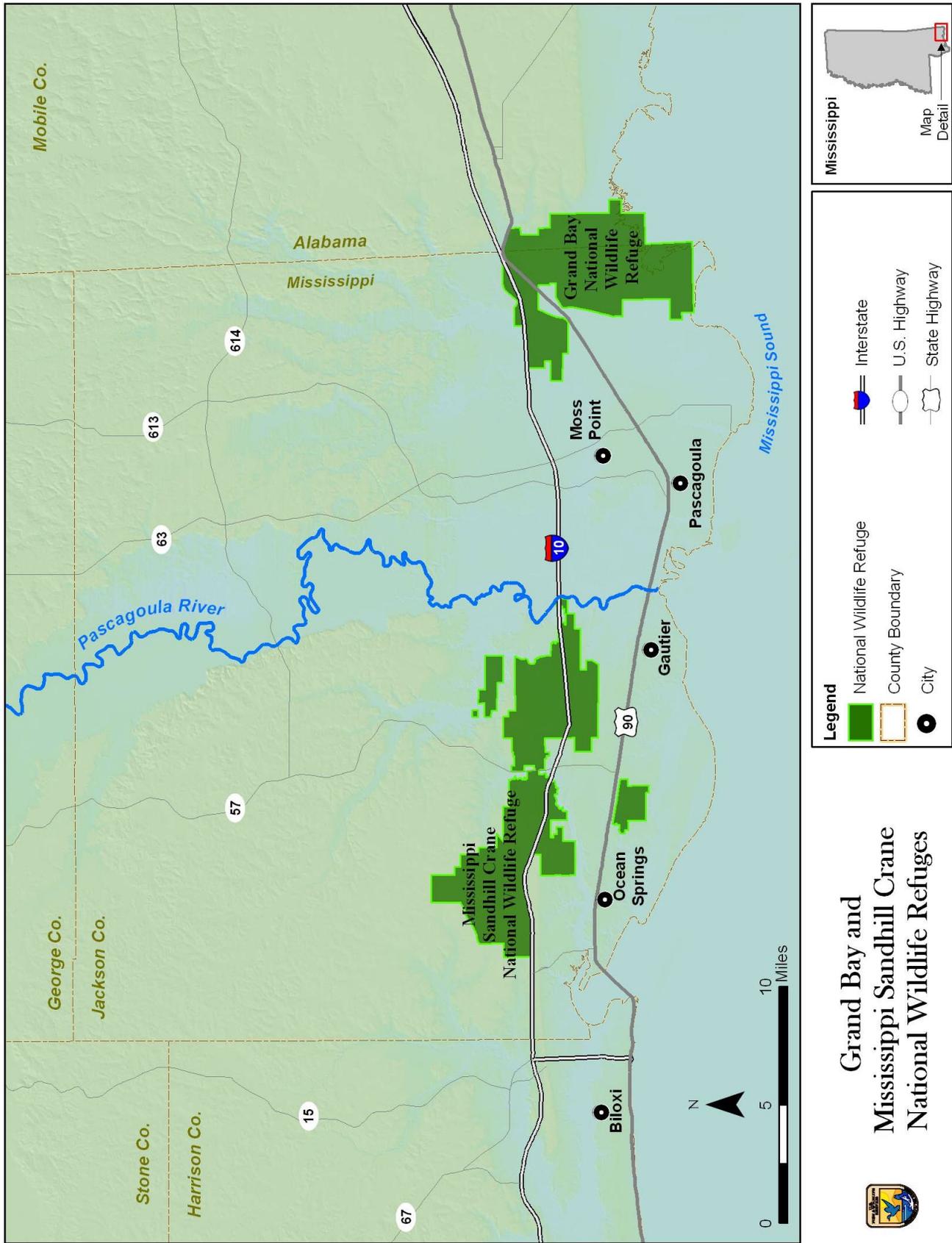
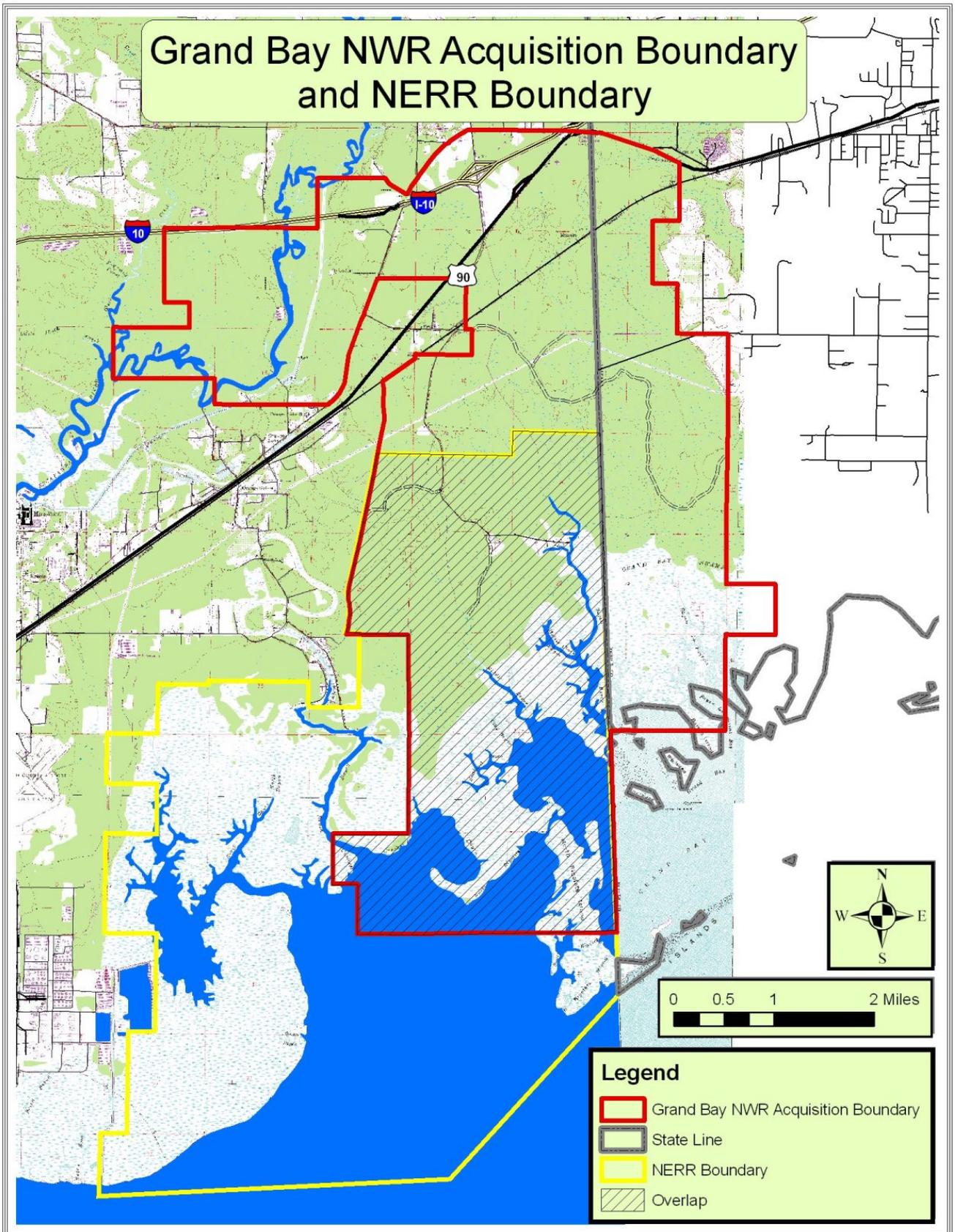


Figure 2. Acquisition boundary, Grand Bay National Wildlife Refuge.



REFUGE HISTORY AND PURPOSE

Grand Bay National Wildlife Refuge (NWR) was established in 1992 with an acquisition boundary of 12,100 acres. The main function of the refuge is to protect one of the largest expanses of Gulf Coast savanna remaining in a relatively undisturbed state. In 1997, a 2,700-acre expansion was approved to bring under management a section of the scenic Escatawpa River. In 2003, another expansion was approved to include a string of nearshore barrier islands just to the south of the refuge (660 acres) and a 5-acre tract on the north side of Independence Road, which forms part of the refuge's northern boundary. To date, the Service has acquired approximately 10,188 acres within the acquisition boundary. The refuge was established under the authority of the Emergency Wetlands Resources Act of 1986, which calls 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 USC 3901 (b), 100 Stat. 3583).

SPECIAL DESIGNATIONS

GRAND BAY NATIONAL ESTUARINE RESEARCH RESERVE

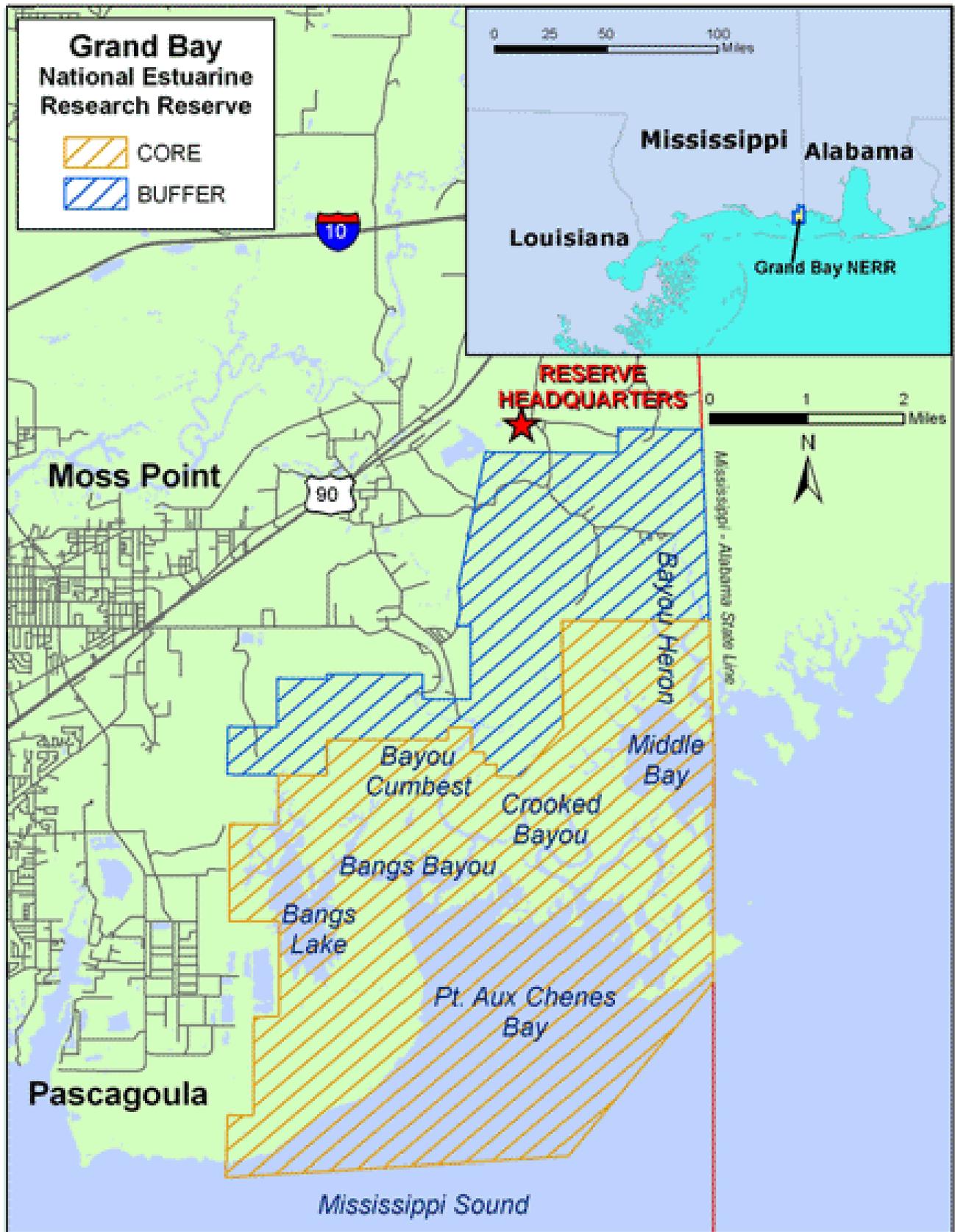
The Mississippi portion of Grand Bay NWR is part of the 18,400-acre Grand Bay National Estuarine Research Reserve (NERR), which was designated in 1999 (Figure 3). This reserve contains a variety of wetland habitats, both tidal and nontidal, such as pine savannas, salt marshes, salt pannes, bays and bayous, as well as terrestrial habitats that are unique to the coastal zone such as maritime forests.

These habitats support many important species of fish and wildlife. Commercially and recreationally important species of finfish and shellfish such as brown shrimp, speckled trout and oysters are abundant. Sea turtles, bottlenose dolphin and, on occasion, manatees can be found in the deeper waters of the reserve. Many species of carnivorous plants and orchids grow in the higher savanna habitats (Grand Bay NERR 2006).

The Grand Bay NERR is one of 27 designated areas within the National Estuarine Research Reserve System, a network representing different biogeographic regions of the United States that are protected for long-term research, water quality monitoring, education, and coastal stewardship. Established by the Coastal Zone Management Act of 1972, as amended, the National Estuarine Research Reserve System is a partnership program between the National Oceanic and Atmospheric Administration (NOAA) and the coastal states. NOAA provides funding, national guidance and technical assistance. Each reserve is managed on daily basis by a lead state agency or university, with input from local partners (National Estuarine Research Reserve System 2006). The lead state agency for the Grand Bay NERR is the Mississippi Department of Marine Resources.

Other major partners of the Grand Bay NERR include NOAA; the Mississippi Secretary of State's Office; Mississippi State University; The Nature Conservancy; U.S. Fish and Wildlife Service; and the University of Southern Mississippi. Additionally, a Citizens Advisory Committee has been formed to assure that the concerns of local citizens are adequately addressed by the Grand Bay NERR's Management Board.

Figure 3. Grand Bay National Estuarine Research Reserve.



The Grand Bay NERR carries out a range of research, educational, and stewardship activities, in addition to allowing for recreation. Its research program is conducted by the reserve's research staff and consists of two major components: (1) the System-wide Monitoring Program (SWMP; pronounced "swamp") and (2) the Graduate Research Fellowship Program (GRF). The objective of the SWMP is to track the short-term variability and long-term trends of environmental conditions in coastal ecosystems throughout the United States. The GRF program provides funding for graduate students to conduct targeted research projects of local and national significance to coastal zone management.

The Grand Bay NERR's education program is an integrated program of life-long learning designed to educate a variety of audiences on the importance of wisely caring for estuarine and coastal resources. It includes Coastal Training, Community Education, K-12 and Collegiate programs. The NERR staff passes on information gathered by its scientists and other researchers to audiences through the use of hands-on learning methods, both inside classrooms and out in the field. Whenever possible, the staff uses the reserve's many habitats as "living laboratories" so that audiences can experience the unique biological, geological, historical, and cultural wonders on a first-hand basis.

The stewardship program at Grand Bay NERR includes monitoring, management, and restoration activities. These activities are designed to demonstrate best management practices that other resource professionals, local decision-makers, and the general public can apply in their own communities.

Recreation is permitted year-round on the Grand Bay NERR and includes hunting, fishing, paddling and boating, oystering, birding, wildlife and plant observation, hiking, and nature photography (Grand Bay NEER 2006).

Grand Bay NWR and Grand Bay NERR share office facilities and cooperate on many management activities on the refuge and reserve.

GRAND BAY BIORESERVE

The Nature Conservancy (TNC) has designated the Grand Bay Bioreserve in southeastern Mississippi and southern Alabama. This is a spectacular landscape that includes an area of uplands, wetlands, and nearshore coastal waters comprising more than 300 square miles. Within this area, TNC has helped the State of Alabama establish the Forever Wild Grand Bay Nature Preserve (2,800 acres).

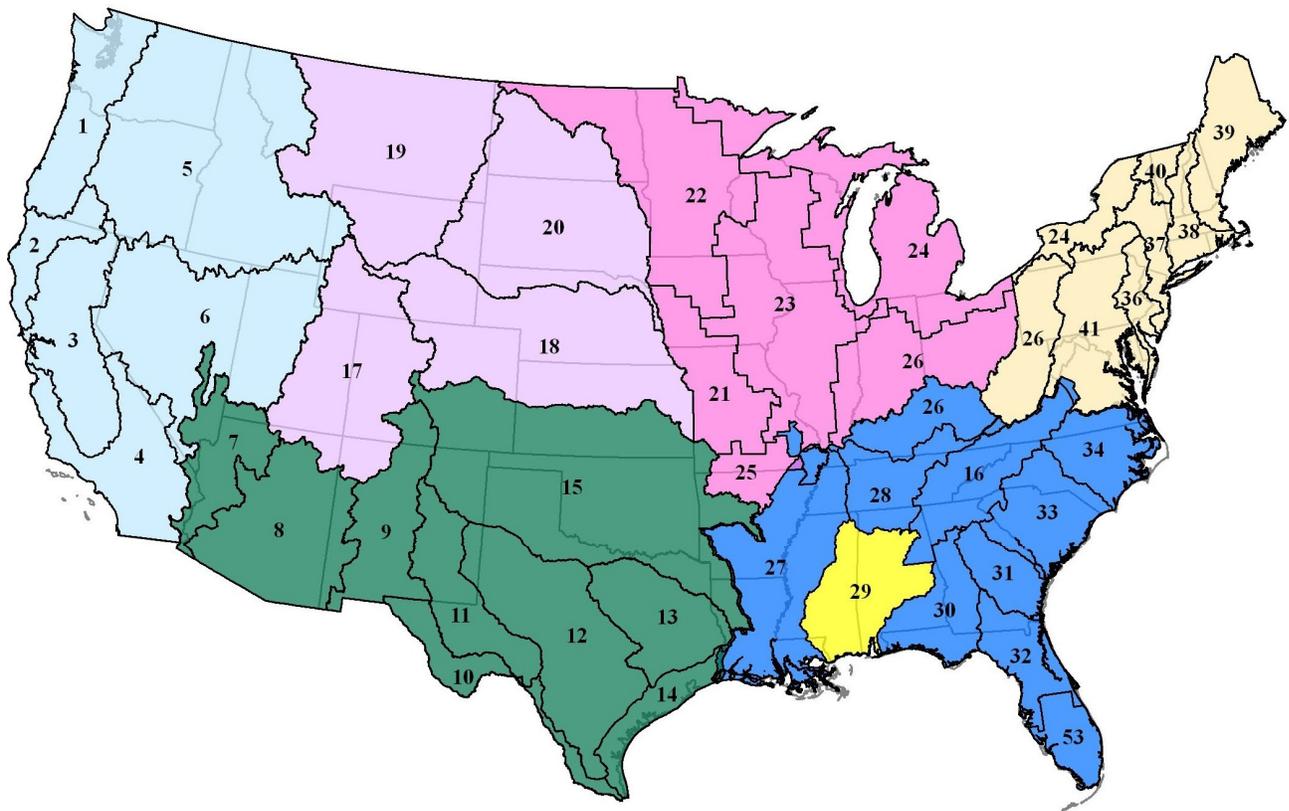
COASTAL RESERVES PROGRAM

The Mississippi Department of Marine Resources (MDMR) administers the Coastal Preserves Program, which seeks intergovernmental and private cooperation to manage selected high priority sites along the coast. The Grand Bay Savanna is one of these sites.

ECOSYSTEM CONTEXT

In approaching its mission to conserve wildlife and their habitats throughout the country, the U.S. Fish and Wildlife Service has found it useful to divide the country into 53 distinct ecosystems, drawn primarily along watershed boundaries (Figure 4). Grand Bay National Wildlife Refuge lies within, and is an active participant of, conservation efforts within the Central Gulf Coast Ecosystem, which spans portions of Mississippi, Alabama, and Georgia. As such, the refuge collaborates in pursuing goals and objectives of the ecosystem as a whole, in addition to working toward achieving goals specific to itself.

Figure 4. U.S. Fish and Wildlife Service-designated ecosystems in the conterminous U.S. The Central Gulf Coast Ecosystem is #29.



Much of the Central Gulf Ecosystem is characterized by flat to rolling topography broken up by numerous streams and river bottoms. Uplands are dominated by pine (longleaf and slash pines in the south, originally) and shortleaf pine mixed with hardwoods in the north. These are fire-maintained systems that give way to loblolly pine and hardwoods in damper areas and to bottomland hardwood forest in extensive lowland drainages. Within its southernmost reaches, the ecosystem encompasses estuaries and coastal waters and includes saline, brackish (mixed saline and fresh) and fresh waters, as well as coastlines and adjacent lands. Coastal dunes, strands, offshore barrier islands, and tidal marsh, in addition to the freshwater wetlands, pine woodlands, and live oak forests, are all interrelated parts of the functioning whole. As such, they each figure as crucial habitat for coastal fish and wildlife. Today, the ecological health of the Central Gulf Coast Ecosystem is significantly degraded in comparison to historical baselines. The refuge is located in the southern portion of the ecosystem.

Sustainable communities and species conservation and recovery require the joint efforts of private landowners and local communities as well as state and federal governments. This synergy of federal, state, tribal, and private organizations working together will ensure that the Service not only protects the more important areas, but also reduces redundancy of effort, allowing precious resources to be directed where they are most needed.

CENTRAL GULF COAST ECOSYSTEM PLAN

The restoration, recovery, and protection of pine habitats and associated plant and animal communities are the goals for the Central Gulf Coast Ecosystem Plan. Historically, the longleaf pine community was the predominant vegetative community of the southeastern coastal plain, with roughly 60 percent coverage in upland areas. Currently, most of the remaining longleaf pine and pine savanna habitat is in private ownership. It is highly fragmented and degraded by logging, grazing, intensive site preparation, and fire suppression (USFWS 2003a).

The regional ecosystem priorities for 2003 were extracted from the ecosystem team activity guidances (TAGs), and those that involved the Central Gulf Ecosystem included:

- Waterfowl management and resident and neotropical migratory bird monitoring.
- Control of Invasive/exotic species.
- Outreach and environmental education.
- Significant decline in longleaf pine ecosystem.
- Fish passage.
- Fisheries program support.

Restoring the functions and values of wetlands in the Southeast Region is a top priority. The goal is to prioritize and manage wetlands to most effectively maintain and possibly restore the ecosystem's biological diversity. Some areas are prioritized as focus areas for reforestation.

It is widely recognized, however, that most of the acreage of forested wetlands that have been cleared and converted to other uses in the Central Gulf Coast Ecosystem will not be reforested. Some areas would have lower value for reforestation and so are targeted for intensive management for nonforest-dependent species, such as waterfowl and shorebirds. Through combining efforts, apportioning resources, and focusing available programs, the ecosystem's biological diversity can be improved.

REGIONAL CONSERVATION PLANS AND INITIATIVES

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

In Mississippi, the Mississippi Department of Wildlife, Fisheries and Parks has prepared a CWCS that identifies the state's Species of Greatest Conservation Need (SGCN), classifies and ranks Mississippi wildlife habitats, and identifies threats and conservation actions for species and their habitats (MDWFP 2005). The major habitats identified are dry/mesic upland forests/woodlands; agriculture fields, hay and pasture lands, old fields, prairies, cedar glades and pine plantations; mesic upland forests; bottomland hardwood forests; riverfront forests/herblands/sandbars; wet pine savannas; spring seeps; bogs; inland freshwater marshes; swamp forests; and lacustrine (lentic) communities. Wet pine savannas are one of the major habitat types present at Grand Bay NWR. With regard to this habitat, the Mississippi CWCS indicates that less than five percent of the original acreage of wet pine savanna habitat remains in the Atlantic/Gulf Coastal Plain, making it one of the most endangered ecosystems in the country. Decades of

fire suppression coupled with the lack of prescribed fire have had a dramatic negative impact on the size and distribution of wet pine savannas. Fire suppression allowed pines and shrubs to invade and out-compete the native savanna plants. Then, in the 1960s and 1970s, much of the remaining open savanna was converted to pine plantation by planting and ditching (bedding), the latter of which disrupted the natural water regime. Moreover, accelerating urbanization of Mississippi's three coastal counties in recent decades caused further losses of this habitat. The savannas of the Mississippi Sandhill Crane and Grand Bay national wildlife refuges are considered the last remaining large patches of this species-rich community (MDWFP 2005).

In Alabama, the CWCS effort began when the Division of Wildlife and Freshwater Fisheries sponsored the 2002 Nongame Conference that assembled scientists and stakeholders to compile the best available information on Alabama's wildlife. This two-year effort resulted in a comprehensive four-volume publication entitled *Alabama Wildlife*, and it serves as the foundation for the Alabama CWCS. The Alabama CWCS was approved by the U.S. Fish and Wildlife Service in November 2005 (Alabama Department of Conservation and Natural Resources n.d.). This CWCS defines those wildlife species in greatest need of conservation in Alabama and describes the actions necessary for their restoration. The Grand Bay Savanna is recognized as a Priority Area for Conservation in the CWCS.

ECOLOGICAL THREATS AND PROBLEMS

HABITAT LOSS AND FRAGMENTATION

Over the past two centuries, as civilization has spread throughout the region, ever-increasing needs for transportation, housing, water supply, electricity, food, and waste disposal have led to dramatic alterations of the landscape. The greatest alteration has been from land clearing for agriculture and flood control projects.

Although these changes have allowed people to settle and earn a living, they have had a tremendous negative impact on the biological diversity, biological integrity, and environmental health of the Central Gulf Coast Ecosystem. National wildlife refuges in the Central Gulf Coast have come to serve as part of the final safety net to support biological diversity—the greatest challenge, in fact, facing the Service.

For coastal habitats located along the Gulf, underlying threats to biological diversity include:

- Loss, alteration, and fragmentation of high quality coastal habitat due to development;
- Loss of natural shoreline as a result of development, hydrologic modifications, natural erosion, bulkheading, shoreline armoring, and inadequate coastal engineering;
- Lack of monitoring and regulation to protect fish and wildlife resource; and
- Increased demand for beach access and use, resulting in increased disturbance to wildlife.

More generally, threats to biodiversity across the variety of habitat types represented in this ecosystem are posed by invasive species; overuse of resources; pollution; global climate change; improper practices of fire suppression; and most of all, habitat loss and fragmentation.

As a consequence of these threats, all manner of habitats in this ecosystem have seen their acreages reduced. Forested wetlands, marshes, oyster reefs, and seagrass beds are disappearing rapidly. Immense areas of bottomland hardwood forests have been reduced to forest fragments. These range from a few large areas of more than 10,000 acres that have maintained many of the original functions and values of bottomland hardwood forest, to very small tracts just a few acres in size possessing limited functional value.

Elimination and fragmentation of coastal habitats have decimated wildlife species throughout the Gulf Coast, and are recognized by the Service as serious threats to wildlife in Mississippi. The species most adversely affected by fragmentation are those that are area-sensitive or require special habitat, such as protected, undisturbed beach dunes that offer secure breeding habitat and a particular food source. Fragmentation affects migratory songbirds, sea turtles, beach mice, and many other species, primarily through high rates of nesting failure and predation. While more than 370 species of breeding migratory songbirds, shorebirds, waterfowl, and raptors are found in this region, some of these species or sub-species have declined significantly, such as the red-cockaded woodpecker, Bachman's warbler, and Mississippi sandhill crane. These species therefore need the benefits of large, managed forest blocks to recover and sustain their existence.

As a result of habitat loss and degradation, the Central Gulf Coast Ecosystem is experiencing biotic extinctions at a rate unparalleled elsewhere in the United States; within the last century, nearly 50 percent of U.S. biotic extinctions have occurred in the region (USFWS n.d.). Species once abundant in the Central Gulf Coast that have since become endangered or threatened include the endangered wood stork and the threatened bald eagle (which has been proposed for de-listing). The most highly endangered of all is the ivory-billed woodpecker, dependent on once-extensive old-growth swamp forests dominated by ancient cypresses and thought by many to be extinct. Until credible, but still disputed, sightings beginning in early 2004 of at least one individual at Cache River National Wildlife Refuge in the Big Woods of eastern Arkansas, the last confirmed sighting of an ivory-bill was in the 1940s.

The avian species most adversely affected by fragmentation include those that are area-sensitive (dependent on large continuous blocks of hardwood forest); those that depend on forest interiors; those that depend on special habitat requirements like mature forests or a particular food source; and those that depend on good water quality. Species such as the prothonotary warbler, cerulean warbler, and, in particular, Bachman's warbler, have declined significantly, and will require the benefits of large, managed forest blocks to recover and sustain their existence.

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

The Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) reports that the state's biodiversity has diminished due to a variety of threats, including habitat loss, proliferation of nonnative invasive species, disruption of ecological processes, and ecosystem degradation (MDWFP n.d.a). According to the MDWFP, the threats to one of the most important habitats at Grand Bay National Wildlife Refuge—wet pine savannas—include:

- Altered fire regime
- Forestry conversion
- Groundwater withdrawal
- Incompatible forestry practices
- Industrial development
- Invasive species
- Recreation activities
- Urban/suburban development
- Road construction/management

Mississippi's wet pine savannas are not associated with riverine floodplains, but are found on broad coastal flats and sloping plains with more than 60 inches of rainfall annually. They remain saturated for long periods during the growing season. The coastal region receives ample growing season rainfall from frequent convective thunderstorms, which results in the surface horizon remaining saturated for extended periods because of the slow permeability of the area's subsoils. Stands of wet savanna in good condition have a herbaceous ground cover that is exceptionally diverse. While plentiful rainfall and sunlight create ideal growing conditions, a lack of soil nutrients prevents any one species or suite of species from dominating. Of more than 200 understory plant species, two-thirds are graminoids (grasses) and one-third consist of forbs and ferns. Prominent groups of herbs include grasses, asters, sedges, pipeworts, pitcherplants and lilies. Common grasses include beaksedge, toothache grass, switchgrass, and three-awn. Forbs include rayless goldenrod, one flowered honeycombhead, sunflowers, pitcherplants, meadowbeauties, sundews, and orchids (MDWFP 2005).

ALTERATIONS TO HYDROLOGY

The natural hydrology of a region is directly responsible for the connectedness of forested wetlands and indirectly responsible for the complexity and diversity of habitats through its effects on topography and soils. Natural resource managers recognize the importance of dynamic hydrology to forested wetlands and waterfowl-habitat relationships.

In addition to the loss of vast acreage of bottomland-forested wetlands and other habitat types, there have been significant alterations in the region's hydrology due to development, river channel modification, flood control levees, reservoirs, and deforestation, as well as degradation to aquatic systems from excessive sedimentation and contaminants.

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

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

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

PROLIFERATION OF INVASIVE AQUATIC PLANTS AND ANIMALS

Compounding the problems faced by aquatic systems is the growing threat from invasive aquatic vegetation like alligator weed and willows. Static water levels caused by the lack of annual flooding and reduced water depths resulting from excessive sedimentation have created conditions favorable for the establishment and proliferation of several species of invasive aquatic plants. Additionally, the introduction of exotic (nonnative) vegetation capable of aggressive growth is further threatening viability of aquatic systems. These invasive aquatic species threaten the natural aquatic vegetation important to aquatic systems, and choke waterways to a degree that often prevents recreational use.

Various species of nonnative wildlife and fish also flourish in this temperate climate. Animals like the nutria compete with native wildlife for limited resources and many, like feral hogs, have caused extensive habitat damage and alterations.

HURRICANE KATRINA

After cutting across Florida and churning through the Gulf of Mexico, on August 29, 2005, Hurricane Katrina made landfall on the Gulf Coast near Buras, Louisiana, as a Category 4 hurricane with sustained winds of 145 mph and higher gusts. Katrina made her way up the eastern Louisiana coastline with the eye wall passing just east of New Orleans. A few hours later, Katrina made landfall for a third time near the Mississippi-Louisiana border with 125 mph Category 3 sustained winds. However, because the storm was so large, extreme damaging eye wall winds and the strong northeastern quadrant of the storm pushed record storm surges onshore and smashed the entire Mississippi Gulf Coast, including towns such as Waveland, Bay St. Louis, Pass Christian, Long Beach, Gulfport, Biloxi, Ocean Springs, Gautier, and Pascagoula. As Katrina moved inland diagonally over Mississippi, high winds cut a swath of damage that affected almost the entire state.

At Grand Bay Refuge, Katrina damaged the joint refuge-NERR office on Bayou Heron Road so badly that it had to be vacated and replaced with temporary office trailers. High winds and the nearly 20-foot storm surge engulfed the boat ramp and pier and significantly damaged the adjacent education pavilion. Refuge roads (Goat Farm Road, Bayou Heron Road, and Pollack Ferry Road) were also inundated with storm surge and littered with debris. In addition, a house raised on stilts that provided lodging for visiting researchers, interns, and short-term employees was damaged and had to be condemned. With regard to habitat, the main impacts (trees down) and significant storm surge debris have been assessed post-hurricane. However, the socioeconomic impacts to the local community from the hurricane have been severe. The neighboring communities of Pecan and Orange Grove have suffered major flood damage to their residences. The Federal Emergency Management Agency (FEMA) and Jackson County are proceeding with purchasing numerous damaged homes in these communities and assisting qualified participants with relocation outside of the floodplain.

PHYSICAL RESOURCES

CLIMATE

As a general rule, the state of Mississippi has hot, humid summers and relatively mild winters (U.S. Almanac 2004), and Jackson County, where a majority of the refuge is located, is no exception. Located on the Gulf of Mexico, the county has mild winters and long spring and summer seasons. Freezing temperatures are rare and snowfall is even rarer. January's average temperature is 50 degrees Fahrenheit (F), while summers reach into the 90s (Jackson County Economic Development Foundation 2003).

Weather records for nearby Pascagoula, Mississippi indicate average maximum temperatures of 61 degrees F in January, the coldest month of the year, and average minimum temperatures of 42 degrees F for the same month (Southeast Regional Climate Center 2005). July and August are the hottest months, with an average maximum temperature of 90 degrees F. Like most of Mississippi and the Southeast, the area receives substantial rainfall, averaging more than 64 inches a year; of this, a mere one-tenth of an inch on average falls as snow. Summer is the wettest season and July the wettest single month.

GEOLOGY AND TOPOGRAPHY

Located in the Gulf coastal plain close to the ocean, the refuge is characterized by flat topography and a low elevation just a few feet above mean sea level. The Mississippi-Alabama-Florida panhandle coasts result from a history of low to moderate sediment supply, with the primary sediment sources being the Mobile, Pascagoula, Pearl and Mississippi Rivers (Kindinger et al. 2004). Flat, weakly dissected alluvial plains and active coastlines predominate in this region. Quaternary geology and soils are typically Pliocene-Pleistocene sandy clay residuum.

The geologic units comprising the surface of Mississippi's coastal counties range in age from the late Pliocene Epoch (3.4 million years ago) to the present (Schmid and Otvos 2005). The oldest exposed unit in the area is the Citronelle Formation. This unit, which consists mostly of sand and silt, with some gravel, was deposited in coalescing river floodplains on the broad coastal plain from southern Louisiana to Florida. Following the Pliocene, coastal sediments during the Pleistocene Epoch (1.6 million to 10,000 years ago) were related to warm interglacial and cooler glacial periods. Sea level during the Sangamon interglaciation rose as high as 20–25 feet above the present. The Pleistocene surface formations of this period include the fluvial Prairie deposits that formed level floodplains and the ridge-forming Gulfport coastal barrier formations. They are preceded and underlain by the muddy-sandy, fossil-rich Biloxi Formation, deposited in nearshore Gulf, bay, and lagoonal settings. The Gulfport Formation formed a wide belt of beach ridges representing a Sangamon age Gulf shoreline; it includes fine to medium-grained sand and is often stained with humate, a dark brown to black organic-rich amorphous matter that formed after deposition and impregnated the lower Gulfport sand intervals.

In the Holocene Epoch of the last ten thousand years the sea level has continued to rise from its very low late-glacial stand about twenty thousand years ago. This rise gradually drowned coastal river valleys and prevented coarse stream sediments from directly reaching the coast. Holocene sediments fill coastal estuaries and have built up locally wide marshlands, rich in organic matter. These deposits consist mostly of sandy fine-grained silts and clays with significant organic material (Schmid and Otvos 2005).

SOILS

Soils are Ultisols of wet areas that have clayey horizons frequently impervious to groundwater percolation (Clewell and Raymond 1995). These soils tend to be strongly acidic and infertile. The dominant soil types and series (with recent soil classification) on the refuge are the following:

- Loamy sands: Scranton, Klej, Plummer
- Very fine sandy loams: Lynchburg (Harleston)
- Loams: Rains (Atmore), Goldsboro (Harleston)
- Silt-loams: Bayboro (Hyde)
- Undefined series supporting swamps and tidal marshes: (Croatan)

Slightly elevated ridges on the refuge are characterized by nonhydric (non-saturated, well-oxygenated) soils that support mesic pine savanna habitat. On the other hand, hydric soils—more poorly drained than the mesic savannas, with long periods (days or weeks) of soil saturation, and generally wet at surface—support wet pine savanna.

HYDROLOGY

As mentioned under the *Climate* heading above, Grand Bay National Wildlife Refuge is located in a region with abundant annual rainfall, receiving more than 64 inches per year. Three groundwater hydrologic sources for the savannas and flatwoods are found on the refuge:

1. Hydrology driven by an apparent water table, where water arises from below. This occurs on the Plummer series of soils (loamy sands).
2. Hydrology driven by a perched water table, whereby water in saturated soil is lying above an impermeable and unsaturated subsurface horizon. This occurs on the Atmore series of soils (loams).
3. Hydrology driven by episodic rainfall events, causing temporary perching and ponding but without the benefit of an impermeable subsoil. Nonetheless, flat topography and copious precipitation combine to allow periods of saturation long enough for redoximorphic features to develop (those associated with low oxygen levels), even though the soil is not considered as being hydric. This occurs on the Harleston series of soils (very fine sandy loams) (Teaford et al. 1995).

As noted earlier, the refuge encompasses a variety of habitats that reflect different hydrologic conditions, ranging from the freshwater flows of the Escatawpa River to the brackish water and tidal influence of Bayou Heron and Middle Bay. The Escatawpa River rises in southwest Alabama less than one mile from the Alabama/Mississippi border in Washington County, Alabama. From there it flows south into Mississippi through a watershed that is long and narrow, with a total length of about 100 miles and a width of approximately 15 miles. The river eventually empties into a series of water bodies that form the mouth of Mississippi's Pascagoula River. Although portions of the Escatawpa flow through somewhat remote locales, the watershed sits less than an hour's drive from the City of Mobile, and equally as close to Pascagoula, Mississippi (WKRG News 5, 2006).

A portion of the lower Escatawpa River has been affected by a combination of apparent saltwater intrusion associated with channel deepening and marsh impoundment caused by a rail crossing over the river and associated marshes. A needle rush (*Juncus roemerianus*) marsh was constructed here about 10 years ago as mitigation for bridge and highway construction. Needle rush appears to be

replacing sawgrass (*Cladium jamaicense*) in this area, which is oligohaline. Sawgrass is still present in areas adjacent to the uplands and on islands along the river. Dead cypress trunks are scattered about in the marsh near the center of the river (MDMR 1998a).

AIR QUALITY

Under the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has established primary air quality standards to protect public health. EPA has also set secondary standards to protect public welfare. Secondary standards relate to protecting ecosystems, including plants and animals, from harm, as well as protecting against decreased visibility and damage to crops, vegetation, and buildings.

The EPA has developed National Ambient Air Quality Standards (NAAQS) for six principal air pollutants (also called “criteria pollutants”). They are ground-level ozone (O₃), particulate matter (PM), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), carbon monoxide (CO), and lead (Pb). The Mississippi Department of Environmental Quality (MDEQ) monitors all of these pollutants except lead. (Because the past lead concentrations reported were so much lower than the air quality standard and because lead is no longer used in automobile fuels, it was determined by the EPA and MDEQ that lead no longer needed to be monitored in Mississippi.)

In general, Mississippi is meeting all of the NAAQS and has recently been designated in attainment with the new 8-hour ground-level ozone and fine particulate matter (PM_{2.5}) standards. Mississippi is one of only three states east of the Mississippi River (Florida and Vermont) that is meeting all of the standards (MDEQ 2004).

Jackson County, in which the refuge is located, has two air quality monitoring stations, in Vancleave and Pascagoula. Data from 2004 from both of these two stations indicate that Jackson County is also in attainment with all of the NAAQS.

While not quite as good as the air quality in Jackson County, Mobile County, Alabama’s air quality is judged to be “good” about 70 percent of the time and “moderate” almost all the rest of the time. Mobile County’s air quality is considered to be “unhealthful” only a very small fraction of the time (Scorecard 2005).

WATER QUALITY AND QUANTITY

Like most waterways in the United States, the Escatawpa River faces two major types of water pollution: point source and nonpoint source pollution. Point sources may be traced to a particular point of entry, such as a waste water pipe emptying into a stream from a factory or sewage treatment plant discharge. State and federal agencies manage point source pollution using various permit systems. Nonpoint source pollution is dispersed, and occurs mainly from urban and rural runoff, whether from rain, car washing or the irrigation of crops or lawns; moving water picks up various contaminants, including dog feces, oil, dirt, and asbestos (worn off from brake linings) from roadways, agricultural chemicals (e.g. herbicides, insecticides, fertilizers) from farmland, and nutrients and toxic materials from urban and suburban areas. This runoff finds its way into streams, rivers, lakes, bays and estuaries, either directly or through storm drain collection systems. Nonpoint source pollution seldom shows up overnight and often goes unnoticed for years; it reflects both land use patterns and the use and disposal of the myriad chemicals produced by our industrialized society. These characteristics make it all the more difficult to control and is currently the most significant source of water pollution in our waterways (WKRK News 5, 2006).

BIOLOGICAL RESOURCES

HABITAT

Grand Bay National Wildlife Refuge and the Escatawpa River drainage lie in the East Gulf Coastal Plain physiographic area. When viewed at a broad scale, this is part of the Southeast Conifer Forest ecoregion, which is a swath covering the coastal areas of the Northern Gulf of Mexico from eastern Louisiana to coastal Georgia. In coastal Mississippi, some of the distinct terrestrial communities are: pitcher plant bogs, longleaf pine savannas, and bayhead swamps, all of which are found on the refuge. The ecoregions present within this system are critical because of the variety of habitats they provide to many migratory bird species (USFWS 2005).

Within the East Gulf Coastal Plain, Grand Bay Refuge includes the following regions: the Southern Pine Hills predominantly north of Interstate 10; the Gulf Coast Flatwoods just south of Interstate 10; and the Marsh regions in the southern portions of Jackson County. Flatwoods are characterized by various species of pine, including slash, loblolly, and longleaf. Commonly encountered hardwoods and shrubs include *Quercus nigra* (water oak), *Quercus virginiana* (live oak), *Magnolia* spp. (magnolias and bay trees), *Myrica cerifera* (wax myrtle), *Ilex* spp. (hollies), and *Cyrilla racemiflora* (titi). The flatwoods ecosystems provide important habitat for neotropical birds and wood ducks.

A gradient effect occurs from the flatwoods to the marsh. As this occurs the coastal area widens into floodplain swamps dominated by *Taxodium distichum* (southern bald cypress), *Nyssa aquatica* (black gum), *Carya* spp. (hickories), and *Acer rubrum*, (red maple). These bottomland hardwood swamps provide feeding and resting habitat for a variety of waterfowl, including mallards, green-winged teal, and blue-winged teal, along with other species.

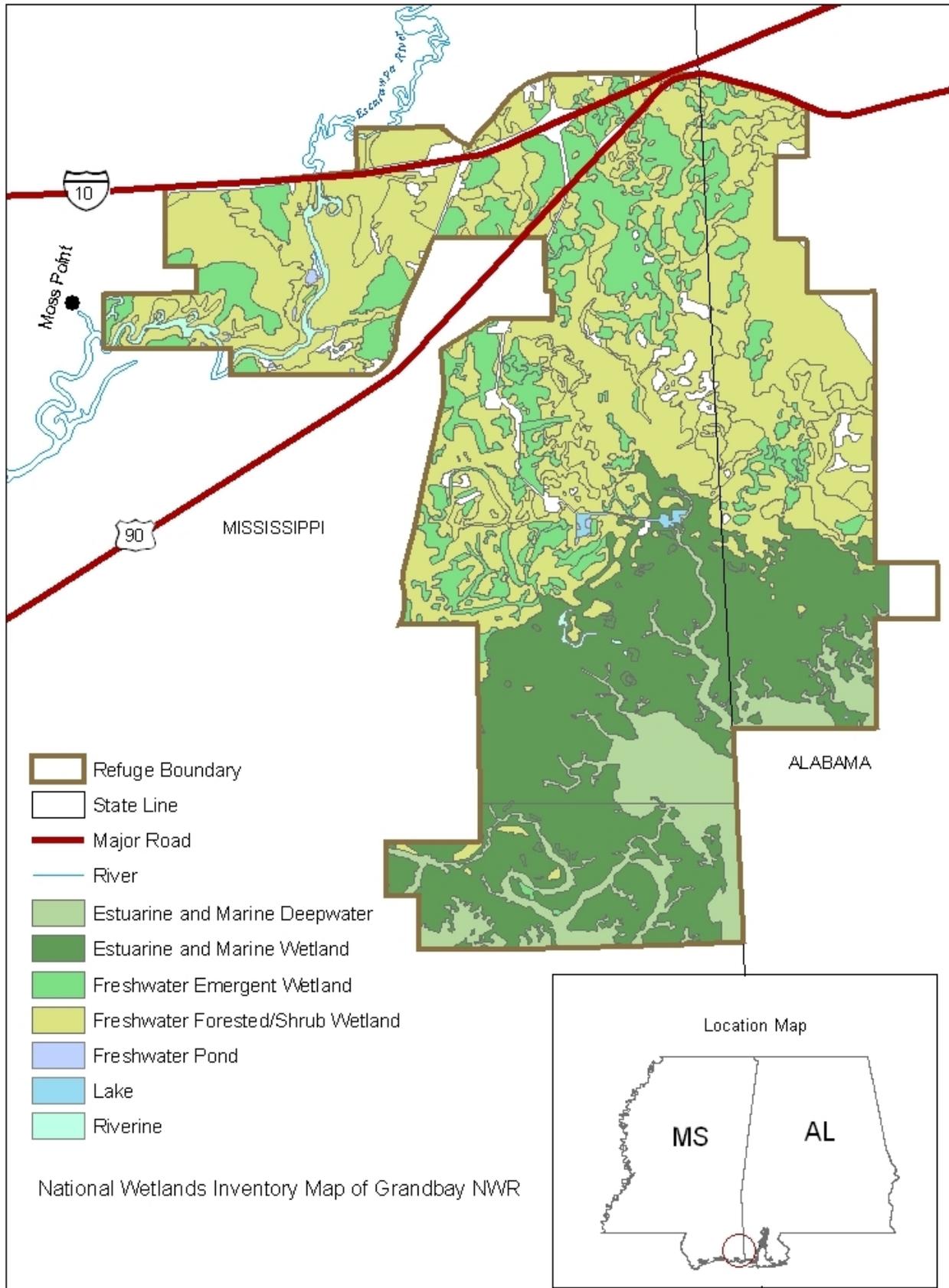
In the northernmost marshes there are isolated pockets and fringes of freshwater marsh dominated by freshwater herbaceous plant species such as *Pontederia* spp. (pickerel weed), *Typha* spp. (cattail), and *Sagittaria* spp. (arrowhead). Further south, intermediate or brackish marshes exist where tidal influence is constant. Saline marsh vegetation found along the coastal area includes *Juncus roemerianus* (black needlerush), and *Spartina* spp. (cordgrasses). This area supports a number of open water ducks, including canvasback, American wigeon, gadwalls, and shovelers.

Figure 5 depicts the major vegetation communities and habitats of Grand Bay National Wildlife Refuge.

Pine Savannas

Pine savannas are open, nearly treeless fire-dependent plant communities dominated by a well-developed ground cover, some low-growing shrubs with only scattered trees (*Pinus palustris* and *P. elliotii*) trees with pond cypress (*Taxodium*) in wet areas. More specifically, ground cover is 95–100 percent, shrub cover is 0–20 percent (10 percent desired max), and overstory cover is under 10 percent. Frequent surface fires that are carried principally by graminoids inhibit woody plant growth and maintain the characteristic openness of the savannas. The fire return interval is about 2–3 years on average.

Figure 5. Vegetation communities at Grand Bay NWR (based on National Wetlands Inventory).



The ground-level plant community is highly species-rich and consists of grasses (*Aristida*, *Ctenium*, *Muhlenbergia*, *Dicanthelium*, *Schizachyrium*), sedges (*Dichromena*, *Rhynchospora*, *Scleria*, *Fuirena*), and rushes (*Juncus* spp.), interspersed with a highly diverse number of forbs, including *Aletris*, *Aster*, *Balduina*, *Bigelowia*, *Calopogon*, *Carphephorus*, *Coreopsis*, *Eriocaulon*, *Eryngium*, *Eupatorium*, *Helianthus*, *Hypoxis*, *Lachnanthes*, *Ludwigia*, *Lobelia*, *Lophiola*, *Phlox*, *Polygala*, *Rhexia*, *Sabatia*, *Solidago*, *Tofieldia*, *Viola*, *Xyris*, and *Zigadenus*. The ground level also features several insectivorous plants such as pitcher plants (*Sarracenia* spp.), sundews (*Drosera* spp.), bladderworts (*Utricularia* spp.) and butterworts (*Pinguicula* spp.). There are low-growing shrubs including *Gaylussacia*, *Hypericum*, and *Vaccinium* as well as taller-growing species like *Ilex*, *Cyrilla*, *Lyonia*, *Clethra*, *Myrica* that are kept low by regular fire.

Wet pine savannas are one of the most endangered ecosystems in North America; only 3–5 percent of the original area remains. They also contain the highest ground cover species packing rates (i.e. species diversity) yet described. The differences between mesic and wet savannas are mainly a matter of wetness.

Mesic Pine Savanna is found on generally nonhydric soils on slightly elevated ridges and flats with convex surfaces. There is a greater number of nonhydric indicators than in wet savannas.

Wet Pine Savanna is found generally on hydric soils, more poorly drained than the mesic savannas, with long periods (days or weeks) of soil saturation; soils are generally wet at the surface. They contain widely spaced pond cypresses (*Taxodium distichum*) and sometimes swamp tupelos, slash pines, and other hydric trees. Sedges are generally much more abundant than grasses. They experience surface fires with the same frequency as mesic savannas.

Pine Flatwoods

Pine flatwoods are open park-like pine woodlands dominated by a low and species-rich turf of grasses, forbs, and small shrubs. Clewell and Raymond (1995) assert that the term “flatwoods” has little ecological significance, since the only difference between flatwoods and savannas are that once the former is clear-cut, it becomes the latter de-facto. In other words, flatwoods are savannas with a higher overstory cover. Thus, flatwoods and savannas are “merely different expressions of the same ecosystem.” This may be true, but refuge managers still find it useful to maintain flatwoods as a habitat category in order to track habitat restoration efforts. It is a major management goal to convert flatwoods to savannas through a combination of thinning and fire.

Scattered longleaf pine (*Pinus palustris*) and clumps of saw palmetto (*Serenoa repens*) are considered conspicuous but not abundant. Mid-story hardwoods such as bluejack oak may occur as scattered individuals on better-drained soils. Soils are well oxygenated relative to other communities. More specifically, overstory cover is 50–75 percent, mid-understory 25–50 percent, and ground cover 60–100 percent. Surface fires with a return interval of about two years maintain the open character. Grasses are the principal fuel, along with pine straw. Surface fires inhibit the establishment of trees, shrubs, and woody vines that would otherwise replace grasses and forbs. The differences between mesic and wet flatwoods are mainly a matter of wetness.

Mesic Pine Flatwoods are found on nonhydric soils and have a greater number of mesic herbaceous species than wet flatwoods. They are similar to wet pine savannas in physical aspects but have a greater abundance of woody plants cover and less herbaceous cover.

Mixed (pine-hardwood) Forest became established in small colonies in fire-protected areas on better drained soils. Hardwood tree species include several species of oaks (*Quercus* spp.).

Wet Pine Flatwoods are found on wetter soils than mesic flatwoods and have a greater number of hydric herbaceous species. Although similar to wet pine savannas in species composition and wetter sites, they differ in having a greater number of pines and woody plants and fewer herbaceous species.

Pine Scrub

Pine scrub habitats are former “flatwoods” or savannas or even planted pine plantations that have degraded and become overgrown with woody vegetation due to silviculture and/or fire suppression. Clewell and Raymond (1995) labeled this hodgepodge “Pinelands and Brush.” Brush 1–3 meters or taller has overtopped the herbaceous component and become dominant. The herbaceous ground cover decreases at the expense of the increase in woody vegetation growth. The shrub component includes the gallberry species inkberry (*Ilex glabra*), large gallberry (*Ilex coriacea*), and youpan (*Ilex vomitoria*), as well as titi, fetterbrush, wax myrtle, blackberry (*Rubus argutus*), and sweet pepperbush. Overstory and mid-understory cover both exceed 15 percent and ground cover 0–20 percent.

Short scrub is characterized by a shrub layer below two meters in height.

Tall scrub has not experienced recent fire and is characterized by a shrub midstory and understory.

Hydric Drains or Swamps

Hydric drains or swamps are forested wetlands that occupy low gradient drains through the savannas. Gradients are slight and stream flow is diffuse. Soils are hydric and contain much organic matter. Vegetation is dominated by mid and overstory trees above a shrub layer and a sparse herbaceous ground layer dominated by sedges and even peat moss mats. Overstory cover is 75–100 percent, mid/understory 40–100 percent, and ground cover 10–60 percent. Common trees include cypress (*Taxodium* spp), sweetbay (*Magnolia virginiana*), swamp bay (*Persea palustris*), titi (*Cyrilla racemiflora*, *Cliftonia monophylla*), slash pine, swamp tupelo (*Nyssa biflora*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*) and bottomland oaks. Important shrubs include several *Ilex* spp., wax myrtle (*Myrica* spp.), titi, fetterbush (*Lyonia lucida*), sweet pepperbrush (*Clethra alnifolia*) and poison sumac (*Toxicodendron vernix*). Characteristic herbs include *Carex* spp, beakrushes (*Rhynchospora* spp.) and ferns. Although surface fires are frequent, they are less destructive to hydric trees owing to wetter site conditions.

Cypress-Tupelo Drains occupy broad flat depressional areas lacking clearly defined drainage ways. Fires are not uncommon. Pond cypress, swamp tupelo, red maple, and sweet bay are common trees in the overstory. The midstory consists of hollies and overstory saplings. The ground cover consists of sedges and ferns.

Forested Bayheads occupy flat topography upstream from cypress-tupelo drains with narrow (5–10m), well defined drainage ways. Fires are rarer here. The vegetation is like cypress-tupelo drains but sweet bay is more abundant and the midstory is far denser and contains titi, swamp bay, fetterbush, and large gallberry. There may be several grasses in the ground cover (USFWS 2005).

Estuarine or Tidal Marsh

Estuarine or tidal marshes comprise 40 percent of the refuge. The water is fresh or slightly brackish. The most common tidal marsh species include sawgrass (*Cladium jamaicensis*) which dominates the vegetation. Sawgrass and a few other species occupy perennially saturated soils that sustain only hydrophilic trees like pond cypress (USFWS 2005).

A bald cypress/black gum swamp and bog that is found in the mid-reaches of the Escatawpa River. This area appears to be tidal. The swamp portion lies adjacent to the river, with generally bare

substrate between the trees. With distance from the river and a concomitant increase in elevation (10–15 cm), the ground grades into a *Sphagnum* moss covered bog that included pitcher plants (*Sarracenia*), sundews (*Drosera*), yellowed eyed grass (*Xyris*), and pipewort (*Eriocaulon*). This habitat type appears to be typical of the broader ecosystem along this stretch of the river. Downstream, the cypress swamp intermixes with sawgrass-dominated marsh habitat.

The Escatawpa River Swamp is composed of a mixture of cypress, sawgrass (*Cladium*) marsh, and water-lily pond habitat. The cypress swamp grades gradually into the sawgrass, with scattered cypress trees in the marsh. The marsh is dominated almost entirely of sawgrass (*Cladium jamaicense*) (MDMR 1998a).

Invasive Plants

The refuge is infested with invasive species, particularly along roadsides and ditches where disturbances occur most frequently. The most common invasive species are torpedo grass (*Panicum repens*), Japanese climbing fern (*Lygodium japonica*), cogongrass (*Imperata cylindrica*) and the Chinese tallow tree (*Triadica sebifera*). Cogongrass and the Chinese tallow tree are of the most immediate concern. Both species are very aggressive with expanding populations. Steps are being taken to determine the extent of infestation. The cogongrass is of particular concern because it reproduces both sexually and asexually. It is also fire-tolerant and shows a favorable growth response when soil is disturbed. These characteristics of cogongrass make it difficult to manage and control.

WILDLIFE

Waterfowl

The refuge represents an important wintering ground for migratory waterfowl. There have been 28 species of waterfowl observed using the refuge's diverse habitats. These species include American black duck, American wigeon, blue-winged teal, bufflehead, Canada goose, canvasback, common goldeneye, common merganser, gadwall, greater scaup, greater white-fronted goose, green-winged teal, hooded merganser, lesser scaup, mallard, mottled duck, northern pintail, northern shoveler, old squaw, red-breasted merganser, redhead, ring-necked duck, Ross's goose, ruddy duck, snow goose, surf scoter, and wood duck.

The most common waterfowl species at Grand Bay NWR are northern shoveler, blue-winged teal, green-winged teal, ruddy duck, and lesser scaup.

Wood ducks and mottled ducks are the only resident waterfowl at Grand Bay Refuge. Wood ducks nest in the bottomland hardwood/bay gum swamps found on the Escatawpa River system and in the interior portions of the refuge. Mottled ducks nest in the tidal marshes on the southern most-areas of the refuge (USFWS 2005).

Landbirds

Many species of songbirds are experiencing long-term declines as a result of widespread habitat loss particularly, bottomland forests and riparian woodlands as-well-as early successional habitats such as grasslands and scrub habitats that exist on Grand Bay NWR. A large variety of neotropical migratory songbirds are common in the refuge. Some common year-round residents include the Carolina chickadee, tufted titmouse, northern mockingbird, and red-winged blackbird. Yellow-bellied sapsuckers, white-eyed vireo, hermit thrush, yellow-rumped warbler and white-throated sparrow are some birds common in the winter.

Raptors

Sixteen species of diurnal raptors and four owl species are believed to be found using the refuge's savanna habitats. Ospreys, red-shouldered hawks, red-tailed hawks, eastern screech owls and great horned owls nest on the refuge. Bald and golden eagles have been observed in fall and winter around refuge ponds and shallow water areas.

Shorebirds

Shorebirds migrate through the Central Gulf Ecosystem (CGE) from the southernmost parts of South America to the northernmost part of North America. They typically probe in soft mud (mudflats) and shallow water for worms and small crustaceans. In the CGE these birds generally move through during spring and fall, foraging as they migrate. They may only spend 10 days in the CGE. Few shorebirds overwinter or nest in the summer in the CGE. Habitat is generally more limited during their fall migration in the CGE than the spring. Shorebirds observed on the refuge during recent surveys include killdeer, willets, least sandpipers, lesser yellowlegs, black-necked stilts, pectoral sandpipers, solitary sandpipers, peeps, and common snipes.

Woodcocks are showing significant long-term declines in the eastern United States. Habitat loss, including the loss of nocturnal wintering habitat is likely a factor. Since mature bottomland hardwoods are lacking on the refuge, birds may use old fields as nighttime foraging habitat.

Wading and Marsh Birds

Many species of wading and marsh birds use the savanna and marsh habitats at Grand Bay. These include species such as American bittern, American coot, American white pelican, anhinga, black rail, black-crowned night heron, cattle egret, common loon, common moorhen, double-crested cormorant, eared grebe, glossy ibis, great blue heron, great egret, green heron, horned grebe, king rail, least bittern, little blue heron, pied-billed grebe, purple gallinule, snowy egret, sora, tri-colored heron, Virginia rail, white ibis, white-faced ibis, yellow rail, and yellow-crowned night heron.

Grassland Birds

Given the precipitous drop in fire-maintained savanna and grassland habitats in the Southeastern coastal plain, it is not surprising that several species of disturbance-dependent birds are declining. Most of these species are benefiting from current refuge management activities such as frequent prescribed fire.

Declining grassland (and associated habitat) bird species found on Grand Bay NWR of conservation importance are as follows: Bachman's sparrow, Henslow's sparrow, brown-headed nuthatch, American swallow-tailed kite, southeastern American kestrel, prairie warbler, chuck-will's widow, northern bobwhite, red-headed woodpecker, American woodcock, sedge wren, loggerhead shrike and the northern harrier.

The Henslow's sparrow may be one of the most vulnerable species (Hunter et al. 2001) due to its area sensitivity and selection of frequently burned areas (Chandler and Woodrey 1995). Henslow's sparrows favor recently burned refuge savannas (Thatcher 1994).

Other non-grassland conservation priority birds using the refuge include chuck-will's widow and swallow-tailed kites; the latter are observed over the savannas in March.

Mammals

Although no white-tailed deer population survey has been conducted to date, general observations and available habitat indicate a stable population on the refuge (USFWS 2005).

Swamp and cottontail rabbits appear to be abundant. Fox and gray squirrels are limited due to the lack of mature bottomland hardwood forests.

A number of fur-bearers, including nutria, raccoon, mink, opossum, coyote, bobcat, beaver, muskrat and river otter are found on the refuge. Beaver, muskrat, river otter, nutria and mink are associated with the more permanently inundated wetlands and bayous. The raccoon is well-adapted to all existing habitats. Opossums, coyotes, and bobcats are mostly associated with the drier areas of the refuge. At this time, there are not enough survey data available to provide population estimates for these species.

Reptiles and Amphibians

Amphibian management and conservation are of great interest due to apparent global amphibian declines. Habitat loss, fragmentation, and degradation appear to be the primary factors in the declines. This group of animals requires quality wetland habitat for their survival and they also serve as important indicators of environmental health. A number of species of reptiles and amphibians occur on the refuge, including those listed in Table 1.

Table 1. Amphibians and reptiles at Grand Bay National Wildlife Refuge.

Amphibians	Reptiles-Turtles and Crocodilians	Reptiles-Lizards and Snakes
<i>Southern cricket frog</i>	American alligator#	Eastern slender Glass Lizard#
<i>Oak toad</i>	<i>Graptemys</i> unidentified #	Eastern Glass lizard*
Southern toad*	Common snapping turtle#	Southern fence lizard#
Gulf coast toad*	Alligator snapping turtle#	Green anole#
Eastern narrowmouth toad*	Eastern mud turtle#	Southern coal skink#
Bird-voiced treefrog*	River cooter#	Five-lined skink#
Cope's Gray treefrog#	Mississippi redbelly turtle#	Southeastern five-lined skink#
<i>Green treefrog</i>	Gulf coast box turtle#	Ground skink#
<i>Pinewoods treefrog</i>	Three-toed box turtle#	Six-lined racerunner#

Amphibians	Reptiles-Turtles and Crocodilians	Reptiles-Lizards and Snakes
<i>Barking treefrog</i>	Red-eared slider#	Northern scarlet snake#
<i>Squirrel treefrog</i>		Southern black racer#
Gray treefrog		Corn snake#
Spring peeper*		Gray rat snake#
Southern chorus frog*		Rainbow snake
Crawfish frog		Western mud snake#
Pickerel frog		Eastern hognose snake#
Southern Leopard frog*		Speckled kingsnake#
<i>Bullfrog</i>		Scarlet kingsnake
<i>Bronze frog</i>		Eastern coachwhip
<i>Pig frog</i>		Green water snake#
One-toed amphiuma#		Broad-banded water snake#
Two-toed amphiuma#		Banded water snake#
Dwarf salamander#		Rough green snake#
Eastern Lesser siren#		Black pine snake*
		Gulf crayfish snake#
		Pinewoods snake*
		Eastern ribbon snake#
		Western earth snake#

Amphibians	Reptiles-Turtles and Crocodilians	Reptiles-Lizards and Snakes
		Southern copperhead*
		Western cottonmouth#
		Eastern diamondback rattle snake*
		Dusky pygmy rattle snake*

*Italics on survey, *incidental, #TNC survey, rest: expected*

Threatened and Endangered Species

Gopher tortoises occur on the Alabama portions of the refuge. Alligators are common and bald and golden eagles have been observed as well. Brown pelicans are found in southern estuarine areas of the refuge near the coast. Manatees, an endangered species, are an occasional visitor to the refuge. The endangered red-cockaded woodpecker is not found on the refuge (USFWS 2005).

Invasive Animals

The major invasive wildlife species on the refuge is the nutria (*Myocastor coypus*), a large, semi-aquatic rodent originally introduced from South America in the 1930s for its fur. When the market for nutria fur collapsed in the 1940s, thousands of the animals were released into the wild by ranchers who could no longer afford to raise them. Also, entrepreneurs began selling them to control noxious weeds. Even wildlife agencies became involved in their introduction and naturalization in the United States, by introducing the species into new areas. Belatedly, it was learned that while nutria did devour weeds and overabundant vegetation, they also destroyed aquatic vegetation, crops, and wetland areas (Animal and Plant Health Inspection Service 2005; National Invasive Species Information Center 2006).

Nutria are most common in the Gulf coast states, but they also pose a problem in other southeastern states and along the Atlantic seaboard. In addition to damaging vegetation and crops, nutria can destroy the banks of ditches, lakes, and other water bodies. However, their worst potential impact is the permanent damage they can cause to marshes and other wetlands by feeding on native vegetation that binds the wetland soils together. The destruction of this vegetation may exacerbate the ongoing loss of coastal marshes set into motion by rising sea levels (Animal and Plant Health Inspection Service 2005).

CULTURAL RESOURCES

Cultural resources include historic properties as defined in the National Historic Preservation Act (NHPA), cultural items as defined in the Native American Graves Protection and Repatriation Act (NAGPRA), archaeological resources as defined in the Archeological Resources Protection Act (ARPA), sacred sites as defined in Executive Order 13007, *Protection and Accommodation of*

Access to "Indian Sacred Sites" to which access is provided under the American Indian Religious Freedom Act (AIRFA), and collections. As defined by the NHPA, a historic property or historic resource is any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP), including any artifacts, records, and remains that are related to and located in such properties. The term also includes properties of traditional religious and cultural importance (traditional cultural properties), which are eligible for inclusion in the NRHP as a result of their association with the cultural practices or beliefs of an American Indian tribe. Archaeological resources include any material of human life or activities that is at least 100 years old, and that is of archaeological interest.

Between 25,000 and 30,000 Indians are believed to have inhabited the area now encompassed by the State of Mississippi when the Spanish explorer Hernando De Soto first discovered the Mississippi River in 1541. The principal tribes were the Chickasaw, Choctaw, and Natchez. Much later, in 1682, French explorers descended the Mississippi, claiming the entire Mississippi Valley for France, including the future state of Mississippi. French settlers first arrived in 1699, followed in 1716 by another near present-day Natchez. African slaves were first brought to Mississippi in 1719 to work in rice and tobacco fields. All French possessions east of the Mississippi River were ceded to the British in 1763, and a few years later, after the Revolutionary War, to the United States. Spain retained control of the area below the 31st parallel as West Florida until 1810 (U-S-History.com n.d.).

In 1817, Congress divided the Mississippi Territory into two parts: the Territory of Alabama to the east and the State of Mississippi to the west. The state capital was located in various cities until Jackson was selected permanently in 1822. Most of Mississippi's Indian tribes were gradually forced off their land and onto reservations in Indian Territory, now Oklahoma. The land they left was often ideally suited for cotton farming, which had grown greatly since Eli Whitney's invention of the cotton gin in 1793. Mississippi became one of the wealthiest states in the nation, with an agricultural economy based on slavery and the export of cotton (U-S-History.com n.d.).

Southeastern coastal Mississippi had long been settled and used by humans, in good part because of its mild winters and abundant fish and wildlife resources. Prior to European settlement, a number of Indian tribes inhabited the area in the vicinity of the refuge. In the Mobile Bay-Delta Region, the so-named Pensacola Culture flourished prior to European contact. This culture, which was marked by elaborate ceramics, was practiced by two of many resident tribes of the area, the Mobile and the Tahome. These tribes, along with the Choctaw and the Naniabas, were the tribes met by De Soto between 1540 and 1541. Indigenous interests in the region were officially terminated with the ceding of Choctaw lands in 1830, relegating them to "squatters" after centuries of at times productive, but most often uneasy or explosive coexistence with Europeans and their descendants. Nearly all indigenous people had disappeared from Alabama by the time of the Choctaw cession as a result of disease, warfare, and migration.

Another local tribe, the Biloxi, is known from their earliest historical location on the lower reaches of the Pascagoula River. Individuals belonging to the tribe were met by Iberville on his first expedition to Louisiana in 1699, and in June of the same year his brother Bienville visited them. In 1700 Iberville found their town abandoned and does not mention encountering the people themselves, though they may have been sharing the Pascagoula village at which he made a short stop. A few years later, the Biloxi were said to have abandoned their village and settled on a small bayou near New Orleans. By 1722 they had returned a considerable distance toward their old home and were established on the former terrain of the Acolapissa Indians on the Pearl River (Access Genealogy 2005).

Later in the eighteenth century, the Biloxi moved to Louisiana and settled not far from Marksville. They soon moved farther up Red River and still later to Bayou Boeuf. Early in the nineteenth century

they sold their lands, and, while part of them remained on the river, a large number migrated to Texas and settled on Biloxi Bayou, in Angelina County. All eventually left, either to return to Louisiana or to settle in Oklahoma. A few Biloxi are still living in Rapides Parish, LA., and there are said to be some in the Choctaw Nation, but the tribe is now virtually extinct. Their name survives in the coastal town of Biloxi. The Siouan origin of the Biloxi language, unusual in this area, was established in 1886 by Dr. Gatschet of the Bureau of American Ethnology, and a considerable record of it was obtained by James O. Dorsey of the same institution in 1892–93.

Yet another small tribe that inhabited the general area in the vicinity of the refuge was the Pascagoula, who lived along the river that still bears their name. They were closely associated with the Biloxi Indians, and are believed to have eventually been absorbed by the Biloxi and/or the Choctaw (Access Genealogy 2005). A colorful legend has it that members of the Pascagoula nation linked hands and walked into the Pascagoula River, drowning rather than be taken captive by hostile Indian tribes; their mournful death chant earned the Pascagoula the nickname “Singing River” (MDWFP n.d.b). Today the name Singing River graces schools, credit unions, hospitals, and even yacht clubs and kennels in the area, commemorating the legend.

Many aboriginal earth and shell middens are located in the vicinity of Grand Bay. The majority are multi-component earth and shell accumulations, products of hundreds of years of use as seasonal encampments and food processing sites. They are found principally along the remnant river levees of the historic Escatawpa River channel, now known as the Bayou Cumbest, Crooked Bayou, and Heron Bayou systems (MDMR 1998b).

By the late 1990s, at least six archeological or cultural resource surveys had been conducted in the Grand Bay area, though most of these surveys did not contribute new knowledge about the region’s past (MDMR 1998b). To date, the refuge has not been systematically surveyed for cultural and archaeological resources, but the presence of additional prehistoric and/or historic resources would be expected.

SOCIOECONOMIC ENVIRONMENT

Grand Bay National Wildlife Refuge is located mostly within Jackson County, Mississippi, a coastal county in the extreme southeastern corner of the state, bordering Alabama. A portion of the refuge lies in Mobile County, Alabama; the City of Mobile itself lies 20 miles to the east. A rapidly-developing string of coastal towns and small cities (at least until Hurricane Katrina struck in August 2005) are just to the west of the refuge, including Gulfport, Biloxi, Ocean Springs, Gautier, and Pascagoula.

Jackson County is three times more densely populated than the state (181 persons per square mile vs. 61 persons per square mile) and growing faster. In 2003, the county’s estimated population was 133,928, about five percent of Mississippi’s population of 2,881,281 (U.S. Census Bureau 2005). The county population grew by 1.9 percent from 2000 to 2003, compared to Mississippi’s 1.3 percent growth in the same three years. From 1990 to 2000, Jackson County grew 14 percent compared to Mississippi’s 10.5 percent in the same decade.

In terms of race and ethnicity, whites and blacks dominate both the county and the state populations. Jackson County is 75 percent white and 21 percent black (96 percent white and black combined) while Mississippi is 61 percent white and 36 percent black (97 percent white and black combined). Other minorities make up much smaller percentages of the county and state populations: Asians 1.6 percent of the county and 0.7 percent of the state; American Indians 0.3 percent county and 0.4 percent state; and Latinos or Hispanics 2.1 percent of the county and 1.4 percent of the state (all

figures from 2000 Census). Foreign-born persons accounted for 2.7 percent of the county population in 2000 and a language other than English was spoken in five percent of homes that same year.

Educational attainment in the county is similar to the state's: 81 percent of the county population 25 years and older holds a high school diploma and 17 percent a Bachelor's degree, compared to 73 percent and 17 percent, respectively, for the state (U.S. Census Bureau 2005). The median household income in 1999 was \$39,118 for the county and \$31,330 for the state, while 13 percent of the county population and 20 percent of the state population lived below the poverty line.

Over the last decade, residential and commercial development have been proceeding rapidly in the coastal portion of Jackson County, Mississippi, converting forest plantations and farm fields into developed lots with houses, businesses, and institutions. Open space and habitat are becoming more and more fragmented. This development is expected to continue over the foreseeable future, in part because of the desirability of living in a coastal county with beach and ocean access. However, recent recommendations by the Pentagon, if acted upon by the Base Realignment and Closure Commission (BRAC), could temporarily reverse this trend. BRAC is charged with streamlining U.S. military bases and operations around the country. The Pentagon has recommended the closure of the Pascagoula Naval Station with a loss of 844 military personnel, 112 civilian workers, and seven contractors. In addition, the 81st Medical Group at Keesler Air Force Base in Biloxi (in neighboring Harrison County) is recommended for restructuring, with an associated reduction of 181 military, 31 civilian and 190 contractor positions (Anon. 2005a). These recommendations are scheduled for delivery to the President in September, 2005, and to be sent to Congress shortly thereafter. The Pentagon would then have six years to close, relocate or downsize bases on the final list.

There is growing awareness of the economic potential of ecotourism on the part of governments and business interests in the area (Anon. 2005b). Jackson County conducted the Pascagoula River Ecotourism Study in 2002–2003. The Gautier Economic Development Council formed an Ecotourism Planning Committee which published an "Ecotourism Master Plan" in 2004 (Gautier Economic Development Council 2004). This plan acknowledges Mississippi Sandhill Crane National Wildlife Refuge as one of the premier local nature destinations that can attract tourists to the area for outdoor activities. Other local attractions are Shepard State Park (MDWFP), Pascagoula River Marsh (MDMR), Indian Point Campground and RV Resort (privately owned), and Alf Dantzler Wildlife Preserve (MDMR). The plan also presented a marketing strategy.

In late August 2005, Category 3 Hurricane Katrina slammed into Jackson County and coastal Mississippi, wreaking catastrophic destruction on human life and property. As of December 11, 2005, the confirmed death toll in Jackson County alone stood at 12, at 230 for Mississippi as a whole, and at least 1,383 altogether (most of which were in Louisiana). These figures may rise considerably, because thousands of individuals are still unaccounted for (Anon. 2005c). Hurricane Katrina was the most costly natural disaster in U.S. history. Its economic impact extends not just to the destruction of homes, businesses, and infrastructure, but to widespread and long-lasting adverse impacts on unemployment, oil production, the Mississippi gambling industry, agriculture and forestry, fisheries and aquaculture, tax revenues, and bankruptcies (Congressional Budget Office 2005). Reconstruction and recovery will take years or decades.

REFUGE ADMINISTRATION AND MANAGEMENT

As a relatively new refuge with only one full-time staff person (the refuge manager), active management of wildlife and habitats as well as visitor services at Grand Bay NWR have been somewhat constrained to date. Refuge management cooperates extensively with the Grand Bay NERR staff in a number of ways.

LAND PROTECTION AND CONSERVATION

As a new refuge, a major focus for Grand Bay NWR management has been acquiring lands from willing sellers within the authorized acquisition boundary. The refuge was established in 1992 with an original acquisition boundary of 12,100 acres. In 1997, a 2,700-acre expansion was approved to bring under management a section of the scenic Escatawpa River. In 2003, a 665-acre expansion was approved to preserve valuable nearshore barrier islands habitat and enable the Service to acquire a small tract with a metal storage building which could be utilized as a refuge maintenance facility. This brought the total acreage within the acquisition boundary to 15,465 acres. To date, the Service has acquired a total of 10,188 acres (66 percent of the lands available) within this boundary.

There is no active waterfowl or other migratory bird management at present. Observations of threatened and endangered species on the refuge are documented; however, no active efforts to inventory or survey other wildlife are being made.

Wet pine savanna, one of the key habitats present at Grand Bay NWR, is actively managed. The refuge maintains approximately 1,000 acres of wet pine savanna, primarily through an active prescribed fire program using fire management staff stationed at the nearby Mississippi Sandhill Crane Refuge. Prescribed fire is utilized both to manage habitat and to reduce hazardous fuels. The refuge aims to set prescribed fires on a 2–3 year rotation. All wildfires are actively suppressed. The average fire size at Grand Bay NWR is 79 acres, compared to 59 acres at Mississippi Sandhill Crane NWR; and 20 percent of the Grand Bay fires reach 100 acres or more, compared to 13 percent at Mississippi Sandhill Crane (USFWS 2005).

Some effort is being made to contain the spread of invasive plants on the refuge. In partnership with the Grand Bay NERR, the staff annually controls 20–30 acres of cogongrass and Chinese tallow. The refuge also cooperates with NERR to protect Grand Bay's most significant known cultural resource—the shell middens mentioned earlier. Law enforcement functions are accomplished with the assistance of one law enforcement officer shared with Mississippi Sandhill Crane NWR and Bon Secour NWR, the two other refuges in the complex.

VISITOR SERVICES

The refuge receives about 700 visitors annually. Wildlife observation and photography, hunting (waterfowl, mourning doves, white-tailed deer, and feral hogs), and boating in tidal marshes are the managed recreational uses of Grand Bay NWR. The refuge boundary is marked with boundary signs, although many are fading and need to be replaced. No directional signs are posted off of Interstate 10 leading to the refuge, but signs are planned after the opening of new visitor facilities. No directional signs are posted on any of the trails. All refuge roads open to the public are either paved or gravel. Bayou Heron Road and Pecan Road together are about 3 miles in length. Jackson County maintains the 3-mile entrance road into the existing headquarters area, which has a gravel parking area that can accommodate 10–15 vehicles. The refuge office is open from 9:00 a.m. to 4:00 p.m. and is shared with the Grand Bay NERR staff (USFWS 2004).

At present, Grand Bay NWR provides visitor services without the guidance of a Visitor Services Plan. This plan will be developed as a step-down management plan after the completion and approval of this comprehensive conservation plan. The refuge lacks full-time staff dedicated to managing visitor services, volunteers, and outreach services. Until this expertise is provided on the refuge, staff will have to provide these services as a collateral duty.

In partnership with Grand Bay NERR, the refuge is in the process of developing a new joint research, office and education facility/visitor center to provide benefits to refuge visitors. This center will be located near the existing office complex alongside Bayou Heron Road. Building plans had already been prepared when Hurricane Katrina struck in August 2005, resulting in a delay because the plans had to be revised to raise the proposed building by several additional feet, to provide greater security and safety in the event of future hurricanes and flooding.

Hunting

A hunt plan was approved for Grand Bay NWR in 1999 and the hunting program actually began in 2001. The refuge currently offers hunting for white-tailed deer, feral hogs, squirrel, geese, ducks, coots, and mourning doves on designated areas, subject to state regulations and conditions outlined in the refuge's Hunting Regulations brochure. These hunts are non-quota and require a signed refuge hunt regulations brochure and permit, which is available at the Grand Bay NWR office.

This is currently a small hunting program. Commercial guides are not allowed. Law enforcement on the refuge has been minimal; the Gulf Coast Refuge Complex (three refuges) shares a single law enforcement officer. The MDMR enforces marine laws and regulations in the coastal navigable waters of the refuge. There are no hunter check stations on the refuge. Hunters are currently allowed access to the Oak Grove birding trail, which may create potential user conflicts and safety issues with nonconsumptive trail users. The following hunting programs are available at Grand Bay NWR:

Waterfowl Season. The refuge is open to waterfowl hunting in Alabama and Mississippi in designated areas and in accordance with each state's season. Hunting is allowed from sunrise to noon on Saturday, Sunday, Wednesday and Thursday; the refuge is closed to waterfowl hunting on Monday, Tuesday, and Friday. All decoys must be retrieved by 1:00 p.m. and no permanent blinds are allowed. Federally approved nontoxic shot is required for all waterfowl hunts. Dogs are allowed to retrieve downed birds.

Big Game Season. The refuge is open to deer hunting with bow and arrow only during the state hunting seasons for both Alabama and Mississippi. No crossbows are permitted and no permanent stands are allowed. Also, hunting with the aid of bait, dogs, or poisonous arrows is prohibited, as are organized deer drives.

Small Game Season. The refuge is open for squirrel hunting in Alabama and Mississippi in accordance with each state's season. Shotguns using number two or smaller shot size are allowed and all shells must be federally approved nontoxic shot. The use of .22-caliber rimfire is allowed for squirrel hunting only. The use of dogs is prohibited (USFWS 2004).

Fishing

The refuge provides diverse habitats of salt marshes, bayous, grass beds, etc. for the region's important commercial and recreational species of fish. These habitats serve as nursery areas as well as breeding and feeding grounds for shrimp, red drum, speckled trout, blue crab, oysters, and crabs, among other marine and aquatic organisms.

Excellent fishing opportunities are available off-refuge lands and along the coastline, but it is unclear from reading the refuge brochures and the web site, what opportunities exist and what agencies are involved. A public boat launch facility and bank fishing area is located at the end of Bayou Heron Road (USFWS 2004). A universally accessible fishing pier that is compliant with the Americans with

Disabilities Act (ADA) is adjacent to the boat launch, along with a resurfaced ADA-compliant gravel parking area. The Service is cooperating with the MDMR to provide additional safety and enforcement of fishing opportunities within the waters of Grand Bay NWR.

Wildlife Observation and Photography

Grand Bay NWR provides limited opportunities for wildlife observation. Birding is one of the most popular forms of wildlife observation on the refuge, with viewing opportunities changing seasonally. Viewing opportunities include wintering flocks of wading birds and waterfowl in the bayou and bay, songbirds in the trees and shrubs, and harriers and hawks hunting over the savanna. Visitors may also see other common wildlife such as white-tailed deer, raccoon, snakes, and frogs.

The refuge is working closely with the Grand Bay NERR to provide opportunities for wildlife observation. There is currently an educational pavilion at the Bayou Heron boat launch that loosely provides some wildlife observation and photography opportunities. The refuge also has the ½-mile Oak Grove birding trail that provides some wildlife observation and photography opportunities. A kiosk has been developed but not yet placed at the trailhead.

Currently, the Escatawpa Trail is being developed in partnership with the Mississippi Interstate Welcome Center and a contractor to build the trail. A two-mile part boardwalk and part gravel trail is under development at the Mississippi Interstate Welcome Center. Plans are underway to make this a universally accessible trail and provide several benches for resting and wildlife viewing opportunities. There are also plans to provide and construct parking areas near the trailhead. Once completed and open to the public, the trail will provide wildlife observation and photography opportunities, particularly at the Escatawpa River overlook. The Mississippi Department of Transportation is also constructing a picnic pavilion near the trail entrance on land adjacent to the refuge. The trail surface will include an ADA-compliant porous pavement and gravel boardwalk. Seven benches will be strategically placed to increase wildlife observation opportunities for the visiting public.

The Grand Bay NERR has created a visitor's field journal with mammal, bird, amphibian, butterfly, reptile, and plant checklists for use by visitors to the Grand Bay National Estuarine Research Reserve and the Grand Bay National Wildlife Refuge.

Visitors with boats can use the Bayou Heron boat launch and pursue wildlife observation opportunities in Gautier Bayou, Bayou Heron, and Grand Bay. Currently, there is no fee to use the boat launch.

A "Bio Blitz" event was held in 2004 in partnership with the Grand Bay NERR. Researchers and educators worked with over 100 volunteers and the general public viewing and inventorying wildlife. Boat rides, canoe and kayak tours, sunrise birding cruises, night time owl banding and calling, and birding were some of the main events.

The Grand Bay NERR is currently providing specialized group on-demand boat tours leaving from the Bayou Heron boat launch. These tours promote wildlife observation and photography on Grand Bay NWR and Grand Bay NERR. Currently, the refuge has no auto tour routes.

Environmental Education

The refuge has an environmental education program that is managed by the MDMR and the Grand Bay NERR. The refuge manager provides offsite environmental education presentations to schools, garden clubs, and organizations, as well as pre- and post-field trip briefings and participation in

National Wildlife Refuge Week. A primary goal of the Grand Bay NERR is to implement education and resource management components.

About six million dollars was recently appropriated to provide facilities to support the Grand Bay NERR. As noted above, an architectural firm was retained to design and build the new office and visitor center, including a small exhibit area and library.

The refuge staff's outreach endeavors include distribution of a general brochure. The refuge website provides some information regarding refuge facts and management, vicinity maps, and directions. Offsite participation in National Wildlife Refuge Week is the main event in which the refuge staff participates. Grand Bay NERR mentions the partnership with Grand Bay NWR in its publications, provides a link to the refuge's website, and works extensively with the public, providing tours and participating in special events such as festivals.

In terms of the local community, the refuge rarely communicates information relating to the purpose of the refuge and its management activities, education, and research. The refuge does not publish information relating to refuge habitats and management in local papers.

Interpretation

The Grand Bay Refuge staff relies on the Grand Bay NERR staff to provide interpretation for the refuge. The refuge manager participates in National Wildlife Refuge Week annually in October.

PERSONNEL, OPERATIONS AND MAINTENANCE

At present, Grand Bay NWR has a staff of two: the Refuge Manager and one Law Enforcement Officer shared with two other refuges in the Gulf Coast National Wildlife Refuge Complex.

As stated earlier in this comprehensive conservation plan, the Grand Bay National Estuarine Research Reserve partially overlays the refuge. This overlay and its management are addressed in a memorandum of understanding with the Fish and Wildlife Service. The Grand Bay NERR staff is an important partner and full-time contributor to providing environmental education for the refuge. The NERR's core staff includes the reserve manager and education, research, and stewardship coordinators. Refuge and NERR staff currently share temporary post-Katrina office space and will also share the new headquarters, office, and visitor center building that is slated for construction in 2007.

The refuge has a newly acquired maintenance building and storage yard north of Interstate 10 on a recently purchased tract. This site also serves as the office of the Law Enforcement Officer.

The Gulf Coast National Wildlife Refuge Complex is headquartered at Mississippi Sandhill Crane NWR 20 miles to the west. The Complex project leader and biologist provide expertise and assistance in Grand Bay NWR management. The fire staff is also located at Mississippi Sandhill Crane NWR, and assists Grand Bay NWR with wildfire suppression and prescribed burns.

III. Plan Development

PUBLIC INVOLVEMENT AND THE PLANNING PROCESS

In accordance with Service guidelines and National Environmental Policy Act recommendations, public involvement has been a crucial factor throughout the development of the Draft Comprehensive Conservation Plan for Grand Bay National Wildlife Refuge. This plan 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 Grand Bay Refuge. The Service as a whole, and the refuge 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 refuge.

Scoping is the gathering of input from a variety of internal and external sources on the identification of key issues, concerns and opportunities that are likely to be associated with the conservation and management of the refuge. Sources of internal scoping include the refuge staff and other Service biologists and professionals. External scoping sources include concerned private citizens; research and educational institutions; members of conservation, sportsmen and civic groups; refuge neighbors; citizens of the local community; and state, tribal, and local agencies. These various interests are referred to collectively as “stakeholders,” that is, those individuals and groups that have a stake in how the refuge is managed. In developing this comprehensive conservation plan for Grand Bay National Wildlife Refuge, the planning team conducted both internal and external scoping.

The first step in developing the plan was a biological review that took place during the week of February 23–27, 2004. The biological review team included 17 Service biologists, managers, foresters, and non-Service managers and biologists. The team members came from a variety of agencies in addition to the Service, including Mississippi State University; the Grand Bay National Estuarine Research Reserve; Mississippi Department of Marine Resources; Mississippi Department of Wildlife, Fisheries and Parks; Museum of Natural Science; and the Alabama Department of Conservation and Natural Resources.

The biological review involved onsite evaluations to assist the refuge in meeting its purpose and determining the role(s) the refuge could play regarding its wildlife needs and objectives at various geographical scales (local, ecosystem, regional, and national). The approach was to take a holistic look for achieving refuge and landscape-level conservation needs, while still giving priority to accomplishing the refuge’s originally established purpose. The team presented its recommendations in a Biological Review Report (USFWS 2005). In keeping with the planning process, these recommendations were made in the form of goals, objectives and strategies for the management of the refuge’s biological resources. These preliminary goals, objectives and strategies were studied by the planning team and modified and adapted for use in this comprehensive conservation plan.

A visitor services review was also conducted in October 2004. The four-member visitor services review team consisted of personnel from the Service’s Visitor Services and Outreach Division in the Southeast Regional Office in Atlanta; Tensas National Wildlife Refuge; and the Grand Bay National Estuarine Research Reserve (NERR). The review team was provided with copies of the 2001 Hunt Plan and 2003–2004 Hunting Regulations brochure. In addition, the Grand Bay NERR provided a slide presentation and briefing materials outlining its current programs and future planned programs and facilities. The team also met with the refuge manager and an education specialist from the

Mississippi Department of Marine Resources to tour the refuge and discuss its visitor services program. After touring the refuge and reviewing its public use areas, the team presented its recommendations to the staff and held an open discussion of the pros and cons of the various recommendations. The team then submitted a report with recommendations for improving and expanding the refuge's visitor use program (USFWS 2004).

The comprehensive planning team, comprised of the refuge manager; a natural resources planner and two biologists from the Service's Jackson, Mississippi, field office; the project leader of the Gulf Coast National Wildlife Refuge Complex; a biologist from Mississippi Sandhill Crane NWR; two officials from the Grand Bay NERR; a biologist from the Mississippi Department of Wildlife, Fisheries, and Parks; and an outside professional consultant (see Appendix X, List of Preparers) met for the first time in February 2006. The planning team toured the refuge and received an overview of its habitat, wildlife resources, and public use programs, facilities, and opportunities. It also conducted additional internal scoping and prepared a preliminary schedule, a mailing list, and plans for public involvement. A Notice of Intent to prepare a comprehensive conservation plan for the refuge was published in the *Federal Register* on December 29, 2005.

The planning team held an open house and public scoping meeting on March 22, 2006, at the Orange Lake Elementary School cafeteria in Moss Point, Mississippi, several miles from the refuge. The meeting was coordinated with officials of other governmental agencies, the Grand Bay NERR, various organizations, and the surrounding communities. The meeting was publicized in advance in several ways. Letters and flyers were sent to those on the mailing list, which included refuge users, government and civic leaders, congressional staff, private organizations, and other interested parties. Information announcing the public scoping meeting was also sent to local newspapers, and a public service announcement was sent to local radio stations. Approximately 10 citizens attended the open house and scoping meeting. The attendees were able to meet and interact with the refuge staff, ask questions, view the exhibits and maps on hand, and provide comments.

The meeting began with brief overviews of the refuge, the comprehensive planning process, and the Service's policy of land acquisition from willing sellers, followed by a facilitated open-floor question and comment period. The attendees were given the opportunity to ask questions and voice their thoughts and concerns about the refuge and how it should be managed in the future. In addition, a comment form was distributed for the attendees and other interested parties to submit written comments. The written comments could be submitted either at the meeting or subsequently by mail or e-mail. The issues, concerns, and suggestions received at this meeting were considered and evaluated in the preparation of the draft comprehensive conservation plan. A total of 28 comments were received. Appendix IV, Public Involvement, provides a summary of the public scoping comments.

Earlier on the same day in which the public scoping meeting and open house was held, the planning team met at the office shared jointly with the Grand Bay NERR. These discussions focused on the issues facing the management of the refuge, the refuge's ongoing partnership with the Grand Bay NERR, and the bearing of this partnership on the comprehensive conservation plan.

SUMMARY OF ISSUES, CONCERNS AND OPPORTUNITIES

The planning team identified a number of issues, concerns and opportunities related to fish and wildlife conservation, habitat management, recreation, and protection of threatened and endangered species. Additionally, the planning team considered federal and state mandates as well as applicable local ordinances, regulations, and plans. The team also directed the process of obtaining public input through a public scoping meeting, open planning team meetings, comment forms, and personal contacts. All public and advisory team comments were considered; however, some issues important

to the public are beyond the Service's authority and fall outside the scope of the planning process. Nevertheless, the team did consider all issues that were raised through this planning process, and has developed a plan that attempts to balance the competing opinions regarding important issues. The team identified those issues that, in its best professional judgment, are the most significant to the refuge. They are summarized below.

FISH AND WILDLIFE POPULATIONS AND HABITAT MANAGEMENT

- Grassland birds: providing pine savanna habitat for the benefit of these species
- Other migratory birds: improving knowledge base for management by increasing baseline knowledge of the distribution, abundance and use of the refuge by a variety of birds, including waterfowl, marsh birds and landbirds
- Amphibians and reptiles: continuing monitoring their presence through surveys and considering projects that might benefit their populations while pursuing primary MSC-oriented goals and objectives of refuge
- Wet pine savanna habitat: maintaining and increasing the area of this rare and vanishing, fire-maintained, sub-climax vegetation community on the refuge
- Other habitats: maintaining flatwood forest, forested wetlands, ponds and salt pannes on the refuge
- Fire management: proactively using prescribed fire for habitat management and fuel reduction objectives in a rapidly developing area with ever more constraints that must be observed by fire managers
- Manage and protect migratory birds
- Achieve goals (savanna restoration, fire, roll chopping, etc.) to meet refuge purpose of establishing breeding pairs of Mississippi sandhill cranes
- After fire, conduct migratory bird surveys in savanna

RESOURCE PROTECTION

- Invasive species: cogongrass is the principal invasive on the refuge with tallow trees in second place; should aim to sharply reduce the former and even eliminate the latter
- Control invasive plant species
- Law enforcement: dumping of refuse, rubbish, and old furniture has been a particular problem on the refuge
- Cultural resources: not much is known about the refuge's cultural resources and the refuge lacks a Cultural Resources Management Plan, as well as a comprehensive survey of cultural resources
- Increase law enforcement
- Pursuit of willing sellers in the acquisition boundary
- Partner with The Nature Conservancy to speed up the process of land acquisition for USFWS
- NERR mentioned a possibility to follow through with their land acquisition
- Houses within the Pecan community may be acquired by FEMA and given to Jackson County. FWS should consider a refuge boundary expansion to incorporate these lands
- Bayou Heron Road (major dump site, gate road to keep folks out)
- Two landowners of small tracts were interested in selling their property to the refuge

VISITOR SERVICES

- Overall public use and visitor services: the refuge lacks a Visitor Services Plan and a park ranger to implement it; overall, the refuge should be doing more to attract and appeal to the public to increase appreciation and support as threats and pressures intensify from rapid local development
- Signage and brochure: Need to make and place standard refuge signs along roads and trails; refuge also needs a general refuge brochure that complies with FWS graphics and format standards
- Wildlife observation and photography: there are limited opportunities and facilities, but these could be expanded
- Environmental education and interpretation: while staff participates in both, efforts are limited by the lack of a park ranger who would focus on these and other visitor services
- Hunting and fishing: explore opportunities to expand/enhance current hunting and fishing programs
- Volunteers: volunteers participate in a variety of activities but the establishment of a Friends Group would expand their potential
- Develop and strengthen partnerships related to environmental education and visitor use programs
- Hire Interpretive Specialist
- Partner with NERR to get message out
- Develop Friends Group to advocate for both refuge and Reserve
- Pool volunteers to maximize output
- Coordinate with MDWFP on hunting and fishing programs on the refuge and expand the state's participation in refuge planning activities.
- Add a primitive weapons hunt (muzzleloader)
- Hunters believe that deer populations are on the rise and that muzzleloaders are needed
- Hunters are also aware that the hurricane reduced wildlife numbers; but they will rebound

REFUGE ADMINISTRATION

- Establish/update refuge/reserve memorandum of understanding with NERR (new building/daily operations)
- NERR requested some form of housing to continue to bring researchers/students to the refuge/reserve
- Increased security at Bayou Heron Boat Launch
- Increased law enforcement presence at high public use areas
- Light at boat ramp (added security for residents, their belongings, and deter illegal activity)
- Boat tickets (management areas) to track how many boats are launched and who has launched

WILDERNESS REVIEW

Refuge planning policy requires a wilderness review as part of the comprehensive conservation planning process. The lands within Grand Bay National Wildlife Refuge were inventoried to identify whether any areas meet the criteria for wilderness designation, as set forth in the Wilderness Act of 1964. The results of that determination are provided in Appendix VII.

IV. Management Direction

INTRODUCTION

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

Described below is the proposed comprehensive conservation plan (CCP) for managing Grand Bay National Wildlife Refuge over the next 15 years. This plan contains the goals, objectives, and strategies that will be used to achieve the refuge vision.

Four alternatives for managing the refuge were considered and analyzed: Alternative A, Current Management (No Action); Alternative B, Custodial or Passive Management; Alternative C, Optimize Wildlife and Habitat Management; and Alternative D, Optimize Visitor Services. Each alternative is described in Chapter III of the Environmental Assessment (Section B). The Service chose Alternative C (Optimize Wildlife and Habitat Management) as the proposed management direction.

Implementing the proposed alternative will result in the restoration of additional wet pine savanna habitat, enhancing favorable conditions for gopher tortoises and possible reintroduction of endangered Mississippi sandhill cranes and gopher frogs. The refuge will acquire 100 percent of the lands within the approved acquisition boundary within 15 years. It will also restore forest structure to promote super-emergent trees, cavities, and understory structure on approximately 2,000 acres to benefit migratory land birds. In addition, use of prescribed fire as a habitat management tool will be increased, with 50 percent of prescribed burns conducted during the growing season. The refuge will continue to partner closely with the Grand Bay National Estuarine Research Reserve in promoting public uses, which will be facilitated by the planned construction of a new visitor center.

VISION

Grand Bay National Wildlife Refuge was established under the authority of the Emergency Wetlands Resources Act of 1986 to protect one of the largest expanses of Gulf Coast savanna remaining in a relatively undisturbed state. It has forested wetland habitat important for several high priority migratory land birds. The refuge also contains coastal marsh and estuarine habitats, including seagrass beds and salt pannes, considered vital for resident and migratory waterfowl, shorebirds, and marsh birds, as well as for marine organisms and fisheries. The savanna is a fire-maintained, sub-climax community and refuge management will continue to be a leader in effectively using prescribed fire to manage rare habitats and species in the expanding wildland urban interface. The refuge was conceived as and continues to represent a possible site for reintroduction of an experimental, nonessential population of the endangered Mississippi sandhill crane. The refuge also protects cultural resources including shell middens that were established thousands of years ago by the area's indigenous human residents.

While managing a healthy refuge, in cooperation with the Grand Bay National Estuarine Research Reserve, Grand Bay NWR will expand opportunities for environmental education, interpretation, and other wildlife-dependent recreation such as fishing and hunting. The refuge, in partnership with the

Reserve, aspires to become a nationwide leader in conducting ecological research on coastal ecosystems. The refuge's vision is one of expanded partnerships working on behalf of habitat conservation and restoration, land acquisition and protection, and public enjoyment of its rare assets and recreational opportunities.

GOALS, OBJECTIVES, AND STRATEGIES

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

These goals, objectives, and strategies reflect the Service's commitment to achieve the mandates of the National Wildlife Refuge System Improvement Act of 1997; the mission of the National Wildlife Refuge System; and the purposes and vision of Grand Bay National Wildlife Refuge. With adequate staffing and funding as outlined in Chapter V, the Service intends to accomplish these goals, objectives, and strategies within the next 15 years.

FISH AND WILDLIFE POPULATIONS AND HABITAT MANAGEMENT

Goal 1: In support of national and regional plans, promote management actions that will provide for viable populations of native fish and wildlife species and habitats, with special emphasis on wet pine savanna.

Discussion: Grand Bay NWR lies in the East Gulf Coastal Plain physiographic area, part of the Southeast Conifer Forest ecoregion extending from eastern Louisiana to coastal Georgia. In coastal Mississippi, distinct terrestrial communities including pitcher plant bogs, longleaf pine savannas, and bayhead swamps, all of which are found in the refuge. The ecoregions present within this system are critical because of the variety of habitats they provide to many migratory bird species. The refuge includes the following regions: Southern Pine Hills predominantly north of Interstate 10, Gulf Coast Flatwoods just south of the Interstate, and Marsh regions in the southern portions of the county. Chapter I of this CCP discusses the national and regional plans toward which implementing these goals, objectives and strategies will contribute, including the North American Bird Conservation Initiative, North American Waterfowl Management Plan, Partners in Flight Bird Conservation Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan.

Objective 1-1: Migratory Waterfowl – Within 15 years of CCP approval, support the annual population objective of the North American Waterfowl Management Plan (NAWMP), by contributing 20 percent (3,600 ducks) of a midwinter population of approximately 18,000 ducks in the Coastal Mississippi Wetlands Initiative Area.

Discussion: The NAWMP is an international (Canada, Mexico, and United States) agreement undertaking an intensive and extensive effort to protect and restore North America's waterfowl populations and their habitats. The implementing mechanisms for the NAWMP are partnerships known as joint ventures, which are composed of federal, state, and local agencies and organizations concerned with conserving migratory birds and their habitats in a particular physiographic region. The Gulf Coast Joint Venture (GCJV) is one of the original focus areas and extends along the western Gulf of Mexico from the Alabama-Florida boundary across Texas.

The GCJV is the terminus of the Central and Mississippi Flyways and, therefore, one of the most important waterfowl wintering areas in North America. The GCJV also provides year-round habitat for over 90 percent of the continental population of mottled ducks. The GCJV is divided geographically into six initiative areas, each with a different mix of habitats, management opportunities, and species priorities. Grand Bay NWR lies within the Coastal Mississippi Wetlands Initiative Area. The midwinter population objectives for this initiative area are:

<u>Species</u>	<u>Population Goal</u>
Mallard	619
Gadwall	268
American wigeon	191
Green-winged teal	413
Blue-winged teal	1,738
Northern shoveler	84
Mottled duck	397
Canvasback	174
Greater and lesser scaup	13,836

Habitat conservation is imperative to the success of the NAWMP and the GCJV. Critical to meeting the goals and objectives of the Coastal Mississippi Wetlands Initiative is the maintenance and restoration of wetland habitat.

Although waterfowl are not common in many habitats of the savanna complex of Grand Bay NWR, wetland habitats used by waterfowl include cypress-tupelo swamps and coastal marsh and bays. About 20 percent of the wintering waterfowl in coastal Mississippi are found in this area. The most prevalent wintering species are lesser scaup, redhead, ring-necked duck, bufflehead, mallard, and American wigeon. The Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) does not survey the coastal areas when conducting fall and winter surveys, leaving a significant data need for the refuge. As a minimum, the refuge should survey waterfowl during the mid-winter period, usually the first full week of January and, if possible, every two weeks on Monday or Tuesday of the first and third full weeks of each month during the October through February period.

Wood ducks and mottled ducks are year-round refuge residents and nest around shallow ponds and swamps. The GCJV is sponsoring a multi-agency effort to monitor mottled duck populations through a significant pre-season banding program, particularly in Texas and Louisiana. All indications are that mottled duck populations in Texas have declined significantly, presumably as a result of changes in rice culture and land use. In Louisiana, the mottled duck population appears to be holding steady to slightly increasing. Little information is available for Mississippi and Alabama populations. In both Louisiana and Texas, the states have taken the lead in the banding effort and are provided significant support by Service personnel and equipment.

Strategies:

- Work with the GCJV and the Grand Bay NERR to monitor and archive habitat conditions, including grassbeds and marsh ponds. Relate waterfowl use to habitat type/conditions.

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- Initiate a waterfowl monitoring program to survey waterfowl during the mid-winter period, usually the first full week of January, or preferably on Monday or Tuesday of the first and third full weeks of each month from October through February. Aerial surveys are the most effective in coastal situations, but data gathered from ground surveys would be an improvement over existing data sources.
 - The preferred survey technique would be conducted along line transects that are surveyed from an airplane or helicopter, are replicable, and can be expanded to estimate total numbers of waterfowl. Refuge personnel should work with the Service's Migratory Bird Office in Jackson, Mississippi; the MDWFP; the U.S. Geological Survey; and the Mississippi Department of Marine Resources (MDMR) to establish the refuge survey and, hopefully, coordinate it with a coastal survey south of Interstate 10.
 - Waterfowl survey data should be entered and archived on the database administered by the South Atlantic Migratory Bird Initiative (SAMBI). That database can be queried to provide charts and tables useful in refuge reports.
 - Support mottled duck population monitoring efforts if the geographic scope increases to include Mississippi, and the MDWFP becomes significantly involved in the effort.
 - Provide wood duck nesting structures on suitable habitat exceeding 2–5 acres in size and other suitable habitats on the refuge. The number of wood duck nest boxes should not exceed the refuge staff's ability to routinely clean and repair the boxes at least once per year prior to nesting (January, if possible). Initially, perhaps only 10 or 20 boxes could be erected and the number could expand as box usage increases.
 - The publication "Increasing Wood Duck Productivity: Guidelines for Management and Banding, USFWS Lands (Southeast Region) 2003 (Update)" by the Division of Migratory Birds, Atlanta, Georgia, should be used to guide the wood duck nest box program. However, if staff or volunteer time does not allow for annual maintenance, the boxes should be boarded up or removed from the refuge.

Objective 1-2: Other Migratory Birds – Within 15 years of CCP approval, provide habitats sufficient to meet population goals of regional and national bird conservation plans.

Discussion: Wet pine savanna and forested wetland habitats are each covered below by their own objectives, respectively, so this objective encompasses a variety of other habitats, including longleaf/slash flatwoods, all hardwood forest types for transient landbirds and shrub-scrub nesting species, waterbird habitats, freshwater marshes, grasslands, coastal marshes (including tidal flats and unvegetated salt panes), and islands in Grand Bay.

Longleaf/slash flatwoods – Priority species of longleaf/slash pine flatwoods include Extremely High Priority red-cockaded woodpecker (pine cavity-nester, but not expected to occur on refuge anytime into the near future), Bachman's sparrow (ground-nester), Henslow's sparrow (ground, wintering); High Priority brown-headed nuthatch (pine cavity-nester), field sparrow (ground, wintering), Le Conte's sparrow (ground, wintering); Moderate Priority grasshopper sparrow (ground, wintering), palm warbler (shrubs/ground, wintering), Carolina chickadee (cavity-nester), chuck-will's-widows (ground-nester), pine warbler (pine canopy), summer tanager (open canopy); Local and Regional Interest red-headed woodpecker (pine cavity-

nester), eastern wood-pewee (open canopy); also include northern bobwhite (ground-nester) as part of this community.

Hardwood forest types – Priority species include High Priority black-throated blue warbler, cerulean warbler, wood thrush, worm-eating warbler, veery, bay-breasted warbler, Louisiana waterthrush; Moderate Priority black-throated green warbler, common ground dove (ground-nester), eastern towhee (shrub-nester), white-eyed vireo (shrub-nester), orchard oriole (shrub-nester).

Waterbird habitats – These are forested habitats supporting colonial nesting waterbirds. Priority species include High Priority brown pelican, white ibis; Local and Regional Interest anhinga, great blue heron, great egret, snowy egret, little blue heron, tricolored heron, black-crowned night-heron, yellow-crowned night heron.

Freshwater marshes and grasslands – Priority species include High Priority black rail, Henslow's sparrow, yellow rail, king rail, short-eared owl, sedge wren; Moderate Priority American bittern, least bittern, northern harrier, barn owl; Local and Regional Interest eastern meadowlark.

Coastal marshes – Coastal marshes include unvegetated salt panes and tidal flats. Priority species include Extremely High Priority American oystercatcher, red knot; High Priority black rail, brown pelican, white ibis, whimbrel, marbled godwit, semipalmated sandpiper, short-billed dowitcher, Wilson's plover, Nelson's sharp-tailed sparrow, yellow rail, seaside sparrow, king rail, clapper rail, short-eared owl, black tern, sedge wren; Moderate Priority gull-billed tern, least tern, black skimmer, royal tern, bald eagle, sandwich tern, least bittern, northern harrier, barn owl, black-bellied plover, willet, ruddy turnstone, western sandpiper, American avocet, least sandpiper, dunlin, greater yellowlegs; Local and Regional Interest common tern, Forster's tern, semipalmated plover, spotted sandpiper, lesser yellowlegs, anhinga, great blue heron, great egret, snowy egret, little blue heron, tricolored heron, black-crowned night-heron, yellow-crowned night-heron.

Islands in Grand Bay – Priority species include Extremely High Priority American oystercatcher (nesting); High Priority Wilson's plover (nesting); Moderate Priority least tern (nesting).

Strategies:

Longleaf/slash flatwoods

- Reduce stocking of slash pine plantations so that remaining pines are open enough to allow natural regeneration of longleaf in drier sites and slash on wetter sites.
- Reduce saw palmetto, gallberry, and ferns and promote grassy-herbaceous ground cover through appropriate chopping and use of prescribed fire.
- Monitor bird population responses to habitat restoration using direct counts, point counts, transects (project prairie bird) or area search protocols.

Hardwood forest types

- Promote fleshy-fruit producing shrubby conditions through appropriate use of prescribed fire.

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- Monitor bird population responses to habitat restoration using transects (migration monitoring; www.gcbo.org) and protocols for tracking timing and extent of transient landbird use of the refuge.
 - Establish at least one transect of 2 km in an appropriate area known to support many transient landbirds. Consider one other transect along a more inland forested area. Attempt to survey each transect weekly (or at least bi-weekly) during both spring and fall migrations.

Waterbird habitats

- Survey once during April to determine most likely rookeries and determine potential disturbance factors and minimize sources of disturbance as much as possible.
- Annually, determine locations of nesting colonies and as best as possible estimate number of pairs for each species present at each colony. Additional monitoring may not be necessary unless a specific need is identified to address other management activities.
- Annual survey to follow existing refuge protocol.
- Establish more specific protocol as necessary to achieve other management objectives.

Freshwater marshes and grasslands

- Determine marshbird use of impoundment habitats and responses to various water management and prescribed burning regimes, with special emphasis on black and yellow rails.
- Promote grassy-herbaceous ground cover or diverse marsh habitats through appropriate use of prescribed fire and water management.
- Monitor bird population responses to habitat maintenance using secretive marshbird surveys (see www.nacwcp.org/waterbirds/ and search for North American Marshbird Survey Protocols), a point count type approach along levee roads adjacent to marsh and grassy habitats.
- Establish a route along areas most likely to support marsh and grassy habitats where a minimum of 50 points may be established, with summer counts providing a focus on black rail, king rail, and least bittern.
- Establish the same route for winter secretive marshbird counts with same species focus plus yellow rail.

Coastal marshes

- Determine marshbird, shorebird, and other waterbird use of coastal marshes, with special emphasis on black and yellow rails and seaside and Nelson's sharp-tailed sparrows, roosting shorebirds, and foraging wading birds.

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- Establish Secretive Marshbird Survey throughout the extensive brackish and salt marshes of the Grand Bay NWR/NERR.
 - Establish a route along the areas most likely to support marsh and grassy habitats where a minimum of 50 points may be established, with summer counts providing a focus on black rail, king rail, seaside sparrow, and least bittern.
 - Establish the same route for winter secretive marshbird counts with same species plus yellow rail and Nelson's sharp-tailed sparrow.
 - Monitor shorebird (and all other waterbird) along coastal marshes using International Shorebird Survey.

Islands in Grand Bay

- Support a minimum of five pairs of American oystercatchers and 15 pairs of Wilson plovers with average reproductive rates recommended in Southeastern Coastal Plain Shorebird Conservation Plan.
- Maintain law enforcement presence to ensure integrity of nesting islands during summer months.
- Monitor bird populations on islands.
- Maintain data as best as possible on total numbers of pairs of oystercatcher, plovers and least terns from boat surveys using the Florida Fish and Wildlife Conservation Commission's "Beach Bird Survey."
- If more data are needed on reproduction, then onsite inspections may be warranted, but these would need to be balanced with the likely level of disturbance that may be involved.

Objective 1-3: Threatened and Endangered Species – Document all sightings of listed species, and within 15 years of CCP approval, create and enhance favorable conditions for gopher tortoises (200 acres) and possible reintroduction of 12-15 Mississippi sandhill cranes (5-7 nesting pairs) and gopher frog (creating 2 ponds).

Discussion: The only existing wild population of the endangered Mississippi sandhill crane (*Grus canadensis pulla*) in the world occurs in and around the Mississippi Sandhill Crane National Wildlife Refuge, about 20 miles to the west of Grand Bay NWR and also in Jackson County, MS. The Mississippi sandhill crane is a genetically distinct, nonmigratory subspecies of the sandhill crane (*G. canadensis*) that depends on wet pine savanna habitat. One of the purposes in the establishment of Grand Bay Refuge was the potential for developing a distinct population of Mississippi sandhill cranes as an insurance policy and to expand the range and numbers of this highly endangered creature.

The threatened gopher tortoise (*Gopherus polyphemus*) is also known to occur on Grand Bay NWR. The gopher tortoise has a long life expectancy, does not reach sexual maturity until over ten years of age, produces relatively small clutches and has low recruitment; it also suffers from an upper respiratory tract disease, high levels of predation and most importantly, loss of habitat. Serious habitat and population declines in the western half of its range have resulted in the gopher tortoise being federally listed in Louisiana, Mississippi, and western

Alabama. Gopher tortoises are a medium-sized, averaging 10 inches long and about nine pounds as adults. They are solitary and inhabit small home ranges. They frequently dig burrows several feet deep into the ground, where they spend the majority of their time. The burrows, which can be up to 10 feet deep and 40 feet in length, are generally found in dry places such as sandhills, flatwoods, prairies, and coastal dunes. Gopher tortoises feed on grasses, berries, other fruit, and even carrion.

Another rare species, the endangered Mississippi gopher frog, was known historically from nearby areas. The Mississippi gopher frog is a distinct population segment of the wider-ranging dusky gopher frog. Its genetic characteristics are different from all other gopher frogs and it is isolated from them by 125 miles of unoccupied habitat and the Mobile River delta. This frog once existed in the longleaf pine forests of the lower coastal plain from east of the Mississippi River in Louisiana to the Mobile River delta in Alabama. It has not been seen in Louisiana since 1962 or in Alabama since 1922. Today, only 100 adult Mississippi gopher frogs remain, all located in one pond at the edge of DeSoto National Forest in Harrison County, Mississippi. Biologists believe loss and degradation of habitat is the primary reason the species has declined. As a part of the recovery strategy for this species, ponds on the refuge could be used as translocation sites to establish new gopher frog populations.

Strategies:

Mississippi sandhill crane

- Follow strategies below under wet pine savanna objective, with the aim of restoring and maintaining 2,500 acres of wet pine savanna habitat on the refuge.
- Cooperate closely with crane biologists at Mississippi Sandhill Crane NWR to determine the appropriate time for an attempt at reintroducing the Mississippi sandhill crane to Grand Bay NWR. Timing would have to fit circumstances at both the Mississippi Sandhill Crane and Grand Bay NWRs. Establishment of a self-sustaining, breeding population at Grand Bay would necessitate a certain commitment of staffing and funding resources for some years.
- Create two ponds for breeding pairs and chicks.

Gopher tortoise

- Conduct a gopher tortoise habitat assessment by ground-truthing soils and determining the potential for establishment of a viable tortoise population on the refuge.
- Maintain pine flatwood stands on the refuge.
- Suitable habitat for gopher tortoises must have well-drained sandy soils for digging burrows, herbaceous food plants, and open sunny areas for nesting and basking.
- Use prescribed fire to maintain tortoise habitat. Fires help maintain tortoise habitat by opening up the canopy and promoting growth of herbaceous food plants.

Mississippi gopher frog

- Create shallow ponds for Mississippi gopher frogs (same ponds for cranes and ducks).
- Create two release sites for Mississippi gopher frogs.
- Work with the Jackson Ecological Services Field Office to monitor the use of ponds by gopher frogs and the possible occurrence of amphibian diseases

Objective 1-4: Other Wildlife Inventories – Within 15 years of CCP approval, develop and maintain inventories for small mammals, butterflies, reptiles, amphibians, and possibly other taxa.

Discussion: Grand Bay NWR has a mix of terrestrial and wetland communities that provide a wide array of habitats for amphibians, reptiles, mammals and insects such as butterflies. Unfortunately, not much is known about the diversity of species that occur on the refuge or how abundant any particular species might be. Systematic surveys of the available habitats on the refuge are needed for these diverse taxa.

Grand Bay NWR is in partnership with the Grand Bay NERR, whose primary mission is to conduct scientific research in an estuarine environment. A formal memorandum of understanding (MOU) between the refuge and NERR will allow scientists and graduate students to conduct scientific research and surveys on the refuge. Data collected from these studies will provide the refuge with valuable information that will allow for optimum management of refuge resources.

Habitat changes and the encroachment of development have impacted the natural balance of species in the area of the refuge. Some species have been essentially extirpated from the area and others have likely benefited from the changes. A number of mammalian, amphibian and reptilian species are known to occur on the refuge through observation. A formal survey of all species on the refuge is needed to document species diversity and to provide the information needed for management.

Strategies:

- Conduct a systematic amphibian and reptile survey of available habitats on the refuge.
- Conduct a survey of mammalian species on the refuge and adjust management as appropriate to provide habitat for endemic species, particularly species of concern.
- Cooperate closely with the NERR, nongovernmental organizations (NGOs) such as The Nature Conservancy and Audubon Society, universities, and volunteers in coordinating and conducting systematic surveys for the various taxa.

Objective 1-5: Wet Pine Savanna – Within 15 years of CCP approval, restore 2,500 acres of wet pine savanna habitat, supporting primarily grassy-herbaceous dominated conditions to benefit grassland birds.

Discussion: As discussed in Chapter II, five percent or less of the original acreage of wet pine savanna habitat remains in the Atlantic/Gulf Coastal Plain; it is one of the most endangered ecosystems in the country. Decades of fire suppression coupled with the lack of prescribed fire have had a dramatic adverse effect on the size and distribution of wet pine savannas.

Priority species of wet pine savanna include Extremely High Priority yellow rail (ground wintering), Bachman's sparrow (ground-nester), Henslow's sparrow (ground, wintering), southeastern American kestrel (pine cavity-nester, forages on ground); High Priority brown-headed nuthatch, field sparrow (ground, wintering), Le Conte's sparrow (ground, wintering); Moderate Priority sedge wren (ground, wintering), grasshopper sparrow (ground, wintering), palm warbler (shrubs/ground, wintering); Local and Regional Interest loggerhead shrike (tree- or shrub-nesting, forages on ground); also includes northern bobwhite (ground-nester) as part of this community.

Strategies:

- Restore hydrology.
- Reduce stocking so that remaining pines are widely spaced (meeting definitions of being "non-stocked," or those describing crane habitat)
- Promote grassy-herbaceous ground cover through appropriate use of prescribed fire
- Monitor bird population responses to habitat restoration using direct count, point count, transect (project prairie bird) protocols focusing on breeding Bachman's and wintering Henslow's sparrows.
- Determine whether breeding southeastern American kestrel occur on refuge lands and whether placing nest boxes would attract more of them.
- In combination with Mississippi Sandhill Crane NWR, establish at least three replicate sites of similar conditions so as to assess both within and between variations in savanna conditions in supporting breeding bird populations.
- Use point counts in each of six discrete savannas; survey a total of 60 point counts once per nesting season to monitor breeding bird populations to measure whether increases in priority species populations occurs, focusing on breeding Bachman's sparrows.
- In combination with Mississippi Sandhill Crane NWR, establish at least three replicate sites of similar conditions so as to assess both within and between variations in savanna conditions in supporting winter bird communities. Establish at least three transects 100 meters long (at least 200 meters apart) in each of six discrete savannas (three presently existing and three savannas to be restored; total of 18 transects) use project prairie bird protocol (www.tpwd.state.tx.us/nature/birding/prairie_birds) to count wintering bird populations (as other areas are restored, add new transects), focusing on wintering Henslow's sparrows.

Objective 1-6: Forested Wetlands – Within 15 years of CCP approval, restore forest structure to promote super-emergent trees, cavities, and understory structure on approximately 2,000 acres to benefit migratory land birds.

Discussion: The forested wetlands at Grand Bay NWR include mesic hardwood-pine, bottomland hardwoods, hydric drains, cypress-tupelo domes, and forested bayheads. The general emphasis for forested wetlands should be on passive management, principally hammocks, bottomland hardwoods, and cypress domes. Remnant cypress domes should be allowed to mature with little need for active management, though some thinning may be prudent to encourage release of the larger trees to become larger, faster.

Overall, if future active management is to be considered, then the future desired condition of hardwood forests would be to emphasize (1) increasing stand structural diversity by favoring retention of largest trees (removing surrounding potentially competing trees); (2) opening up stands allowing light to reach the ground in support of better understory structure; and (3) group selection-sized openings to further structural complexity and support regeneration of shade-intolerant tree species (oaks) where needed.

Priority species associated with forested wetlands include Extremely High Priority swallow-tailed kite; High Priority Swainson's warbler (nests dense understory, forages open moist ground), American woodcock (winter [breed?] dense understory, but forages open moist ground), northern parula (breeding canopy, Spanish moss), hooded warbler (dense understory), yellow-throated warbler (breeding canopy, spanish moss), wood thrush (breeding midstory, forage moist ground); Moderate Priority Kentucky warbler (nest patches of dense ground cover), yellow-billed cuckoo (breeding midstory and canopy), prothonotary warbler (cavity-nesting, usually in trees over open water), acadian flycatcher (breeding open midstory), yellow-throated vireo (breeding open canopy), summer tanager (breeding open canopy); Local and Regional Interest wood duck (cavity-nesting over or near open water), whip-poor-will (wintering ground, roost in trees), eastern wood-pewee (breeding open canopy), and black-and-white warbler (winter).

Strategies:

- Establish at least 10 control plots, emphasizing passive management where only monitoring of bird populations and vegetation will occur.
- Establish at least 10 experimental plots emphasizing management without use of heavy equipment (i.e., noncommercial thinning, timber stand improvement through chemical injection, chainsaws), to reduce stocking while achieving other desired stand characteristics and monitoring bird population and vegetative responses.
- Establish at least 10 experimental plots emphasizing more active management with minimal use of heavy equipment (thinning to shelterwood, retention of largest trees, culls for cavities, and group selection for regeneration), to reduce stocking while achieving other desired stand characteristics and monitoring bird population and vegetative responses.
- Monitor bird population responses to habitat restoration using at minimum point counts which will include data for both canopy and understory species, but also considering more involved protocols such as those used in Bbird or MAPS focusing on breeding Swainson's, hooded, prothonotary, and Kentucky warblers and acadian flycatcher.

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- At a minimum, establish 10 or more point counts at each of the 30+ plots (total of 300 point counts) and collect pre-treatment data for at least two years to establish baseline and continue through post-treatment. These data will include some information on canopy species, but may not provide the best data to assess treatment effects.
 - Consider employing more involved protocols to address not only species occurrences, but also their relative rates of reproductive success and/or post-fledging survival in response to management protocols, with focus on all understory and ground nesting species.

Objective 1-7: Fire Management – Utilize prescribed fire to manage habitat and reduce hazardous fuels on approximately 5,000 acres; attempt to set prescribed fires on a 2-3 year rotation with 50 percent of burns during the growing season, and suppress wildfires.

Discussion: Since the 1950s, suppression of wildfires in Jackson County has led to the decline and disappearance of Mississippi sandhill crane habitat and wet pine savannas as well as an unnatural buildup of hazardous natural fuels in the form of flammable shrubs, vines and planted pine on and around the refuge. The 2001 National Fire Plan directs the federal fire fighting agencies to manage fuels and reduce the threat to life, private and public property and natural resources posed by this condition. Management ignited prescribed fire will be one of the tools used to both reduce the threat of wildfire and restore and maintain the wet pine savannas.

There have been 275 wildfires from 1980 to 2003. Sixty-two percent of these fires have been caused by arson and 21 percent caused by debris pile burns. Areas where fuel loadings are high with fine dead fuels and thick loads of brush, common on the refuge, allow fires with rapid rates of spread and higher fire intensities. Since 1980 about half of the wildfires that have burned on or around the refuge have exceeded 10 acres; 84 percent of all fires have been contained at less than one acre. There have been 44 fires or approximately two per year that exceed 100 acres, which are considered large fires. It is noteworthy that the average fire size at Grand Bay NWR is 79 acres, compared to 59 acres at Mississippi Sandhill Crane NWR; and 20 percent of Grand Bay fires reach 100 acres or more, compared to 13 percent at MSC NWR.

The hazardous fuels of the refuge are made up of both dead and living plant matter. Accumulations of fine dead fuels include pine litter and cured grasses which provide the tinder to ignite fast moving fires that spread through the crowns of woody shrubs and pines which are the live fuels that then burn with long flame lengths. Invasive cogongrass is increasing the fire hazard where it is replacing the native grasses in abundance and increasing the intensity and severity of the fires.

The increase in the quantity of hazardous fuels over time has also had a negative impact on the wintering habitat for migratory birds like the Henslow's sparrow. Native savanna plant species, such as wiregrass, longleaf pine, pitcher plants and other unique carnivorous plant species, are also significantly impacted by accumulating fuels as shrubs increase and spread into the wet savannas.

One of the primary purposes of the refuge is to restore native savanna habitat (See Savanna Goals) for the Mississippi sandhill crane to use as nesting and rearing habitat. A large part of the restoration of the savanna lies in the ability to use fire to initially reduce the amount of unwanted trees and shrubs on the refuge, then to use fire to maintain growing season burns to promote the growth of native plant species.

Many plant species that occur in the pine savannas are fire dependent, that is, they require growing season burns for reproduction or have adapted characteristics that enable them to survive fire better than other species. Wiregrass (*Aristida berychiana*) is one good example of this; it requires growing season fires for flowering, thus it cannot reproduce sufficiently without a growing season burn. The longleaf pine (*Pinus palustris*) is able to survive fires as a seedling stage, the only tree species in Mississippi with this ability. In addition, there are many species that can only survive in areas that are open and provide full to mostly full sunlight. Species such as the carnivorous sundews, pitcher plants and butterworts require sunny open habitats with little shrub or tree encroachment. Fire is a key management tool to keep areas open and maintained as grass dominated habitats.

Both seasonality and frequency play a role in effectively managing wet pine savannas as open, grass dominated, species rich plant habitats. While dormant season burns may be required for the initial treatment of fuels and reduction of woody growth in a savanna, frequent growing season burns are required for maintaining open savanna habitat. It is believed that the natural fire frequency in the wet pine savannas was every 2–5 years with fire naturally occurring most often during the growing season. Fires in this habitat type were thought to be in high frequency, but of lower intensity and severity.

In addition to reducing the competition of woody vegetation into the savannas, fire is also used as a tool to reduce unwanted and/or invasive species. Fire has helped to reduce unwanted species such as Chinese tallow tree (*Sabium sebiferum*) and others from encroaching into the refuge.

Strategies:

Fuel reduction

- Estimate fuel loads using established standardized protocols.
- Prioritize areas with hazardous fuel build up that pose a threat to life, property and natural resources.
- Use high severity fires to initially reduce heavy fuel accumulations of shrubs and unwanted timber species.
- Use low to moderate severity fires on a 2–5 year return interval to maintain acceptable fuel loads.
- Use dormant or growing season burns to reduce and maintain fuel loads.
- Coordinate all fire activities with resource specialist or biologist as needed on an individual event basis.
- Monitor results of burns using monitoring protocols, photo-points and plots established throughout refuge.

Maintenance of pine savanna habitat

- Use 2–3 year fire return intervals in areas of acceptable fuel loads.
- Use growing season fires every two years in wiregrass/savanna compartments and every three years on other non-wiregrass compartments. If growing season burns are not possible in a given compartment, burn in the dormant season within the following year.
- Use low to moderate severity fires to maintain plant species.
- Monitor response of species with established monitoring protocols.

Objective 1-8: Controlling Invasive Species – In partnership with NERR, annually control 50 acres of cogongrass and Chinese tallow, while controlling other invasives opportunistically.

Discussion: Cogongrass (*Imperata cylindrica*), an exotic grass that has invaded many disturbed sites along the Gulf Coast, can cause an increase in rate of spread and intensity of fire behavior that makes fires difficult to control. Cogongrass has no wildlife value and displaces native vegetation, forming monoculture stands. It has also lowered the diversity of native plants within disturbed savannas and is threatening the pristine savannas on Gulf Coast refuges. To reduce the threat to firefighter safety, private property and natural resources, a combination of mechanical, chemical and prescribed fire treatments will be required to control cogongrass.

Cogongrass is native to Southeast Asia and infests nearly 500 million acres of plantation and agricultural land worldwide. It has become naturalized in the southeastern United States within the last fifty years, with Alabama, Mississippi, and Florida having extensive acreages of roadway and pasture infested with cogongrass. Cogongrass first appeared in the area around Grand Bay, Alabama, as an escape from Satsuma orange crate packing in 1912. In 1921, it was intentionally introduced from the Philippines into Mississippi as possible forage. Cogongrass was also introduced intentionally into Florida in the 1930s and 1940s as potential forage and for soil stabilization purposes.

Extensive research into the control of cogongrass has been conducted on three continents. Burning, cultivation, cover crops, and herbicides have been tried, meeting with varying degrees of success. To eliminate cogongrass, its rhizomes must be destroyed to avoid regrowth. Cultivation and herbicides have been the two control strategies used most often. One of the oldest and most successful methods is to deep plow or disk several times during the dry season to desiccate the rhizomes and exhaust the food reserves. It is essential to cut to a depth of at least six inches to ensure that most, if not all the rhizomes have been cut. Results from these practices are evident when observing cogongrass growing up to the edge of a cultivated field with no evidence of spread into the field itself.

The Chinese tallow tree (*Sapium sebiferum*), a fast-growing, nonnative, small to medium-sized tree, was first introduced into the United States from China in the late 1700s (reportedly by Benjamin Franklin) as an ornamental. It is in the process of transforming the Southeastern Coastal Plain. It typically grows on elevated and undisturbed ground along fencerows and levees, where it crowds out native species. Chinese tallow

establishes itself in endangered coastal prairies and transform them into biotically depauperate forests, lacking in both native plant and animal species.

Chinese tallow can reach reproductive age in as few as three years and can remain productive for at least 60 years. It does not appear to have a preference for disturbed over undisturbed areas and can grow in a variety of places, in both full sunlight and shade. It is more tolerant of salinity and flooding than many native species.

Once established, Chinese tallow is very hard to eradicate. Trees can be chopped down, roots dug up and removed, and herbicides used, but aggressive seedlings continue to sprout for years. Fire can keep Chinese tallow in check when the tree density is low, but since tallow can suppress fuel species, fire can go up to a stand and then go out from lack of fuel, leaving the tallow relatively unharmed. Tallow can resprout if top-killed as well as root at some distance from the original stem.

Herbicidal methods appear to be the most effective option for control of Chinese tallow at this time. Simply cutting tallow trees down results in extensive root and stump sprouting. Biological control is being pursued as a long-term option, but requires lengthy field research in the native range of Chinese tallow to find insects, or pathogens, that are host-specific. The best control methods for this species on Gulf Coast refuges have been herbicides on levees and manipulation of fields in which it grows. However, the tallow tree is a very resilient species, and tends to re-sprout shortly after the herbicide is no longer available.

Strategies:

Cogongrass

- Utilize herbicides such as glyphosate and imazapyr (Arsenal or Chopper), which have provided excellent control of cogongrass in trials and practice.
- Use an integrated approach to cogongrass control that combines burning, tillage (mechanical disturbance) and chemical applications.
- Initially, burn or mow cogongrass to remove excess thatch and older leaves, which initiates regrowth from the rhizomes, thereby reducing rhizome biomass. This also allows herbicides to be applied to only actively growing leaves, maximizing herbicide absorption into the plant. Ideally, burning should occur in the summer.
- Arrange for a one- to four-month regrowth period, which has been shown to provide a sufficient level of leaf biomass for herbicide treatment.
- If tillage can be incorporated, then a discing treatment directly following a burn is the best approach. This further depletes the rhizome reserve through dessication (drying out) and increase the density of shoots.
- Once good control of cogongrass has been achieved, it is critical to introduce desirable plant cover as swiftly as possible to prevent cogongrass from re-infesting the area.

Chinese tallow tree

- Stay abreast of advances in control methods for Chinese tallow.
- While plants are actively growing, excellent control is being achieved with triclopyr (Garlon 4) and a mineral or vegetable oil adjuvant, designed for basal applications.
- Make basal bark applications by applying herbicide directly to the bark around the circumference of the tree up to 15 inches above the ground. Using hand-held equipment (paintbrush) or backpack sprayers, thoroughly wet the area to obtain good control.
- To control resprouting of freshly cut stumps, use a 20% solution of Triclopyr. Spray the root collar area, sides of the stump, and the outer portion of the cut surface including the cambium until thoroughly wet. Apply herbicide within 30 minutes of cutting.
- The best time to initiate herbicidal control of Chinese tallow is during the spring months; the trees are breaking dormancy and the sap is rising. Also, there are no seeds being produced. During this time, either the cut stump or basal bark treatment are effective.

RESOURCE PROTECTION

Goal 2: Identify, conserve and protect natural and cultural resources through partnerships, land protection programs, and law enforcement.

Discussion: As described above, the refuge partners closely with the Grand Bay NERR in all aspects of refuge management, including resource protection. The NWR has programs in land acquisition, cultural resources, and law enforcement, all related to natural and cultural resources protection on the refuge.

Objective 2-1: Land Acquisition – Acquire 100 percent of lands within the approved acquisition boundary within 15 years of CCP approval.

Discussion: Grand Bay National Wildlife Refuge was established in 1992 with an acquisition boundary of 12,100 acres. In 1997, a 2,700-acre expansion was approved to bring under management a section of the scenic Escatawpa River. In 2003, a 665-acre expansion was approved to preserve valuable near-shore barrier islands habitat and enable the Service to acquire a small tract with a metal storage building which could be utilized as a refuge maintenance facility. The Service has acquired a total of 10,188 acres at Grand Bay NWR.

Strategies:

- Identify all inholders, update address and contact lists, and inquire as to willingness to sell by 2007.
- Work closely with partnering organizations such as The Nature Conservancy, The Conservation Fund, NERR, and others to acquire land.
- Pursue the potential exchange of isolated refuge tracts (former Farmers Home Administration [FmHA] properties) for inholdings within the refuge acquisition boundary.

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- Continue to update the Land Acquisition Priority System (LAPS) submissions for the refuge in order to receive project funding.
 - By 2008, develop an outreach program that provides information on land acquisition and non-traditional land protection programs such as management agreements, leases, and conservation easements for the benefit of landowners within the acquisition boundary.
 - Focus land acquisition efforts on properties adjacent to existing refuge lands in order to consolidate the refuge land base and provide more opportunities for prescribed burning.

Objective 2-2: Cultural Resources – Within 15 years of CCP approval, develop and begin to implement a Cultural Resources Management Plan (CRMP).

Discussion: A number of aboriginal earth and shell middens are located beside rivers and bayous in and around the refuge. Most consist of earth and shell accumulations, remainders of centuries of use as seasonal encampments and food processing sites. The middens are found mainly along the remnant river levees of the historic Escatawpa River channel, now known as the Bayou Cumbest, Crooked Bayou, and Heron Bayou systems. At least six archeological or cultural resource surveys have been conducted in the Grand Bay area, though most of these surveys have not contributed new knowledge about the region's past. To date, the refuge has not been systematically surveyed for cultural and archaeological resources, but the presence of additional prehistoric and/or historic resources would be expected.

Strategies:

- Within 10 years of CCP approval, conduct a Phase I archeological survey of the non-flooded areas of the refuge by qualified personnel, as a necessary first step in cultural resources management.
- Conduct a Phase II investigation if archeological resources are identified during the Phase I survey. In this, the eligibility of identified resources for listing on the National Register of Historic Places (NRHP) is evaluated prior to any disturbance.
- Conduct a Phase III data recovery if resources identified in Phases I and II are determined to be eligible. This will recover data and mitigate adverse effects of any undertaking.
- Follow procedures outlined in CRMP for consultation with RHPO, SHPO, and potentially interested American Indian tribes.
- Follow procedures detailed in CRMP for inadvertent discoveries of human remains.
- Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings.
- Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program.

Objective 2-3: Law Enforcement – Provide 2.0 FTE law enforcement officers.

Discussion: One full-time law enforcement officer is stationed at Grand Bay NWR but his services are shared with the two other refuges (Mississippi Sandhill Crane and Bon Secour) in the three-refuge complex. The officer does not have a boat and other necessary equipment to conduct water patrols. Law enforcement on the refuge cooperates closely with state and local law enforcement agencies. Overall, law enforcement on the refuge has been minimal; typical violations are of hunting and dumping regulations.

Strategies:

- Continue to cooperate closely with Mississippi and Alabama game and fish wardens, county sheriffs, and local police departments on and off the refuge.
- Maintain boat (Boston Whaler) and related equipment to use in water patrols.
- Continue to work closely with local citizens on crime solving and prevention.
- Expand educational efforts with surrounding communities with regard to hunting and fishing regulations on the refuge and proper disposal of litter, refuse, garbage and debris.

VISITOR SERVICES

Goal 3: Provide opportunities for high quality, wildlife-dependent public uses, leading to greater understanding and enjoyment of fish, wildlife, and the Gulf Coast ecosystems contained within the refuge.

Discussion: The Grand Bay Refuge receives about 700 visitors annually, which is low compared to other refuges. This relatively low visitation is due to several factors: the newness of the refuge, its small staff (one full-time employee), its limited visitor use facilities and programs, and its focus to date on acquisition of valuable habitats within the acquisition boundary, rather than on building up its visitor services program. The refuge has also tended to rely on the Grand Bay NERR to offer recreational and educational opportunities to the public. Fishing, hunting (waterfowl, mourning doves, white-tailed deer, and feral hogs), wildlife observation and photography, and boating in tidal marshes are the managed recreation uses on the refuge.

Objective 3-1: Visitor Services Plan – Within three years of CCP completion, develop a Visitor Services Plan to be used in managing public use facilities and opportunities on the refuge.

Discussion: The refuge does not have a Visitor Services Plan. After the CCP is completed, the refuge will develop a step-down Visitor Services Plan. Issues related to refuge management will be addressed in this step-down plan. Current and future staffing needs to implement the recommendations within the CCP and step-down plan will also be addressed. The plan will include budgetary needs and current databases such as RONS and MMS and will explore opportunities for funding and partnerships to help the refuge accomplish the recommendations within the plan. The plan will include a system for monitoring and evaluating the effectiveness of the visitor services program annually.

Strategies:

- Following the CCP, develop a Visitor Services Plan that reflects current legislation, director's orders, initiatives, policy, the purpose of Grand Bay NWR, and the mission of the NWR System and the U.S. Fish and Wildlife Service. The plan should also address the current and future visitor services and recreation needs of refuge visitors.
- Work closely with NERR when developing the refuge Visitor Services Plan.
- Work closely with NERR to include refuge public use in NERR visitor/education planning (Public Access Policy p. 80 of RMP).
- Work with NERR to develop visitor impacts research (hunting, boat impacts, etc.).

Objective 3-2: Visitor Center – In partnership with NERR, operate new joint research, office and education facility/visitor center to provide benefits to refuge visitors.

Discussion: In partnership with NERR, the refuge is in the process of developing a joint visitor center to welcome refuge visitors and provide educational and interpretive opportunities. This center will be located near the existing office complex alongside Bayou Heron Road. Building plans and specs had already been prepared when Hurricane Katrina smashed into Mississippi in August 2005; existing facilities were badly damaged. Katrina also delayed ground-breaking on the new building, which was to have occurred in 2006, because the plans had to be revised to raise the floor of the joint office-visitor center facility by several additional feet to provide greater protection from storm surges.

Strategies:

- Provide visitors to the visitor center with a basic level of understanding that a consortium of agencies are involved with the management of Grand Bay, without get bogged down in multiagency missions and messages.
- Work with NERR to develop a joint theme of managing and protecting coastal biodiversity; natural and cultural history messages are linked to the importance of stewardship to maintain biodiversity.
- Work with NERR, the Regional Office, and professional contractor(s) to provide interesting, interactive exhibits that will appeal to a cross-section of the visiting public.
- Provide annual orientation/appreciation day at the Escatawpa Trail head and the I-10 Welcome Center to show support of the Service partnership with MDOT and encourage trail use to the traveling public.
- Use visitor center as a focal point of volunteer activities.
- Provide effective directional signage for the visitor center along Bayou Heron Road, I-10, and U.S. 90.
- Ensure adequate parking facilities at visitor center.

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- Partner with NERR to develop a short ¼- or ½-mile interpretive loop trail starting from and returning to the visitor center parking lot. Engage volunteers or other partners in the preparation of interpretive stations or posts and the preparation of a brochure to accompany the trail.

Objective 3-3: Fishing and Hunting – Continue to allow fishing and provide hunting for deer, squirrel, and waterfowl consistent with state regulations and seasons.

Discussion: Fishing is perhaps the most popular recreational activity undertaken at the Grand Bay Refuge. The refuge's diverse array of salt marshes, bayous, and grass beds serve as nursery areas and breeding and feeding grounds for shrimp, red drum, speckled trout, blue crab, and oysters, among other species. Outstanding fishing opportunities are available locally, though it is unclear from reading the refuge brochure and website precisely what these opportunities are and which agencies are involved. A public boat launch facility is located on Bayou Heron Road.

The refuge currently has a small hunting program, which began in 2001, after approval of a hunt plan in 1999. Hunting is permitted for white-tailed deer, feral hogs, squirrel, geese, ducks, coots, and mourning doves on designated areas of the refuge, subject to state regulations and conditions outlined in the Grand Bay NWR Hunting Regulations brochure. These hunts are non-quota and require a signed refuge hunt regulations brochure and permit, which is available at the Grand Bay NWR office. Commercial guides are prohibited. There are no hunter check stations on the refuge. Hunters are currently allowed access to the Oak Grove birding trail, which may create potential user conflicts and safety issues with nonconsumptive trail users.

Strategies:

Fishing

- Law enforcement should work to eliminate any illegal commercial fishing occurring on the refuge.
- Revise the fishing brochure and refuge web site to adequately address sport fishing opportunities and the role the two agencies play in offering fishing opportunities.
- Put regulatory kiosk (do/don't) at all boat launch areas that access the refuge.

Hunting

- Revise the hunt brochures and provide better map, better organization of the information (better layout that is more easily read and understood; work with Regional Office Visitor Services to improve).
- Investigate where hunters obtain the brochure and determine if there are outlets where they can get state and refuge at the same time.
- As other uses increase, limit hunting (time, zone) around new visitor center and Oak Grove Birding Trail.

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- Include hunting as a public use opportunity on websites and future general brochure.
 - Consider the need for a hunter check station at a central point on the refuge to collect hunter use information needed for better game management.

Objective 3-4: Environmental Education and Interpretation – With limited refuge support, NERR continues EE and interpretation at current levels, including participation in community events, offsite and onsite environmental education, guided tours, and interpretive trails.

Discussion: The EE program at Grand Bay NWR is managed by the Grand Bay NERR. Offsite EE conducted by the Refuge manager includes presentations to schools, garden clubs, and organizations, pre- and post-field trip briefings, and participation in National Wildlife Refuge Week. The refuge also relies upon the Grand Bay NERR staff to provide most interpretation at the refuge. The Refuge Manager participates in Refuge Week every October.

Strategies:

- Work with NERR to develop an Environmental Education Step-down Management Plan.
- Work with NERR to develop EE programs that include refuge messages.
- Request assistance from Regional Office EE specialist.
- Use USFWS interns to help with EE Program.
- Work with NERR to develop interpretive information (brochures, panels, exhibits) that include refuge messages.
- Develop interpretive panels for trailhead kiosk at Oak Grove trail, pitcher plant area, boat ramp, I-10 Mississippi Welcome Center, possible other areas such as the visitor center.
- Design kiosks so panels can be easily replaced and updated as information changes.
- Develop interpretation panels for the Refuge Complex (Grand Bay, Mississippi Sandhill Crane, and Bon Secour NWRs on the trail at the Welcome Center).

Objective 3-5: Wildlife Observation and Photography – In partnership with NERR, maintain current programs and facilities.

Discussion: At the present time, Grand Bay NWR has limited opportunities for wildlife observation. The refuge is cooperating with the NERR to expand these. The educational pavilion at the Bayou Heron Boat Launch offers some staff-guided wildlife observation and photography opportunities. Visitors with boats can access the Bayou Heron Boat Launch and have wildlife observation opportunities in Gautier Bayou, Bayou Heron, and Grand Bay.

Birding is one of the most popular forms of wildlife observation on the refuge. Viewing opportunities include wintering flocks of ducks and wading birds in the bayou, songbirds in the trees and shrubs, and harriers and hawks hunting over the savanna. The Oak Grove birding trail is off Bayou Heron Road; a kiosk has been developed but not yet placed at the trailhead.

The two-mile Escatawpa Trail, part boardwalk and part gravel, is being developed in partnership with the Mississippi Interstate Welcome Center. This is intended to be a handicapped-accessible trail and provide several benches for resting and wildlife viewing opportunities.

Grand Bay NERR has created a visitor's field journal with animal, bird, amphibian, butterfly, reptile, and plant checklists for use by visitors to the Grand Bay National Estuarine Research Reserve and the Grand Bay National Wildlife Refuge. The NERR also provides specialized group on-demand boat tours leaving from the Bayou Heron Boat Launch. These tours promote wildlife observation and photography on Grand Bay NWR and Grand Bay NERR. Currently, there are no auto tour routes on the refuge.

Strategies:

- Coordinate with NERR to develop wildlife observation opportunities, such as observation opportunities at the Pitcher Plant Bog, an elevated observation platform at "Goat Farm" to look out over the marsh, or a canoe-kayak trail through the bay and bayous.
- Coordinate with NERR to develop either permanent or portable photo blinds.
- Work with NERR to develop a wildlife photography workshop.
- Develop computer-based brochures (especially checklists) that can be printed by visitors as needed (or downloaded off web).

REFUGE ADMINISTRATION

Goal 4: In cooperation with Grand Bay National Estuarine Research Reserve, provide for sufficient staffing, facilities, and infrastructure to implement a comprehensive refuge management program to protect and manage the natural and cultural values of the refuge's habitats and fulfill the refuge's purposes, goals, and objectives.

Discussion: A small staff—one full-time employee, the Refuge Manager—has forced Grand Bay NWR to focus its efforts on acquisition and protection of additional lands within the authorized acquisition boundary. There has been limited capability to carry out active habitat and wildlife management, visitor services, or expansion of visitor facilities and opportunities on the refuge. An active support of and partnership with the NERR has enabled the refuge to implement certain programs typically undertaken on national wildlife refuges.

Objective 4-1: Staffing – Maintain current staff of two, including Refuge Manager and Law Enforcement Officer. Add park ranger, biologist, one biological technician, one equipment operator, and one law enforcement officer for a total of five FTEs.

Discussion: The positions listed above are those the planning team believes are necessary to fully implement this CCP. Not filling a given position will likely compromise the ability of the refuge to carry out the related objectives and strategies listed in the plan.

Strategies:

- The biologist and biological technician will be charged with managing and restoring Grand Bay's forests and related habitats, in particular wet pine savanna, but also flatwoods and forested wetlands. They will develop a forest management plan and fire management plan for the refuge. They will also be responsible for developing and implementing a prescribed fire program and a fire suppression program as key parts of the fire management plan. In addition, they will plan and direct timber harvests on the refuge.
- The biologist and biological technician will be responsible for wildlife and fisheries management on the refuge. Primary responsibilities including planning and implementing refuge hunts, participating in fisheries management in partnership with the States, surveys and inventories of wildlife taxa, and protection of endangered and threatened species, including the Mississippi sandhill crane, if the decision is taken to reintroduce the crane at Grand Bay.
- The equipment operator will utilize a variety of light and heavy equipment in the management and manipulation of habitat and the maintenance and repair of refuge equipment and facilities and infrastructure.
- A law enforcement officer will serve the refuge, staff and visitors in the areas of public safety, resource protection, and crime solving and prevention.
- The park ranger will coordinate with NERR to develop environmental education, interpretation, wildlife observation, and photography opportunities.

V. Plan Implementation

INTRODUCTION

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

To accomplish the purpose, vision, goals, and objectives contained in this plan for Grand Bay National Wildlife Refuge, this section identifies the projects, funding and personnel needs, volunteers, partnerships 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. The proposed projects reflect the priority needs identified by the public, the planning team, and the refuge staff based upon available information. These projects were generated for the purpose of achieving the refuge's objectives and strategies. The primary linkages of these projects to those planning elements are identified in each summary.

FISH AND WILDLIFE POPULATIONS AND HABITAT MANAGEMENT

Control Invasive Plants (Cogon grass, Chinese Tallow, and Japanese Climbing Fern)

First year cost - \$200,000

Invasive plant species are one of the greatest threats to habitat loss. On the lands within the acquisition boundary of Grand Bay NWR, there are significant concentrations of cogon grass, Chinese tallow, and Japanese climbing fern. Each of these species spreads rapidly without providing any wildlife benefit. Collectively these nuisance plants displace native vegetation, forming monoculture stands; negatively alter fire behavior during prescribed burns; and reduce wildlife foods via replacing lush forbs and grasses with unpalatable dense stands of invasive plants. Preferred measures to eliminate each of these nonnative species require costly herbicide applications, and remain difficult to accomplish with present staffing levels, partner participation, and existing volunteer pools. Presently about 20 acres of invasive plant species are treated annually but prescribed burning and mechanical treatments are needed to maximize attempts to control infested stands and restore preferred habitat. This project meets Objective 1-8.

Improve Knowledge and Management of Rare Plant Communities (Wildlife Biologist)

First year cost - \$256,000 (combined)

This position will facilitate optimal prescribed fire activities, improve the knowledge of the varied communities of the refuge, and will facilitate scientific research. The aforementioned wet pine savanna and pine flatwoods habitats, which are fire-dependent ecosystems, have high levels of plant

species diversity in their understory. This position will assist in the drafting of fire plans, providing biological input to fire management officials which could aid in prioritizing prescribed fire activity to critical areas, i.e. utilizing fire in conjunction with invasive species management and identifying areas in jeopardy of habitat loss due to fire suppression. This project will also assist in monitoring habitat response as prescribed fires are conducted on the refuge. Due to the diverse habitats found on Grand Bay NWR (wet pine savanna, mesic pine savanna, wet pine flatwoods, mesic pine flatwoods, pine scrub, hydric drains, cypress-tupelo drains, forested bayheads, and estuarine marsh), improved knowledge of the floral and faunal communities found on the refuge will improve all management decisions which is consistent with the National Wildlife Refuge System's Mission Statement. Furthermore, this position will be critical to fulfill the refuge purpose of establishing a second breeding pair of the endangered Mississippi sandhill cranes on Grand Bay NWR. This project will also spearhead the Service's lead research interests and coordinate the research activities of students and partners (NERR). This project meets Objectives 1-4, 1-5, 1-6, and 1-7.

Restore and Enhance Rare Wetland Habitats (Equipment Operator)

First year cost - \$60,000

Wet pine savanna habitat is a rare and vanishing, fire-maintained, sub-climax vegetation community along the Gulf Coast. Indeed, it is one of the most endangered ecosystems in the country. Decades of fire suppression coupled with the lack of prescribed fire have had a dramatic adverse effect on the size and distribution of wet pine savannas. This project—related to Objective 1-5—will fund an equipment operator to maintain and increase the area of this rare habitat on the refuge. It will also fund the restoration and enhancement of up to 2,000 acres of forested wetlands (Objective 1-6).

Demolish Unwanted Acquired Structures

First year cost - \$125,000

Grand Bay NWR was established in 1992 and has an active land acquisition program. Due to land use history in the Southern Alabama/Southern Mississippi area, residential, agricultural, commercial, and municipal structures remain on tracts after they are incorporated into the refuge. The most common type of demolition needed is the removal of old home sites (houses, barns, fencing, septic tanks, etc.). A majority of the residents of Pecan and Orange Grove Mississippi are relocating to less flood-prone areas following the devastating landfall of Hurricane Katrina. Demolishing these unwanted structures may involve disposing of potentially hazardous materials such as asbestos, lead paint, storage tanks, and securing wells and septic systems. Removing these unwanted structures will improve habitat and wildlife management and enhance public health and safety on the entire refuge. Objective 1-5, 1-6, 1-7.

Restore Escatawpa River Bank Adjacent to South Pollack's Ferry Road

First year cost - \$125,000

This project involves site cleanup and restoration of the illegal boat houses located at the Pollack's Ferry boat launch. After acquiring this particular tract of land from International Paper Company, the refuge has been tasked with addressing illegal residences set up along the banks of the Escatawpa River. These illegal residents have accumulated significant debris piles ranging from household trash to abandoned vehicles. Anticipated cleanup of this site will most likely include abandoned house boats and various types of debris. Following the removal of all of the debris, minimal measures may need to be taken at this location to minimize bank erosion.

Mississippi Sandhill Crane Reintroduction, Monitoring and Threat Assessment (Bio Tech)

First year cost - \$225,000

One of the purposes for the Grand Bay NWR is to establish an experimental, nonessential population of the federally endangered Mississippi sandhill cranes. Presently the only location of these endangered species is found at the Mississippi Sandhill Crane NWR some 20 miles away. Establishing a second population of Mississippi sandhill cranes at Grand Bay would require monitoring crane behavior, mapping nests, telemetry, construction of release pens, and threat assessment. Presently the birds are found on Mississippi Sandhill Crane NWR, a refuge which is largely closed to the public. If an experimental flock is established at Grand Bay NWR, regular threat assessments of public use activities must be reviewed to determine if fishing, hunting, and wildlife observation would negatively affect the cranes. Also, nest and bird predation must be monitored and, if applicable, measures taken to facilitate establishment of these federally endangered birds.

RESOURCE PROTECTION

Survey Refuge Lands

First-year cost - \$270,000

This project will contract with surveyors to survey and mark the boundaries of Grand Bay Refuge on the ground. In addition, using GPS technology, it will obtain coordinates at boundaries to accurately portray the refuge boundaries on ArcView and GIS maps. This information is crucial to protecting and managing the refuge's land and resources. This project relates to Objective 2-1 on land acquisition. As new lands are acquired, they need to be surveyed and boundaries marked on the ground.

Conduct Archeological Survey

First-year cost - \$105,000

A number of aboriginal earth and shell middens are located beside rivers and bayous in and around the refuge. At least six archeological or cultural resource surveys have been conducted in the Grand Bay area, though most of these surveys have not contributed new knowledge about the region's past. To date, the refuge has not been systematically surveyed for cultural and archaeological resources, but the presence of additional prehistoric and/or historic resources would be expected. This project relates to Objective 2-2 on cultural resources.

Airboat with Trailer and Jon Boat with Motor and Trailer

First-year cost - \$80,000

Much of the refuge is difficult for staff—including law enforcement personnel—to reach, because it is inaccessible except by water. This project will provide an airboat with a trailer and a jon boat with a motor and trailer. Airboats can travel in very shallow water, and indeed, can cross short distances that are pretty dry. This project will enable refuge management to exert a greater presence on the refuge and exercise more control over what happens; it relates to Objective 2-3 on law enforcement.

VISITOR SERVICES

Cost Share for Joint Office Facilities

First-year cost - \$314,000

In partnership with NERR, the refuge is in the process of developing a joint visitor center to welcome refuge visitors and provide educational and interpretive opportunities. This center will be located near

the existing office complex alongside Bayou Heron Road. Building plans and specs had already been prepared when Hurricane Katrina smashed into Mississippi in August 2005; existing facilities were badly damaged. Katrina also delayed ground-breaking on the new building, which was to have occurred in 2006, because the plans had to be revised to raise the floor of the joint office-visitor center facility by several additional feet to provide greater protection from storm surges.

Maintain and Improve Interagency Coordination, Outreach and Partnership Programs (Park Ranger)

Recurring annual cost - \$128,000

This new position will be responsible for maintaining and improving coordination between the refuge and other federal, state, and local agencies. It will also collaborate closely with NERR staff to build on existing outreach programs. In particular, this position will focus on projects and programs related to the environmental education, interpretive, wildlife observation and photography objectives (Objectives 3-4 and 3-5).

Develop and Print Educational Brochures

First-year cost - \$50,000

This project involves the preparation and printing of educational brochures about Grand Bay Refuge, including the refuge's general brochure, birds, wetlands, habitats, and recreational opportunities. It is related to all of the objectives under the Visitor Services goal.

Table 2 summarizes the proposed projects and their associated costs and staffing needs.

FUNDING AND PERSONNEL

The preceding chapters have set forth a vision for the refuge and outlined the management goals, objectives and strategies needed to realize that vision. The current level of refuge funding will not be able to allow for the realization of this vision and the management goals, objectives and strategies that emerge from it. The extent to which the refuge can pursue its purposes and achieve its goals hinges on the resources made available to the refuge.

Implementing the vision set forth in this CCP will require additions to the organizational structure of the refuge. The existing staff of two—the Refuge Manager and a Law Enforcement Officer—will intensify their efforts and five new staff members will enable the refuge to expand its wildlife and habitat conservation, resource protection, enforcement, and public education and outreach endeavors. The staffing objective of the CCP recommends providing one biologist, one park ranger, one biological technician, one equipment operator, and one law enforcement officer for a total of five FTEs at the Grand Bay Refuge (Table 3). Figure 6 shows the refuge's current staffing chart, and Figure 7 shows the proposed staffing chart.

Table 2. Summary of projects with their associated costs and staffing needs.

PROJECT TITLE	FIRST YEAR COST	RECURRING ANNUAL COST	STAFF (FTE'S)
Control Invasive Plants (Cogon grass, Chinese Tallow, and Japanese Climbing Fern)	\$200,000	--	--
Improve Knowledge and Management of Rare Plant Communities (Wildlife Biologist)	\$256,000	\$256,000	1
Restore and Enhance Rare Wetland Habitats (Equipment Operator)	\$60,000	\$60,000	1
Demolish Unwanted Acquired Structures	\$125,000		--
Restore Escatawpa River Bank Adjacent to South Pollack's Ferry Road	\$125,000	--	--
Mississippi sandhill crane Reintroduction, Monitoring and threat assessment (Bio Tech)	\$225,000	\$225,000	1
Survey Refuge Lands	\$270,000	--	--
Conduct Archeological Survey	\$105,000	--	--
Airboat with trailer and Jon Boat with motor and trailer	\$80,000	--	--
Cost Share for Joint Office Facilities	\$314,000	--	--

PROJECT TITLE	FIRST YEAR COST	RECURRING ANNUAL COST	STAFF (FTE'S)
Maintain and Improve Interagency Coordination, Outreach and Partnership Programs (Park Ranger)	\$128,000	\$128,000	1
Complete CCP and Enhance Public Outreach Opportunities	\$140,000	--	--
Develop and Print Educational Brochures	\$50,000	--	--

Table 3. Additional personnel identified to implement the CCP for Grand Bay NWR.

Position Title	Grade	Funding Required
Wildlife Biologist	GS-11	\$128,000
Park Ranger	GS-11	\$128,000
Biological Technician	GS-7/9	\$125,000
Law Enforcement Officer	GS-7/9	\$125,000
Equipment Operator	WG-10	\$60,000

Figure 6. Current staffing chart, Grand Bay National Wildlife Refuge.

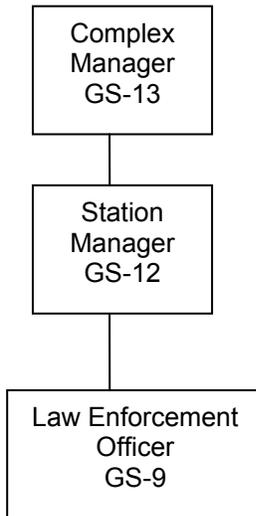
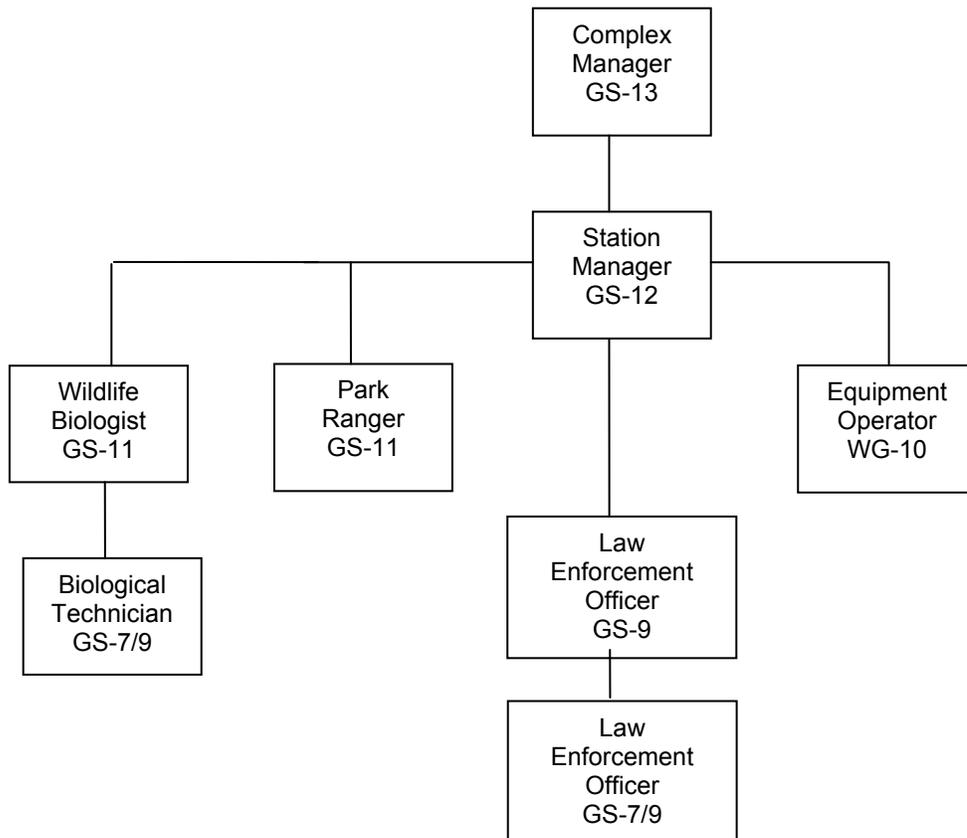


Figure 7. Proposed staffing chart, Grand Bay National Wildlife Refuge.



PARTNERSHIP AND VOLUNTEER OPPORTUNITIES

A key element of this comprehensive conservation plan is to establish and enhance partnerships with local volunteers, landowners, private organizations, and state and federal natural resource agencies. During the 15-year planning horizon of this CCP, the refuge will cooperate and collaborate even more closely with the Grand Bay NERR, sharing office space and a visitor center as well as resource management and educational programs. In the immediate vicinity of the refuge, opportunities exist to establish and enhance partnerships with Jackson County and Mobile County agencies, including planning agencies and county sheriffs (for law enforcement); local businesses, especially those focused on sport fishing and ecotourism; local landowners; local chambers of commerce; and nongovernmental conservation organizations. At regional and state levels, partnerships may be established or enhanced with organizations such as the Mississippi Department of Wildlife, Fisheries, and Parks; Mississippi Department of Marine Resources; Mississippi State University; and the Alabama Department of Conservation and Natural Resources.

STEP-DOWN MANAGEMENT PLANS

A comprehensive conservation plan is a strategic plan that guides the future direction of the refuge. A step-down management plan provides specific guidance on activities, such as habitat, fire, and visitor services management. These step-down management plans (Table 4) 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 4. Refuge step-down management plans related to the goals and objectives of the CCP.

Step-down Plan	Completion Date
Visitor Services Plan	2011
Environmental Education Plan	2013
Hunt Plan Revision	2014
Forest Management Plan	2015
Forest Management Plan	2015
Cultural Resources Management Plan	2023

MONITORING AND ADAPTIVE MANAGEMENT

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

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

PLAN REVIEW AND REVISION

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

SECTION B. ENVIRONMENTAL ASSESSMENT

I. Background

INTRODUCTION

This Environmental Assessment (EA) for Grand Bay National Wildlife Refuge has been prepared in compliance with the National Environmental Policy Act. It discusses the purpose and need for the Comprehensive Conservation Plan (CCP) for the refuge, which is located in Jackson County, Mississippi and Mobile County, Alabama, and analyzes the environmental impacts that could be expected from each of the management alternatives considered for the plan. This analysis assists the U.S. Fish and Wildlife Service in determining if it will need to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) for the refuge's proposed CCP.

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

PURPOSE AND NEED FOR ACTION

The purpose of the CCP and EA is to establish and implement management direction for Grand Bay National Wildlife Refuge for the next 15 years.

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

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

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

DECISION FRAMEWORK

Based on the assessment described in this document, the Service will select an alternative to implement the Comprehensive Conservation Plan for Grand Bay National Wildlife Refuge. The finalized CCP will include a Finding of No Significant Impact (FONSI), which is a statement explaining why the selected alternative will not have a significant effect on the quality of the human environment. This determination is based on an evaluation of the Service and refuge system mission, the purpose(s) for which the refuge was established, and other legal mandates. Assuming no significant

impact is found, implementation of the plan will begin, and the plan will be monitored annually and revised when necessary.

PLANNING STUDY AREA

The study area is Grand Bay National Wildlife Refuge, located in the coastal zone of Jackson County, Mississippi and Mobile County, Alabama, approximately 10 miles east of Pascagoula, Mississippi and about 20 miles west of Mobile, Alabama (Figure 1). The refuge has an approved acquisition boundary of 12,100 acres. Grand Bay NWR forms part of the Gulf Coast National Wildlife Refuge Complex, which also includes Mississippi Sandhill Crane NWR to the west and Bon Secour NWR to the east.

AUTHORITY, LEGAL COMPLIANCE, AND COMPATIBILITY

The Service has developed this plan in compliance with the National Wildlife Refuge System Improvement Act of 1997 and Part 602 (National Wildlife Refuge System Planning) of the Fish and Wildlife Service Manual. The actions described in this plan also meet the requirements of the National Environmental Policy Act of 1969. Compliance with this Act is being achieved through the involvement of the public and the incorporation of an environmental assessment, which describes the alternatives considered and an analysis of the environmental consequences of the alternatives (Chapters III and IV in this section). When fully implemented, the plan will strive to achieve the vision and purposes of Grand Bay National Wildlife Refuge.

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

COMPATIBILITY

The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, states that national wildlife refuges must be protected from incompatible or harmful human activities to ensure that Americans can enjoy Refuge System lands and waters. Before activities or uses are allowed on a national wildlife refuge, the uses must be found to be compatible. A compatible use is one that "... will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge." In addition, "wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety."

An interim compatibility determination is a document that assesses the compatibility of an activity during the period of time the Service first acquires a parcel of land to the time a formal, long-term management plan for that parcel is prepared and adopted. The Service has completed an interim compatibility determination for the six priority general public uses of the system, as listed in the National Wildlife Refuge System Improvement Act of 1997. These uses are hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

PLANNING PROCESS AND ISSUE IDENTIFICATION

During the preplanning and public scoping phases of the comprehensive planning process for Grand Bay National Wildlife Refuge, a myriad of issues and concerns were identified. While many of these issues and concerns are important and relevant to the future management of the refuge, some are beyond the Service's authority and fall outside the scope of the planning process. Nevertheless, the planning team did consider all issues that were raised throughout the planning process, and has identified those issues that, in its best professional judgment, are the most significant to the refuge. For detailed information about the planning process and the issues that were identified, please refer to Chapter III, Plan Development, of the Draft Comprehensive Conservation Plan (Section A).

A complete summary of the issues and concerns that were identified through public scoping is provided in Appendix IV, Public Involvement.

II. Affected Environment

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

III. Description of Alternatives

FORMULATION OF ALTERNATIVES

Alternatives are different approaches or combinations of management objectives and strategies designed to achieve the refuge's purpose and vision, and the goals identified in the comprehensive conservation plan; the priorities and goals of the Central Gulf Coast Ecosystem Team; the goals of the National Wildlife Refuge System; and the mission of the Fish and Wildlife Service. Alternatives are formulated to address the significant issues, concerns, and problems identified by the Service and the public during public scoping.

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

DESCRIPTION OF ALTERNATIVES

Serving as a basis for each alternative, a number of goals and sets of objectives were developed to help achieve the purposes of Grand Bay National Wildlife Refuge and the mission of the National Wildlife Refuge System. Objectives are desired conditions or outcomes that are grouped into sets and, for this planning effort, were consolidated into four alternatives. These alternatives represent different management approaches for managing the refuge over a 15-year timeframe, while still meeting the refuge's purposes and goals. The four alternatives are:

Alternative A: Current Management (No Action)

Alternative B: Custodial or Passive Management

Alternative C: Optimize Wildlife and Habitat Management (Proposed Action)

Alternative D: Optimize Visitor Services

Each alternative is summarized below.

ALTERNATIVE A: CURRENT MANAGEMENT (NO ACTION)

In general, Alternative A would maintain current management direction. In other words, the refuge's habitats and wildlife populations would continue to be managed as they have in recent years. Public use patterns would remain relatively unchanged from those that exist at present. This alternative would pursue the same four broad refuge goals as each of the other alternatives.

Goal 1 concerns fish and wildlife population and habitat management. It calls for Grand Bay National Wildlife Refuge (NWR), in support of national and regional plans, to promote management actions that will provide for viable populations of native fish and wildlife species and habitats, with special emphasis on wet pine savanna. Under Alternative A, the refuge would work toward achieving a number of objectives in pursuit of the fish, wildlife, and habitat management goal.

There would be no active, direct management of waterfowl or other migratory bird populations. All sightings and the presence of threatened and endangered species would be documented on the refuge. However, no active efforts would be undertaken to inventory other wildlife.

The refuge would maintain approximately 1,000 acres of pine savanna, which is the existing acreage. No active management would be undertaken to improve the habitat condition of forested wetlands. Staff would continue to utilize prescribed fire to manage habitat and reduce hazardous fuels on approximately 1,000 acres; furthermore, staff would attempt to set prescribed fires on a 2–3 year rotation and to suppress wildfires. In partnership with the Grand Bay National Estuarine Research Reserve (NERR), the Grand Bay Refuge would annually control 20–30 acres of cogongrass and Chinese tallow.

Goal 2 concerns resource protection. It calls for the refuge to identify, conserve and protect its natural and cultural resources through partnerships, pursue land protection programs, and law enforcement. Under Alternative A, the refuge would work toward achieving several objectives in pursuit of the resource protection goal.

The refuge would acquire 90 percent of all lands within the approved acquisition boundary within 15 years of CCP approval. Through a partnership with the Grand Bay NERR, the Service would protect the shell middens on the refuge. In order to pursue these and other objectives, Grand Bay NWR would provide one full-time equivalent (FTE) law enforcement officer.

The refuge's third goal calls for it to provide opportunities for high quality, wildlife-dependent public uses, leading to greater public understanding and enjoyment of fish, wildlife, and the Gulf Coast ecosystems contained within the refuge.

Under Alternative A, the refuge would continue to serve the public without a Visitor Services Plan. In partnership with the Grand Bay NERR, the refuge would operate a new joint research, office and education facility/visitor center to provide benefits to refuge visitors. The refuge would continue to allow fishing and provide hunting for deer, squirrel, and waterfowl consistent with state regulations and seasons.

With limited refuge support, under Alternative A, the Grand Bay NERR would continue environmental education and interpretation at current levels. This would include participation in community events, offsite and onsite environmental education, guided tours, and interpretive trails. Also in partnership with NERR, the refuge would maintain current wildlife observation and photography programs and facilities.

Goal 4 calls for Grand Bay NWR, in cooperation with the Grand Bay NERR, to provide for sufficient staffing, facilities, and infrastructure to implement a comprehensive refuge management program to protect and manage the natural and cultural values of the refuge's habitats and fulfill the refuge's purposes, goals, and objectives.

Under this goal, Alternative A would maintain the refuge's current staff of two—the Refuge Manager and one Law Enforcement Officer.

ALTERNATIVE B: CUSTODIAL OR PASSIVE MANAGEMENT

Alternative B's emphasis would be on custodial, also called passive, management, which in general means that the refuge staff would not actively intervene in the process of natural succession. Under this alternative, no active habitat management would be implemented, and no prescribed fires or selective logging activities would be used to open up dense forest understories.

Goal 1 concerns fish and wildlife population and habitat management. It calls for Grand Bay NWR, in support of national and regional plans, to promote management actions that will provide for viable populations of native fish and wildlife species and habitats, with special emphasis on wet pine savanna. Under Alternative B, there would be no active, direct management of waterfowl or other migratory bird populations. Sightings and presence of threatened and endangered species would be documented on the refuge; however, this would be a more constrained effort than in Alternative A. Moreover, no active efforts would be undertaken to inventory other wildlife.

Alternative B does not have a wet pine savanna objective. This habitat type would neither be encouraged or discouraged at the Grand Bay Refuge under this alternative. Likewise, no active management would be undertaken to improve the habitat condition of forested wetlands. In addition, the refuge would not utilize prescribed fire to set back succession or manipulate habitats and plant communities. However, in keeping with Service policy, the refuge would suppress all wildfires with the assistance of fire personnel from the Gulf Coast National Wildlife Refuge Complex.

Control of invasive plant species would continue on a limited basis under this alternative. The Grand Bay NERR would annually control 5–10 acres of cogongrass and Chinese tallow on the refuge.

Goal 2 concerns resource protection. It calls for the refuge to identify, conserve, and protect natural and cultural resources through partnerships, pursue land protection programs, and law enforcement. Under Alternative B, the refuge would work toward achieving several objectives in pursuit of the resource protection goal.

Land acquisition would be the same under Alternative B as Alternative A: the refuge would aim to acquire 90 percent of all lands within the approved acquisition boundary within 15 years of CCP approval.

Concerning cultural resources that occur or may occur on the refuge, the Grand Bay NERR would continue to protect shell middens. Refuge staff would not undertake any additional efforts on behalf of discovering, protecting and interpreting cultural resources, such as preparation and implementation of a cultural resources management plan.

Under Alternative B, no Service law enforcement would be provided on refuge lands. As a result, no public hunting would be permitted, because the presence of hunters on the refuge necessitates a law enforcement presence to ensure public safety and enforce compliance with state hunting regulations and refuge rules.

Goal 3 calls for the refuge to provide opportunities for high quality, wildlife-dependent public uses, leading to a greater public understanding and enjoyment of fish, wildlife, and the Gulf Coast ecosystems contained within the refuge.

With regard to visitor services and public use of the refuge as a whole, Alternative B would be the same as Alternative A. The refuge staff would continue to serve the public without the overall guidance and direction of a Visitor Services Plan. The Grand Bay NERR would operate the joint research, office, and education facility/visitor center. Fishing would continue to be allowed in state waters on the refuge.

The Grand Bay NERR would continue environmental education and interpretation at current levels, including participation in community events, offsite and onsite environmental education, guided tours, and interpretive trails. The NERR would also maintain current wildlife observation and photography programs and facilities.

Due to scaled-back direct management responsibilities for habitat, wildlife populations, and visitor services, under Alternative B there would be no staff present on Grand Bay National Wildlife Refuge. The nearest Service personnel would be located at Mississippi Sandhill Crane National Wildlife Refuge.

ALTERNATIVE C: OPTIMIZE WILDLIFE AND HABITAT MANAGEMENT (PROPOSED ACTION)

Under Alternative C, the proposed action alternative, the Service would aim to optimize wildlife and habitat management on Grand Bay National Wildlife Refuge.

Goal 1 concerns fish and wildlife population and habitat management. It calls for the refuge, in support of national and regional plans, to promote management actions that will provide for viable populations of native fish and wildlife species and habitats, with special emphasis on wet pine savanna. Under Alternative C, the refuge would work toward achieving a number of objectives in pursuit of the wildlife goal.

Within 15 years of CCP approval, that is, over the life of the plan, the Grand Bay Refuge would support the annual population objective of the North American Waterfowl Management Plan, by contributing 20 percent (3,600 ducks) of a midwinter population of approximately 18,000 ducks in the Coastal Mississippi Wetlands Initiative Area. For all other migratory birds, within 15 years of CCP approval, the refuge would provide habitats sufficient to meet the population goals of regional and national bird conservation plans.

Within 15 years of CCP approval, the refuge would create and enhance favorable conditions for gopher tortoises (200 acres) and for the possible reintroduction of 12–15 Mississippi sandhill cranes (5–7 nesting pairs) and the gopher frog (creating two ponds). Over the same timeframe, Grand Bay NWR would develop and maintain inventories for small mammals, butterflies, reptiles, amphibians, and possibly other taxa.

With regard to habitat management, within 15 years of CCP approval, the refuge would restore 2,500 acres of wet pine savanna habitat, supporting primarily grassy-herbaceous dominated conditions to benefit grassland birds. Grand Bay NWR would also aim to restore forest structure to promote super-emergent trees, cavities, and understory structure on approximately 2,000 acres to benefit migratory land birds. The refuge would utilize prescribed fire to manage habitat and reduce hazardous fuels on approximately 5,000 acres; with a goal to set prescribed fires on a 2–3 year rotation with 50 percent of burns during the growing season, and suppress wildfires.

In partnership with the Grand Bay NERR, the refuge would annually control 50 acres of cogongrass and Chinese tallow, while controlling other invasive flora opportunistically.

Goal 2 concerns resource protection. It calls for the refuge to identify, conserve, and protect natural and cultural resources through partnerships, pursue land protection programs, and law enforcement.

Under Alternative C, Grand Bay NWR would pursue several objectives related to Goal 2. It would aim to acquire 100 percent of all lands within the approved acquisition boundary within 15 years of CCP approval. The refuge would develop and begin to implement a Cultural Resources Management Plan that would be used to provide overall management direction for cultural resources on Grand Bay NWR. In order to protect the resources at Grand Bay, the refuge would provide two FTE law enforcement officers.

Goal 3 calls for the refuge to provide opportunities for high quality, wildlife-dependent public uses, leading to greater public understanding and enjoyment of fish, wildlife, and the Gulf Coast

ecosystems contained within the refuge. In partnership with the Grand Bay NERR, the refuge would operate a new joint research, office and education facility/ visitor center to provide benefits to refuge visitors. The refuge would also continue to allow fishing and provide hunting for deer, squirrel, and waterfowl consistent with state regulations and seasons. With limited refuge support, the Grand Bay NERR would continue environmental education and interpretation at current levels, including participation in community events, offsite and onsite environmental education, guided tours, and interpretive trails. In partnership with NERR, the Grand Bay Refuge would maintain current wildlife observation and photography programs and facilities.

Goal 4 calls for the refuge, in cooperation with the Grand Bay NERR, to provide for sufficient staffing, facilities, and infrastructure to implement a comprehensive refuge management program to protect and manage the natural and cultural values of the refuge's habitats and fulfill the refuge's purposes, goals, and objectives.

Under Alternative C, in terms of staffing, the Grand Bay Refuge would have all staff under Alternative A, plus one biologist, one park ranger, one biological technician, one equipment operator, and one law enforcement officer, for a total of five FTEs.

ALTERNATIVE D: OPTIMIZE VISITOR SERVICES

Under Alternative D, the Service would aim to optimize services for visitors on Grand Bay National Wildlife Refuge. This alternative would attempt to substantially expand opportunities for public use on the refuge.

Goal 1 concerns fish and wildlife population and habitat management. It calls for Grand Bay NWR, in support of national and regional plans, to promote management actions that will provide for viable populations of native fish and wildlife species and habitats, with special emphasis on wet pine savanna. Under Alternative D, there would be no active, direct management of waterfowl or other migratory bird populations. All sightings and the presence of threatened and endangered species would be documented on the refuge. Also, within 15 years of CCP approval, the refuge would develop and maintain inventories for small mammals, butterflies, reptiles, amphibians, and possibly other taxa, as under Alternative C; this knowledge would benefit visitors by informing them of what they might expect to see on a visit to the refuge.

Under Alternative D—like Alternative A—the refuge would maintain approximately 1,000 acres of pine savanna, which is the existing acreage. No active management would be undertaken to improve the habitat condition of forested wetlands. Staff would continue to utilize prescribed fire to manage habitat and reduce hazardous fuels on approximately 1,000 acres; furthermore, staff would attempt to set prescribed fires on a 2–3 year rotation and to suppress wildfires. In partnership with the Grand Bay NERR, the refuge would annually control 20–30 acres of cogongrass and Chinese tallow.

Goal 2 concerns resource protection. It calls for Grand Bay Refuge to identify, conserve and protect natural and cultural resources through partnerships, pursue land protection programs, and law enforcement. Under Alternative D, the refuge would work toward achieving several objectives in pursuit of the resource protection goal. It would aim to acquire 100 percent of all lands within the approved acquisition boundary within 15 years of CCP approval. Through an ongoing partnership with NERR, the refuge's shell middens would be protected. In order to protect resources and the public at Grand Bay, the refuge would provide two FTE law enforcement officers.

Goal 3 calls for the refuge to provide opportunities for high quality, wildlife-dependent public uses, leading to greater understanding and enjoyment of fish, wildlife, and the Gulf Coast ecosystems contained within the refuge. Under Alternative D, within three years of CCP completion and approval, the refuge would develop a Visitor Services Plan to be used in expanding public use facilities and opportunities on the refuge. As in Alternative A, under Alternative D, in partnership with NERR, the refuge would operate a new joint research, office and education facility/ visitor center to provide benefits to refuge visitors. In addition, the Service would develop a new welcome center along Interstate 10 near its interchange with Franklin Creek Road (Exit 75).

Under Alternative D, within five years of CCP approval, the refuge would develop a hunt plan that coordinates hunting with other increased public uses such as wildlife observation and photography. The refuge would also implement its own program of expanded environmental education and interpretation to complement NERR's efforts, in keeping with the recommendations of the new Visitor Services Plan. In partnership with NERR, the refuge would implement expanded opportunities for wildlife observation and photography, such as a canoe/kayak trail, photo blind(s), and elevated marsh observation platform at the "Goat Farm."

Goal 4 calls for the refuge, in cooperation with the Grand Bay NERR, to provide for sufficient staffing, facilities, and infrastructure to implement a comprehensive refuge management program to protect and manage the natural and cultural values of the refuge's habitats and fulfill the refuge's purposes, goals, and objectives. In order to provide for expanded visitor services under Alternative D, the refuge would increase the size of its staff from the current two employees. The new positions Alternative D calls for include: one assistant manager, one park ranger, one equipment operator, and two law enforcement officers for a total of five FTEs.

FEATURES COMMON TO ALL ALTERNATIVES

Although the four alternatives differ in many ways, there are similarities among them as well. These common features are listed below to reduce the length and redundancy of the individual alternative descriptions. Each of the alternatives would:

- Provide habitat for migratory waterfowl and other migratory birds.
- Protect all threatened and endangered species and document all sightings and presence of listed species on the refuge.
- Suppress all wildfires.
- Facilitate the control of a minimum of 5–10 acres annually of cogongrass and Chinese tallow by the Grand Bay NERR or in partnership with NERR.
- Acquire a minimum of 90% of the lands within the refuge's approved acquisition boundary within 15 years of CCP approval.
- Facilitate the preservation of shell middens on the refuge by the Grand Bay NERR or in partnership with NERR.
- Accommodate at least a limited amount of public visitation.

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- Host a research, office, and education facility/visitor center on the refuge either by the Grand Bay NERR alone or in association with NERR.
 - Continue to allow fishing in state waters.
 - Allow for some level of environmental education and interpretation, including participation in community events, offsite and onsite environmental education, guided tours, and interpretive trails, at a minimum by the Grand Bay NERR.
 - At a minimum, allow the Grand Bay NERR to maintain current wildlife observation and photography programs and facilities.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

The alternative development process under NEPA and the Refuge System Improvement Act is designed to allow consideration of the widest possible range of issues and potential management approaches. During the alternative development process, two different additional alternatives were proposed and considered. The following describes these two other alternatives and the reasons why they were not selected for inclusion in this Draft CCP/EA.

Returning the refuge to its “pre-European settlement condition” (circa 1500 AD) was considered briefly as an alternative but rejected because of the impracticality of implementing it in the 21st century. First of all, it is probably not possible to deduce with precision the exact vegetation communities that existed on these particular lands five centuries ago. Additionally, even if this habitat or habitats could be identified correctly and then recreated over time, their small size and fragmented nature would not allow for their self-maintenance and ecological integrity. It is highly likely that a number of the plant and animal species that would have lived here in the ecological communities of 500 years ago are now extirpated from the refuge, if not the region. This alternative, therefore, was eliminated because it could not meet the test of being “reasonable.”

A second alternative considered and dismissed concerned one that combined both Alternative C (optimizing wildlife and habitat management) and Alternative D (optimizing visitor services). This alternative was not carried through the analysis because of the improbability of ever receiving the budgetary and staffing resources needed to make it a reality within the next 15 years. Grand Bay National Wildlife Refuge is a young refuge, and the emphasis of its management in the course of its existence to date and for the foreseeable future is on land acquisition and habitat restoration.

COMPARISON OF ALTERNATIVES

Table 5 compares each of the four alternatives relative to the management issues for Grand Bay National Wildlife Refuge.

Table 5. Comparison of alternatives by management issues, Grand Bay National Wildlife Refuge.

Issues	Alternative A (Current Management – No Action Alternative)	Alternative B – Custodial or Passive Management	Alternative C (Preferred Alternative) – Optimize Wildlife and Habitat Management	Alternative D – Optimize Visitor Services
<i>Fish and Wildlife Populations and Habitat Management</i>				
Migratory Waterfowl	No active, direct management of waterfowl populations.	Same as Alternative A.	Within 15 years of CCP approval, support the annual population objective of the NAWMP, by contributing 20% (3,600 ducks) of a midwinter population of approximately 18,000 ducks in the Coastal MS Wetlands Initiative Area.	Same as Alternative A.
Other Migratory Birds	No active management at present.	Same as Alternative A.	Within 15 years of CCP approval, provide habitats sufficient to meet population goals of regional and national bird conservation plans.	Same as Alternative A.
Threatened and Endangered Species	Document all sightings and presence of listed species on the refuge.	Same as Alternative A but more constrained effort.	Same as Alternative A, and within 15 years of CCP approval, create and enhance favorable conditions for gopher tortoises (200 acres) and possible reintroduction of 12-15 MS sandhill cranes (5-7 nesting pairs) and gopher frog (creating 2 ponds).	Same as Alternative A.

Issues	Alternative A (Current Management – No Action Alternative)	Alternative B – Custodial or Passive Management	Alternative C (Preferred Alternative) – Optimize Wildlife and Habitat Management	Alternative D – Optimize Visitor Services
Other Wildlife Inventories	No active efforts to inventory other wildlife.	Same as Alternative A.	Within 15 years of CCP approval, develop and maintain inventories for small mammals, butterflies, reptiles, amphibians, and possibly other taxa.	Same as Alternative C.
Wet Pine Savanna	Maintain approximately 1,000 acres of pine savanna on the refuge.	No wet pine savanna objective.	Within 15 years of CCP approval, restore 2,500 acres of wet pine savanna habitat, supporting primarily grassy-herbaceous dominated conditions to benefit grassland birds.	Same as Alternative A.
Forested Wetlands	No active management to improve habitat condition of forested wetlands.	Same as Alternative A.	Within 15 years of CCP approval, restore forest structure to promote super-emergent trees, cavities, and understory structure on approximately 2,000 acres to benefit migratory land birds.	Same as Alternative A.
Fire Management	Utilize prescribed fire to manage habitat and reduce hazardous fuels on approximately 1,000 acres; attempt to set prescribed fires on a 2-3 year rotation and suppress wildfires.	Suppress wildfires.	Utilize prescribed fire to manage habitat and reduce hazardous fuels on approximately 5,000 acres; attempt to set prescribed fires on a 2-3 year rotation with 50% of burns during the growing season, and suppress wildfires.	Same as Alternative A.

Issues	Alternative A (Current Management – No Action Alternative)	Alternative B – Custodial or Passive Management	Alternative C (Preferred Alternative) – Optimize Wildlife and Habitat Management	Alternative D – Optimize Visitor Services
<i>Resource Protection</i>				
Controlling Invasive Species	In partnership with NERR, annually control 20-30 acres of cogongrass and Chinese tallow.	NERR annually controls 5-10 acres of cogongrass and Chinese tallow.	In partnership with NERR, annually control 50 acres of cogongrass and Chinese tallow, while controlling other invasives opportunistically.	In partnership with NERR, annually control 20-30 acres of cogongrass and Chinese tallow.
Land Acquisition	Acquire 90% of lands within the approved acquisition boundary within 15 years of CCP approval.	Same as Alternative A.	Acquire 100% of lands within the approved acquisition boundary within 15 years of CCP approval.	Same as Alternative C.
Cultural Resources	Through partnership with NERR, protect shell middens on refuge.	NERR protects shell middens on the refuge.	Within 15 years of CCP approval, develop and begin to implement a Cultural Resources Management Plan (CRMP).	Same as Alternative A.
Law Enforcement	Provide 1.0 FTE law enforcement officer.	No USFWS law enforcement provided on Refuge lands.	Provide 1.0 FTE law enforcement officers.	Provide 2.0 FTE law enforcement officers.

Issues	Alternative A (Current Management – No Action Alternative)	Alternative B – Custodial or Passive Management	Alternative C (Preferred Alternative) – Optimize Wildlife and Habitat Management	Alternative D – Optimize Visitor Services
Visitor Services				
Visitor Services Plan	Continue to serve public without Visitor Services Plan.	Same as Alternative A.	Within 3 years of CCP completion, develop a Visitor Services Plan to be used in managing public use facilities and opportunities on the Refuge.	Within 3 years of CCP completion, develop a Visitor Services Plan to be used in expanding public use facilities and opportunities on the refuge.
Visitor Center	In partnership with NERR, operate new joint research, office and education facility/ visitor center to provide benefits to Refuge visitors.	NERR operates research, office, and education facility/visitor center.	Same as Alternative A.	Same as Alternative A, but in addition develop new welcome center along Interstate 10 near interchange with Franklin Creek Road (Exit 75).
Fishing and Hunting	Continue to allow fishing and provide hunting for deer, squirrel, and waterfowl consistent with State regulations and seasons.	Continue to allow fishing in State waters.	Same as Alternative A.	Within 5 years of CCP approval, develop hunt plan that coordinates hunting with other increased public uses such as wildlife observation and photography.
Environmental Education and Interpretation	With limited refuge support, NERR continues EE and interpretation at current levels, including participation in community events, offsite and onsite environmental education, guided tours, and interpretive trails.	NERR continues EE and interpretation at current levels, including participation in community events, offsite and onsite environmental education, guided tours, and interpretive trails.	Same as Alternative D.	Within 5 years of CCP approval, refuge would implement its own program of expanded EE and interpretation to complement NERR's efforts, in keeping with recommendations of new Visitor Services Plan.

Issues	Alternative A (Current Management – No Action Alternative)	Alternative B – Custodial or Passive Management	Alternative C (Preferred Alternative) – Optimize Wildlife and Habitat Management	Alternative D – Optimize Visitor Services
Wildlife Observation and Photography	In partnership with NERR, maintain current programs and facilities.	NERR maintains current programs and facilities.	Same as Alternative D.	In partnership with NERR, and within 5 years of CCP approval, implement expanded opportunities such as a canoe/kayak trail, photo blind(s), and elevated marsh observation platform at “Goat Farm.”
<i>Refuge Administration</i>				
Staffing	Maintain current staff of two, including Refuge Manager and Law Enforcement Officer.	No staff on refuge.	Same as Alternative A, plus, 1 biologist, 1 park ranger, 1 biological technician, 1, and 1 equipment operator for a total of 5 FTEs.	Same as Alternative A, plus 1 assistant manager, 1 park ranger, 1 equipment operator, 2 law enforcement officers for a total of 5 FTEs.

IV. Environmental Consequences

OVERVIEW

This section analyzes and discusses the potential environmental effects or consequences that can be reasonably expected by the implementation of each of the four alternatives described in Chapter III of this environmental assessment. For each alternative, the expected outcomes are portrayed through the 15-year life of the CCP.

EFFECTS COMMON TO ALL ALTERNATIVES

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

ENVIRONMENTAL JUSTICE

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

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

CLIMATE CHANGE

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

The increase of carbon within the earth's atmosphere has been linked to the gradual rise in surface temperatures commonly referred to as global warming. In relation to comprehensive planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact to be considered in planning. The U.S. Department of Energy's report entitled, *Carbon Sequestration and Development* defines carbon sequestration as "... the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere" (U.S. Department of Energy 1999).

The land is a tremendous force in carbon sequestration. Terrestrial biomes of all sorts—grasslands, forests, wetlands, tundra, perpetual ice, and desert—are effective both in preventing carbon emissions and in acting as a biological “scrubber” of atmospheric carbon monoxide. The conclusions of the Department of Energy’s report noted that ecosystem protection is important to carbon sequestration and may reduce or prevent the loss of carbon currently stored in the terrestrial biosphere.

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

OTHER MANAGEMENT

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

LAND ACQUISITION

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

CULTURAL RESOURCES

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

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

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

REFUGE REVENUE-SHARING

Annual refuge revenue-sharing payments to Jackson County, Mississippi, and Mobile County, Alabama, would continue at similar rates under each alternative. If lands are acquired and added to the refuge, the payments would increase accordingly.

OTHER EFFECTS

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

SUMMARY OF EFFECTS BY ALTERNATIVE

The following describes the environmental consequences of adopting each refuge management alternative.

ALTERNATIVE A: CURRENT MANAGEMENT (NO ACTION)

The effects of Alternative A on wildlife populations and habitat would probably be relatively small and insignificant. Breeding and wintering waterfowl populations would be unlikely to change substantially; any change in numbers would be in response to external factors rather than refuge management actions. No change would be likely in the relative abundance and diversity of other migratory birds.

Under Alternative A, there would be no active reintroduction of the endangered Mississippi sandhill crane or the endangered Mississippi gopher frog at Grand Bay National Wildlife Refuge. Neither of these species would be likely or capable of reestablishing themselves on the refuge on their own. Numbers of the threatened gopher tortoise may remain stable or continue to decrease as a result of gradual habitat succession that would not favor their habitat needs.

With regard to habitat, no change in acreage of wet pine savanna on the refuge is anticipated under Alternative A. In addition, no change is likely in the quantity and quality of forested wetlands. Prescribed fire would be utilized on a limited basis to manage habitat primarily on pine savanna and to control hazardous fuels. This would help maintain the open understory and midstory of pine savanna habitat. Cogongrass and Chinese tallow would continue to be controlled as at present, which might not be sufficient to prevent these species from continuing to encroach on habitats and displace native species. Also, other invasive species not presently being controlled could become problematic.

Resource protection within the refuge acquisition boundaries would continue at present levels. By the close of the 15-year planning horizon, a high percentage of lands would be owned by the refuge, ensuring the protection of natural habitats on these areas. Shell middens on the refuge would continue to be protected both by refuge and NERR staff. However, the chronic problems of illegal dumping, littering, theft, and game violations would be likely to continue at current levels, because of the limited ability and presence of law enforcement to prevent these crimes and punish the perpetrators.

Overall, gradual increases are expected in the “Big Six” public uses under Alternative A. The visitor center would be constructed and operated with information and educational benefits for visitors to the refuge. This facility alone would likely account for an increasing number of visitors, some of whom would be drawn to other public uses on the refuge. Hunting opportunities for deer, squirrel, and waterfowl would be unchanged, as would fishing opportunities. Except for increased opportunities at the new visitor center, environmental education and interpretation would continue at current levels, conducted primarily by the Grand Bay NERR. The currently limited opportunities for wildlife observation and photography would continue.

Visitor spending and refuge expenditures would continue to have a miniscule but positive impact on the local economy. Occasional refuge purchases of lands within the acquisition boundary would help willing sellers achieve their aims of selling their properties. As observed during scoping, willing sellers are present locally, especially in the wake of Hurricane Katrina.

ALTERNATIVE B: CUSTODIAL OR PASSIVE MANAGEMENT

The effects of Alternative B on wildlife populations and habitat would be similar to those of Alternative A: probably relatively small and insignificant. Breeding and wintering waterfowl populations would be unlikely to change substantially; any change in their numbers would be in response to external factors rather than refuge management actions. No change would be likely in the relative abundance and diversity of other migratory birds.

Under Alternative B, as with Alternative A, there would be no active reintroduction of the endangered Mississippi sandhill crane or the endangered Mississippi gopher frog at the Grand Bay Refuge, and neither of these species would be likely or capable of reestablishing themselves on the refuge on their own. Numbers of the threatened gopher tortoise may remain stable or continue to decrease as a result of gradual habitat succession that would not favor their habitat needs.

Alternative B’s passive management would have mostly adverse consequences for the refuge’s habitat. During the 15-year planning period, wet pine savanna would likely be replaced gradually by pine flatwoods with a denser understory and herb layers, because this alternative would not use prescribed fire and thinning to maintain this habitat type. This would run counter to the first goal articulated for the refuge, which calls for a “special emphasis on wet pine savanna” as part of aiming to “provide for viable populations of native fish and wildlife species and habitats” at the Grand Bay Refuge. In contrast, no change is expected in the quantity and quality of forested wetlands under Alternative A, at least during the 15-year planning horizon.

Elimination of prescribed fire would likely result in habitat changes throughout the refuge, as noted above. Not only would understory density increase, but species composition would shift to favor fire-intolerant plants, especially herbs, forbs, shrubs, and saplings in the understory.

Cogongrass and Chinese tallow would be controlled even less than at present, which could contribute to the spread of these species and the ensuing displacement of native species throughout the refuge. Also, other invasive species that are not being controlled and not considered serious problems at present could become more problematic in the near future. In general, any increase in the extent of infestation by nonnative species would represent a detrimental impact on wildlife.

Resource protection within the refuge’s acquisition boundaries would decrease somewhat under Alternative B. The chronic problems of illegal dumping, littering, theft, and game violations would likely worsen because of even more limited law enforcement ability and presence than at present.

However, by the close of the 15-year planning horizon, a high percentage of lands would be owned by the refuge. While this would prevent habitat loss to development, and encourage overall wildlife conservation, poaching and game violations could increase on these newly acquired areas because of the reduction of law enforcement personnel. On the other hand, shell middens on the refuge would continue to be protected both by refuge and NERR staff.

Even though the refuge would be managed in custodial status under Alternative B, the proposed visitor center would still be constructed and operated because of prior commitments and cooperation with NERR. This facility would confer information and educational benefits to refuge visitors. The visitor center alone would likely account for an increasing number of visitors, some of whom would be drawn to other public uses on the refuge.

Among the Big Six public uses, only hunting would be eliminated entirely under Alternative B, because of the inability to regulate hunting due to the absence of law enforcement capacity. Fishing on state waters could continue at approximately current levels. Except for increased opportunities at the new visitor center, environmental education and interpretation would be reduced to those that are conducted entirely by the Grand Bay NERR. The current limited opportunities for wildlife observation and photography would be reduced still further.

Under Alternative B, visitor spending and refuge expenditures would continue to have a positive but miniscule impact on the local economy. Occasional refuge purchases of lands within the acquisition boundary would help willing sellers achieve their aims of selling their properties. As observed during scoping, willing sellers are present locally, especially in the wake of Hurricane Katrina.

ALTERNATIVE C: OPTIMIZE WILDLIFE AND HABITAT MANAGEMENT (PROPOSED ACTION)

Under Alternative C, breeding and wintering waterfowl populations would potentially increase slightly in size because of the more suitable habitat that would be provided, especially in forested wetlands and on lands acquired and protected by the refuge. However, any substantial changes in the numbers of breeding and wintering waterfowl would most likely continue to be in response to external factors rather than refuge management actions. The relative abundance and diversity of other migratory birds would be expected to increase somewhat due to the refuge's intensified efforts to maintain and restore wet pine savanna and forested wetlands.

Under Alternative C, small numbers of endangered Mississippi sandhill cranes may be reintroduced onto the refuge within the 15-year planning horizon, if Complex managers and biologists determine that sufficient lands with appropriate habitat are available and that the cranes would have a good chance of surviving and establishing a second population (in addition to the lone population that already exists on Mississippi Sandhill Crane National Wildlife Refuge). Populations of the threatened gopher tortoise and the endangered gopher frog could also increase in response to planned increases in habitat; in addition, there might be active reintroduction of the gopher frog onto two ponds that may be created for this purpose. Overall, Alternative C could potentially entail greater benefits for the listed species than either Alternative A or Alternative B.

With full implementation of Alternative C, the acreage of wet pine savanna habitat would more than double over the 15-year period. The forest structure would be altered to promote super-emergent trees, cavities, and understory structure on approximately 2,000 acres for the benefit of migratory land birds. Prescribed fire would be utilized on an expanded basis to manage habitat primarily on pine savanna and pine flatwoods and to control hazardous fuels. Cogongrass and Chinese tallow

would be controlled more intensively, with possible decreases in their extent of infestation. Other invasive plant species would be monitored and controlled opportunistically, and would be less likely to become problematic in the future.

Resource protection within the refuge's acquisition boundaries would increase somewhat. By the close of the 15-year planning horizon, nearly all lands within the approved acquisition boundary would be owned by the refuge, ensuring the protection of natural habitats on these areas. Shell middens on refuge would continue to be protected by both the refuge and NERR staff. In addition, cultural resources management would be expanded to increase knowledge, protection, education, and appreciation. The chronic problems of illegal dumping, littering, theft, and game violations would likely diminish to some extent because of an expanded law enforcement ability and presence, and thus greater ability to prevent these crimes and punish the perpetrators.

Implementation of a Visitor Services Plan, in conjunction with adequate staffing (outreach specialist), would likely lead to substantial increases in all Big Six public uses, especially wildlife observation and photography, and environmental education and interpretation. The visitor center would be constructed and operated with information and educational benefits for visitors to the refuge. This facility alone would likely account for an increasing number of visitors, some of whom would be drawn to other public uses on the refuge. Hunting opportunities for deer, squirrel, and waterfowl would be unchanged, as would fishing opportunities. Except for increased opportunities at the new visitor center, environmental education and interpretation would continue at current levels, conducted primarily by NERR. The current limited opportunities for wildlife observation and photography would also continue.

Visitor spending and refuge expenditures would continue to have a miniscule but beneficial impact on the local economy. Occasional refuge purchases of lands within the acquisition boundary would help willing sellers achieve their aims of selling their properties. As observed during scoping, willing sellers are present locally, especially in the wake of Hurricane Katrina.

ALTERNATIVE D: OPTIMIZE VISITOR SERVICES

The impacts of Alternative D are very similar to those under Alternative A, except with regard to visitor services and public use, which Alternative D emphasizes more than any other alternative.

Alternative D's impact on wildlife populations and habitat would probably be relatively small and insignificant. Breeding and wintering waterfowl populations would be unlikely to change substantially; any change in their numbers would be in response to external factors rather than refuge management actions. No change would be likely in the relative abundance and diversity of other migratory birds.

Under Alternative D, there would be no active reintroduction of the endangered Mississippi sandhill crane or the endangered Mississippi gopher frog at the Grand Bay Refuge, and neither of these species would be likely or capable of reestablishing themselves on the refuge on their own. Numbers of the threatened gopher tortoise may remain stable or continue to decrease as a result of gradual habitat succession that would not favor their habitat needs.

With regard to habitat, no change in the refuge's acreage of wet pine savanna is anticipated under Alternative D. In addition, no change is likely in the quantity and quality of forested wetlands. Prescribed fire would be utilized on a limited basis to manage habitat primarily on pine savanna and to control hazardous fuels. This would help maintain the open understory and midstory of pine savanna

habitat. Cogongrass and Chinese tallow would continue to be controlled as at present, which might not be sufficient to prevent these species from continuing to encroach on habitats and displace native species. Also, other invasive species not presently being controlled could become problematic.

Resource protection within the refuge's acquisition boundaries would generally increase from current levels under Alternative D. By the close of the 15-year planning horizon, nearly all lands would be owned by the refuge, ensuring the protection of natural habitats on these areas. Shell middens on the refuge would continue to be protected both by refuge and NERR staff. The chronic problems of illegal dumping, littering, theft, and game violations would likely diminish to some extent because of an expanded law enforcement ability and presence, and thus greater ability to prevent these crimes and punish the perpetrators.

Implementation of a Visitor Services Plan, in conjunction with adequate staffing (outreach specialist), would likely lead to substantial increases in all Big Six public uses, especially wildlife observation and photography, and environmental education and interpretation. The visitor center would be constructed and operated with information and educational benefits for visitors to the refuge. These benefits would be expanded under Alternative D by the operation of a welcome center or information kiosk at the state's welcome center along Interstate 10.

The visitor center would likely account for an increasing number of visitors, some of whom would be drawn to other public uses on the refuge. Hunting opportunities for deer, squirrel, and waterfowl would remain unchanged, as would fishing opportunities on state waters within the refuge. Refuge-presented environmental education and interpretation would be expanded to complement NERR's efforts. Expanded wildlife observation and photography opportunities, such as a canoe/kayak trail, photo blind(s), and elevated marsh observation platform at the "Goat Farm," would represent a benefit for the public.

Visitor spending and refuge expenditures would continue to have a miniscule but positive impact on the local economy. Occasional refuge purchases of lands within the acquisition boundary would help willing sellers achieve their aims of selling their properties. As observed during scoping, willing sellers are present locally, especially in the wake of Hurricane Katrina.

Table 6 summarizes the likely environmental effects of each alternative, and is organized by broad issue categories.

Table 6. Summary of environmental effects by alternative, Grand Bay National Wildlife Refuge

Issues	Alternative A: Current Management (No Action)	Alternative B: Custodial or Passive Management	Alternative C: Optimize Wildlife and Habitat Management (Proposed Action)	Alternative D: Optimize Visitor Services
<i>Fish and Wildlife Populations and Habitat Management</i>				
Migratory Waterfowl	Breeding and wintering waterfowl populations unlikely to change substantially; any change would be in response to external factors rather than refuge management actions.	Same as Alternative A.	Breeding and wintering waterfowl populations potentially increase slightly in size.	Same as Alternative A.
Other Migratory Birds	No change likely in relative abundance and diversity of other migratory birds.	Same as Alternative A.	Relative abundance and diversity of other migratory birds likely to increase somewhat.	Same as Alternative A.
Threatened and Endangered Species	No reintroduction of endangered MS sandhill crane; threatened gopher tortoise numbers may remain stable or continue to decrease; endangered MS gopher frog would not be reintroduced on the refuge.	Same as Alternative A.	Small numbers of endangered MS sandhill crane may be reintroduced onto the refuge; threatened gopher tortoise and endangered gopher frog numbers may increase in response to planned increases in habitat and possible reintroduction of the latter.	Same as Alternative A.

Issues	Alternative A: Current Management (No Action)	Alternative B: Custodial or Passive Management	Alternative C: Optimize Wildlife and Habitat Management (Proposed Action)	Alternative D: Optimize Visitor Services
Wet Pine Savanna	No change in acreage of wet pine savanna on the refuge.	Wet pine savanna likely to be replaced gradually by pine flatwoods with denser understory and herb layers.	Acreage of wet pine savanna would more than double over 15-year period.	Same as Alternative A.
Forested Wetlands	No change likely in quantity and quality of forested wetlands.	Same as Alternative A.	Forest structure would be altered to promote super-emergent trees, cavities, and understory structure on approximately 2,000 acres to benefit migratory land birds.	Same as Alternative A.
Fire Management	Prescribed fire would be utilized on a limited basis to manage habitat primarily on pine savanna and to control hazardous fuels.	Elimination of prescribed fire would likely result in habitat changes throughout refuge, by increasing understory density and species composition to favor fire-intolerant plants.	Prescribed fire would be utilized on an expanded basis to manage habitat primarily on pine savanna and pine flatwoods and to control hazardous fuels.	Same as Alternative A.
Resource Protection				
Invasive Species	Cogongrass and Chinese tallow would continue to be controlled as at present; other invasive species may become problematic.	Cogongrass and Chinese tallow would be controlled less intensively than at present, and may expand; other invasive species could become problematic.	Cogongrass and Chinese tallow would be controlled more intensively with possible decreases in extent of infestation; other invasive plant species would be monitored and controlled opportunistically, and would be less likely to become problematic.	Same as Alternative A.

Issues	Alternative A: Current Management (No Action)	Alternative B: Custodial or Passive Management	Alternative C: Optimize Wildlife and Habitat Management (Proposed Action)	Alternative D: Optimize Visitor Services
Land Ownership within Refuge Acquisition Boundary	High percentage of lands would be owned by refuge by close of 15-year planning horizon.	Same as Alternative A.	Nearly all lands would be owned by refuge by close of 15-year planning horizon.	Same as Alternative C.
Cultural Resources	Shell middens on refuge would continue to be protected.	Same as Alternative A.	Cultural resources management would be expanded to increase knowledge, protections, education and appreciation.	Same as Alternative A.
Law Enforcement Issues	Chronic problems with dumping, littering, theft, and game violations continue because of limited law enforcement ability to prevent crimes and punish perpetrators.	Chronic problems with dumping, littering, theft, and game violations would not only continue but would probably worsen because of no law enforcement presence.	Chronic problems with dumping, littering, theft, and game violations would likely diminish because of stepped-up law enforcement ability to prevent crimes and punish perpetrators.	Same as Alternative C, but even further crime abatement probable.
Visitor Services				
Overall public use	Gradual increases expected in all Big Six public uses.	Legitimate public uses likely to remain stable or decrease, except for legal hunting, which would be eliminated.	Implementation of a Visitor Services Plan, in conjunction with adequate staffing (outreach specialist), would likely lead to substantial increases in all Big Six uses, especially wildlife observation/photography, and EE and interpretation.	Same as Alternative C.

Issues	Alternative A: Current Management (No Action)	Alternative B: Custodial or Passive Management	Alternative C: Optimize Wildlife and Habitat Management (Proposed Action)	Alternative D: Optimize Visitor Services
Visitor Center	Constructed and operated with information and education benefits for visitors to the Refuge.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A, but new welcome center along Interstate 10 would further expand outreach.
Fishing and Hunting	Hunting opportunities for deer, squirrel, and waterfowl would be unchanged, as would be fishing.	Hunting opportunities would be deleted but fishing opportunities in State waters would remain unchanged.	Same as Alternative A.	Same as Alternative A.
Environmental Education and Interpretation	The new visitor center would increase environmental education and interpretation; elsewhere on the refuge, they would continue at current levels, conducted primarily by NERR.	Same as Alternative A.	Same as Alternative A.	Refuge-presented EE and interpretation would be expanded to complement NERR's efforts.
Wildlife Observation and Photography	Limited opportunities for wildlife observation and photography would continue.	Limited opportunities for wildlife observation and photography would be reduced still further.	Same as Alternative A.	Expanded opportunities such as a canoe/kayak trail, photo blind(s), and elevated marsh observation platform at "Goat Farm" would represent a benefit for the public.

Issues	Alternative A: Current Management (No Action)	Alternative B: Custodial or Passive Management	Alternative C: Optimize Wildlife and Habitat Management (Proposed Action)	Alternative D: Optimize Visitor Services
<i>Refuge Administration</i>				
Facilities	New headquarters/visitor center increases ability of building to serve both as visitor center and refuge headquarters.	Same as Alternative A.	New visitor center increases both refuge administrative capacities and ability to provide public with a satisfying and educational experience.	Same as Alternative A.
Partners, Volunteers, Friends Group, and Interns	Maintain and increase as approached by interested partners.	Greater cooperation with partners and use of volunteers related to intensified habitat and wildlife management.	Greater cooperation with partners and use of volunteers related to environmental education and interpretation.	Greater cooperation with partners and use of volunteers related to intensified habitat, wildlife management, and environmental education and interpretation.
Staff	Maintain current program and staffing levels. Total Staff = 2.	No staff on refuge.	Increased habitat management, law enforcement, and visitor services by adding five additional positions. Total Staff = 5.	Increased law enforcement, biological, supervisory, and visitor services by adding five additional positions. Total Staff = 5.

Issues	Alternative A: Current Management (No Action)	Alternative B: Custodial or Passive Management	Alternative C: Optimize Wildlife and Habitat Management (Proposed Action)	Alternative D: Optimize Visitor Services
<i>Other Human Dimensions</i>				
Human Health and Safety	Acceptable, typical risks to visitors, motorists, and nearby residents from accidents and wildfires.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Socioeconomic Impacts	Impact from visitor spending and refuge expenditures on local economy would continue to be positive but miniscule.	Same as Alternative A.	Positive impacts would increase from Alternative A but would still be insignificant in the local economy.	Positive impacts would increase from Alternative A but would still be insignificant in the local economy.

UNAVOIDABLE IMPACTS AND MITIGATION MEASURES

Under Alternative A, the current management (no action) alternative, there are numerous unavoidable impacts, including law enforcement that is not adequate for protecting resources and visitors themselves from any significant visitor use; continued degradation of the biological functions of native plant communities and wildlife habitat due to the invasion of exotic plants and possibly nuisance animals; and a continued decline in indigenous biodiversity because of undesirable habitat changes, principally from the disappearance of wet pine savanna habitat. Over time, if these issues are not addressed, they will continue to impact refuge resources.

Under Alternative B, the custodial or passive management alternative, many of the unavoidable impacts in Alternative A would be even greater. Law enforcement would be reduced still further, and would be unable to deter and solve crimes against natural resources (e.g., poaching, dumping) and people (e.g. theft). The unchecked invasion of exotic plants, and possibly nuisance animals, would continue the degradation of the biological functions of native plant communities and wildlife habitat. Undesirable habitat changes, primarily the accelerated loss of wet pine savanna to pine flatwoods, would represent a decline in indigenous biodiversity. Over time, by not addressing these issues, their impacts on refuge resources would be likely to worsen.

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

Alternative D, which would optimize visitor services, would likely lead to an increase in public use and the benefits in terms of appreciation and education that would result from that increased use. However, this alternative, which would not intensify habitat management, would probably incur many of the same impacts as Alternative A, including the continuing loss of wet pine savanna and the continued encroachment of nonnative plants and animals and the displacement of native species this causes.

WATER QUALITY FROM SOIL DISTURBANCE AND USE OF HERBICIDES

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

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

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

WILDLIFE DISTURBANCE

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

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

VEGETATION DISTURBANCE

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

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

USER GROUP CONFLICTS

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

EFFECTS ON ADJACENT LANDOWNERS

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

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

LAND OWNERSHIP AND SITE DEVELOPMENT

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

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

CUMULATIVE IMPACTS

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

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

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

The refuge is unaware of any past, present or future planned actions that would result in a significant cumulative adverse impact when added to the refuge's proposed actions, as outlined in the proposed alternative.

Nevertheless, because of concerns expressed about the cumulative effects of hunting on national wildlife refuges, the following section analyzes and discusses in some detail the cumulative impacts of each alternative on a variety of wildlife resources at Grand Bay National Wildlife Refuge. The refuge's small hunting program is relatively new; it began only in 2001.

ANTICIPATED IMPACTS ON WILDLIFE SPECIES

Migratory Birds

The U.S. Fish and Wildlife Service annually prescribes frameworks, or outer limits, for dates and times when hunting may occur and the number of birds that may be taken and possessed. These frameworks are necessary to allow state selections of season and limits for recreation and sustenance; aid federal, state, and tribal governments in the management of migratory game birds; and permit harvests at levels compatible with population status and habitat conditions. Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations (50 CFR Part 20) that establish frameworks from which the states may select season dates, bag limits, shooting hours, and other options for the each migratory bird hunting season. The frameworks are essentially permissive in that hunting of migratory birds would not be permitted without them. Thus, in effect, the annual federal regulations both allow and limit the hunting of migratory birds.

Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any ... bird, or any part, nest, or egg" of migratory game birds can take place, and to adopt regulations for this purpose. These regulations are written after giving due regard to "the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds," and are updated annually (16 U.S.C. 704(a)). This responsibility has been delegated to the U.S. Fish and Wildlife Service as the lead federal agency for managing and conserving migratory birds in the United States. Acknowledging regional differences in hunting conditions, the Service has administratively divided the nation into four flyways for the primary purpose of managing migratory game birds. Each flyway (Atlantic, Mississippi, Central, and Pacific) has a Flyway Council, a formal organization generally composed of one member from each state and province in that flyway. Grand Bay NWR is within the Mississippi Flyway.

The process for adopting migratory game bird hunting regulations, located in 50 CFR Part 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rule-making process will last. Most importantly, however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation. The process of adopting migratory game bird hunting regulations includes two separate regulation-development schedules, based on "early" and "late" hunting season regulations. The early hunting seasons pertain to all species of migratory game birds in Alaska, Hawaii, Puerto Rico, and the U.S. Virgin Islands; migratory game birds other than waterfowl (e.g., dove, woodcock, etc.); and special early waterfowl seasons such as those for teal or resident Canada geese. The early hunting seasons generally begin prior to October 1. Late hunting seasons generally start on or after October 1 and include most waterfowl seasons not already established. There are basically no differences in the processes for establishing either the early or late hunting seasons. For each cycle, Service biologists and others gather, analyze, and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to Flyway Councils and other interested parties (USFWS 2006).

Under each of the four alternatives, including the proposed action, no increase in the annual harvest of ducks on the refuge is anticipated; thus, there would be no additional cumulative impact of this action on duck populations in Mississippi, Alabama, and the Mississippi Flyway. Overall, the populations of ducks in the Mississippi Flyway are reasonably healthy, while fluctuating up and down

in response to a number of natural and human factors. Wintering populations of ducks at the Grand Bay Refuge, in particular, have not yet been formally surveyed to date. Objective 1-1 on migratory waterfowl in this CCP includes a strategy outlining mid-winter surveys for waterfowl on the refuge.

Because the Service is required to take the abundance of migratory birds and other factors into consideration, the Service undertakes a number of surveys throughout the year in conjunction with the Canadian Wildlife Service, state and provincial wildlife management agencies, and others. To determine the appropriate frameworks for each species, the Service considers factors such as population size and trends, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest. After the frameworks are established for season lengths, bag limits, and areas for migratory game bird hunting, migratory game bird management becomes a cooperative effort of state and federal governments. After Service establishment of final frameworks for hunting seasons, the states may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative in their selections than the federal frameworks, but never more liberal. Season dates and bag limits for national wildlife refuges open to hunting are never longer or larger than the state regulations. In fact, based upon the findings of an environmental assessment developed when a national wildlife refuge opens a new hunting activity, the season dates and bag limits may be more restrictive than the state allows. At Grand Bay NWR, the season length of the non-quota duck hunt is the same as that allowed by Mississippi and Alabama.

NEPA considerations by the Service for hunted migratory game bird species are addressed by the programmatic document, "Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds" (FSES 88-14), filed with the Environmental Protection Agency on June 9, 1988. The Service published a Notice of Availability in the *Federal Register* on June 16, 1988 (53 FR 22582), and a Record of Decision on August 18, 1988 (53 FR 31341). Annual NEPA considerations for waterfowl hunting frameworks are covered under a separate Environmental Assessment, "Duck Hunting Regulations for 2006-07," and an August 24, 2006, Finding of No Significant Impact. Further, in a notice published in the September 8, 2005, *Federal Register* (70 FR 53376), the Service announced its intent to develop a new Supplemental EIS for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006, as announced in a March 9, 2006, *Federal Register* notice (71 FR 12216). More information may be obtained from: Chief, Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Department of the Interior, MS MBSP-4107-ARLSQ, 1849 C Street, NWR, Washington, DC 20240.

Resident Big Game

White-tailed Deer

Grand Bay NWR conducts an annual non-quota, archery deer hunt requiring a refuge permit and state hunting license. Since there are no hunter check stations on the refuge, it is not possible to obtain an exact figure on the number of hunters, but it is believed to be small. Each of the alternatives would continue to allow deer hunting at approximately current levels, or less in the case of Alternative B which would prohibit hunting altogether. Deer hunting does not have regional population impacts due to the restricted home ranges of white-tailed deer. Although no white-tailed deer population survey has been conducted to date, general observations and available habitat indicate a stable deer population on the refuge (USFWS 2005). Therefore, the continuation of deer hunting on refuge lands should have no negative cumulative impacts on the area's and state's deer herd.

Feral Hogs

Feral hogs are an extremely invasive, nonnative species that degrades habitat and displaces native species like deer and wild turkey. Currently the refuge allows informal hunting for feral hogs but has no formal control program. Each of the four alternatives would encourage hunting of feral hogs on the refuge. Thus, there could be a cumulative impact on local feral hog numbers, and if such a reduction occurs, it would be considered beneficial for the refuge's habitat and native wildlife.

Wild Turkey

Wild turkey are not common on the refuge and there is no current hunting season for them.

Resident Small Game

The refuge is open for squirrel hunting in both Alabama and Mississippi in keeping with each state's season. Shotguns using number two or smaller shot size are allowed and all shells must be federally approved nontoxic shot. The use of .22 caliber rimfire is allowed for squirrel hunting only. The use of dogs is prohibited. Relatively few hunters participate and squirrel populations appear to be stable in both states. If there were indications that squirrel numbers were in decline, the refuge would implement measures to restrict the harvest.

Nongame Wildlife

Nongame or nonhunted wildlife would include nonhunted migratory birds such as songbirds, wading birds, raptors, and woodpeckers; small mammals such as voles, moles, mice, shrews, and bats; reptiles and amphibians such as snakes, skinks, turtles, lizards, salamanders, frogs and toads; and invertebrates such as butterflies, moths, other insects and spiders. Except for migratory birds and some species of migratory bats, butterflies and moths, these species have very limited home ranges and hunting could not affect their populations regionally; thus, only local effects will be discussed.

Disturbance to nonhunted migratory birds could have regional, local, and flyway effects. Regional and flyway effects would not be applicable to species that do not migrate such as most woodpeckers, and some songbirds including cardinals, titmice, wrens, chickadees, etc. The cumulative effects of disturbance to nonhunted migratory birds under the proposed action are expected to be negligible for the following reasons. Hunting season would not coincide with the nesting season. Long-term future impacts that could occur if reproduction was reduced by hunting are not relevant for this reason. Disturbance to the daily wintering activities of birds, such as feeding and resting, might occur. Disturbance to birds by hunters would probably be commensurate with that caused by nonconsumptive users. The cumulative effects of disturbance to nonhunted migratory birds under the proposed action are expected to be negligible for the above reasons.

With regard to other wildlife, disturbance would be unlikely for the following reasons. Small mammals, including bats, are inactive during winter when hunting season occurs. These species are also nocturnal. Both of these qualities make hunter interactions with small mammals very rare. Hibernation or torpor by cold-blooded reptiles and amphibians also limits their activity during the hunting season when temperatures are low. Hunters would rarely encounter reptiles and amphibians during most of the hunting season. Encounters with reptiles and amphibians in the early fall are few and should not have cumulative negative effects on reptile and amphibian populations. Invertebrates are also not active during cold weather and would have few interactions with hunters during the

hunting season. Refuge regulations further mitigate possible disturbance by hunters to nonhunted wildlife. Vehicles are restricted to roads and the harassment or taking of any wildlife other than the game species legal for the season is not permitted.

Although the ingestion of lead shot by nonhunted wildlife could be a cumulative impact, it is not relevant to Grand Bay NWR because the use of lead shot would not be permitted on the refuge for any type of hunting.

Some species of bats, butterflies and moths are migratory. Cumulative effects to these species at the “flyway” level should be negligible. These species are in torpor or have completely passed through Alabama and Mississippi by the peak hunting season in November–January. Some hunting occurs during September and October when these species are migrating; however, hunter interaction would be commensurate with that of nonconsumptive users.

Threatened and Endangered Species

Gopher tortoises occur on the Alabama portions of the refuge. Alligators are common and bald and golden eagles have been observed as well. Brown pelicans are found in southern estuarine areas of the refuge near the coast. Manatees, an endangered species, are an occasional visitor to the refuge. The endangered red-cockaded woodpecker is not found on the refuge. An Intra-Service Section 7 evaluation under the Endangered Species Act is included as Appendix VI in this Draft CCP. It concludes that the proposed action would have no effect on the several listed species mentioned above. While these species do occur regularly on the refuge, hunters are unlikely to mistake bald eagles, brown pelicans, or manatees for ducks, deer, or squirrels. The cumulative adverse impact on listed species would be negligible, and would be comparable to that caused by anglers, boaters and nonconsumptive users.

ANTICIPATED IMPACTS ON REFUGE PROGRAMS, FACILITIES, CULTURAL RESOURCES, ENVIRONMENTAL JUSTICE, ENVIRONMENTAL RESOURCES, AND SURROUNDING COMMUNITIES

Wildlife-Dependent Recreation

As public use levels expand as projected over time, unanticipated conflicts between user groups may occur at Grand Bay NWR. The refuge’s visitor use programs would be adjusted as needed to eliminate or minimize each problem and provide quality wildlife-dependent recreational opportunities. Experience on many national wildlife refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. In the context of the present proposed action, one of the strategies under the fishing and hunting objective would be to limit hunting (time, zone) around the new visitor center and the Oak Grove Birding Trail as other public uses, such as wildlife observation, photography, and interpretation, increase over time.

Overall, the cumulative impact of hunting on other wildlife-dependent recreation at the Grand Bay Refuge is expected to be negligible to minor.

Refuge Facilities

The Service defines facilities as: “Real property that serves a particular function(s) such as buildings, roads, utilities, water control structures, raceways, etc.” Those facilities most utilized

by hunters are roads, parking lots, trails, and boat launching ramps. Maintenance or improvement of existing facilities (i.e., parking areas, roads, trails, and boat ramps) would cause minimal short-term impacts to localized soils and waters and may cause some wildlife disturbances and damage to vegetation. The facility maintenance and improvement activities described are periodically conducted to accommodate daily refuge management operations and general public uses such as wildlife observation and photography. These activities would be conducted at times (seasonal and/or daily) to cause the least amount of disturbance to wildlife. Siltation barriers will be used to minimize soil erosion, and all disturbed sites will be restored to as natural a condition as possible. During times when roads are impassible due to flood events or other natural causes, those roads, parking lots, trails and boat ramps impacted by the event would be closed to vehicular use.

Overall, the cumulative impact of hunting on the refuge's facilities would be negligible.

Cultural Resources

Hunting, regardless of method or species targeted, is a consumptive activity that does not pose any threat to historic properties on or near the refuge. In fact, hunting meets only one of the two criteria used to identify an "undertaking" that triggers a federal agency's need to comply with Section 106 of the National Historic Preservation Act. These criteria, which are delineated in 36 CFR Part 800, state:

1. an undertaking is any project, activity, or program that can alter the character or use of an archaeological or historic site located within the "area of potential effect;" and
2. the project, activity, or program must also be either funded, sponsored, performed, licensed, or have received assistance from the agency.

Consultations with the pertinent State Historic Preservation Offices and federally recognized Tribes are, therefore, not required.

Environmental Justice

Executive Order 12898, "Federal Actions to address Environmental Justice in Minority Populations and Low-income Populations" was signed by President Bill Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations to achieve environmental protection of all communities. In part the order intended to promote nondiscrimination in federal programs substantially affecting human health and the environment and to provide minority and low-income communities with access to public information and participation in matters relating to human health or the environment.

Low-income and minority populations are present in the area, but there is no evidence of adverse disproportionate environmental justice issues associated with the refuge's existing hunting program or proposed expansion. Any affected populations would generally be affected in the same ways as the regional population as a whole.

Environmental Resources

The refuge expects no appreciable adverse impacts of the proposed action on the Grand Bay Refuge environment, which consists of soils, vegetation, air quality, water quality, and solitude. Some disturbance to surface soils and vegetation would occur in areas selected for hunting; however impacts would be minimal. Litter left behind by hunters would also be expected, although unlike the

litter associated with fishing, which often concentrates near or at certain heavily fished locations, litter from hunters is likely to be more widely scattered and therefore less conspicuous. Hunting would be expected to benefit vegetation, since it is used to maintain many resident wildlife populations, particularly deer, in balance with the habitat's carrying capacity. When and where necessary, the refuge would also control access or close areas to minimize habitat degradation.

The refuge expects impacts to air and water quality to be minimal and only due to refuge visitors' automobile and outboard motor emissions. The effect of these refuge-related activities, as well as other management activities, on overall air and water quality in the region are anticipated to be negligible, compared to the contributions of industrial centers, power plants, and non-refuge vehicle traffic in this portions of Jackson County, Mississippi and Mobile County, Alabama. Existing state water quality criteria and use classifications are adequate to achieve desired on-refuge conditions; thus, implementation of the proposed action and alternatives would not impact adjacent landowners or users beyond the constraints already implemented under existing state standards and laws. Impacts associated with solitude are expected to be minimal given time and space zone management techniques, such as seasonal access and area closures, used to avoid conflicts among user groups.

Surrounding Communities

The refuge would work closely with state, federal, and private partners to minimize the adverse cumulative impacts to adjacent lands and their associated natural resources; however, no cumulative impacts are anticipated. The newly opened hunt(s) would result in a net gain of public hunting opportunities, which are expected to positively impact the general public, nearby residents, and refuge visitors. Residents in the area and neighboring communities are likely to view continued hunting opportunities favorably. The refuge expects continuing visitation and tourism, some of it due to hunting, to generate revenues to local communities, but this spending would be very small in comparison with the size of the local economy.

DIRECT AND INDIRECT EFFECTS OR IMPACTS

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

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

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

SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

The habitat protection and management actions proposed under the proposed alternative are dedicated to maintaining the long-term productivity of refuge habitats. The benefits of this plan for long-term productivity far outweigh any impacts from short-term actions, such as the construction of observation towers and a visitor center, or creation of new trails. While these activities would cause

short-term negative impacts, the educational values and associated public support gained from the improved visitor experience would produce long-term benefits for the refuge's entire ecosystem.

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

V. Consultation and Coordination

This chapter summarizes the consultation and coordination that has occurred to date in identifying the issues, alternatives, and proposed alternative which are presented in this Draft CCP. It lists the meetings that have been held with the various agencies, organizations, and individuals who were consulted in the preparation of the Draft CCP.

The following meetings, contacts, and presentations were undertaken by the Fish and Wildlife Service during the preparation of the Draft CCP.

The planning team gathered input from a variety of internal and external sources to identify the key issues, concerns, and opportunities that needed to be addressed in the CCP. Sources of internal scoping included the refuge staff itself and other Service biologists and professionals in the region. External scoping sources included concerned private citizens; research and educational institutions; members of conservation, sportsmen and civic groups; refuge neighbors; members of the local community; and state, tribal, and local agencies. These various interests are sometimes referred to collectively as stakeholders, that is, those individuals and groups that have a stake in how the refuge is managed. In developing the CCP for Grand Bay NWR, the planning team conducted both internal and external scoping.

The first step in developing the CCP was a biological review that took place during the week of February 23–27, 2004. The 17-member biological review team included Service biologists, managers, foresters, and non-Service managers and biologists. The participants represented a variety of agencies in addition to the Service, including Mississippi State University; the Grand Bay National Estuarine Research Reserve; Mississippi Department of Marine Resources; Mississippi Department of Wildlife, Fisheries and Parks; Museum of Natural Science; and the Alabama Department of Conservation and Natural Resources.

A visitor services review was also conducted in October 2004. The four-member visitor services review team included visitor services and outreach specialists from the Service's Southeast Regional Office in Atlanta, Georgia; Tensas National Wildlife Refuge; and the Grand Bay NERR. The review team met with the refuge manager to discuss the visitor services program. The Refuge Manager explained what the visitor services program is currently doing to provide recreational and educational opportunities on the refuge. The Refuge Manager and a MDMR education specialist then took the review team to all the different public use areas on the refuge.

The nucleus of the CCP planning team itself, comprised of the refuge manager; a Service natural resources planner; the project leader of the Gulf Coast National Wildlife Refuge Complex; a Mississippi Sandhill Crane NWR biologist; Grand Bay NERR staff; and an outside professional contractor (see Appendix X, List of Preparers) met for the first time in February 2006 for a tour of the refuge and an overview of its habitat, wildlife resources, and public use programs, facilities, and opportunities. At that time, the planning team also conducted additional internal scoping and prepared a preliminary schedule and plans for public involvement.

The planning team then held an open house and public scoping meeting on March 22, 2006, at the Orange Lake Elementary School cafeteria in Moss Point, Mississippi, several miles from the refuge. Approximately 10 citizens attended the open house and scoping meeting. The attendees were able to meet and interact with the refuge staff, ask questions, provide comments, and view the exhibits and maps on hand.

Refuge Manager Durwin Carter began the scoping meeting with a brief overview of the refuge, followed by a slide presentation on the comprehensive planning process given by Mike Dawson, a Natural Resources Planner from the Service's Jackson, Mississippi, field office. Jackie Cumpton, a Senior Realty Specialist from the Service's Southeast Regional Office in Atlanta, Georgia, then provided an overview of the Service's policy of land acquisition from willing sellers. The floor was then opened to questions, comments, and suggestions from the meeting attendees. Leon Kolankiewicz, a consultant with the Mangi Environmental Group, facilitated this open-floor question and comment session. The attendees were able to express their concerns about the refuge and submit ideas and suggestions for its future management. Comment forms were also distributed to the attendees and other interested parties so they could submit their comments in writing. The written comments could be submitted either at the meeting or subsequently by mail or e-mail. A total of 28 comments were received during the public scoping period. A summary of the public scoping comments is provided in Appendix IV, Public Involvement.

Earlier on the same day in which the scoping meeting and open house was held, the core planning team met at the office shared jointly with the Grand Bay National Estuarine Research Reserve. Three Service employees (Lloyd Culp, Durwin Carter, and Mike Dawson), four NERR employees (Dave Ruple, Mark Woodrie, Chris May, and Jennifer Buchanan), and Mangi contractor Leon Kolankiewicz discussed issues facing the refuge. These discussions focused especially on the ongoing partnership between the Grand Bay National Wildlife Refuge and the Grand Bay National Estuarine Research Reserve and its bearing on the comprehensive conservation plan.

SECTION C. APPENDICES

Appendix I. Glossary

- Adaptive Management:** Refers to a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plan. Analysis of results help managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.
- Alluvial:** Sediment transported and deposited in a delta or riverbed by flowing water.
- Alternative:** 1. A reasonable way to fix the identified problem or satisfy the stated need (40 CFR 1500.2). 2. Alternatives are different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues (Service Manual 602 FW 1.6B).
- Anadromous:** Migratory fishes that spend most of their lives in the sea and migrate to fresh water to breed.
- Biological Diversity:** The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (USFWS Manual 052 FW 1. 12B). The System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as Biodiversity.
- Carrying Capacity:** The maximum population of a species able to be supported by a habitat or area.
- Categorical Exclusion (CE, CX, CATEX, CATX):** A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a Federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).
- CFR:** Code of Federal Regulations.
- Compatible Use:** A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife refuge (50 CFR 25.12 (a)). A compatibility determination supports the selection of compatible uses and identifies stipulations or limits necessary to ensure compatibility.

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

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

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

National Wildlife Refuge:	A designated area of land, water, or an interest in land or water within the System.
Native Species:	Species that normally live and thrive in a particular ecosystem.
Notice of Intent (NOI):	A notice that an environmental impact statement will be prepared and considered (40 CFR 1508.22). Published in the Federal Register.
Noxious Weed:	A plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or nonnative, new, or not common to the United States, according to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or had adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.
Objective:	A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Making objectives attainable, time-specific, and measurable (Service Manual 602 FW 1.6N).
Plant Association:	A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.
Plant Community:	An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community.
Preferred Alternative:	This is the alternative determined [by the decision maker] to best achieve the Refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management.
Prescribed Fire:	The application of fire to wildland fuels to achieve identified land use objectives (Service Manual 621 FW 1.7). May be from natural ignition or intentional ignition.

Priority Species:	Fish and wildlife species that the Washington Department of Fish and Wildlife believe require protective measures and/or management guidelines to ensure their perpetuation. Priority species include the following: (1) State-listed and candidate species; (2) species or groups of animals susceptible to significant population declines within a specific area or statewide by virtue of their inclination to aggregate (e.g., seabird colonies); and (3) species of recreation, commercial, and/or tribal importance.
Public Involvement Plan:	Broad long-term guidance for involving the public in the comprehensive planning process.
Public Involvement:	A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.
Public:	Individuals, organizations, and groups; officials of Federal, State, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in service issues and those who do or do not realize that Service decisions may affect them.
Purposes of the Refuge:	“The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge sub-unit.” For refuges that encompass Congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge (Service Manual 602 FW 106 S).
Recommended Wilderness:	Areas studied and found suitable for wilderness designation by both the Director and Secretary, and recommended for designation by the President to Congress. These areas await only legislative action by congress in order to become part of the Wilderness System. Such areas are also referred to as “pending in Congress” (Draft Service Manual 610 FW 1.5).
Record of Decision (ROD):	A concise public record of decision prepared by the Federal agency, pursuant to NEPA, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).
Refuge Goal:	See Goal.

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

Wilderness Study Areas:

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

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

Wilderness:

See Designated Wilderness

Wildfire:

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

Wildland Fire:

Every wildland fire is either a wildfire or a prescribed fire (Service Manual 621 FW 1.3)

ACRONYMS AND ABBREVIATIONS

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

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Appendix III. Relevant Legal Mandates

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 Secretary of the Interior and Commerce to enter into cooperative agreements with states and other non-Federal interest for conservation, development, and enhancement of anadromous fish and contribute up to 50 percent as the Federal share of the cost of carrying out such agreements. Reclamation construction programs for water resource projects needed solely for such fish are also authorized.
Archaeological Resources Protection Act of 1979, as amended.	This act strengthens and expands the protective provisions of the Antiquities Act of 1906 regarding archaeological resources. It also revised the permitting process for archaeological research.
Architectural Barriers Act of 1968	Requires that buildings and facilities designed, constructed, or altered with Federal funds, or leased by a Federal agency, must comply with standards for physical accessibility.
Bald and Golden Eagle Protection Act of 1940, as amended	Prohibits the possession, sale or transport of any bald or golden eagle, alive or dead, or part, nest, or egg except as permitted by the Secretary of the Interior for scientific or exhibition purposes, or for the religious purposes of Indians.

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

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

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

STATUE	DESCRIPTION
Fish and Wildlife Act of 1956	Establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry but also includes the inherent right of every citizen and resident to fish for pleasure, enjoyment, and betterment and to maintain and increase public opportunities for recreational use of fish and wildlife resources. Among other things, it authorizes the Secretary of the Interior to take such steps as may be required for the development, advancement, management, conservation and protection of fish and wildlife resources including, but not limited to, research, development of existing facilities, and acquisition by purchase or exchange of land and water or interests therein.
Fish and Wildlife Conservation Act of 1980, as amended	Requires the Service to monitor nongame bird species, identify species of management concern, and implement conservation measures to preclude the need for listing under the Endangered Species Act.
Fish and Wildlife Coordination Act of 1958	Promotes equal consideration and coordination of wildlife conservation with other water resource development programs by requiring consultation with the Fish and Wildlife Service and the state fish and wildlife agencies where the “waters of a stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted...or otherwise controlled or modified” by any agency under Federal permit or license.
Improvement Act of 1978	This act was passed to improve the administration of fish and wildlife programs and amends several earlier laws, including the Refuge Recreation Act, the National Wildlife Refuge Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out volunteer programs.
Fish and Wildlife Programs Improvement and National Wildlife Refuge System Centennial Act of 2000	Recognizes the vital importance of the Refuge System and the fact that the System will celebrate its centennial anniversary in the year 2003. Established the National Wildlife Refuge System Centennial Commission to prepare a plan to commemorate the 100 th anniversary of the System, coordinate activities to celebrate that event, and host a conference on the National Wildlife Refuge System. The commission is also responsible for developing a long-term plan to meet the priority operations; maintenance and construction needs for the System, and improve public use programs and facilities.
Fishery (Magnuson) Conservation and Management Act of 1976	Established Regional Fishery Management Councils comprised of Federal and State officials including the Fish and Wildlife Service. It provides for regulation of foreign fishing and vessel fishing permits.

STATUE	DESCRIPTION
Freedom of Information Act, 1966	Requires all Federal agencies to make available to the public for inspection and copying administrative staff manuals and staff instructions, official, published and unpublished policy statements, final orders deciding case adjudication, and other documents. Special exemptions have been reserved for nine categories of privileged material. The Act requires the party seeking the information to pay reasonable search and duplication costs.
Geothermal Steam Act of 1970, as amended	Authorizes and governs the lease of geothermal steam and related resources on public lands. Section 15 c of the Act prohibits issuing geothermal leases on virtually all Service-administrative lands.
Lacey Act of 1900, as amended	Originally designed to help states protect their native game animals and to safeguard U.S. crop production from harmful foreign species. This Act prohibits interstate and international transport and commerce of fish, wildlife or plant taken in violation of domestic or foreign laws. It regulates the introduction to America of foreign species into new locations.
Land and Water Conservation Fund Act of 1948	This act provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources for land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for outdoor recreation projects and for land acquisition by various federal agencies including the Fish and Wildlife Service.
Marine Mammal Protection Act of 1972, as amended	The 1972 Marine Mammal Protection Act established a Federal responsibility to conserve marine mammals with management vested in the Department of Interior for sea otter, walrus, polar bear, dugong, and manatee. The Department of Commerce is responsible for cetaceans and pinnipeds, other than the walrus. With certain specified exceptions, the Act establishes a moratorium on the taking and importation of marine mammals as well as products taken from them.
Migratory Bird Conservation Act of 1929	Established a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. The role of the Commission was expanded by the North American Wetland Conservation Act to include approving wetlands acquisition, restoration, and enhancement proposals recommended by the North American Wetlands Conservation Council.
Migratory Bird Hunting and Conservation Stamp Act of 1934	Also commonly referred to as the Duck Stamp Act", requires waterfowl hunters 16 years of age or older to possess a valid Federal hunting stamp. Receipts from the sale of the stamp are deposited into the Migratory Bird Conservation Fund for the acquisition of migratory bird refuges.

STATUE	DESCRIPTION
Migratory Bird Treaty Act of 1918, as amended	This Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Except as allowed by special regulations, this Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export or import any migratory bird, part, nest, egg or product.
Mineral Leasing Act for Acquired Lands (1947), as amended	Authorizes and governs mineral leasing on acquired public lands.
Minerals Leasing Act of 1920, as amended	Authorizes and governs leasing of public lands for development of deposits of coal, oil, gas and other hydrocarbons, sulphur, phosphate, potassium and sodium. Section 185 of this title contains provisions relating to granting rights-of-ways over Federal lands for pipelines.
Mining Act of 1872, as amended	Authorizes and governs prospecting and mining for the so-called "hardrock" minerals (such as gold and silver) on public lands.
National and Community Service Act of 1990	Authorizes several programs to engage citizens of the U.S. in full-and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Among other things, this 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 an Act of Congress. Several National Trails cross units of the National Wildlife Refuge System.

STATUE	DESCRIPTION
National Wildlife Refuge System Administration Act of 1966	Prior to 1966, there was no single Federal Law that governed the administration of the various wildlife refuges that had been established. This Act defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of an area provided such use is compatible with the major purposes(s) for which the area was established.
National Wildlife Refuge System Improvement Act of 1997	This Act amends the National Wildlife Refuge System Administration Act of 1966. This Act defines the mission of the National Wildlife Refuge System, establishes the legitimacy and appropriateness of six priority 'wildlife-dependent' public uses, establishes a formal process for determining 'compatible uses' of System lands, identifies the Secretary of the Interior as responsible for managing and protecting the System, and requires the development of a 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 grants program to fund projects that promote the conservation of Neotropical migratory birds in the united States, Latin America and the Caribbean.
North American Wetlands Conservation Act of 1989	Provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, U.S. and Mexico. North American Wetlands Conservation Council is created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. Available funds may be expended for up to 50 percent of the United States share cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on Federal lands).
Refuge Recreation Act of 1962, as amended	This Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife oriented recreational development or protection of natural resources. It also authorizes the charging fees for public uses.

STATUE	DESCRIPTION
Partnerships for Wildlife Act of 1992	Establishes a Wildlife Conservation and Appreciation Fund, to receive appropriated funds and donations from the National Fish and Wildlife Foundation and other private sources to assist the State fish and game agencies in carrying out their responsibilities for conservation of nongame species. The funding formula is no more that 1/3 Federal funds, at least 1/3 Foundation funds, and at least 1/3 State funds.
Refuge Revenue Sharing Act of 1935, as amended	Provided for payments to counties in lieu of taxes from areas administered by the Fish and Wildlife Service. Counties are required to pass payments along to other units of local government within the county, which suffer losses in tax revenues due to the establishment of Service areas.
Rehabilitation Act of 1973	Requires nondiscrimination in the employment practices of Federal agencies of the executive branch and contractors. It also requires all federally assisted programs, services, and activities to be available to people with disabilities.
Rivers and Harbors Appropriations Act of 1899, as amended	Requires the authorization by the U.S. Army Corps of Engineers prior to any work in, on, over, or under a navigable water of the United States. The Fish and Wildlife Coordination Act provides authority for the Service to review and comment on the effects on fish and wildlife activities proposed to be undertaken or permitted by the Corps of Engineers. Service concerns include contaminated sediments associated with dredge or fill projects in navigable waters.
Sikes Act (1960), as amended	Provides for the cooperation by the Department of the Interior and Defense with State agencies in planning, development, and maintenance of fish and wildlife resources and outdoor recreation facilities on military reservations throughout the U.S. It requires the Secretary of each military department to use trained professionals to manage the wildlife and fishery resource under his jurisdiction, and requires Federal and State fish and wildlife agencies be given priority in management of fish and wildlife activities on military reservations.
Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948	This Act provides that upon determination by the Administrator of the General Services Administration, real property no longer needed by a Federal agency can be transferred, without reimbursement, to the Secretary of the Interior if the land has particular value for migratory birds, or to a State agency for other wildlife conservation purposes.
Transportation Equity Act for the 21 st Century (1998)	Established the Refuge Roads Program, requires transportation planning that includes public involvement, and provides funding for approved public use roads and trails and associated parking lots, comfort stations and bicycle/pedestrian facilities.

STATUE	DESCRIPTION
Uniform Relocation and Assistance and Real Property Acquisition Policies Act (1970), as amended	Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. The Act requires that any purchase offer be no less than the fair market value of the property.
Water Resources Planning Act of 1965	Established Water Resources Council to be composed of Cabinet representatives including the Secretary of the Interior. The Council reviews river basin plans with respect to agricultural, urban, energy, industrial, recreational and fish and wildlife needs. The act also established a grant program to assist States in participating in the development of related comprehensive water and land use plans.
Wild and Scenic Rivers Act of 1968, as amended	This act selects certain rivers of the nation possessing remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values; preserves them in a free-flowing condition; and protects their local environments.
Wilderness Act of 1964, as amended	The Wilderness Act of 1964 directs the Secretary of the Interior to review every roadless area of 5,000 acres or more and every roadless island regardless of size within the National Wildlife Refuge System and to recommend suitability of each such area. The Act permits certain activities within designated Wilderness Areas that do not alter natural processes. Wilderness values are preserved through a “minimum tool” management approach, which requires refuge managers to use the least intrusive methods, equipment and facilities necessary for administering the areas.
Youth Conservation Corps Act of 1970	Established a permanent Youth Conservation Corps (YCC) programs within the Department of Interior and Agriculture. Within the Service, YCC participants perform many tasks on refuges, fish hatcheries, and research stations.

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

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

EXECUTIVE ORDERS	DESCRIPTIONS
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. (2001)	Instructs federal agencies to conserve migratory birds by several means, including the incorporation of strategies and recommendations found in Partners in Flight Bird Conservation plans, the North American Waterfowl Plan, the North American Waterbird Conservation Plan, and the United States Shorebird Conservation Plan, into agency management plans and guidance documents.

Appendix IV. Public Involvement

SUMMARY OF PUBLIC SCOPING COMMENTS

The planning team identified a number of issues, concerns and opportunities related to fish and wildlife conservation, habitat management, recreation, and protection of threatened and endangered species. Additionally, the planning team considered federal and state mandates, as well as applicable local ordinances, regulations, and plans. The team also directed the process of obtaining public input through a public scoping meeting, open planning team meetings, comment forms, and personal contacts. All public and advisory team comments were considered; however, some issues important to the public fall outside the scope of the decision to be made within this planning process. The team has considered all issues that were raised throughout this planning process, and has developed a plan that attempts to balance the competing opinions regarding important issues. The team identified those issues that, in its best professional judgment, are most significant to the refuge. A summary of the significant issues follows.

FISH AND WILDLIFE POPULATIONS AND HABITAT MANAGEMENT

- Grassland birds: providing pine savanna habitat for the benefit of these species
- Other migratory birds: improving knowledge base for management by increasing baseline knowledge of the distribution, abundance and use of the refuge by a variety of birds, including waterfowl, marsh birds and landbirds
- Amphibians and reptiles: continuing monitoring their presence through surveys and consider projects that might benefit their populations while pursuing primary MSC-oriented goals and objectives of refuge
- Wet pine savanna habitat: maintaining and increasing the area of this rare and vanishing, fire-maintained, subclimax vegetation community on the refuge
- Other habitats: maintaining flatwood forest, forested wetlands, ponds and salt pannes on the refuge
- Fire management: proactively using prescribed fire for habitat management and fuel reduction objectives in a rapidly developing area with ever more constraints that must be observed by fire managers
- Manage and protect migratory birds
- Achieve goals (savanna restoration, fire, roll chopping, etc.) to meet refuge purpose of establishing breeding pairs of Mississippi sandhill cranes
- After fire, conduct migratory bird surveys in savanna

RESOURCE PROTECTION

- Invasive species: cogongrass is the principal invasive on the refuge with tallow trees in second place; should aim to sharply reduce the former and even eliminate the latter
- Control invasive plant species
- Law enforcement: dumping of refuse, rubbish, and old furniture has been a particular problem on the refuge
- Cultural resources: not much is known about the refuge's cultural resources and the refuge lacks a Cultural Resources Management Plan as well as a comprehensive survey of cultural resources
- Increase law enforcement
- Pursuit of willing sellers in the acquisition boundary
- Partner with TNC to speed up the process of land acquisition for USFWS
- NERR mentioned a possibility to follow through with their land acquisition
- Houses within the Pecan community may be acquired by FEMA and given to Jackson County. FWS should consider a refuge boundary expansion to incorporate these lands
- Bayou Heron Road (major dump site, gate road to keep folks out)
- Two landowners of small tracts were interested in selling their property to the refuge

VISITOR SERVICES

- Overall public use and visitor services: the refuge lacks a Visitor Services Plan and a park ranger to implement it; overall, the refuge should be doing more to attract and appeal to the public to increase appreciation and support as threats and pressures intensify from rapid local development
- Signage and brochure: Need to make and place standard refuge signs along roads and trails; refuge also needs a general refuge brochure that complies with FWS graphics and format standards
- Wildlife observation and photography: there are limited opportunities and facilities, but these could be expanded
- Environmental education and interpretation: while staff participates in both, efforts are limited by the lack of a park ranger who would focus on these and other visitor services
- Hunting and fishing: explore opportunities to expand/enhance current hunting and fishing programs

-
- Volunteers: volunteers participate in a variety of activities but the establishment of a Friends Group would expand their potential
 - Develop and strengthen partnerships related to environmental education and visitor use programs
 - Hire Interpretive Specialist
 - Partner with NERR to get message out
 - Develop Friends Group to advocate for both Refuge and Reserve
 - Pool volunteers to maximize output
 - Coordinate with MDWFP on hunting and fishing programs on the Refuge and expand the state's participation in refuge planning activities.
 - Add a primitive weapons hunt (muzzleloader)
 - Hunters believe that deer populations are on the rise and that muzzleloaders are needed
 - Hunters are also aware that the hurricane reduced wildlife numbers; but they will rebound

REFUGE ADMINISTRATION

- Establish/update Refuge/Reserve MOU with NERR (new building/daily operations)
- NERR requested some form of housing to continue to bring researchers/students to the Refuge/Reserve
- Increased security at Bayou Heron boat launch
- Increased law enforcement presence at high public use areas
- Light at boat ramp (added security for residents, their belongings, and deter illegal activity)
- Boat tickets (management areas) to track how many boats are launched and who has launched

Appendix V. Compatibility Determinations

GRAND BAY NATIONAL WILDLIFE REFUGE COMPATIBILITY DETERMINATIONS

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

Uses: Several uses were evaluated to determine their compatibility with the Refuge System and the mission and purposes of the refuge: (1) big game hunting; (2) dove hunting; (3) environmental education; (4) environmental interpretation; (5) recreational fishing; (6) small game hunting; (7) waterfowl hunting; (8) wildlife observation; and (9) wildlife photography.

Refuge Name: Grand Bay National Wildlife Refuge.

Date Established: 1992.

Establishing and Acquisition Authorities:

Emergency Wetlands Resources Act of 1986; Endangered Species Act of 1973; Fish and Wildlife Act of 1956.

Refuge Purposes:

“... 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) (Emergency Wetlands Resources Act of 1986)

“... to conserve (A) fish or wildlife which are listed as endangered species or threatened species or (B) plants ...” 16 U.S.C. § 1534 (Endangered Species Act of 1973)

“... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...” 16 U.S.C. § 742f(a)(4) “... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ...” 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

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

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

Other Applicable Laws, Regulations, and Policies:

Antiquities Act of 1906 (34 Stat. 225)
Migratory Bird Treaty Act of 1918 (15 U.S.C. 703-711; 40 Stat. 755)
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715r; 45 Stat. 1222)
Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-178h; 48 Stat. 451)
Criminal Code Provisions of 1940 (18 U.S.C. 41)
Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d; 54 Stat. 250)
Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)
Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)
Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)
Wilderness Act (16 U.S.C. 1131; 78 Stat. 890)
Land and Water Conservation Fund Act of 1965
National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et seq.; 80 Stat. 915)
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd, 668ee; 80 Stat. 927)
National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et. seq; 83 Stat. 852)
Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 10989)
Endangered Species Act of 1973 (16 U.S.C. 1531 et. seq; 87 Stat. 884)
Refuge Revenue Sharing Act of 1935, as amended in 1978 (16 U.S.C. 715s; 92 Stat. 1319)
National Wildlife Refuge Regulations for the Most Recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3)
Emergency Wetlands Resources Act of 1986 (S.B. 740)
North American Wetlands Conservation Act of 1990
Food Security Act (Farm Bill) of 1990 as amended (HR 2100)
The Property Clause of the U.S. Constitution Article IV 3, Clause 2
The Commerce Clause of the U.S. Constitution Article 1, Section 8
The National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, USC668dd)
Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System, March 25, 1996
Title 50, Code of Federal Regulations, Parts 25-33
Archaeological Resources Protection Act of 1979
Native American Graves Protection and Repatriation Act of 1990

Description of Use: *Big Game Hunting*

Hunting is one of the six priority public uses as identified in the National Wildlife Refuge System Improvement Act of 1997. Big game hunting (archery only) for white-tailed deer and feral hog would enable the general public to participate in recreational hunting on Grand Bay National Wildlife Refuge.

Hunters must possess a refuge hunting permit and may only hunt desired species within the outlined hunting season of the State of Alabama or the State of Mississippi and any specific refuge regulations.

Hunting will be limited to areas within the refuge boundaries which are open to hunting. Hunting will not be allowed in areas which are closed due to potential harm to other refuge visitors or endangered species. Maps will be distributed to all hunters with their hunting permits, identifying areas designated as closed.

All hunting activities follow applicable state and federal laws and seasons. The refuge may administer further restrictions to ensure compliance with refuge-specific laws and compatibility issues.

Since the refuge is a daylight use only area, night hunts may not occur within the boundaries of the Grand Bay National Wildlife Refuge. Refuge management reserves the right to alter season length if public safety, resources, or endangered/threatened species are in jeopardy.

The general public would park vehicles in designated parking areas and proceed on foot to desired hunting locations. Due to severe impacts to the habitat (wet pine savanna), all-terrain vehicles (ATVs) are prohibited. Tree stands and blinds should be removed daily (no permanent structures). A signed copy of the Grand Bay National Wildlife Refuge Hunting Permit is required and must be in the possession of all hunters at all times. Facilities such as boat ramps, designated parking areas and foot trails which are not posted closed to hunting may be used. Camping, campsites, and campfires are prohibited on Grand Bay NWR.

This use is proposed by the refuge to provide a form of wildlife-dependent recreation (big game hunting) to the general public that is in compliance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Improvement Act of 1997. This use would also assist in the management of the game species, in particular white-tailed deer and feral hogs, found within the boundaries of Grand Bay National Wildlife Refuge. If negative impacts to other public uses, resources, public safety, threatened or endangered species, or significant declines in game populations emerge, the hunting program would be adjusted accordingly during the annual review.

Availability of Resources:

Resources involved in the administration and management of the use: Travel to attend annual hunt coordination meetings with state and federal partners. Nominal cost to print hunt brochures and permits, which would be disseminated to the general public.

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

Maintenance costs: None

Monitoring costs: No additional costs. Law enforcement officers throughout the Gulf Coast National Wildlife Refuge Complex would routinely field-check hunter compliance to state, federal, and refuge-specific regulations.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Disturbance to wildlife during the hunting season as people participate in the unit is an anticipated affect. Disturbance by vehicles would be limited as off-road travel or use of all-terrain vehicles (ATVs) would not be permitted.

Long-term impacts: If long-term impacts are realized to game populations, resources, threatened or endangered species, public health and safety, or other public uses on the refuge, adjustments to the hunting program would be made during an annual review process. Because these ecological systems are dynamic, adaptive management techniques will be applied if warranted.

Cumulative impacts: Health of game populations resulting in quality hunting program within the boundaries of the Grand Bay National Wildlife Refuge.

Public Review and Comment: This compatibility determination is being made available for public review and comment in conjunction with the public comment period for the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Grand Bay National Wildlife Refuge. Public comments on this compatibility determination are invited and are due by the deadline stated on the cover of the Draft CCP/EA.

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

Determination:

Big Game Hunting (white-tailed deer and feral hog) Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: The hunt program for big game will be conducted in accordance with state (Mississippi and Alabama) hunt regulations, as well as refuge-specific regulations. Annually refuge management will review impacts to habitat, nonhunted species, and hunted species and make adjustments to the hunting program if negative impacts are realized. Hunt season dates and bag limits will be adjusted as needed to achieve reduction of the resident breeding population of white-tailed deer. Coordination with the State of Mississippi's Department of Wildlife, Fisheries, and Parks and the State of Alabama's Department of Conservation and Natural Resources will also provide valuable input related to bag limits, hunter distribution, and state wildlife trends.

Big game hunting (archery only) for white-tailed deer and feral hogs on Grand Bay NWR are subject to the following refuge-specific regulations:

1. The use or construction of any permanent tree stand is prohibited.
2. Portable and climbing stands are allowed but must be removed from the tree when not in use or they will be subject to confiscation.
3. Safety belts are required at all times with the use of tree stands.
4. The refuge is a day-use area only with the exception of legal hunting activities.
5. The use of all-terrain vehicles (ATVs) is prohibited on all refuge hunts.
6. The use of mules and horses is prohibited on all refuge hunts.
7. The use of organized deer drives by two or more hunters is prohibited. The definition of a drive is: the act of chasing, pursuing, disturbing, or otherwise directing deer so as to make the animals more susceptible to harvest.
8. Target practice on refuge property is prohibited.
9. All hunters must have in their possession a current, signed copy of the Grand Bay National Wildlife Refuge Hunting Permit while participating in refuge hunts.

If conflicts with other refuge uses arise, time/space zoning will be employed and actions will be taken to minimize future conflicts.

Justification: Hunting is a historical and current tradition of the residents of southern Alabama and Mississippi. The Grand Bay NWR Hunting Plan provides the management needed to ensure compatibility with the goals of the refuge and to maintain compliance with the National Wildlife Improvement Act of 1997. Annual wildlife surveys or observations conducted by either the U.S. Fish and Wildlife Service or comparable state agencies have provided data to ensure that hunting of these species doesn't jeopardize long range population goals. Additional surveys/observations on Grand

Bay National Wildlife Refuge would provide the necessary data for managing the hunting program into the future.

NEPA Compliance for Refuge Use Description: *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- or 15-year Re-evaluation Date: _____

Description of Use: *Dove Hunting*

Hunting is one of the six priority public uses as identified in the National Wildlife Refuge System Improvement Act of 1997. Dove hunting would enable the general public to participate in one form of recreational hunting on Grand Bay National Wildlife Refuge.

Hunters must possess a refuge hunting permit and may only hunt desired species within the outlined hunting season of the State of Alabama or the State of Mississippi and any specific refuge regulations.

Hunting will be limited to areas within the refuge boundaries which are open to hunting. Hunting will not be allowed in areas that are closed due to potential harm to other refuge visitors or endangered species. Maps will be distributed to all hunters with their hunting permits, identifying areas designated as closed.

All hunting activities follow applicable state and federal laws and seasons the refuge may administer further restrictions to ensure compliance with refuge specific laws and compatibility issues. Since the refuge is a daylight use only area, night hunts may not occur within the boundaries of Grand Bay National Wildlife Refuge. Refuge management reserves the right to alter season length if public safety, resources, or endangered/threatened species are in jeopardy.

The general public would park vehicles in designated parking areas and proceed on foot to desired hunting locations. Due to severe impacts to the habitat (wet pine savanna), all-terrain vehicles (ATVs) are prohibited. All hunting blinds should be removed daily (no permanent structures). A signed copy of the Grand Bay National Wildlife Refuge Hunting Permit is required and must be in the possession of all hunters at all times. Facilities such as boat ramps, designated parking areas and foot trails which are not posted closed to hunting may be used. Camping, campsites, and campfires are prohibited on Grand Bay NWR.

This use is proposed by the refuge to provide a form of wildlife-dependent recreation (migratory bird hunting) to the general public which is in compliance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Improvement Act of 1997. This use would also assist in the management of the game species, in particular mourning doves, found within the boundaries of Grand Bay National Wildlife Refuge. If negative impacts to other public

uses, resources, public safety, threatened or endangered species, or significant declines in game populations emerge, the hunting program would be adjusted accordingly during the annual review.

Availability of Resources:

Resources involved in the administration and management of the use: Travel to attend annual hunt coordination meetings with state and federal partners. Nominal cost to print hunt brochures and permits, which would be disseminated to the general public.

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

Maintenance costs: None

Monitoring costs: No additional costs. Law enforcement officers throughout the Gulf Coast National Wildlife Refuge Complex would routinely field check hunter compliance to state, federal, and refuge-specific regulations.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Disturbance to wildlife during the hunting season as people participate in the unit is an anticipated affect. Disturbance by vehicles would be limited as off-road travel or use of all-terrain vehicles (ATVs) would not be permitted.

Long-term impacts: If long-term impacts are realized to game populations, resources, threatened or endangered species, public health and safety, or other public uses on the refuge adjustments to the hunting program would be made during an annual review process. Because these ecological systems are dynamic adaptive management techniques will be applied if warranted.

Cumulative impacts: Health of game populations resulting in quality hunting program within the boundaries of the Grand Bay National Wildlife Refuge.

Public Review and Comment: This compatibility determination is being made available for public review and comment in conjunction with the public comment period for the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Grand Bay National Wildlife Refuge. Public comments on this compatibility determination are invited and are due by the deadline stated on the cover of the Draft CCP/EA.

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

Determination:

Hunting of Migratory Birds (mourning doves)

Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: The dove hunting program will be conducted in accordance with state (Mississippi and Alabama) hunt regulations as well as refuge-specific regulations. Annually refuge management will review impacts to habitat, nonhunted species, and hunted species and make adjustments to the hunting program if negative impacts are realized. Hunt season dates and bag limits will be adjusted as needed to ensure dove populations are not negatively impacted. Coordination with the State of Mississippi's Department of Wildlife, Fisheries, and Parks and the State of Alabama's Department of Conservation and Natural Resources will also provide valuable input related to bag limits, hunter distribution, and state wildlife trends.

Hunting of mourning doves will be subject to the following refuge-specific regulations:

1. Only portable or temporary blinds may be used.
2. All portable or temporary blinds and decoys must be removed from the refuge following each day's hunt.
3. Each hunter must possess only approved nontoxic shot while hunting dove in the field.
4. The refuge is a day-use area only with the exception of legal hunting activities.
5. The use of all-terrain vehicles (ATVs) is prohibited on all refuge hunts.
6. Target practice on refuge property is prohibited.
7. Mules and horses are prohibited on refuge hunts.
8. All firearms must be unloaded and encased or dismantled before transporting them in a vehicle or boat within the boundaries of the refuge or along rights-of-way for public or private land within the refuge.
9. Each hunter must have in his/her possession a current, signed copy of the Grand Bay National Wildlife Refuge Hunting Permit while participating in refuge hunts.

If conflicts with other refuge uses arise, time/space zoning will be employed and actions will be taken to minimize future conflicts.

Justification: Hunting is a historical and current tradition of the residents of southern Alabama and Mississippi. The Grand Bay NWR Hunting Plan provides the management needed to ensure compatibility with the goals of the refuge and to maintain compliance with the National Wildlife Refuge System Improvement Act of 1997. Annual wildlife surveys or observations conducted by either the U.S. Fish and Wildlife Service or comparable state agencies have provided data to ensure that hunting of these species doesn't jeopardize long-range population goals. Additional surveys and observations on Grand Bay National Wildlife Refuge would provide the necessary data for managing the hunting program into the future.

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- or 15-year Re-evaluation Date: _____

Description of Use: *Environmental Education*

Environmental education is one of the six priority public uses as identified in the National Wildlife Refuge System Improvement Act of 1997.

All areas of the refuge will be open to environmental education unless the area is posted closed to the public or closed to all entry. Primary areas for this public use will be the Escatawpa River Trail and the Oak Grove Trail. Both trails have wheelchair-accessible surfacing material (porous pavement and boardwalk). The wheelchair-accessible portion of the Escatawpa Trail ends at an overlook of the Escatawpa River. These trails would give visitors the opportunity to visit a wide array of the habitats and inhabitants of the refuge. Gated roads may be traveled by foot traffic only to reach the refuge interior unless they are posted closed to all entry. Also, an Education Pavilion at the terminus of Bayou Heron Road will serve as a locale for environmental education events that feature the marsh, estuary, and bayou. The refuge headquarters and trail head kiosks will also provide educational information.

All uses will be conducted within regular refuge hours. Refuge hours are a half-hour before sunrise to a half-hour after sunset, 7 days a week. Special events must be scheduled with the refuge staff.

Refuge visitors are welcome to come to the refuge and participate in environmental education events along the trails, roads, waterways, or any areas identified during a special event. The refuge headquarters, the education pavilion, and field tours may serve as a gathering place to educate visitors during staff-led special events. For nonstaff-led visitors, educational kiosks and brochures would be available for public viewing at trail heads or refuge headquarters.

Environmental education is one of the six priority public uses as defined by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 05-57). If environmental education is deemed compatible, it would receive enhanced consideration over other types of public uses or activities for the general public.

Availability of Resources:

Resources involved in the administration and management of the use: No additional funding will be required since there will not be an expansion of environmental educational opportunities on the refuge.

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

Maintenance costs: None

Monitoring costs: No additional costs. Law enforcement officers throughout the Gulf Coast National Wildlife Refuge Complex would routinely provide safety to refuge visitors participating in environmental education.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Vehicle disturbance would be minimal since off-road travel and ATVs are prohibited. Minimal impacts would be realized since visitors would generally traverse the refuge on the graveled, boardwalked, and gravel paved trails. A minority of wildlife observers may travel by foot into the refuge interior in areas that are not posted closed to all entry, but their impact on the resources would be minimal.

Long-term impacts: If long-term impacts are realized to resources, threatened or endangered species, public health and safety, or other public uses on the refuge, adjustments to all environmental education opportunities would be addressed. Because off road-vehicle use is not permitted and ATVs are prohibited, it is anticipated that vegetation would be minimally trampled by a minority the environmental education participants. Most environmental education would take place on nature trails, observation decks, piers, or staff/volunteer-led events. Because these ecological systems are dynamic, adaptive management techniques will be applied if warranted.

Cumulative impacts: Public activity along trails or other heavily used areas may displace birds that are close to said area. Also, vegetation may become trampled if the same entry/exit to refuge interior is used frequently.

Public Review and Comment: This compatibility determination is being made available for public review and comment in conjunction with the public comment period for the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Grand Bay National Wildlife Refuge. Public comments on this compatibility determination are invited and are due by the deadline stated on the cover of the Draft CCP/EA.

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

Determination:

Environmental Education

Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: ATV use is prohibited on Grand Bay NWR. Grand Bay NWR is a daylight use only refuge. Refuge visitors are limited to participate in environmental education in areas that are not posted closed to all entry. Refuge management would reserve the right to close areas of the refuge that may be considered hazardous to the general public, which interferes with refuge management operations, or if the proposed use (environmental education) negatively impacts the resources of the refuge.

Justification: One of the secondary goals of the National Wildlife Refuge System is to assist the general public in developing or reestablishing a connection with wildlife on refuges if it is deemed compatible. Environmental education is identified in the National Wildlife Refuge System Improvement Act of 1997 as one of the six priority public uses. This public activity will not interfere with the National Wildlife Refuge System mission or the purposes of Grand Bay NWR.

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- or 15-year Re-evaluation Date: _____

Description of Use: *Environmental Interpretation*

Environmental interpretation is one of the six priority public uses as identified in the National Wildlife Refuge System Improvement Act of 1997.

All areas of the refuge will be open to environmental interpretation unless the area is posted closed to the public or closed to all entry. Primary areas for this public use will be the Escatawpa River Trail and the Oak Grove Trail. Both trails have wheelchair-accessible surfacing material (porous pavement and boardwalk). The wheelchair-accessible portion of the Escatawpa Trail ends at an overlook of the Escatawpa River. These trails give visitors the opportunity to visit a wide array of the habitats and inhabitants of the refuge. Gated roads may be travelled by foot traffic only to reach the refuge interior unless they are posted closed to all entry. Also, an Education Pavilion at the terminus of Bayou Heron Road will serve as a locale for environmental interpretation events which feature the marsh, estuary, and bayou. The refuge headquarters and trail head kiosks will also provide interpretive information.

All uses will be conducted within regular refuge hours. Refuge hours are a half-hour before sunrise to a half-hour after sunset, 7 days a week. Special events must be scheduled with the refuge staff.

Refuge visitors are welcome to come to the refuge and participate in environmental education events along the trails, roads, waterways, or any areas identified during a special event. The refuge headquarters, the education pavilion, and field tours may serve as a gathering place to educate visitors during staff-led special events. For nonstaff-led visitors, educational kiosks and brochures would be available for public viewing at trail heads or refuge headquarters.

Environmental interpretation is one of the six priority public uses as defined by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 05-57). If environmental interpretation is deemed compatible, it would receive enhanced consideration over other types of public uses or activities for the general public.

Availability of Resources:

Resources involved in the administration and management of the use: No additional funding will be required since there will not be an expansion of environmental interpretation opportunities on the refuge.

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

Maintenance costs: None

Monitoring costs: No additional costs. Law enforcement officers throughout the Gulf Coast National Wildlife Refuge Complex would routinely provide safety to refuge visitors participating in environmental interpretation.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Vehicle disturbance would be minimal since off road travel and ATVs are prohibited. Minimal impacts would be realized since visitors would generally traverse the refuge on the graveled, boardwalked, and gravel paved trails. A minority of wildlife observers may travel by foot into the refuge interior in areas that are not posted closed to all entry, but their impact on the resources would be minimal.

Long-term impacts: If long-term impacts are realized to resources, threatened or endangered species, public health and safety, or other public uses on the refuge, adjustments to all environmental interpretation programs would be addressed. Because off-road vehicle use is not permitted and ATVs are prohibited, it is anticipated that vegetation would be minimally trampled by a minority of the environmental interpretation participants. Most environmental interpretation would take place on nature trails, observation decks, piers, or staff/volunteer-led events. Because these ecological systems are dynamic, adaptive management techniques will be applied if warranted.

Cumulative impacts: Public activity along trails or other heavily used areas may displace birds that are close to said area. Also, vegetation may become trampled if the same entry/exit to the refuge interior is used frequently.

Public Review and Comment: This compatibility determination is being made available for public review and comment in conjunction with the public comment period for the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Grand Bay National Wildlife Refuge. Public comments on this compatibility determination are invited and are due by the deadline stated on the cover of the Draft CCP/EA.

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

Determination:

Environmental Interpretation

Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

ATV use is prohibited on Grand Bay NWR. Grand Bay NWR is a daylight use only refuge. Refuge visitors are limited to participate in environmental interpretation in areas that are not posted closed to all entry. Refuge management would reserve the right to close areas of the refuge that may be considered hazardous to the general public, which interferes with refuge management operations, or if the proposed use (environmental interpretation) negatively impacts the resources of the refuge.

Justification:

One of the secondary goals of the National Wildlife Refuge System is to assist the general public in developing a connection, or re-establishing a connection, with wildlife on refuges if it is deemed compatible. Environmental interpretation is identified in the National Wildlife Refuge System Improvement Act of 1997 as one of the six priority public uses. This public activity will not interfere with the National Wildlife Refuge System mission or the purposes of the Grand Bay NWR.

NEPA Compliance for Refuge Use Description: *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- or 15-year Re-evaluation Date: _____

Description of Use: *Recreational Fishing*

Fishing is one of the six priority public uses as identified in the National Wildlife Refuge System Improvement Act of 1997.

Before the refuge was established, local residents regularly participated in recreational fishing of the bayous, estuaries, bays and rivers of the area. Residents from Mississippi and Alabama participated in recreational fishing for redfish, flounder, speckled trout, red drum, Atlantic croaker, largemouth bass, and mullet in the waters adjacent to Grand Bay NWR. Fishermen would need to have in their possession a valid fishing license and they would need to adhere to the established creel limits (Mississippi regulations in Mississippi waters; Alabama regulations in Alabama waters).

Fishing would be limited to areas within the refuge boundaries which are open to the general public. A majority of refuge fishing would take place near the Bayou Heron boat launch and pier. Bank fishermen would use the pier while boaters would launch at this location or at a privately owned boat launch at Bayou Cumbest to reach the bayous, estuaries, and bays of the Grand Bay NWR. Other inland boaters would launch their boats on privately owned ramps, such as Shingle Mill or Pollack's Ferry, to fish in the waters of the Escatawpa River or Black Creek on Grand Bay NWR. Also, there are a few freshwater ponds that would be accessed if the adjacent lands are not posted closed to all entry.

All uses will be conducted within regular refuge hours. Refuge hours are a half-hour before sunrise to a half-hour after sunset, 7 days a week.

Visitors would park their vehicles in designated areas and participate in recreational fishing on the Bayou Heron fishing pier. Boaters would launch their boats at the Bayou Heron boat launch or the privately owned Bayou Cumbest boat launch to access the refuge's bayous, estuaries, or bays. Public inland boat launch facilities, such as the Shingle Mill boat launch or Pollack's Ferry boat launch, would be used by recreational fishermen to access the Escatawpa River or Black Creek. Freshwater ponds located within the boundaries of the refuge would be included for recreational bank

fishermen as long as the surrounding lands are not posted close to all entry. The use of all-terrain vehicles (ATVs) are prohibited on Grand Bay National Wildlife Refuge.

Recreational fishing is one of the six priority public uses as defined by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 05-57). If recreational fishing is deemed compatible, it would receive enhanced consideration over other types of public uses or activities for the general public.

Availability of Resources:

Resources involved in the administration and management of the use: No additional costs will be associated with this use.

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

Maintenance costs: None

Monitoring costs: No additional costs. Law enforcement officers throughout the Gulf Coast National Wildlife Refuge Complex would routinely provide safety and to ensure that recreational fishermen on the refuge are in compliance with all fishing regulations.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Refuge visitors who participate in recreational fishing would park their vehicles on designated parking areas. Vehicle disturbance would be minimal since off road travel and ATV's are prohibited. Fishing debris left on the pier, such as unwanted tackle and discarded fishing line or beverage containers, would be the biggest impact from recreational fishermen.

Long-term impacts: If long-term impacts are realized to resources, threatened or endangered species, public health and safety, or other public uses on the refuge, adjustments to the recreational fishing program would be addressed. Because off road vehicle use is not permitted and ATVs are prohibited we anticipate that vegetation would be minimally trampled by a minority of recreational fishermen accessing refuge freshwater ponds. Most recreational fishing would take place in the bayous, estuaries, bays, rivers, creeks, and fishing pier of the refuge. The main long-term impact would be litter left behind by recreational fishermen. Because these ecological systems are dynamic, adaptive management techniques will be applied if warranted.

Cumulative impacts: Health of fish populations resulting in quality recreational fishing program within the boundaries of the Grand Bay National Wildlife Refuge.

Public Review and Comment: This compatibility determination is being made available for public review and comment in conjunction with the public comment period for the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Grand Bay National Wildlife Refuge. Public comments on this compatibility determination are invited and are due by the deadline stated on the cover of the Draft CCP/EA.

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

Determination:

Recreational Fishing

Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

All recreational fishermen must have a valid fishing license in their possession (Mississippi license in Mississippi waters and Alabama license in Alabama waters). Recreational fishermen must be in compliance with state (Mississippi and Alabama) regulations and creel limits. ATV use is prohibited on Grand Bay NWR. Grand Bay NWR is a daylight use only refuge. Refuge visitors are limited to recreational fishing in areas that are not posted closed to all entry. Refuge management would reserve the right to close areas of the refuge that may be considered hazardous to the general public, which interferes with refuge management operations, or if the proposed use (recreational fishing) negatively impacts the resources of the refuge.

Justification:

One of the secondary goals of the National Wildlife Refuge System is to assist the general public in developing or reestablishing a connection with wildlife on refuges if it is deemed compatible. Recreational fishing is identified in the National Wildlife Refuge System Improvement Act of 1997 as one of the six priority public uses. This public activity will not interfere with the mission of the National Wildlife Refuge System or the purposes of Grand Bay NWR.

NEPA Compliance for Refuge Use Description: *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- or 15-year Re-evaluation Date: _____

Description of Use: *Small Game Hunting*

Hunting is one of the six priority public uses as identified in the National Wildlife Refuge System Improvement Act of 1997. Hunting for upland small game (squirrel) would enable the general public to participate in one form of recreational hunting on Grand Bay National Wildlife Refuge.

Hunters must possess a refuge hunting permit and may only hunt desired species within the outlined hunting season of the State of Alabama or the State of Mississippi and any specific refuge regulations.

Hunting will be limited to areas within the refuge boundaries which are open to hunting. Hunting will not be allowed in areas which are closed due to potential harm to other refuge visitors or endangered species. Maps will be distributed to all hunters with their hunting permits, identifying areas designated as closed.

All hunting activities follow applicable state and federal laws and seasons the refuge may administer further restrictions to ensure compliance with refuge specific laws and compatibility issues. Since the refuge is a daylight use only area, night hunts may not occur within the boundaries of Grand Bay National Wildlife Refuge. Refuge management reserves the right to alter season length if public safety, resources, or endangered/threatened species are in jeopardy.

The general public would park vehicles in designated parking areas and proceed on foot to desired hunting locations. Due to severe impacts to the habitat (wet pine savanna), all-terrain vehicles (ATVs) are prohibited. All hunting blinds should be removed daily (no permanent structures). A signed copy of the Grand Bay National Wildlife Refuge Hunting Permit is required and must be in the possession of all hunters at all times. Facilities such as boat ramps, designated parking areas, and foot trails which are not posted closed to hunting may be used. Camping, campsites, and campfires are prohibited on Grand Bay NWR.

This use is proposed by the refuge to provide a form of wildlife-dependent recreation (small game hunting) to the general public which is in compliance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge Improvement Act of 1997. This use would also assist in the management of the game species, in particular squirrels, found within the boundaries of Grand Bay National Wildlife Refuge. If negative impacts to other public uses, resources, public safety, threatened or endangered species, or significant declines in game populations emerge, the hunting program would be adjusted accordingly during the annual review.

Availability of Resources:

Resources involved in the administration and management of the use: Travel to attend annual hunt coordination meetings with state and federal partners. Nominal cost to print hunt brochures/permits which would be disseminated to the general public.

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

Maintenance costs: None

Monitoring costs: No additional costs. Law enforcement officers throughout the Gulf Coast National Wildlife Refuge Complex would routinely field check hunter compliance to state, federal, and refuge-specific regulations.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Disturbance to wildlife during the hunting season as people participate in the unit is an anticipated affect. Disturbance by vehicles would be limited as off-road travel or use of all-terrain vehicles (ATVs) would not be permitted.

Long-term impacts: If long term impacts are realized to game populations, resources, threatened or endangered species, public health and safety, or other public uses on the refuge, adjustments to the hunting program would be made during an annual review process. Because these ecological systems are dynamic, adaptive management techniques will be applied if warranted.

Cumulative impacts: Health of game populations resulting in quality hunting program within the boundaries of the Grand Bay National Wildlife Refuge.

Public Review and Comment: This compatibility determination is being made available for public review and comment in conjunction with the public comment period for the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Grand Bay National Wildlife Refuge. Public comments on this compatibility determination are invited and are due by the deadline stated on the cover of the Draft CCP/EA.

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

Determination:

Upland Small Game Hunting (squirrel) Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

The hunt program for small upland game (squirrel only) will be conducted in accordance with state (Mississippi and Alabama) hunt regulations as well as refuge specific regulations. Annually refuge management will review impacts to habitat, nonhunted species, and hunted species and make adjustments to the hunting program if negative impacts are realized. Hunt season dates and bag limits will be adjusted as needed to ensure populations are not negatively impacted. Coordination with the State of Mississippi’s Department of Wildlife, Fisheries, and Parks and the State of Alabama’s Department of Conservation and Natural Resources will also provide valuable input related to bag limits, hunter distribution, and state wildlife trends.

Upland game hunting of squirrel is allowed on designated areas of the refuge subject to state regulations and the following conditions:

1. The use of mules and horses are prohibited on refuge hunts.
2. The use of all-terrain vehicles (ATVs) is prohibited on all refuge hunts.
3. The refuge is a day-use area only with the exception of legal hunting activities.
4. Target practice on refuge property is prohibited.
5. Shotguns are limited to no larger than 10 gauge. All shotgun ammunition must meet legal shot-size requirements.
6. Firearms must be unloaded and encased or dismantled before transporting them in a vehicle or boat within the boundaries of the refuge or along rights-of-way for public or private land within the refuge.
7. Each hunter must have in his/her possession a current, signed copy of the Grand Bay National Wildlife Refuge Hunting Permit while participating in refuge hunts.

If conflicts with other refuge uses arise, time/space zoning will be employed and actions will be taken to minimize future conflicts.

Justification: Hunting is a historical and current tradition of the residents of southern Alabama and Mississippi. The Grand Bay NWR Hunting Plan provides the management needed to ensure compatibility with the goals of the refuge and to maintain compliance with the National Wildlife Refuge System Improvement Act of 1997. Annual wildlife surveys or observations conducted by either the U.S. Fish and Wildlife Service or comparable state agencies have provided data to ensure that hunting of this species doesn't jeopardize long-range population goals. Additional surveys and observations on Grand Bay National Wildlife Refuge would provide the necessary data for managing the hunting program into the future.

NEPA Compliance for Refuge Use Description: *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- or 15-year Re-evaluation Date: _____

Description of Use: *Waterfowl Hunting*

Hunting is one of the six priority public uses as identified in the National Wildlife Refuge System Improvement Act of 1997. Waterfowl hunting would enable the general public to participate in one form of recreational hunting on Grand Bay National Wildlife Refuge.

Hunters must possess a refuge hunting permit and may only hunt desired species within the outlined hunting season of the State of Alabama or the State of Mississippi and any specific refuge regulations.

Hunting will be limited to areas within the refuge boundaries which are open to hunting. Hunting will not be allowed in areas that are closed due to potential harm to other refuge visitors or endangered species. Maps will be distributed to all hunters with their hunting permits, identifying areas designated as closed.

All hunting activities follow applicable state and federal laws and seasons. The refuge may administer further restrictions to ensure compliance with refuge-specific laws and compatibility issues. Since the refuge is a daylight use only area, night hunts may not occur within the boundaries of the Grand Bay National Wildlife Refuge. Refuge management reserves the right to alter season length if public safety, resources, or endangered/threatened species are in jeopardy.

The general public would park vehicles in designated parking areas and proceed on foot to desired hunting locations. Due to severe impacts to the habitat (wet pine savanna), all-terrain vehicles (ATVs) are prohibited. All hunting blinds should be removed daily (no permanent structures). A signed copy of the Grand Bay National Wildlife Refuge Hunting Permit is required and must be in the possession of all hunters at all times. Facilities such as boat ramps, designated parking areas, and

foot trails that are not posted closed to hunting may be used. Camping, campsites, and campfires are prohibited on Grand Bay NWR.

This use is proposed by the refuge to provide a form of wildlife-dependent recreation (migratory bird hunting for waterfowl) to the general public which is in compliance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Improvement Act of 1997. This use would also assist in the management of the game species, in particular ducks, geese, and coots, found within the boundaries of Grand Bay National Wildlife Refuge. If negative impacts to other public uses, resources, public safety, threatened or endangered species, or significant declines in game populations emerge, the hunting program would be adjusted accordingly during the annual review.

Availability of Resources:

Resources involved in the administration and management of the use: Travel to attend annual hunt coordination meetings with state and federal partners. Nominal cost to print hunt brochures and permits, which would be disseminated to the general public.

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

Maintenance costs: None

Monitoring costs: No additional costs. Law enforcement officers throughout the Gulf Coast National Wildlife Refuge Complex would routinely field check hunter compliance to state, federal, and refuge-specific regulations.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Disturbance to wildlife during the hunting season as people participate in the unit is an anticipated effect. Disturbance by vehicles would be limited as off-road travel or use of all-terrain vehicles (ATVs) would not be permitted.

Long-term impacts: If long-term impacts are realized to game populations, resources, threatened or endangered species, public health and safety, or other public uses on the refuge, adjustments to the hunting program would be made during an annual review process. Because these ecological systems are dynamic, adaptive management techniques will be applied if warranted.

Cumulative impacts: Health of game populations resulting in quality hunting program within the boundaries of Grand Bay National Wildlife Refuge.

Public Review and Comment: This compatibility determination is being made available for public review and comment in conjunction with the public comment period for the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Grand Bay National Wildlife Refuge. Public comments on this compatibility determination are invited and are due by the deadline stated on the cover of the Draft CCP/EA.

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

Determination:

Waterfowl Hunting

Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility:

The hunt program for waterfowl will be conducted in accordance with State (Mississippi and Alabama) hunt regulations as well as refuge-specific regulations. Annually refuge management will review impacts to habitat, nonhunted species, and hunted species and make adjustments to the hunting program if negative impacts are realized. Hunt season dates and bag limits will be adjusted as needed to ensure flyway populations are not negatively impacted. Coordination with the State of Mississippi's Department of Wildlife, Fisheries, and Parks and the State of Alabama's Department of Conservation and Natural Resources will also provide valuable input related to bag limits, hunter distribution, and state wildlife trends.

Hunting of geese, ducks, and coots on designated areas of the refuge will be subject to state regulations and the following conditions:

1. Hunting of waterfowl will cease at 2:00 p.m. each day during the open season.
2. Only portable or temporary blinds may be used.
3. All portable or temporary blinds and decoys must be removed from the refuge following each day's hunt.
4. Hunters must possess only approved nontoxic shot while hunting waterfowl in the field.
5. The refuge is a day-use area only with the exception of legal hunting activities.
6. The use of all-terrain vehicles (ATVs) is prohibited on all refuge hunts.
7. Target practice is prohibited on refuge property.
8. The use of mules and horses is prohibited on refuge hunts.
9. All firearms must be unloaded and encased or dismantled before transporting them in a vehicle or boat within the boundaries of the refuge or along rights-of-way for public or private land within the refuge.
10. Each hunter must have in his/her possession a current, signed copy of the Grand Bay National Wildlife Refuge Hunting Permit while participating in refuge hunts.

If conflicts with other refuge uses arise, time/space zoning will be employed and actions will be taken to minimize future conflicts.

Justification: Hunting is a historical and current tradition of the residents of southern Alabama and Mississippi. The Grand Bay NWR Hunting Plan provides the management needed to ensure compatibility with the goals of the refuge and to maintain compliance with the National Wildlife Refuge System Improvement Act of 1997. Annual wildlife surveys or observations conducted by either the U.S. Fish and Wildlife Service or comparable state agencies have provided data to ensure that hunting of these species does not jeopardize long-range population goals. Additional surveys and observations on Grand Bay National Wildlife Refuge would provide the necessary data for managing the hunting program into the future.

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- or 15-year Re-evaluation Date: _____

Description of Use: *Wildlife Observation*

Wildlife observation is one of the six priority public uses as identified in the National Wildlife Refuge System Improvement Act of 1997.

All areas of the refuge will be open to wildlife observation unless the area is posted closed to the public or closed to all entry. Primary areas for this public use will be the Escatawpa River Trail and the Oak Grove Trail. Both trails have wheelchair-accessible surfacing material (porous pavement and boardwalk). The wheelchair-accessible portion of the Escatawpa Trail ends at an overlook of the Escatawpa River. These trails would give visitors the opportunity to visit a wide array of the habitats and inhabitants of the refuge. Gated roads may be travelled by foot traffic only to observe wildlife in the refuge interior unless they are posted closed to all entry.

All uses will be conducted within regular refuge hours. Refuge hours are a half-hour before sunrise to a half-hour after sunset, 7 days a week.

Refuge visitors are welcome to come to the refuge and participate in wildlife observation along the trail system, entry road, or waterways. The Escatawpa River Trail will be open to the public in the near future. The trailhead is adjacent to the Mississippi Department of Transportation's Welcome Center along Interstate 10. This Welcome Center is one of the busiest in the State of Mississippi and it is anticipated that the general public will pursue a high level of wildlife observation at this location. The Oak Grove Trail has experienced major renovations (wheelchair-accessible substrate) and public awareness of this trail remains low. There are no directional signs from any of the major intersections (Interstate 10 and Highway 90). Following the placement of supporting signage for these trails, the general public will be encouraged to traverse these trails during regular refuge hours. Gated roads may also be used for wildlife observation, by foot traffic only, if they are not posted closed to all entry.

Wildlife observation is one of the six priority public uses as defined by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 05-57). If wildlife observation is deemed compatible, it would receive enhanced consideration over other types of public uses or activities for the general public.

Availability of Resources:

Resources involved in the administration and management of the use: No additional funding will be required since there will no expansion of wildlife observational opportunities on the refuge.

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

Maintenance costs: None

Monitoring costs: No additional costs. Law enforcement officers throughout the Gulf Coast National Wildlife Refuge Complex would routinely provide safety to refuge visitors participating in wildlife observation.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Vehicle disturbance would be minimal since off-road travel and all-terrain vehicles (ATVs) are prohibited. Minimal impacts would be realized since visitors would generally traverse the refuge on the graveled, boardwalked, and gravel-paved trails. A minority of wildlife observers may travel by foot into the refuge interior in areas that are not posted closed to all entry, but their impact on the resources would be minimal.

Long-term impacts: If long-term impacts are realized to resources, threatened or endangered species, public health and safety, or other public uses on the refuge, adjustments to the wildlife observation opportunities would be addressed. Because off-road vehicle use is not permitted and ATVs are prohibited, it is anticipated that vegetation would be minimally trampled by a minority of wildlife observers. Most wildlife observation would take place on nature trails, observation decks, or piers. Because these ecological systems are dynamic, adaptive management techniques will be applied if warranted.

Cumulative impacts: Public activity along trails or other heavily used areas may displace birds that are close to these areas. Also, vegetation may become trampled if the same entry/exit to the refuge interior is used frequently.

Public Review and Comment: This compatibility determination is being made available for public review and comment in conjunction with the public comment period for the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Grand Bay National Wildlife Refuge. Public comments on this compatibility determination are invited and are due by the deadline stated on the cover of the Draft CCP/EA.

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

Determination:

Wildlife Observation

Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: All-terrain vehicle (ATV) use is prohibited on Grand Bay NWR. Grand Bay NWR is a daylight use only refuge. Refuge visitors are limited to wildlife observation in areas that are not posted closed to all entry. Refuge management would reserve the right to close areas of the refuge that may be considered hazardous to the general public, which interferes with refuge management operations, or if the proposed use (wildlife observation) negatively impacts the resources of the refuge.

Justification: One of the secondary goals of the National Wildlife Refuge System is to assist the general public in developing or reestablishing a connection with wildlife on refuges if it is deemed compatible. Wildlife observation is identified in the National Wildlife Refuge System Improvement Act of 1997 as one of the six priority public uses. This public activity will not interfere with the mission of the National Wildlife Refuge System or the purposes of Grand Bay NWR.

NEPA Compliance for Refuge Use Description: *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- or 15-year Re-evaluation Date: _____

Description of Use: *Wildlife Photography*

Wildlife photography is one of the six priority public uses as identified in the National Wildlife Refuge System Improvement Act of 1997.

All areas of the refuge will be open to wildlife photography unless the area is posted closed to the public or closed to all entry. Primary areas for this public use will be the Escatawpa River Trail and the Oak Grove Trail. Both trails have wheelchair-accessible surfacing material (porous pavement and boardwalk). The wheelchair-accessible portion of the Escatawpa Trail ends at an overlook of the Escatawpa River. These trails would give visitors the opportunity to visit a wide array of the habitats and inhabitants of the refuge. Gated roads may be traveled by foot traffic only to photograph wildlife in the refuge interior, unless they are posted closed to all entry.

All uses will be conducted within regular refuge hours. Refuge hours are a half-hour before sunrise to a half-hour after sunset, 7 days a week.

Refuge visitors are welcome to come to the refuge and participate in wildlife photography along the trail system, entry road, or waterways. The Escatawpa River Trail will be open to the public in the near future. The trailhead is adjacent to the Mississippi Department of Transportation's Welcome Center along Interstate 10. This Welcome Center is one of the busiest in the State of Mississippi and a high level of wildlife photography is anticipated from the general public at this location. The Oak Grove Trail has experienced major renovations (wheelchair-accessible substrate) and public awareness of this trail remains low. There are no directional signs from any of the major intersections (Interstate 10 and Highway 90). Following the placement of supporting signage for these trails, the general public will be encouraged to traverse these trails during regular refuge hours. Gated roads may also be used for wildlife photography by foot traffic only, if they are not posted closed to all entry.

Wildlife photography is one of the six priority public uses as defined by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 05-57). If wildlife photography is deemed compatible, it would receive enhanced consideration over other types of public uses or activities for the general public.

Availability of Resources:

Resources involved in the administration and management of the use: No additional funding will be required since there will no expansion of wildlife photography opportunities on the refuge.

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

Maintenance costs: None

Monitoring costs: No additional costs. Law enforcement officers throughout the Gulf Coast National Wildlife Refuge Complex would routinely provide safety to refuge visitors participating in wildlife photography.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Vehicle disturbance would be minimal since off-road travel and all-terrain vehicles (ATVs) are prohibited. Minimal impacts would be realized since visitors would generally traverse the refuge on the graveled, boardwalked, and gravel-paved trails. A minority of wildlife observers may travel by foot into the refuge interior in areas that are not posted closed to all entry, but their impact on the resources would be minimal.

Long-term impacts: If long-term impacts are realized to resources, threatened or endangered species, public health and safety, or other public uses on the refuge, adjustments to the wildlife photography opportunities would be addressed. Because off-road vehicle use is not permitted and ATVs are prohibited, it is anticipated that vegetation would be minimally trampled by a minority of wildlife observers. Most wildlife photography would take place on nature trails, observation decks, or piers. Because these ecological systems are dynamic, adaptive management techniques will be applied if warranted.

Cumulative impacts: Public activity along trails or other heavily used areas may displace birds that are close to these areas. Also, vegetation may become trampled if the same entry/exit to the refuge interior is used frequently.

Public Review and Comment: This compatibility determination is being made available for public review and comment in conjunction with the public comment period for the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Grand Bay National Wildlife Refuge. Public comments on this compatibility determination are invited and are due by the deadline stated on the cover of the Draft CCP/EA.

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

Determination:

Wildlife Photography

Use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility: All-terrain vehicle (ATV) use is prohibited on Grand Bay NWR. Grand Bay NWR is a daylight use only refuge. Refuge visitors are limited to wildlife photography in areas that are not posted closed to all entry. Refuge management would reserve the right to close areas of the refuge that may be considered hazardous to the general public, which interferes with refuge management operations, or if the proposed use (wildlife photography) negatively impacts the resources of the refuge.

Justification: One of the secondary goals of the National Wildlife Refuge System is to assist the general public in developing or reestablishing a connection with wildlife on refuges if it is deemed compatible. Wildlife photography is identified in the National Wildlife Refuge System Improvement Act of 1997 as one of the six priority public uses. This public activity will not interfere with the mission of the National Wildlife Refuge System or the purposes of Grand Bay NWR.

NEPA Compliance for Refuge Use Description: *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- or 15-year Re-evaluation Date: _____

Appendix VI. Intra-Service Section 7 Biological Evaluation

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Division/Office: Grand Bay NWR

Refuge Manager/Phone #: Durwin Carter (228)218-3561

Date: January 8, 2007 Conservation Conservation Plan

I. Proposed Action: Implementation of the Comprehensive Conservation Plan.

The U.S. Fish and Wildlife Service (Service) has developed a Draft Comprehensive Conservation Plan (CCP) to provide a foundation for the management and use of Grand Bay NWR. The plan is intended to serve as a working guide for the Complex's management programs and actions over the next 15 years.

II. Location (County and State/attach project area map):

Grand Bay NWR is located in the coastal zone of Jackson County, Mississippi and Mobile County, Alabama, approximately 10 miles east of Pascagoula, Mississippi.

III. Description of proposed action (describe in enough detail to allow proper evaluation of project impacts, attach additional pages as needed):

The plan's overriding consideration is to carry out the purposes for which the refuge was established. Fish and wildlife are the first priority in refuge management, and public use (wildlife-dependent recreation) is allowed and encouraged as long as it is compatible with, or does not detract from, the refuge's mission and purposes.

Individual consultations will occur under Section 7 for projects related to endangered species and are not intended to be covered in this document. This CCP prioritizes wildlife and habitat management, and proposes wildlife-dependent, compatible recreational opportunities. Chapter 4 of the CCP outlines specific goals, objectives and strategies to achieve an expanded wildlife and habitat management approach, while optimizing (making the best use of) public use and environmental education opportunities. While seeking concurrences on the general management direction of the refuge, as stated previously, individual consultations will occur for projects specifically related to endangered species and critical habitat.

- A. List all federally endangered, threatened, proposed, and candidate species, and describe any associated critical or proposed critical habitat that may be affected by the proposed action. Make a determination of how the proposed action may affect each:**

SPECIES/CRITICAL HABITAT	STATUS ¹	DETERMINATION ²			RESPONSE REQUESTED ³
		NE	NA	AA	
Bald eagle	T		X		

¹STATUS: E = endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, CH = critical habitat, PCH = proposed critical habitat, C = candidate species

²DETERMINATION:

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.

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.

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.

³RESPONSE REQUESTED: conference, concurrence, formal consultation

A. Explanation of effects of the action: include direct, indirect, interrelated, interdependent, and cumulative effects (attach additional pages as needed):

Definitions for Effects of the Action:

Direct Effects = are those that are an immediate result of the action.

Indirect Effects = are those that are caused by the action and are later in time but are still reasonably certain to occur. They include the effects of future activities that are induced by the action and that occur after the action is completed.

Interrelated = are those that are part of a larger action and depend on the larger action for their justification.

Interdependent = are those that have no significant independent utility apart from the action that is under consideration.

Cumulative Effects = are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area.

The proposed CCP should benefit the listed species.

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

n/a

VI.

Project Leader _____
Signature Date

No effect: _____

Is not likely to adversely affect: _____

Is likely to adversely affect: _____

VII. Reviewing Ecological Services Office(ESO) Evaluation:

A. Concurrence Nonconcurrency _____

B. Formal Consultation Required _____

C. Conference Required _____

D. Remarks (attach additional pages if needed): _____

VIII. Signatory Approval: _____
Signature Date

ES Supervisor: _____
Signature Date

Note: The process ends here if the proposed action is "not likely to adversely affect".

REFUGE CHIEF : _____
Signature Date

Note: These signatures are required for approval of a conference report or biological opinion.

Appendix VII. Wilderness Review

The Wilderness Act of 1964 defines a wilderness area as an area of federal land that retains its primeval character and influence, without permanent improvements or human inhabitation, and is managed so as to preserve its natural conditions and which:

- generally appears to have been influenced primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
- has outstanding opportunities for solitude or primitive and unconfined types of recreation;
- has at least 5,000 contiguous roadless acres or is of sufficient size to make practicable its preservation and use in an unimpeded condition; or is a roadless island, regardless of size;
- does not substantially exhibit the effects of logging, farming, grazing, or other extensive development or alteration of the landscape, or its wilderness character could be restored through appropriate management at the time of review; and
- may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

The lands within Grand Bay National Wildlife Refuge were reviewed for their suitability in meeting the criteria for wilderness, as defined by the Wilderness Act of 1964. No lands on the refuge were found to meet these criteria. While the fifth criterion (features of ecological, scientific, educational, and historic value) is met, none of the others are. There are no "outstanding opportunities for solitude or primitive and unconfined types of recreation" present on the refuge, nor are there 5,000 contiguous roadless acres. Therefore, the suitability of refuge lands for wilderness designation is not further analyzed in this plan.

Appendix VIII. Refuge Biota

Lists have been prepared for amphibians and reptiles at Grand Bay National Wildlife Refuge, but not for birds, mammals, and fish. The list for birds below includes those species whose presence is documented at nearby Mississippi Sandhill Crane NWR, while the list for amphibians and reptiles in Chapter II of the CCP and below includes both documented and expected occurrences.

BIRDS

Grand Bay National Wildlife Refuge does not currently maintain its own bird checklist. Due to the proximity of Mississippi Sandhill Crane National Wildlife Refuge and the similarity of its habitats, the following bird species documented at this neighboring refuge would also be expected to occur at Grand Bay Refuge.

Seasonal Appearance

W – Winter: Dec. - Feb.
s – Spring: March - May
S – Summer: June - August
F – Fall: Sept. - Nov.

Seasonal Abundance

a - abundant -- a common species which is very abundant
c - common -- certain to be seen or heard in suitable habitat
u - uncommon -- present, but not certain to be seen
o - occasional -- seen only a few times during a season
r - rare -- seen at intervals of 2-5 years
x - accidental -- has been seen once or twice
* - Nests on refuge

This checklist includes species of birds and is based on observations by refuge personnel, ornithologists, and members of the Mississippi Coast Audubon Society. Observations of birds at the West Jackson County Land Treatment Facility, which includes some refuge property, are not included on this checklist.

revised 8/00

GREBES	W	s	S	F
Pied-billed Grebe	o	-	-	o
PELICANS	W	s	S	F
American White Pelican	-	o	-	o
Brown Pelican	r	-	-	-
CORMORANTS	W	s	S	F
D.C. Cormorant	o	o	-	-
FRIGATEBIRDS	W	s	S	F
Magnificent Frigatebird	-	-	-	r
BITTERNs and HERONS	W	s	S	F
American Bittern	-	o	-	o
Least Bittern	-	u	-	u
Great Blue Heron*	c	u	u	u
Great Egret	c	u	u	u
Snowy Egret	-	u	u	-
Little Blue Heron	u	u	u	u
Tricolored Heron	u	o	o	o
Cattle Egret	o	u	c	u
Green Heron*	u	u	u	u
B.C. Night-Heron	c	-	-	-
Y.C. Night-Heron	-	o	o	-
IBISES	W	s	S	F
White Ibis	-	o	-	o
AMERICAN VULTURES	W	s	S	F
Black Vulture	a	a	a	a
Turkey Vulture	c	c	c	c

WATERFOWL	W	s	S	F
Snow Goose	r	-	-	-
Canada Goose*	c	u	u	u
Wood Duck*	u	c	c	u
Gadwall	u	-	-	-
Mallard	r	-	-	r
Mottled Duck*	u	u	u	u
Blue-winged Teal	u	o	-	o
Northern Shoveler	u	-	-	-
Redhead	o	-	-	-
Green-winged Teal	u	-	-	-
Hooded Merganser	u	-	-	u
KITES, HAWKS and EAGLES	W	s	S	F
Osprey*	o	c	c	o
Swallow-tailed Kite	-	o	-	o
Mississippi Kite	-	o	o	-
Bald Eagle	o	-	-	o
Northern Harrier	c	u	-	u
Sharp-shinned Hawk	u	u	-	u
Cooper's Hawk	u	u	o	u
Red-shouldered Hawk*	c	c	c	c
Broad-winged Hawk	-	u	u	-
Red-tailed Hawk*	c	c	c	c
Golden Eagle	r	-	-	-
FALCONS	W	s	S	F
American Kestrel	a	c	u	c
Merlin	o	-	-	-
Peregrine Falcon	o	-	-	-
PTARMIGANS	W	s	S	F
Wild Turkey*	u	u	u	u
Northern Bobwhite*	c	c	c	c
RAILS, GALLINULES, and COOTS	W	s	S	F
Yellow Rail	r	r	-	r
Clapper Rail	c	c	c	c
King Rail	u	u	u	u
Virginia Rail	o	o	-	o
Sora	-	u	-	u
Purple Gallinule	-	o	o	-
Common Moorhen	u	u	u	u
American Coot	c	c	o	c

CRANES	W	s	S	F
Sandhill Crane*	u	u	u	u
PLOVERS	W	s	S	F
Black-bellied Plover	u	o	-	o
Semipalmated Plover	u	-	-	o
Killdeer*	a	c	u	u
SANDPIPERS and PHALAROPES	W	s	S	F
Greater Yellowlegs	u	u	-	u
Lesser Yellowlegs	u	u	-	u
Solitary Sandpiper	-	u	-	-
Spotted Sandpiper	u	-	-	u
Semipalmated Sandpiper	u	u	-	u
Western Sandpiper	u	u	-	u
Least Sandpiper	u	u	-	u
Pectoral Sandpiper	u	u	-	u
Long-billed Dowitcher	-	o	o	o
Common Snipe	u	u	u	u
American Woodcock	u	u	-	u
GULLS and TERNS	W	s	S	F
Laughing Gull	o	o	o	o
Least Tern	-	-	u	-
DOVES	W	s	S	F
Rock Dove	o	o	o	o
Eurasian Collared-Dove	-	-	r	-
Mourning Dove*	a	a	a	a
Common Ground Dove	u	u	u	u
CUCKOOS	W	s	S	F
Black-billed Cuckoo	-	o	o	u
Yellow-billed Cuckoo	-	u	o	u
BARN OWLS	W	s	S	F
Barn Owl	o	o	o	o
OWLS	W	s	S	F
Eastern Screech Owl*	u	u	u	u
Great Horned Owl*	c	c	c	c
Barred Owl	u	u	u	u

NIGHTJARS	W	s	S	F
Common Nighthawk*	u	c	c	c
Chuck-will's widow*	u	c	c	c
Whip-poor-will	r	r	-	r
SWIFTS	W	s	S	F
Chimney Swift	-	c	c	c
HUMMINGBIRDS	W	s	S	F
Ruby-throated Hummingbird	-	c	u	u
KINGFISHERS	W	s	S	F
Belted Kingfisher*	a	a	u	a
WOODPECKERS	W	s	S	F
Red-headed Woodpecker*	c	c	c	c
Red-bellied Woodpecker*	c	c	c	c
Yellow-bellied Sapsucker	u	u	-	u
Downy Woodpecker*	c	c	c	c
Hairy Woodpecker	o	o	o	o
Northern Flicker*	c	c	c	c
Pileated Woodpecker*	c	c	c	c
TYRANT FLYCATCHERS	W	s	S	F
Eastern Wood-Pewee	-	c	u	c
Least Flycatcher	-	o	-	o
Eastern Phoebe	u	u	-	u
Great Crested Flycatcher	c	c	u	-
Eastern Kingbird*	-	c	c	c
SHRIKES	W	s	S	F
Loggerhead Shrike*	c	c	c	c
VIREOS	W	s	S	F
White-eyed Vireo*	c	c	c	c
Blue-headed Vireo	u	-	u	-
Yellow-throated Vireo	-	u	u	-
Red-eyed Vireo	-	u	u	-

JAYS and CROWS **W** **s** **S** **F**

Blue Jay*	c	c	c	c
American Crow*	a	a	a	a
Fish Crow	c	c	c	c

SWALLOWS **W** **s** **S** **F**

Purple Martin*	o	u	u	u
Tree Swallow*	-	u	u	u
N. Rough-winged Swallow	-	u	u	u
Bank Swallow	-	u	u	u
Cliff Swallow	-	u	u	u
Barn Swallow	-	u	u	u

CHICKADEES and TITMICE **W** **s** **S** **F**

Carolina Chickadee*	c	c	c	c
Tufted Titmouse*	u	u	u	u

NUTHATCHES **W** **s** **S** **F**

Red-breasted Nuthatch	r	r	-	-
Brown-headed Nuthatch*	c	c	c	c

WRENS **W** **s** **S** **F**

Carolina Wren*	u	u	u	u
House Wren*	c	u	-	u
Winter Wren	u	u	-	u
Sedge Wren	c	c	-	c
Marsh Wren	u	u	-	u

THRUSHES **W** **s** **S** **F**

Golden-crowned Kinglet	u	u	-	u
Ruby-crowned Kinglet	c	u	-	u
Blue-gray Gnatcatcher	c	c	o	u
Eastern Bluebird*	a	c	c	c
Veery	u	-	-	u
Gray-cheeked Thrush	u	-	-	u
Swainson's Thrush	u	-	-	u
Hermit Thrush	c	u	-	u
Wood Thrush	-	u	u	-
American Robin*	a	c	u	c

MIMIC THRUSHES	W	s	S	F
Gray Catbird*	u	u	u	u
Northern Mockingbird*	c	c	c	c
Brown Thrasher*	a	a	a	a
STARLINGS	W	s	S	F
European Starling*	u	u	u	u
PIPITS	W	s	S	F
American Pipit	u	u	-	u
WAXWINGS	W	s	S	F
Cedar Waxwing	a	c	o	c
WARBLERS	W	s	S	F
Tennessee Warbler	-	u	-	u
Orange-crowned Warbler	u	-	u	-
Northern Parula*	-	u	u	-
Yellow Warbler	-	u	-	u
Magnolia Warbler	-	-	-	o
Yellow-rumped Warbler	a	c	u	c
Black-throated Green Warbler	-	-	-	o
Yellow-throated Warbler	o	-	-	-
Pine Warbler*	c	c	a	c
Prairie Warbler*	-	c	c	u
Palm Warbler	u	o	-	o
Black-and-white Warbler	-	u	-	u
American Redstart	-	u	-	u
Prothonotary Warbler*	-	o	u	o
Worm-eating Warbler	-	u	u	-
Ovenbird	o	o	-	-
Northern Waterthrush	o	o	-	-
Kentucky Warbler	-	u	-	u
Common Yellowthroat*	u	c	c	c
Hooded Warbler*	-	u	c	u
Yellow-breasted Chat*	-	o	u	o
TANAGERS	W	s	S	F
Summer Tanager	-	u	-	u
Scarlet Tanager	-	u	-	u

SPARROWS	W	s	S	F
Eastern Towhee*	a	a	a	a
Bachman's Sparrow*	c	c	c	c
Chipping Sparrow	c	u	o	u
Field Sparrow	u	u	u	u
Vesper Sparrow	u	-	-	u
Savannah Sparrow	c	c	o	c
Henslow's Sparrow	c	o	-	o
Le Conte's Sparrow	u	o	-	o
Fox Sparrow	u	u	-	u
Song Sparrow	c	u	-	u
Swamp Sparrow	u	u	-	u
White-throated Sparrow	u	-	u	u

JUNCOS	W	s	S	F
Dark-eyed Junco	c	u	-	u

GROSBEAKS and ALLIES	W	s	S	F
Northern Cardinal*	a	a	a	a
Rose-breasted Grosbeak	-	r	-	r
Blue Grosbeak*	o	c	c	c
Indigo Bunting*	-	c	c	u
Painted Bunting	-	r	-	-
Dickcissel	x	-	-	-
Bobolink	-	o	-	o
Red-winged Blackbird	a	c	c	c
Eastern Meadowlark*	c	c	u	c
Common Grackle	c	c	c	c
Boat-tailed Grackle*	c	c	c	c
Brown-headed Cowbird*	c	c	c	c
Orchard Oriole*	x	c	c	c
Baltimore Oriole	x	u	-	u

FINCHES	W	s	S	F
Purple Finch	u	u	-	r
House Finch	o	o	o	o
American Goldfinch	u	u	-	u

WEAVERS	W	s	S	F
House Sparrow	o	o	o	o

REPTILES AND AMPHIBIANS

Amphibians	Reptiles-Turtles and Crocodilians	Reptiles-Lizards and Snakes
<i>Southern cricket frog</i>	American alligator#	Eastern slender Glass Lizard#
<i>Oak toad</i>	<i>Graptemys</i> unidentified #	Eastern Glass lizard*
Southern toad*	Common snapping turtle#	Southern fence lizard#
Gulf coast toad*	Alligator snapping turtle#	Green anole#
Eastern narrowmouth toad*	Eastern mud turtle#	Southern coal skink#
Bird-voiced treefrog*	River cooter#	Five-lined skink#
Cope's Gray treefrog#	Mississippi redbelly turtle#	Southeastern five-lined skink#
<i>Green treefrog</i>	Gulf coast box turtle#	Ground skink#
<i>Pinewoods treefrog</i>	Three-toed box turtle#	Six-lined racerunner#
<i>Barking treefrog</i>	Red-eared slider#	Northern scarlet snake#
<i>Squirrel treefrog</i>		Southern black racer#
Gray treefrog		Corn snake#
Spring peeper*		Gray rat snake#
Southern chorus frog*		Rainbow snake
Crawfish frog		Western mud snake#
Pickerel frog		Eastern hognose snake#

Amphibians	Reptiles-Turtles and Crocodilians	Reptiles-Lizards and Snakes
Southern Leopard frog*		Speckled kingsnake#
<i>Bullfrog</i>		Scarlet kingsnake
<i>Bronze frog</i>		Eastern coachwhip
<i>Pig frog</i>		Green water snake#
One-toed amphiuma#		Broad-banded water snake#
Two-toed amphiuma#		Banded water snake#
Dwarf salamander#		Rough green snake#
Eastern Lesser siren#		Black pine snake*
		Gulf crayfish snake#
		Pinewoods snake*
		Eastern ribbon snake#
		Western earth snake#
		Southern copperhead*
		Western cottonmouth#
		Eastern diamondback rattle snake*
		Dusky pygmy rattle snake*

italics= *Calling Frog survey*, * incidental, # TNC Fort Bayou tract survey, rest: expected

Appendix IX. Budget Requests

REFUGE OPERATING NEEDS SYSTEM (RONS)

Please see next page for RONS list.

Refuge Operating Needs System

Project Number	Record OK?	Org Code	Station	Project Title	Cost Estimate (Thousands)	Station Rank	Region Rank	Reg FY Group	Mark for Deletion
00004		43617	Grand Bay NWR	Restore and Enhance Rare Wetland Habitats (Equipment Operator)	\$129K	2			
00002		43617	Grand Bay NWR	Improve Knowledge and Management of Rare Plant Communities (Biologist)	\$140K	3			
99001		43617	Grand Bay NWR	Maintain and Improve Interagency Coordination, Outreach and Partnership Programs (Park Ranger)	\$128K	1			
99002		43617	Grand Bay NWR	Control Of Invasive Cogon Grass	\$105K	4			
99003		43617	Grand Bay NWR	Develop and Print Educational Brochures	\$20.5K	7			
00001		43617	Grand Bay NWR	Survey Refuge Lands	\$270K	3			
00005		43617	Grand Bay NWR	Heavy Equipment for Wetland Restoration	\$180K	8			
00007	✓	43617	Grand Bay NWR	Complete CCP and Enhance Public Outreach Opportunities	\$140K	2			
98004		43617	Grand Bay NWR	Conduct Archeological Survey	\$105K	5			
01002		43617	Grand Bay NWR	Airboat with trailer and Jon Boat with motor and trailer	\$65K	6			
04001		43617	Grand Bay NWR	Cost Share for Joint Office Facilities	\$314K	1			No

Appendix X. List of Preparers

Durwin Carter, U.S. Fish and Wildlife Service, Grand Bay National Wildlife Refuge

Sabrina Clark, U.S. Fish and Wildlife Service, Jackson, Mississippi Office

Lloyd Culp, U.S. Fish and Wildlife Service, Gulf Coast National Wildlife Refuge Complex

Mike Dawson, U.S. Fish and Wildlife Service, Jackson, Mississippi Office

Scott Hereford, U.S. Fish and Wildlife Service, Mississippi Sandhill Crane National Wildlife Refuge

Leon Kolankiewicz, Mangi Environmental Group

Chris May, Mississippi Department of Marine Resources, Grand Bay National Estuarine Research Reserve

Lynn McCoy, Mississippi Department of Wildlife, Fisheries, and Parks

Paul Necaie, U.S. Fish and Wildlife Service, Jackson, Mississippi Office

Dave Ruple, Mississippi Department of Marine Resources, Grand Bay National Estuarine Research Reserve