OKEFENOKEE NATIONAL WILDLIFE REFUGE

DRAFT COMPREHENSIVE CONSERVATION PLAN

AND

ENVIRONMENTAL ASSESSMENT

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August 2005

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SECTION A. DRAFT COMPREHENSIVE CONSERVATION PLAN

I. Background

INTRODUCTION

The U.S. Fish and Wildlife Service (USFWS) has developed this Draft Comprehensive Conservation Plan (CCP) to provide a foundation for the management and use of Okefenokee National Wildlife Refuge (NWR) in Charlton, Ware, and Clinch Counties, Georgia, and Baker County, Florida. The plan is intended to serve as a working guide for the refuge's management programs and actions over the next 15 years.

The plan was deveoped in compliance with the National Wildlife Refuge System Improvement Act of 1997 and Part 602 (National Wildlife Refuge System Planning) of the Fish and Wildlife Service Manual. The actions described within this plan also meet the requirements of the National Environmental Policy Act of 1969. Compliance with this Act is being achieved through the involvement of the public and the inclusion of an Environmental Assessment (Section B). When fully implemented, this plan will strive to achieve the vision and purposes of Okefenokee NWR.

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 als long as it is compatible with, or does not detract from, the refuge's mission and purposes.

The plan has been prepared by a planning team, composed of the management staff team at Okefenokee NWR, representatives from USFWS Office of Ecological Services, Georgia Wildlife Federation, Georgia Department of Natural Resources, Georgia State Parks and Historic Sites, Osceola National Forest, and a private natural resource consultant. In developing this plan, the planning team has incorporated the input of local citizens and the general public received through a public comment period and a series of stakeholder and public scoping meetings. This public involvement and the planning process itself are described in the Planning Process section of the Environmental Assessment (Section B.I).

The plan represents the USFWS's proposed alternative and is being put forward after considering three other alternatives, as described in the accompanying Environmental Assessment. After reviewing public comments and management needs, the planning team developed these alternatives in an attempt to determine how best to manage the Okefenokee NWR in the next 15 years. The proposed alternative is the USFWS's recommended course of action for the future management of the refuge, and is embodied in this comprehensive conservation plan.

PURPOSE AND NEED FOR THE PLAN

The purpose of this comprehensive conservation plan is to identify the role that Okefenokee NWR will play in support of the mission of the National Wildlife Refuge System, and to provide long-term guidance to the refuge's management programs and activities. The plan is needed to:

- Provide a clear statement of direction for the future management of the refuge;
- Provide refuge neighbors, visitors, and government officials with an understanding of the USFWS's management actions on and around the refuge;

- Ensure that the USFWS's management actions, including land protection and recreational and educational programs, are consistent with the mandates of the National Wildlife Refuge System Improvement Act of 1997;

- Ensure that the management of the refuge is coordinated with federal, state, and county plans; and

- Provide a basis for developing budget requests for the refuge's operational, maintenance, and capital improvement needs.

U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service is the primary federal agency responsible for the conservation, protection, and enhancement of the Nation's fish and wildlife populations and their habitats. Although the USFWS shares some conservation responsibilities with other federal, state, tribal, local, and private entities, it has specific trustee obligations for migratory birds, threatened and endangered species, anadromous fish, and certain marine mammals. In addition, the USFWS administers a national network of lands and waters for the management and protection of these resources.

As part of its mission, the USFWS manages more than 540 national wildlife refuges covering a total of more than 95 million acres. These areas comprise the National Wildlife Refuge System, the world's largest collection of lands and waters specifically managed for fish and wildlife. The System supports over 800 bird species, 220 mammal species, 250 reptile and amphibian species, 1,000 fish species, and countless species of invertebrates and plants.

NATIONAL WILDLIFE REFUGE SYSTEM

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

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

The National Wildlife Refuge System Improvement Act of 1997 established, for the first time, a clear mission of wildlife conservation for the National Wildlife Refuge System. The Act states that each refuge shall be managed to:

- Fulfill the mission of the Refuge System;

- Fulfill the individual purposes of each refuge;

- Consider the needs of 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.

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

Approximately 37.5 million people visited the country's national wildlife refuges in 1998, mostly to observe wildlife in their natural habitats. As this visitation continues to grow, significant economic benefits are being generated to the local communities that surround the refuges. Economists have reported that national wildlife refuge visitors contribute more than $400 million annually to the local economies. In addition, the National Survey of Fishing, Hunting, and Wildlife Associated Recreation reports that nearly 40 percent of the country's adults spent $101 billion on wildlife-related recreational pursuits in 1996 (U.S. Fish and Wildlife Service 1996).

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

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

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

OKEFENOKEE NATIONAL WILDLIFE REFUGE

LOCATION, ESTABLISHMENT, AND IMPORTANCE

The Okefenokee NWR is situated in the southeastern Georgia counties of Ware, Charlton, and Clinch and northeastern Florida's Baker County, roughly between latitudes 30°33' and 31°05' North and longitudes 82°07' and 82°33' West (Figure 1). The refuge was established in 1936 with the purchase of land and consists presently of 395,080 acres (Figure 2). The refuge's approved acquisition boundary includes 519,480 acres (Figure 3), 123,480 acres beyond the current refuge acres. The primary purpose of the refuge is to protect the ecological system of the 438,000-acre Okefenokee Swamp. Approximately 371,000 acres of the Okefenokee Swamp wetlands are incorporated into the refuge; and 353,981 acres within the swamp were designated as wilderness by the Okefenokee Wilderness Act of 1974, making it the third largest National Wilderness Area east of the Mississippi

River. In 1986, the Okefenokee NWR was designated by the Wetlands Convention as a Wetland of International Importance.

Okefenokee's natural beauty was first threatened in the 1890s, when attempts were made to drain the swamp to facilitate logging operations. The Suwannee Canal was dug 11.5 miles into the swamp from Camp Cornelia. After the failure of this project, known as "Jackson's Folly," other interests acquired the swamp and began removing timber in 1909, using a network of tram roads extending deep into the major timbered areas. When logging operations were halted in 1927, more than 423 million board feet of timber, mostly cypress, had been removed from the swamp.

The establishment of Okefenokee NWR in 1936 marked the culmination of a movement that had been initiated at least 25 years earlier by a group of scientists from Cornell University that recognized the education, scientific and recreational values of this unique area. The Okefenokee Preservation Society formed in 1918 promoted nationwide interest in the swamp. With the support of state and local interests and numerous conservation and scientific organizations, the federal government acquired most of the swamp for refuge purposes in 1936.

Okefenokee NWR preserves the unique qualities of the Okefenokee Swamp for future generations to enjoy. The swamp is considered the headwaters of the Suwannee and St Marys Rivers. Habitats provide for threatened and endangered species, such as red-cockaded woodpeckers, wood storks, indigo snakes, and a wide variety of other wildlife species. It is world renowned for its amphibian populations that are bio-indicators of global health. More than 600 plant species have been identified on refuge lands.

Combining Okefenokee NWR with Osceola National Forest, private timberlands, and state-owned forests, more than 1 million contiguous acres provide wildlife habitat and recreational opportunities. Researchers and students study the resources.

The Georgia communities of Waycross (12 miles north), Folkston (7 miles east), St George (8 miles southeast), Fargo (5 miles west), and Homerville (20 miles northwest) surround the refuge with Jacksonville, Florida 40 miles to the southeast. Nearly 400,000 people visit Okefenokee NWR each year making it the 16th most visited refuge in the National Wildlife Refuge System. In 1999, the economic impact of tourists in Charlton, Ware, and Clinch Counties in Georgia was over $67 million.

The Okefenokee Swamp has shaped the culture of southeast Georgia. Most residents of Charlton, Clinch, and Ware Counties have ancestors who once lived or worked in the swamp and view the swamp as a part of their heritage.

REFUGE PURPOSE

The executive order establishing Okefenokee NWR in 1937 stated the purpose of the refuge as “a refuge and breeding ground for migratory birds and other wildlife” (Appendix I).

Figure 1. Location of Okefenokee National Wildlife Refuge in relation to other wildlife refuges

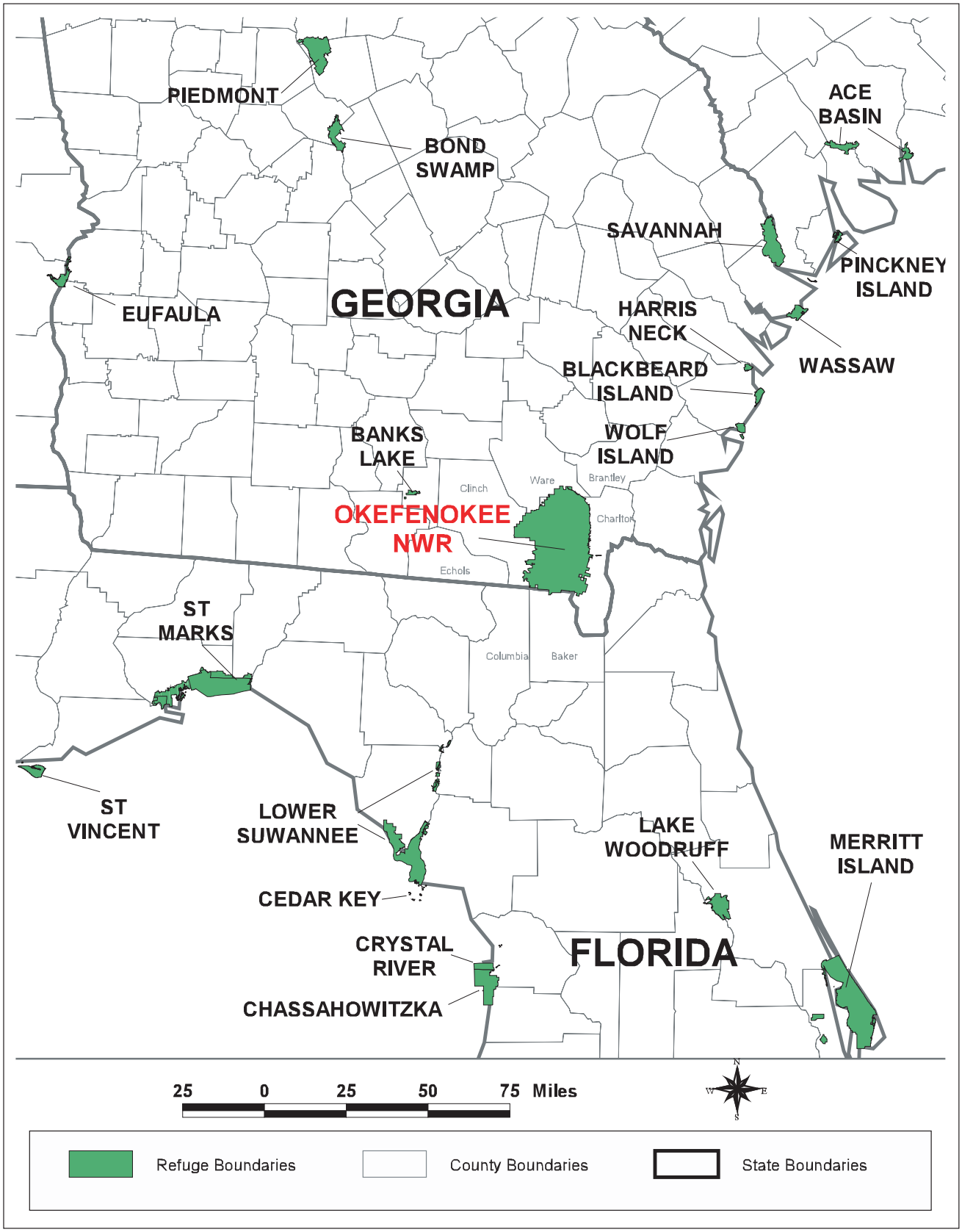


Figure 2. Okefenokee National Wildlife Refuge and Wilderness Area

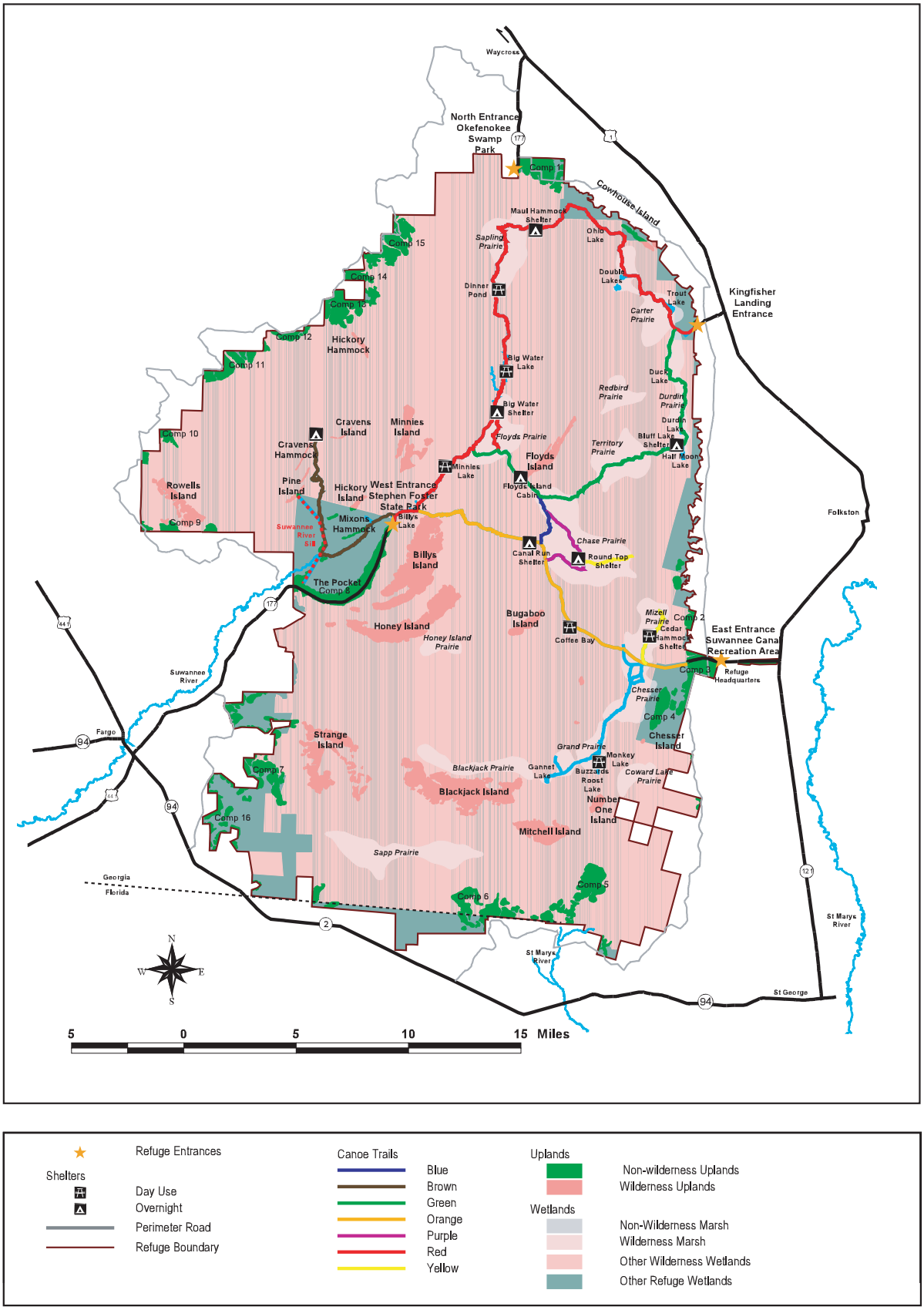
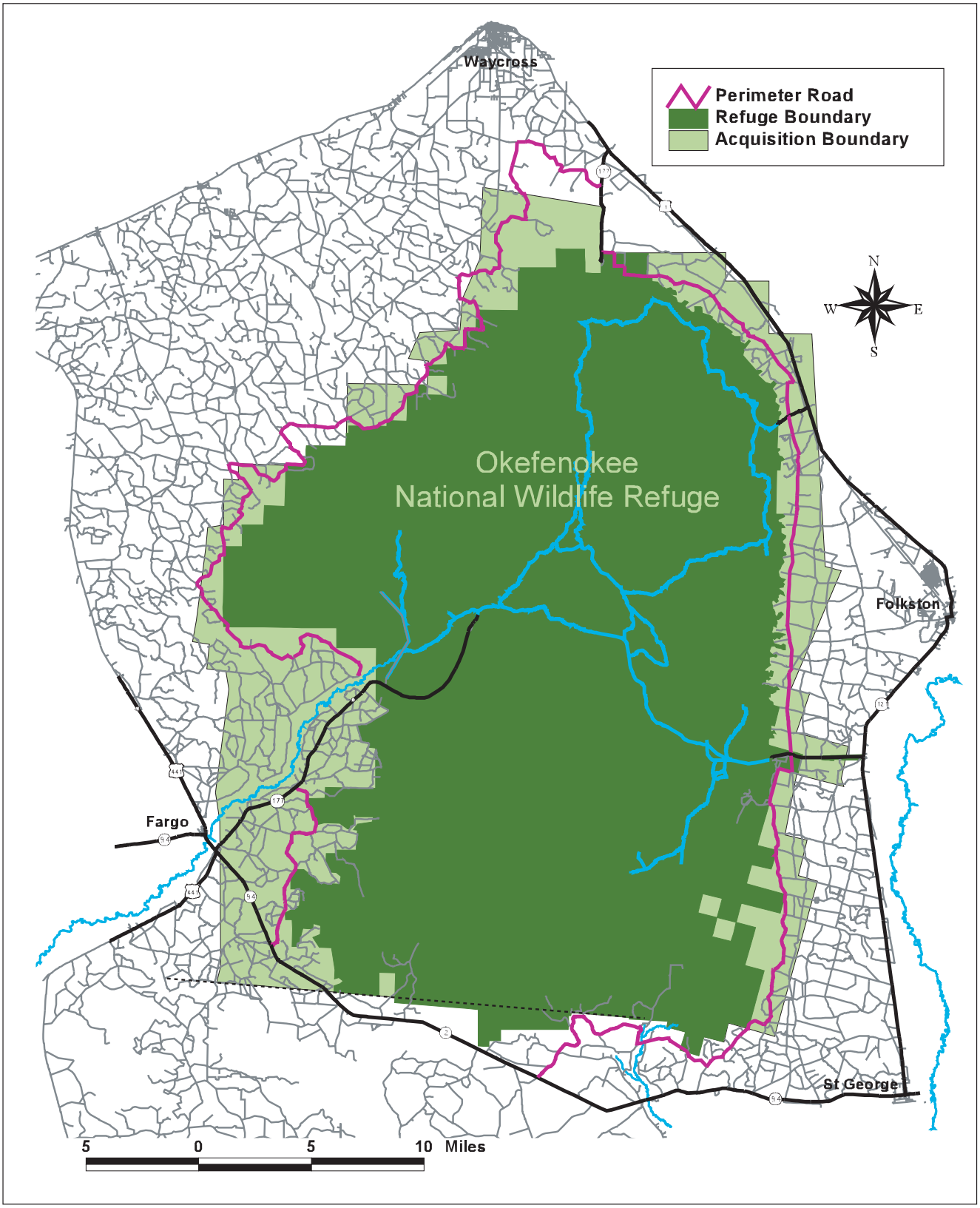


Figure 3. Approved acquisition boundary for Okefenokee National Wildlife Refuge



FACILITIES

Three primary entrances and two secondary entrances exist on the refuge. The east entrance, located 11 miles southwest of Folkston, Georgia, is the location of the refuge headquarters and is managed solely by the USFWS. Spur 121 is the entrance road to Camp Cornelia and Suwannee Canal Recreation Area, both part of the east entrance. An administration building just outside the refuge boundary houses approximately 16 employees while the shop area at Camp Cornelia serves as a base for 10 additional employees. Two additional employees are located in the visitor center at Suwannee Canal Recreation Area. A Volunteer Village located adjacent to the shop area provides housing and trailer hookups for volunteers from outside the immediate area. A helibase is also located nearby to facilitate management flights over the refuge. In association with this helibase, there are 18 helispots that are maintained for safe landing and take off. The Suwannee Canal Recreation Area is open to the public and offers a newly renovated visitor center and a concession offering swamp tours, boat rentals, food, and souvenirs. Access is also provided to hiking trails, a wildlife drive, a ¾-mile-long boardwalk with a 40-foot observation tower, and a restored homestead.

The west entrance to the refuge is via Spur 177 that leads to The Pocket, where two employees are stationed. Just after entering the refuge, two residences serve as office space and housing for employees, researchers, or volunteers. A shop area is also located at this site. At the end of Spur 177 is Jones Island, the site of Stephen C. Foster State Park, which was established in 1954. This state park is operated on 82 acres of refuge lands under the provisions of a long-term agreement (until 2016) with the Georgia State Parks and Historic Sites. The park offers boat tours, boat and cabin rentals, souvenirs, camping facilities and supplies, a museum, and a picnic area. The refuge maintains a boathouse on Jones Island.

The refuge's north entrance is via the Okefenokee Swamp Park, which is located about 12 miles south of Waycross, Georgia. This park is administered by a nonprofit organization on refuge and state forestlands. The organization offers boat tours, a boardwalk and tower, wildlife and cultural displays and presentations, and souvenirs.

Kingfisher Landing located between Folkston and Waycross, and the Suwannee River Sill area on the west side, are considered the secondary entrances into the swamp. Both have a boat ramp. The Suwannee River Sill area provides bank fishing opportunities.

The refuge has 16 upland management compartments encompassing approximately 15,000 acres around the perimeter of the swamp. Roads providing access and fire lines are maintained. The Swamp Perimeter Road was established after the fires of 1954-1955 to provide access around the swamp. In 1993, the

Swamps Edge Break was created to provide a fuels management zone to allow indirect suppression actions during wildfires. The refuge has responsibility for the maintenance of the Swamps Edge Break and Swamp Perimeter Road that falls on refuge lands and all bridges on the Swamp Perimeter Road. The refuge is also responsible for maintaining five man-made dipsites for fire suppression operations.

Appendix II lists the facilities on and adjacent to the refuge.

STAFFING AND FUNDING

The refuge is currently managed by 31 employees. The permanent personnel include a project leader, deputy project leader, 3 administration staff, 1 law enforcement staff, 2 biological staff, 6

public use staff, 10 forestry staff, 4 heavy equipment operators, 1 mechanic, and 2 laborers. The refuge currently has one temporary park ranger.

In Fiscal Year 2003, the refuge operated with a budget of $2,026,600 for payroll and operation needs from refuge operations and fire funds. In addition, $182,800 in special funding were allocated to address the maintenance backlog and support for the Youth Conservation Corps (YCC) support, $1,200 were allocated for safety signs, and $20,000 were allocated for Wildland Urban Interface (WUI) projects.

In Fiscal Year 2002, the refuge was allocated $1,927,500 for payroll and operation needs from refuge operations and fire funds. In addition, $238,700 in maintenance funding and YCC support, $67,100 for visitor center renovation, and $21,000 for WUI projects were allocated.

ECOSYSTEMS

South Atlantic Coastal Plain Physiographic Area

The Okefenokee NWR lies within the South Atlantic Coastal Plain physiographic area as designated by the Partners-in-Flight initiative (Figure 4). The South Atlantic Coastal Plain covers northeastern Florida, the southern half of Georgia and the eastern halves of South Carolina and North Carolina. Its western boundary is the fall line that marks the beginning of the hilly Piedmont and its eastern boundary is the Atlantic Ocean. As part of a continuous Coastal Plain that extends from New York to Texas, it has arbitrary boundaries at the Alabama-Georgia border and at the North Carolina-Virginia border, extending into the southeast corner of Virginia only to capture the Great Dismal Swamp. Pocosins and Carolina bays are non-alluvial forested wetlands unique to this physiographic area. Uplands were historically dominated by fire-maintained pine forests, with longleaf nearer the coast and on sandy soils inland and a mixture of shortleaf, loblolly, and hardwoods elsewhere (Hunter 2001).

The South Atlantic Coastal Plain has been altered through fire suppression, conversion to other land uses, and short-rotation pine plantations. Large tracts of fire-maintained pine savannahs are needed for the health of the high priority pine and pine-grassland bird species, such as the red-cockaded woodpecker.

The bottomland hardwood bird community requires large tracts of forest in river systems. The black-throated green warbler and breeding swallow-tailed kites use these sites. In addition, coastal maritime forest and scrub-shrub habitats not only support most of the eastern population of painted bunting but also are extremely important for in-transit migrants. Much of this forest has been developed for intensive human use, and what remains should be maintained (Hunter 2001).

North Florida Ecosystem

The North Florida Ecosystem as designated by the USFWS based on watersheds includes portions of south Georgia and most of north and central Florida (Figure 5). The area includes southern temperate and subtropical climates, numerous physiographic districts, and many unique and widely varied habitat types. The northern boundary of this ecosystem includes the watersheds of the St. Marys River and the Suwannee River, including the Okefenokee Swamp. The northeast boundary begins at Camden County, Georgia, and proceeds down the east coast of Florida to the Brevard/Indian River county line. The ecosystem then turns west and includes the following counties as its southern border: Orange, Lake, and Sumter. The western boundary includes all Florida counties from Sarasota north through Taylor and Jefferson. In Georgia, the ecosystem is inclusive of all counties east and south of the following: Thomas, Colquitt, Worth, Turner, Ben Hill, Coffee, Ware, Charlton, and Camden (USFWS 1996).

Figure 4. Location of Okefenokee National Wildlife Refuge within the South Atlantic Coastal Plain physiographic area

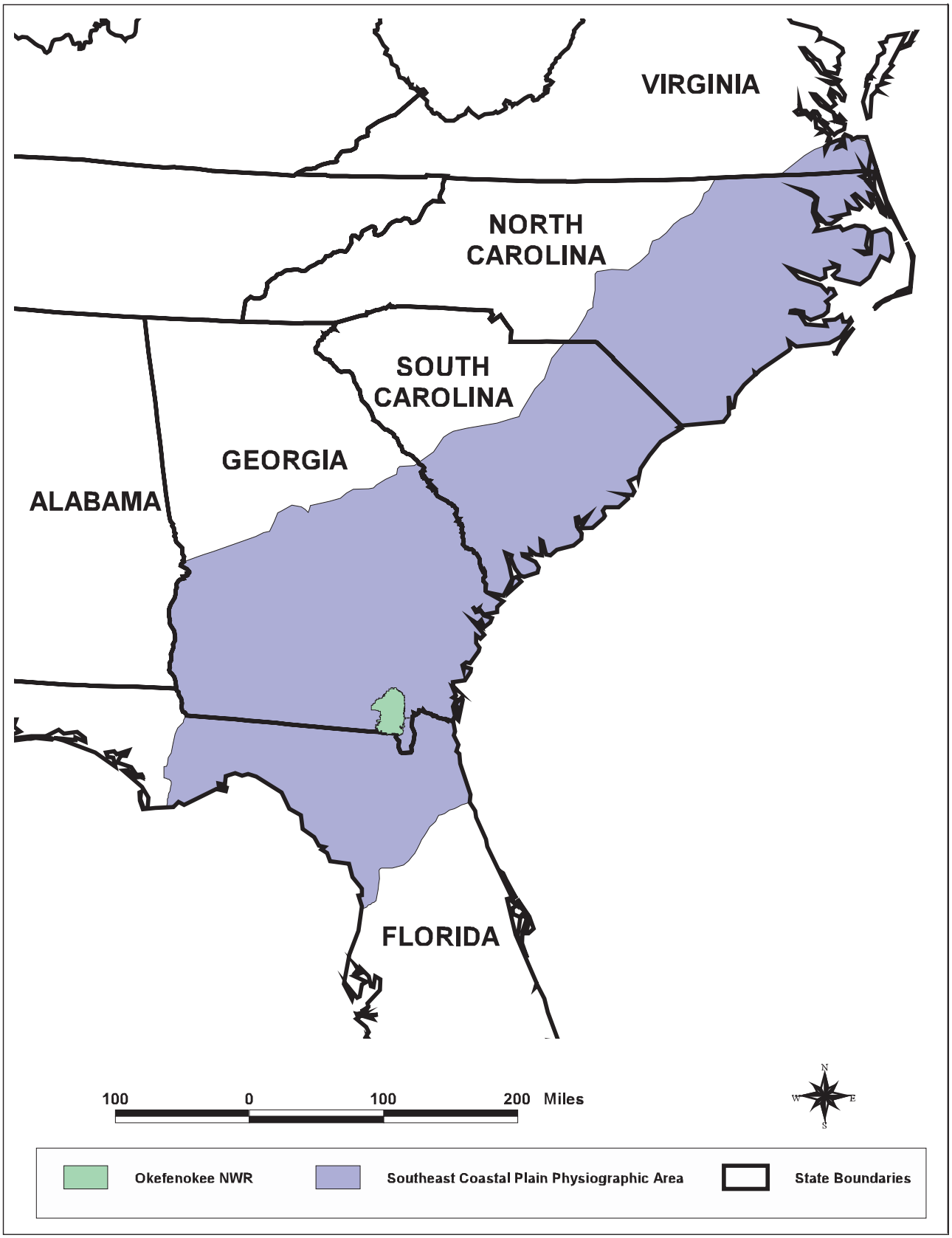
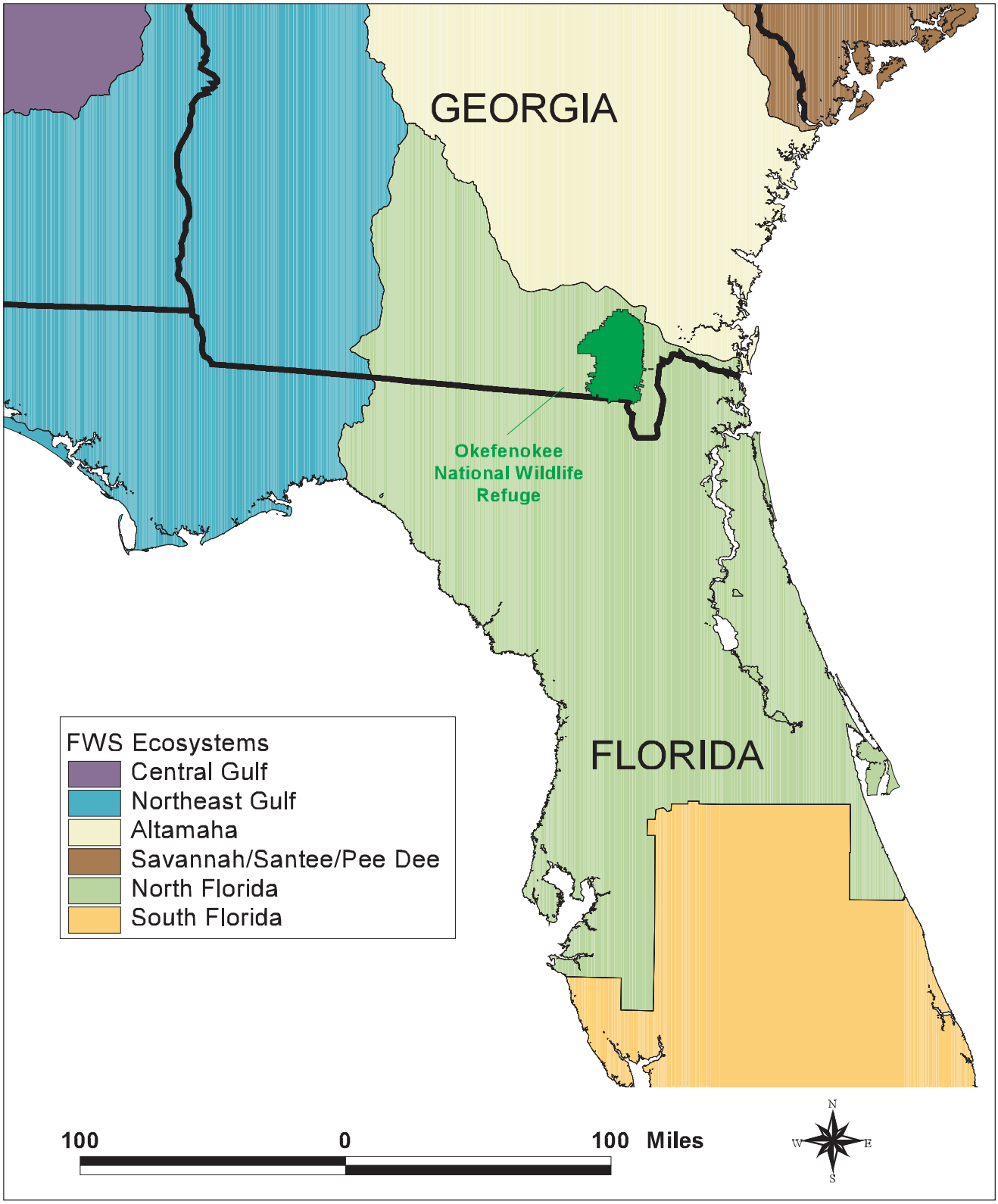


Figure 5. Location of Okefenokee National Wildlife Refuge within the North Florida Ecosystem



Besides the wetlands of the Okefenokee Swamp, this ecosystem includes barrier islands, xeric scrub, pine flatwoods, freshwater marshes, lakes, streams and springs, mixed hardwood/pine forests, cypress swamps and domes, dry prairies, maritime forests, hardwood hammocks, estuarine marshes, pine rocklands, sandhill woodlands, coastal strands, sawgrass prairies, sloughs, and tree islands. Okefenokee NWR, Merritt Island NWR, Ocala and Osceola National Forests, Canaveral National Seashore, and Timucuan Ecological and Historical Preserve protect a variety of the habitat types. Other areas are subject to habitat loss from direct destruction, fragmentation, or the impacts of human activities. The ecosystem team identified the following tools to manage the North Florida Ecosystem:

- Reliance on and use of the best science and technology;
- Education of peers, associates, clients, and public;
- Active and effective law enforcement;
- Aggressive land protection efforts;
- Strong adherence to regulatory responsibilities;
- Sound public and private land management;
- Strong inter-governmental coordination; and
- Increased private landowner partnerships.

Greater Okefenokee Ecosystem

The Greater Okefenokee Ecosystem includes the Okefenokee NWR, Osceola National Forest, state-owned forests, and private timberlands (Figure 6). It encompasses over a million contiguous acres of suitable habitat for a diversity of wildlife. The Okefenokee Swamp and Pinhook Swamp are two large wetlands included in this area. Upland pine forests, oak hammocks, and small isolated wetlands cover the remaining area. Rainfall and fire are the two primary factors governing the landscape.

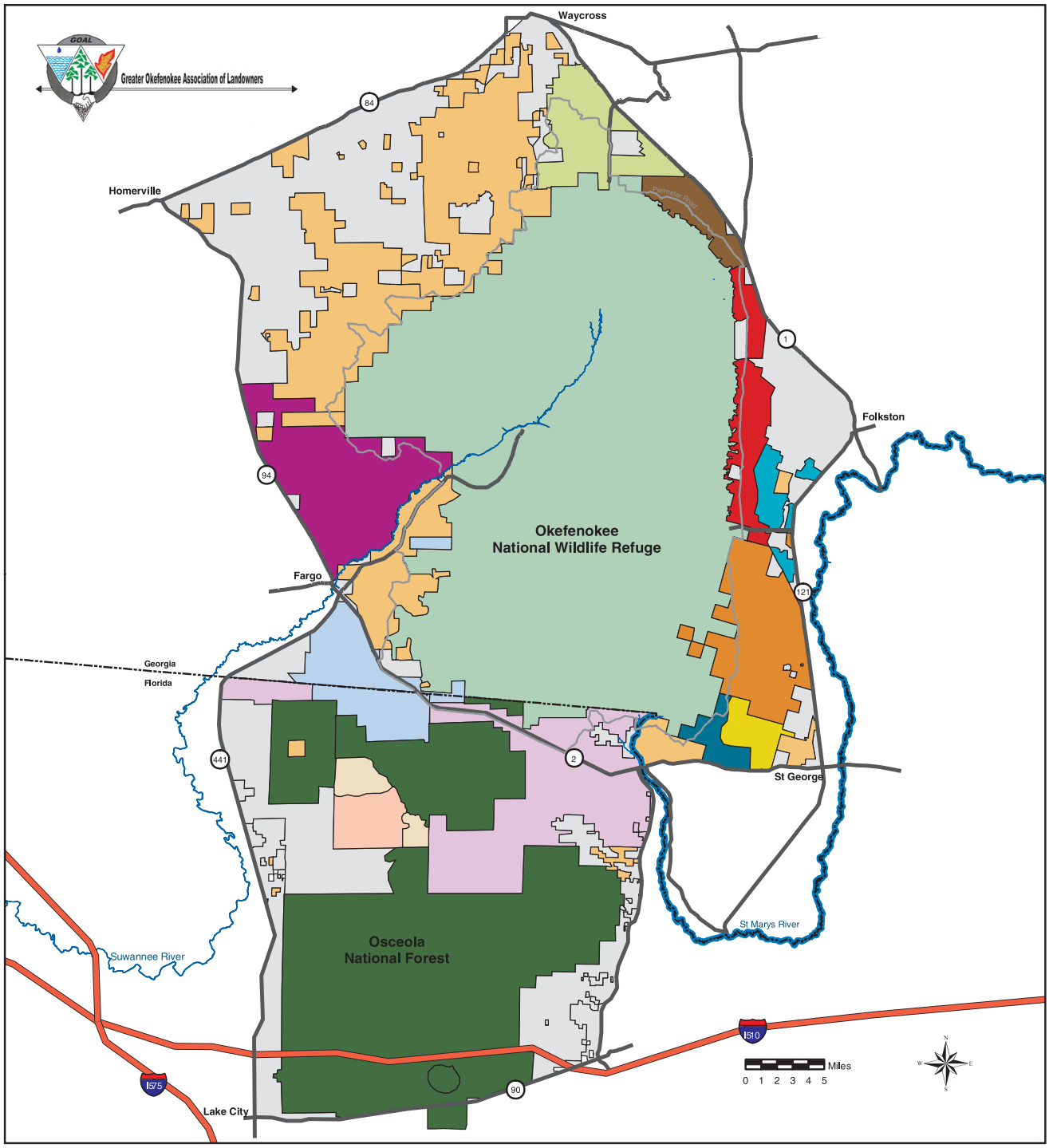
As part of this ecosystem, the Okefenokee NWR provides a valuable reservoir of biological resources that supply the surrounding lands. It is a stronghold for the Florida black bear. Wading birds abound. Old growth cypress still exist and longleaf pine communities are successfully being restored with visions focused on 200-300 years into the future. Management for the associated wildlife species, such as the endangered red-cockaded woodpecker, follows this long-term vision.

Understanding the wildlife populations, the quality of the system, and man's potential impacts to the system contributes to the well being of neighboring communities and protects their heritage. Ecotourism is building in the area.

A unified effort to manage, protect, and promote forest resources in and around the Okefenokee Swamp has been made through the Greater Okefenokee Association of Landowners (GOAL), which recognizes the following:

- Forest resources are the major industries in the area;
- The Okefenokee Swamp is a national treasure and economically and biologically beneficial to the local communities and the States of Georgia and Florida;
- It is essential to have a coordinating committee for fire protection of public and private resources; and
- A formal organization of landowners provides an avenue for communications and develops strength in dealing with area issues.

Figure 6. Greater Okefenokee Ecosystem And Its Landowners



State Wildlife Agencies

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

Georgia Wildlife Resources Division
The Georgia Wildlife Resources Division (GAWRD) is charged with enforcement responsibilities for migratory birds and endangered species, as well as managing the State's natural resources. The GAWRD manages Dixon Memorial Wildlife Management Area adjacent to Okefenokee NWR, provides expertise in fisheries management, and assists in management of hunting on Okefenokee NWR. The division has also been a partner in a comprehensive black bear study. The GAWRD has been represented on the core planning team, the biological review team, and also served as a presenter at public meetings.

Georgia State Parks and Historic Sites
The Georgia State Parks and Historic Sites (GASPHS) is charged with managing state park lands and historic sites. The GASPHS manages Stephen C. Foster State Park, located on 82 acres of the Okefenokee NWR. The park provides visitor services and protection to about 120,000 people each year. The GASPHS also manages Laura S. Walker State Park in close proximity to Okefenokee NWR and the new Suwannee River Visitor Center downstream from the Okefenokee NWR. The GASPHS has been represented on the core planning team, the public use review team, and also served as a presenter at public meetings.

Florida Fish and Wildlife Conservation Commission
The Florida Fish and Wildlife Conservation Commission (FLFWCC) is charged with enforcement responsibilities for migratory birds and endangered species, as well as managing the State's natural resources. The FLFWCC manages the Osceola Wildlife Manage Area in close proximity to Okefenokee NWR and the John Bethea State Forest Wildlife Management Area adjacent to Okefenokee NWR. The FLFWCC was requested to provide a core team member but declined; however, FLFWCC will play an important role in the review process.

THREATS AND PROBLEMS

Mining/Oil/Gas
Strip mining for titanium has been proposed on 22,000 acres directly adjacent to the southeastern boundary of the swamp. The USFWS has many concerns regarding strip mining and its proximity to this globally unique resource - The Okefenokee Swamp. Potential impacts include:

- Alternations to water table elevation in the swamp as a result of changes to surface and ground water quantities and flows of the Trail Ridge;
- Destruction of endangered and rare species and their habitats;
- Destruction of wetlands;
- Reduction of air and water quality through the release of contaminants; and
- Degradation of the wilderness experience for refuge visitors.

This same threat was recently eliminated from 16,000 acres adjacent to the northeastern boundary of the refuge when E.I. DuPont De Nemours and Company, Inc., donated it to The Nature Conservancy.

Wetland Management
Numerous threats to the quantity and quality of the water resources of the area may affect wetland management and its health.

- Water quality is being degraded as a result of increased use of fertilizers and herbicides on surrounding timberland, contaminant deposition from the atmosphere, and increased water withdrawals from the aquifer along the coast. This degradation influences the survival of certain species by limiting food sources, restricting reproduction, and decreasing the health of the entire ecosystem.

- Although the Suwannee River Sill was constructed to retain water during drought, its greatest effects appear to be during high water. Due to a series of natural terraces in the swamp, the zone of influence during low water levels decreases to only about 1percent of the swamp. An Environmental Assessment identified the preferred alternative to the future management of the sill as a "Phased removal of concrete water control structures and breaching of the sill in selected locations" that would restore the natural connection between the swamp and the Suwannee River, and restore the river flood plain and the natural fire cycle of the swamp. The U.S. Geological Survey (USGS) has completed the 4-year study of water level impacts downstream. Funding is now needed to remove the concrete structures and breach the sill in four locations.

- Surface hydrology has been altered through silvacultural practices. Ditching shortens the hydroperiod by increasing drainage rates. It also connects isolated wetlands and exposes amphibians to threats from fish invasions.

Floods/Droughts/Natural Disasters/Climate Change
Wildland fire is a natural, frequent, and desirable occurrence in the Okefenokee habitat. However, adjacent private industrial forestland, refuge facilities, and the growing urban interface areas create challenges to managing natural fire. Prescribed burning is a resource and fire prevention tool used to restore habitats and reduce the intensity of wildland fire. The landowner organization, GOAL, was formed to address the management of wildfires in a more effective manner. GOAL's combined efforts are helping to protect both refuge and private resources. The refuge must maintain the ability to work with adjoining landowners and support the state forestry organizations through grants, agreements, and fuels reduction burning.

Timber Management
Short rotation silviculture with heavy mechanical site preparation, including the application of herbicides, is eliminating the habitat suitable for at-risk animals on adjoining industrial forestlands. The refuge has begun to enter into Memorandums of Understanding (MOUs) with agreeable landowners to grow forest products on a longer rotation. Less than 2 percent of adjoining lands are covered by MOUs at the present time. Land purchase and/or timber management by the USFWS of critical uplands are the long-term solutions.

Industrial and Commercial Development
Demands for ground water are increasing in the coastal plain. With paper mills and other industrial interests along the coast, the area from which they draw ground water (i.e., cone of depression) increases and may actually be affecting the Okefenokee Swamp. Where once the ground water was replenishing the swamp, the swamp may now be replenishing the aquifer. This would be detrimental to the health of the swamp by creating drier conditions and the loss of wetlands, concentrating contaminants and degrading the system.

Air Pollution
The amount of substances dispersed in the atmosphere and deposited by precipitation, aerosols, and gasses is of great concern and is expected to continue to increase throughout North America. Okefenokee NWR serves as a regional base for air quality by participating in two air quality programs - The National Atmospheric Deposition Program (measuring substances introduced into precipitation falling on the refuge) and the Interagency Monitoring of Protected Visual Environments (measuring the substances filtered from the air). The primary purpose is to protect the visibility in this Class 1 air shed and to characterize the regional haze. Trends related to hydrogen, major and trace elements from sodium to lead, nitrates, chloride, organic and elemental carbon, and PM 10 size particles are examined. Continued monitoring and implementation of industrial limits are required to protect this air shed.

Authorized Public Use Activities
The Okefenokee Education and Research Center, in Folkston, Georgia, is now partially funded and beginning operations that will increase environmental education use and scientific research on the refuge. Special refuge accommodations related to facilities, staffing, budgeting, and carrying capacities will have to be planned in advance in order to accommodate these significant increases in activities.

In addition, public use activities will be evaluated as to their impacts on the wilderness and other resources and modified when necessary.

Urbanization
Charlton, Ware, and Clinch Counties in Georgia, and Baker County in Florida, all touch portions of the Okefenokee. Home and subdivision developments have shown a marked increase in numbers over the past 10 years. These homes are encroaching on and further fragment the habitats around the refuge. In addition, this development requires the withdrawal of ground water for water systems and increases pollution of air, water, light, and noise. These developments also create significant problems in protecting structures and fighting wildfires in the area.

LEGAL AND POLICY GUIDANCE

The administration of Okefenokee NWR is guided not only by the refuge's authorizing legislation and the National Wildlife Refuge System Improvement Act of 1997, but by a variety of federal laws, Presidential executive orders, and international treaties. For the establishing executive order and a description of the key legislation and policies, see Appendix I.

II. Refuge Environment

PHYSICAL ENVIRONMENT

CLIMATE

The climate of Okefenokee NWR is warm and humid for most of the year. This is due in part to its southern latitude and also to its proximity to the Atlantic Ocean and the Gulf of Mexico.

All four seasons are apparent, though spring and fall are usually short. Winters are usually mild and summers are long, hot, and humid. The average yearly rainfall for the swamp is 52.29 inches (1945-2003). The maximum yearly rainfall was 78.11 inches in 1947 and the lowest rainfall total measured was 26.07 recorded in 1954. Climatological averages show that November is normally the driest month with 2.18 inches, and July is normally the wettest month with 7.43 inches. The average annual maximum temperature is 93 degrees and the average annual minimum temperature is 42 degrees.

During the summer, the weather pattern is dominated by the Bermuda High. This feature usually extends along 35 degrees north latitude across the Atlantic Ocean and into the Gulf of Mexico. This pattern blocks fronts from progressing into south Georgia and Florida and ushers in warm moist air from the Atlantic Ocean and Gulf of Mexico. This flow of moist air over the warm land surfaces creates frequent afternoon thunderstorms. Under weak atmospheric flow or stagnant conditions, these thunderstorms are often initiated by the sea breeze front from either coast. Intense thunderstorms producing heavy downpours of rain and frequent cloud to ground lightning strikes are common during summer afternoons and evenings. Coincidently, most of the Okefenokee's wildfires occur during this period. The summer weather pattern can also be affected by tropical systems moving across the area. Hurricanes, tropical storms, and tropical depressions moving ashore from the Atlantic Ocean or the Gulf of Mexico can produce very heavy rain across the region. Summer high temperatures will normally exceed 100 degrees on two or three occasions. Nighttime temperatures normally range in the upper 60s to lower 70s.

In winter, without the blocking effect of the Bermuda High and with shorter days and less heating, cold fronts will move through the area. Winter conditions are often controlled by large mid-latitude weather systems in which most storm development occurs over the middle of the country or the Gulf of Mexico and move east and southeast into the Atlantic Ocean and into Florida. As cold fronts pass through the area, the wind shifts from the southwest to the northwest and north. After a cold frontal passage, high pressure will dominate the area with weather conditions becoming drier and stable for a period, with steady northerly winds, cold temperatures, and low relative humidity values. Temperatures can vary greatly from day-to-day, with readings ranging from the seventies to the teens within a period of a few days. During the winter, the Okefenokee NWR has an average high temperature of 67 degrees and an average low of 42 degrees. A normal winter will have about 21 days below 32 degrees.

During the spring and fall, the weather can be quite variable across the region. In the fall, cold fronts return to the south Georgia/north Florida area. In the early fall and late spring, many cold fronts will stall and become stationary in north Florida before becoming warm fronts and moving back toward the north. These warm fronts will bring warm moist air northward overriding the colder air and creating cloudy, drizzly, rainy conditions. In the spring, mid-latitude weather systems intensify in the Great Plains and sweep eastward. Cold Canadian air masses colliding with warm moist air from the Gulf of Mexico will bring thunderstorm squall lines through the area. The highest frequency of severe weather, such as tornadoes, occurs in the spring, in large part, due to the collision of the colder, drier air mass with the warm, moist Gulf air (McAllister 1998).

Table 1 shows the maximum and minimum average temperatures and the average rainfall for each month.

Table 1. Climatological averages at Camp Cornelia weather station (east entrance)

	Average Minimum °F	Average Maximum °F	Absolute Minimum °F	Absolute Maximum °F	Rainfall (Avg)
Year	**1990-2003**	**1990-2003**	**1990-2003**	**1990-2003**	**1945-2003**
January	42	67	16	84	3.50
February	46	71	13	88	3.39
March	50	76	21	90	4.30
April	55	82	34	95	3.25
May	62	89	38	103	3.67
June	68	92	54	104	5.83
July	71	95	63	106	7.43
August	70	93	61	104	7.27
September	68	89	50	98	5.37
October	58	82	36	95	3.22
November	49	75	24	89	2.18
December	44	67	19	83	2.87

Relative humidity averages are fairly high due to the refuge's location between the Gulf of Mexico and the Atlantic Ocean. Year around averages at 7:00 a.m. are about 85 percent. Minimum relative humidity (about 2:30 p.m.) averages about 52 percent. Maximum relative humidity reaches 100 percent every night except during the very driest of seasons.

Most dormant season prescribed burning takes place during several days of stable weather conditions following each weather system. Although very little lightning occurs during this period, a secondary fire season exists during the winter months. An abundance of cured understory vegetation, occasional heavy winds, and the presence of a great deal of prescribed burning contributes to this wildfire danger. If arson were more prevalent, the winter season might be Okefenokee's major wildfire season.

During the short spring and fall seasons, normal lightning activity is only moderate; thus, lightning caused wildfires are not common.

From mid-May through mid-September, most storm systems are convective in nature. Warm, moist air masses begin to rise, causing the convective thunderstorms common to this area during this period. Spectacular lightning storms with hundreds of strikes often occur. Most of Okefenokee's wildfires occur during this period. These late spring and summer wildfires are the major factor that shaped the historical longleaf pine communities once common to this area and maintained the swamp's diversified landscape. Growing season prescribed fire is being introduced to restore these environmental conditions. The unstable winds caused by afternoon thunderstorms may make burning conditions very difficult. Careful planning, timing, and execution are very important.

HISTORICAL/ECOLOGICAL ROLE OF NATURAL EVENTS

Although fire is the most obvious natural event shaping the Okefenokee ecosystem, several other recurring events have played an important part. These events include drought, lightning strikes, insect infestations, diseases, tornados, windstorms (microbursts), hurricanes, and water level fluctuations.

Role of Fire in Uplands

Fire determines the overstory and ground cover species dominating the uplands within the Okefenokee NWR, and indirectly, its wildlife species. The Okefenokee Ecosystem is part of the vast southeastern coastal plain where the uplands were once dominated by a major fire dependent plant association, the longleaf pine community. The Southeast once supported 60-92 million acres of this association.

Ecologists have identified over 30 longleaf pine associations supporting a wide array of native wildlife species. The most traditional community association is longleaf pine/wiregrass. Longleaf pine and wiregrass (*Aristida beyrichiana*), along with many of its associated wildlife species, including the red-cockaded woodpecker (*Dendrocopus borealis*), gopher tortoise *(Gopherus polyphemus*), and indigo snake (*Drymarchon corais*) are all long-lived but reproductively unprolific species. As long as the area remained undisturbed, the community prospered. The fine, resinous, wiregrass understory promoted the spread of frequent, low intensity wildfires over vast areas, killing seedlings of competing pine species as they attempted to invade the uplands from the edges of swamps, ponds, and river bottoms. The fire resistant longleaf pine seedlings and mature pines survived, thus perpetuating the open park-like longleaf pine community. Growing season fires, during the normal lightning season, stimulated the seeding of new clones of wire grass and other community plants, while setting back growth of tall shrub species, such as gallberry, palmetto and hurrah bush. The understory components and structure of longleaf pine communities provided a diverse habitat suitable for all other native species of wildlife common to the southeastern coastal plain.

Upland fire, in addition to perpetuating longleaf community species, created additional habitat diversity by acting with other natural disturbances to create openings in the mature forest overstory. Over many hundreds of years, the regular occurrence of new openings resulted in the traditional, multi-aged longleaf pine forest. As the new openings seeded in to create new age classes, fire, in turn, destroyed less fire resistant seedlings, maintaining the pure longleaf stand.

During pre-settlement times, fire in the longleaf pine association was quite common. Lightning season fires were frequent and widespread. Analysis of the flammability of longleaf community understory species, the frequency of lightning strikes, the presence of and the location of natural barriers has shown the average fire frequency on the uplands surrounding the Okefenokee Swamp to have been one to three years (Frost 1998).

Fire ignited during all seasons by natives and early settlers for cultural reasons added to the effects of lightning caused fire. Fire was used by native Americans to stimulate berry growth, to improve hunting, and to clear land. Later settlers continued to set fires for similar reasons, as well as to improve cattle grazing (Wahlenberg 1946).

Role of Fire in Wetlands

Fire has played an important part in the formation of the Okefenokee Swamp. The entire floor of the swamp is covered by a bed of peat varying from a few inches thick at the swamp's edge to 3 to 15 feet thick in the swamp's interior (Cohen 1984). During construction of logging trams in the swamp, some holes over 20 feet deep were discovered (Hopkins 1947). In scrub-shrub and forested areas, the root mat covering the surface of the peat is usually at about the average water level. Most of the

peat surface is covered with bog forest or dense scrub-shrub. Approximately 31,246 acres of the swamp (8 percent) are open marshes or "prairies" varying in size up to several thousand acres. Depending on water levels, the peat surface in the prairies is covered with a few inches to two or three feet of water. Most of these prairies are believed to be the result of very severe fires, which killed the woody plants and burned away part of the upper peat bed. Most of the prairie lakes and ponds are the result of pockets being burned in the peat (Cypert 1972). Alligators may create small open water areas or help to maintain existing “holes” (Pirkle 1984).

According to Cypert, a fire in 1844 was the last fire to be severe enough to have caused prairies. Since then, there have been fires severe enough to kill timber but not severe enough to permanently kill the woody vegetation and remove significant layers of peat. Repeated fires such as those in 1932 and 1954-55 could create prairie conditions, however. One area examined by Cypert in 1956 and 1970 was burned quite severely by both fires. Prior to 1932, another area north of the Suwannee Canal, between Camp Cornelia and Mizell Prairie, was covered with pond cypress and slash pine. The 1932 fire killed most of the timber. By 1954, a dense thicket of pond cypress, white bay, sweet bay, swamp black gum, hurrah, titi, and bamboo vine sprouted up in its place. The 1954-55 fire burned away the remaining trees, the thicket, and about one foot of peat. When inspected in 1956 and again in 1970, the woody growth had been reduced severely. One more severe fire over this area would probably result in a prairie (Cypert 1973).

The swamp ponds and prairies seem to be slowly reverting to swamp forest. Cypert classified 60,000 acres as prairie during his studies following the 1954-55 fires (Cypert 1973). Cyndy Loftin’s studies during the 1990s showed about 31,246 acres as prairie (Loftin 1998). The future occurrence of drought periods and fires will play an extremely important role in the appearance and character of the Okefenokee as a wildlife refuge. In a report on a 13-year study of “Plant Succession on Burned Areas in the Okefenokee Swamp following the fires of 1954 and 1955”, Eugene Cypert (1972) concludes the following:

"*It is difficult to appraise the importance of extreme droughts and the accompanying fires to Okefenokee Swamp. The aesthetic damage is incalculable. Doubtless the droughts and fires are damaging to most forms of swamp wildlife at the time of their occurrence. However, the prairies and the prairie lakes and ponds are a unique part of the swamp. It is obvious that they are now slowly but steadily reverting to swamp forest. If this trend should continue until the whole swamp is forested, most of the more important and interesting species of wildlife would be adversely affected. The sandhill crane, bitterns, rails, gallinules and the roundtail muskrat would disappear entirely from the swamp. There would be little use of the swamp by waterfowl. Alligators would probably survive but their required habitat would be drastically reduced. Herons, ibises, ospreys and probably other important kinds of wildlife would become rare or disappear from the swamp. Serious consideration must be given as to what control measures should and should not be taken to prevent or to permit fires in Okefenokee Swamp during periods of extreme drought*."

Fire also plays an important role in maintaining the numerous isolated wetlands that are interspersed throughout the uplands. Keeping fire out of these areas has promoted the growth of the woody understory and diminished their function. Restoring these wetlands by allowing fire to pass through them contributes to the overall health of the ecosystem by re-establishing the natural hydrology. As a result, conditions for the reproduction of amphibians are enhanced.

Role of Other Natural Events

Lightning - Most of the fires that served to maintain upland and wetland ecosystems were started by lightning; however, the vast majority of lightning strikes do not start fires. Lightning has the additional important effect of maintaining age, diameter, and density diversity by killing small clumps of trees, creating natural patch regeneration areas. Fire, in turn, destroys seedlings of any other less fire

resistant species, maintaining the pure longleaf stand. Within the swamp, lightning's only effect, other than igniting fires, is to kill single trees or groups of trees.

Wind Storms - The occurrence of tornados, wind storms, and microbursts is less common than lightning but these natural events also create openings and new stands in uplands and wetlands.

The effects of hurricane force winds are more difficult to assess. The effects of past hurricanes are very anecdotal. In addition, twentieth century hurricane seasons are believed to be very anomalous, departing from the 18th and 19th century frequency of a particularly destructive hurricane season every 20 years (Sandrik and Landsea 2003). Sandrik's research has identified two hurricanes during the 19th century that should have been very destructive to Okefenokee's timber stands, one in 1896 (category 3) and one in 1813.

Historians indicate that longleaf pine reached ages of up to 400 years on the southeastern coastal plain. Plantations managed for quail hunting in west Georgia contain groves of longleaf pine approaching this age. A section cut from a stump on Blackjack Island in Okefenokee Swamp in 1920 and burned many times since, still shows 300 growth rings (Phernetton personal communication). It is not known how resistant longleaf pine is to category 3 hurricanes, but if each hurricane of this nature was totally destructive to longleaf pine stands, very few trees would reach the age of 400 years. It is postulated that longleaf pine stands are at least partially resistant to hurricane winds of up to 120 mph, although hurricanes and accompanying tornados probably played a large part in the patchwork multi-aged stand makeup of old growth longleaf pine stands. A study at the Medway Plantation near Charleston, South Carolina, following Hurricane Hugo, a category 4 hurricane, supports the resistance of longleaf pine to hurricanes. The eye of Hurricane Hugo passed within a few miles of the plantation. A survey of damages showed 70 percent of the longleaf pine to be standing while less than 20 percent of the loblolly pine remained (Hortman personal communication).

There is no documented evidence of the effects of hurricanes within the wetlands, although some of the hurricanes of the 1800s must have passed through the swamp.

Hurricanes and tropical storms indirectly affect the ecosystem by controlling fire. The summer fire season is often terminated by a series of tropical storms that extinguish surface fires and recharge water levels, drowning fires smoldering in the organic layers of the swamp.

Water Levels - Fluctuating water levels affect the Okefenokee wetlands in several ways. Periods of drying and flooding affect the species composition in the wetlands. Rates of decomposition of organic material are determined by exposure times during dry periods (Yin and Brook 1992).

Water levels also play a very important factor in determining fire effects. Water levels determine:

- Whether a fire will burn at all, even on the uplands.
- Whether the fire will burn into the swamp or remain confined to uplands.
- The effectiveness of natural barriers within the swamp. Natural barriers may isolate fires within sections of the swamp.
- Whether it will burn only the aerial portion of the swamp vegetation resulting in a temporary opening until scrub/shrub or other vegetation grows from root sprouts.
- Whether it will burn into the root mat, creating permanent openings.
- Whether it will burn deep into decomposed peat, creating new lakes and prairies.

PHYSIOGRAPHY AND GEOLOGY

Okefenokee NWR lies within the South Atlantic Coastal Plain that covers northeastern Florida, the southern half of Georgia, and the eastern halves of South Carolina and North Carolina. This physiographic region's western boundary is the fall line that marks the beginning of the hilly Piedmont and its eastern boundary is the Atlantic Ocean. As part of a continuous Coastal Plain that extends from New York to Texas, it has arbitrary boundaries at the Alabama-Georgia border and at the North Carolina-Virginia border, extending into the southeast corner of Virginia only to capture the very Southeastern Great Dismal Swamp. The southeastern boundary marks a broad transitional zone into Peninsular Florida. (http://blm.gov/wildlife/pifplans.htm).

The Okefenokee Swamp is a vast peat bog filling a huge saucer-shaped sandy depression. The upper margin of the swamp, or the "swamp line," ranges in elevation from 125 feet above sea level on the northeast side to 105 feet on the southwest side. The shallow, dark-stained waters of Okefenokee NWR flow slowly but continuously across the swamp toward the two outlets--the famed Suwannee River on the west side and the historic St. Marys River on the southeast. Scattered throughout the swamp are narrow arcuate sandy ridges forming islands and peninsulas.

The origin of the Okefenokee Swamp has been a subject of continuous debate among geologists and historians. Two theories have developed to describe the origin of the swamp (Parrish and Rykiel, Jr. 1979). The traditional and more popular (although probably incorrect) theory developed by R. M. Harper in 1909 places the origin of the swamp prior to the Illinois glaciation period, several hundred thousand years ago. Ocean currents are thought to have caused a series of spits (sand bars) to form along the eastern edge of the swamp. When water levels dropped during the ensuing glaciation period, a large body of water was trapped behind the sand bar (Trail Ridge) creating a marine lagoon. Over a period of time salt water was replaced by fresh water and the lake began to fill with organic vegetation. As peat accumulated, the lake gradually turned into a swamp (Pirkle and Pirkle 1984; Trowell 1994).

The Holocene freshwater theory postulated by O. Veatch in 1911 was expanded in recent times by others (Parish and Rykiel 1979; Brooks 1966; Rich 1979; Davis 1987; Huddleston 1988) and summarized by C. T. Trowell (1994). This freshwater theory indicates that origins of the Okefenokee Swamp were much more complex than previously believed. Basically the swamp formed in two stages. A series of events beginning during the Miocene Period through the Pleistocene Period resulted in the formation of the Okefenokee Basin. These events include: a 200 foot thick layer of clay deposited on the coastal plain; delta bars formed by ancient rivers; formation of a series of step like terraces and barrier islands by fluctuating ocean levels; diversion of drainages and capturing of rivers by geologic uplifts. These delta bars and barrier islands are present today and form the upland habitats of the refuge. The second stage, formation of the swamp, began during very recent times (Holocene Period) as a freshwater event (Pirkle 1984; Trowell 1994).

The Okefenokee Swamp is located on the Wicomico Terrace (Okefenokee Terrace, Sunderland Terrace, Northern Highlands) left at an elevation of 100 to 120 feet above sea level by an earlier receding sea level. The swamp's eastern margin, Trail Ridge, is an ancient beach ridge created by wave/wind action at the cresting edge of an eroding, encroaching sea during the Pliocene or Pleistocene ages. The 200 feet thick impermeable calcareous clay layer called the Hawthorn Formation underlies the Wicomico Terrace. The Hawthorn Formation overlays the carbonate formation forming the Floridan Aquifer. The Hawthorn Formation bordered by Trail Ridge is a key element in the formation of the Okefenokee Swamp (Pirkle 1984 and Pirkle and Pirkle 1984, Rich 1979, Trowell 1994) (Figure 7).

During the Wisconsin glaciation period, the swamp was high and dry with no evidence of organic material formed by marine organisms. Oak forests and prairie probably dominated the landscape.

Fire was common. As the climate became warmer, the glaciers began to recede, the environment became more humid, rainfall increased, and ocean levels and the groundwater table began to rise. From about 5,000 years ago to the present, vegetation gradually changed from upland herb/oak communities to longleaf pine forests. The thick clay bottom held water in the basin. Low areas remained wet year-round. The Okefenokee Swamp began to form. Mesic broadleaved communities began to form in depressions and along drainages. Cypress began to invade the swamp. The swamp forest spread laterally away from stream courses and small lakes as peat accumulated. As peat accumulated, raising the water table, the swamp grew vertically and laterally until it eventually covered higher areas between streams and ponds, eventually forming the swamp as we know it today (Parish and Rykiel 1979; Trowell 1994).

SOILS

A soil survey concentrating on the uplands of the Okefenokee Swamp was completed by the National Resources Conservation Service in 1996. A soil profile showing the relative position of each series is illustrated in Figure 8 and a brief description of each soil series is presented in Table 2. The soil types are generally arranged from the lowest wetland to the highest upland.

HYDROLOGY

The Okefenokee Swamp is considered a deep water swamp containing peat soils. It is an elevated wetland ranging from an elevation of 125 feet above mean sea level (AMSL) on the northeast side of the refuge to 105 feet AMSL at the outflow to the Suwannee River. Although most of the area has no perceptible surface flow, the water is not stagnant and flows across the swamp through a series of depressions stair-stepping towards the outlets of the swamp.

The Okefenokee Swamp receives water via precipitation (70 percent) and surface runoff (30 percent) (Rykiel 1977). Measurement of the watershed draining directly into the swamp (30 X 60 minute Geological Survey Map; scale-100,000, 1980) shows a drainage of 600 square miles. Over 400 square miles of the watershed are located northwest of the swamp. The remaining 200 square miles drain a narrow strip between the swamp's edge and Trail Ridge to the east, Waycross Ridge to the north, and a series of islands and ridges south of the swamp through many small parallel creeks. Major creeks draining into the swamp on the northwest side are: Black River, Alligator Creek (north), Greasy Branch, Suwannee Creek, Cane Creek, Bear Branch, Surveyors Creek, Barnum Branch, Turkey Branch, and Big Branch.

Groundwater contributions to the swamp's water budget are not well known. However, some prairies may be influenced locally by groundwater contributions (Loftin 1998). Holes in the bed of the swamp were located during construction of logging railroads (Hopkins 1947). There is a possibility of sinkholes in the bed of the swamp, which may allow seepage through the Hawthorn formation to or from the aquifers below. Most available studies, however, indicate that the Hawthorn formation effectively separates the water table aquifer from the principal artesian aquifer (Rykiel 1977). The swamp may receive some input from surficial aquifers. Researchers have detected cold water currents in some locations (Loftin 1998).

Figure 7. West to east profile of the sediments under the Okefenokee Swamp and surrounding it (Hyatt 1984)

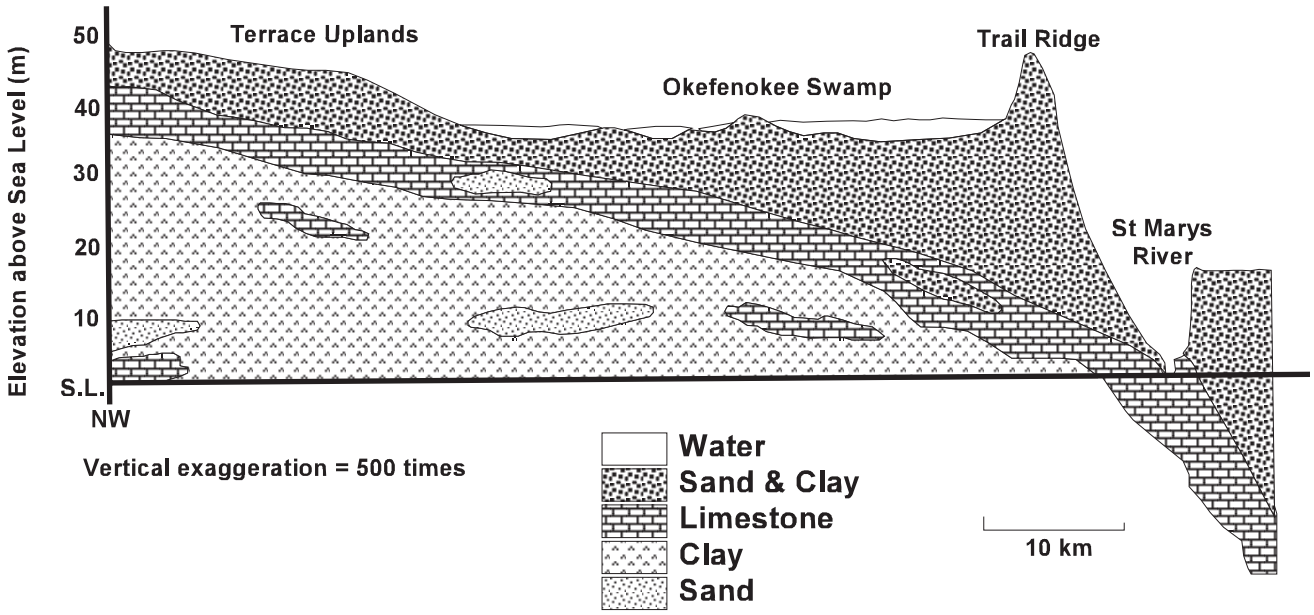


Figure 8. Typical soils series within the Okefenokee National Wildlife Refuge with the associated vegetation types

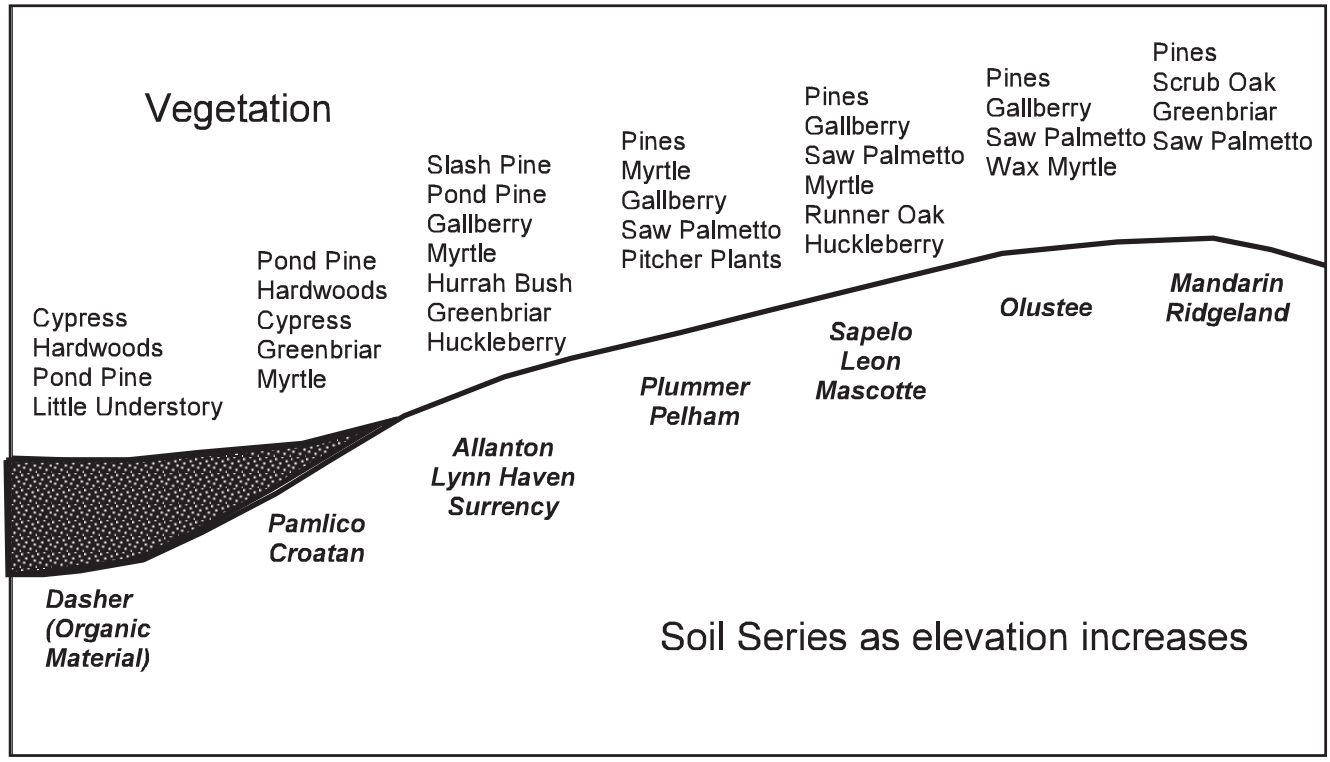


Table 2. Soil series descriptions at Okefenokee National Wildlife Refuge

NAME	[1] MAP SYMBOL	[2] COMPOSITION			[3] SITE INDEX	[4] WATER TABLE DEPTH (ft)	FLOODED	PERMEABILITY	REMARKS
		S	C	OM					
DASHER MUCK	728A1	R%	0%	40-99%	PP: Varies CYP: Varies	+? to -0.5	Usually	Moderately rapid	Identifying characteristic: OM extends > 51 inches. Assoc. Veg.: Scrub pond & slash pine; cypress; water tupelo;swamp tupelo; sweet bay magnolia. Ground Cover: Saw grass; iris; bull-tongue; arrowhead; greenbriar; ferns; aquatic plants.
CROATAN	28A1	R%	0%	25-60%	Scrb Pines:Varies Cypress: Varies	+? to -1.0	Seasonally	Rapid	Identifying characteristic: OM extends to 28 inches. Location: Depressions; Between Dasher & upland. Ground Cover: Saw grass; iris; bull-tongue; arrowhead; greenbriar; ferns; aquatic plants.
KINSTON/ JOHNSTON	767A1	R%	5-18%	2-8%	BHwds: 90-100 Loblolly P: 100	0 to -1.0	Common	Moderate to Rapid	Location : Flood Plains. Rare on Okefenokee NWR except on Suwannee River drainage.
ALLANTON MUCK SAND (ponded)	855A1	R%	3-12%	10-20%	Cypress: 75 Wet Hwds: NA		Seasonally	Moderate to Moderately Rapid	Location: Depressions; Ponds Identifying Characteristic: Organic stained layers to 80 in. Assoc. Veg.:Red maple; swamp & water tupelo; swamp chestnut oak; water oak; willow oak; cypress; sweetgum. Understory: Greenbrial; hurrah bush; titi; other shrubs.
SURRENCY MUCKY SAND (ponded)	55A1	R%	2-8%	10-20%	Sweetgum: 90 Slash P: 90 Loblolly P: 95 Misc Hwds: varies Cypress: varies	0 to -0.5	Common	Moderate	Location: Drainage ways & depressions. Assoc. Veg.: Hardwood forest types; pond pine; slash pine; Lob. Pine. Understory: Greenbriar; hurrah bush; titi; other wetland shrubs.

NAME	[1] MAP SYMBOL	[2] COMPOSITION			[3] SITE INDEX	[4] WATER TABLE DEPTH (ft)	FLOODED	PERMEABILITY	REMARKS
		S	C	OM					
MASCOTTE MUCKY FINE SAND	840A1	R%	0-5%	2-7%	Longleaf P.: Slash P.: NA Loblolly P.: NA	+1.0 to -1.0		Moderately Slow	Characteristics: Very deep, very poorly drained. Marine deposits. Location: Level, flatwood areas, depressions and low stream terraces. Assoc Veg: Longleaf, slash, & loblolly pines. Understory: Palmetto, gallberry, fetterbush, myrtle, grasses.
LEON SAND (ponded)	39A1	R%	1-6%	10-20%	Slash pine: 75 Loblolly pine: 70	+2 to -3.5	Common	Moderate to Rapid	Location: Outside ring of many islands in Oke Swamp. Assoc. Veg.: Probably slash & loblolly pine. Understory: Heavy rough; gallberry; hurrah bush; poor mans soap.
RUTLEGE SAND (ponded)	755A1	R%	2-10%	3-9%	Cypress: 75 Other Hwds: NA	0 to -1.0	Common	Rapid	Location: Shallow depressions and drainageways. In Oke, located in shallow areas between islands or drainages between upland areas. Assoc Veg.: Hardwoods forest; pond, slash, loblolly pines. Understory: Gallberry; huckleberry; myrtle; grasses; sedges.
MASCOTTE FINE SAND	740A1	R%	0-5%	2-7%	Longleaf P: 70 Slash P: 85 Loblolly P: 80	0 to -1.0		Moderately Slow	Location: Broad low-lying areas. Examples are east end of Seldom Seen Point and high part of Comp 9-3. Characteristics: Loamy; Depth of 24 - 40 inches. Assoc. Veg.on Higher areas: Longleaf & slash pine. Understory: Gallberry; palmetto; myrtle; hurrah bush; grasses. Assoc. Veg. on Depressional areas: Slash P; Cypress; Wetland hardwoods. Understory: Grasses; ferns; moss; pitcher plants greenbriar; sedges.

NAME	[1] MAP SYMBOL	[2] COMPOSITION			[3] SITE INDEX	[4] WATER TABLE DEPTH (ft)	FLOODED	PERMEABILITY	REMARKS
		S	C	OM					
PELHAM LOAMY SAND (ponded)	52A1	R%	1-8%	1-2%	Wet Hwds: 86 Slash P.: 86 Loblolly P: 86	-0.5 to -1.5	Subject to Flooding Seasonally Ponded	Moderate	Characteristic: Deep, poorly drained. Location: Low flats, depressions. Drainageways, ponds. Assoc. Veg.: Slash, loblolly, pond P.; sweetgum; blackgum, swamp tupelo, water oak, cypress. Understory: Gallberry, myrtle, other water tollerant veg.
SAPELO FINE SAND (moderately wet)	65A1	R%	2-5%	1-3%	Longleaf P.: 65 Slash P.: 85 Loblolly P.: 85	-0.5 to -1.5		Moderate	Characteristic: Deep, poorly drained, sandy throughout. Location: Low pine flatwood areas adjacent to depress-ions and drainageways. Assoc. Veg.: Longleaf, slash, loblolly pines. Understory:
PELHAM LOAMY SAND	752A1	R%	5-10%	1-2%	Sweetgum: 80 Blackgum: 80 Water oak: 80 Longleaf P.: 80 Slash P.: 90 Loblolly P.: 90	-0.5 to -1.5	Subject to Flooding.	Moderate	Characteristics: Deep, poorly drained. Subsoil is loamy, extends to depths greater than 5 ft. Well suited to forest management. Location: Low flats, depressions and drainageways. Examples are found in the Suwannee River drainage. Assoc. Veg.: Longleaf, slash, loblolly pines; sweetgum; blackgum ; water oak; cypress. Understory: Gallberry, myrtle, palmetto, swamp holly, wire grass and other water tollerant grasses.
SAPELO FINE SAND	765A1	R%	2-5%	1-3%	Longleaf p.: 65 Slash P.: 77 Loblolly P.: 77	-0.5 to -1.5		Moderate	Characteristics: Deep, poorly drained, sand throughout. Location: Flatwood areas adjacent to depressions and drainageways. Examples are flatwood parts of peninsulas extending into the swamp (C 11-4, C 12, parts of C 8, Strange Island). Assoc. Veg.: Longleaf, slash, loblolly P.; blackgum; water oak. Understory: Gallberry, palmetto, dwarf huckleberry.

NAME	[1] MAP SYMBOL	[2] COMPOSITION			[3] SITE INDEX	[4] WATER TABLE DEPTH (ft)	FLOODED	PERMEABILITY	REMARKS
		S	C	OM					
LEON SAND	739A1	R%	1-5%	O.5-4%	Longleaf P.: 70 Slash P.: 80 Loblolly P.: 75	0 to -1 ft.		Moderate to Moderately rapid	Characteristics: Deep, poorly drained soil. Sandy with organic stained layers below 15 inches. Location: Smooth uplands. Mid-level parts of most islands in swamp. Assoc. Veg.: Longleaf and other pines; water oak. Understory: Myrtle, palmetto, gallberry.
PLUMMER	751A1	R%	1-10%	1-3%	Longleaf P.: 70 Slash P.: 88 Loblolly P.: 91	0 to -1.0	Subject to Flooding	Moderately Rapid	Characteristics: Deep, poorly drained soil. Subloil loamy down to 5 ft. Location: Low flats, depressions and drainageways. Assoc. Veg.: Longleaf, slash and loblolly pine; swamp tupelo; cypress. Understory: Gallberry; waxmyrtle; bayberry; wiregrass; pitcher plants; bracken fern.
LYNN HAVEN SAND	808A1	R%	1-6%	1-4%	Longleaf P.: 70 Pond P.: 70 Slash P.: 85 Loblolly P. 80	0.0 tp 0.5 wet periods >-3.5 dry periods	None	Moderate to Moderately Rapid	Characteristics: Very deep, very poorly drained sandy soil. Location: Low level flatwoods and depressions. Chesser Island near homestead. Assoc. Veg.: Longleaf and slash pines. Underatory: Palmetto, gallberry, fetterbush, huckberry, grasses.
MANDARAN SAND	19A1	R%	0-3%	0.5-3%	Longleaf P.: 60 Slash P.: 70 Live Oak: NA			Moderate	Characteristics: Somewhat poorly drained soil, thick sandy deposit on marine terraces. Location: Found on Trail Ridge and ridge of many islands. Topped by Ridgeland sand on highest islands. Assoc. Veg. Longleaf and slash P.; scrub oak. Understory: Gallberry, palmetto, greenbriar, grasses.

NAME	[1] MAP SYMBOL	[2] COMPOSITION			[3] SITE INDEX	[4] WATER TABLE DEPTH (ft)	FLOODED	PERMEABILITY	REMARKS
		S	C	OM					
RIDGELAND SAND	48A1	R%	0-10%	1-4%	Longleaf P.: 70 Slash P.: 80 Loblolly P.: 80	1.5 to 2.5		Moderate to Moderately Rapid	Characteristics: Somewhat poorly drained soil, very deep and sandy throughout. Location: Ridgeline of highest islands. Assoc. Veg.: Understory:
CENTENNARY SAND	81A1	R%	1-8%	0.5-1%	Longleaf P.: 70 Slash P.: 85 Loblolly P.: 85	3.5 to 5.0	None	Moderately Rapid	Characteristics: Well drained on broad ridges and flats. Location: Homestead Area on Chesser Island. Assoc. Veg: Slash and Loblolly Pine Understory:

[1]The soil series designation (855A1) is printed on each map where the type exists. These series are also color coded.
[2]Composition: S= Sand
C= Clay
OM= Organic Material
R= Percent of clay and organic material is given. R designates the remainder is sand.
[3]Site Index: The site index is the height in feet a particular species will grow on a soil type in 50 years.
[4]Water Table Depth: Seasonal high water table.
+ Indicates above the surface.
- Indicates below the surface.

Rykiel determined that in general 80 percent of the water output from the swamp left through evapotranspiration and only 20 percent left via river and stream flow. The principal drainages are the Suwannee River (85 percent of the surface water outflow), the St. Marys River (11 percent), and Cypress Creek (4 percent). The northern four-fifths of the swamp drain into the Suwannee River. The St. Marys River drains only the area east and south of Blackjack Island, south of Mitchell and Broomstraw Islands, and areas surrounding Soldier Camp Island.

Loftin (1998) defined five major hydrologic "basins" within the swamp (Figure 9). Although they are partially connected and demonstrate similar seasonal trends, the amplitudes of these trends vary regionally. The northwestern region, including the Suwannee River, experiences the greatest seasonal and annual fluctuations in water elevations. Over a 3- to 4-week period, water elevations may fluctuate $\pm$0.75 m. This corresponds to seasonal rainfall, not only that which falls over the swamp, but also that falling on the area northwest of the swamp and carried into the region by numerous streams. The least water level fluctuations occur in the northeast region of the swamp where during the same interval, elevations might fluctuate $<\pm$0.06 m. This may be because less runoff is received from neighboring uplands or there is a contribution of ground water in the area. Vegetation composition differs between these areas, which may also affect regional evaporative demands. Surface outflow is also more limited from the northeast basin than from the northwest basin.

The water level varies from 117.6 feet in dry years to 123 feet in wet years on the east side and from 110.4 feet to 118.6 feet on the west side. Average water level at Camp Cornelia is 121.4 feet and at Jones Island is 115.2 ft. Table 3 shows semi-monthly average water levels at Suwannee Canal and Stephen C. Foster State Park.

The swamp has experienced extreme highs and lows throughout history. Droughts have been reported in the literature and summarized by Rykiel (1977) during the following years: 1844, 1856-57 (winter), 1860, 1902, 1909-10, 1932, 1943, 1954-55. During some of these droughts, the Suwannee River and Billys Lake were dry (1860 and 1943). Precipitation during 1954 was 26.07 inches. Since this time, annual rainfall has not been below 33 inches. The eastern side of the refuge received less than 40 inches of rain in 1968, 1978, 1981, and 1990. Annual precipitation was over 70 inches during 1948, 1964, 1973, and 1991.

A 5-mile earthen dike and two water control structures were completed in 1960 to reduce the flow of water out of the swamp during drought periods. This structure was examined through an environmental assessment (USFWS 1998) and plans to be breached and the water control structures removed to re-connect the swamp with the Suwannee River.

Figure 9. Hydrological basins within the Okefenokee Swamp (Loftin 1998)

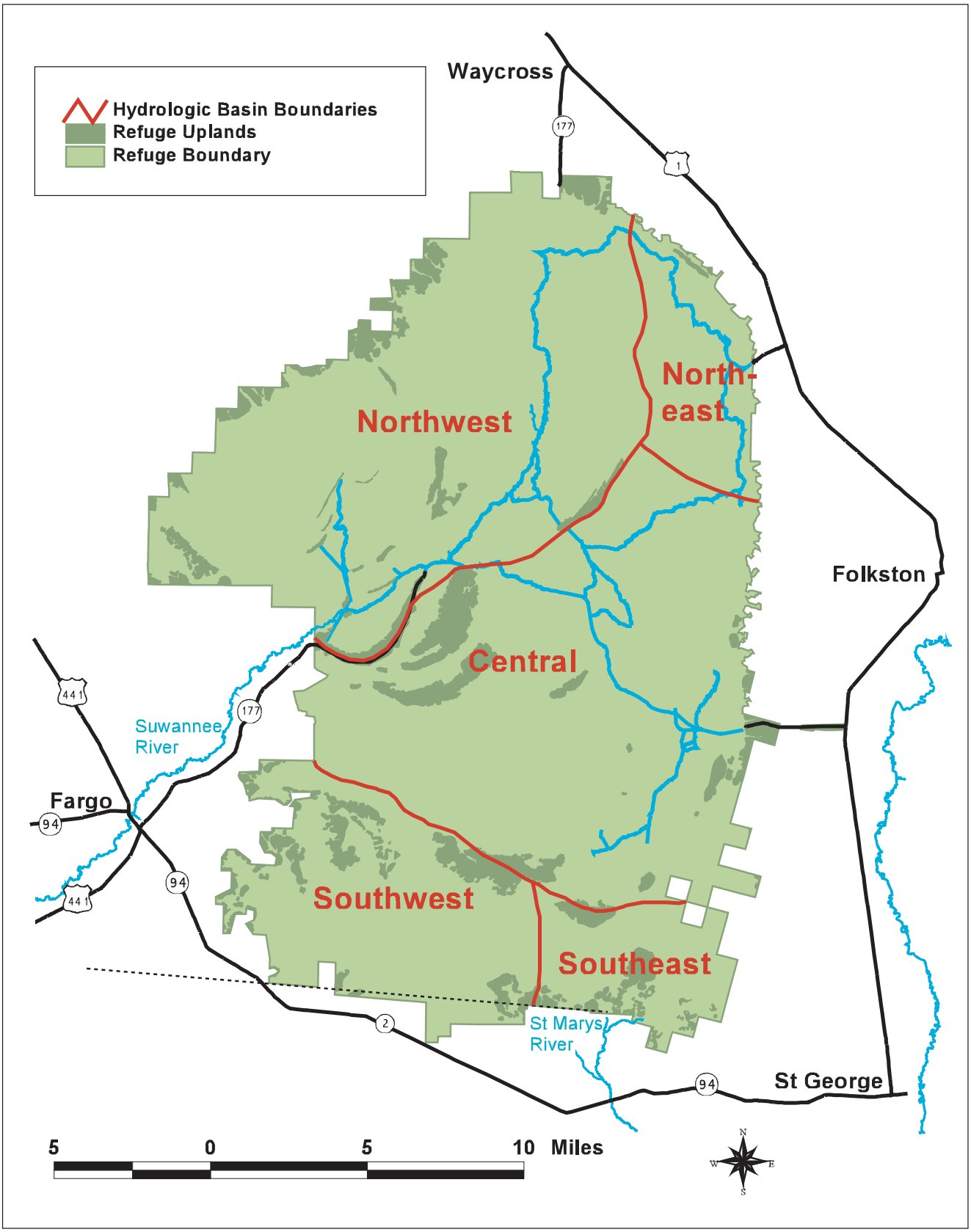


Table 3. Semi-monthly average water levels (msl) at Suwannee Canal Recreation Area (SCRA) and Stephen C. Foster State Park (SCFSP) between 1990 and 2003

Date	SCRA	SCFSP
Jan 1	119.89	114.54
15	120.02	114.72
Feb 1	120.25	115.06
15	120.25	115.20
Mar 1	120.26	115.33
15	120.37	115.38
Apr 1	120.36	115.18
15	120.24	114.81
May 1	120.08	114.44
15	119.81	114.03
Jun 1	119.57	113.86
15	119.62	114.02
Jul 1	119.57	114.10
15	119.62	114.16
Aug 1	119.82	114.31
15	119.94	114.42
Sep 1	119.91	114.34
15	119.85	114.42
Oct 1	119.94	114.28
15	120.11	114.56
Nov 1	120.11	114.45
15	119.96	114.39
Dec 1	119.86	114.33
15	119.86	114.39

Isolated Wetlands

Seasonally ponded isolated wetlands are scattered over the uplands of the Okefenokee ecosystem in association with sandy soils. Dependent on rainfall and adjacent run-off, water levels fluctuate in these shallow basins causing cycles of drying and wetting. Unless altered, they are not connected to other wetlands, are not spring-fed, and lack a permanent fish population. Within the refuge, these ponds begin filling as the fall rains come. By June, most small ponds are again dry. This cycle along the edges of the ponds is critical for the successful reproduction of amphibian and invertebrate species.

The Suwannee River

The Suwannee River is the primary surface water outflow from the Okefenokee Swamp. Eighty-five percent of the surface water outflow exits the swamp via this river (Rykiel 1977). From the swamp, it travels approximately 235 miles to the Gulf of Mexico (Save Our Suwannee, Inc., brochure). Twenty-nine miles are located in Georgia, while the remaining two-hundred and six miles are in Florida. The Alapaha, Withlacoochee, and Santa Fe Rivers are the principal tributaries. Contributions to the river below the sill before reaching Fargo, 12 miles downstream, include Bay Creek, Alligator Creek, Sweetwater Creek and Jones Creek. Except for Jones Creek, the remaining creeks draw water from the Okefenokee Swamp. Cypress Creek also draws water from the southwest corner of the swamp and joins the river below Fargo. Loftin (1998) estimates that 10-30 percent of the water that passes the Fargo water gauge is comprised of water passing through and around the sill. Bay, Alligator, Sweetwater, and Jones Creeks contribute the remainder.

The Upper Suwannee River, from the swamp to White Springs, is characterized by steep banks, swift flow, shoals and tannic acid stained waters (Save Our Suwannee, Inc., brochure). There is evidence along the banks that the flow in this region has cut through the Hawthorn clay and runs along the limestone aquifer. The river channel at the Suwannee River Sill structures is at 105 feet AMSL. Twelve miles downstream, at the Fargo gaging station, the elevation is at 91.9 feet AMSL (a 13.1-foot drop in elevation or 1.09 feet/mile). Benton gaging station is 27 miles below Fargo at an approximate elevation of 74.1 feet AMSL (a 17.8-foot drop in elevation or 0.66 feet/mile). Twenty-five miles further downstream at White Springs gaging station the elevation is 48.54 feet AMSL (a 25.56-foot drop in elevation or 1.02 feet/mile). The surrounding land use in the upper portion of the Suwannee River is primarily timber production and sparsely populated.

Humans have influenced the Suwannee River drainage through the years, beginning with extensive logging and turpentining by the earliest settlers. Later phosphate mining along the Suwannee River banks, increasing development that eliminates flood-controlling wetlands, and discharging effluent from towns, individual residences, and businesses have affected the river and its watershed.

WATER QUALITY

The slow-moving waters of the Okefenokee Swamp are tea-colored due to the tannic acid released from decaying vegetation. Levels of pH have been recorded through various studies and most recently during visits to water recorders throughout the swamp. Between 1994-1996, pH levels have ranged between 3.36 and 4.63 within the swamp. Researchers have found pH values between 3.1 and 4.86 (Bosserman 1984). Certain plants influence the acidic levels within the swamp and cause local variation in acidity. Winger (1997) found a mean pH level of 3.91 in the surface water within the Narrows. With such low pH levels, Rykiel (1977) expressed the importance of rainfall and atmospheric deposition over the Okefenokee Swamp in the mineral cycling and nutrient availability within the system.

Examining pH levels recorded at the Fargo, Georgia gaging station on the Suwannee River, Holder (personal communication) found a decreasing trend in pH from 4.32 (1968) to 3.93 (1994). Mills (1994) found the average pH of the Suwannee River just below the sill to be 3.94 with a range of 3.8 to 4.53.

Dissolved oxygen is also a factor in slow-moving water and areas of high decomposition of plant material. Low oxygen levels are a problem to aquatic life in the Upper Suwannee River during low water periods (Soulak personal communication) as they are assumed to be within shallow marsh areas of the swamp.

Mercury contamination has been a Suwannee River watershed problem for at least the last 20 years (Kasbohm 1996). A limited consumption advisory has been placed on the Suwannee River, as well as the Okefenokee Swamp. Past investigations within the Okefenokee Swamp found a mean mercury concentration of 0.359$\pm$0.21 mg/L (wet weight) in four species of fish. There were no significant differences within species, among species or between years, but sample size was small (Masson and Bowers 1995). Mercury is a natural occurring element of peat systems; however, Winger (1997) found elevated levels in the water, sediment, and biotic communities within the swamp. Mercury concentrations in rainfall were sufficiently high to account for these elevated levels.

Like mercury, lead is more soluble and bioavailable to aquatic biota under low pH conditions. Lead has been studied within the fisheries and sediments of the Okefenokee Swamp. The mean wet weight lead concentrations in 35 fish fillets was 0.505$\pm$0.51 mg/L with no differences within species, among species or between years (Masson and Bowers 1995). Mean lead level within the sediment of the Narrows was reported to be 180.25 ug/g (Winger 1997).

Both mercury and lead are able to bioaccummulate through the Okefenokee system possibly affecting reproduction, hormone levels, and behavior of the fauna.

AIR QUALITY

The Clean Air Act's Prevention of Significant Deterioration (PSD) program was established, in part, "to preserve, protect and enhance the air quality in national parks, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic or historic value," including wilderness areas. Under this PSD program, certain areas of the country were set aside to receive the most stringent degree of air quality protection. These so-called "Class I" areas include:

- International parks;
- National wilderness areas and national memorial parks in excess of 5,000 acres; and
- National parks in excess of 6,000 acres.

The Okefenokee Wilderness is one of the 21 Class I areas administered by the USFWS. It is a member of the Southeast States Air Resource Managers (SESARM) regional planning partnership. The USFWS has the responsibility to protect the air quality and air quality related values (AQRVs) of the area from manmade air pollution. AQRVs include vegetation, wildlife, soils, water quality, visibility, odor, and cultural and archaeological resources. As industry and development move into the area, the airshed and wilderness are threatened. As in most of the eastern United States, visibility in the wilderness area is affected by pollution-caused regional haze. Rainfall, carrying pollutants and contaminants, is the primary source of water to the swamp. It is often acidic and may carry elevated levels of mercury that is then deposited on the refuge. As a result, some species of fish and wildlife have elevated concentrations of mercury in their tissues. Management of prescribed fires and wildfires in the area also affects the quality of the air. The USFWS monitors air quality in Okefenokee NWR in partnership with three national programs. Atmospheric pollutants in rain are analyzed as part of the National Atmospheric Deposition Program (the "acid rain" program). Mercury in rain is analyzed as part of the nationwide Mercury Deposition Network. And, fine particles responsible for visibility impairment are measured as part of the Interagency Monitoring of Protected Visual Environments program. Table 4 lists the parameters monitored at Okefenokee NWR over the past 12 years.

National Atmospheric Deposition Program
The amount of substances dispersed in the atmosphere and deposited by precipitation, aerosols, and gasses is of great concern and is expected to continue to increase throughout North America. In order to know the extent to which these substances are affecting agricultural, forest, and wetland ecosystems now and in the future, it is essential that careful and standardized sampling take place over the North American continent. It is also necessary to know how these substances are transported from sources throughout the continent. The National Atmospheric Deposition Program helps scientists to monitor how human activities and the forces of nature affect the health of the atmosphere.

National Trends Network
The National Trends Network was developed to gain a better understanding of the geographical distribution of acid precipitation over time. Okefenokee NWR is one of more than 220 sites that measure national trends data. Weekly precipitation samples are analyzed for pH, conductivity, calcium, magnesium, potassium, sodium, ammonium, nitrate, chloride, sulfate, and orthophosphate.

Table 4. Air monitoring history at Okefenokee National Wildlife Refuge

Okefenokee National Wildlife Refuge - *Site No. 01*			
Latitude: 30 44 25 N Longitude: 82 7 43 W			
Elevation: 47 m Operating Agency: USFWS			
Parameter	**Start**	**End**	**Years**
35MM Camera Slide	04/20/1992	11/13/1992	0.6
Scattering coefficient	02/12/1993	06/01/1997	4.3
Dry/Wet Bucket	06/03/1997	present	6.6
Dry/wet bucket plus mercury	07/29/1997	present	6.5
IMPROVE Sampler Module A	09/28/1991	05/01/2000	8.6
IMPROVE Sampler Module A - ver 2	05/01/2000	present	3.7
IMPROVE Sampler Module B	09/28/1991	05/01/2000	8.6
IMPROVE Sampler Module B - ver 2	05/01/2000	present	3.7
IMPROVE Sampler Module C	09/28/1991	05/01/2000	8.6
IMPROVE Sampler Module C - ver 2	05/01/2000	present	3.7
IMPROVE Sampler Module D	09/28/1991	05/01/2000	8.6
IMPROVE Sampler Module D - ver 2	05/01/2000	present	3.7
Relative Humidity	02/12/1993	06/01/1997	4.3
Sulfur Dioxide	04/01/1993	02/15/1997	3.9
Ambient Temperature (aspirated)	02/12/1993	06/01/1997	4.3

Mercury Deposition Network
The Mercury Deposition Network collects data from 40 sites each week. These data enable researchers to determine seasonal and annual changes in mercury in precipitation falling on lakes, wetlands, streams, forested watersheds, and other sensitive ecosystems.

Interagency Monitoring of Protected Visual Environments
One of 145 Interagency Monitoring of Protected Visual Environments (IMPROVE) sites is located on Okefenokee NWR. IMPROVE is a cooperative visibility monitoring effort between the U.S. Environmental Protection Agency, federal land management agencies, and state agencies. Its primary purpose is the protection of visibility in Class I areas and the characterization of regional haze.

The IMPROVE sampler collects four simultaneous samples every three days. Trends related to hydrogen, major and trace elements from sodium to lead, nitrates, chloride, organic and elemental carbon, and PM10 size particles are examined.

BIOLOGICAL ENVIRONMENT

FLORA

Extensive logging at the turn of the century altered the forested vegetation communities. It created large areas suitable for shrub growth. These areas burned frequently during the early 20th century, possibly due to the accumulation of logging debris (Loftin 1998). However, fires over the past 150 years have not been severe enough to change large areas of forests or shrub to prairies or lakes. Wildfires between 1952 and 1977 resulted in shrub, shrub-prairie, scrub-shrub, and wet forests becoming established in the burned areas. General observations by those familiar with the swamp have described the encroachment of shrubs into the prairies, reducing the amount of open areas and giving the image of the swamp filling in. Loftin (1998) found that structurally the swamp has not changed today from what was present 150 years ago. However, there have been shorter intervals when changes in species and structure have occurred and influenced the system. Proportions of wet forest, shrub, and upland forest associations are approaching pre-logged conditions, although there have been changes in the species composition within these communities. Species composition may affect evapotranspiration and flow rates, wildlife use, and fire occurrence and behavior. Logging and fire have a role in shaping the vegetation composition, distribution, and structure within the swamp. Most fires have probably only reduced the litter component of the habitat, or caused short-term changes in system structure. However, fire suppression may have caused greater changes within the wetlands and uplands as more woody plant species became established.

Wetland Vegetation Classification
Several vegetation classifications have been used to describe Okefenokee's swamp interior. Wetland forest types are described in the Society of American Foresters (SAF) publication, *Forest Cover Types of North America* (Eyre 1980). Hamilton (1982) described the entire range of wetland vegetative types from mature cypress to marsh and open water. Loftin (1998) developed a 21-class system. Loftin's vegetation map created from 1990 satellite images is presented in Figure 10. This classification has been used to create a 6-class habitat map (Figure 11) for basic management purposes and a fuel model map (Figure 12) for managing fires.

Appendix III presents Loftin's 6 and 21-classification and compares it to Hamiliton's classes and SAF types.

Following are descriptions of Loftin's wetland classifications shown on the six-class vegetation cover type map. Included are five wetland descriptions. Loftin's sixth classification is upland forest.

Figure 10. Vegetation cover types of the Okefenokee National Wildlife Refuge (Loftin 1998)

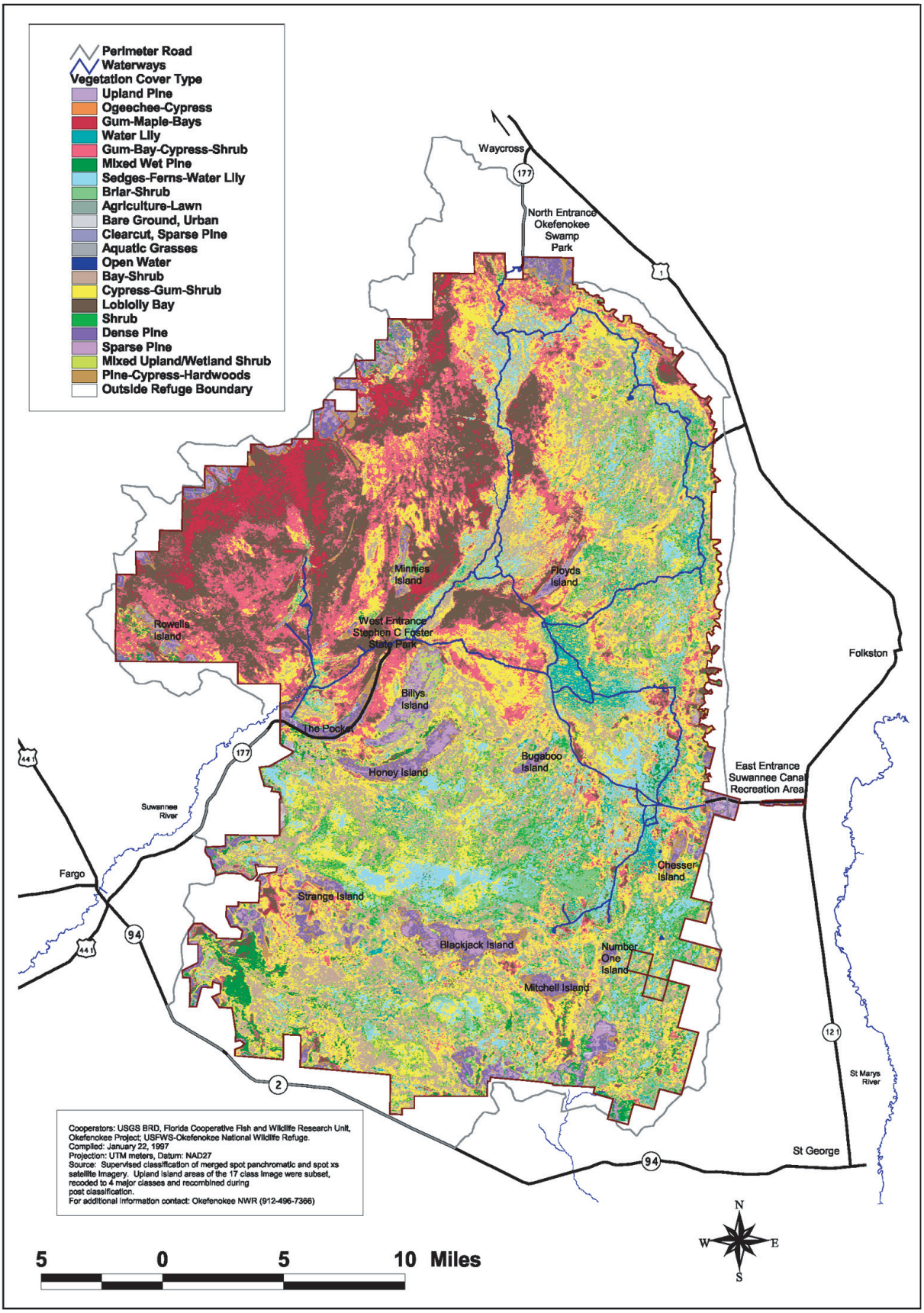


Figure 11. Six-class vegetation cover type for Okefenokee National Wildlife Refuge

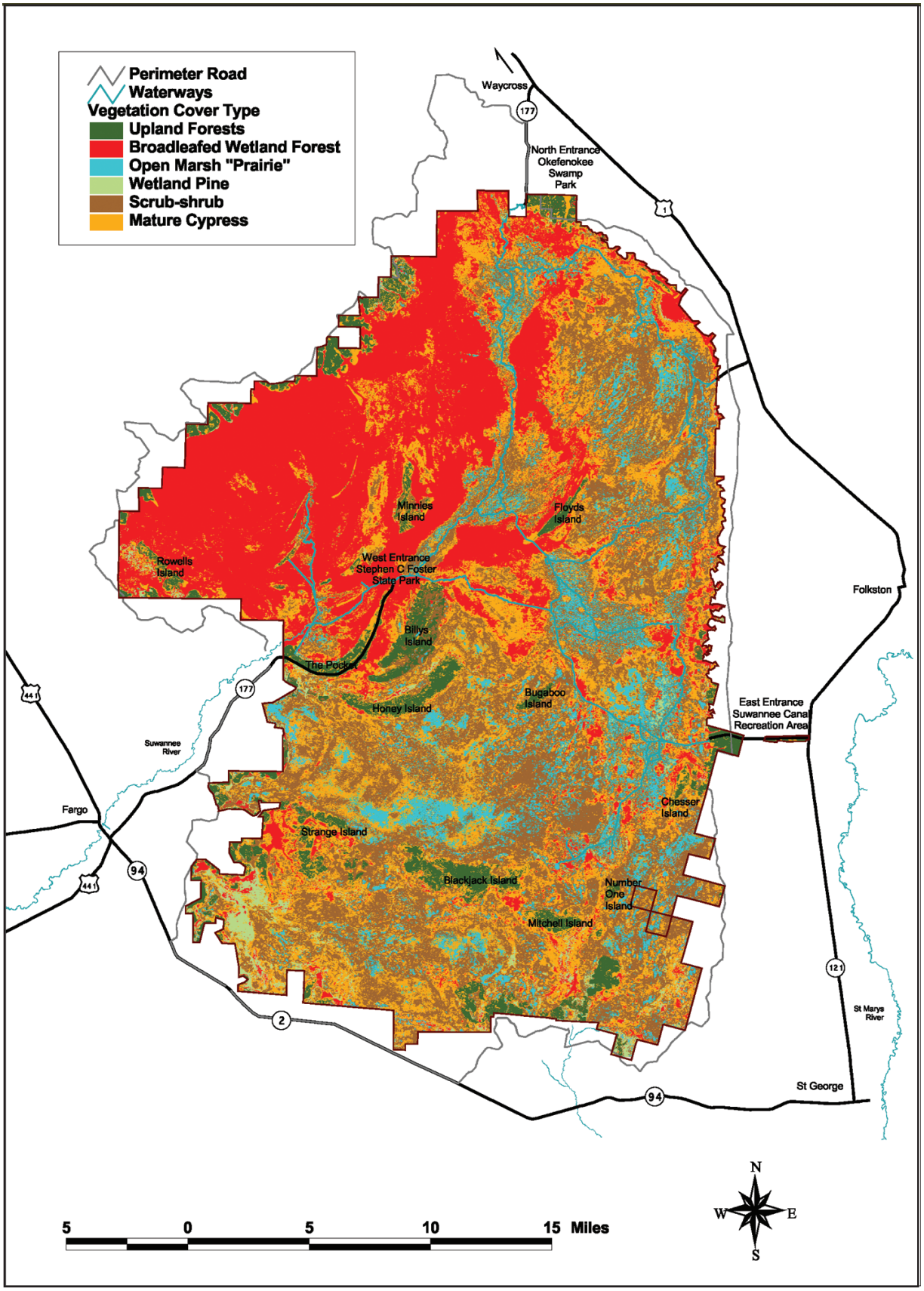
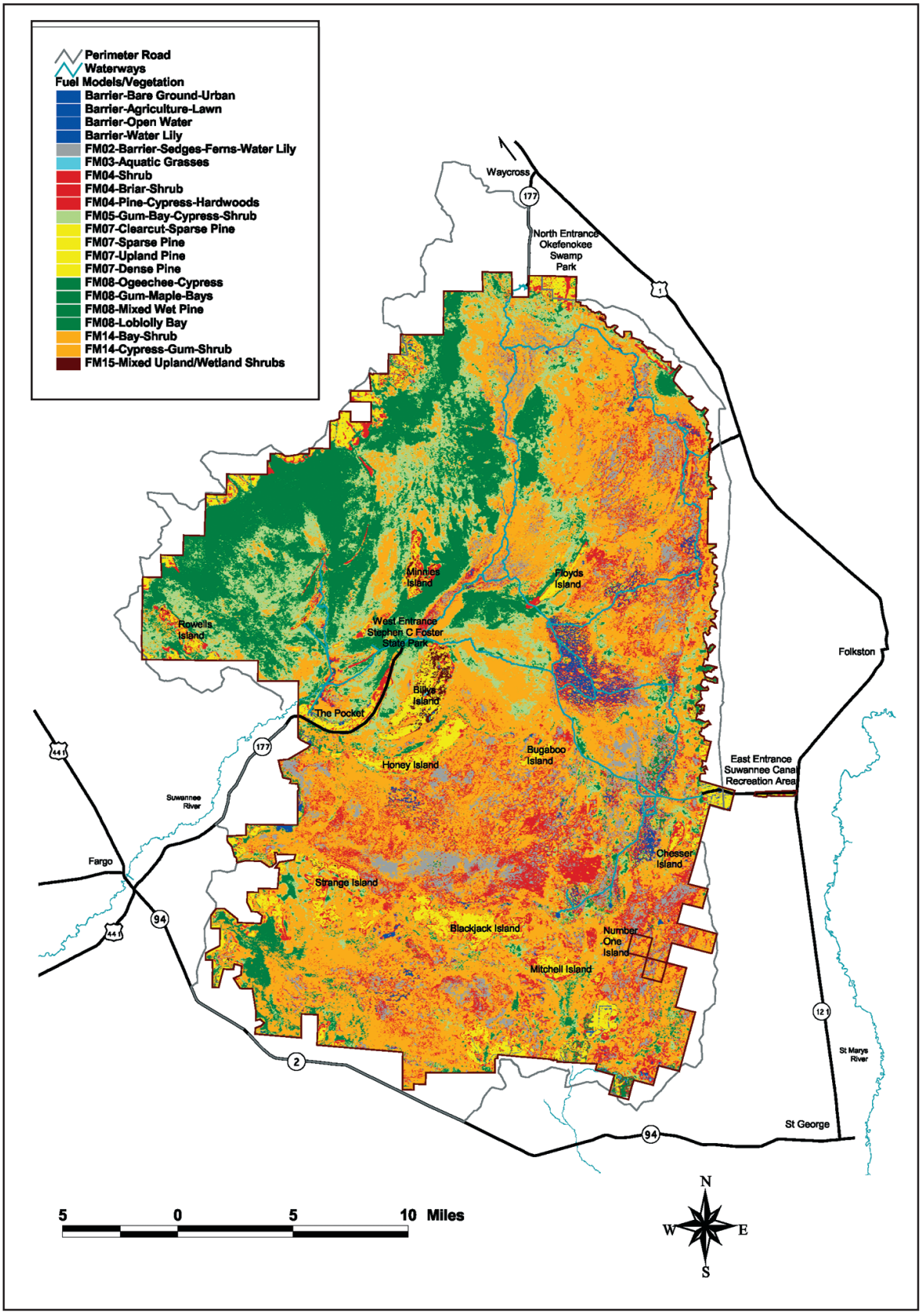


Figure 12. Fuel model map for the Okefenokee National Wildlife Refuge



Broadleaved Hardwoods - These are mature, evergreen and deciduous, broadleaved forests. Crown density is usually great enough to limit understory vegetation, leaving the understory relatively open. This type covers a large portion of the northwest side of the swamp. Much of this area once was mature cypress before logging occurred in the early 20th century. Blackgum is found as sprout growth in areas where logging removed both cypress and blackgum, and as mature blackgum forests where only cypress was removed. Dominant species also include loblolly bay, red bay, sweet bay, largeleaf gallberry, and dahoon holly. Small patches of shrub are commonly mixed with the bay. Scattered cypress and pine may compose less than 20 percent of the canopy. Sphagnum moss *(Sphagnum spp.)* is common as ground cover (Hamilton 1982). Because of the lack of understory vegetation, fire does not readily enter these stands except during extreme dry periods. Little is understood about the value of broadleaved forest in Okefenokee Swamp. Current research indicates that this habitat, especially blackgum, is valuable habitat for bear. Use of this habitat by neotropical migratory birds has not been investigated. The stands may also harbor rare or endangered plants.

Cypress/Hardwoods (Mature) - Pond cypress occurs in the swamp as scattered individuals, small patches interspersed with other vegetation, and as large stands. Small “virgin” stands of cypress still exist in the north central part of the swamp and southeast part where volumes did not make harvesting economical. The subcanopy is often dominated by broad-leaved evergreen species and the understory by scrub/shrub species. Sphagnum moss also commonly occurs in this habitat (Hamilton 1982). The cypress in this vegetative type is mature and does not include young or scrub cypress often found in scrub/shrub stands. Where the canopy is closed, this vegetative type may exhibit some of the same habitat characteristics found in the broadleaved hardwoods type.

Mixed wetland Pine - The mixed wetland pine complex contains a canopy of at least 30 percent pine mixed with two or more other vegetation types. Cypress, bay, scrub/shrub and prairie may be present in various proportions (Hamilton 1982). Although slash pine grows throughout the swamp, the most dense stands grow where the bog is shallow, such as along the swamp’s edge or above sand ridges on the swamp’s bottom. Fire often kills the pine component where the understory allows severe fire behavior. In other areas, where fire intensity is low, ferns develop below the pine stands and fire will maintain a wetland savanna. Associated species are blackgum, loblolly bay, sweet bay, pond cypress, and ferns.

Scrub/Shrub - The scrub/shrub type includes many species of evergreen and deciduous shrubs as well as dense even-aged stands of small trees (scrub). In addition, several species of greenbriar often cover everything. This evergreen vine is often so dense it masks the deciduous shrubs, making the mass appear to be evergreen. No differentiation is shown between most of the scrub/shrub types because they appear similar on infra-red photography. Evergreen shrubs include: hurrah bush, dahoon holly, largeleaf gallberry, and gallberry. Deciduous shrubs include: swamp cyrilla, common buttonbush, poor man’s soap, Virginia sweetspire, fetter bush, and highbush blueberry. Scrub species (small trees) include: young cypress, blackgum, and bay trees (Hamilton 1982). Small patches of scattered pine, cypress or hardwood trees may be present in the scrub/shrub. It is interesting to speculate in the case of this scattered overstory, which way succession may be progressing. In the absence of fire, the scrub or young tree component of the understory may grow, joining the scattered overstory crown, shading out the remainder of the understory, eventually developing a bog forest; or the dense understory of shrubs may prevent regeneration of the overstory component. Fire may kill the scattered overstory, allowing the understory to dominate. It is important to note that the scrub component of the understory may be stunted, slowly growing trees that will permanently remain part of the understory or they may be vigorous young trees that will eventually become overstory. The scrub/shrub vegetative type also contains small patches of prairie.

Prairie - Shallow marshes of the Okefenokee Swamp are locally called "prairies." Although this term is incorrect in a phytogeographical sense, this long-standing term is found in earlier literature on the

swamp (Wright and Wright 1932; Hopkins 1947; Cypert 1961) and is used on U.S. Geological Survey topographical maps. Many of these prairies contain small islands of trees, shrubs, or herbaceous vegetation, commonly referred to as "tree houses" or "batteries." These islands cover less than 50 percent of this mapping unit. Two types of prairie are recognized: aquatic macrophyte prairie and herbaceous prairie.

The aquatic macrophyte prairie contains the following species: Water lily, spatterdock, and floating heart (*Nymphoides aquaticum*). Several herbaceous emergents, pickeral weed (*Pontedaria cordata*), golden club (*Orontium aquaticum*), wampee, pipewort (*Ericaulon compressum*), and yellow-eyed grass (*Xyris smalliana*) are also common. Masses of bladderwort and green algae are abundant submergents. Sphagnum moss occurs in shallow areas.

The herbaceous prairie is dominated by emergents such as sedges. Other taxa often found in herbaceous prairies include: Chain fern, pitcher plants (*Sarricenis* spp.); swamp loosestrife (*Decadon verticillatus*); paint root (*Lacnanthes tinctoria*); wampee (*Peltandria virginica*); golden club (*Orontium aquaticum*); water lily, pipewort (*Eriocaulon compressum*); and yellow-eyed grass (*Xyris smalliana*). Less than 10 percent of the area is open water.

Open Water - Most or all of the lakes in the swamp occur where natural depressions in the topography exist or where the peat has been burned out by fires in the past. There is some speculation that some of the lakes may have been formed by subsidence of the bed of the swamp (e.g., sink holes) but this has not been substantiated. Prairie species and eventually scrub/shrub species gradually invade many of Okefenokee's lakes. Other open water areas are the watercourses through the swamp. These watercourses are kept open by the flowing action of the water and by mechanical means.

Upland Classification

Upland vegetation communities at Okefenokee NWR have been described by Phernetton (2001) and relate to the Society of American Foresters (SAF) standard forest cover types. Understory species are mentioned but a more in depth discussion on understory/groundcover species follows the type descriptions.

Upland Hardwoods - This forest cover type consists of a mixture of scrub oaks listed in the description of SAF Type 72. The type is common throughout the Southeastern Coastal Plain, especially in the sand hills, or dry, sandy ridges (Eyre 1980). On Okefenokee NWR, this type is found on dry, infertile, well-drained soils on almost imperceptible rises known locally as oak hammocks (hummocks). Some of these stands were once longleaf pine stands with scrub oak in the understory. In other cases the soil type supports very little combustible fine fuels, allowing only low intensity fires to pass. With the exclusion of high intensity fire, these stands pass through successional stages to scrub oak. These species have adapted to drought conditions, are shade tolerant, and once established are self perpetuating if fire is excluded. Generally the oak leaf litter layer developed is relatively fire resistant and other ground vegetation species are patchy. Where large enough to constitute a stand, these areas are shown on refuge habitat maps as upland hardwoods. Smaller patches of oaks usually are included in longleaf pine stands.

Longleaf Pine - Upland forest stands identified as pure longleaf pine on habitat management maps have a basal area comprised of at least 70 percent longleaf pine (*Pinus palustris*). Some stands on the northwest side of the refuge have been maintained in pure condition by periodic fire ignited by cattlemen as late as the 1940s. Some of Okefenokee NWR's pure longleaf stands are dry and infertile and will not support other pine species (i.e., Camp Cornelia area). In the Okefenokee area, slash pine (*P. elliottii*), loblolly pine (*P. taeda),* and pond pine (*P. serotina*) are often located around the stands next to drains and ponds. Where frequent fire has occurred, longleaf pine stands may

extend to the edge of the swamp with the other pines restricted to the very edge of the stand. Longleaf pine stands on Okefenokee NWR most closely match SAF Type 70. Principal hardwoods associated include several scrub oak species, black gum (*Nyssa sylvatica*), persimmon, and sweetgum (*Liquidambar styraciflua*). Several of the longleaf pine community understory types are located in these stands. Ground cover density and species vary considerably depending upon fire history and soil conditions (Eyre 1980). Understory species in this type have been drastically altered by changes in the fire regime. Some areas support dense southern rough communities; others, where fire has occurred frequently, support variations of low shrub/wire grass communities.

Longleaf/Mixed Pine - Pine stands are identified as longleaf/mixed pine if the longleaf basal area is between 35 and 70 percent. This type is designated on refuge habitat management maps as longleaf/mixed pine (LP/MP). Slash, loblolly, or pond pine may comprise the mixed pine component. In LP/MP stands, longleaf restoration goals may be accomplished by favoring existing longleaf pine during selective thinning operations. Where associated with slash pine, the stand fits the description of SAF Type 83. This type occurs on a variety of sites since the range of all of the pine species is from dry sandy ridges to poorly drained flatwoods. Longleaf/mixed pine stands occur most often where fire is excluded and a slash pine seed source is present. With or without fire, this type is temporary. Burning destroys regeneration of other pine species, allowing longleaf pine to dominate the stand. Exclusion of fire will allow other pine species and eventually hardwoods to dominate the stand. Understory associates vary, depending on fire frequency, soil and topographic features.

Mixed Pine/Longleaf Pine - Stands are designated as Mixed Pine/Longleaf Pine (MP/LP) where longleaf pine is less than 35 percent of the basal area but at least two stems per acre of any size exist. In MP/LP stands, some form of regeneration must be utilized to accomplish longleaf pine restoration goals. This type exists where the longleaf stand was clear-cut during the 1920s, leaving only a few small or unmerchantable stems. Slash, loblolly, or pond pines, formerly restricted to the swamps edge or drains by frequent fire, were able to invade the cut over longleaf pine stands. Typically, these stands will have a mixture of 50- to 80-year-old slash, loblolly, or pond pine with scattered longleaf pine averaging 130 years old. Understory species associated with this type are variations of southern rough, low shrub, and grass species, depending on past and current fire activity.

Mixed Pine - Because the primary upland management goal for Okefenokee NWR is to restore longleaf pine communities wherever possible, slash pine, loblolly pine, and pond pine, whether in pure or mixed stands are all classified collectively as “mixed pine” and identified on management maps as MP. Predominately slash pine stands are described in SAF Type 84. Loblolly stands are described in SAF Type 81. Pond pine stands are described in SAF Type 98. Where possible, longleaf pine will be restored on these sites. Associated species are sweetbay, swamp tupelo, pond cypress, pond pine, loblolly bay, live oak, red maple, water oak, and laurel oak. On higher (but still poorly drained) sites, it is associated with loblolly pine, longleaf pine, and several oaks. Ground cover on very wet sites may be limited to sphagnum moss. Pure slash pine plantations often exist on disturbed high sites, while others exist on poorly drained sites. Understory communities will vary depending on the site, the amount of disturbance, and condition (Eyre 1980).

Wetland Hardwoods - These hardwoods grow on mineral soil wetland flats where fire seldom occurs. A great many species, which grow on moist to wet sites, are associated with this hardwood type. These include sweetbay, redbay, swamp tupelo, black tupelo, red maple, loblolly bay, sweetgum, water and laurel oak, yellow poplar, American holly, southern magnolia, pond cypress, and several pine species. The sites are described in SAF Type 104 (Eyre 1980). On Okefenokee NWR, these are climax stands that succeed slash pine growing on wetter sites. Many understory species may be associated with this type.

Ground Cover Vegetation Types
Upland understory vegetation responds to reintroduction of fire more rapidly than overstory species. While understory species present may be influenced by overstory species and density, they are more dependent upon elevation, soil conditions, fire frequency, intensity and season, and other catastrophic events.

Ground cover types are classified in two ways: Classifications representing fuel types important for fire management; and understory communities important for habitat management. Understory fuels are described in the refuge's Habitat and Wildlife Management Plan.

Wiregrass Ridges - Some of the highest parts of the refuge around Camp Cornelia and some islands contain fairly well-drained sandy areas, which support wiregrass (*Aristida beyrichina*) communities even without the occurrence of frequent fire. Soils in these areas are probably Ridgeland sand. Longleaf pine and scrub oaks are dominant on these areas because soils are too dry for competing species. Other species found in these areas are paw paw (*Asimina angustifolia*), prickly pear cactus (*Opuntia humifusa*), saw palmetto (*Serenoa repens*), and several species of dwarf blueberry.

Palmetto Terraces - These are somewhat poorly drained areas but slightly higher than the flatwoods. Soil types may be Mandarin or Leon sands. In the absence of fire, these areas will contain saw palmetto along with a mixture of gallberry, greenbriar, and grasses. Growing season fire in these areas will stimulate wiregrass, piney woods dropseed (*Sporobulus* sp.), other warm season grasses, shiny blueberry (*Vaccinium myrsinites*), and huckleberry species *(Gaylussacia* spp*.),* and other low shrub species. Continued occurrence of growing season fire will cause gallberry, palmetto, and other high shrub species to diminish and allow several longleaf pine associated understory communities to dominate these areas.

Gallberry/Palmetto Flatwoods - These understory types are located on the traditional flatwoods areas that make up about half of the refuge uplands. Soil types on these flatwoods may be Sapelo fine sand or Pelham fine sand and higher Mascotte fine sand. In the absence of fire, gallberry (*Ilex glabra*) will dominate with a heavy palmetto component. Wax myrtle (*Morella cerifera*), hurrah bush (*Lyonia lucida*) greenbriar (*Smilax* sp.), dahoon holly (*Ilex cassine*), huckleberry, blueberry, wiregrass, piney wood dropseed, and other grasses are also present. Frequent growing season fire will decrease the vigor of hardwood shrubs, allowing warm season grasses, low shrubs, and other species to dominate.

Lower Gallberry Flatwoods - These understory types are located in areas of wet or ponded soil types located in depressions or adjacent to drainage ways. Gallberry and other hardwood shrubs dominate. Scattered clumps of palmetto exist. These areas will burn during dormant or growing seasons. Under a frequent growing season fire regime, wiregrass, piney woods dropseed, and other warm season grasses and low shrubs will exist in place of the hardwood shrub thicket.

Upland/Wetland Transition Zones - These understory types are located in the mucky sand soil types and generally form a thick band around the edge of most uplands. This tangle of thick hardwood shrubs may blend into scrub/shrub areas at the edge of the swamp. Some of these areas may have been burned regularly before the natural fire regime was disturbed; others may have burned only during dry cycles. Where high intensity fire has frequently occurred in the past, small open bands of grasses and ferns exist within these zones. It is unknown whether these are areas formerly kept open by fire that have not yet been invaded by hardwood shrubs, or if some other condition has kept them open. Some historical accounts indicate the presence of wetland longleaf pine savannas existing within these transition areas. An important unanswered question is whether a long series of growing season fires would create or restore open areas of longleaf pine with an understory of fire dependent grasses and shrubs. Longleaf pine stumps are occasionally found in these hardwood

shrub thickets. It would be impossible for longleaf pine to become established under present conditions.

Endangered Plant Species

In addition to diminishing plant communities in the Okefenokee area, several native plant species are of concern. Although there is only one known native plant species (hairy rattleweed) on the federal endangered plant list, several plants on the Georgia list of plants of concern are located in the Okefenokee area. These species include:

Hairy Rattleweed	*Baptisia arachnifera*	Endangered
Silver Buckthorn	*Bumelia anomala*	Rare
Greenfly Orchid	*Epidendrum conopseum*	Unusual
Fly Catcher/Golden Trumpet	*Sarracenia flava*	Unusual
Hooded Pitcher Plant	*Sarracenia minor*	Unusual
Parrot Pitcher Plant	*Sarracenia psittacina*	Threatened

The following plants are located in the Okefenokee area but have not been confirmed on the refuge:

Purple Honeycomb Head	*Balduina atropurpurea*	Rare
Velvet Sedge	*Carex dasycarpa*	Rare
Dwarf Witch Alder	*Fothergilla gardenii*	Threatened
Hartwrightia	*Hartwrightia floridana*	Threatened
Pond Spice	*Litsea aestivalis*	Threatened

A comprehensive list of plants common to Okefenokee NWR is located in Appendix IV.

FAUNA

Okefenokee NWR is home to 48 species of mammals, 200 birds, 33 fish, 101 species of reptiles and amphibians, and an undetermined number of invertebrates. The executive order establishing Okefenokee NWR stated the purpose of the refuge as “a refuge and breeding ground for migratory birds and other wildlife.” Although large numbers of waterfowl were reported to use Okefenokee Swamp at that time, they were not specifically mentioned in the purpose of the refuge. It was recognized that this area was important for a large variety of wildlife.

Even prior to the swamp becoming a refuge, it drew the attention of herpetologists. It quickly became world renown for its amphibian and reptile populations. Besides the expanse of wetland habitats inhabited by the American alligator (*Alligator mississippiensis)* and many species of frogs and turtles, the refuge uplands contain many ephemeral ponds. Management of these ponds is important for the flatwoods salamander (*Ambystoma cingulatum)*, the striped newt (*Notophthalamus perstriatus*), the gopher frog (*Rana areolata aescpus*), and other species.

Okefenokee NWR is important for large populations of wading birds that find food and shelter. Their movements from off-refuge sites and between the open prairies depend on food availability and the depth of water. In the past, three to four nesting colonies were found each year. These birds, along with the sandhill crane, are considered to be indicators of the health of the wetland system.

Because of its size, the Okefenokee NWR is valuable for species such as the black bear that have large home ranges. A healthy population of the Florida black bear (*Ursus americanus floridianus*) exists today, moving on and off the refuge depending on the resources available. The Florida panther (*Felis concolor coryi*) once roamed the area as well; however, there have been no recent confirmed sightings.

As the base for the food chain, healthy populations of invertebrates and fish are critical in the support of the other fauna. Ensuring that the levels of environmental contaminants are monitored and evaluated for potential risks within this group of fauna is a key factor to avoid degradation of the Okefenokee ecosystem.

Federally listed threatened or endangered species that make their home in the refuge include the red-cockaded woodpecker, indigo snake (*Drymarchon couperi*), the American alligator, the wood stork (*Mycteria americana*), and the flatwoods salamander. The bald eagle (*Haliaeetus leucocephalus*) passes through the area and has nested nearby, but has not been known to nest on the refuge. The ivory-billed woodpecker (*Campephilus principalis*) was part of the Okefenokee ecosystem in the past but has not been seen since the 1920s.

The following are several other species that are of special concern on Okefenokee NWR: the gopher tortoise (*Gopherus polyphemus*), Sherman's fox squirrel (*Sciurus niger niger*), round-tailed muskrat (*Neofiber alleni exoristus),* Bachman's sparrow (*Aimophila aestivalis*), Florida sandhill crane (*Grus Canadensis pratensis),* neotropical migrants, black-banded sunfish (*Enneacanthus chaetodon)*, mud sunfish (*Acantharchus pomotis)*, and banded topminnow (*Fundulus cingulatus)*.

Appendix V contains a list of wildlife species native to Okefenokee NWR. Appendix VI shows associations between native wildlife species and the vegetation types.

Birds

Okefenokee NWR was established for the conservation of migratory birds. There are many priority species, both migrant and resident, for which the Okefenokee NWR provides habitat. Wading birds are the most noticeable inhabitants of the wetland habitats and may actually serve as indicators of the health of the Okefenokee ecosystem. This includes the resident population of Florida sandhill cranes, which are possibly unique because of their isolation. Wood ducks also use the refuge throughout the year. Other waterfowl species migrate through the refuge. Osprey, swallowtail kites, and neotropical migrants also make use of the wetlands. In addition, upland management efforts have focused primarily on the red-cockaded woodpecker, which relies on mature longleaf pine uplands within the refuge. Many migratory and other resident bird species are associated with these open pine forests on the refuge.

Wading Birds - Okefenokee NWR supports large numbers of wading birds. Great egrets (*Ardea alba*), great blue herons (*Ardea herodias*), white ibis (*Eudomicus albus*), and little blue herons (*Egretta caerulea*) are common in the open prairies. In the early 1900s, hunting was a factor influencing wading bird populations in the swamp. Wright and Harper (1913) and Hebard (1941) noted that large colonies were present on Floyds Island, Chase, and Mixons Prairies. Today, Grand, Chase, and Chesser Prairies appear to be used the most by wading birds. Surveys of waterbirds have included monthly counts in selected prairies via an airboat. An annual aerial survey during the breeding season has been used to check historic colony sites for activity.

Many of the wading birds currently utilizing the wetlands of Okefenokee NWR are foraging within the refuge and nesting elsewhere. From 1992 through 2001, surveys indicate there has been an increase in use by white ibis during the summer months. Drought conditions throughout the region during this time may have forced them to the large wetlands such as the Okefenokee Swamp that still had some water left. However, many of the historic nest sites have been abandoned. Reasons for the loss of breeding colonies remains unclear, but it may also be related to changing water levels and food resources.

The USFWS, USGS, and many state agencies have begun collaborating to create a system of periodic inventories of colonial waterbirds in the United States. Future refuge surveys may contribute

to these efforts along with an understanding of regional movements of these birds. Spatial distribution of wading birds reflects the location of appropriate water levels for foraging. As water levels recede during prolonged periods of drought, ibis, egrets, and herons shift their distribution to suitable feeding sites. With consistent survey methods, the relative numbers of these common long-legged waders using Okefenokee NWR, in association with their location, may provide important information indicating the aquatic habitat conditions that they prefer and the differences between prairies within the swamp. Changes within the swamp may also be revealed by examining this data over the next 15 years.

Sandhill Crane - Prior to the 1940s, breeding sandhill crane (*Grus canadensis pratensis*) populations could be found from the Texas coast to peninsular Florida and may have formed a contiguous population prior to European settlement. Today, remnant populations are found in coastal Mississippi and peninsular Florida and southeast Georgia. The Mississippi subspecies is listed as federally endangered, while the Florida subspecies is generally considered stable but is listed as threatened by the State of Florida. The resident population of Florida sandhill cranes at Okefenokee NWR is a non-migratory population that is considered to be isolated from other populations of cranes in the southeast. However, greater sandhill cranes from the upper midwestern United States and Ontario migrate through or spend the winter months with resident cranes on the refuge. Wright and Harper (1913) noted that cranes were found throughout the wet prairie habitat of the Okefenokee NWR. Extensive logging within the swamp during the early 1900s may have resulted in greater opportunities for crane hunters and possibly resulted in over-hunting and a decline in the population (Bennett 1989). Bennett also suggested that the practice of fire suppression in the swamp in the mid to late 1900s likely resulted in shrub/scrub vegetation encroachment and reduced the size of wet prairie habitat that is important to this species.

Florida sandhill cranes are commonly seen in most of the large prairies – Grand, Chesser, Chase, Floyds, Maul Hammock, and Sapling prairies. Bennett (1989) estimated the Florida sandhill crane population within the swamp in the late 1980s to be 403, which included approximately 160 pairs. These numbers were obtained from extensive call counts and low level (32 m) helicopter flights searching for birds and nests. Refuge staff have counted the sandhill cranes that are observed during monthly bird surveys within the swamp. An average of 21.3 cranes between March and October are seen in the eastern and northern prairies. Staff also conduct an annual aerial survey in late October as part of a cooperative effort by the USFWS to estimate the size of the eastern United States' migratory greater sandhill crane population. In most years, these surveys probably count resident birds, since most migrant cranes typically do not arrive until mid-November. Between 1990 and 2003 (excluding 2001 when it appears an early migration took place), this aerial survey resulted in counts averaging 10.2 cranes within the major prairie areas. Despite differences in counts and area surveyed, it appears that there is a decline in the population of resident Florida sandhill cranes since the mid-1980s that needs to be investigated further.

The migratory greater sandhill cranes generally arrive at Okefenokee NWR the first or second week of November and the majority depart during the first two weeks of February. Their numbers have reached at times over 1000 birds. These birds travel from Minnesota and the Upper Peninsula of Michigan to the Jasper-Pulaski Wildlife Area staging ground in northwestern Indiana before proceeding to Georgia and Florida. Refuge counts of this migration have been conducted during monthly bird surveys conducted by airboat.

Wood Stork (Endangered) - The wood stork is also known locally as wood ibis, iron head, or gannet. The breeding area of the wood stork in the southeastern United States may have once extended from Texas to South Carolina. Currently within the United States, the majority of the breeding area is in Florida with about 20 percent in Georgia and South Carolina. United States' breeding populations have been declining since the 1930s. The wood stork was determined to be endangered in 1984.

The primary reason for declining populations is loss of suitable wetland habitat, alteration of natural hydroperiods, and a corresponding decline of their food base. The bird primarily feeds on small fish. An important wetland habitat involves the seasonal flooding of extensive areas of flat, low lying marsh areas, followed by drying so that water is increasingly restricted to ponds and sloughs. Fish populations reach high numbers during the wet season, but become concentrated in increasingly restricted habitats as drying occurs. Groups of wood storks "grope feed" as they wade through these shallow ponds, stirring up concentrations of small fish. Breeding activities are apparently triggered by these seasonally heavy concentrations of fish (USFWS 1986).

In this area, the majority of wood stork nesting occurs in Florida and coastal Georgia with movement into the Okefenokee Swamp in the summer and fall after the nesting season. Wood storks move onto the refuge in increasing numbers between June and August. Surveys for wading birds conducted by refuge staff have counted wood storks along with other waders. They are often seen in feeding groups in Grand, Chesser, and Chase Prairies. Their distribution is highly dependent on the fluctuating water conditions of the current year.

Wood stork nesting activity within the refuge was first documented in 1967 when 12 nests were found at Cravens Hammock. Nests were again observed in 1976 and 1977 but have not been reported since this time.

Waterfowl – Okefenokee NWR is a temporary stopping point and overwintering site for waterfowl migrating along the Atlantic Flyway. However, the refuge only supports a small number of ducks compared to other refuges and wetlands along the east coast. Hebard (1941) reported that flocks of several thousand ducks spent the winter months at Okefenokee NWR. He noted that the most common species included ring-necked ducks (*Nyroca collaris*) and mallards (*Anas platyrhynchos*). These species, along with blue-winged and green-winged teal and wood ducks, are still observed individually and/or in small flocks on surveys but not in the numbers reported by Hebard. Wood ducks (*Aix sponsa*) are the most common resident species of waterfowl on the refuge. Wright and Harper (1913) listed this species as the only resident species that was common throughout the swamp. Until the 1990s, refuge staff actively trapped and banded several hundred wood ducks annually at bait areas on the east and west sides of Okefenokee NWR. They also submitted early January counts of waterfowl as part of the annual national winter waterfowl count.

Osprey - Early records indicate that ospreys (*Pandion haliaetus*) were fairly common and widely distributed throughout the refuge; nests were found in Chase, Honey Island, and Floyds Island Prairies and near Minnies Lake (Wright and Harper 1913). The refuge has monitored osprey nest sites via an annual aerial survey. During the past decade, the distribution of active osprey nests appears to have shifted toward the Pocket area. Many of the nest sites that were identified and monitored by refuge staff during the 1980s are abandoned. This shift and observed decline in nesting activity may be due to changes in the hydrology and the availability of food items. The distribution of osprey nests may again change in the future as the former river floodplain hydrologic regime within the Pocket area is restored by the breaching of the Suwannee River Sill.

Ivory-Billed Woodpecker (Endangered) - The ivory-billed woodpecker is North America's largest and rarest woodpecker and is believed to be extinct. The bird originally lived in swamps from southeastern North Carolina to eastern Texas. The woodpecker feeds upon wood-boring insects that live in the inner bark or between the bark and sapwood of dead or dying, old growth pine and hardwood (USFWS 1967). Old growth sweetgum stands are a particularly important habitat for the ivory billed woodpecker (Cypert 1965) as well. Most of the ivory-billed woodpeckers observed in the swamp were near Minnies Island, probably the most suitable habitat in the swamp. Before logging operations, the island contained an old growth oak and sweetgum stand on one lobe of the island adjacent to an old growth pine stand on another lobe. John M. Hopkins saw several of the birds while

cruising timber for the Hebard Cypress Company between 1901 and 1903 (Cypert 1965). In 1912, a wounded ivory-billed woodpecker was taken near Minnies Island and presented to refuge manager John Hopkins. The latest sighting (reliable but unconfirmed) of an ivory-billed woodpecker was by Frederick V. Hebard near Grand Prairie Gap (Goose House Gap) in 1948.

Large tracts of old growth hardwood wetlands and old growth pine, on which this bird depended, no longer exist in the southeast. This is the primary reason for the decline and probable extinction of the species.

Swallow-tailed Kite - Early records of swallow-tailed kites indicate that they were commonly seen over islands (Wright and Harper 1913). These birds once occurred as far north as Minnesota and throughout the south; but, population declines in the early 1900s resulted in only a fraction of the original range being occupied. The total population today is estimated at fewer than 5,000 birds. The reasons for the drastic decline of this striking black and white raptor are uncertain but likely include habitat loss and illegal shooting. Today, swallow-tailed kites are found nesting only in association with major river systems in the southeast from South Carolina to Texas, with the majority of the population found in peninsular Florida. Following the breeding season, kites migrate through Central America and most of the United States' population may winter in central Brazil.

Prior to the State of Georgia's Swallow-tailed Kite Initiative that began in 1997, there were no documented nests in the state. Nest surveys began in Georgia during 1999. More than 75 nests have been found, most of which are located in very large loblolly pine trees within mature bottomland forests or remnants of these forests. All but one of these nests is located on private lands. These lands are intensively managed for timber production. The only nest on public land was found on the wester boundary of the Okefenokee NWR in 2001. The state has conducted aerial surveys over the swamp and the refuge actively participates in the state's observation reporting system.

Red-cockaded Woodpecker (Endangered) - Okefenokee NWR has been designated part of the Osceola National Forest/Okefenokee NWR recovery population under the USFWS's Red-cockaded Woodpecker Recovery Plan (2003). Approximately 38 clusters of red-cockaded woodpecker (RCW) cavities are currently active (2003) on Okefenokee NWR. Twenty-four of the active clusters are located on five upland pine islands in the interior of the swamp and fourteen are located in the upland management compartments around the perimeter of the swamp. Table 5 and Figure 13 show the distribution of RCW clusters on the refuge. Suitable habitat on the refuge is fragmented. Examining the distribution of clusters and the distances between them, four sub-populations are identified: northwest, central, east, and south. Considering demographic isolation, populations of 2-10 clusters are less likely to persist over the next 20 years, especially if immigration does not occur (Crowder et al., 1998).

Early biological reports (Carter 1941, 1942) indicate that the RCW was not abundant on Okefenokee NWR, although other naturalists and biologists imply that it may have been abundant on some islands before logging in the 1920s (Hebard 1941; Wright & Harper 1913). Harper (1921-1929) identified RCWs on five islands (Billy's, Blackjack, Bugaboo, Chesser, and Floyds) in his notes from 1921 to 1929. It is probable that the longleaf pine communities surrounding the refuge provided superior habitat to the fragmented, isolated stands in the swamp (Figure 14) and the birds were concentrated on adjacent lands. As mature timber was removed from these lands, the RCW gradually began to occupy refuge uplands.

For two or three decades, RCW populations probably increased in numbers on the refuge as longleaf pine stands matured on the refuge, supported by second and third growth natural pine stands on private lands. Dormant season prescribed fire, introduced in management compartments in the 1960s and 1970s, followed by dormant season fire on the interior islands in the 1980s significantly

improved RCW habitat within the refuge. A temporary increase in RCW activity resulted during this period in response to improved habitat within the refuge. This continued until the early 1990s when natural second growth pine stands adjacent to the refuge were clearcut and replaced with short rotation pine plantations leaving small isolated and fragmented refuge stands as the only habitat available. The natural second growth pine stands provided foraging and corridors for dispersal. Since 1990, active clusters have decreased in number or disappeared in almost all of the management compartments and some of the interior islands. Although habitat throughout the upland management compartments is improving, remaining groups are too isolated or too small to increase. During the mid-1970s, several clusters were using old longleaf pine stands in state and local parks, private yards, and other public places. Most of these are gone. Several other clusters are located in mature, commercial longleaf pine stands surrounding the swamp. Most of these are at risk as these mature longleaf pine stands are harvested.

The Osceola National Forest RCW population of 84 groups (2004) is located primarily in the southern portion of the Forest, which is approximately 40 miles southwest of the refuge. The acquisition of Pinhook Swamp, connecting Okefenokee NWR and Osceola National Forest, is progressing. However, this land is also naturally fragmented and highly modified industrial forestry.

With limited possibilities on the refuge for expanding the RCW population to sustainable levels, developing management agreements with surrounding landowners to enhance foraging habitat and dispersal pathways is critical. To date, one agreement with Georgia Forestry Commission and Georgia Department of Natural Resources is in place that provides an additional 1,279 acres that will be managed for foraging habitat adjacent to upland management compartment 1. An agreement with International Paper is currently being drafted that will increase timber rotation to approximately 30 years on 6,300 acres adjacent to compartment 3.

In 1994, staff began to install artificial cavities within the refuge's upland management compartments to provide suitable cavities within existing clusters and to create recruitment clusters to attract dispersing birds. No artificial cavities have been placed within the wilderness area due to issues related to access, chainsaw use, and the value of an unmanipulated population. Banding of RCW began at Okefenokee NWR in 1996. Only birds occupying clusters within the refuge's upland management compartments are banded. RCW's occupying territories on interior wilderness islands have not been banded due to access issues.

In 1998, augmentation of the northwest sub-population, where only one pair remained in upland management compartment 15, began with two pairs translocated from Appalachicola National Forest. Another 10 birds were translocated from Ft. Stewart in 1999 and 2000, bringing the total number of translocations to 14 birds. In 2004, there were five active clusters that attempted to nest in compartment 15 and four pairs that fledged young.

The refuge conducted a review of the RCW management in June 1999. RCW recovery coordinator Ralph Costa and Regional Refuge Program Supervisor Ricky Ingram participated in the review and based on the resulting recommendations, the original RCW population target of 126 groups was revised and established at 86 groups. The original population goal was based on 24,413 acres of pine uplands and 86 clusters is based on an estimation of 18,500 acres of upland pine forest that will be potentially suitable for woodpecker habitat.

Table 5. RCW clusters on Okefenokee National Wildlife Refuge in 2003

Upland Management Compartment	All clusters		Artificial clusters	Total Clusters
	Active	Inactive		
2	0	2	1	2
3	7	4	3	11
4	0	2	1	2
5	0	5	1	5
6	0	1	1	1
7	0	2	0	2
8	0	1	1	1
11	0	1	1	1
12	0	2	0	2
13	0	2	1	2
14	0	2	2	2
15	7	3	5	10
Billys Island	11	4	0	15
Blackjack Island	2	5	0	7
Bugaboo Island	1	5	0	6
Honey Island	6	4	0	10
Mitchell Island	4	1	0	5
Number One Island	0	2	0	2
Totals	38	48	17	86

Figure 13. Distribution of RCW clusters on Okefenokee National Wildlife Refuge (2003).

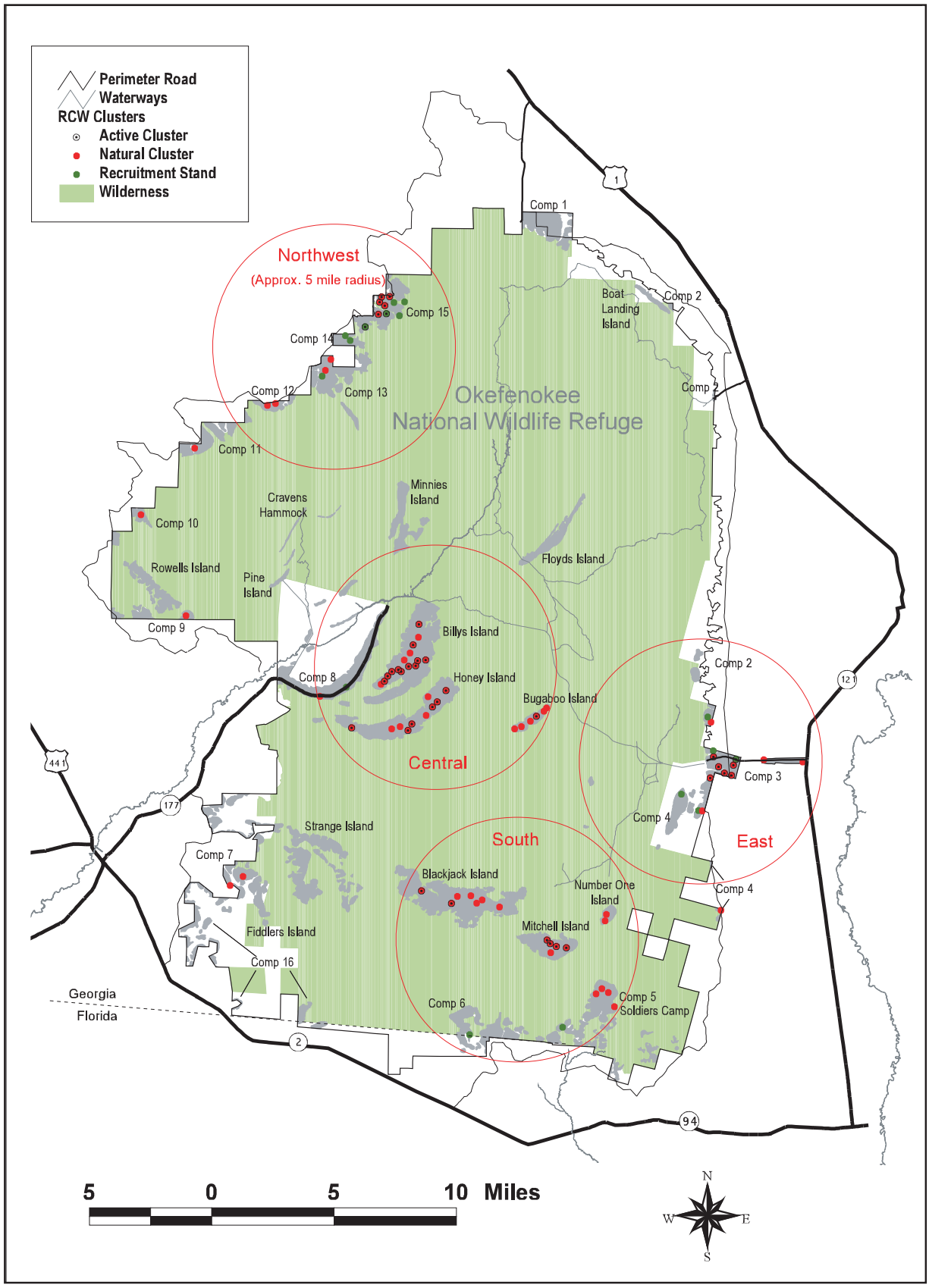
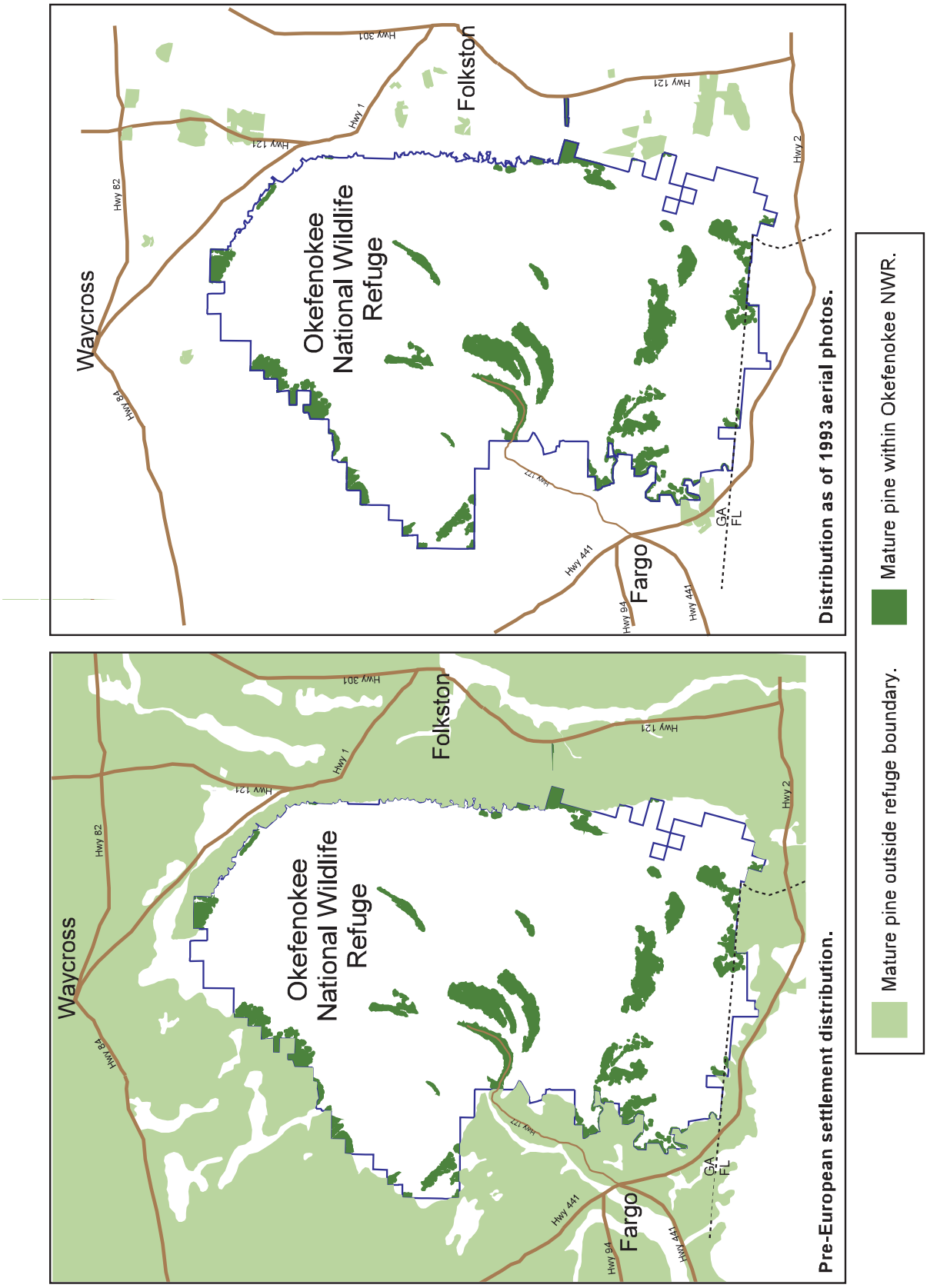


Figure 14. Distribution of mature pine forest (>60 years) in vicinity of Okefenokee National Wildlife Refuge



RCW management was also part of the review of the refuge's biological program in 2001. Reviewers suggested that highest priority be given to augmenting the existing habitat through agreements with surrounding landowners, acquisition of uplands adjacent to existing perimeter compartments, and development of a model to predict the likelihood of long-term viability of refuge subpopulations.

Resident Upland Bird Communities - Active management of upland pine stands, which includes commercial thinning, planting, and prescribed fire, is only conducted on the uplands on the perimeter of the swamp. On the wilderness islands, only prescribed and wildland fires are used to manage the habitat. As stated previously, most of the management efforts on upland habitats is designed to meet the requirements of the RCW through restoration of mature longleaf pine forests, the native community that once covered large portions of the southeast. However, this habitat type is also beneficial to other "priority" species as well. Bachman's sparrows reside in many of the upland pine forests, both on the perimeter of the refuge and on islands. These sparrows require open uneven-aged pine habitat with sparse midstory vegetation, conditions similar to RCWs. Use of prescribed fire is essential in these communities. The use of growing-season over dormant-season burns is emphasized. Other priority species that should benefit from these management actions include Carolina chickadee (*Poecile carolinensis*), brown-headed nuthatch (*Sitta pusilla*), chuck-will's-widow (*Caprimulgus carolinensis*), pine warbler (*Dendroica pinus*), summer tanager (*Piranga rubra*), red-headed woodpecker (*Melanerpes erythrocephalus*), eastern wood-pewee (*Contopus virens*) and northern bobwhite (*Colinus virginianus*).

Breeding bird point counts are established within the refuge's upland habitats. This effort needs to be expanded and the results shared through regional databases.

Neotropical Migratory Birds - Over the past few decades, scientists have detected a decline in the numbers of migratory birds to Central and South America. This decline has been attributed to the destruction of wintering habitat in tropical forests, predation, inclement weather during migration, and collisions with communication towers and utility lines. Although the movement patterns of landbirds migrating across inland portions of the southeastern United States are not very well understood, scientists have enough information to be concerned with loss of what is termed "stopover habitat" (i.e., places where migrating birds can rest and replenish their energy supply during long distance flights). Very little is known about the neotropical migratory birds that use the Okefenokee NWR. The scrub/shrub habitat has drawn large flocks of these birds in other locations and may do the same within the Okefenokee NWR. The significance of the various habitats to this group of birds needs to be investigated to determine the role Okefenokee NWR plays in migration corridors.

Okefenokee NWR also supports a number of species throughout the winter months. Hebard (1941) reported that Henslow's sparrows (*Ammodramus henslowii*) were common during winter in several open areas. Suppression of fire and the widespread use of dormant-season prescribed fire may have promoted less suitable habitat for over-wintering sparrows. Growing-season burns should be beneficial to several species, such as the Henslow's, field, Le Conte's, and grasshopper sparrows by reducing palmettos, gallberry, and ferns and promoting grassy-herbaceous conditions preferred by these species.

Mammals

In the past, monitoring of mammal populations on the refuge has been limited primarily to game species. White-tailed deer spotlight counts and black bear bait station surveys have been conducted by refuge staff while state agency and university biologists have conducted studies on deer herd health and black bear home range and habitat use. The Okefenokee ecosystem was also looked at as a future potential reintroduction site for Florida panthers. Other key species that occur on the refuge include the Rafinesque's big-eared bat (*Plecotus rafinesquii*), and round-tailed muskrat.

White-tailed Deer – White-tailed deer are abundant throughout the refuge. They are commonly seen on the uplands, as well as traversing the wetlands. With private hunt clubs surrounding the refuge, deer move between the refuge and adjacent timber lands depending on available food sources and hunting pressure.

The refuge allows hunting of deer at the east entrance, on the Pocket, and on the uplands on Cowhouse Island. In 2003, 12 deer were taken at the east entrance in two days, 11 deer were taken during the archery only hunt on the Pocket over a 34-day hunt, and 4 deer were taken on Cowhouse Island during a 4-day hunt. The refuge has surveyed the population at the east entrance and on the Pocket in the past. The deer taken at the east entrance were aged and weighted. This limited data set was determined to be of little scientific value and thus, the surveys have been stopped. Currently, the refuge periodically checks the health of the deer population.

Florida Black Bear - The Florida black bear, the subspecies found at Okefenokee NWR, has been proposed for listing as a federally threatened species and its current status is under court review. Historically, this subspecies occurred throughout Florida and the coastal plains of Georgia, Alabama, and Mississippi (Hall 1981). Urbanization and conversion of forested lands to agriculture have reduced the bears' range to seven disjunct populations. Research by Dobey et al., (2002) studied the distribution and habitat use of bears in the Okefenokee-Osceola ecosystem. Dobey et al., estimated the population in this ecosystem to be approximately 400. Bears exhibited a preference for gum/bay/cypress habitats. Average home range sizes were 21.6 mi^2 and 132.4 mi^2 for female and male bears, respectively.

On upland and bottomland hardwood habitats within the refuge, black gum and palmetto fruits are considered important food sources for bears prior to the winter season. The availability of black gum fruit plays a role in the availability of bear on the uplands during the hunting season. If there is a good crop of black gum fruit, bears tend to stay within the wetlands of the swamp. If it is a poor year for black gum, bears seek the mast found on the uplands surrounding the swamp, increasing their contact with hunters. Frequency and timing of dormant season burns may be important to consider in providing suitable forage resources for bears on the uplands. A shift to growing season burns, which will be more effective in reducing and maintaining understory vegetation, should restore some native grasses but may reduce the amount of saw palmetto and mast producing oak on upland sites. Burning that is too frequent may affect the berry crop that the bears also utilize.

In cooperation with the Georgia Department of Natural Resources (DNR), the refuge has conducted annual bait-station surveys in six (34 stations) perimeter compartments around the south and west borders of the refuge. Georgia DNR maintains another 160 bait stations around the perimeter of the refuge. Over the past 23 years, an average of 38 bears have been harvested in the counties surrounding the swamp. No bear hunting has been allowed on the refuge.

Florida Panther (Endangered) - The Florida panther is one of 27 subspecies of the cougar. It is one of the most endangered large mammals in the world. Before European settlement, the original distribution of the cougar throughout North America corresponded with that of the white-tailed deer and the mule deer. This subspecies once ranged throughout the southeast. The Florida panther, which once intermixed with the eastern cougar, is now the only cougar subspecies known to survive east of the Mississippi River. The only documented populations now surviving are in remote areas of south Florida, although confirmed sightings have occurred as far north as Glades and Palm Beach Counties, Florida. The range of the Florida panther varies from 25 to 500 square miles depending on season and circumstances. Two centuries of hunting and habitat destruction have contributed to reduction of the subspecies to its present level. The Florida population of the subspecies is now estimated to be 30 to 50 animals. The goal of the recovery plan is to establish three self-sustaining

populations within the historic range of the panther, two of which will have to be reestablished populations.

No confirmed sightings have occurred in the vicinity of Okefenokee NWR. The more intensely managed uplands may not provide adequate habitat; however, the interior of the swamp and some of the islands may provide enough suitable, undisturbed habitat for this species. Okefenokee NWR was included in a panther reintroduction feasibility study conducted in the mid-1990s. The areas that were being considered for reintroduction were evaluated based on site size, prey density, human population density, paved highway density, land use, human attitudes toward reintroduction, human population growth, and land ownership. Okefenokee NWR was not one of the top five rated sites for reintroduction of the Florida panther.

Round-tailed Muskrat -The range of the round-tailed muskrat in Georgia, which is included in the state's list of rare species, is restricted to Okefenokee NWR and the Grand Bay - Banks Lake ecosystem in south central Georgia. Harper (1920) was the first to record this species in Georgia. He found neofiber to be common on most wet prairies, including Cowhouse, Floyds Island, Chesser, Grand, and Honey Island. Harper (1927) wrote that round-tailed muskrat nests on Floyd's Island Prairie in June 1921 were "beyond belief, far surpassing anything seen there on previous trips". This observation seems to indicate that populations were probably cyclic, fluctuating in relation to hydrologic conditions in the swamp. Observations of this species' nests are infrequent today.

Rafinesque's Big-eared Bat - Rafinesque's big-eared bat is a species of concern and on the Georgia list of rare species. Early records from Harper (1927) indicated that this species was the most common bat species seen during the summer months at Okefenokee NWR. The primary roost sites for this species are hollow cavities in large old-growth cypress trees. Since most of the large cypress were removed from Okefenokee Swamp prior to the establishment of the refuge, lack of roost sites may be a limiting factor for this species. Its current status on the refuge is unknown.

Fish

Historically, fish communities of the Okefenokee Swamp have been poorly studied resulting from inaccessibility and difficulty in surveying swamp habitats. It was not until 1920 that the first published records of fishes inhabiting the swamp became available (Palmer and Wright 1920). This survey was the only major account of the fish assemblage in the swamp until Laerm and Freeman published "Fishes of Okefenokee Swamp" in 1986. Laerm and Freeman (1986) identified 36 species of fish representing 14 families, as well as provided life-history information and qualitative assessments of species abundance and habitat use in the swamp. Despite the advances of these works, the population dynamics of the fish assemblage within the swamp are poorly understood.

Recreational fishing in Okefenokee NWR has been well known locally, as well as through the southeast, for the quality of its sport fishery. Early reports from Palmer and Wright (1920) indicated that flier and bowfin were common in the early 1900s. Fish surveys from 1992-2001 indicate that bowfin and flier remain the numerically dominant taxa in the eastern portion of the swamp, representing over 88 percent of all fishes collected (Herrington et al., 2004). Results also indicate that the dominant fish species (e.g., bowfin, flier, warmouth, and chain pickerel) were persistent and stable over the past 10 years. When combined with the high catch-per-unit-effort and angler-preferable sizes reported, this indicates that the swamp supports an excellent flier and bowfin fishery, as well as a good fishery for chain pickerel and warmouth (Herrington et al., 2004).

There has been concern over the status of largemouth bass and bluegill in the swamp since the early 1940s. Stocking of largemouth bass and bluegill was used to boost the swamp's populations after low water in 1942, 1956, and 1965. Anecdotal information, as well as more recent survey data, indicates that the stocked largemouth bass and bluegill fishery has declined from the 1940s and

currently are rarely encountered. Herrington et al., (2004) have suggested the lack of traditional sport fishes and other fishes common to the area is likely attributable to the abiotic conditions of the swamp, specifically low pH levels. Declines in stocked bass and bluegill may also indicate declines in other more sensitive species; however, there is no evidence for this trend, as forage fishes (including rare species like the black-banded sunfish) have not been adequately sampled. Heavy metal contamination may also play a role in the decline of these species, as surveys by the USFWS and University of Georgia indicate higher than accepted levels of mercury in bowfin, flier, chain pickerel, and warmouth. However, it is likely that the swamp never supported a strong natural population of largemouth bass and bluegill.

Reptiles and Amphibians

Reptiles and amphibians (herps) are an important component of both the wetlands and uplands of the Okefenokee NWR. Early investigations of amphibians in the swamp were conducted by A. H. Wright in the early 1900s. Wright (1932) focused primarily on gathering basic information on frog species within the swamp.

Many populations of herps are declining nationwide due to combinations of habitat loss, environmental degradation, and exploitation. Federally listed species occurring on the refuge include the indigo snake and the American alligator. Other species that are either in decline or have specialized habitat requirements include the gopher tortoise, striped newt, flatwoods salamander, gopher frog, pine snake (*Pituophis melanoleucus*), southern hognose (*Heterodon simus*), diamondback rattlesnake (Cr*otalus adamanteus*), and mimic glass lizard (*Ophisaurua mimicus*). All except the flatwoods salamander are known to be currently present on the refuge. These upland species are found in pine habitats with an open understory. Understory requirements for these species are consistent with understory objectives for restoring native longleaf pine communities. When fire is eliminated or infrequent in longleaf pine communities, habitat for these species is reduced or degraded. The amphibians mentioned above also depend on temporary wetlands that do not contain fish. These species require a suitable wetland surrounded by an appropriate amount of suitable upland.

American Alligator - The American alligator, considered a sentinel of the swamp, is one of two members of the order Crocodilia existing in North America. The other species, the American crocodile *(Crocodylus actus)* is found only in south Florida. The natural range of the American alligator is throughout all of Louisiana and Florida, and parts of Texas, Arkansas, Mississippi, Alabama, Georgia, South Carolina and North Carolina (Chabreck1967)

Alligators are one of the prime landscape architects of the swamp. The Okefenokee Swamp is criss-crossed with alligator trails and small alligator pools that have been excavated from the peat. This forms a network of travel corridors used by many other species inhabiting the swamp. In addition, their eggs provide food for raccoons and black bear.

This reptile was once present in tremendous numbers, proving at first, a nuisance to settlers, but later provided a means of livelihood. During the mid 19th century, the demand for alligator hides for shoes, boots, saddlebags, and other items began to grow. From this point until the mid 20th century, millions were slaughtered for this purpose. In Florida and Louisiana, between 1880 and 1904, alligators populations had been reduced 80 percent (Chabreck 1967). By the middle of the 20th century, the American alligator was practically non-existent over most of its range accept where rigid protection was provided. Alligator populations continued to decrease even after protective legislation was enacted by the states during the 1960s due to continued illegal hunting (Chabreck 1971).

The Endangered Species Act passed by Congress in 1970, which controlled the shipment of alligators or hides across state lines. This coupled with closed hunting seasons by the states,

effectively curtailed the alligator skin trade and subsequently the illegal kill of the animal (Chabreck 1971). The alligator was downlisted from endangered to threatened throughout its range in 1987. Although the population has recovered, it is still listed due to similarity with the endangered American crocodile. Georgia started an alligator hunting season in select locations in 2003.

Alligator populations in Okefenokee NWR remained in good condition throughout the 1960s in spite of a great deal of illegal hunting. This may be due to vast areas of the swamp being remote and inaccessible to hunters. Present alligator populations in the Okefenokee Swamp are estimated to be about 10-12,000**.** The numbers fluctuate with duration of drought conditions as open water areas increase or decrease. Fewer alligators are found outside the refuge boundary as development increases in the area. Also, contaminants that have accumulated within the food chain are present in the alligators of the Okefenokee NWR and may be affecting reproduction.

Eastern Indigo Snake (Threatened) - The eastern indigo snake is Georgia's largest snake, attaining a maximum length of about 8½ feet. During the warmer spring and summer months, indigos are found in mesic habitats, such as river floodplains or other wetlands, where they hunt a variety of small prey. During late fall and winter, indigo snakes retreat to the much drier sand ridges where they seek shelter from the cooler weather in tortoise burrows and stump holes. They are active during the winter, their breeding season, and seek prey all through the winter. Open, park-like habitat is preferable because the snake requires a sunny area to warm up before it can seek prey.

Factors limiting the distribution of the snake include habitat loss and degradation. Disruption of the natural fire regime has allowed dense scrub oak thickets to invade longleaf pine communities. In addition to needing the open understory for sunning, this community is also the preferred habitat of the gopher tortoise, whose burrow is the snake's primary winter shelter. Site preparation for pine plantations eliminates gopher tortoise and any available stump holes. Conversion of suitable habitat for other uses has severely fragmented the remaining habitat. Many are killed on the highway. Gassing or smoking out gopher tortoise burrows to control diamondback rattlesnakes is also a major threat to indigo snakes. Effects of pesticides which accumulate in indigo snakes (because they are high on the food chain) may be a contributing factor to reduced numbers (USFWS 1982). In the past, large numbers were collected for the pet trade.

A survey that began in 1978 by Joan E Diemer and Dan W. Speake of the Alabama Cooperative Wildlife Research Unit, Auburn University, indicated a population of approximately 45 eastern indigo snakes in the Okefenokee basin (Diemer and Speake 1983). The current status of this snake on the uplands of the refuge is not known and needs to be evaluated. Sightings of this reptile are common in the Camp Cornelia area. Information gathered from this effort could be used to help prioritize areas for burning. Efforts should be made to maintain appropriate site conditions in areas with high gopher tortoise or indigo snake use. The refuge's management of the longleaf pine communities is compatible with the needs of the indigo snake.

Gopher Tortoise - The gopher tortoise occurs in the southeastern Coastal Plain from South Carolina to Louisiana. They are associated with well-drained sandy soils, which support a variety of fire-dependent plant communities. The gopher tortoise constructs subterranean tunnels, averaging 15 feet in length, which protect the tortoise from temperature extremes, desiccation and predators (Diemer 1986). The burrows are of particular ecological importance. Their use has been documented by 60 vertebrates and 302 invertebrates (Jackson and Milstrey 1989).

The major reasons for the decline of the gopher tortoise are habitat destruction, habitat degradation, and human predation. Recovery is very slow. Female gopher tortoises do not reach sexual maturity until 10 to 20 years of age. They produce a single annual clutch of about six eggs. Eggs and hatchlings are heavily predated (Diemer 1986).

Gopher tortoises have been documented throughout the higher regions of upland management compartment 3, where trail ridge passes through the compartment. Throughout most of the refuge uplands, drainage is too poor to allow the tortoise to construct its burrows. Billys and Blackjack Islands have some suitable habitat for gopher tortoises and may have supported the tortoise in the past. The tortoise may have been exterminated by residents of the island during the logging era (Speak 1988).

Flatwoods Salamander (Threatened) - The range of the flatwoods salamander is restricted to the coastal plains of South Carolina, Georgia, Florida and Alabama. These salamanders live in mesic flatwoods habitats within the vanishing longleaf pine/wiregrass communities. Breeding sites are typically shallow ephemeral cypress or tupelo ponds that have diverse emergent and submergent herbaceous vegetation with a relatively open canopy of primarily cypress (Dodd and Laclair 1995). The herbaceous, grass, sedge dominated perimeters of ponds are important sites for salamander egg deposition. Survival of larvae is dependent upon the rise of water levels in late winter and the absence of fish species that would consume the larvae. Both the terrestrial and pond sites are dependent on lightning season fires to maintain an open site and promote growth of grasses, sedges, and forbs (Jensen 1999).

Habitat loss has been the primary cause of this salamander's demise throughout its range. Agricultural and silviculture have eliminated the vast majority of the once widespread longleaf pine flatwoods community in Georgia and elsewhere. Disruption of the natural fire regime has allowed slash pine and high, dense shrubs to invade both ponds and uplands. Pines may alter the ponds hydrology (reduce hydroperiod) and create shading and needle fall that is unsuitable for flatwoods salamander and some other amphibians. In addition to appropriate pond conditions, flatwoods salamanders (and other pond breeding amphibians) require maintained uplands adjacent to the pond.

No salamanders were located on Okefenokee NWR or along Trail Ridge during a 1997 spring survey (Johnson 1997) or during surveys in 2000/2001 by USGS researchers (Smith 2001). Some of the interior islands contain suitable habitat and additional surveys were recommended (Jensen 1995).

Other Reptiles and Amphibians - Striped newts require sites similar to those needed by flatwoods salamanders, but this species also occur in more xeric sites. Johnson (2000) studied the life history characteristics of striped newts in a north Florida breeding pond and found that newts had four distinct activity periods, defined by immigration and emigration around breeding ponds. Gopher frogs, another species of concern, also breed in temporary ponds.

Invertebrates

Invertebrates occupy many niches in each of the wetland and upland habitats. Visitors as well as researchers have been fascinated by the diversity of the invertebrate life. Researchers have examined termites, spiders, moths, ants, and dragonflies. The University of Georgia's entomology class has regularly collected specimens from the Okefenokee NWR. In addition, an annual butterfly count has been conducted at the end of August by butterfly enthusiasts.

Kratzer (2002) concentrated on aquatic invertebrates and found the taxa richness in the wetlands to be 104 taxa, which is within the range of similar wetlands. Chironomids, water mites, and ceratopogonids were the most dominant taxa making up 85 percent of the total individuals collected. The high abundance of predacious and parasitic water mites may have impacts on other aquatic invertebrate; however, DiSabatino et al., (2000) found water mites to be useful as indicators of water quality. Molluscs and oligochaetes were absent from Kratzer's (2002) samples and may not be able to tolerate the acidity of the Okefenokee waters. Also, invertebrates in the Okefenokee NWR do not tend to be responsive to different plant communities as in other wetlands. However, there are a few

species that would be susceptible to changes in environmental conditions and would make good candidates for indicators.

There is no doubt that invertebrates play a critical role in food web dynamics and trophic structure of many species assemblages on the refuge. Because of their structural level in the food chain, they have the potential to transfer contaminants released into the system, such as mercury, to fish, birds, amphibians, reptiles, and mammals that fill the role of consumers. George and Batzer (2002) found levels of mercury in excess of 20 ppm and levels averaged 1.6 ppm. These levels are extremely high compared to other wetlands. These levels were found in amphipods that are in close association with the sediment and mercury sequestering plants. Concentrations of mercury in odonates and crayfish were significantly less and corresponded to levels found elsewhere. Amphipods are considered the superior indicators of mercury in Okefenokee food webs. This food source may be contributing to the high levels of mercury found in the fisheries. Further study is needed to evaluate the connection between drought and extensive fires on the availability of mercury. George and Batzer concluded that the source of mercury is probably atmospheric deposition because similar levels were found between all sampling locations and habitats.

SOCIOECONOMIC ENVIRONMENT

The Okefenokee Swamp has shaped the culture of southeast Georgia. From Native Americans to canal diggers in the swamp, and from timber harvesters to fire fighters, most residents of Charlton, Ware, and Clinch Counties have ancestors who once lived, worked, or relied on the swamp for their very existence. To them, the swamp is a part of their family heritage. In addition to its cultural link, the refuge exerts a strong financial incentive to the local three-county area. During the 1990s refuge visitation grew to an estimated 400,000 visits per year. The economic impact is predicted to continue to increase along with Okefenokee NWR's continuing rise in popularity locally, regionally, and statewide, nationwide and worldwide.

EARLY SETTLEMENT

Indians inhabited Okefenokee Swamp as early as 2500 B.C. Peoples of the Deptford Culture, the Swift Creek Culture, and the Weeden Island Culture occupied sites within the Okefenokee Swamp. The last tribe to seek sanctuary in the swamp, the Seminoles, conducted raids on settlers in surrounding areas. Troops led by General Charles R. Floyd during the Second Seminole War, 1838-1842, ended the age of the Indians in the Okefenokee.

The Suwannee Canal Company purchased 238,120 acres of the Okefenokee Swamp from the State of Georgia in 1891. The aim of the company was to drain the swamp for rice, sugar cane, and cotton plantations. When this failed, the company began industrial wetland logging as a source of income. Captain Henry Jackson and his crews spent 3 years digging the Suwannee Canal 11.5 miles into the swamp. Economic recessions led to the company's bankruptcy and eventual sale to Charles Hebard in 1901. Logging operations, focusing on the cypress, began in 1909 after a railroad was constructed on the northwest area of the swamp. More than 431 million board feet of timber were removed from the Okefenokee Swamp by 1927, when logging operations ceased.

LAND USE

The earliest use of southeastern lands was by the Native American Indians starting some 4,000 years ago. Trowell (1998b) commented that "The frontier culture of the Okefenokee was a piney woods cracker culture. Men and women possessed and fostered a self-sufficient life style, a strong sense of independence in thought and behavior and a commitment to family relationships and traditions." Trowell goes on to comment that "In contrast to the Plantation societies of the Georgia coast and the

up-country, the Okefenokee frontier developed as a hunting-stockminding society. Some of the major economic and social events of the year were the spring wiregrass burns and cattle roundups, the winter drives to the cowhouses, and periodically, the bear hunts to protect the razor back hogs." Trowell continues "The frontier culture gradually gave way to the new industrial world following the war. Steamboats made their way up to Traders Hill on the St. Marys River as early as the 1830s and a steam sawmill was operating at Burnt Fort on the Satilla River by lumbermen from Maine by 1836. But it was the railroad and commercial society that undermined and supplanted the independence and self-sufficiency of frontier culture. . . . The railroad that really altered the landscape and culture of the Okefenokee was the Waycross and Jacksonville branch of the Savannah – Florida and Western completed in along the eastern rim of the swamp in April 1881."

"Trees grow jobs" is a sign often seen along the roadways of southeast Georgia. Hundreds of thousands of acres of land are dedicated to the production of commercial pine trees. Although primarily produced for pulp and paper, some trees are also marketed as posts/poles and some for commercial lumber construction. In contrast to the past, the 396,000-acre Okefenokee NWR and the U.S. Forest Service (Osceola National Forest), along with State of Florida lands to the south of the swamp, are now dedicated to wildlife and wildlife habitat protection.

Although the Okefenokee area is quite rural, population centers are developing in the area. The cities of Waycross and Homerville to the north of the swamp and Folkston, Kingsland, and St. Marys to the east are experiencing significant growth. To the south of the swamp, the cities of Jacksonville and Lake City are growing rapidly. This growth directly translates to the use of land for homes, shopping centers, roads, etc. The Okefenokee NWR is somewhat unique in that it is closely bounded on three sides by interstate highways. With population centers located where they are and road systems developing, the Okefenokee NWR and its adjoining state and federal lands to the south appear to be a "framed wildlife habitat or haven preserved for future generations."

ADJACENT LANDOWNERS

A description of the physical features of Okefenokee NWR is not complete without a description of properties adjacent to the refuge. Resource management and protection activities on the refuge have an impact on adjacent lands. Each land manager, including the USFWS, assumes some liability for the impacts of management activities on adjacent properties. A spirit of cooperation between landowners is necessary to maintain a productive relationship.

The refuge is surrounded by high value commercial forestland, most of it in slash or loblolly pine plantations. Scattered through the commercial forests are small parcels of private lands with a mixture of modern and "old swamper" home sites. Working relations with these public, corporate, and private landowners have been excellent. Cooperation between fire management personnel and the adjacent agency, industrial, and private landowners is facilitated through the Greater Okefenokee Association of Landowners (GOAL) organization. Activities of GOAL include setting of priorities, acquisition of local resources, technology transfer and general problem solving. The formation and development of GOAL is discussed in Section 1. Ecosystems.

Listing of Adjacent Landowners

Following is a list of landowners sharing the Okefenokee NWR's 162-mile boundary. Many other landowners, particularly private property owners with dwellings, are located within a short distance of the refuge boundary.

The *Dixon Memorial Forest*, managed by the Georgia Forestry Commission is located next to the north end of the refuge. The Dixon Memorial Forest extends approximately 10.4 miles or along 6.4 percent of the refuge boundary. In the past, the forest has been managed on medium long rotation

for pulpwood, poles, and saw timber. After an initial commercial thinning for pulpwood, the remaining stems are tapped for naval stores. After a period of naval store operations, the stand is clear-cut for poles or saw timber. In 2002, the USFWS entered into a memorandum of understanding with Georgia Forestry Commission and Georgia Department of Natural Resources to manage cooperatively suitable upland habitat sites to restore habitat for the federally endangered RCW with the long-term goal for the restoration of the longleaf pine-wiregrass ecosystem.

Within the Dixon Memorial Forest, Land Lot 20 is leased to The Okefenokee Swamp Park Association. *Okefenokee Swamp Park* is a private, non-profit organization, operating as a concession to provide an entrance to the north end of the swamp. Several million dollars of improvements are located on Okefenokee Swamp Park.

Adjoining the Dixon Memorial Forest and extending 32.5 miles along the northeastern and eastern refuge boundary are lands managed by *International Paper Company* and owned by The Conservation Fund. The boundary line follows the swamp line throughout the length of the property. During 1978, a former owner, Union Camp Corporation donated most of the swampland in its ownership to the USFWS. International Paper Company lands adjoin 20.1 percent of the refuge boundary. This land includes the lands that E.I. duPont de Nemours & Company Inc., proposed to mine zircon, staurolite, and titanium bearing minerals. Lands are managed on an 18- to 25-year rotation, primarily for wood fiber products. Some larger stems are utilized by a chip and saw mill to provide lumber and pulpwood. Slash pine and loblolly pine grows on almost all of the lands. A memorandum of understanding for managing approximately 6,000 acres at the south end of the property is being discussed. This land would be managed on a longer rotation to enhance foraging areas for the RCW adjacent to nesting habitat on the refuge.

Several private tracts adjoin the refuge along the eastern boundary. Residences, farms, and forestlands are located on these private lands. Two private tracts on the west side, one near compartment 9 and the other near Council, are managed for commercial timber. The total boundary length along private lands is 6.4 miles, 4.0 percent of the refuge boundary.

Toledo Manufacturing Company, Inc., lands share the refuge boundary from Camp Cornelia 17.3 miles south to the vicinity of Boone Creek, representing 10.7 percent of the refuge boundary. Toledo Manufacturing Company, Inc., manages its timberlands on a medium-long rotation, thinning stands heavily for pulpwood, then retaining the remaining stems until about age 40. They are then cut for poles, chip, and saw logs and saw timber. The portion of Toledo lands on Trail Ridge directly adjacent to the swamp was leased to DuPont and was part of the mining foot print. The lease has expired. Several thousand acres of Toledo's ownership lies within the swamp line, within the refuge acquisition boundary. In addition, two Land Lots belonging to Toledo Manufacturing are inholdings, completely surrounded by refuge property.

South of the Toledo Manufacturing lands are lands formerly belonging to Gilman Paper Company. These lands are now owned by *Wachovia***,** and managed by F & W Forestry Services, Inc. The company owns land along 5.2 miles, or 3.2 percent of Okefenokee NWR's southeastern boundary. The Company manages slash and loblolly pine on a pulpwood rotation.

Florida Division of Forestry recently acquired a tract of land adjacent to the refuge, west of the St Marys River. It borders the refuge for 10.5 miles (6.5 percent) and is being managed as John Bethea State Forest.

Rayonier Incorporated presently owns tracts of land adjoining several parts of the refuge boundary. One tract joins 2.8 miles of boundary near Ellicotts Mound. After purchasing Jefferson Smurfit Corporation lands, Rayonier borders the refuge along the entire northwest side totaling 27.4 miles

and the southwest boundary totaling 27.1 miles. Rayonier, Inc., has the most boundary in common with the refuge at a total of 57.3 miles, 35.4 percent of the total boundary. Rayonier manages most of its forest for wood fiber products, but manages some stands on a longer rotation for other purposes.

Langdale Corporation owns two tracts of land near Sapp Prairie and Strange Island, joining the refuge boundary for a total of 7.5 miles. These two segments represent 4.6 percent of the refuge boundary. Langdale Corporation performs a commercial thinning after its stands reach pulpwood size with the ultimate goal of producing poles and saw timber.

Superior Pine owns land next to the refuge near compartment 9. Superior Pine's land lies along 8.4 miles of refuge boundary, representing 5.2 percent of the boundary. The land is managed by Champion International.

The Pinhook Unit of the Osceola National Forest joins the refuge along 3.7 miles of boundary on the south end of the refuge; 2.3 percent of the total.

DEMOGRAPHICS

Okefenokee NWR encompasses portions of Charlton, Ware, and Clinch Counties in Georgia and Baker County in Florida and attracts 350,000 visitors annually. Three staffed entrances are located near the Georgia towns of Folkston, Homeland, St. George, Waycross, Homerville, and Fargo. These communities serve the refuge and visitors by providing supplies, lodging, restaurants, and customer services. Their support and understanding of the refuge's management and contribution to the area influence the direction of growth and enhancement in southeast Georgia. For this reason, it is important to understand the demographics of the people living within these counties.

Charlton County
Charlton County is considered the most timbered county in Georgia. In addition, the Okefenokee Swamp covers one-third of the county's land. The refuge's East Entrance, also known as Suwannee Canal Recreation Area, and the administrative headquarters are located in this county, 11 miles southwest of the town of Folkston, Georgia. This entrance has the highest visitation. Other towns near the refuge within Charlton County include Race Pond, Homeland, Moniac, and St. George.

As of the 2000 Census, there were 10,282 people and 3,327 households residing in Charlton County (http://www.census2000.com). Sixty-nine percent of the residents were white, twenty-nine percent were black, and the remaining two percent were other races. The median income for a household was $27,869. Twenty-one percent of the population were living below the poverty level. Tables 6 and 7 compare the income and education levels of the four counties the Okefenokee NWR lies within.

Ware County
Okefenokee Swamp Park located near Waycross, Georgia, in Ware County, is the north entrance into the Okefenokee Swamp. Ware County is the largest county, in area, in Georgia. Waycross is the hub for the small towns that surround it.

As of the 2000 Census, there were 35,483 people and 13,478 households residing in the county. The racial makeup of the county was 70 percent white, 28 percent black, and 2 percent other races. The median income for a household in the county was $28,360. Twenty-one percent of the population were living below the poverty level.

Clinch County
Stephen C. Foster State Park provides the facilities at the west entrance to the refuge. This entrance is in Charlton County; however, Fargo, Georgia in Clinch County is the nearest town. Other towns in Clinch County that are near the refuge are Homerville, DuPont, Argyle, Edith, and Council.

The total estimated population for Clinch County reported in the 2000 Census was 6,878 and 2,518 households. The racial makeup of the county was 69 percent white, 30 percent black, and 1 percent other races. The median income for a household in the county was $26,755. Twenty-three percent of the population were living at the poverty level.

Baker County
A portion of the Okefenokee NWR is located in Baker County, Florida. Baker County is one of Florida's First Coast counties located only a short distance from Jacksonville on the Atlantic Ocean. Baker County is growing rapidly due to its prime location and the availability of five interchanges on Interstate 10, which crosses the county from east to west. Towns or cities within Baker County are MacClenny and Glen St. Marys.

As of the 2000 Census, there were 22,259 people and 7,075 households residing in the county. The racial makeup of the county was 84 percent white, 14 percent black, and 2 percent other races. The median income for a household in the county was $40,035. Fifteen percent of the population were living at the poverty level.

Table 6. Household income of the four counties the Okefenokee National Wildlife Refuge lies within. Numbers are based on the 2000 Census

Subject	Charlton	Ware	Clinch	Baker
2000 Population	10,282	35,483	6,878	22,259
Households	3,327	13,478	2,518	7,075
Household Income in 1999				
Less than $10,000	570	2,208	559	768
$10,000 to $14,999	290	1,347	267	445
$15,000 to $24,999	623	2,494	360	958
$25,000 to $34,999	497	1,979	405	969
$35,000 to $49,999	521	2,186	426	1,375
$50,000 to $74,999	539	2,010	331	1,668
$75,000 to $99,999	147	741	67	516
$100,000 to $149,999	102	339	69	255
$150,000 to $199,999	21	71	22	58
$200,000 or more	17	103	12	63
Median household income (dollars)	*27,869*	*28,360*	*26,755*	*40,035*

Table 7. Educational attainment of the population 25 years and over within the four counties the Okefenokee National Wildlife Refuge lies within. Numbers are based on the 2000 Census

Subject	Charlton	Ware	Clinch	Baker
Population 25 years and over	6,404	23,380	4,380	13,953
Less than 9th grade	696	2,394	845	1,164
9th to 12th grade, no diploma	1,540	4,545	957	2,758
High School graduate (include equivalency)	2,695	9,060	1,421	5,780
Some college, no degree	905	3,860	589	2,144
Associate degree	161	862	111	964
Bachelor's degree	215	1,582	265	744
Graduate or professional degree	192	1,077	192	399
Percent not completed high school	34.92	29.68	41.14	39.1
Percent bachelor's degree or higher	6.36	11.37	10.43	8.2

FINANCIAL BENEFITS

The Georgia Department of Industry, Trade and Tourism reported an annual tourism expenditure during Calendar Year 2000 at over $16 billion, and support for more than 200,000 jobs per fiscal quarter. Eco-tourism is defined as responsible travel that results in sustainable economic development while conserving the environment. Spending by tourists directly benefits towns and communities where goods and services are purchased. Wildlife-oriented recreation found at a refuge like Okefenokee can have a significant and lasting economic impact on local economies, especially in small towns and rural areas that form "Gateway Communities" adjacent to national wildlife refuges nationwide.

Okefenokee NWR contributes heavily to the economies of the surrounding three Georgia counties and one Florida county. Tourism expenditures for the year 2000 totaled $77.2 million. Ware County (north entrance) received the greatest benefit at $57.5 million followed by Charlton County (east entrance) at $13.5 million and Clinch County (west entrance) at $6.2 million.

In the three Georgia county areas, a total of 66 businesses and 1,083 jobs were supported by tourism in 2000. The East entrance concessionaire, Okefenokee Adventures, employs as many as 12 people seasonally and generates sales tax on goods and services utilized by as many as 200,000 visitors per year. The West entrance, Stephen C. Foster State Park, employs as many as 14 employees and generates sales tax on goods and services utilized by as many as 120,000 visitors per year. Both the East and West entrances are located in Charlton County. West entrance sales tax funds are credited to Charlton County but there is a residual economic effect within the towns of Fargo and Homerville, Georgia due to their close proximity to the entrance. The North entrance (Okefenokee Swamp Park) employs between 20-40 people on a seasonal basis and generates sales tax on goods and services utilized by as many as 80,000 visitors per year.

The refuge has a current staff of 31 permanent employees and numerous volunteers who live within the surrounding communities and support the local businesses.

All counties that the refuge has land within benefit from federal payment in lieu of taxes, called Revenue Sharing. This annual payment is comparable to taxes paid by other landowners. Table 8 shows the amounts paid to each county over the past four years.

Table 8. Revenue sharing amounts paid to each county in lieu of taxes

Counties	2003	2002	2001	2000
Baker	$1,531	$1,639	$1,606	$1,831
Charlton	$79,954	$85,587	$83,852	$95,587
Clinch	$27,280	$29,202	$28,610	$32,614
Ware	$103,463	$110,753	$108,508	$123,694

PUBLIC SERVICES

Although the Okefenokee NWR is primarily managed for wildlife, public use is an important aspect of the refuge. The East entrance has a visitor center, hiking trails, wildlife drive, boardwalk, observation tower, and a restored homestead in addition to concession services. The North entrance via Okefenokee Swamp Park is a private, non-profit attraction operating under a lease agreement with the Georgia Department of Natural Resources. Interpretive displays, a boardwalk, boat tours, animal habitats, and lectures are available to visitors. The West entrance via the 82-acre Stephen C. Foster State Park operates under a lease agreement with the USFWS. Its facilities include a museum, guided boat tours, boat, motor and canoe rentals, a campground, and furnished cabins. The two secondary entrances, Kingfisher Landing and the Suwannee River Sill, have public boat ramps and parking lots available to the public.

Okefenokee NWR provides opportunities related to the six priority uses: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The majority of visitors come to the refuge to view and photograph wildlife and birds (86 percent). Hunting opportunities are offered for white-tailed deer, feral hogs, turkey, and small game. The four areas of the refuge opened for hunting during specified seasons are the Suwannee Canal Recreation Area, Chesser Island, Cowhouse Island, and The Pocket. Sport fishing is a year-round activity primarily done from boats. Interpretation of the resources is accomplished through the visitor centers, special presentations, guided tours, brochures, and informational signs. The refuge also provides an outdoor classroom for environmental education ranging from pre-school to college level courses.

In addition, the refuge gives the visitor the opportunity to experience the solitude of wilderness while expanding the opportunities for wildlife observation, fishing, and photography by permitting overnight camping within the wilderness. Seven overnight campsites are scattered over the refuge's 120 miles of boat trail. Wilderness canoe groups consisting of one to twenty people make advanced reservations and secure permits, which allow them to spend from two to five days in the swamp (one to four nights). Travel on these trips is entirely non-motorized and averages between eight and twelve miles of paddling per day. Four overnight campsites consist of wooden platforms about 20'x28' in size with a partial roof and composting toilet. The other three sites are located on dry ground. Only one party per site reduces contact with other parties and promotes the feeling of solitude.

VISITOR CHARACTERISTICS

Of the 350,000 annual visitors to the refuge, roughly 35 percent originate from within Georgia, while up to 25 percent originate in Florida. Visitation records kept at the refuge for over twenty years indicate a repeating pattern of visitation from all 50 states and several foreign countries each year. Urban population centers surrounding the refuge include: Jacksonville, Gainesville, and Tallahassee,

Florida, as well as Brunswick, Savannah, Macon, Columbus, and Albany, Georgia, all of which are within 150 miles of the refuge.

The influence of I-95 and I-75, which link Georgia and Florida (and run parallel east and west of the Okefenokee NWR), contributes to refuge visitation. Visitors traveling north and south on these Interstates often include side-trips to the refuge as a part of their Georgia-Florida vacation.

Longwoods International (2001) surveyed travel and tourism in Georgia during the Calendar 2000 Travel Year and found that the Okefenokee Swamp was the 12th most popular attraction to visit. Okefenokee NWR is the most visited refuge in Georgia and the 16th most visited refuge in the National Wildlife Refuge System.

In 2000, a visitor survey was conducted by the Georgia Institute of Technology at the refuge's three main entrances and other neighboring recreational attractions, such as Obediah's Okefinok. A total of 300 interviews were completed. In-depth telephone interviews were conducted with these visitors to develop a more comprehensive profile. The survey found that 49 percent of the visitors originated their trip in Georgia of which 17 percent came from Atlanta. Twenty one percent originated their trip in Florida of which five percent came from Jacksonville. Only 4 percent originated their trip in North Carolina, 3 percent in Alabama and 23 percent came from other States. Georgia was the destination of 85 percent of the people surveyed while 11 percent had Florida as their final destination. Table 9 describes the refuge's visitors.

The Georgia Institute of Technology survey showed that visitors came to the refuge for its nature, wilderness and animals, water birds, and the whole experience of the swamp. Other reasons included boating, relaxation, and visiting the state park or wilderness area. Ninety four percent had a good experience and eighty percent were likely to make a repeat visit.

Table 9. Visitor characteristics as described by Center for Economic Development Services (2001)

Average party size	4.67
Most common party size	2 (36%)
Visitors without children	55%
Visitors with 1 or 2 children	31%
Median pleasure trips/year	5
Average visitor's age	50
Most common age bracket	35 to 54
Married	86%
Most common occupations	
-Professionals	26%
-Retired	24%
-Executives	9%
Education	
-Less than college	25%
-College grad	23%
-Post graduate study	27%
Average Income	$62,500

In 1999 and 2000, the Virginia Institute of Technology also conducted a study on Okefenokee NWR's wilderness visitor characteristics, perceptions and management preferences (Roggenbuck and Yoder 2001). During on-site contacts, 770 individuals agreed to participate in the study. These individuals were sent a mail-back questionnaire, and 542 returned the completed survey. Of these, 16 percent were overnight visitors, and 84 percent were day users.

The Virginia Institute of Technology (Roggenbuck and Yoder 2001) study showed that the range of distance traveled by respondents from home to Okefenokee NWR ranged broadly, but the mean distance was 693 miles. Persons on the guided trips came from even a farther distance with a mean distance of 798 miles. The average size of all groups coming to Okefenokee Wilderness was 6.7 persons. The most common type of group that visited the Okefenokee Wilderness was the family (39 percent) and about 23 percent of all groups were friends only. Visits were typically quite short. For the day visitors, the average length of stay was 3.1 hours with guided visitors staying only 1.5 hours. For overnight visitors, the average number of nights spent in the swamp/wilderness was 1.5.

It is interesting to note that in this survey of wilderness users, only 33 percent knew they had entered a federally declared wilderness area and 79 percent knew they had entered a national wildlife refuge. A high percentage believed the land was managed by the National Park Service. About 38 percent of all Okefenokee wilderness visitors admitted that they had no idea or knew only a little about the purpose and characteristics of federally declared wilderness.

CULTURAL ENVIRONMENT

PREHISTORIC INFLUENCES

According to archaeological evidence, the swamp was uninhabited until about 2500 BC. Prior to this time, the basin was probably too dry (Trowell 1989). Evidence indicates that small bands of Native American cultures occupied campsites throughout the swamp from this time through the 18th century. Several cultures existed during this period, identified by the types of pottery shards they left behind. These cultures are listed below and summarized in Appendix VII. Detailed descriptions of Native American cultures living around the Okefenokee are described in Chris Trowell's Publication "*Indians of the Okefenokee"* (1998).

- 2000 BC to 1000 BC: Fiber Tempered Pottery Period.
- 1000 BC to 500 AD: Deptford and Swift Creek Culture.
- 500 AD to 1000 AD: Weeden Island Culture.
- 1000 AD to 1200 AD: Cord Marked Cultures.
- 1200 AD to 1700 AD: Spanish Period. Miscellaneous Native American Cultures remain including Lamar Culture, Timucuan and Apalachee speaking natives. Native populations declined sharply due to diseases introduced by the Spanish, and slaughter by military and Creek warriors. By the time the swamp was occupied by the Seminoles, the early natives had disappeared (Hopkins 1947).
- 1750 to 1840: Seminoles. Remnants of other native tribes including Creeks, Yuchees, Hitchitis, and others who took refuge in the swamp following skirmishes with European settlers and military (Trowell 1998).

Continued skirmishes between the Seminole Indians and the settlers led to the establishment of several forts around the perimeter of the swamp to protect the settlers. Two forts were built within the swamp, one on The Pocket, another on Billys Island. Campaigns by federal and state militia were conducted to eradicate or move the Seminoles from the area. Several forts remained manned and U.S. Army troops continued to patrol the rim of the swamp until 1842. By 1850, "the age of the

Indian" in the Swamp had passed. Only Indian stories, mounds, scattered ceramic and stone artifacts, and several names on the map remained" (Trowell 1998).

Native American occupation had some effect on Okefenokee habitats. Fire was used as a hunting tool. Huckleberry, blueberry, and chinkapin productivity was enhanced by regular burning of islands. Villages, garden sites and other activity areas may have created permanent relic openings. Some of the lakes or openings in the swamp may be related to accidentally or intentionally set fires by Native Americans (Trowell 1989).

Since cultural sites are often difficult to identify without careful examination, construction of new roads, firebreaks, or other disturbances is only done with consultation from the regional archaeologist. General locations of known cultural resources are listed in Appendix VIII. Detailed descriptions and locations of cultural sites are restricted information and are on file at the refuge.

HISTORICAL INFLUENCES

The Okefenokee area was mapped in the early 1800s as part of Wayne County for disposal in land lotteries. Settlement of the area occurred very slowly because of the apparent worthlessness of the land, difficulty of transportation, periodic outbreaks of Indian or outlaw attacks, and the difficulty of protecting the settlements. Most of the original settlers had large families skilled in swamp living. They were highly mobile and usually squatted for a few years on government or unclaimed land and then moved on to a more attractive homestead site (Allen 1854; Trowell 1984).

During the mid-19th century, pioneer families moved in as Native Americans began to disappear, generally settling on isolated farmsteads. The majority of the settlers lived in the tradition of the Native Americans, using fire for hunting and habitat management. "Their frequent burning of the wire-grass pine woods was probably their greatest legacy. Fire-adapted species of plants, and the creatures that lived in these open woods, became even more dominant. Not only did they burn the upland woods that encircle the swamp, but they burned the islands. This increased visibility for hunting, invigorated the growth of grass for deer, and improved the huckleberry yield. Hunters often set fires on the islands when they left after a hunting trip. Some of the lakes are probably the result of accidentally or intentionally set fires on tree-houses, especially the prairie lakes near the eastern rim (Trowell 1989).

The communities of Traders Hill and Folkston were established. In 1857, railroads began to penetrate the swamp area, and a new settlement, Waycross, was located at an important trail crossing. By the turn of the century, railways circled the swamp, helping to build other cities and villages including Folkston, Fargo, Homerville, and others (Hurst 1974).

Up to this point, Native Americans and European settlers were essentially part of the environment, changing only slightly the events that took place naturally. Lightning fire frequency of one to three years in the Southeast supports a truly fire- dependent ecosystem as opposed to the ecosystems in the west, lake states, and northeastern states where natural fire frequency was 25 to 150 years. The primary effect of fires set by Native Americans and early settlers was to extend the fire season into the dormant season.

Livestock grazing also occurred. Some disagreements exist among researchers and historians about the effects of cattle grazing on longleaf communities. The consensus seems to be that improperly managed cattle grazing destroyed longleaf regeneration and the understory communities. According to Wahlenberg (1946), in a traditional native grass understory, cattle and horse grazing has a significant effect only during the seedlings first year. Cattle normally avoid seedlings in the grass stage (Wahlenberg 1946). Much greater damage occurred when non-native pasture grasses were

introduced into the forests. Apparently, bermuda and carpet grass were planted in the forest stands for pasture (Pendleton 1900). These non-native grasses could feed many times more cattle than wiregrass and are cropped very closely to the ground. The result is trampling and destruction of longleaf seedlings (Wahlenberg 1946).

Annual or biennial burning along with grazing has been credited with deterioration of the wiregrass range (Pendleton 1900), although burning should have been beneficial to the wiregrass understory. During the cattle grazing era, an aggressive burning program was developed. The most effective time for burning wiregrass for pasture was January 1 to February 10 and it should be burned annually (Blocker 1875). The dry stems would be burned and a flush growth of new grass would provide cattle forage. This is not the best season for control of woody vegetation, but the annual burning and constant grazing probably accomplished this objective. Also, dormant season fire would not stimulate the wiregrass to seed. The combination of constant dormant season burning with no interval between burns, along with constant trampling of the grass clumps, probably caused the rangeland to deteriorate. Compaction of the soil by grazing animals may have contributed to the deterioration of the range.

Damage by razorback, piney woods hogs (mongrel hogs escaped from settlers farms and bred in the wild) is far greater than grazing by cattle or other livestock. Hogs relish the taproot, larger lateral roots, the succulent inner bark and even eat fallen longleaf pine seeds. Hogs can completely eliminate a longleaf pine regeneration area in three to five years (Wahlenberg 1946).

During the late 1800s, industrial operations began to take place that forever changed the face of the Okefenokee.

Resource Exploitation – Pre-Refuge Era

Exploitation of the Okefenokee and its resources began with the turpentine industry. The naval store industry began in America during colonial times, although it was not an important part of the economy until the 19th century when the industry was centered in North Carolina. As demand for turpentine and resin products increased and resources in North Carolina could no longer satisfy demand, the industry began to move south. From 1880 until the present, the States of Georgia or Florida led the nation in the production of crude gum naval stores. As other sources of turpentine and alternative products were developed (1930 to 1950), the crude gum naval stores industry began to decline. By 1960, the number of crude gum producers and the volume of crude gum produced dropped to only 14 percent of the 1950 figures (Thomas 1975). There are now only a few scattered operations throughout the southeast to fill a small demand for naval stores and to provide historic interpretation for a vanishing era. The naval store industry, however, had a long lasting effect on the longleaf pine community that will take more than a century to mitigate.

By the time Okefenokee NWR was established in 1936, the naval stores industry had made its mark. During a visit to Okefenokee NWR in the early 1940s, Ira N. Gabrielson expressed his disappointment that the uplands around the swamp and virtually every island within the swamp had been “worked again and again until the trees are dying prematurely” (Gabrielson 1943). Management notes from the refuge’s Narrative Reports mention removal of substantial volumes of turpentine faced trees throughout the refuge in 1944, 1946, 1947, 1949, 1952, 1954, 1955 and 1956 (USFWS 1939-1960). Many more cat-faced trees were probably removed during salvage operations following the 1954-55 fires. In most cases, it was probably not the naval store operations that caused premature mortality but the fires that periodically burned the longleaf pine uplands. The tar covered turpentine faces catch fire easily when subjected to fire that ordinarily would not harm the tree. Once the face catches fire, it will burn until it kills the tree or burns it down. These salvage operations removed a substantial part of the longleaf pine stems on the refuge. Most of the remaining old

growth longleaf pine trees have turpentine faces. Faced trees are no longer salvaged, but they are subject to mortality during prescribed or wildland fires.

Okefenokee Swamp has long been considered for various other schemes of exploitation including a barge or ship canal. According to Hopkins (1947), President Washington is believed to have had some investigations made during his first administration. Subsequent investigations for the same purpose were made in 1829, 1832, 1877 and 1920. In 1856, the State of Georgia (owners of the swamp at the time) commissioned Colonel R. L. Hunter to survey the swamp with intentions of draining it and utilizing it for agricultural purposes. Nothing was actually done until 1887 when the Georgia Legislature authorized the Governor to grant 235,000 acres of the Okefenokee Swamp to the Suwannee Canal Company for the expressed purpose of draining the swamp (Hopkins 1947).

In 1891, a canal was begun between the swamp and the St. Marys River. Sixteen miles were excavated into the swamp and through the upland before the project finally failed due to economic and engineering difficulties. The company did remove some pine timber from Camp Cornelia and about 11,000,000 board feet of cypress from the swamp. The lumber, sawed at the sawmill at Camp Cornelia, was shipped to Bull Head Bluff by trains over the company's railroad, the Brunswick and Pensacola Railroad. At Bull Head Bluff, the lumber was loaded aboard ships (Hopkins 1947; Trowell 1984).

In 1901, the Suwanee Canal Company holdings of 257,889 acres were purchased by Charles Hebard. His sons who inherited the property later formed the Hebard Lumber Company. The property was then leased to the Hebard Cypress Company in 1909 (Trowell personal communication).

Between 1909 and 1927, the Hebard Cypress Company and the Twin Tree Lumber Company (harvesting mainly the pines on the islands) utilizing logging railroads, cut and removed most of the cypress and pine trees from the Okefenokee. The Hebard Cypress Company built a huge sawmill west of Waycross at Hebardville and manufactured lumber for 17 years. Logging camps housing hundreds of workers were built on Billys Island and The Pocket near the present site of Stephen Foster State Park. The Swamp resounded and trembled with logging activity. By 1927, the Hebards and Twin Tree had cut the most profitable stands of timber and they ceased operations (Trowell 1989). The company removed 423,600,000 board feet of lumber between 1909 and 1927 (Hopkins 1947).

Probably as much as 400,000,000 additional board feet of lumber were harvested by other companies as logs and cross ties between 1926 and 1942. Other small companies constructed 250 miles of temporary railroads into the swamp during this period. In addition, Phillips Lumber Company also harvested logs from the Coffee Bay area by tug boat during the 1930s (Trowell 1983).

Indiscriminate harvesting of the valuable lumber species accelerated the conversion of longleaf pine stands on the uplands and cypress stands within the swamp to other species.

Longleaf pine is a long-lived species (up to 350 years) but does not reproduce very proficiently. The absence of fire allowed invading seedlings to out compete longleaf pine seedlings. Even where a longleaf seed source still existed, lack of periodic fire has allowed a dense understory to develop, permitting very little natural regeneration.

The overall result of resource exploitation throughout the southeast is virtual destruction of a major habitat group, the longleaf pine communities, and a decline in the populations of those wildlife species that are specifically dependent upon these communities. Throughout the longleaf pine

range, traditional longleaf pine community wildlife populations have been replaced by species more adapted to hardwoods, dense, younger timber stands and higher understories.

Within the swamp, the effect of clear cutting was no less devastating to the centuries old stands of cypress that once existed in the Okefenokee. When young cypress up to 200 years old is blown down or cut, sprouts rapidly develop from the stumps. Older cypress sprouts less readily after cutting. Most of the cypress cut in the Okefenokee was between 400 and 900 years old. Therefore, the sprout growth was probably minimal. In addition, when cypress is girdled prior to cutting, as was the practice in the Okefenokee, regeneration through sprouting generally does not occur. Reestablishment of cypress, therefore, would have to occur primarily through natural seeding. Records indicate that all cypress greater than 12 inches were removed, leaving very few seed trees suitable for regeneration. The very restrictive set of conditions under which cypress seed will disperse, germinate, and survive, severely restrains the reestablishment of cypress through natural seeding. As a result, most areas where cypress were harvested in the Okefenokee are not likely to return to their pre-logging condition (Hamilton 1982). Clear cutting of the old growth cypress was followed by the 1932 wildfire. The fire burned in extensive concentrations of slash, probably burning areas it might otherwise have passed. Natural cypress regeneration, if it existed, was probably destroyed. The result was conversion of cypress stands to other wetland hardwood species.

As people moved into the area, aggressive fire suppression also grew in popularity removing the benefit of the occasional fire that would start in individual stands. However, the greatest effect on the fire regime was the fragmentation of the landscape. Wildfires, when they occurred, were suppressed; but, it was other attempts to harness the resources of the southeastern coastal plain that altered the natural fire regime. As settlement continued, roads, fields, pastures, and homesites were cleared, fragmenting the landscape. These man-made barriers stopped or altered the fires that once spread for miles through the countryside. Slash, loblolly and pond pines, once confined to wet areas around drains and ponds due to frequent fires on the uplands, were now able to encroach into the open longleaf pine communities. Hardwood understory species that could not survive the periodic growing season fires now replaced the open understory. Fires no longer approached the swamp on a several mile front, slamming into the swamp's edge, burning out areas of scrub/shrub and scrub forest within the swamp or burning depressions into the peat layer during drier periods. Without fire, open marsh areas and ponds within the swamp are no longer created or maintained.

On a smaller scale, the peat/sphagnum moss harvesting that occurred between the 1930s and the 1950s had a more localized impact. Peat was mined for only one year by John King during development of approximately 3miles of canals. Alton Carter harvested sphagnum moss for about 20 years (Carter personal communication). The operation resulted in the existence of Kings Canal, a popular entrance to the Okefenokee Swamp for local residents for many years, and one of the entrances to the wilderness canoe system. The hydrology of the area was altered through the creation of a 3-mile canal. This canal begins at the swamp’s edge, enters Carters Prairie, and extends a short distance north and south. Mining of the peat may have also released into the water some contaminants deposited into the peat over periods of time (Winger 1997).

MODERN INFLUENCES

Efforts to establish a biological preserve or wildlife refuge in the Okefenokee Swamp can be traced to the first decade of the twentieth century. Between 1909 and 1917, Roland M. Harper and later A. H. Wright, J. G. Needham, and Francis Harper suggested that the swamp be preserved (Trowell 1998a). In 1918, the “Okefinokee Society" was organized, led by Dr. J. F. Wilson of Waycross and members of the scientific community, to give authentic publicity regarding the Okefenokee Swamp and to secure its preservation (J. G. Needham Collection). During the 1920s, a Cornell group and Francis Harper of the U.S. Biological Survey continued to promote the swamp as a preserve. The U.S.

Biological Survey continued to study the potential of the swamp, especially following the cessation of logging activity by the Hebard Cypress Company in 1927. The U.S. Senate Special Committee on Conservation and Wildlife Resources investigated the feasibility of the Okefenokee as a preserve in 1931. Articles by Francis Harper, in such magazines as *National Geographic* and *National History* during the early 1930s, sustained interest in the project.

The Georgia Society of Naturalists, organized in 1929, promoted the preservation of the Okefenokee and became the primary force lobbying the state and federal government to purchase the Hebard property as a game preserve (Trowell 1994).

A survey by the Works Progress Authority to locate a route for a road across the swamp in 1935 finally prompted action (Trowell 1998a). During 1936, the Government offered the Hebard Cypress Company $1.50 per acre for the land and took possession of the land on November 30, 1936. Okefenokee NWR was established by executive order in 1937 to preserve habitat for all native species of wildlife, birds, mammals, and reptiles. At that time, a Government survey showed 292,979 acres as the refuge area (Hopkins 1947). Several purchases and donations over the past 59 years have brought the refuge size up to its present 395,515 acres.

Refuge Management History

The Okefenokee NWR was established by Executive Order 7593, dated March 1937 to be "reserved and set apart for the use of the Department of Agriculture, subject to valid existing rights, as a refuge and breeding ground for migratory birds and other wildlife". Management philosophy was then, and continues to be, a major issue. Acquisition of the swamp was advocated by many for several different reasons. Some wanted to set the Okefenokee aside as a National Park; others as a wilderness area; others as a waterfowl refuge; and others wanted to exploit its scenic wonders.

A series of reports were prepared for the U.S. Biological Survey prior to acquisition. In 1936, a *Preliminary Report on Okefenokee Swamp* was prepared for the U.S. Biological Survey by William D. Marshall. The report described the Okefenokee Swamp, the habitats, wildlife, and recommendations for management of the swamp as a national wildlife refuge. The report described the Okefenokee Swamp as about 418,000 acres, 20 percent of which is waterfowl habitat, and recognized its values as a wilderness area and waterfowl refuge. Little consideration was given to the uplands in this report. Recommendations by the U.S. Biological Survey for an initial 3-year management program for the Okefenokee NWR were as follows (Marshall 1936):

- Program of blocking out the refuge on the east side. This involves purchase of about 80,000 acres.
- Very energetic enforcement against unauthorized trespassers.
- Development of a permit system for authorized entry.
- Building of two cabins and telephone lines to each.
- Building a skeleton firefighting organization on the west side.
- Ecological study of the prairies and of Eriocaulon compressum (hatpin) and Xyris smalliniana (yellow-eyed-grass).
- Engineering study of the possibilities of a dam at Mixons Ferry.

The possibility of constructing a dam in the vicinity of Mixons Ferry received serious consideration in Marshall's report. It was noted that most of the 13-foot drop in the swamp surface elevation between east and west occurs between Billys Lake and Mixons Ferry. In this case, a low dam would have little effect beyond the western edge of the swamp. It was noted that careful engineering would be necessary to influence water levels in the eastern prairies.

During this same period, James Silver of the U.S. Biological Survey, while recommending acquisition of the swamp noted that: “The key to its value, as a waterfowl refuge, in my estimation, lies in the construction of a dam across the Suwannee River to enable the control of the water level. At present the water is very low and many thousands of acres normally under water are now dry. At least 50 percent of the 300,000 acres of Hibbard [Hebard] holdings are open prairie practically all of which at high water are under water, and by raising the water 2 feet an open water area of over 150,000 acres would result” (Trowell 1994). Later, in a letter to the Director of the USFWS in 1956, he opposed the dam (Silver 1956).

In 1941, refuge biologist Harden A. Carter completed a study to "investigate and study the need of and opportunities for wildlife development and management." The report was based on six months of intensive field work and previous studies. The report concluded that "life in the swamp" is only secondarily dependent upon biological factors. The primary single physical factor in the environment that controls life in the swamp is the fluctuation of water-level. Stabilization was thought to preserve conditions in the Okefenokee Swamp much longer than continued fluctuation of water levels (Carter 1941).

The basis of much of the management philosophy was to develop or improve Okefenokee NWR's value as a waterfowl refuge. According to Carter and Marshall, to improve, or even maintain its pre-refuge value, water levels were to be stabilized. Marshall recommended an impoundment in the Mixons Ferry area high enough to raise water levels throughout the swamp. It was believed at this time the major loss of water was through discharge into the Suwannee River. Later investigations showed the majority of water to be lost through evapotranspiration (80 percent) while only 20 percent was discharged through the Suwannee and St. Marys Rivers combined (Rykiel 1977). Early investigators may have ignored the presence of several natural sills within the swamp. These natural impoundments may maintain swamp surface levels in a series of steps rather than a gradual sloping surface to the west as may have been envisioned. Also, not considered were oxidation of organic materials during dry periods and the importance of fire during dry cycles, both of which alter or set back succession.

On the uplands, managers and biologists were concerned that upland game bird populations, already set back by removal of the old growth forest, were continually declining due to deterioration of understory habitat. Hopkins (1947) continually noted that the upland understory (interior islands and perimeter uplands), which had once been open, was becoming too rough for native game birds. The need for prescribed fire was noted in many of the early narratives.

A summary of management and development of the refuge programs follows:

Physical Development - In order to establish the Okefenokee NWR and allow management activities to function, the major thrust between 1938 and 1942 was site development. CCC Camps were established at Camp Cornelia and Fargo to construct the initial service buildings, residences, and other buildings. Road construction, boundary line marking, and fencing began. The canal and boat trails were opened and maintained.

During the following half century, buildings were repaired, enlarged, improved, and replaced. Fire and forest management facilities were constructed. Additional tracts of swampland and adjoining uplands were acquired until the refuge reached its present size of 395,515 acres. A major public use program was developed involving three entrances into the swamp.

Wetlands Management - Although recommendations to the U.S. Biological Survey stressed the importance of stabilizing water levels within the swamp (Marshall 1936), little was done during the first few years. Marshall recommended a 25-foot dam at Mixons Ferry that would raise water levels to

the 120-foot level. At one point, the introduction of beavers was considered to stabilize water levels throughout the swamp (Creaser 1939). Emphasis was placed on law enforcement within the swamp. The canal and many boat trails were opened to facilitate patrol of the refuge.

Biologist Carter's investigation and report in 1941 showed continued interest in impoundments to stabilize swamp water levels for maintenance of waterfowl habitat in the swamp (Carter 1941). Carter believed that stabilizing water levels would retard the spread of the emergents into the prairies. During dry (low water) periods, grass and shrubs were observed to be encroaching into dry peat areas, which had been open water. In light of this, Carter favored stabilization of water levels by controlling discharge from the swamp in the Suwannee River area (Carter 1941). During the same period, Director Ira Gabrielson proposed to the Secretary of the Interior, a series of water control structures in natural and man-made channels throughout the swamp in order to stabilize water level fluctuations throughout the swamp (Hopkins 1947). The outbreak of World War II, lack of materials, personnel, and funding limited serious interest in actual construction.

During the next decade, fire suppression action increased interest in impounding water in the swamp to reduce wildfire hazard, but again because of limited resources, no action was taken. The drought of 1954-55 and the associated wildfires that burned 80 percent of the swamp and thousands of acres of privately owned timber brought serious consideration of the idea of an impoundment to stabilize Okefenokee's water levels. Various schemes were proposed to stabilize water levels (Gresh 1955).

At this time, maintaining water levels to prevent what were perceived as “disastrous wildfires” in the swamp had greater priority than waterfowl management objectives. The construction of an impoundment drew a great deal of support from local citizenry, adjacent landowners and timber companies, the Georgia Forestry Commission and individuals within the USFWS. During this time, local representative Iris Blitch introduced congressional action to construct a sill and dike in the Suwannee River with additional sills in the old St Marys River Canal (actually the Suwannee Canal) and at such other points within the refuge as determined necessary (H.R. 9742). The same legislation directed the U.S. Department of the Interior to construct a fire access road system around the perimeter of the swamp. Representative Blitch's Bill was passed in March 1956 (Pub. Law 84-810; 70 Stat. 668), and the sill was completed in 1960. A copy of Public Law 84-810 is located in Appendix I.

The Suwannee River Sill was not constructed near Mixons Ferry as Marshall recommended but between The Pocket, Macks Island, Middle Island, and Pine Island. The sill was not constructed as high as Marshall recommended. (The impoundment Marshall recommended probably would have flooded a great deal of upland in the vicinity of the pocket.) The intended purpose of the sill was to impede flow out of the swamp so that swamp water levels would remain higher longer after the onset of dry periods.

Recent studies indicate that during low water periods, the sill affects water levels only in a 10,000- to 15,000-acre area between the sill and the first natural sill near Billys Lake (Loftin 1998). Stabilization of water levels was thought to be necessary to maintain waterfowl habitat, but it may be fluctuation of water levels that has kept the swamp alive.

If, as Carter believed, fluctuation of water level is the single physical factor in the environment that is the determinant of life in the swamp, he neglected other factors, driven by water level fluctuation. One is oxidation of organic material when exposed during dry periods. The other tool is fire. Without water level fluctuation, the fire regime is greatly altered. Time has shown that without fire, the swamp is dying. In 1998, an environmental assessment of the management of the sill was completed and after four years of further study by the U.S. Geological Survey, funds are being sought to remove the water control structures in the sill and breach it in selected locations.

Other management activities affecting wetlands include annual cutting of boat trails with a trailcutter, removal of debris from trails, and spraying of herbicides to reduce encroachment of grasses, sedges, and aquatic vegetation from boat and canoe trails.

Some activities periodically take place on private lands adjacent to the refuge that could affect the health of the swamp. These activities include fire retardant drops, fertilization of commercial forests, use of herbicides in commercial forests, and channelization of drainages or drainage of cypress ponds.

Wilderness Management - The establishment of the Okefenokee Wilderness by Congress on October 1, 1974 designated 353,981 acres within the existing refuge as a Class I Wilderness. This wilderness designation was supplemental to the purposes for which the refuge was established. Wilderness legislation provides additional environmental protection to the refuge from outside influences. This same legislation significantly increases the complexity of decision making regarding the management of various refuge resources. The Okefenokee Wilderness is administered to preserve its wildlife habitat, to protect its wilderness character, and is devoted to the public purposes of recreational, scenic, scientific, and educational use.

Public Use Management - The overall philosophy of the refuge is to provide a quality experience for visitors. Interpretation and recreation management are tools which help the refuge meet its objectives.

Optimum habitat and protection for threatened, endangered, and other wildlife species are provided through public use policies and facility designs. These practices concentrate the impact of the large numbers of people visiting the refuge on a fraction of the area managed. A large percentage of refuge visitors never venture beyond the public use areas provided. Fishermen, photographers, researchers, and other more intrepid visitors are restricted to day-use visitation or are issued a Special Use Permit, which restricts access. The interpretive program provides exhibits, brochures, films, and videos, as well as live program presentations, which enhance the recreational experience by providing accurate, up-to-date environmentally oriented educational and recreational experiences that incite constituents to make informed decisions at the local, state, and federal levels.

Fire Management - Fire suppression activities began almost as soon as the refuge was established. The 1939 Annual Narrative Report lists 2,500 acres of uplands burned by wildland fire. Early Annual Narrative Reports (1939 - 1960) listed several fires almost every year, burning a total of a thousand acres or more. During this period, many fires spread onto the refuge from adjacent areas burned by cattlemen. Other fires were started by lightning.

The need for prescribed fire for hazardous fuels reduction and resource management was recognized by John Hopkins and others from the time the refuge was established. The 1944 Narrative Report mentions a "Controlled Burn Plan" being prepared to be submitted to the Regional Office. A small amount of fire suppression equipment was acquired. Prescribed burning began in 1945. Two areas were burned: 200 acres around Camp Cornelia and 1,000 acres in compartment 13. Burning was generally conducted in an attempt to improve northern bobwhite quail habitat. No more burning was conducted until 1951 because of lack of equipment. Prescribed fires after 1951 averaged 1,000 to 2,000 acres per year. Burning was restricted to the perimeter upland areas. Burning was not authorized on any of the interior islands including Chesser Island. Prescribed burning began on Chesser Island in 1957 after the 1945-55 fire destroyed almost all of the mature pine on the Island. The fire hazard continued to increase on all other interior islands. Billys Island received its first prescribed fire in 1968. A 100-acre section of Floyds Island was burned in 1971. Lack of access made prescribed fire on most interior islands impractical. Aerial ignition by helicopter was initiated on the refuge in 1981 with the burning of Billys and Honey Islands during one burning period. The other

interior islands were included in the prescribed fire schedule of 1984. With the approval of prescribed fire on all of the interior islands, up to 16,000 acres have been burned annually.

Until the mid-1980s, all prescribed burning was accomplished during the dormant season. Prescribed fire can be accomplished most easily and economically during the dormant season. The steady, predictable winds following winter frontal passages provide excellent burning conditions. Danger of escape or resource damage is lowest at this time. Dormant season burning, however, does not accomplish all of the refuge habitat management or hazard reduction goals. Fire naturally occurred during the growing season in the southeast and upland ecosystems and associated fauna have adapted to and are dependent upon growing season fire. Growing season fire must be utilized to some extent to restore and maintain the upland longleaf pine communities. Experimental growing season burns began with 20, 3-acre experimental plots in 1988. During the following years, parts of burning units and then whole burning units were prescribed burned. Over the past five years, an average of 515 acres have been prescribed burned during the growing season. However, a wildland fire in 2002 burned over all the interior islands, having the same effect as a prescribed growing season fire.

Upland Habitat Management History - Restoration and maintenance of longleaf pine community habitats did not become a priority until recent times when more emphasis was directed towards habitat management rather than single species management. In 1937, a fair representation of the longleaf pine wiregrass community still remained. Refuge manager John Hopkins repeatedly documented concern over the deterioration of bobwhite quail habitat, and the need for prescribed fire to restore and maintain the habitat. Prescribed fire plans were approved. Increasing amounts of prescribed burning occurred each year. By this time, woody shrubs had apparently become established on most of the uplands. Although several thousand acres were burned annually, dormant season burning did little to reverse the encroachment of woody vegetation into the understory.

In addition, almost all of the mature longleaf pine timber left after the 1920 logging operations were “cat-faced” trees, those with some type of injury scar that had been rejected by the loggers. Each fire occurring after this period ignited the faces of some of these trees, often killing them. Those trees that escaped fire and faller still required constant suppression and mop-up action during prescribed burning operations. The solution to this problem was to remove the "cat faced" trees before fire could kill them, further reducing the longleaf pine component of the refuge forest uplands. Although no forest management program existed at the time, the 1944 and 1946 Annual Narrative Reports describe surveys and plans to inventory and remove turpentine-faced trees, those trees that had scars from turpentine operations, from the refuge. During 1947, 1,500 acres of faced trees were removed from Camp Cornelia and Chesser Island. The operation was continued around Camp Cornelia until 1949. In 1952, additional faced trees were harvested around Camp Cornelia. In 1954, during salvage operations on Mims Island (compartment 6) after the Mule Tail Fire, faced trees were removed from areas adjacent to the salvage areas. In 1955, after the fires were out, more turpentine-faced trees were removed during fire salvage operations. During 1956, 225,000 board feet of "cat faced" trees were removed from The Pocket (compartment 8).

These faced trees would have been our relict stands of today. The objective behind removal of the old faced trees was often "to improve the appearance of the pine lands," or to create areas for propagation of longleaf pine. While longleaf pine on some high ridges dates back to this period, the altered fire regime and growing hardwood understory favored encroachment of slash pine into most areas.

The 1954-55 wildfire destroyed a substantial amount of longleaf pine forest, particularly in areas which had not burned by recent prescribed or wildland fire. After the fire, a considerable effort was expended in reestablishing longleaf pine. Between 1956 and 1959, longleaf and slash pine seed and

seedlings were planted on Chesser Island, Camp Cornelia, Fowls Roost Island, Cowhouse Island, Soldier Camp Island, and Jones Island. While slash pine planting was apparently successful on all of these areas, there is little evidence of longleaf pine plantations except at Camp Cornelia and Chesser Island, where several excellent direct seeded stands of longleaf pine exist.

A Timber Management Plan for Okefenokee NWR was begun in 1951. In 1960, a plan was completed for the management of 9,533 acres of upland. During this period, USFWS objectives focused upon individual species or groups of species, managing their numbers or attempting to create habitat to benefit those species. With emphasis on species, the importance of the individual communities that fit together to make up an ecosystem was not fully recognized. Within the southeastern coastal plain, resource managers did not appreciate the importance of longleaf pine communities, their fire dependency, or their association with the wildlife species that are adapted to and dependent upon them. Consequently, forest management often meant replacing an old stand with a new, vigorous, well-stocked stand; after the stand was established, it was managed to create the conditions for the featured wildlife species.

Accepted forest management practices tended to increase the number of slash pine stands on the refuge at the expense of longleaf pine. Annual Narrative Reports and Forest Management Prescriptions of the past document the clearcutting of "poorly stocked" stands of longleaf pine with wiregrass understories so that they could be replaced with a "more productive" stand, usually slash pine. In addition, the site preparation that preceded planting of the new stand usually destroyed wiregrass and other ground cover components of the community.

Attempts were made to plant longleaf; however, with the techniques available at that time, survival was often poor. Adding to the difficulty of establishing longleaf pine was the heavy understory resulting from changes in the fire regime and the raised water table following clear cutting of the old stand. After one or two failures, slash pine was usually planted in the intended longleaf site. Attempts were also made to establish longleaf pine regeneration under some stands of scattered, cat-faced, remnant longleaf pine by harrowing strips through the stand. By this time, however, the hardwood understory was too well established to allow longleaf regeneration.

Soil and moisture conditions make most of Okefenokee NWR's forested uplands excellent slash pine sites. It was only the frequent occurrence of growing season fires throughout history that destroyed slash pine seedlings and allowed longleaf pine to dominate this area. Consequently, many of the species dependent upon fire dependent sites are now threatened or endangered as their habitats disappeared.

During 1968, a land-for-timber exchange was completed with Rayonier, Inc., for several tracts of land on the south end of the refuge. The result was the loss of many more acres of old (second) growth longleaf pine. In addition, the upland areas acquired contained several hundred acres of bare, cutover land, most of it supporting longleaf pine at one time. In 1974, with the exchange completed, several hundred acres of bare land to plant, the RCW recently classified as endangered, and an increased appreciation for natural longleaf pine communities, the refuge staff was challenged to restore longleaf pine on these bare acres.

Between 1974 and 2003, 1,437 acres of refuge land were reforested, most of it with longleaf pine. Methods of regeneration include direct seeding, and planting of bare root and containerized longleaf seedlings. Many small areas have been naturally regenerated, the preferred method of reforestation.

Initially, extensive site preparation was accomplished (e.g., root raking, burning, chopping, harrowing) to create a "good bed" before planting. In each plantation, longleaf pine was planted on the best site. Slash pine was planted in the lowest areas next to the swamp, drains or around ponds. In recent

years, with increased use of growing season fire, site preparation has been reduced to a minimum, to avoid destruction of scattered residual warm season ground cover plants that may have survived the many years of altered fire regime. Currently, longleaf pine is planted over the entire plantable area in a regeneration area. If slash pine manages to escape prescribed fire, it is allowed to regenerate naturally in low areas. In some areas, growing season fire may promote the reestablishment of wetland longleaf communities.

The most successful method of restoration of longleaf pine in mixed stands practiced has involved selective thinning to remove other pine species or to open up small patches in mixed stands for natural regeneration. Prescribed fire is used to prevent reestablishment of slash and loblolly pine seedlings. The major tool used on interior islands within the National Wilderness Area has been dormant and growing season fire. All of the major islands have received prescribed fire in recent years. While slash and loblolly pine are not harvested from these areas, natural and prescribed fire has been used to kill or thin patches of unwanted pine, less tolerant to fire. Other patches die naturally due to lightning strikes, wildfires, and insect or disease outbreaks. With the continued use of fire, longleaf pine will eventually be established in these openings.

Management of Adjacent Lands - Fewer and fewer forest landowners are using prescribed fire to reduce fuels on their forests. Reasons include cost of burning, reduced growth, resource damage, danger of escaped fire, and liability due to drift smoke on highways. Some forest managers are using herbicides to reduce fuel levels. Others are using harvesting, site preparation, and planting patterns to produce barriers to retard the spread of fire. Some landowners who have curtailed burning operations elsewhere are burning between the Swamps Edge Break and the Perimeter Road to reduce the risk of fire around the swamp. Most commercial forest landowners still use fire for site preparation.

Management strategies on adjacent lands pose several threats to refuge wildlife and habitat. These include:

- Escaped prescribed fire. While most refuge habitats are fire dependent, fire at the wrong time can destroy habitat.

- Heavy fuel accumulations. Heavy fuel accumulations next to the refuge increase the chances of high intensity fire adjacent to and spreading into refuge habitats.

- Fertilization. Most industrial forest landowners now fertilize forest plantations to increase growth. Nutrients leaching into refuge wetlands will increase the growth of scrub/shrub encroachment, create algae blooms, and change the oxygen balance of the water. Changes of pH or nutrient levels may affect the growth or survival of aquatic organisms.

- Pesticide applications. Periodic applications of herbicides intended to reduce fuels and competition for nutrients may affect wetland habitats and organisms.

The presence of private lands adjacent to the refuge influences refuge management strategies in several ways:

- Fire management. The presence of private property increases the level of responsibility of refuge fire managers for fire management actions and the liability of escaped fire.

- Fragmentation of uplands. The refuge boundary in most areas is within or adjacent to the swamp edge, leaving only fragments of uplands around the perimeter of the swamp. Virtually all old growth timber on adjacent lands has been harvested, eliminating available nesting and foraging

habitat for the RCW outside the refuge. The value of refuge old growth forests as nesting and foraging habitat is severely limited because of its location and size. Most forest management compartments are limited to one to four groups of RCW because of size. Genetic transfer is limited because of the distance between subpopulations.

III. Plan Development

PLANNING PROCESS

This Draft Comprehensive Conservation Plan for Okefenokee National Wildlife Refuge has been prepared in compliance with the National Wildlife Refuge System Improvement Act of 1997, and the National Environmental Policy Act of 1969. The Refuge System Improvement Act requires the USFWS to actively seek public involvement in environmental planning. It also requires the USFWS to seriously consider all reasonable alternatives, including a "no action" alternative. These alternatives were considered in the accompanying Environmental Assessment.

In developing the refuge plan, the USFWS completed the following planning process:

1) Established a planning team consisting of refuge management staff, a private ecology consultant and representatives from Ecological Services, Georgia Wildlife Federation, Georgia Department of Natural Resources - Wildlife Division, Georgia State Parks and Historic Sites, and Osceola National Forest.

2) Notified the public and interest groups about the planning process and distributed comment packets.

3) Held public workshops to identify the important issues, concerns, and suggestions related to the future management of the refuge.

4) Hosted professional reviews of the refuge's forestry/fire, biological, and public use programs.

5) Evaluated lands for additions to the Okefenokee Wilderness Area through the Wilderness Inventory and Study process.

6) Prepared a draft plan for public review and comment.

The refuge management staff began meeting regularly on March 16, 2001 to discuss the planning process. The first core planning team meeting was held on July 26, 2001. The team developed a vision statement for the refuge and identified a number of issues and concerns that were likely to affect the management of the refuge. Alternatives and goals were also developed after reviewing comments received during the public comment period and program reviews. These alternatives are evaluated through the Environmental Assessment.

The public and interest groups were notified of the refuge's intent to begin the comprehensive conservation planning process through a mailing to over 800 individuals, newspaper articles, and presentations at civic organization meetings. Upon request, a comment packet was sent in hopes of initiating feedback. (Presentations and newspaper articles are listed in Appendix IX.)

The public scoping workshops were held in five towns surrounding the Okefenokee NWR. The location and dates follow:

Homerville, GA	September 18, 2001
St. George, GA	September 20, 2001
Fargo, GA	September 25, 2001
Waycross, GA	September 27, 2001
Folkston, GA	October 4, 2001

These meetings identified issues, concerns, and opportunities concerning the management of the refuge. All comments received during the comment period are summarized in Appendix X and incorporated into management discussions throughout the environmental assessment.

Refuge planning policy requires a wilderness review concurrent with the comprehensive conservation planning process. The USFWS inventoried the refuge lands adjacent to the Okefenokee Wilderness Area for their eligibility as Wilderness Study Areas. Seven areas were evaluated. Through the review, it was recommended that these lands not be added to the wilderness area (Appendix XI). Without wilderness designation, they would benefit both the refuge and wilderness by providing areas for monitoring parameters, research, environmental education, managing fire and other threats, and options for distributing visitors to lessen their impact at a few entrances.

This draft comprehensive conservation plan is being distributed to officials of federal, state, and local government agencies, private organizations, and the general public for review and comment. A public comment period will follow along with several public meetings where each alternative will be presented and verbal comments will be received from the public.

PLANNING ISSUES

The refuge received 25 completed questionnaires and 23 letters and phone calls during the pre-plan scoping period. Participation at the scoping workshops was low with at most ten individuals present. Combining these comments with comments received through program reviews (Appendix X), the following six issues were identified and formed the basis for the development and comparison of the different alternatives described in the environmental assessment:

A. Wildlife Management
B. Resource Protection
C. Wilderness Values
D. Public Services
E. Partnerships
F. Administration

The core planning team (Section B.V.) developed a refuge vision statement and the alternatives to be addressed in the environmental assessment. After the draft plan is released, there will be a 30-day public comment period and formal public meetings to gather comments on the proposed action.

IV. Management Direction

INTRODUCTION

The management direction for Okefenokee NWR over the next 15 years is presented below. This includes the goals, objectives, and strategies that will be used to achieve the refuge vision.

The planning team selected Alternative 2, Integrated Landscape Management, to direct the management of Okefenokee NWR over the next 15 years. This alternative is the most comprehensive and balanced alternative, incorporating the responsibilities associated with the original purpose of the refuge, the Endangered Species Act, the Wilderness Act, and other laws and directives. By viewing the refuge as a portion of a larger ecosystem, the refuge staff will strive to protect the resources to the best of its ability using the current knowledge base. The other alternatives evaluated in the environmental assessment were Alternative 1, Current Management; Alternative 3, Conservation Through Natural Processes; and Alternative 4, Refuge Focus Management.

Implementing the selected alternative will result in the maintenance, protection, and enhancement of the native habitats of Okefenokee NWR while meeting the refuge's primary purpose of providing "a refuge and breeding ground for migratory birds and other wildlife." It incorporates an understanding of the refuge's place locally, regionally, nationally, and internationally and recognizes the potential benefits of networking, partnerships, and data sharing. Management through the use of prescribed and natural fire is promoted for the maintenance and restoration of native habitats. Endangered species and other wildlife will benefit from improved or maintained habitat conditions. Monitoring is essential in evaluating the effects of management, natural processes, and human activity within the "zones of influence." This alternative acknowledges the refuge's responsibilities in the preservation of wilderness characteristics and emphasizes solitude. All activities within the wilderness will be evaluated through the Minimum Requirement Decision Guide. In addition, wildlife-dependent public uses (hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) are incorporated into the plan. These activities will be allowed if they are appropriate and compatible with wildlife and habitat conservation.

REFUGE VISION

The vision for the refuge is as follows:

The Okefenokee is like no other place on earth;
where natural beauty and wilderness character prevail.
The vision for Okefenokee National Wildlife Refuge
is to protect and enhance wildlife and its habitat,
ensure integrity of the ecological system,
and embrace the grandeur, mystery, and cultural heritage
that lead visitors to an enrichment of the human spirit.

COMPREHENSIVE CONSERVATION PLAN SUMMARY

Threats to the refuge are becoming more prominent as development activities increase in northeast Florida and southeast Georgia. Although Okefenokee NWR is a large system in itself, the swamp may be greatly compromised by activities a great distance away from its boundary. This plan recognizes the impact these activities may have on the integrity of the swamp and the importance of looking beyond the refuge boundary. These "zones of influence" vary depending on the natural

resources involved. The refuge staff will continue open communication and partnerships with adjacent landowners and interest groups downstream from the Okefenokee Swamp to protect the natural resources especially during emergency fire/weather situations. In addition, partnerships beyond the refuge's immediate neighbors will be developed to address issues associated with the aquifer, air shed, and biota exchange pathways. Extensive resource sharing and networking with other refuges, state agencies, organizations, specialists, researchers and private citizens would expand the knowledge base and develop cooperation between interest groups.

Upland management will emphasize the maintenance and restoration of longleaf pine communities. The refuge will continue to seek partnerships with adjacent landowners to enhance the refuge's habitat for the endangered RCW and associated species by providing corridors between refuge upland management compartments or expanding foraging and nesting areas. Restoration of natural systems, native communities, and healthy environments will be emphasized thus promoting a high quality of life regionally. Within the refuge, natural processes and the wilderness philosophy will be strongly considered in all decisions. Management within the wilderness will be evaluated through the Minimum Requirement Decision Guide. Monitoring environmental parameters, flora and fauna will be incorporated into an integrated study to gain knowledge on the health of the Okefenokee ecosystem. The biggest challenge is having a comprehensive monitoring network capable of identifying small changes in the system. The refuge staff and partners must be proactive and forward thinking to anticipate the potential of any apparently insignificant action that may cause a significant change to the overall system.

The future of Okefenokee NWR is dependent upon a constituency that is knowledgeable of refuge resources, mandates, and environmental issues, and willing to work toward common goals. To build and maintain this constituency, this plan not only provides actions to protect, restore, and conserve wildlife habitat, but also provides expanded educational and appropriate, compatible, wildlife-dependent recreational opportunities. The refuge and surrounding area will be promoted, linking recreational and educational avenues. Developing partnerships among our constituencies is the common theme to implement these actions and opportunities. Promoting the refuge as an asset of Charlton, Clinch, and Ware Counties in Georgia and Baker County in Florida will enhance the refuge's image and help expand local support.

Staffing will be expanded to meet the increased communication commitment and accommodate data and resource sharing. Also, a significant increase in staff is presented due to the additional manpower that will be required to manage the refuge with a greater consciousness for the wilderness resource.

GOALS, OBJECTIVES, AND STRATEGIES

The goals, objectives, and strategies presented below are the USFWS's responses to the issues and concerns expressed by the planning team, the public at the scoping meetings, and comments submitted by the public. The goals, objectives, and strategies are presented in hierarchical format. Following each goal is a list of objectives, and under each objective is a list of strategies.

These goals, objectives, and strategies reflect the USFWS's commitment to achieve the mandates of the National Wildlife Refuge System Improvement Act of 1997, the mission of the Refuge System, the Endangered Species Act, the Wilderness Act, and the purpose and vision for Okefenokee NWR. Depending upon the availability of funds and staff, the USFWS intends to accomplish these goals, objectives, and strategies during the next 15 years.

GOAL 1 – (WILDLIFE MANAGEMENT)

Promote and provide high quality habitat and protection for threatened and endangered species and conserve the natural diversity, abundance, and ecological function of native flora and fauna on and off refuge lands.

Objective 1.1 Protect and maintain the threatened and endangered species populations, expanding their populations where possible, and enhancing the habitat on the refuge by working with adjacent landowners. Encourage other land managers in the area to promote appropriate habitat for threatened and endangered species to create a larger gene pool, increase opportunities for survival within the ecosystem, and restore a piece of the area's natural heritage.

- Strategy 1.1: Continue to monitor annually the status of RCW clusters on the uplands outside the wilderness.

- Strategy 1.2: Continue to band all RCW outside the wilderness to identify movements and group dynamics and evaluate the need and feasibility of banding RCW within the wilderness.

- Strategy 1.3: Use artificial cavities where needed to enhance existing clusters or encourage the use of an area adjacent to active clusters outside the wilderness, and evaluate the need for artificial cavities on the interior islands after each wilderness survey.

- Strategy 1.4: Survey the status of RCW clusters on wilderness islands every other year during the breeding season to assess activity, suitability of cavities, and habitat conditions. Complete a summary report of conditions and recommendations.

- Strategy 1.5: Identify potential RCW habitat using vegetation maps and aerial photos and survey 10 percent of the area each year for RCW clusters.

- Strategy 1.6: Evaluate the need for a population viability model to assess the RCW populations at Okefenokee NWR and in cooperation with the Regional RCW Coordinator, identify the refuge's contribution to the regional resource.

- Strategy 1.7: Promote forest management practices designed to benefit RCWs and associated community species and facilitate growth of longleaf pine, both on the refuge and on adjacent state and private lands.

- Strategy 1.8: Seek incentives for landowners to grow longleaf pine stands adjacent to the refuge to at least 60 years-old for the benefit of RCWs and other endemic species associated with longleaf pine – wiregrass habitat.

- Strategy 1.9: Develop and implement surveys for "focal" species of mammals, birds, fish, amphibians and reptiles, particularly those species that are threatened, endangered, or species of special concern (e.g., Rafinesque's big-eared bat, round-tailed muskrat, pocket gopher, Sherman's fox squirrel, gopher tortoise, Bachmans sparrow, black-banded sunfish, mud sunfish, banded topminnow).

- Strategy 1.10: Consider acquisition of property that would benefit populations of threatened and endangered species to be high priority.

- Strategy 1.11: Evaluate the potential for reintroduction of endangered species that occurred historically at Okefenokee NWR or augmentation of existing populations through translocation from outside sources (e.g. RCW).

- Strategy 1.12: Continue to work with landowner/land manager adjacent to the east side of the refuge on Trail Ridge to provide habitat that enhances the use of refuge lands by RCW.

- Strategy 1.13: Continue working with Georgia Forestry Commission under a Memorandum of Understanding to create suitable habitat on Cowhouse Island for RCW and investigate additional partners on Cowhouse Island to expand the amount of suitable RCW habitat.

- Strategy 1.14: Develop and implement surveys to determine distribution and population status of amphibians and reptiles, particularly those species that are threatened, endangered, or species of special concern.

- Strategy 1.15: Determine the historic use of the Okefenokee NWR by wood storks and examine conditions for re-establishing populations within the refuge.

- Strategy 1.16: Develop and implement surveys to determine distribution, population status, and needs of rare fishes within the Okefenokee NWR.

Objective 2. Identify factors influencing declines in the Okefenokee NWR's fishery by examining water chemistry, groundwater withdrawals, water quality, pH levels, invertebrate populations and the physical environment. Evaluate feasibility of restoring the fish population.

- Strategy 2.1: Review past research for the extent of aquatic habitat changes that have occurred in the Okefenokee NWR that may relate to fish population dynamics. Use water quality databases and hydrologic information to parameterize and develop fisheries models.

- Strategy 2.2: Determine the changes in fish population dynamics using current and historic census data. In cooperation with the Georgia Department of Natural Resources - Fisheries Division and the USFWS Fisheries Resources Office, identify "focal" fish species to represent the overall health of the fisheries. Develop sampling scheme to sample fish species in aquatic habitats based upon availability of habitat types. Conduct surveys at 2-year intervals to assess changes in fish community structure, particularly with emphasis on abundance of aquatic invertebrates and non-game species.

- Strategy 2.3: Develop or further promote partnerships with federal, state, and private organizations to manage water resources and protect fish habitat within the Okefenokee watershed.

- Strategy 2.4: Analyze weather station and water quality monitoring data from Okefenokee NWR sites. Determine the need to modify existing monitoring protocols and collect additional water quality data to monitor long-term health of Okefenokee NWR's water resources and its fisheries.

Objective 3. Determine the status, specific habitat requirements, and limiting factors of reptile species, including those associated with the upland pine community. Evaluate feasibility of restoration.

- Strategy 3.1: Develop and employ survey methods to determine status and distribution of reptiles within the upland pine community (including pine snake, southern hognose snake, eastern diamondback rattlesnake, and mimic glass lizard). Compare findings with other populations.

- Strategy 3.2: Identify specific habitat requirements for the upland pine community reptile species and use GIS analysis to locate additional suitable sampling sites.

- Strategy 3.3: Monitor the status of gopher tortoises on the refuge and compare with other populations. Map the location of gopher tortoise burrows; establish the level of activity and use by commensal species.

- Strategy 3.4: Conduct a thorough review of literature to determine specific habitat requirements of indigo snakes, particularly for historic information (notes and sightings) that identifies sites within Okefenokee NWR where indigo snakes were found.

- Strategy 3.5: Develop methods to survey for indigo snakes within the Okefenokee NWR to determine status and health of the population. Use GIS analyses to locate optimal habitats in which to focus survey efforts. Compare results with other populations.

- Strategy 3.6: Consider development of habitat management guidelines that would benefit indigo snakes and balance with the needs of other species.

- Strategy 3.7: Develop and implement surveys to determine the status, health, and population dynamics of the American alligator.

Objective 4. Maintain, enhance, and promote upland linkages to ephemeral wetlands for the flatwoods salamander, striped newt, gopher frog, and other amphibians.

- Strategy 4.1: Develop a spatial database of ephemeral wetlands on and adjacent to the refuge. Analyze existing digital elevation models and aerial photography to identify potential areas and follow up with ground-truthing sites.

- Strategy 4.2: Work with amphibian researchers from federal and state agencies or universities to establish sampling protocols and verify presence or absence of key amphibian species at ephemeral sites and surrounding habitat.

- Strategy 4.3: Protect the ephemeral wetlands by restricting activity within 100 feet, maintaining low understory vegetation around the perimeter, keeping logging debris away from the wetlands, and allowing fire to move freely into the wetlands to maintain herbaceous characteristics of the ponds and relatively open adjacent uplands.

- Strategy 4.4: Minimize impacts to breeding amphibians along ephemeral wetland edges during October – December by providing unburned patches.

- Strategy 4.5: Develop additional habitat management strategies to promote or maintain ephemeral wetlands in upland habitats on interior islands and upland management compartments.

- Strategy 4.6: Restore the hydrology of ephemeral wetlands disrupted by ditches and borrow pits on the refuge and promote the restoration of these wetlands off the refuge.

Objective 5. Understand and maintain the role of invertebrates in the structure and function of the Okefenokee ecosystem.

- Strategy 5.1: Survey specific habitat types for species composition and relative abundance.
- Strategy 5.2: Develop a reference collection of invertebrates from specific habitat types.
- Strategy 5.3: Identify invertebrate species associated with the ephemeral ponds.
- Strategy 5.4: Evaluate Chironomidae (midge larvae) head capsules (and diatoms) in peat cores to categorize historical and present water quality regimes.

Objective 6. Understand the use patterns of select resident and migratory birds to identify critical habitat components and the impacts of management practices and natural events.

- Strategy 6.1. As an indicator of the aquatic system quality, initiate a formal monthly survey of waterbird foraging habits to cover the major open water and prairie habitats in a timely manner and correlate with measures of water depth and food sources. (Airboat and aerial methods will be evaluated and new remote sensing techniques will be evaluated as they are developed.)
- Strategy 6.2. Establish a reporting system for potential wading bird nesting colonies if large flocks of wading birds are seen roosting or nesting during aerial flights between February and May. Further investigate these sites via foot, watercraft, or helicopter depending on accessibility. Identify potential colony sites through GIS habitat analysis and conduct standard aerial strip-transect surveys in these areas.
- Strategy 6.3. Conduct annual helicopter surveys for ospreys during the peak nesting season to determine productivity and how productivity may change with changing water levels.
- Strategy 6.4. Expand annual point counts during migration and breeding periods to assess changes in passerine bird species composition and abundance. Contribute data to a national or regional database. Determine the need to augment point counts with other methods of studying avian species diversity (i.e., mist-netting and banding).
- Strategy 6.5. Eliminate Midwinter Waterfowl Survey because Okefenokee NWR is not an important contributor to this national database.
- Strategy 6.6. Eliminate Annual Bald Eagle Survey because Okefenokee NWR is not an important contributor to this national database.
- Strategy 6.7. Remove artificial nest boxes for wood ducks on the east side of the refuge and continue to maintain and monitor through the assistance of the boy scouts the use of the boxes on the west side of the refuge annually until 2008 and determine the efficiency of this program.
- Strategy 6.8. Establish at least 20 point counts in upland pine stands (>10 in longleaf and >10 in slash dominated; both presently existing and in areas to be restored) to monitor breeding bird populations for increases in priority species, focusing on brown-headed nuthatch and Bachman's sparrow.
- Strategy 6.9. Establish at least one transect along the Chesser Island Boardwalk to survey transient land birds and breeding and wintering species. Survey each transect weekly.

- Strategy 6.10. Investigate the feasibility of remote sensing, such as radar, for determining passerine bird movements and use of habitat within the swamp. If feasible, seek funding and implement.

- Strategy 6.11. Continue to participate in the late October "Sandhill Crane Survey," covering all potential occupied habitat, with emphasis on determining family group sizes as an indicator of yearly productivity of resident populations. Consider repeating several times within the count week to determine adequacy of a single count protocol.

- Strategy 6.12. Develop strip-transect aerial surveys by helicopter of open marsh areas to provide an estimate of current resident sandhill crane population size and distribution. In addition, conduct call-counts, following protocol established in previous studies and determine the most appropriate survey method. Compare current population estimates with results of past studies.

- Strategy 6.13. Determine the need for more intensive studies to detect changes in movements (home range), habitat use/suitability, and survival of resident cranes. Determine how the hydrological dynamics of Okefenokee Swamp's wet prairie system affect the resident crane population.

- Strategy 6.14. Continue cooperation with state agencies by providing sighting information for swallow-tailed kites.

- Strategy 6.15. Determine the status of nesting swallow-tailed kites on the refuge and examine habitat components by conducting aerial (helicopter) surveys in late April through early May, based on sightings and potential sites in cooperation with Georgia Department of Natural Resources. Record GPS coordinates, nest tree species, dominant vegetation, and site description.

- Strategy 6.16. Institute forest and wetland management practices that would optimize habitat for kites and also benefit other wildlife species. Encourage landowners of parcels adjoining the refuge to consider requirements of swallow-tailed kites in their management practices. Provide at least a 120-foot buffer around all nests found.

Objective 7. Continue to work with Georgia Department of Natural Resources and Florida Fish and Wildlife Conservation Commission to monitor and manage the mammal populations within and around the refuge.

- Strategy 7.1. Conduct the annual bait station surveys with Georgia Department of Natural Resources and assess the need by 2007 for increasing or decreasing the amount of effort.

- Strategy 7.2. Evaluate and implement other sampling methods to provide a robust estimate of Okefenokee black bear population dynamics and mast production by 2007 (i.e., remote cameras and hair snares).

- Strategy 7.3. Work with federal and state partners to evaluate the need for spatially explicit habitat models for Okefenokee black bears.

- Strategy 7.4. Promote and assist in developing a cooperative management plan for black bear in Georgia and Florida.

- Strategy 7.5. Monitor the health of white-tailed deer population within the Okefenokee NWR every five years by examining deer from both the east and west sides of the refuge.

- Strategy 7.6. Determine suitable refuge habitat for the Pocket gopher and establish survey methods to assess the status of this species on refuge lands.

- Strategy 7.7. Re-establish the pocket gopher if it has been extirpated and prevent future management practices that could potentially damage the habitat conditions necessary for this species.

- Strategy 7.8. Determine the presence or absence of the Rafinesque's big-eared bat on the refuge by sound frequency survey techniques and determine the need for roost sites.

- Strategy 7.9. Using wintertime aerial photography, identify location, density, and spatial distribution of round-tailed muskrat den sites every 5 years.

Objective 8. Examine wildlife population health and contaminant availability within the ecosystem.

- Strategy 8.1. Work with bio-contaminant specialists from federal and state agencies to develop sampling protocols for collecting tissue, blood, or hair/feather samples to evaluate the levels of mercury, lead, and other contaminants in selected species (e.g., mammal-river otter, round-tailed muskrat, black bear; bird-white ibis, sandhill crane, osprey; amphibian-pig frog, greater siren; reptile-American alligator; fish and invertebrate species) every 5 years or when there is a concern.

- Strategy 8.2. Using water quality monitoring data and past contaminant studies, identify areas that may serve as "contaminant sinks" within which to focus sampling efforts.

- Strategy 8.3. Examine amphipods for mercury and other contaminants to form a comparison level for future investigations.

Objective 9. Strive to maintain the natural diversity and abundance of wildlife species within the physiographic region of the Okefenokee Swamp by forming a network of agencies and organizations that would share data in a timely manner to influence management decisions and recognize problems within the system.

- Strategy 9.1. Develop or further promote partnerships with federal and state management agencies to identify threats to the resources within the "zones of influence."

- Strategy 9.2. Create a database indicating wildlife surveys conducted by agencies and organizations within the physiographic region of the Okefenokee Swamp to gain an understanding of the regional perspective and the potential of movements between wildlife areas.

- Strategy 9.3. Participate in regional efforts to compile data from wildlife surveys and observations.

GOAL 2 – (RESOURCE PROTECTION)

Restore, maintain, protect, and promote native habitats and healthy natural systems where possible to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.

Objective 1. Restore, enhance, and promote the native upland communities and the associated wetlands to maintain the natural vegetation mosaic, diversity, and viability found prior to European settlement within the Greater Okefenokee Ecosystem while improving opportunities for RCW activity.

- Strategy 1.1. Investigate the pre-European settlement vegetation of wilderness islands by 2007, compiling descriptions from the literature on specific islands. If another vegetation class currently dominates it, determine whether it is desirable and feasible to return it to the pre-European settlement vegetation class.

- Strategy 1.2. Inventory upland management compartments, including understory species, to monitor conditions and identify management needs to progress toward a self-perpetuating longleaf forest. Develop forest management prescriptions by compartment, using a 1 percent line plot cruise, on a return interval of 10 years.

- Strategy 1.3. Evaluate prescribed burn cycle to maximize benefit to the community plant species, black bears, RCWs and other species associated with fire-dependent systems. Base the use of prescribed fire on need rather than on a set schedule (holistic approach).

- Strategy 1.4. Establish representative photo and vegetation sampling points within upland management compartments, islands, and wetlands to illustrate changes in the vegetation structure related to fire effects, management practices, and natural events.

- Strategy 1.5. Strive for a self-perpetuating longleaf forest as the majority of trees reach 100 years. Timber harvesting and prescribed fire would be conducted as needs occur. Use prescribed fire to maintain understory composition and structure as needed.

- Strategy 1.6. Expand and maintain a multi-layered database for fire, forestry, and biological resource analysis including but not limited to soils, hydrology, wildlife distribution, and vegetation.

- Strategy 1.7. Inventory Number One Island to identify the unique old-growth longleaf and slash pine components of the island for baseline information.

- Strategy 1.8. Promote, through partnerships, the establishment of a demonstration/community area emphasizing the native longleaf pine community such as seen at Southern Pines Elementary School, Southern Pines, North Carolina.

- Strategy 1.9. Refuge staff will seek and promote the local/regional development of a wood based market that utilizes the historic products of the native longleaf (Pinus palustris) and slash pine (Pinus elliottii).

- Strategy 1.10. Encourage the Georgia Forestry Commission and the Florida Division of Forestry on their respective state forests that adjoin the refuge to create demonstration areas that showcase long rotation silviculture and fire pre-suppression techniques.

- Strategy 1.11. Continue to utilize the National Fire Plan Operation Reporting System to develop Wildland Urban Interface projects that support fire wise activities.

- Strategy 1.12. Wilderness islands will be prescribed burned using aerial ignition in the dormant season for hazardous fuel reduction and in the growing season for habitat restoration. Prescribed fire will be applied as needed to meet habitat restoration goals, generally between 2 to 6 years.

- Strategy 1.13. Prescribed fire, both aerial and ground ignition, will be applied to upland management compartments outside the wilderness in the dormant season for hazardous fuel reduction and in the growing season for habitat restoration on an “as needed” basis (generally between 2 to 6 years).

- Strategy 1.14. Annually plan and implement an average 6,200 acres of dormant season and 6,500 acres of growing season burning on refuge property to simulate the natural fire dynamics of the area.

- Strategy 1.15. Utilize Firebase, National Fire Plan Operating System, and the Fire Reporting System to secure funding for all future prescribed burning, mechanical fuel reduction, and selected silvicultural operations.

- Strategy 1.16. Develop as part of the joint GOAL Fire Management Plan the support and funding through the National Fire Plan to conduct interagency prescribed burning within the fuel reduction zone between the Swamps Edge Break and the Perimeter Road.

- Strategy 1.17. Maintain annually, island helispots to provide an emergency landing area during prescribed fire operations and to allow safe access for forestry crews and biologists working with wildlife and habitat issues.

- Strategy 1.18. Selective thinning in upland management compartments will be used as the preferred silvicultural management tool to accomplish habitat restoration goals.

- Strategy 1.19. Use patch regeneration areas ranging in size from ¼-acre to 15 acres to increase the age variability and promote the establishment of longleaf pine within upland management compartments. Log loading areas, natural openings, and proximity to seed source will be considered when establishing patch regeneration areas.

- Strategy 1.20. Plan regeneration on approximately 50 acres (1/30 of each compartment visited) each year. Plant improved, containerized longleaf pine seedlings at 500 trees per acre.

- Strategy 1.21. Exclude logging operations from all upland bog filled depressions and drains.

- Strategy 1.22. Use prescribed fire to reestablish the natural size and composition of wetlands dispersed throughout the uplands by using water levels and duff moisture to regulate fire intensity and penetration.

- Strategy 1.23. Evaluate annually the upland management compartment roads. As needed, pull ditches, grade, set culverts, or construct low water crossings to provide for fire and forest management access.

- Strategy 1.24. Evaluate annually and maintain as needed the upland management compartment roads by mowing to provide for fire and forest management access and to serve as a permanent fuels break.

- Strategy 1.25. Inspect and make needed repairs on the 26 perimeter road bridges as required by regional guidelines while considering fish movements and erosion potential.

- Strategy 1.26. Monitor forest insects and disease according to USFWS and regional direction.

- Strategy 1.27. Protect ephemeral wetlands by restricting activity within 100 feet, maintaining low understory vegetation around the perimeter, keeping logging debris away from the wetlands, and allowing fire to move freely into the wetlands to maintain herbaceous characteristics of the ponds and relatively open adjacent uplands.

- Strategy 1.28. Develop educational programs on habitats and select wildlife needs for equipment operators, foresters, fire crews, etc., to instill an interest and heighten awareness of their potential impact to the environment through their management actions.

- Strategy 1.29. Update the refuge Fire Management Plan by 2006 to comply with the National Format for Fire Management Plans.

- Strategy 1.30. Ensure all refuge staff engaged in fire related activities meet National Wildfire Coordinating Group training requirements for positions held.

- Strategy 1.31. Maintain assigned fire suppression equipment according to manufacturers specifications to ensure safe efficient operation.

- Strategy 1.32. Maintain annual operating plans with Florida Division of Forestry and Georgia Forestry Commission to continue joint fire operations.

Objective 2. Maintain, enhance, and promote the Greater Okefenokee ecosystem's native wetland communities, their natural vegetation mosaic, diversity, viability, and dynamics, as found within the Okefenokee Swamp.

- Strategy 2.1. Investigate the vegetation of the swamp wetlands by 2007 for areas within the swamp that have been altered to the extent that natural succession will not restore it to pre-European settlement vegetation (i.e., examine cypress regeneration in the northeast basin).

- Strategy 2.2. Investigate the influence of the underlying aquifer on the Okefenokee Swamp to identify threats from increased demands on ground water within 100 miles of the swamp.

- Strategy 2.3. Develop a water monitoring network using wells around the perimeter of the swamp to examine both surface and ground water to determine changes in water depths, flows and hydroperiods. Investigate partnerships with USGS Water Resources, Georgia and Florida scientists for this work.

- Strategy 2.4. Continue to monitor pH, conductivity, and dissolved oxygen at selected water monitoring stations and develop further the monitoring program to address water chemistry dynamics related to fire, water levels, weather events, plant composition, public use activities and land use adjacent to the refuge.

- Strategy 2.5. Monitor the water quality exiting the swamp near the Suwannee River Sill to identify changes as they relate to natural and man-made events and how it relates to data collected downstream by USGS.

- Strategy 2.6. Collaborate with a university/college to examine the pH levels through the history of the swamp using appropriate materials within the peat layers.

- Strategy 2.7. Develop a means of updating the fuel model map on a yearly basis to reflect the effects of fire moving across the swamp landscape.

- Strategy 2.8. Revise the vegetation map every 10 years (next 2011), using appropriate images and ground truthing and determine percent change of each vegetation class.

- Strategy 2.9. Establish photo points within each major prairie to illustrate changes in the vegetation structure related to management practices and natural events.

- Strategy 2.10. Educate the public on the importance of good air quality, the threats of light and noise to the resources, and the avenues to reduce the negative effects.

- Strategy 2.11. Continue to restore the river flood plain associated with the Suwannee River that has been influenced by the presence of the Suwannee River Sill by removing the two concrete water control structures and breaching the sill in four places.

- Strategy 2.12. Keep accurate records of water levels and rainfall throughout the swamp and relate them to public use opportunities, fire hazards and occurrence, wildlife distribution, and water distribution. Currently 10 water monitoring stations are in use. Add additional stations at Breakfast Branch and at the outlet to the St Marys River. Pursue making this data available on the web.

- Strategy 2.13. Investigate the influence of boat trail maintenance on the hydrologic dynamics within hydrologic basins of the swamp.

- Strategy 2.14. Expand and maintain a multi-layered database for fire, forestry, and biological resource analysis within the swamp including but not limited to soils, hydrology, wildlife distribution, and vegetation.

- Strategy 2.15. Inventory the old-growth cypress stands (e.g., Grand Prairie and Dinner Pond) that remain for baseline information.

- Strategy 2.16. Encourage the use of natural fires within the wetlands versus scheduling prescribed fires that may decrease the impact of a future natural fire.

- Strategy 2.17. Using historical water level records, minimize the movement of prescribed fire off wilderness islands and upland management compartments to accomplish stated objectives.

- Strategy 2.18. Minimize the impacts of corridors on the landscape (e.g., roads, fire lines, swamps edge break) that alter water flows, seepages, compaction, and wildlife movement by rehabilitating unnecessary lines and considering maintenance practices that minimize soil disturbance.

- Strategy 2.19. Collect data from the on-site regional air quality station at the end of each wildland fire event to document levels of fire-related pollutants.

- Strategy 2.20. At the beginning of each wildland fire event, contact local and state transportation officials to advise of possible smoke production that may adversely impact road visibility.

- Strategy 2.21. Finalize the Fire Use Guidebook of the refuge Fire Management Plan to allow the use of fire for natural resource benefits and amend the Okefenokee NWR Fire Management Plan.

- Strategy 2.22. By 2007, complete initial training of refuge personnel and state and federal cooperators in the implementation of Fire Use as the appropriate management strategy on the Okefenokee NWR.

- Strategy 2.23. By 2007, have a wetland fuels modeling research project to accurately represent the unique wetland fuels found on the refuge in Firebase (the USFWS prescribed fire funding database).

Objective 3. Conserve natural resources through partnerships, protection, and land acquisition from willing sellers within the "zones of influence."

- Strategy 3.1. Assess and prioritize lands within the watershed by 2010 that would protect the resources and/or enhance management opportunities to meet refuge objectives.

- Strategy 3.2. Establish acquisition priorities based upon habitat values and/or possible threats to existing resources.

- Strategy 3.3. Initiate and continue contact with all landowners within the refuge acquisition boundary to determine landowner interest and willing-seller status. Acquire land as opportunities arise or enter into agreements to protect resources associated with the health of the wetlands and native upland communities.

- Strategy 3.4. Continue to utilize and seek partnerships with conservation organizations and others to complete acquisitions.

- Strategy 3.5. Develop Property Proposals as lands are identified as critical for managing the resources of the Okefenokee NWR.

- Strategy 3.6. Seek incentives for landowners to grow longleaf pine stands adjacent to the refuge to at least 60 years-old for the benefit of RCWs.

- Strategy 3.7. Through presentations and the distribution of information, encourage other land managers to restore, maintain, and protect native upland and wetland communities as a part of southeast Georgia's heritage.

- Strategy 3.8. Keep abreast of the threats within the "zones of influence" and be proactive in reducing the negative impacts (e.g., aerial, biota, water, and soil pathways).

- Strategy 3.9. Form a network of stakeholders within the surface and groundwater basins associated with the Okefenokee Swamp to protect and restore the natural flows and monitor for changes in flows and water quality. Identify the reason for changes and work toward resolving any detrimental consequences.

- Strategy 3.10. Every 5 years beginning in 2007, examine select plant and lichen species for injury due to air quality.

- Strategy 3.11. Maintain the annual operation plans for the two Memorandums of Understanding with International Paper Company and seek opportunities with other adjoining landowners.

- Strategy 3.12. By 2007, begin to develop a GOAL Fire Management Plan to cover the 1,500,000 acres now contained in the group's zone of influence.

Objective 4. Investigate presence of and reduce non-native invasive plants and animal populations to minimize negative effects to native flora and fauna.

- Strategy 4.1. Develop and maintain by 2007, a GIS database on known locations within and outside the refuge and the area covered by invasive plants and animals, type and date of the treatment, and the results of treatment.

- Strategy 4.2. Take measures to eradicate the non-native invasive species. This may include the use of pesticides within the wilderness.

- Strategy 4.3. Develop a team of refuge staff to revisit known sites and new sites where exotic species have been reported on an annual basis to document the current condition and future needs.

- Strategy 4.4. Work with neighbors that are harboring and/or promoting non-native invasive species to reduce the threat of invasion onto the refuge.

- Strategy 4.5. Remove non-native animals such as feral swine and domestic cats and dogs from refuge lands. Educate the local community of the damage done by these animals.

Objective 5. Identify and protect the archaeological and historical sites on the refuge from illegal take or damage in compliance with the established Acts.

- Strategy 5.1. By 2007, all known locations will be cataloged using GPS coordinates for inclusion into the refuge GIS data base system. Continue to collect location information on historic properties as identified. Sites will be identified as needed when disturbance of soil is proposed or expected during an emergency.

- Strategy 5.2. Educate the public through programs on the significance of the archaeological and historical sites.

- Strategy 5.3. Develop and implement a long-term maintenance plan for the Chesser Island Homestead, and buildings on the National Historical Register.

Objective 6. Preserve the wilderness resource within the designated wilderness area.

- Strategy 6.1. Every five years, beginning in 2006, survey light and noise pollution on the edge of the swamp and within the interior according to the protocols established by the Georgia Institute of Technology.

- Strategy 6.2. Identify light and noise sources and reduce negative impacts of light and noise pollution where possible.

- Strategy 6.3. Review new industry and development within the airshed as they relate to visibility impairments and air quality over the Swamp and coordinate comments with the USFWS Air Quality Division.

- Strategy 6.4. Monitor air quality under the guidance of the USFWS Air Quality Division, including the current partnership with the three national programs: National Atmospheric Deposition Program, Mercury Deposition Network, and the Interagency Monitoring of Protected Visual Environments.

- Strategy 6.5. Monitor human disturbance factors within zones of influence to protect the wilderness resource including habitat, wildlife, and human values.

- Strategy 6.6. Continue to consider development of visitor surveys, particularly for overnight canoeists, to assess the overall quality of wilderness experience and if appropriate, implement a survey.

- Strategy 6.7. Use the approved Minimum Requirement Decision Guide for non-emergency wilderness activities that are not covered within this comprehensive conservation plan.

- Strategy 6.8. Plan helicopter flight paths when possible to minimize disturbance to wildlife, the wilderness, and visitors.

- Strategy 6.9. Conduct emergency operations in a safe manner that addresses wilderness concerns.

- Strategy 6.10. Distribute wilderness information to special task teams, volunteers, interns, and researchers to give a clear understanding of the Okefenokee Wilderness and the management requirements.

GOAL 3 -- (WILDERNESS VALUES)

Restore, preserve, and protect the primeval character and natural processes of the Okefenokee Wilderness, leaving it untrammeled by man while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.

Objective 1. Preserve the primeval character of the Okefenokee Wilderness through management and re-establishment of ecological conditions that allow maximum use of natural processes.

- Strategy 1.1. Monitor and evaluate public impacts and modify management to protect the wilderness resource.

- Strategy 1.2. Be proactive within the “zones of influence” in minimizing potential threats to the wilderness resource.

- Strategy 1.3. Establish guidelines as in the Fire Use Management Plan to allow maximum benefit for the wilderness resource from natural processes.

- Strategy 1.4. Investigate remote sensing techniques as they become available while using traditional monitoring techniques when determined appropriate through Minimum Requirement Guidelines to monitor wildlife populations and habitat conditions.

Objective 2. Provide recreational opportunities in wilderness that emphasize solitude.

- Strategy 2.1. Continue to maintain and use the existing wilderness reservation system, the trail system, and the overnight shelters to ensure solitude.

- Strategy 2.2. Be sensitive to visitor use when scheduling administrative activities in wilderness.

- Strategy 2.3. Conduct Minimum Requirement Decisions prior to all management activities within the wilderness.

- Strategy 2.4. Encourage, modify, or if necessary, directly control wilderness uses and influences to minimize their impact on solitude.

- Strategy 2.5. Work with FAA and military installations to alter flight paths of commercial and military overflights.

- Strategy 2.6. Maintain a minimum of 700 feet for administrative overflights. Special use flights will be governed by the Minimum Requirement Decision Guide on the specified activity.

- Strategy 2.7. Maintain low vegetation at helispots on interior islands for safety in transporting equipment and workers.

- Strategy 2.8. Continue to pursue the use of electric motors for guided tours.

Objective 3. Provide educational enrichment related to wilderness.

- Strategy 3.1. Continue to waive fees for educational groups.

- Strategy 3.2. Encourage all visitors to enjoy the Visitor Center services where they can be oriented to wilderness concepts.

- Strategy 3.3. Continue to provide wilderness related environmental education and interpretation programs.

Objective 4. Accommodate scientific study for the purpose of managing the area as wilderness and protecting the Okefenokee Ecosystem.

- Strategy 4.1. Evaluate the management contribution of proposed studies and use the Minimum Requirement Decision Guide to evaluate the need and wilderness compatibility.

- Strategy 4.2. Expand relationships with the Carhart Wilderness Center, the Leopold Institute, colleges, and universities to develop needed wilderness research.

Objective 5. Promote conservation ethics in wilderness.

- Strategy 5.1. Manage natural processes to the benefit of the wilderness resource.

- Strategy 5.2. Continue to monitor air and water quality and investigate potential threats.

- Strategy 5.3. Use interdisciplinary science skills to manage wilderness.

- Strategy 5.4. Promote and practice wilderness concepts such as Leave No Trace principles.

- Strategy 5.5. Distribute information through printed materials and the internet about wilderness issues and ethics to local businesses, concessionaires, Stephen C. Foster State Park, and Swamp Park to distribute to their customers for greater awareness of human impacts.

Objective 6. Provide scenic vistas in wilderness.

- Strategy 6.1. Allow natural processes to open areas to provide scenic vistas.

- Strategy 6.2. Continue to maintain boat/canoe trails to provide access and scenic views.

- Strategy 6.3. Camouflage equipment or use natural materials to minimize the "hand-of-man."

GOAL 4 – (PUBLIC SERVICES)

Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation when compatible to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.

Objective 1. Promote the refuge, the work of the USFWS, and wilderness philosophy and concepts through brochures, personal contacts, and the refuge's website. Provide clear directional information and signage to lead interested parties to the refuge, as well as to visitor opportunities once they have arrived. Opportunities within the Okefenokee Ecosystem will be promoted.

- Strategy 1.1. Implement revised refuge Sign Plan to direct individuals through their refuge visit.

- Strategy 1.2. Enhance orientation along the refuge hiking trail system by incorporating informational signs and mile markers.

- Strategy 1.3. Continue to maintain routed, painted, wooden signs along the canoe trails to assist visitors in their travels through the swamp.

- Strategy 1.4. Clearly mark the wilderness boundary at each entry/access point.

- Strategy 1.5. Ensure existing traffic signs meet standards as outlined in the Manual on Uniform Traffic Control Devices.

- Strategy 1.6. Continue updating refuge brochures and web pages to provide the most up-to-date and accurate information possible including other environmental opportunities within the Okefenokee Ecosystem.

- Strategy 1.7. Revise, expand, and develop brochures and other outreach materials to increase awareness of the wilderness resource and the concept of "Leave No Trace."

- Strategy1.8. Revise brochures and other outreach materials to increase awareness of the Okefenokee NWR's designation as a Wetland of International Importance, Important Birding Area, and the existence of Research and Public Use Natural Areas.

- Strategy 1.9. Expand and develop contacts with all Georgia and Florida interstate, regional, and local visitor centers to provide refuge information on a regular basis for travelers.

- Strategy 1.10. Develop "Introduction to Okefenokee NWR" packets including brochures, pictures, and a short orientation video to assist welcome center and rest stop personnel in addressing questions from travelers. Continue to offer introductory refuge visits to these individuals as a supplement to the information packets.

- Strategy 1.11. Initiate contact with Alabama, Tennessee, and South Carolina interstate, regional, and local welcome centers as possible outlets for refuge information and offer orientation packets and visits for their personnel.

- Strategy 1.12. Continue working with Georgia Department of Transportation on refuge informational signage for North and South bound lanes of I-75 near Tifton/ Valdosta and I-95 near Brunswick/Kingsland.

- Strategy 1.13. Initiate discussions with the Florida Department of Transportation about refuge informational signage for the north and south bound lanes of I-75 near Lake City/ Valdosta and I-95 near Jacksonville/Yulee.

- Strategy 1.14. Expand eco-tourism opportunities for the refuge, as well as for regional and local communities in partnership with businesses, civic and conservation organizations by promoting area attractions and joining together for birding festivals, Earth Day events, canoe clinics, and the establishment of extended bike and canoe trails, car tours, etc.

- Strategy 1.15. Expand supply of key outreach products (e.g., posters and tattoos).

- Strategy 1.16. Develop public service announcements for radio and television markets to promote refuge events.

- Strategy 1.17. Prepare for emergencies by developing appropriate procedures for quickly contacting and engaging refuge partners with information about rapidly developing refuge and/or local concerns or issues.

Objective 2. Implement a fee demonstration program where revenues will be strategically invested to support the operation and maintenance of hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation opportunities on the refuge.

- Strategy 2.1. Continue fee-demonstration program that was implemented in 1998 and that was re-authorized in 2004.

- Strategy 2.2. Expand methodologies for tracking use of fee demonstration funding in support of visitor services.

- Strategy 2.3. Adjust user fees as necessary to ensure that a safe and quality wilderness and recreational experience is provided to the public.

- Strategy 2.4. Conduct an annual evaluation of the fee collection program.

Objective 3. Provide quality hunting opportunities within specified upland management compartments, making every effort to provide hunts for universal accessibility where possible.

- Strategy 3.1. Evaluate current and potential individualized hunting opportunities on specified upland management compartments in Georgia and Florida. Implement hunts as appropriate.

- Strategy 3.2. Evaluate and where appropriate expand and develop special hunting opportunities for family-oriented groups (e.g., father/son and mother/daughter).

- Strategy 3.3. Incorporate into hunting brochures the variability of wildlife populations and hunter success and skill in diverse refuge habitats.
- Strategy 3.4. Provide a refuge hunt brochure that summarizes all pertinent refuge regulations, discusses each of the designated hunt areas in detail, and provides a means for the public to apply for the hunt(s) by mail, fax, e-mail, or via the refuge website.

- Strategy 3.5. Evaluate hunting opportunities on newly acquired lands.

- Strategy 3.6. Expand and develop contacts with Handicapped Sportsmen's groups in Georgia and Florida to improve accessibility to hunts.

- Strategy 3.7. Monitor hunt programs and provide end-of-the-season harvest reports, including suggested improvements, to the state and other interested parties. Gather results of state administered hunts surrounding the refuge.

Objective 4. Provide quality fishing opportunities on the refuge, making every effort to provide universal accessibility where possible.

- Strategy 4.1. Coordinate with Georgia Department of Natural Resources to maintain year-round fishing seasons.

- Strategy 4.2. Survey and evaluate refuge ponds, dip sites, and canals for expansion or deletion of bank fishing opportunities.

- Strategy 4.3. Expand and develop contacts with Handicapped Sportsmen's groups in Georgia and Florida for suggestions on improving access to fishing opportunities.

- Strategy 4.4. Investigate opportunities for youth fishing derbies at sites accessed from all refuge entrances.

- Strategy 4.5. Continue to develop fishing access opportunities at the Suwannee River Sill and Kingfisher Landing.

- Strategy 4.6. Monitor fishing program through periodic creel surveys and voluntary reporting system at the entrances to the swamp.

- Strategy 4.7. Develop fishing brochure and expand refuge website to include maps showing the open fishing areas, regulations, and information on the dynamics of fish populations.

Objective 5. Provide quality opportunities and facilities for wildlife observation and photography in different habitats of the refuge.

- Strategy 5.1. Evaluate all access points for use patterns and the need for additional facilities and improve as needed.

- Strategy 5.2. Expand and develop plans and associated costs for linking boardwalk spurs #1 and #2 into a loop boardwalk

- Strategy 5.3. Develop a boardwalk and observation point leading from visitor center parking lot into Mizell Prairie.

- Strategy 5.4. Expand development and interpretation of Phernetton Long-leaf Pine and Canal Diggers Trail extension.

- Strategy 5.5. Investigate, expand, and develop, where feasible, hiking trails outside the wilderness area for optimum wildlife viewing opportunities while preserving the integrity of the habitat and wildlife.

- Strategy 5.6. Evaluate and, where feasible, develop one fully accessible trail opportunity at all entrances.

- Strategy 5.7. Maintain wilderness canoe trails for additional wildlife observation and photography opportunities while preserving the integrity of the habitat, wildlife, and wilderness resource.

- Strategy 5.8. Maintain wilderness canoe trail reservation system to promote solitude and enhance opportunities to observe and photograph wildlife in their natural surroundings.

- Strategy 5.9. Expand program offerings, workshops, activities, and exhibits used to teach and enhance wildlife viewing skills and ethics.

- Strategy 5.10. Investigate the need for expanded wildlife oriented viewing opportunities including trails, exhibits, etc., at Kingfisher Landing and the Suwannee River Sill Area.

- Strategy 5.11. Convert the manicured lawn area at Suwannee Canal Recreation Area to a backyard habitat for wildlife observation and photography.

- Strategy 5.12. Continue to promote wildlife observation and photography opportunities at key points within the ecosystem through brochures, news releases, displays, and special events. Include messages on good wildlife observation and photography practices to minimize disturbance.

- Strategy 5.13. Continue to promote the Colonial Coast Birding Trail in partnership with Georgia Wildlife Resources Division.

Objective 6. Expand environmental education to a multi-faceted, curriculum based program for use on and off the refuge to enhance public awareness and understanding of the refuge's natural ecology, the human influences on the swamp ecosystem, the wilderness philosophy and concepts, and to inspire action among local, national, and international education groups on behalf of the USFWS, refuge, and the ecosystem.

- Strategy 6.1. Develop grade appropriate environmental education activities and materials that support the Georgia/Florida approved curricula.

- Strategy 6.2. Develop environmental education facilities, including outdoor and indoor classroom settings at various entrances and locations, to balance environmental education demands on the landscape and to reduce conflicts between groups and/or activities.

- Strategy 6.3. Enhance the existing Cane Pole Trail for an alternative environmental education area by creating an interpretive boardwalk with an observation platform extending out into Mizell Prairie.

- Strategy 6.4. Develop a plan that deals with the administration of groups seeking environmental education from contact to follow-up activities.

- Strategy 6.5. Expand and develop environmental education outreach to local schools and other interested groups covering on-going refuge activities.

- Strategy 6.6. Expand and develop environmental education support materials for teachers to use both on and off refuge.

- Strategy 6.7. Enhance teacher workshop materials and host teacher workshops at the refuge.

- Strategy 6.8. Encourage concession operations at various entrances to support curriculum based environmental education and sales items.

- Strategy 6.9. Develop a multifaceted Junior Refuge Manager program to all young refuge users including those off the refuge via the Internet.

- Strategy 6.10. Develop yearly environmental education projects that involve the financial support and physical assistance of the Okefenokee Wildlife League.

- Strategy 6.11. Develop a partnership with the city of Folkston and the Georgia Wildlife Federation in the coordination of programs offered by the Okefenokee Education and Research Center and utilizing refuge facilities for environmental education to promote the purpose/objectives of the refuge and USFWS.

- Strategy 6.12. Increase or enhance the partnerships with environmental education organizations to develop and present educational programs, activities, and exhibits on the refuge that promote awareness of the resources.

- Strategy 6.13. Continue to participate in the St. Marys to the Suwannee initiative for establishing a canoe trail from the Atlantic Ocean to the Gulf of Mexico.

- Strategy 6.14. Evaluate and determine the effectiveness of all environmental education activities and modify as needed to meet refuge needs.

Objective 7. Provide non-personal and personal interpretive media and programs that increase awareness and understanding of the refuge's natural and human influences, habitat diversity, wildlife values, wilderness philosophy and concepts, and management activities performed to protect, enhance, restore, and maintain the Okefenokee ecosystem.

- Strategy 7.1. Promote an understanding of the relationship among all programs of the USFWS, the National Wildlife Refuge System, and Okefenokee NWR through interpretive panels, brochures, signing, etc.

- Strategy 7.2. Re-examine and refine key resource management messages that define and simplify refuge actions to protect, enhance, restore, and maintain the Okefenokee ecosystem.

- Strategy 7.3. Develop interpretive panels, brochures, signing, etc., that increase awareness of the swamp ecosystem, the importance of wetlands, and wilderness management.

- Strategy 7.4. Evaluate all brochures for necessity. Eliminate or condense brochures where possible.

- Strategy 7.5. Evaluate all festivals and special events for appropriateness.

- Strategy 7.6. Evaluate feasibility of interpretation within the wilderness area and consider the use of backcountry rangers.

- Strategy 7.7. Expand and develop kiosks and interpretive panels for all upland trails and boardwalks with a trail map and brief description of the trail, including elements of interest.

- Strategy 7.8. Continue current MOU with International Paper for provision of an interpretive trail across their lands.

- Strategy 7.9. Evaluate and develop, if feasible, other avenues for presenting the living history of the Chesser Island homestead.

- Strategy 7.10. Interpret through various media the conversion of manicured lawn area to a backyard habitat exhibit to promote natural landscapes.

- Strategy 7.11. Evaluate current MOU with Zoo Atlanta and the potential for partnerships with other zoos and aquariums (Jacksonville Zoo and Georgia Aquarium) to decide if there are common goals in interpretation and environmental education, which we want to share.

- Strategy 7.12. Examine feasibility of maintaining an interpretive radio station available 24 hours a day to inform visitors of refuge hours, visitor center, trail locations, and a description of all refuge entrances.

- Strategy 7.13. Develop news releases and magazine articles for weekly and monthly civic and conservation organization publications.

- Strategy 7.14. Enhance website to reach major national and international markets. Establish web site links through civic and conservation organizations.

- Strategy 7.15. Expand refuge outreach and media relations plan to reach major media markets locally, regionally, and nationally.

- Strategy 7.16. Continue to cultivate partnerships with community or conservation organizations capable of developing and administering funds to assist in key refuge issues and interpretive themes.

- Strategy 7.17. Expand refuge volunteers to include youth groups such as 4-H clubs, Girl and Boy Scouts, etc., working on projects that enhance the refuge while educating youth and their leaders about key refuge issues.

- Strategy 7.18. Support off-site outreach programs when feasible and beneficial to the goals of the refuge.

Objective 8. Use concession contracts, permits, and commercial uses within the policies of the National Wildlife Refuge System and the National Wilderness legislation established for Okefenokee NWR to assist in meeting the management goals of the refuge.

- Strategy 8.1. Continue to meet regularly with concession supervisors to maintain lines of communication and to clarify policies and issues of interest to each party.

- Strategy 8.2. Investigate the need, feasibility, and impact of concession contracts and facilities at Kingfisher Landing and the Suwannee River Sill area.
- Strategy 8.3. As technology becomes available, negotiate concession contracts requiring conversion to battery-operated motors for guided tour boats, and boat and motor rentals.

- Strategy 8.4. Evaluate the need and feasibility of alternative means of transportation for remote parking areas off refuge and an interpretive tram for tours on refuge.

- Strategy 8.5. Develop specialized training for concession guides concentrating on interpretive messages and environmental education principles relevant to refuge issues and concerns.

- Strategy 8.6. Re-negotiate commercial outfitter guidelines for soliciting, evaluating, awarding, and monitoring overnight and day use of the refuge.

- Strategy 8.7. Re-negotiate Stephen C. Foster State Park's contracts emphasizing compatible recreational activities on the refuge.

- Strategy 8.8. Re-negotiate east side concession contract emphasizing interpretation and environmental education.

- Strategy 8.9. Re-negotiate Okefenokee Swamp Park contract emphasizing interpretation and environmental education.

- Strategy 8.10. Re-evaluate refuge commercial guiding procedures.

GOAL 5 – (PARTNERSHIPS)

Promote communication, cooperation, and partnerships between local, state, and federal agencies, land managers, and private citizens within the "zones of influence" to conserve the integrity of the pathways associated with resource protection, wildlife populations, and public services.

Objective 1. Promote, support, and assist the cooperative efforts of land managers, interest groups, and government entities to protect and/or enhance the natural resources and processes within the "zones of influence."
- Strategy 1.1. Examine and develop, where feasible, innovative management agreements with adjacent landowners and other land managers within the "zones of influences" to protect the natural resources and processes of the area and promote fire use within the Okefenokee Wilderness Area.

- Strategy 1.2. Continue to encourage and support the efforts of the Greater Okefenokee Association of Landowners.

- Strategy 1.3. Continue to support Okefenokee Wildlife League and develop an advocacy group for the refuge.

- Strategy 1.4. Continue to support the Tri-Agency Agreement with the National Park Service and Forest Service.

- Strategy 1.5. Continue to support the Suwannee River Interagency Alliance with the Suwannee River Water Management District and Georgia Department of Environmental Protection as partners.

- Strategy 1.6. Continue to develop working relationships with Georgia Forestry Commission and Florida Division of Forestry in fire management, longleaf/wiregrass restoration, and endangered species management.

- Strategy 1.7. Continue to develop working relationships with Georgia Division of Wildlife Resources and the Florida Fish and Wildlife Conservation Commission in an effort to enhance habitat conditions and data collection to promote cooperative management of resident species.

- Strategy 1.8. Work with local and state governments to develop an understanding of the importance of the Okefenokee NWR and encourage environmentally friendly development in the "zones of influence."

- Strategy 1.9. Identify influences to the refuge's natural resources from non-traditional sources and distances, and develop partnerships to reduce negative influences.

Objective 2. Develop agreements, partnerships, and advocacy groups to support implementation of natural process management within the Okefenokee wilderness in concert with other agency and refuge missions.

- Strategy 2.1. Identify experts in natural process management, particularly in the southeast.

- Strategy 2.2. Sponsor a workshop on natural process management, agency mission, and refuge objectives to obtain ideas, techniques, and support for management decisions.

- Strategy 2.3. Hold workshops and training sessions with professional natural resource managers, local citizens, local governments, state agencies, and congressional leaders to gain understanding and support for the integration of natural process management to meet the objectives of the agency and refuge.

Objective 3. Maintain current relationships and encourage new partnerships with nationally recognized organizations, universities and colleges, and other agencies to provide valuable scientific data that will enhance natural resource management within the greater Okefenokee ecosystem while providing research and education opportunities for their students.

- Strategy 3.1. Organize a diverse group of multi-disciplinary professionals to determine the boundaries of the "zones of influence."

- Strategy 3.2. Encourage government agencies, colleges, universities, private institutions, and non-government offices to perform management and problem-based research within the "zones of influence" and issues related to wilderness management.

- Strategy 3.3. Establish an agreement with all researchers conducting research on the refuge through the Special Use Permit procedure to determine the benefit of the research, the appropriate techniques and methods, coordination needed, and the deliverables required, considering whether the research will be conducted within or outside the wilderness area.

- Strategy 3.4. Monitor air quality under the guidance of the USFWS Air Quality Division, including the current partnerships with the three national programs: National Atmospheric Deposition Program, Mercury Deposition Network, and the interagency Monitoring of Protected Visual Environments.

- Strategy 3.5. Establish a liaison as part of an organized collaborative process within the Okefenokee Education and Research Center to promote sound scientific management-based research on issues concerning the refuge and the "zones of influence."

- Strategy 3.6. Serve as an advisor or member of a board for the Okefenokee Education and Research Center to promote integrated ecosystem-based research.

Objective 4. Enhance and promote innovative environmental education opportunities within the greater Okefenokee ecosystem.

- Strategy 4.1. Develop partnerships with environmental education organizations to promote assistance with programs, activities, and exhibits on the ecosystem's resources.

- Strategy 4.2. Develop partnerships with the city of Folkston and the Georgia Wildlife Federation for coordinated operation of the Okefenokee Education and Research Center, utilizing refuge facilities for environmental education.

- Strategy 4.3. Coordinate, integrate, and promote environmental education opportunities at the refuge with Okefenokee State Park and Swamp Park.

- Strategy 4.4. Continue partnership with Zoo Atlanta to promote the ecosystem's resources through environmental education and interpretation.

- Strategy 4.5. Investigate potential for partnerships with Jacksonville Zoo, Georgia Aquarium, and others to facilitate environmental education on the area's natural resources and implement if feasible.

- Strategy 4.6. Continue to expand Okefenokee Wildlife League's contribution towards environmental education.

Objective 5. Identify and secure funding through grants and other available sources for research projects that will aid in the protection and management of those area resources influencing the health of the greater Okefenokee ecosystem.

- Strategy 5.1. Annually seek information and apply for grants from both inside and outside the USFWS.

- Strategy 5.2. Work with non-government organizations and private institutions to identify potential partners in support of management-based research.

Objective 6. Identify partners and cooperators within the "zones of influence" and develop a network for sharing and analyzing data that would enhance the protection and restoration of the area's resources.

- Strategy 6.1. Contribute to regional and national surveys, where appropriate, and develop a network among land managers within the "zones of influence" to share wildlife distribution data.

- Strategy 6.2. Identify through a cooperative effort with other USFWS groups, local and State governments, universities, communities, and others the potential negative impacts within the "zones of influence" and lines of communication to keep abreast of potential threats.

- Strategy 6.3. Develop a partnership with the Water Management Districts for the purpose of encouraging hydrologic and environmental research and information sharing within the "zones of influence."

- Strategy 6.4. Continue to contribute to national fire databases and promote and support fire behavior research through partnerships.

- Strategy 6.5. Continue to monitor the health and status of the fisheries population through cooperation and support from USFWS Fisheries Resource Office, Georgia Department of Natural Resources, and other fish specialists.

Objective 7. Facilitate partnerships with other pertinent federal and state agencies, professional archaeologists, descendants of early settlers, Native American and other communities, and the general public to aid in the management of cultural resources.

- Strategy 7.1 Investigate potential agreements with federal agencies, such as the U.S. Forest Service and the National Park Service, that facilitate investigations related to violations of the Archaeological Resources Protection Act.

- Strategy 7.2. Identify potential institutions specializing in archaeological and historic investigations and promote interdisciplinary research.

- Strategy 7.3. Negotiate an agreement with the University of Georgia, or other appropriate facilities, for the permanent curation of archaeological collections and associated documentation derived from archaeological investigations on the refuge.

Objective 8. Develop partnerships that promote and expand eco-tourism opportunities and the enrichment of the human spirit.

- Strategy 8.1. Develop and promote eco-tourism opportunities within the greater Okefenokee ecosystem through partnerships with businesses, civic and conservation organizations, and city, county, and state governments.

- Strategy 8.2. Develop agreements with partners who support the interpretation of the area's natural resources and are capable of securing funds.

- Strategy 8.3. Continue supporting the St. Marys to the Suwannee initiative to establish a canoe trail from the Atlantic Ocean to the Gulf of Mexico.

- Strategy 8.4. Continue to support the Colonial Coast Birding Trail in partnership with Georgia Wildlife Resources Division.

- Strategy 8.5. Take an active roll in community improvements that promote natural resources and/or the enrichment of the human spirit.

Objective 9. Develop partnerships with groups to provide a supplemental work force for maintaining trails and conducting other natural resource management functions following the minimum requirement decision guidelines.

- Strategy 9.1. Continue to maintain and develop relationships with AmeriCorps, scouts, 4-H, and other groups, and develop "Leave No Trace" and other wilderness skills.

- Strategy 9.2. Develop partnerships with canoe clubs to solicit help with Wilderness Canoe Trail maintenance.

- Strategy 9.3. Develop partnerships with wilderness organizations to encourage participation in the refuge's trail maintenance program.

- Strategy 9.4. Develop a cache of appropriate tools for wilderness maintenance.

- Strategy 9.5. Train all staff and volunteers in "Leave No Trace" and other wilderness skills along with providing a clear understanding of the Minimum Requirement Decision process.

GOAL 6 – (ADMINISTRATION)

Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics and the "zones of influence."

Objective 1. Add an additional 98 staff (25 support, 8 Law Enforcement, 15 public service, 41 resource management, 9 facility management). Develop and train expanded staff to support the comprehensive refuge management programs of the refuge.

- Strategy 1.1. Develop an implementation plan for increasing the staffing to levels appropriate for accomplishing the strategies proposed within the comprehensive conservation plan.

- Strategy 1.2. Advertise vacancy announcements showing wilderness goal requirements as they relate to duties.

- Strategy 1.3. Develop an Individual Development Plan for each employee and provide continuing education and training opportunities to meet individual goals and ensure a highly competent and motivated team.

- Strategy 1.4. Provide wilderness training as part of new employee/volunteer/intern orientation.

- Strategy 1.5. Provide program cross-training to all employees, interns, and volunteers.

- Strategy 1.6. Encourage the further development of volunteer services to support all programs within the "zones of influence."

- Strategy 1.7. Provide on-going wilderness awareness training/workshops/seminars to staff to improve decisions made by program managers at refuge.

- Strategy 1.8. Continue to enhance wilderness awareness at regular monthly staff/safety meetings. Encourage staff to express any concerns or questions regarding wilderness in relation to on-going projects.

- Strategy 1.9. Create a staff advisory team to evaluate and determine if an administrative action is necessary using the minimum requirements decision guide.

Objective 2. Recruit and retain high quality volunteers to work in all refuge programs.

- Strategy 2.1. Investigate sources for recruiting volunteers with specific skills.
- Strategy 2.2. Continue to evaluate the role of interns within the overall volunteer program.
- Strategy 2.3. Develop a volunteer management plan.
- Strategy 2.4. Evaluate annually the volunteer program.
- Strategy 2.5. Provide advanced and basic training opportunities for volunteers in safety, first aid, and various techniques.
- Strategy 2.6. Develop a series of day programs for volunteers on wilderness issues and concepts.
- Strategy 2.7. Develop volunteer newsletter, news releases, and video and audio public service announcements concerning volunteering at the refuge.
- Strategy 2.8. Develop written evaluation process for volunteers and supervisors to gain feedback on the volunteer program.
- Strategy 2.9. Evaluate periodically the volunteer-incentive program.
- Strategy 2.10. Develop procedures for nominating and following through on local, regional, and national awards for volunteers, interns, and Americorps.

Objective 3. Provide facilities and equipment as appropriate for the growing number of staff in support of the goals presented in the comprehensive conservation plan.

- Strategy 3.1. Expand administrative office and maintenance facilities to accommodate additional staff. Approximately 110 square feet are needed per person plus additional common work/meeting areas.
- Strategy 3.2. Provide up-to-date facilities for biological staff to set up and test new equipment, store supplies, and conduct in-house research.
- Strategy 3.3. Develop housing facilities for the growing number of volunteers, interns, and researchers. Consider off-refuge sites, as well as at the east and west entrances, and evaluate the need at Kingfisher Landing.
- Strategy 3.4. Create a centralized database network compatible with GIS to house information on fires, forestry inventories, biota, water, weather, soil, and public use so information is readily accessible by the management staff.

- Strategy 3.5. Obtain and use up-to-date computer-based maintenance software available from either USFWS or open market sources to keep track of preventive and needed maintenance on facilities, equipment, and vehicles.

- Strategy 3.6. Investigate, purchase, and maintain appropriate tools to be used in wilderness as established by the minimum requirement decisions.

Objective 4. Increase refuge funding to support comprehensive refuge operations, maintenance, facilities management, endangered species, wilderness, habitat, and partnership programs.

- Strategy 4.1. Use the comprehensive conservation plan to promote refuge and ecosystem needs through grant writing and networking with other entities.

- Strategy 4.2. Analyze existing RONS and MMS projects to determine consistency with the comprehensive conservation plan. Update project needs every six months.

- Strategy 4.3. Develop Memorandums of Understanding and other agreements with federal and state agencies and private stakeholders to share equipment, staff, and services.

- Strategy 4.4. Promote partnerships in support of fish and wildlife resources, recreational opportunities, and educational programs, and seek challenge cost-share grants.

Objective 5. Ensure resource protection, enforcement of all refuge-related acts and regulations, and the safety of visitors, staff, volunteers, interns, and researchers.

- Strategy 5.1. Continue to provide up-to-date training and equipment to all full-time and collateral duty officers.

- Strategy 5.2. Develop Memorandums of Understanding with state and county enforcement agencies to facilitate cooperation and assistance in law enforcement activities.

- Strategy 5.3. Integrate law enforcement concepts in all aspects of refuge management, including agreements with partners, special use permits, plans, and specific refuge activities.

- Strategy 5.4. In accordance with the approved Law Enforcement Plan, conduct patrols and visitor compliance checkpoints in addition to regular contacts with visitors to ensure understanding and compliance with laws and regulations.

- Strategy 5.5. Assist Public Use and other staff in the development of environmental education and interpretation programs and provide up-to-date information on applicable laws and regulations.

- Strategy 5.6. Increase law enforcement presence during refuge activities to educate and assist the public and provide information and monitor compliance.

- Strategy 5.7. Provide education and outreach programs in local communities as part of a preventive law enforcement effort to encourage voluntary compliance.

- Strategy 5.8. Train and provide search and rescue operations when appropriate.

Objective 6. Develop and implement law enforcement procedures to protect the refuge's cultural resources and diminish site destruction due to looting and vandalism.

- Strategy 6.1. All refuge law enforcement officers will attend the Archaeological Resources Protection Act training course.

- Strategy 6.2. Pertinent refuge staff will attend the Overview for Cultural Resources Management Requirements course.

- Strategy 6.3. Establish and implement a protocol for site damage assessments.

- Strategy 6.4. Conduct law enforcement patrols and/or surveillance of archaeological sites on a regular basis.

Objective 7. Enhance awareness of the refuge's socio-economic and biological contribution to the area through enhanced communications, participation, and partnerships.

- Strategy 7.1. Identify and develop working relationships with stakeholders within the "zones of influence" to keep them informed of refuge objectives.

- Strategy 7.2. Develop Friends Group in neighboring towns of Waycross and Homerville, Georgia.

- Strategy 7.3. Encourage refuge staff to be community-friendly and contribute to the enhancement of the surrounding communities.

- Strategy 7.4. Take an active role in the Okefenokee Education and Research Center programs as a place to distribute information on the importance of the Okefenokee NWR within the whole ecosystem.

- Strategy 7.5. Continue to develop and promote the Okefenokee Wildlife League to its full potential.

- Strategy 7.6. Provide opportunities for the staff to participate in cooperative activities that exemplify the benefits of working together.

STEP-DOWN PLANS

This comprehensive conservation plan is a strategic plan that guides the future direction of the refuge. The strategies presented above are tasks that will be accomplished in support of the refuge's vision, goals, and objectives as funding becomes available. The specifics of how these tasks will be done are presented in detailed step-down plans. Okefenokee NWR staff have prepared four step-down plans for review with this comprehensive conservation plan: Habitat and Population Management Plan, Public Services Plan, Law Enforcement Plan, and Safety Plan.

The Habitat and Population Management Plan incorporates the following plans:
- Habitat Management Plan
- Nuisance/Exotic Plant and Animal Control Plan
- Biological Inventory/Monitoring Plan
- Fire Management Plan
- Wilderness Stewardship Plan

The Public Services Plan incorporates the following plans:

- Visitor Services Plan
- Fishing Plan
- Hunt Plan
- Environmental Education Plan
- Sign Plan
- Volunteer Management Plan

V. Plan Implementation

INTRODUCTION

To achieve the proposed management plan for the refuge, this section identifies major projects, staffing and funding needs, partnership opportunities, monitoring and evaluation of progress, and plan review and revision process.

PROJECT SUMMARIES

Listed below are project summaries related to wildlife management, resource protection, public services, and administration and the associated costs. Wilderness and partnership activities are included in the various projects. Staffing is presented in the following section. The recurring cost listed is an estimated yearly cost. The special projects cost is an estimation of costs associated with research, investigations, physical improvements and other special projects that are of short duration (1-6 years). The cost for each project is shown in Table 10. While this project list is not intended to be all inclusive, it does reflect the basic needs supporting the outlined goals and identified by the public, planning team members, and refuge staff, based upon available information.

WILDLIFE MANAGEMENT

Threatened and Endangered Species

Enhancing Red-cockaded Woodpecker (RCW) Habitat - Suitable upland habitat for the RCW is highly fragmented on Okefenokee NWR. Enhancing the habitat through the continued use of fire assists in maintaining the population. Manipulation of the refuge habitat outside the wilderness, along with the promotion of forest management practices designed to benefit RCW on adjacent lands, can encourage an increase in the population. Memorandums of Understanding, partnerships, and incentives for adjacent landowners are needed for long-term health of the RCW population at Okefenokee NWR.
Recurring cost: $80,000 Special Project Cost: $100,000

Population Status of Threatened and Endangered Species - Okefenokee NWR strives to maintain its population of RCWs to fulfill its role as a recovery population. Monitoring the status of the population and condition of the habitat inside and outside the wilderness is important to determine the effects of natural events and management practices. Access to most wilderness islands requires a helicopter, adding to the cost. In addition, surveys need to be established to determine the status of other “focal” species that are threatened, endangered, or of special concern.
Recurring cost: $40,000 Special Project Cost: $30,000

Fisheries

Factors Influencing Fish Populations – Biotic and abiotic factors affecting the fish assemblage within the Okefenokee NWR are poorly understood. Fish are important throughout the food chain and can bio-accumulate contaminants. Identification of factors influencing the health of the fisheries is needed. Water chemistry, groundwater withdrawals, water quality, pH levels, invertebrate population, and the physical environment all may play a role in the current health of the fisheries. Specific research projects are needed along with a consistent monitoring protocol to understand the dynamics of the fisheries within the Okefenokee Swamp.
Recurring Cost: $15,000 Special Projects: $60,000

Reptiles
Population status and trends of selected reptile species - Okefenokee NWR is home to a variety of reptile species including the alligator and those associated with the upland pine habitat. Consistent and reliable surveys are needed to determine their status and identify trends over the next 15 years. The effects of management practices need to be determined.
Recurring Cost: $15,000 Special Projects: $30,000

Amphibians
Population status and habitat enhancement for amphibians - The Okefenokee NWR is world renowned for its amphibian diversity. Little is known on the population status of those species dependent on ephemeral wetlands. A sampling protocol needs to be established along with strategies for enhancing the habitat for these species.
Recurring Cost: $15,000 Special Projects: $30,000

Invertebrates
Role of invertebrates within the Okefenokee ecosystem - Invertebrates being at the base of the food chain have a wide-ranging effect on the health of the ecosystem. Invertebrates found within the layers of peat may be sources of information about historical environmental conditions. Knowledge of their current distribution and abundance is important in evaluating the distribution and abundance of other wildlife.
Recurring Cost: $5,000 Special Projects: $30,000

Birds
Wading Birds as Indicator of Wetland Health - Wading birds are prominent features within the Okefenokee NWR landscape. Foraging and nesting have varied over the years. An understanding of the dynamics of wading bird populations may lead to an increased awareness of changes in the landscape. Accurate distribution and trends data related to environmental parameters are needed.
Recurring Cost: $30,000 Special Projects: $30,000

Role of Okefenokee NWR in Migratory and Breeding Passerine Bird Species Conservation - Little is known about the role the refuge plays in providing habitat for passerine birds. Through various point counts in the habitats of the Okefenokee NWR, the refuge can better understand its contribution and insight into how to improve the habitat. It is speculated that the expanses of scrub/shrub occurring on the refuge harbor flocks of migratory birds as they do in other areas. Through a special investigation, this use may be identified.
Recurring Cost: $15,000 Special Projects: $70,000

Mammals
Population Health of Okefenokee's Mammals - Trends in Okefenokee's black bear population may indicate changes in the landscape. A reliable survey method giving the most information about the population is sought. Periodic deer health checks also signal changes in the landscape.
Recurring Cost: $25,000 Special Projects: $30,000

Contaminants
Contaminant Availability within the Okefenokee Ecosystem - Contaminants have been identified within the Okefenokee ecosystem. To assist in identifying sources and the impacts of these contaminants, periodic checks from standard sampling protocols need to be established.
Recurring Cost: $15,000 Special Projects: $30,000

RESOURCE PROTECTION

Upland Communities
Restore, enhance and promote native upland communities - Native upland communities are rare outside the refuge boundary. Many native wildlife species depend on these communities. Okefenokee NWR is restoring the native habitat where appropriate to enhance conditions for native fauna. The use of fire helps to maintain the communities. With limited and fragmented uplands, agreements with adjacent land managers are promoted, encouraging forestry practices that enhance the wildlife use of refuge uplands.
Recurring cost: $80,000 Special Projects: $200,000

Wetland Communities
Maintain the health of the wetland communities of the Okefenokee NWR - Human activities outside the refuge can threaten the health of Okefenokee wetlands. A robust monitoring network of environmental parameters will give insight into changes related to the health of the wetland communities. The swamp's connection with the Floridan aquifer is of interest since there has been greater demand for water from this aquifer by coastal communities. Understanding past and present vegetation changes also helps predict fire behavior as it moves across the landscape.
Recurring cost: $40,000 Special Projects: $100,000

Restore Connection between the Okefenokee Swamp and the Suwannee River - An Environmental Assessment has been completed on the future management of the Suwannee River Sill. Pending a final report from U.S. Geological Survey, which studied downstream effects of the sill, the two water control structures will be removed and the earthen dam breached in four places. This action will restore the connection between the swamp and the Suwannee River and revert the immediate area to a functioning river flood plain.
Recurring costs: Special Project: $4,400,000

Invasive Plants and Animals
Reduce non-native invasive plants and animals - Okefenokee NWR does not currently have a large problem with invasive non-native plants and animals. Monitoring for threats and occurrences on the refuge is necessary on a routine basis.
Recurring cost: $5,000

Archaeological and Historical Sites
Protect the archaeological and historical sites on Okefenokee NWR - An accurate catalogue and routine surveys of the sites on the refuge assist with identifying changes and damages. The preservation of selected sites requires adherence to a long-term maintenance plan.
Recurring cost: $15,000 Special Projects: $20,000

Wilderness Resource
Preserve the wilderness resource within the Okefenokee Wilderness Area - Pollution from air, light, and noise degrades the wilderness resource and the human experience of wilderness. Air quality is monitored regularly, while light and noise pollution are measured every five years to determine any changes in levels. Direct human impacts to the wilderness also need to be examined periodically. Refuge activities are evaluated through the Minimum Requirement Decision Guide.
Recurring cost: $20,000 Special Projects: $80,000

PUBLIC SERVICES

Promotion
Promote the refuge and eco-tourism - Signs, brochures, personal contacts and the refuge's website are all avenues to bring visitors to Okefenokee NWR and the surrounding area. Expanding and updating these items increase awareness of the area. Forming partnerships for the promotion of the overall area increases the benefit of the refuge to the local communities.
Recurring cost: $80,000 Special Projects: $100,000

Recreational Fee
Support the Recreation Fee Demonstration Program - User fees support visitor services. Tracking these funds and adjusting them as necessary will help provide safe and quality visitor experiences.
Recurring cost: $25,000

Hunting
Provide quality hunting opportunities - Hunting on the refuge is promoted at compatible levels. Each year current hunting opportunities are evaluated and possible expansions are considered. The refuge strives for universally accessible hunts.
Recurring cost: $15,000

Fishing
Provide quality fishing opportunities - Promotion of fishing opportunities will be accomplished through brochures, youth fishing derbies, and improved access. The fishing opportunities will be monitored through periodic creel surveys.
Recurring cost: $12,000 Special Projects: $30,000

Wildlife Observation and Photography
Provide quality opportunities for wildlife observation and photography - Maintenance of the current boat and hiking trails, boardwalks, towers, and platforms will allow continued use. Expansions and improvements to boardwalks and hiking trails will be considered in relation to the natural resources and disturbance. Emphasis is on solitude and natural settings in any expansion or renovation. Improvements to brochures and maps are proposed.
Recurring cost: $80,000 Special Projects: 200,000

Environmental Education
Multi-faceted, curriculum based environmental education program - To enhance public awareness and understanding of the refuge's natural ecology, wilderness philosophy and concepts, and human influences, the refuge plans to expand available facilities to include outdoor and indoor classroom settings, provide grade-appropriate activities, develop outreach programs, and encourage concessionaires to support curriculum based environmental education. Strong partnerships and coordination with other agencies and organizations that are providing environmental education opportunities around the refuge will be emphasized.
Recurring cost: $100,000 Special Projects: $500,000

Interpretation
Provide interpretive media and programs - With 350,000 visitors each year, all avenues for interpretation need to be explored to increase the public's awareness and appreciation of the refuge and USFWS. Interpretive panels, brochures, signs, festivals, special events and programs, and backcountry rangers are being considered to improve interpretation. Enhancing the refuge's website and increasing coverage in news releases and magazine articles expand the refuge's audiences. The role of concessions in interpretation needs to be evaluated and expanded.
Recurring cost: $100,000 Special Projects: $100,000

ADMINISTRATION

Facilities and Equipment
Provide appropriate facilities for the staff and volunteers - With an increase in staff and volunteers, the administration office, maintenance and biological facilities, and volunteer housing need to be maintained and expanded.
Recurring cost: $200,000Special Projects: $5,000,000

Provide appropriate equipment for the staff and volunteers - Equipment from pens and paper to computers to vehicles to heavy equipment will be needed throughout the life of this plan in support of the staff, volunteers, and partners. Equipment repair and replacement are included.
Recurring cost: $2,600,000 based on $20,000 per person.
Special Projects: $1,000,000

STAFFING

The following is a staffing chart for accomplishing the tasks set forth in this Comprehensive Conservation Plan for Okefenokee NWR. It is a "road map" for the next 15 years that will guide the hiring process and direct changes in the organization of the refuge staff as positions are filled. The staffing chart demonstrates careful consideration for how the staff would work most efficiently and contribute to the long-term goals of the refuge system. Staffing Okefenokee NWR to the level presented would advance it towards similar staffing patterns in other land management agencies and bring forward the Refuge System as a significant contributor to environmental knowledge. Okefenokee NWR's supports regional and national efforts, including training and promotional activities. Networking, partnerships, and data sharing are emphasized within this plan to manage Okefenokee NWR as an integral part of an ecosystem and national system of lands. The staffing chart reflects an increased commitment to communication and negotiating that a flagship refuge staff will incorporate into their responsibilities. In addition, Okefenokee NWR is not an island separated from surrounding human development. The Okefenokee NWR will need protection from outside threats through the life of this plan. Knowledge is a powerful tool in the protection process. To understand the Okefenokee system and changes that occur within, inventorying and monitoring are of high priority and require additional specialists and technicians who are capable of performing fieldwork under the guidance of the Wilderness Act. The next 15 years are important in anchoring the human value of natural areas such as Okefenokee NWR and striving for the establishment of environmentally acceptable development. Providing opportunities and educating children and adults through expanded public services support the establishment of human values toward natural landscapes. These services also require the expansion of staff. With the increased number of staff and visitors comes the need for support staff in the form of maintenance workers, laborers, and administrative support. The rate at which Okefenokee NWR will participate at this level depends on the funds received through the next 15 years.

Optimal Staffing Chart for Okefenokee NWR

Salary including benefits (calculated at the highest potential wage possible for each position using FY 2003 wage scales).

T- temporary or seasonal

T1-Support Tri-Agency Facility

#-Shared with Osceola NF

TITLE	*GRADE*	*ANNUAL COST**
Refuge Manager	(GS 14/15)	$169,862
Deputy Refuge Manager	(GS 13/14)	144,410
Assistant Manager	(GS 9/11)	85,747
Assistant Manager	(GS 5/7/9)	70,864
Volunteer Coordinator	(GS 7/9)	70,864
Office Manager	(GS 11/12)	102,764
Human Resource Officer	(GS 9/11)	85,747
Writer/Editor/Publications/Web Site	(GS 7/9)	70,864
Administrative Clerks (2)	(GS 5)	93,526
Administrative Officer	(GS 9/11)	85,747
ADP (2)	(GS 9/11)	171,494
Receptionist	(GS 5)	46,763
Personnel Specialist	(GS 9/11)	85,757
Administrative Clerk	(GS 5)	46,763
Contracting Officers (2)	(GS 9/11)	171,494
Travel/Time Keeper	(GS 9/11)	85,747
Administrative Clerk	(GS 5)	46,763
Budget Analyst	(GS 9/11)	85,747
Lead Fee Collector	(GS 7/9)	70,864
Fee Collectors (8)	(GS 5)	374,104
Data Manager	(GS 9/11)	85,747
GIS Technicians (3)	(GS 5/7)	173,796
Data Technicians(2)	(GS 5/7)	231,728
Supervisory LE Officer	(GS 11/12)*	102,764
LEOs (6)	(GS 7/9)*	425,184
Seasonal Staff (4)	(GS 5/7)^{T}	231,728
Supervisory Refuge Ranger	(GS 11/12/13)	122,205
Assistant Refuge Ranger (West Side)	(GS 9/11)	85,747
EE Specialist	(GS 9/11)	85,747
Refuge Rangers (4)	(GS 5/7)	405,524
Interpretive Specialist	(GS 9/11)	85,747
Refuge Ranger	(GS 5/7)	57,932
Seasonals-1040 (2)	(GS 5/6)^{T}	52,132
Outreach Specialist	(GS 9/11)	85,747
Lead Visitor Services	(GS 9/11)	85,747
VC/CIH Staff (6)	(GS 4/5)	280,578
Clerk	(GS 4/5)	46,763
Wildlife Biologist/Ecologist/Forester	(GS 11/12/13)	122,205
Hydrologist	GS 9/11)	85,747
Wetland Biologist	(GS 9/11)	85,747
Biological Technicians (3)(1-Fisheries)	(GS 5/7/9)	70,864
Term Biologists (2)	(GS 5/6)	104,264
Upland Biologist	(GS 9/11)	85,747
Biological Technicians (3)	(GS 5/7/9)	212,592
Term Biologists (2)	(GS 5/6)	104,264

TITLE	*GRADE*	*ANNUAL COST**
Forester	(GS 9/11)	85,747
Biological Technicians (3)	(GS 5/7/9)	212,592
Term Biologist (2)	GS 5/6)	104,264
Refuge/District FMO	(GS 11/12/13	122,205
Assistant FMO	(GS 9/11)	85,747
Dispatcher/Fire Information	(GS 5/7/9)	70,864
Communication Tech	(GS 5/7)[#]	57,932
Seasonal Dispatcher	(GS 4/5)[T1]	46,763
Prescribed Fire Specialist	(GS 9/11)	85,747
Equipment Operators (3)	(WG 8)	155,750
Lead Firefighter	(GS 5/6/7)	57,932
Firefighters (3)	(GS 4/5)	140,289
Seasonal Firefighters-1040 (6)	(GS 4)[T]	125,388
Wildland Fire Specialist	(GS 9/11)	85,747
Equipment Operators (3)	(WG 8)	155,850
Lead Firefighter	(GS 5/6/7)	57,932
Firefighters (3)	(GS 4/5)	233,815
Facility Manager	(GS 11/12)	102,764
SAMMS Coordinator	(GS 7/9)	70,864
Equipment Operators (2)	(WG 7/8)	103,900
Heavy Equipment Mechanics (2)	(WG 8)	103,900
Light Equipment Mechanics (2)	(WG 8)	51,950
Electrician	(WG 8)	51,950
Carpenter	(WG 8)	51,950
Plumber	(WG 8)	51,950
Safety/HazMat Officer	(GS 7/9)	70,864
Maintenance Workers (4)	**(WG 5)**	**164,468**
Subtotal (annual staff costs)	130 employees	8,305,099

FUNDING

Table 10 presents the estimated funding needs for addressing the issues within this plan. Accomplishments over the next 15 years depend on the funding sources and the amounts obtained.

Table 10. Estimated funding needs to address the issues presented in this plan

	Recurring Annual Cost	Special Projects
Wildlife Management		
Threatened and Endangered Species	$120,000	$130,000
Fisheries	15,000	60,000
Reptiles	15,000	30,000
Amphibians	15,000	30,000
Invertebrates	5,000	30,000
Birds	45,000	100,000
Mammals	25,000	30,000
Contaminants	15,000	30,000
Resource Protection		
Upland Communities	80,000	200,000
Wetland Communities	40,000	4,500,000
Invasive Plants and Animals	5,000	
Archeological and Historical Sites	15,000	20,000
Wilderness Resources	20,000	80,000
Public Services		
Promotion	80,000	100,000
Recreational Fee	25,000	
Hunting	15,000	
Fishing	12,000	30,000
Wildlife Observation and Photography	80,000	200,000
Environmental Education	100,000	500,000
Interpretation	100,000	100,000
Administration		
Staffing	8,305,099	
Facilities	200,000	5,000,000
Equipment	2,600,000	1,000,000
TOTAL	$11,932,099	$12,170,000

MONITORING AND EVALUATION

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 not-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 to reinforce the management direction presented in the plan, as well as determine the need for revision. If a revision is within the guidelines of the plan, changes would be made as a supplement to the appropriate step-down plan. If a significant change in ecological conditions or a major refuge expansion occurs that affects the refuge's goals and objectives, the revisions to the comprehensive conservation plan and the step-down management plans would be subject to public review and NEPA compliance.

SECTION B. ENVIRONMENTAL ASSESSMENT FOR THE FUTURE MANAGEMENT OF OKEFENOKEE NATIONAL WILDLIFE REFUGE

I. Background

INTRODUCTION

This Draft Environmental Assessment for the proposed Comprehensive Conservation Plan for Okefenokee National Wildlife Refuge has been prepared in compliance with the National Environmental Policy Act. It discusses the purpose and need for the plan for the refuge, which is located in Charlton, Clinch, and Ware Counties, Georgia and Baker County, Florida (Section A, Figure 1). A summary of the legal context within which future management options must be developed is included. The issues and concerns expressed by the public are summarized and the major topics identified and defined. The impacts that could be expected from each of the management proposals outlined in the plan are analyzed. This analysis assists the U.S. Fish and Wildlife Service in determining if it will need to prepare an Environmental Impact Statement or a Finding of No Significant Impact for the plan.

PURPOSE AND NEED FOR THE ACTION

The purpose of the comprehensive conservation plan is to establish and implement a set of management directions for Okefenokee NWR for the next 15 years. No current plan exists that identifies priorities and ensures consistent and integrated management for the refuge, thus necessitating the need for an environmental assessment. The National Wildlife Refuge System Improvement Act of 1997 requires that all national wildlife refuges have a plan in place within 15 years to help fulfill the mission of the Refuge System.

The environmental assessment for the plan is needed in order to determine and evaluate a range of reasonable management alternatives for managing Okefenokee NWR. Each alternative was generated with the potential to be fully developed into a final comprehensive conservation plan. The environmental assessment predicts and evaluates the biological, physical, and socioeconomic effects of implementing each alternative. From this range of alternatives, the USFWS's proposed management action is then identified.

In the preparation of an environmental assessment the following is ensured:

- A clear statement of direction and continuity for management of the refuge is presented along with the ecological impacts.
- The refuge's management actions are consistent with the mandates of the National Wildlife Refuge System.
- The planned public use of refuge programs and facilities provides maximum benefit to the users without negatively impacting the wildlife resources and habitat that support those uses.
- Refuge neighbors, visitors, and governmental officials are provided the opportunity to understand the USFWS's management actions on and around the refuge.
- The management of the refuge considers federal, state, and county plans.

- The environmental impacts of the proposed action can be assessed to determine whether the impacts are significant enough to warrant the preparation of an Environmental Impact Statement.

DECISIONS TO BE MADE

Based on this draft environmental assessment, the USFWS has selected a preferred alternative. This document is made available to the public for review and comment. A Finding of No Significant Impact will then be prepared to determine if the selected alternative will have an adverse impact on the quality of the human environment. This determination will be based on an evaluation of the purposes for which the refuge was established, the mission of the USFWS and National Wildlife Refuge System, and other legal mandates. Assuming that no significant adverse impacts are found, a final plan will be prepared and implementation will begin. The plan will be monitored on an annual basis and revised when necessary.

REFUGE VISION

The Okefenokee is like no other place on earth, where natural beauty and wilderness character prevail. The vision for Okefenokee NWR is to protect and enhance wildlife and its habitat, ensure integrity of the ecological system, and embrace the grandeur, mystery, and cultural heritage that lead visitors to an enrichments of the human spirit.

STUDY AREA

The Okefenokee NWR is located in the southeastern Georgia Counties of Ware, Charlton, and Clinch and northeastern Florida's Baker County. The refuge consists presently of 395,080 acres. The primary purpose of the refuge is to protect the ecological system of the 438,000-acre Okefenokee Swamp. Approximately 371,000 acres of the Okefenokee Swamp wetlands are incorporated into the refuge. The Okefenokee Wilderness Act of 1974 designated 353,981 acres within the swamp as wilderness. Approximately 15,000 acres within the wilderness are islands covered by upland habitats. The refuge has approximately 15,000 acres within 16 upland management compartments surrounding the swamp. The refuge's approved acquisition boundary includes 519,480 acres (Section A, Figure 3).

Throughout the EA, there is reference to "zones of influence" which extends the USFWS interest to areas beyond the refuge's acquisition boundary. "Zones of influence" are pathways where resource and land management activities could impact the resources on the refuge. These zones change depending on the resource concerns. For example, a zone could be a migratory corridor of specific bird species or the hydrologic zone influenced by the underlying aquifer. This expansion of the refuge's area of interest refers to being proactive in dealing with threats to the refuge resources rather than an interest in land acquisition or management.

Through evaluating management strategies for each alternative, impacts to the surrounding landscape and nearby communities are included.

LEGAL MANDATES

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honors our trust responsibilities to tribes. Policies and guidelines governing Department of the Interior lands and activities are presented in the Department Manual. These guidelines can be reviewed at http://elips.doi.gov. In addition, management guidance for USFWS lands is provided in the Fish and Wildlife Service Manual (http://policy.fws.gov).

The National Wildlife Refuge System received specific guidance in 1997 with the passage of the National Wildlife Refuge System Improvement Act. Along with the refuge's authorizing legislation, the following documents or acts apply to the management of Okefenokee NWR:

- Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884)
- Okefenokee Wilderness Designation (Public Law 93-429 dated October 1, 1974)
- Wilderness Act (Public Law 88-577; 88th Congress, S.4; September 3, 1964)
- National Environmental Policy Act of 1969
- National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd-668ee)
- Refuge Revenue Sharing Act (16 U.S.C. 715s)
- Fish and Wildlife Act (1956)
- Executive Order 11988, Flood Plain Management

Several policies, programs, and authorities regulate habitat and wildlife management actions. Authorities that mandate major conservation efforts to the USFWS include:

- National Wildlife Refuge System Administration Act of 1966 (16 USC 668dd-668ee)
- Emergency Wetlands Resources Act of 1986 (PL 99-645, USC 3931)
- Migratory Bird Conservation Act of 1929 (16 USC 715-715d)
- Fish and Wildlife Coordination Act of 1934 (16 USC 661-666e)
- North American Wetlands Conservation Act of 1989 (PL 101-233)
- Coastal Wetlands Planning, Protection and Restoration Act of 1990 (16 USC 3951 et seq.)
- Clean Water Act of 1977 (33 USC 1251-1387)
- Water Resources Development Act of 1977 (90 Stat.2921)
- Land and Water Conservation Fund Act (1965)
- Migratory Bird Hunting and Conservation Stamp Act (1934)
- Migratory Bird Treaty Act (1918)
- Executive Order 1312 Invasive species (1999)
- Federal Noxious Weed Act (1990)
- Fish and Wildlife Coordination Act (1958)
- Red-Cockaded Woodpecker Recovery Plan, USDI, Fish and Wildlife Service, January 2003.
- Species specific recovery plans

The following acts and regulations pertain to the management of cultural resources on the refuge:

- Antiquities Act (16 USC 431-433)
- Historic Sites, Buildings and Antiquities Act (16 USC 461-467)
- National Historic Preservation Act of 1966 as amended (16 USC 470-470t)
- Archaeological and Historic Preservation Act (16 U.S.C. 469-469c) (P.L. 86-523)
- Policy Act of 1969, as amended (42 USC 4321-4327) Archeological and Historic Preservation Act (16 USC 469-469c)
- American Indian Religious Freedom Act (P.L. 95-341)
- Archeological Resources Protection Act, as amended (16 USC 470aa-47011)
- Native American Graves Protection and Repatriation Act (25 USC 3001 3013) Protection of Historic and Cultural Properties (36 CFR 800)
- Curation of Federally-Owned and Administered Archeological Collections (36 CFR 79)
- Protection of Archaeological Resources (43 CFR 7)
- Executive Order 13007 Indian Sacred Sites (1996)

Many statutes authorize and provide the means for prevention, presuppression, control, and suppression of wildland fire on lands or threatening land under the jurisdiction of the Department of the Interior, or lands adjacent thereto, and authorize the use of fire as a management tool to accomplish refuge goals. Some of these statutes include:

- Protection Act of September 20, 1922 (42 Stat. 857; 16 USC 594)
- Economy Act of June 30, 1932 (47 Stat. 417; 31 USC 1535)
- Taylor Grazing Act of June 28, 1934 (48 Stat. 1269; 43 USC 315)
- O. and C. Act of August 28, 1937 (50 Stat. 875; 43 USC 1181e)
- National Park Service Acts, as amended (67 Stat. 495; 16 USC 1b)
- Federal Property and Administrative Service Act of 1949 (40 USC 471; et seq.)
- Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66; 42 USC 1856a)
- National Wildlife Refuge System Administration Act of 1966 as amended (80 Stat. 927; 16 USC 668dd through 668ee)
- Alaska Native Claims Settlement Act of December 18, 1971 (85 Stat. 688; 43 USC 1601)
- Disaster Relief Act of May 22, 1974 (88 Stat. 143; 42 USC 5121)
- Federal Fire Prevention and Control Act of October 29, 1974 (88 Stat. 1535; 15 USC 2201)
- Federal Land Policy and Management Act of 1976 (90 Stat. 2743)
- Federal Grant and Cooperative Agreement Act of 1977 (P.L. 95-224, as amended by P.L. 97-258, September 13, 1982 (96 Stat. 1003; 31 USC 6301 thru 6308)
- Alaska National Interest Lands Conservation Act of December 2, 1980 (94 Stat. 2731)
- Supplemental Appropriation Act of September 10, 1982 (96 Stat. 837)
- Wildfire Suppression Assistance Act of 1989 (P.L. 100-428, as amended by P.L. 101-11, April 7, 1989

Acts that guide public services at Okefenokee NWR include:

- Americans with Disabilities Act (1962)
- Architectural Barriers Act (1968)
- Environmental Education Act of 1990 (20 USC 5501-5510: 104 Stat. 3325)
- Executive Order 12996 Management and General Public Use of the National Wildlife Refuge System (1996)
- Refuge Recreation Act (1962)
- Rehabilitation Act (1973)
- Refuge Recreation Act (1952)
- National and Community Service Act of 1960 (42 U.S.C. 12401:104 Stat: 3127)

These documents are briefly described in Appendix I.

OTHER RELEVANT ACTIVITIES AND PLANS

Along with the USFWS's legal mandates and initiatives, other planning activities directly influence the development of Okefenokee NWR's CCP. The USFWS and others develop and coordinate planning initiatives involving federal, state, and local agencies, local communities, non-government organizations, and private individuals. The USFWS has also initiated or participated in numerous partnerships to achieve the mission. These activities help restore habitats for fish and wildlife on and off public lands, develop or enhance nature-based tourism, and provide environmental education and interpretation opportunities.

The activities of the States of Georgia and Florida directly influence the management of Okefenokee NWR. The Georgia Department of Natural Resources began to plan a Comprehensive Wildlife

Conservation Strategy in 2003 that will address all wildlife species of conservation concern. The development of the plan would involve all sections of the Wildlife Resource Division, other conservation organizations, and the public. Stephen C. Foster State Park actually is located on refuge lands and serves as one of the primary entrance points into the swamp. The newly created Okefenokee State Park is just downstream from the refuge and will be linked to the management of Stephen C. Foster State Park. Dixon Memorial Forest (Georgia) borders the north side of the refuge while Bethea State Forest (Florida) borders the southeast side. In addition, Georgia Forestry Commission and Florida Division of Forestry play an integral role in assisting landowners surrounding the refuge with fire preparedness and suppression.

Osceola National Forest lies to the south of the refuge. Implemented in 1999, the Forest Plan provides guidance for the overall management of the national forests in Florida for 10-15 years. The Forest Plan is a framework for decision-making, not a list of specific projects. Land use determinations, management practices, goals, objectives, standards, and guidelines are elements of the Forest Plan's management directions. The Forest Plan also contains monitoring strategies to provide for an adaptive approach to management. Specifically, the refuge's red-cockaded woodpeckers are considered a support population of Osceola's recovery population.

The annual plans of the St. Johns and Suwannee River Water Management Districts are relevant documents since the Okefenokee NWR is the headwaters of the Suwannee River and St. Marys River. Okefenokee NWR and partner agencies have formed the Suwannee Basin Interagency Alliance. Representatives of federal, State of Florida, and State of Georgia agencies have agreed to work together through the Alliance to promote effective communication and coordination, and develop a comprehensive natural resource management plan for the basin utilizing a planning process adopted by the State of Georgia.

The Greater Okefenokee Association of Landowners (GOAL) was organized to serve as a unified team, managing, protecting, and promoting forest resources in and around the Okefenokee Swamp (Section A, Figure 6). The diverse members of GOAL include industrial and private forest landowners, federal and state agencies, and other private landowners adjacent to the swamp. During the past several years, GOAL has addressed a number of fire-related issues. Landowners cooperate on maintenance of the swamp perimeter road, compile and maintain a resource list of fire equipment and personnel, plan and construct helicopter dip sites, share radio frequencies, and plan firefighting tactics. The organization supported black bear research by providing access to their lands and the expertise of their employees.

Other resource management partnerships are important for developing plans and managing endangered species and longleaf pine habitats. A formal agreement with International Paper Company (IP) allows for the management of foraging habitat for the RCW on IP lands adjacent to the refuge. This agreement allows the refuge staff to be involved in the planning and implementation of forest and fire management on specific IP lands.

A similar agreement between Dixon Memorial State Forest, Georgia Wildlife Resources Division, and the refuge allows for long-term planning and implementation of forest and fire management on the Cowhouse Unit of Dixon Memorial State Forest. This agreement takes into account foraging area, potential nesting area, and restoration of longleaf pine habitats.

In 1995, Okefenokee NWR teamed with the Florida Ecological Services Office in Jacksonville, the USGS Biological Resources Division, the University of Tennessee, and the University of Florida to initiate a 5-year study of the black bear population in the Okefenokee-Osceola Ecosystem in south Georgia and north Florida. The objectives of the study were to determine population size, density, reproduction and mortality rates, food habits, and habitat use in order to formulate optimal

management guidelines to ensure the long-term survival of Okefenokee-Osceola black bears. The long-term health of this bear population lies in the cooperative habitat management planning among all land management entities; government, private, and industrial forest; along with concomitant support from environmental groups and the general public. Discussions have begun investigating the development of an organization similar to the Black Bear Conservation Committee in Louisiana.

In 1996, the Okefenokee NWR, Osceola NF, and Cumberland Island National Seashore signed an interagency agreement. Several years later, Timucuan Ecological and Historical Preserve also became signatory to the agreement. The agreement serves as a vehicle to allow for mutual assistance and planning among the four signatory agencies in the form of personnel, services, and equipment required for wildland fire prevention/suppression, prescribed burning, resource management, law enforcement, and the protection of life and property due to natural disasters.

The Okefenokee Wildlife League (OWL) is a non-profit cooperating association, which "promotes better understanding, appreciation, and conservation of the natural history and natural environment of Okefenokee NWR." OWL is involved in local community issues and serves as a conduit for local, state, and national political issues impacting the refuge. This group of volunteers operates a book sales area, participates in refuge special events, and purchases equipment and materials for refuge programs.

The establishment of the Okefenokee Education and Research Center (OERC) in Folkston, Georgia has been proposed as a means of meeting critical education and research needs and providing sustainable economic development opportunities in the surrounding area. The OERC will be operated as a project of the City of Folkston and the Georgia Wildlife Federation. Activities will be overseen by a policy board composed of academic researchers and supporters, and representatives of environmental groups, the local community, including governments, refuge personnel, and foundations. All OERC activities will be carefully coordinated with those of the Okefenokee NWR, local communities and school systems, the university system, nature-based tourism organizations and others involved in similar efforts in the area to encourage synergy, rather than duplication of efforts.

The Georgia Nature-Based Tourism Association is a statewide non-profit organization with a mission of providing a voice to educate public and private decision-makers about the need to integrate economic development with resource conservation and other issues of interest to association members. The organization promotes a shared vision of the State of Georgia as a nature-based tourism destination. Because of the tourist significance of Okefenokee NWR to the region, members of the staff are key members of this association.

PLANNING PROCESS

This Draft Comprehensive Conservation Plan/Environmental Assessment is being prepared in compliance with the National Wildlife Refuge System Improvement Act of 1997, and the National Environmental Policy Act of 1969. The Refuge System Improvement Act requires the USFWS to actively seek public involvement in environmental planning. The planning process and specific issues that were identified for Okefenokee NWR are presented in detail within the comprehensive conservation plan. It also requires the USFWS to seriously consider all reasonable alternatives, including a "no action" alternative. These alternatives are examined closely within this environmental assessment.

II. Affected Environment

See Section II.Refuge Environment in the Draft Comprehensive Conservation Plan for Okefenokee NWR.

III. Alternatives

FORMULATION OF ALTERNATIVES

Alternatives are different approaches or combinations of management objectives and strategies designed to achieve: the refuge purpose and vision; the goals of the National Wildlife Refuge System; and the mission of the USFWS. Alternatives are formulated to address the significant issues, concerns, and problems identified by the USFWS and the public during public scoping.

The four alternatives evaluated in full through this EA are:

Alternative 1. Maintain Current Management (No Action)
Alternative 2. Integrated Landscape Management (Preferred Alternative)
Alternative 3. Conservation Through Natural Processes
Alternative 4. Refuge Focused Management

Two additional alternatives were rejected prior to full evaluation.

Alternative 2. Integrated Landscape Management is the USFWS's preferred alternative for managing Okefenokee NWR. This alternative strives for a balanced approach to the key issues and refuge mandates while maintaining the needs of wildlife first.

DESCRIPTION OF ALTERNATIVES

ALTERNATIVE 1 MAINTAIN CURRENT MANAGEMENT (NO ACTION ALTERNATIVE)

The current management of Okefenokee NWR recognizes the importance of looking beyond the refuge boundary. Open communication and partnerships with adjacent landowners and interest groups downstream from the Okefenokee Swamp are important aspects of the current management strategy. To protect the resources outside the refuge boundary, as well as within the refuge, cooperation during emergency fire/weather incidents has been established and would be continued under this alternative. Upland management would emphasize the maintenance and restoration of longleaf pine communities. The refuge would continue to seek partnerships with adjacent landowners to enhance the refuge's habitat for the endangered red-cockaded woodpecker and associated species by providing corridors between refuge upland management compartments or expanding foraging and nesting areas. Environmental parameters would be monitored, adding additional parameters as issues arise. Current staff would monitor selected flora and fauna for long-term trends. Other institutions would be sought to investigate topics in detail. The protection of wilderness qualities is considered in management decisions and standard operating procedures are established for management activities within the wilderness. The use of fire to benefit the resources is implemented and expanded. The refuge messages are disseminated through the public services program. All six priority uses (e.g., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) are incorporated in the current program. Emphasis is on refuge facilities and activities with some outreach avenues established at both the local and state level. Recreational solitude is emphasized through the current canoe system. Current staffing has limited the quantity and quality of the services the refuge provides. With the addition of 20 recently requested positions identified in Refuge Operating Needs (RONS), staffing would be adequate to meet the management needs at the level presented in this alternative.

A. Wildlife Management

Goal 1.A. Provide optimum habitat and protection for threatened and endangered species and other native fauna on refuge lands with the potential of adjacent landowners enhancing the quality of refuge habitat.

B. Resource Protection

Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.

C. Wilderness Values

Goal 1.C. Protect and preserve the Okefenokee wilderness, while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.

D. Public Services

Goal 1.D. Provide accessible opportunities for hunting, fishing, wildlife observation wildlife photography, and environmental education and interpretation when compatible to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.

E. Partnerships

Goal 1.E. Support ecosystem-based cooperation through good communication and partnerships with landowners and land managers immediately adjacent and downstream from the refuge to facilitate refuge management.

F. Administration

Goal 1.F. Provide adequate staff, facilities, and equipment in a healthful work environment to support refuge goals and objectives in a safe manner.

ALTERNATIVE 2. INTEGRATED LANDSCAPE MANAGEMENT (PREFERRED ALTERNATIVE)

Threats to the refuge are becoming more prominent as development activities occur in northeast Florida and southeast Georgia. Although Okefenokee NWR is a large system in itself, it can be greatly compromised by activities a distance away from its boundary. Through Alternative 2, the refuge staff fully recognizes the impact these activities may have on the integrity of the swamp. These “zones of influence” vary depending on the resources involved. Under this alternative, the staff would continue activities as stated in Alternative 1 and extend beyond the immediate neighbors to address issues associated with the aquifer, air shed, and biota exchange pathways. Extensive resource sharing and networking with other refuges, state agencies, organizations, specialists, researchers, and private citizens would expand the knowledge base and develop cooperation between interest groups. Restoration of natural systems, native communities, and healthy environments would be emphasized thus promoting regionally a high quality of life. Within the refuge, the original refuge purpose, natural processes, and the wilderness philosophy will be strongly considered in all decisions. Management within the wilderness will be evaluated through the Minimum Requirement Decision Guide. Monitoring environmental parameters, flora and fauna would be incorporated into an integrated study to gain knowledge on the health of the Okefenokee ecosystem. The refuge and surrounding area would be promoted, linking recreational and educational avenues. Education and outreach would be expanded with an emphasis on the health of the whole ecosystem and the links between the components. Staffing would be expanded to meet the needs of partners and the greater number of interest groups, and accommodate data and resource sharing. A significant increase in staff is presented in this alternative due to the time necessary to manage the Okefenokee NWR with a greater consciousness for the wilderness

resource. Ninety-eight additional staff members would be needed to fully implement this alternative at the highest quality level.

A. Wildlife Management

Goal 2.A. Promote and provide optimum habitat and protection for threatened and endangered species and conserve the natural diversity, abundance, and ecological function of native flora and fauna on and off refuge lands.

B. Resource Protection

Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems where possible to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.

C. Wilderness Values

Goal 2.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee Wilderness, leaving it untrammeled by man while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.

D. Public Services

Goal 2.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.

E. Partnerships

Goal 2.E. Promote communication, cooperation, and partnerships between local, state, and federal agencies, land managers, and private citizens within the "zones of influence" to conserve the integrity of the pathways associated with resource protection, wildlife populations, and public services.

F. Administration

Goal 2.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics and the "zones of influence."

ALTERNATIVE 3. CONSERVATION THROUGH NATURAL PROCESSES

Management of the upland management compartments outside the wilderness boundary would be similar to Alternative 2, including the interest in networking and partnerships to address outside threats within the "zones of influence." This alternative differs from the others in the concept of embracing the exclusive use of natural processes to govern the health of the Okefenokee Wilderness Area. It also promotes primitive and unconfined recreation. Hand tools and non-motorized equipment would be used to maintain the network of boat trails despite the result of minimum tool decisions. The use of motorized boats by the public in designated areas as established in the legislation for the Okefenokee Wilderness Area would continue; however, motorized transportation, such as motorboats, airboats, and helicopters, and equipment would not be allowed for administrative purposes except for emergencies such as wildland fires. Large crews in canoes using hand tools would maintain the trail system. To promote primitive and unconfined recreation, the canoe reservation system would be eliminated along with all platforms, toilets, and trail markers. The visitors would be allowed to travel throughout the swamp and camp where they are able. Natural processes are relied on exclusively with no prescribed fires conducted on interior wilderness islands.

Protection of private property adjacent to the refuge would be focused on due to the increased threat of wildland fires moving off refuge lands. Land purchases to create a fire management zone outside the wilderness area would be considered. Fire, water levels, and weather parameters would be monitored to make predictions to meet the needs of adjacent landowners. Other environmental, and flora and fauna monitoring would continue at a level to determine general long-term trends as they relate to natural processes. Obtaining data on trends of the endangered red-cockaded woodpecker on interior islands would be limited to Billys Island that is accessible by boat. A significant increase in staff over Alternative 2 is due to the realization of the time and effort needed to maintain trails and conduct surveys in compliance with the specified tool restrictions. One hundred twenty nine, mostly resource management staff, have been identified to fully implement this alternative.

A. Wildlife Management

Goal 3.A. Allow natural processes in wilderness to govern the habitat used by threatened and endangered species and other native fauna. Promote and provide optimum habitat and protection for threatened and endangered species and other native flora and fauna outside the wilderness area.

B. Resource Protection

Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.

C. Wilderness Values

Goal 3.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee Wilderness, leaving it untrammeled by man while providing primitive and unconfined recreation, education, scientific study, conservation ethics, and scenic vistas.

D. Public Services

Goal 3.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem and emphasize primitive and unconfined recreation within the Okefenokee Wilderness Area.

E. Partnerships

Goal 3.E. Develop support and understanding from local, state, and federal agencies, land managers, and private citizens for maximizing natural processes within the Okefenokee Swamp and develop networks to conserve the integrity of the pathways associated with resource protection, wildlife populations, and public services.

F. Administration

Goal 3.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics and the “zones of influence.”

ALTERNATIVE 4. REFUGE FOCUSED MANAGEMENT

This alternative would focus the refuge staff activities internally, within the jurisdictional boundaries, to the land that is directly under the care of the USFWS as Okefenokee NWR. Collecting information on outside threats would continue but few partnerships would be pursued. The refuge would rely on

interest groups to carry the refuge's concerns forward to the appropriate level. The restoration of native communities and the health of resident wildlife species would be emphasized on refuge lands. Monitoring environmental parameters, flora and fauna would demonstrate long-term trends, environmental changes or the results of management practices on refuge lands. Research, management, protection, education, and public use would be conducted to maximize benefits to Okefenokee NWR specifically. Land acquisition would be emphasized on high priority areas rather than forming partnerships. This alternative has an increase in staff similar to Alternative 2 because of the additional time and manpower needed to conduct surveys, trail maintenance, and other management functions within the wilderness area. The additional staff members identified in Alternative 2, for developing and maintaining partnerships and outreach, are not included in Alternative 4 due to the emphasis on refuge lands only. Eighty-four additional staff members are necessary to fully implement this alternative.

A. Wildlife Management

Goal 4.A. Provide optimum habitat and protection for threatened and endangered species and conserve the natural diversity, abundance, and ecological function of other native flora and fauna on refuge lands.

B. Resource Protection

Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.

C. Wilderness Values

Goal 4.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee wilderness, leaving it untrammeled by man while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.

D. Public Services

Goal 4.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the refuge while maintaining the wilderness resource of the Okefenokee Wilderness Area.

E. Partnerships

Goal 4.E. Rely on adjacent landowners and interest groups to represent views of the refuge and be proactive in protecting the Okefenokee NWR from outside threats to ensure the health of the refuge resources.

F. Administration

Goal 4.F. Provide adequate staff and volunteers with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics.

ALTERNATIVES REJECTED

Maximize Public Use: Maximizing public use over other mandates deviates from the Service Policy. The fundamental mission of the National Wildlife Refuge System is wildlife conservation: wildlife must come first in the management of refuges. The USFWS will allow and provide for public use of a refuge - to the extent possible - as long as the uses are compatible with this mission and the purposes for which the refuge was established. In the development of public use opportunities, appropriate, compatible wildlife-dependent recreation uses will be emphasized. However, public use must be at a level where wildlife populations and habitats are unharmed.

Expand the refuge through acquisition of the entire watershed area in Georgia: The USFWS acquiring the watershed related to the Okefenokee Swamp is not feasible. While the USFWS has the authority to acquire appropriate lands from willing sellers to fulfill its mission, those lands must support a critical need. With more than 520 national refuges requesting funds from Congress for land purchases, it is not feasible to think funds would be allocated for the refuge to purchase such an extensive area.

MANAGEMENT COMMON TO ALL ALTERNATIVES

UPLAND MANAGEMENT COMPARTMENTS

Management of the upland management compartments outside the swamp and the wilderness area is similar throughout the alternatives. The primary objective for these areas is to restore the habitat to conditions similar to pre-European settlement, while also considering the immediate needs of the endangered red-cockaded woodpecker. Standard silvacultural practices and prescribed fire are used within these areas.

Table 11. Summary table on major differences between alternatives

	Alternative 1. Maintain Current Management	Alternative 2. Integrated Landscape Management (Preferred Alternative)	Alternative 3. Conservation Through Natural Processes	Alternative 4. Refuge Focused Management
Wildlife Management				
	Provide enhanced habitat and protection for trust species and other native fauna on refuge lands.	Expand on Alternative 1; plus,	Manage wildlife and its habitat outside the wilderness as in Alternative 2.	Similar to Alternative 2 with all activity associated with refuge lands only.
	Seek partnerships with adjacent landowners related to RCW habitat requirements	Provide high quality habitat and protection for trust species.	Monitor select islands as representative of wilderness island RCW populations as access permits.	Share data as requested
	Continue monitoring general occurrence/distribution of fauna.	Conserve the natural diversity, abundance and ecological function of native flora and fauna.	Monitor and inventory indicator species to determine habitat quality within wilderness.	
	Continue limited monitoring of RCW populations to determine status on refuge lands.	Evaluate management options in the context of wilderness.		
	Identify factors influencing declines in fishery	Expand monitoring to gain knowledge about limiting factors.		
		Share data to gain an understanding of the area dynamics of wildlife movements and distribution.		
		Identify wildlife species as wildlife health and contaminant availability indicators within ecosystem.		
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	Alternative 1. Maintain Current Management	Alternative 2. Integrated Landscape Management (Preferred Alternative)	Alternative 3. Conservation Through Natural Processes	Alternative 4. Refuge Focused Management
Resource Protection	Address threats to refuge health as they are identified. Maintain and/or restore landscape features to imitate pre-European distribution and frequency. • Preserve area's cultural heritage. • Preserve wilderness qualities. • Enhance protection of adjacent lands and resources. • Allow fire to affect the swamp interior as part of the natural process. (modified suppression)	• Same as Alternative 1; plus, • Identify "zones of influence" in relation to resources. • Promote landscape features and healthy natural systems on and off the refuge. • Establish agreements or acquire lands to protect resources. • Monitor environmental parameters as part of a network to determine the health of the ecosystem.	• Promote the health of the system as in Alternative 2. • Allow natural processes to occur without interference from man. • Utilize satellite images to assess habitat conditions. • Protect cultural resources to the extent possible, considering travel, time, and safety within the wilderness.	• Maintain and/or restore habitat features to imitate pre-European distribution and frequency on refuge lands. • Protect resources through land acquisition. • Monitor parameters within the refuge.

	Alternative 1. Maintain Current Management	Alternative 2. Integrated Landscape Management (Preferred Alternative)	Alternative 3. Conservation Through Natural Processes	Alternative 4. Refuge Focused Management
Wilderness Values	• Evaluate activities within wilderness through discussions and establish Special Operating Procedures to set guidelines. • Emphasize solitude. • Maintain current day use/camping facilities and reservation system. • Continue to allow motorboat and canoe trails as designated in the establishing legislation. • • Maintain trails with trail cutter and other motorized equipment. • Use helicopters for wildland fire surveillance, prescribed fire, and access to wilderness islands for management purposes.	• Evaluate activities within wilderness through Minimum Requirement Decision Guides. • Emphasize solitude. • Maintain facilities and reservation system. • Promote the wilderness resource and its values. • Continue to allow motorboat and canoe trails as designated in the establishing legislation. • Maintain trails using appropriate tools to reduce human and resource disturbance. • Use helicopters over the wilderness during emergencies and where it is determined to be the minimum tool to meet management objectives. • Evaluate human carrying capacity of the wilderness area and adjust public use appropriately.	• Evaluate activities within wilderness through Minimum Requirement Decision Guides. • Emphasize primitive and unconfined recreation. • Emphasize challenge and self-sufficiency. • Minimize motorboat usage to the extent allowable in wilderness legislation. • Maintain wilderness trails with hand tools. • Allow natural processes exclusively to manage the wilderness landscape. • Reduce helicopter flights to only emergency situations, including wildland fire. • Evaluate human carrying capacity of the wilderness area and adjust public use appropriately.	• Same as Alternative 2.

	Alternative 1. Maintain Current Management	Alternative 2. Integrated Landscape Management (Preferred Alternative)	Alternative 3. Conservation Through Natural Processes	Alternative 4. Refuge Focused Management
Public Services	• Maintain current opportunities for the six priority uses. • Promote public appreciation and greater awareness of the Okefenokee ecosystem. • Maintain current wilderness facilities and trails. • Build volunteer and partnership support. • Continue on-refuge environmental education and interpretation. • Form partnership with Okefenokee Education and Research Center.	• Expand on Alternative 1; plus, • Increase and enhance outreach opportunities. • Promote area, linking recreational and educational avenues. • Expand education/outreach to reflect ecosystem health and connectivity. • Manage appropriate level of public use in relation to wilderness.	• Education, outreach, and recreation opportunities outside the wilderness, as in Alternative 2. • Discontinue overnight canoe reservation system to emphasize unconfined recreation. • Eliminate conveniences within the wilderness to enhance the values of the wilderness experience, including composting toilets and shelters. • Require pack out of human waste. • Minimize human hand on the wilderness area. • Maintain trails using hand tools and non-motorized equipment.	• Similar to Alternative 1 with a strong emphasis on refuge resources and management. • Provide quality experiences on the refuge related to the priority uses. • Build quality environmental education and interpretation programs that promote the refuge.

	Alternative 1. Maintain Current Management	Alternative 2. Integrated Landscape Management (Preferred Alternative)	Alternative 3. Conservation Through Natural Processes	Alternative 4. Refuge Focused Management
Partnerships	• Support ecosystem-based partnerships with adjacent landowners, education institutions, interest groups, and Okefenokee Education and Research Center. • Continue current partnerships related to management of surrounding lands for fire purposes. • Participate in regional and national surveys and share data where appropriate.	• Expand on Alternative 1; plus, • Promote communication, cooperation, and partnerships to conserve the integrity of the ecosystem. • Promote research opportunities for a full understanding of the ecosystem processes. • Develop a network for sharing and analyzing data within "zones of influence."	• Similar to Alternative 2 with the additional emphasis on manual methods of accomplishing tasks within the wilderness. • Develop agreements, partnerships, and advocacy groups to support full implementation of natural processes management. • Gain understanding and support of "natural processes" management from Congress. • Develop partnerships with groups to provide a work force for maintaining trails by hand.	• Support communication and partnerships with landowners and interest groups to ensure the health of refuge resources. • Partner with researchers and educational institutions to gain knowledge of the refuge's resources.

	Alternative 1. Maintain Current Management	Alternative 2. Integrated Landscape Management (Preferred Alternative)	Alternative 3. Conservation Through Natural Processes	Alternative 4. Refuge Focused Management
Administration	• Continue to develop internal USFWS and external partnerships to share equipment, staff, and services. • Integrate staff into communities through communication, participation, and partnerships. • Promote participation in cooperative activities. • Expand refuge staff by 20 positions. • Provide adequate facilities and support to accommodate new positions as they are established. • Increase funding to support the accomplishment of goals.	• Same as Alternative 1; plus, • Provide adequate staff, partners, and volunteers sensitive to wilderness ethics and "zones of influence." • Expand refuge staff by 98 positions.	• Provide staff with wilderness education and training in hand and primitive tool use. • Establish compensation protocol for private property damage when natural processes leave the refuge. • Provide adequate staff, partners, and volunteers sensitive to wilderness and physically able to do the manual labor required. • Expand refuge staff by 129 positions.	• Similar to Alternative 2 with reduced effort with partnerships. • Increase staff by 84 positions. • Obtain funds for acquisition.

Table 12. Matrix of objectives and strategies for each issue and alternative

A. Wildlife Management			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focused Management**
Goal 1.A. Provide optimum habitat and protection for threatened and endangered species and other native fauna on refuge lands with the potential of adjacent landowners enhancing the quality of refuge habitat.	*Goal 2.A. Promote and provide high quality habitat and protection for threatened and endangered species and conserve the natural diversity, abundance, and ecological function of native flora and fauna on and off refuge lands.*	*Goal 3.A. Allow natural processes in wilderness to govern the habitat used by threatened and endangered species and other native fauna. Promote and provide optimum habitat and protection for threatened and endangered species and other native flora and fauna outside the wilderness area.*	*Goal 4.A. Provide optimum habitat and protection for threatened and endangered species and conserve the natural diversity, abundance and ecological function of other native flora and fauna on refuge lands.*
Threatened and Endangered Species			
1.A.1. Protect and maintain the threatened and endangered species populations, expanding their populations where possible, and enhancing the habitat on the refuge by working with adjacent landowners.	**2.A.1. Protect and maintain the threatened and endangered species populations, expanding their populations where possible, and enhancing the habitat on the refuge by working with adjacent landowners. Encourage other land managers in the area to promote appropriate habitat for threatened and endangered species to create a larger gene pool, increase opportunities for survival within the ecosystem, and restore a piece of the area's natural heritage.**	**3.A.1. Protect and maintain the threatened and endangered species populations outside the wilderness area, expanding their populations where possible, and enhancing the habitat on the refuge by working with adjacent landowners. Encourage other land managers in the area to promote appropriate habitat for threatened and endangered species to create a larger gene pool, increase opportunities for survival within the ecosystem, and restore a piece of the area's natural heritage.**	**4.A.1. Protect and maintain the threatened and endangered species populations, expanding their populations where possible**.
1.A.1.1. Continue to monitor the status of red-cockaded woodpecker colonies within the Okefenokee NWR, accessing wilderness islands when funds allow.	2.A.1.1. Continue to monitor annually the status of RCW groups on the uplands outside the wilderness.	3.A.1.1. Same as 2.A.1.1.	4.A.1.1. Same as 2.A.1.1.
1.A.1.2. Continue to band all RCW outside the wilderness to identify movements and cluster dynamics.	2.A.1.2. Continue to band all RCWs outside the wilderness to identify movements and group dynamics and evaluate the need and feasibility of banding RCWs within the wilderness.	3.A.1.2. Continue to band all RCWs outside the wilderness to identify movements and cluster dynamics.	4.A.1.2. Same as 2.A.1.2.
1.A.1.3. Use artificial cavities where needed to enhance an existing cluster or encourage the use of an area adjacent to active clusters outside the wilderness.	2.A.1.3. Use artificial cavities where needed to enhance existing clusters or encourage the use of an area adjacent to active clusters outside the wilderness and evaluate the need for artificial cavities on the interior islands after each wilderness survey.	3.A.1.3. Use artificial cavities where needed to enhance an existing cluster or encourage the use of an area adjacent to active clusters outside the wilderness.	4.A.1.3. Same as 2.A.1.3.
1.A.1.4. Survey the status of RCW clusters on wilderness islands to assess activity, suitability of cavities, and habitat conditions when funds are available.	2.A.1.4. Survey the status of RCW clusters on wilderness islands every other year during the breeding season to assess activity, suitability of cavities, and habitat conditions. Complete a summary report of conditions and recommendations.	3.A.1.4. Allow natural processes to govern RCW clusters on wilderness islands. No monitoring of the islands will be conducted except on Billys Island (accessible by boat) due to the elimination of helicopter use over the wilderness area.	4.A.1.4. Same as 2.A.1.4.
1.A.1.5. Survey a portion of longleaf pine habitat for RCW activity each year	2.A.1.5. Identify potential RCW habitat using vegetation maps and aerial photos and survey 10 percent of the area each year for RCW clusters.	3.A.1.5. Identify potential RCW habitat using vegetation maps and aerial photos and survey 10 percent of the area outside the wilderness area each year for RCW clusters.	4.A.1.5. Same as 2.A.1.5.

A. Wildlife Management			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focused Management**
Goal 1.A. Provide optimum habitat and protection for threatened and endangered species and other native fauna on refuge lands with the potential of adjacent landowners enhancing the quality of refuge habitat.	*Goal 2.A. Promote and provide high quality habitat and protection for threatened and endangered species and conserve the natural diversity, abundance, and ecological function of native flora and fauna on and off refuge lands.*	*Goal 3.A. Allow natural processes in wilderness to govern the habitat used by threatened and endangered species and other native fauna. Promote and provide optimum habitat and protection for threatened and endangered species and other native flora and fauna outside the wilderness area.*	*Goal 4.A. Provide optimum habitat and protection for threatened and endangered species and conserve the natural diversity, abundance and ecological function of other native flora and fauna on refuge lands.*
1.A.1.6. Through guidance from the Regional RCW coordinator, identify the refuge's contribution to the regional resource.	2.A.1.6. Evaluate the need for a population viability model to assess RCW populations at Okefenokee NWR and in cooperation with the Regional RCW Coordinator, identify the refuge's contribution to the regional resource.	3.A.1.6. Same as 2.A.1.6.	4.A.1.6. Same as 2.A.1.6.
1.A.1.7. Promote forest management practices designed to benefit RCWs and facilitate growth of longleaf pine both on and off the refuge.	2.A.1.7. Promote forest management practices designed to benefit RCWs and associated community species and facilitate growth of longleaf pine, both on the refuge and on adjacent state and private lands.	3.A.1.7. Same as 2.A.1.7.	4.A.1.7. Promote forest management practices designed to maximize benefit to RCWs and associated community species and facilitate growth of longleaf pine on the refuge.
1.A.1.8. Conduct periodic surveys on gopher tortoise, Bachman's sparrow, and fish.	2.A.1.8. Seek incentives for landowners to grow longleaf pine stands adjacent to the refuge to at least 60 years-old for the benefit of RCWs and other endemic species associated with longleaf pine – wiregrass habitat.	3.A.1.8. Same as 2.A.1.8.	4.A.1.8. Same as 2.A.1.9.
1.A.1.9. Translocate RCWs to prepared upland management compartments when warranted.	2.A.1.9. Develop and implement surveys for "focal" species of mammals, birds, fish, amphibians, and reptiles, particularly those species that are threatened, endangered, or species of special concern (e.g., Rafinesque's big-eared bat, round-tailed muskrat, pocket gopher, Sherman's fox squirrel, gopher tortoise, Bachmans sparrow, black-banded sunfish, mud sunfish, and banded topminnow).	3.A.1.9. Same as 2.A.1.9.	4.A.1.9. Same as 2.A.1.10.
1.A.1.10. Same as 2.A.1.12.	2.A.1.10. Consider acquisition of property that would benefit populations of threatened and endangered species to be high priority.	3.A.1.10. Same as 2.A.1.10	4.A.1.10. Same as 2.A.1.11.
1.A.1.11. Same as 2.A.1.13.	2.A.1.11. Evaluate the potential for reintroduction of endangered species that occurred historically at Okefenokee NWR or augmentation of existing populations through translocation from outside sources (e.g., RCW).	3.A.1.11. Same as 2.A.1.11.	4.A.1.11. Same as 2.A.1.14.
	2.A.1.12. Continue to work with landowner/land manager adjacent to the east side of the refuge on Trail Ridge to provide habitat that enhances the use of refuge lands by RCWs.	3.A.1.12. Same as 2.A.1.12.	4.A.1.12. Same as 2.A.1.15.

A. Wildlife Management			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focused Management**
Goal 1.A. Provide optimum habitat and protection for threatened and endangered species and other native fauna on refuge lands with the potential of adjacent landowners enhancing the quality of refuge habitat.	*Goal 2.A. Promote and provide high quality habitat and protection for threatened and endangered species and conserve the natural diversity, abundance, and ecological function of native flora and fauna on and off refuge lands.*	*Goal 3.A. Allow natural processes in wilderness to govern the habitat used by threatened and endangered species and other native fauna. Promote and provide optimum habitat and protection for threatened and endangered species and other native flora and fauna outside the wilderness area.*	*Goal 4.A. Provide optimum habitat and protection for threatened and endangered species and conserve the natural diversity, abundance and ecological function of other native flora and fauna on refuge lands.*
	2.A.1.13. Continue working with Georgia Forestry Commission under a MOU to create suitable habitat on Cowhouse Island for RCWs and investigate additional partners on Cowhouse Island to expand the amount of suitable RCW habitat.	3.A.1.13. Same as 2.A.1.13.	4.A.1.13. Same as 2.A.1.16.
	2.A.1.14. Develop and implement surveys to determine distribution and population status of amphibians and reptiles, particularly those species that are threatened, endangered, or species of special concern.	3.A.1.14. Same as 2.A.1.14.	
	2.A.1.15. Determine the historic use of the Okefenokee NWR by wood storks and examine conditions for re-establishing populations within the refuge.	3.A.1.15. Same as 2.A.1.15.	
	2.A.1.16. Develop and implement surveys to determine distribution, population status, and needs of rare fishes within the Okefenokee NWR.	3.A.1.16. Same as 2.A.1.16.	
Fisheries			
1.A.2. Determine factors influencing declines in the Okefenokee NWR's fishery by examining water chemistry.	**2.A.2. Identify factors influencing declines in the Okefenokee NWR's fishery by examining water chemistry, groundwater withdrawals, water quality, pH levels, invertebrate populations, and the physical environment. Evaluate feasibility of restoring the fish population.**	**3.A.2. Identify factors influencing declines in the Okefenokee NWR's fishery by examining water chemistry, groundwater withdrawals, water quality, pH levels, invertebrate populations, and the physical environment**.	**4.A.2. Identify factors influencing declines in the Okefenokee NWR's fishery by examining water chemistry, groundwater withdrawals, water quality, pH levels, invertebrate populations, and the physical environment. Evaluate feasibility of restoring the fish population.**
1.A.2.1. Conduct surveys with the assistance of Georgia Department of Natural Resources and USFWS Fisheries Resources Office at 2-year intervals to assess changes in fish abundance, distribution, and health of individuals.	2.A.2.1. Review past research for the extent of aquatic habitat changes that have occurred in the Okefenokee Swamp that may relate to fish population dynamics. Use water quality databases and hydrologic information to parameterize and develop fisheries models.	3.A.2.1. Same as 2.A.2.1.	4.A.2.1. Same as 2.A.2.1.

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1.A.2.2. Collaborate with Georgia Department of Natural Resources, Suwannee River Management District, and USGS on issues related to water resources and the fisheries.	2.A.2.2. Determine the changes in fish population dynamics using current and historic census data. In cooperation with the Georgia Department of Natural Resources - Fisheries Division and the USFWS Fisheries Resources Office, identify "focal" fish species to represent the overall health of the fisheries. Develop sampling scheme to sample fish species in aquatic habitats based upon availability of habitat types. Conduct surveys at 2-year intervals to assess changes in fish community structure, particularly with emphasis on abundance of aquatic invertebrates and non-game species.	3.A.2.2. Determine the changes in fish population dynamics using current and historic census data. In cooperation with the Georgia Department of Natural Resources - Fisheries Division and USFWS Fisheries Resources Office, identify "focal" fish species to represent the overall health of the fisheries. Develop sampling scheme to sample fish species in aquatic habitats based upon availability of habitat types.	4.A.2.2. Same as 2.A.2.2.
	2.A.2.3. Develop or further promote partnerships with federal, state, and private organizations to manage water resources and protect fish habitat within the Okefenokee watershed.	3.A.2.3. Same as 2.A.2.3.	4.A.2.3. Same as 2.A.2.4.
	2.A.2.4. Analyze weather station and water quality monitoring data from Okefenokee NWR sites. Determine the need to modify existing monitoring protocols and collect additional water quality data to monitor long-term health of Okefenokee NWR's water resources and its fisheries.	3.A.2.4. Same as 2.A.2.4.	
Reptiles			
1.A.3. Encourage research on reptile species, especially associated with the upland pine community.	**2.A.3. Determine the status, specific habitat requirements, and limiting factors of reptile species, including those associated with the upland pine community. Evaluate feasibility of restoration.**	**3.A.3. Determine the status, specific habitat requirements, and limiting factors of reptile species, including those associated with the upland pine community. Evaluate feasibility of restoration outside the wilderness.**	**4.A.3. Determine the status, specific habitat requirements, and limiting factors of reptile species, including those associated with the upland pine community. Evaluate feasibility of restoration.**
1.A.3.1. Record location of reptile sightings.	2.A.3.1. Develop and employ survey methods to determine status and distribution of reptiles within the upland pine community, including pine snake, southern hognose snake, eastern diamondback rattlesnake, and mimic glass lizard. Compare findings with other populations.	3.A.3.1. Same as 2.A.3.1	4.A.3.1. Develop and employ survey methods to determine status and distribution of reptiles within the upland pine community, including pine snake, southern hognose snake, eastern diamondback rattlesnake, and mimic glass lizard.
1.A.3.2. Protect gopher tortoises from development by surveying activity, protecting burrows where possible, marking individuals, and/or re-locating them.	2.A.3.2. Identify specific habitat requirements for the upland pine community reptile species and use GIS analysis to locate additional suitable sampling sites.	3.A.3.2. Same as 2.A.3.2.	4.A.3.2. Same as 2.A.3.2.

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1.A.3.3. Record location of incidental indigo snake sightings.	2.A.3.3. Monitor the status of gopher tortoises on the refuge and compare with other populations. Map the location of gopher tortoise burrows; establish the level of activity and use by commensal species.	3.A.3.3. Same as 2.A.3.3.	4.A.3.3. Monitor the status of gopher tortoises on the refuge. Map the location of gopher tortoise burrows; establish the level of activity and use by commensal species.
1.A.3.4. Prohibit stumping in timber sale areas.	2.A.3.4. Conduct a thorough review of literature to determine specific habitat requirements of indigo snakes, particularly for historic information (e.g., notes and sightings) that identifies sites within Okefenokee NWR where indigo snakes were found.	3.A.3.4. Same as 2.A.3.4.	4.A.3.4. Same as 2.A.3.4.
1.A.3.5. Conduct surveys of the American alligator to determine population trends.	2.A.3.5. Develop methods to survey for indigo snakes within the Okefenokee NWR to determine status and health of the population. Use GIS analyses to locate optimal habitats in which to focus survey efforts. Compare results with other populations.	3.A.3.5. Same as 2.A.3.5.	4.A.3.5. Develop methods to survey for indigo snakes within the Okefenokee NWR to determine status and health of the population. Use GIS analyses to locate optimal habitats in which to focus survey efforts.
	2.A.3.6. Consider development of habitat management guidelines that would benefit indigo snakes and balance with the needs of other species.	3.A.3.6. Same as 2.A.3.6.	4.A.3.6. Same as 2.A.3.6.
	2.A.3.7. Develop and implement surveys to determine the status, health, and population dynamics of the American alligator.	3.A.3.7. Same as 2.A.3.7.	4.A.3.7. Same as 2.A.3.7.
Amphibians			
1.A.4. Protect ephemeral wetlands for amphibians associated with the upland pine habitat.	**2.A.4. Maintain, enhance, and promote upland linkages to ephemeral wetlands for the flatwoods salamander, striped newt, gopher frog, and other amphibians.**	**3.A.4. Maintain, enhance, and promote upland linkages to ephemeral wetlands for the flatwoods salamander, striped newt, gopher frog, and other amphibians.**	**4.A.4. Maintain and enhance upland linkages to ephemeral wetlands for the flatwoods salamander, striped newt, gopher frog, and other amphibians.**
1.A.4.1. Allow researchers to sample ephemeral wetlands to verify presence or absence or key amphibian species.	2.A.4.1. Develop a spatial database of ephemeral wetlands on and adjacent to the refuge. Analyze existing digital elevation models and aerial photography to identify potential areas and follow up with ground-truthing sites.	3.A.4.1. Same as 2.A.4.1	4.A.4.1. Develop a spatial database of ephemeral wetlands on refuge lands. Analyze existing digital elevation models and aerial photography to identify potential areas and follow up with ground-truthing sites.
1.A.4.2. Protect the ephemeral wetlands by allowing fire to move freely into the wetlands to maintain herbaceous characteristics of the ponds.	2.A.4.2. Work with amphibian researchers from federal and state agencies or universities to establish sampling protocols and verify presence or absence of key amphibian species at ephemeral sites and surrounding habitat.	3.A.4.2. Same as 2.A.4.2.	4.A.4.2. Same as 2.A.4.2.

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	2.A.4.3. Protect the ephemeral wetlands by restricting activity within 100 feet, maintaining low understory vegetation around the perimeter, keeping logging debris away from the wetlands, and allowing fire to move freely into the wetlands to maintain herbaceous characteristics of the ponds and relatively open adjacent uplands.	3.A.4.3. Same as 2.A.4.3.	4.A.4.3. Same as 2.A.4.3.
	2.A.4.4. Minimize impacts to breeding amphibians along ephemeral wetland edges during October – December by providing unburned patches.	3.A.4.4. Same as 2.A.4.4.	4.A.4.4. Same as 2.A.4.4.
	2.A.4.5. Develop additional habitat management strategies to promote or maintain ephemeral wetlands in upland habitats on interior islands and upland management compartments.	3.A.4.5. Develop additional habitat management strategies to promote or maintain ephemeral wetlands in upland management compartments.	4.A.4.5. Same as 2.A.4.5.
	2.A.4.6. Restore the hydrology of ephemeral wetlands disrupted by ditches and borrow pits on the refuge and promote the restoration of these wetlands off the refuge.	3.A.4.6. Same as 2.A.4.6.	4.A.4.6. Restore the hydrology of ephemeral wetlands disrupted by ditches and borrow pits on the refuge.
Invertebrates			
1.A.5. Understand the invertebrate composition of the Okefenokee NWR.	**2.A.5. Understand and maintain the role of invertebrates in the structure and function of the Okefenokee ecosystem.**	**3.A.5. Understand and maintain the role of invertebrates in the structure and function of the Okefenokee ecosystem.**	**4.A.5. Understand and maintain the role of invertebrates in the structure and function of the refuge.**
1.A.5.1. As opportunities arise through funding and research, compile invertebrate data from the refuge.	2.A.5.1. Survey specific habitat types for species composition and relative abundance.	3.A.5.1. Same as 2.A.5.1.	4.A.5.1. Same as 2.A.5.1.
	2.A.5.2. Develop a reference collection of invertebrates from specific habitat types.	3.A.5.2. Same as 2.A.5.2.	4.A.5.2. Same as 2.A.5.2.
	2.A.5.3. Identify invertebrate species associated with the ephemeral ponds	3.A.5.3. Same as 2.A.5.3.	4.A.5.3. Same as 2.A.5.3.
	2.A.5.4. Evaluate Chironomidae (midge larvae) head capsules (and diatoms) in peat cores to categorize historical and present water quality regimes.	3.A.5.4. Same as 2.A.5.4.	4.A.5.4. Same as 2.A.5.4.
Birds			
1.A.6. Determine abundance and use patterns of the various resident and migratory birds to identify critical habitat components and trends.	**2.A.6. Understand the use patterns of select resident and migratory birds to identify critical habitat components and the impacts of management practices and natural events.**	**3.A.6. Understand the use patterns of select resident and migratory birds to identify critical habitat components and the impacts of management practices and natural events.**	**4.A.6. Understand the use patterns of select resident and migratory birds to identify critical habitat components and the impacts of management practices and natural events.**

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1.A.6.1. Conduct monthly bird surveys by airboat covering the Suwannee Canal, and Chesser, Grand, Chase, and Territory Prairies to obtain trends in populations of wading birds and occurrence data on other species using the swamp. Quarterly, conduct surveys out of Kingfisher Landing and Stephen C. Foster State Park.	2.A.6.1. As an indicator of the aquatic system quality, initiate a formal monthly survey of waterbird foraging habits by using a combination of airboat and aerial methods to cover the major open water and prairie habitats in a timely manner and correlate with measures of water depth and food sources. (New remote sensing techniques will be evaluated as they are developed.)	3.A.6.1. Identify key bird species to survey as indicators of habitat health and wilderness quality. Establish surveying protocols by canoe to give data on occurrence. Due to the prolonged survey period when conducted by canoe and the rapid movement of wading birds, distribution and use patterns would not be accurately represented.	4.A.6.1. Same as 2.A.6.1.
1.A.6.2. Conduct an annual colonial nesting bird survey of historical nesting sites and potential new sites from observations of large flocks	2.A.6.2. Establish a reporting system for potential wading bird nesting colonies if large flocks of wading birds are seen roosting or nesting during aerial flights between February and May. Further investigate these sites via foot, watercraft, or helicopter depending on accessibility. Identify potential colony sites through GIS habitat analysis and conduct standard aerial strip-transect surveys in these areas	3.A.6.2. Widespread colonial nesting surveys will end in order to eliminate helicopter disturbance over the wilderness. Macks Island and Gum Slough will be surveyed via ground transportation for yearly activity.	4.A.6.2. Same as 2.A.6.2.
1.A.6.3. Conduct annual helicopter surveys for ospreys during the peak nesting season to determine productivity.	2.A.6.3. Conduct annual helicopter surveys for ospreys during the peak nesting season to determine productivity and how productivity may change with changing water levels.	3.A.6.3. Eliminate aerial survey of nesting ospreys.	4.A.6.3. Same as 2.A.6.3
1.A.6.4. Conduct the annual point count surveys for passerine bird species during migration periods and breeding season within pine, scrub/shrub, and prairie habitat	2.A.6.4. Expand annual point counts during migration and breeding periods to assess changes in passerine bird species' composition and abundance. Contribute data to a national or regional database. Determine the need to augment point counts with other methods of studying avian species diversity (i.e., mist-netting and banding).	3.A.6.4. Same as 2.A.6.4.	4.A.6.4. Same as 2.A.6.4.
1.A.6.5. Contribute to the National Midwinter Waterfowl Survey by conducting survey by helicopter or airboat during first week in January	2.A.6.5. Eliminate Midwinter Waterfowl Survey because Okefenokee NWR is not an important contributor to this national database	3.A.6.5. Same as 2.A.6.5	4.A.6.5. Same as 2.A.6.5.
1.A.6.6. Contribute to the Annual Bald Eagle Survey by reporting incidental sightings and recording sightings on standard bird surveys.	2.A.6.6. Eliminate Annual Bald Eagle Survey because Okefenokee NWR is not an important contributor to this national database.	3.A.6.6. Same as 2.A.6.6	4.A.6.6. Same as 2.A.6.6.

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1.A.6.7. Maintain existing wood duck boxes on the east and west sides of the refuge through the assistance of the boy scouts.	2.A.6.7. Remove artificial nest boxes for wood ducks on the east side of the refuge and continue to maintain and monitor, through the assistance of the boy scouts, the use of the boxes on the west side of the refuge annually until 2008 and determine the efficiency of this program	3.A.6.7. Same as 2.A.6.7.	4.A.6.7. Same as 2.A.6.7.
1.A.6.8. Conduct periodic surveys of Bachman's sparrow in upland pine stands.	2.A.6.8. Establish at least 20 point counts in upland pine stands (>10 in longleaf and >10 in slash dominated; both presently existing and in areas to be restored) to monitor breeding bird populations for increases in priority species, focusing on brown-headed nuthatch and Bachman's sparrow.	3.A.6.8. Same as 2.A.6.8	4.A.6.8. Same as 2.A.6.8.
1.A.6.9. Rely on visitor observations for occurrence of bird species along the Chesser Island Boardwalk.	2.A.6.9. Establish at least one transect along the Chesser Island Boardwalk to survey transient land birds and breeding and wintering species. Survey each transect weekly.	3.A.6.9. Same as 2.A.6.9.	4.A.6.9. Same as 2.A.6.9.
Sandhill Cranes 1.A.6.10. Continue to participate in the late October "Sandhill Crane Survey" as part of a national effort to monitor migratory crane populations.	2.A.6.10. Investigate the feasibility of remote sensing, such as radar, for determining passerine bird movements and use of habitat within the swamp. If feasible, seek funding and implement.	3.A.6.10. Same as 2.A.6.10. as long as all equipment is outside the wilderness area.	4.A.6.10. Same as 2.A.6.10.
Swallow-tailed Kite 1.A.6.11. Continue cooperation with state agencies by providing sighting information for swallow-tailed kites.	2.A.6.11. Continue to participate in the late October "Sandhill Crane Survey," covering all potential occupied habitat, with emphasis on determining family group sizes as an indicator of yearly productivity of resident populations. Consider repeating several times within the count week to determine adequacy of a single count protocol.	3.A.6.11. Survey by canoe the sandhill crane population in Chesser and Grand Prairies for the late October "Sandhill Crane Survey."	4.A.6.11. Same as 2.A.6.11.
1.A.6.12. Allow Georgia Department of Natural Resources to conduct swallow-tailed kite surveys over the refuge.	2.A.6.12. Develop strip-transect aerial surveys by helicopter of open marsh areas to provide an estimate of current resident population size and distribution. In addition, conduct call-counts, following protocol established in previous studies and determine the most appropriate survey method. Compare current population estimates with results of past studies.	3.A.6.12. Conduct call-counts, following protocol established in previous studies. Compare current estimates with results of past studies and determine the most appropriate survey method.	4.A.6.12. Same as 2.A.6.12.

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	2.A.6.13. Determine the need for more intensive studies to detect changes in movements (home range), habitat use/suitability, and survival of resident cranes. Determine how the hydrological dynamics of Okefenokee's wet prairie system affect the resident crane population.	3.A.6.13. Same as 2.A.6.13	4.A.6.13. Same as 2.A.6.13.
	2.A.6.14. Continue cooperation with state agencies by providing sighting information for swallow-tailed kites.	3.A.6.14. Same as 2.A.6.14	4.A.6.14. Continue cooperation with state agencies by providing sighting information for swallow-tailed kites on the refuge.
	2.A.6.15. Determine the status of nesting swallow-tailed kites on the refuge and examine habitat components by conducting aerial (helicopter) surveys in late April through early May based on sightings and potential sites in cooperation with Georgia Department of Natural Resources. Record GPS coordinates, nest tree species, dominant vegetation, and site description.	3.A.6.15. Investigate nesting sites of swallow-tailed kites by foot or by watercraft depending on accessibility. Record GPS coordinates, nest tree species, dominant vegetation, and site description. Aerial surveys would not be allowed.	4.A.6.15. Determine the status of nesting swallow-tailed kites on the refuge and examine habitat components by conducting aerial surveys (i.e., helicopter) in late April through early May based on sightings and potential sites. Record GPS coordinates, nest tree species, dominant vegetation, and site description.
	2.A.6.16. Institute forest and wetland management practices that would optimize habitat for kites and also benefit other wildlife species. Encourage landowners of parcels adjoining the refuge to consider requirements of swallow-tailed kites in their management practices. Provide at least a 120-foot buffer around all nests.	3.A.6.16. Institute forest management practices on the edge of the swamp that would optimize habitat for kites and also benefit other wildlife species. Encourage landowners of parcels adjoining the refuge to consider requirements of swallow-tailed kites in their management practices. Provide at least a 120-foot buffer around all nests found.	4.A.6.16. Institute forest and wetland management practices that would optimize habitat for kites and also benefit other wildlife species. Provide at least a 120-foot buffer around all nests.
Mammals			
1.A.7. Continue to work with Georgia Department of Natural Resources to monitor and manage the mammal populations within and around the refuge.	**2.A.7. Continue to work with Georgia Department of Natural Resources and Florida Fish and Wildlife Conservation Commission to monitor and manage the mammal populations within and around the refuge.**	**3.A.7. Continue to work with Georgia Department of Natural Resources and Florida Fish and Wildlife Conservation Commission to monitor and manage the mammal populations within and around the refuge.**	**4.A.7. Monitor and manage the mammal populations within the refuge.**
1.A.7.1. Same as 2.A.7.1.	2.A.7.1. Conduct the annual bait station surveys with Georgia Department of Natural Resources and assess the need by 2007 for increasing or decreasing the amount of effort.	3.A.7.1. Same as 2.A.7.1.	4.A.7.1. Conduct the annual bait station surveys and assess the need by 2007 for increasing or decreasing the amount of effort.

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1.A.7.2. Same as 2.A.7.5.	2.A.7.2. Evaluate and implement other sampling methods to provide a robust estimate of Okefenokee black bear population dynamics and mast production by 2007 (i.e., remote cameras, hair snares, etc.).	3.A.7.2. Same as 2.A.7.2	4.A.7.2. Same as 2.A.7.2
	2.A.7.3. Work with federal and state partners to evaluate the need for spatially explicit habitat models for Okefenokee black bears	3.A.7.3. Same as 2.A.7.3.	4.A.7.3. Same as 2.A.7.5.
	2.A.7.4. Promote and assist in developing a cooperative management plan for black bears in Georgia and Florida.	3.A.7.4. Same as 2.A.7.5	4.A.7.4. Same as 2.A.7.6.
	2.A.7.5. Monitor the health of white-tailed deer population within the Okefenokee NWR every five years by examining deer from both the east and west sides of the refuge	3.A.7.5. Same as 2.A.7.6.	4.A.7.5. Same as 2.A.7.7.
	2.A.7.6. Determine suitable refuge habitat for the pocket gopher and establish survey methods to assess the status of this species on refuge lands.	3.A.7.6. Same as 2.A.7.7.	4.A.7.6. Same as 2.A.7.8
	2.A.7.7. Re-establish the pocket gopher if it has been extirpated and prevent future management practices that could potentially damage the habitat conditions necessary for this species.	3.A.7.7. Same as 2.A.7.8.	4.A.7.7. Same as 2.A.7.9.
	2.A.7.8. Determine the presence or absence of the Rafinesque's big-eared bat on the refuge by sound frequency survey techniques and determine the need for roost sites.	3.A.7.8. Ground search select areas for the presence of round-tailed muskrats and identify the location, density, and distribution of this species. Examine the select area every five years.	
	2.A.7.9. Using winter time aerial photography, identify location, density, and spatial distribution of round-tailed muskrat den sites every five years.		
Population Health and Contaminants			
1.A.8. Examine wildlife population health and contaminant availability on the refuge.	**2.A.8. Examine wildlife population health and contaminant availability within the ecosystem.**	**3.A.8. Examine wildlife population health and contaminant availability within the ecosystem.**	**4.A.8. Examine wildlife population health and contaminant availability on the refuge.**

A. Wildlife Management			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focused Management**
Goal 1.A. Provide optimum habitat and protection for threatened and endangered species and other native fauna on refuge lands with the potential of adjacent landowners enhancing the quality of refuge habitat.	*Goal 2.A. Promote and provide high quality habitat and protection for threatened and endangered species and conserve the natural diversity, abundance, and ecological function of native flora and fauna on and off refuge lands.*	*Goal 3.A. Allow natural processes in wilderness to govern the habitat used by threatened and endangered species and other native fauna. Promote and provide optimum habitat and protection for threatened and endangered species and other native flora and fauna outside the wilderness area.*	*Goal 4.A. Provide optimum habitat and protection for threatened and endangered species and conserve the natural diversity, abundance and ecological function of other native flora and fauna on refuge lands.*
1.A.8.1. Through special funding and/or cooperation with the Georgia Department of Natural Resources, analyze fish and wildlife species that may serve as indicators of elevated contaminant levels.	2.A.8.1. Work with bio-contaminant specialists from federal and state agencies to develop sampling protocols for collecting tissue, blood, or hair/feather samples to evaluate the levels of mercury, lead, and other contaminants in selected species (e.g., mammals - river otter, round-tailed muskrat, black bear; birds - white ibis, sandhill crane, osprey; amphibians - pig frog, greater siren; reptile - American alligator; fish and invertebrate species) every five years or when there is a concern	3.A.8.1. Same as 2.A.8.1.	4.A.8.1. Same as 2.A.8.1.
	2.A.8.2. Using water quality monitoring data and past contaminant studies, identify areas that may serve as “contaminant sinks” within which to focus sampling efforts.	3.A.8.2. Same as 2.A.8.2.	4.A.8.2. Same as 2.A.8.2.
	2.A.8.3. Examine amphipods for mercury and other contaminants to form a comparison level for future investigations.	3.A.8.3. Same as 2.A.8.3	4.A.8.3. Same as 2.A.8.3
Data Sharing			
1.A.9. Share data with interested individuals and agencies and participate in regional surveys.	2.A.9. Strive to maintain the natural diversity and abundance of wildlife species within the physiographic region of the Okefenokee Swamp by forming a network of agencies and organizations that would share data in a timely manner to influence management decisions and recognize problems within the system.	3.A.9. Strive to maintain the natural diversity and abundance of wildlife species within the physiographic region of the Okefenokee Swamp by forming a network of agencies and organizations that would share data in a timely manner to influence management decisions and recognize problems within the system.	
1.A.9.1. Same as 2.A.9.3.	2.A.9.1. Develop or further promote partnerships with federal and state management agencies to identify threats to the resources within the “zones of influence.”	3.A.9.1. Same as 2.A.9.1.	
	2.A.9.2. Create a database indicating wildlife surveys conducted by agencies and organizations within the physiographic region of the Okefenokee Swamp to gain an understanding of the regional perspective and the potential of movements between wildlife areas.	3.A.9.2. Same as 2.A.9.2., although data from the refuge would be limited.	
	2.A.9.3. Participate in regional efforts to compile data from wildlife surveys and observations.	3.A.9.3. Same as 2.A.9.3. although data from the refuge would be limited.	

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
Upland Communities			
1.B.1. Restore, enhance, and promote the native upland communities and the associated wetlands to maintain the natural vegetation mosaic, diversity, and viability found prior to European settlement within the greater Okefenokee ecosystem, while providing immediate needs for RCW.	**2.B.1. Restore, enhance, and promote the native upland communities and the associated wetlands to maintain the natural vegetation mosaic, diversity, and viability found prior to European settlement within the greater Okefenokee ecosystem, while maximizing opportunities for RCW activity.**	**3.B.1. Restore, enhance, and promote the native upland communities and the associated wetlands outside the wilderness area to maintain the natural vegetation mosaic, diversity, and viability found prior to European settlement within the greater Okefenokee ecosystem, while maximizing opportunities for RCW activity**	**4.B.1. Restore, enhance, and promote the native upland communities and the associated wetlands to maintain the natural vegetation mosaic, diversity, and viability found prior to European settlement on the refuge, while maximizing opportunities for RCW activity.**
1.B.1.1. Consider knowledge of historical vegetation on islands to determine whether longleaf pine should be planted or encouraged.	2.B.1.1. Investigate the pre-European settlement vegetation of wilderness islands by 2007, compiling descriptions from the literature on specific islands. If another vegetation class currently dominates it, determine whether it is desirable and feasible to return it to the pre-European settlement vegetation class.	3. B.1.1. Search the literature for the pre- European settlement vegetation of wilderness islands by 2007, compiling descriptions on specific islands. These descriptions will serve as baseline information to compare with current conditions, recognizing the past disturbance to the vegetation. Do not try to restore the vegetation but allow natural processes to take the vegetation through successional stages.	4.B. 1.1. Same as 2.B.1.1.
1.B.1.2. Same as 2.B.1.2.	2.B.1.2. Inventory upland management compartments, including understory species, to monitor conditions and identify management needs to progress toward a self-perpetuating longleaf forest. Develop forest management prescriptions by compartment, using a 1 percent line plot cruise, on a return interval of 10 years.	3.B.1.2. Same as 2.B.1.2.	4.B.1.2. Same as 2.B.1.2.
1.B.1.3. Evaluate prescribed burn cycle to maximize benefit to the plant species and RCW. Prescribe burn on a 2-3 year rotation.	2.B.1.3. Evaluate prescribed burn cycle to maximize benefit to the community plant species, black bears, RCWs, and other species associated with fire-dependent systems. Base the use of prescribed fire on need rather than on a set schedule (holistic approach).	3.B.1.3. Same as 2.B.1.3. outside the wilderness boundary.	4.B.1.3. Same as 2.B.1.3.

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
1.B.1.4. Review prescribed burns to evaluate whether operations are meeting the proposed objectives	2.B.1.4. Establish representative photo and vegetation sampling points within upland management compartments, islands, and wetlands to illustrate changes in the vegetation structure related to fire effects, management practices, and natural events.	3.B.1.4. Same as 2.B.1.4. except on wilderness islands where access would be limited due to the elimination of helicopter flights.	4.B.1.4. Same as 2.B.1.4.
1.B.1.5. Follow a set schedule for timber harvesting and prescribed fire.	2.B.1.5. Strive for a self-perpetuating longleaf forest as the majority of trees reach 100 years. Timber harvesting and prescribed fire would be conducted as needs occur. Use prescribed fire to maintain understory composition and structure as needed.	3.B.1.5. Strive for a self-perpetuating longleaf forest as the majority of trees reach 100 years. Timber harvesting and prescribed fire on upland management compartments would then be conducted as needs occur	4.B.1.5. Same as 2.B.1.5.
1.B.1.6. Create and maintain a multi-layered database for fire, forestry, and biological resource analysis, including but not limited to soils, hydrology, wildlife distribution, and vegetation.	2.B.1.6. Expand and maintain a multi-layered database for fire, forestry, and biological resource analysis including but not limited to soils, hydrology, wildlife distribution, and vegetation	3.B.1.6. Same as 2.B.1. 6.	4.B.1.6. Same as 2.B.1. 6.
1.B.1.7. Work with the Georgia Forestry Commission on its forest that adjoins the refuge to create demonstration areas that showcase long rotation silviculture and fire pre-suppression techniques.	2.B.1.7. Inventory Number One Island to identify the unique old-growth longleaf and slash pine components of the island for baseline information	3.B.1.7. Baseline data would not be collected due to the need for a helicopter to access Number One Island.	4.B.1.7. Same as 2.B.1.7.
1.B.1.8. Same as 2.B.1.11.	2.B.1.8. Promote, through partnerships, the establishment of a demonstration/community area emphasizing the native longleaf pine community such as seen at Southern Pines Elementary School, Southern Pines, North Carolina.	3.B.1.8. Same as 2.B.1.8.	4.B.1.8. Same as 2.B.1.11.
1.B.1.9. Wilderness islands will be prescribed burned using aerial ignition in the dormant season for hazardous fuel reduction and in the growing season for habitat restoration. Prescribed fire will be applied on a 3-year rotation for hazardous fuel reduction and on a sliding rotation for habitat reduction beginning with 2 years and increasing to 4 years.	2.B.1.9. Refuge staff will seek and promote the local/regional development of a wood-based market that utilizes the historic products of the native longleaf pine (Pinus palustris) and slash pine (Pinus elliottii).	3.B.1.9. Same as 2.B.1.9.	4.B.1.9. Same as 2.B.1.12.

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
1B.1.10. Prescribed fire, both aerial and ground ignition, will be applied to other uplands outside the wilderness in the dormant season for hazardous fuel reduction and in the growing season for habitat restoration. Prescribed fire will be applied on a 3-year rotation for hazardous fuel reduction and on a sliding rotation for habitat restoration beginning with 2 years and increasing to 4 years.	2.B.1.10. Encourage the Georgia Forestry Commission and the Florida Division of Forestry on their respective forests that adjoin the refuge to create demonstration areas that showcase long rotation silviculture and fire pre-suppression techniques.	3.B.1.10. Same as 2.B.1.10.	4.B.1.10. Same as 2.B.1.13.
1.B.1.11. Same as 2.B.1.14.	2.B.1.11. Continue to utilize the National Fire Plan Operation Reporting System (NFPORS) to develop Wildland Urban Interface projects that support fire wise activities.	3.B.1.11. Same as 2.B.1.11	4.B.1.11. Same as 2.B.1.14.
1.B.1.12. Same as 2.B.1.15.	2.B.1.12. Wilderness islands will be prescribed burned using aerial ignition in the dormant season for hazardous fuel reduction and in the growing season for habitat restoration. Prescribed fire will be applied as needed to meet habitat restoration goals, generally between 2 to 6 years	3.B.1.12. Wilderness islands will not be prescribed burned and natural processes, such as wildland fire, will be allowed to shape the landscape.	4.B.1.12. Same as 2.B.1.15.
1.B.1.13. Encourage the maintenance of the fuel reduction zone between the Swamps Edge Break and the Perimeter Road.	2.B.1.13. Prescribed fire, both aerial and ground ignition, will be applied to upland management compartments outside the wilderness in the dormant season for hazardous fuel reduction and in the growing season for habitat restoration on an “as needed” basis (generally between 2 to 6 years).	3.B.1.13. Same as 2.B.1.13.	4.B.1.13. Same as 1.B.1.13
1.B.1.14. Maintain annually, island helispots to provide an emergency landing area during prescribed fire operations and to allow safe access for forestry crews and biologists working with RCWs.	2.B.1.14. Annually plan and implement an average 6,200 acres of dormant season and 6,500 acres of growing season burning on refuge property to simulate the natural fire dynamics of the area.	3.B.1.14. Annually plan and implement an average 1,000 acres of dormant season and 4,000 acres of growing season burning on upland management compartments to simulate the natural fire dynamics of the area. Wildland fire will be allowed to control the vegetation on wilderness islands.	4.B.1.14. Same as 2.B.1.17.

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
1.B.1.15. Same as 2.B.1.18	2.B.1.15. Utilize Firebase, National Fire Plan Operating System, and the Fire Reporting System to secure funding for all future prescribed burning, mechanical fuel reduction, and selected silvicultural operations	3.B.1.15. Same as 2.B.1.15.	4.B.1.15. Same as 2.B.1.18
1.B.1.16. Same as 2.B.1.19.	2.B.1.16. Develop, as part of the joint GOAL Fire Management Plan, support and seek funding through the National Fire Plan to conduct interagency prescribed burning within the fuel reduction zone between Swamps Edge Break and the Perimeter Road.	3.B.1.16. Same as 2.B.1.16.	4.B.1.16. Same as 2.B.1.19.
1.B.1.17. Same as 2.B.1.20.	2.B.1.17. Maintain annually, island helispots to provide an emergency landing area during prescribed fire operations and to allow safe access for forestry crews and biologists working with wildlife and habitat issues.	3.B.1.17. Use of helispots on islands will be discontinued. Allow helispots on wilderness islands to be incorporated into the island landscape by allowing the natural seeding of the area from nearby trees and other vegetation.	4.B.1.17. Same as 2.B.1.20
1.B.1.18. Same as 2.B.1.21.	2.B.1.18. Selective thinning in upland management compartments will be used as the preferred silvicultural management tool to accomplish habitat restoration goals.	3.B.1.18. Same as 2.B.1.18	4.B.1.18. Same as 2.B.1.21.
1.B.1.19. Same as 2.B.1.22	2.B.1.19. Use patch regeneration areas ranging in size from ¼ acre to 15 acres to increase the age variability and promote the establishment of longleaf pine within upland management compartments. Log loading areas, natural openings, and proximity to seed source will be considered when establishing patch regeneration areas.	3.B.1.19. Same as 2.B.1.19	4.B.1.19. Same as 2.B.1.22.
1.B.1.20. Same as 2.B.1.23	2.B.1.20. Plan regeneration on approximately 50 acres (1/30 of each compartment visited) each year. Plant improved, containerized longleaf pine seedlings at 500 trees per acre	3.B.1.20. Outside wilderness, plan regeneration on approximately 50 acres (1/30 of each upland management compartment visited) each year. Plant improved, containerized longleaf pine seedlings at 500 trees per acre	4.B.1.20. Same as 2.B.1.23.
1.B.1.21. Same as 2.B.1.24.	2.B.1.21. Exclude logging operations from all upland bog filled depressions and drains	3.B.1.21. Same as 2.B.1.21	4.B.1.21. Same as 2.B.1.24.

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
1.B.1.22. Same as 2.B.1.25	2.B.1.22. Use prescribed fire to reestablish the natural size and composition of wetlands dispersed throughout the uplands by using water levels and duff moisture to regulate fire intensity and penetration.	3.B.1.22. Same as 2.B.1.22.	4.B.1.22. Same as 2.B.1.25
1.B.1.23. Monitor occurrence of gypsy moths by setting traps as directed.	2.B.1.23. Evaluate annually the upland management compartment roads. As needed, pull ditches, grade, set culverts, or construct low water crossings to provide for fire and forest management access.	3.B.1.23. Same as 2.B.1.23	4.B.1.23. Same as 2.B.1.26
1.B.1.24. Protect wetlands associated with upland management compartments according to State Best Management Practices.	2.B.1.24. Evaluate annually and maintain as needed the upland management compartment roads by mowing to provide for fire and forest management access and to serve as a permanent fuels break.	3.B.1.24. Same as 2.B.1.24	4.B.1.24. Same as 2.B.1.27
1.B.1.25. Same as 2.B.2.29.	2.B.1.25 Inspect and make needed repairs on the 26 perimeter road bridges, as required by regional guidelines, while considering fish movements and erosion potential.	3.B.1.25. Same as 2.B.1.25	4.B.1.25. Same as 2.B.1.28
1.B.1.26. Same as 2.B.2.30	2.B.1.26. Monitor forest insects and disease according to USFWS and regional direction.	3.B.1.26. Same as 2.B.1.26.	4.B.1.26. Same as 2.B.1.29
1.B.1.27. Same as 2.B.2.31	2.B.1.27. Protect ephemeral wetlands by restricting activity within 100 feet, maintaining low understory vegetation around the perimeter, keeping logging debris away from the wetlands, and allowing fire to move freely into the wetlands to maintain herbaceous characteristics of the ponds and relatively open adjacent uplands.	3.B.1.27. Same as 2.B.1.27.	4.B.1.27. Same as 2.B.1.30
1.B.1.28. Same as 2.B.2.32.	2.B.1.28. Develop educational programs on habitats and select wildlife needs for equipment operators, foresters, fire crews, etc. to instill an interest and heightened awareness of their potential impact on the environment through their management actions.	3.B.1.28. Same as 2.B.1.28.	4.B.1.28. Same as 2.B.1.31

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
	2.B.1.29. Update the refuge's Fire Management Plan by 2006 to comply with the National Format for Fire Management Plans.	3.B.1.29. Same as 2.B.1.29.	4.B.1.29. Same as 2.B.1.32.
	2.B.1.30. Ensure all refuge staff engaged in fire-related activities meet National Wildfire Coordinating Group training requirements for positions held.	3.B.1.30. Same as 2.B.1.30.	
	2.B.1.31. Maintain assigned fire suppression equipment according to manufacturers specifications to ensure safe efficient operation.	3.B.1.31. Same as 2.B.1.31.	
	2.B.1.32. Maintain annual operating plans with Florida Division of Forestry and Georgia Forestry Commission to continue joint fire operations.	3.B.1.32. Same as 2.B.1.32	
Wetland Communities			
1.B.2. Maintain, enhance, and promote the Greater Okefenokee Ecosystem's native wetland communities, their natural vegetation mosaic, diversity, viability, and dynamics, as found within the Okefenokee Swamp.	**2.B.2. Maintain, enhance, and promote the Greater Okefenokee Ecosystem's native wetland communities, their natural vegetation mosaic, diversity, viability, and dynamics, as found within the Okefenokee Swamp.**	**3.B.2. Allow natural processes to shape the native wetland communities, their natural vegetation mosaic, diversity, viability, and dynamics, as found within the Okefenokee Swamp.**	**4.B.2. Maintain, enhance, and promote the native wetland communities, their natural vegetation mosaic, diversity, viability, and dynamics, as found within the Okefenokee Swamp.**
1.B.2.1. Investigate the dynamics of the swamp's surface hydrology.	2.B.2.1. Investigate the vegetation of the swamp wetlands by 2007 for areas within the swamp that have been altered to the extent where natural succession will not restore the areas to pre-European settlement vegetation (i.e., examine cypress regeneration in the northeast basin).	3.B.2.1. Investigate the pre-European settlement vegetation of the swamp wetlands by 2007 for comparison with current and future conditions.	4.B.2.1. Same as 2.B.2.1.
1.B.2.2. Continue to monitor pH, conductivity, and dissolved oxygen at selected water monitoring stations.	2.B.2.2. Investigate the influence of the underlying aquifer on the Okefenokee Swamp to identify threats from increased demands on ground water within 100 miles of the swamp.	3.B.2.2. Same as 2.B.2.2.	4.B.2.2. Same as 2.B.2.2.

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
1.B.2.3. Same as 2.B.2.5.	2.B.2.3. Develop a water monitoring network using wells around the perimeter of the swamp to examine both surface and ground water to determine changes in water depths, flows and hydroperiods. Investigate partnerships with USGS Water Resources, and Georgia and Florida scientists for this work.	3.B.2.3. Same as 2.B.2.3.	4.B.2.3. Same as 2.B.2.3. but do not seek partnerships.
1.B.2.4. Continue to support current revision of vegetation map.	2.B.2.4. Continue to monitor pH, conductivity, and dissolved oxygen at selected water monitoring stations and develop further the monitoring program to address water chemistry dynamics related to fire, water levels, weather events, plant composition, public use activities, and land use adjacent to the refuge.	3.B.2.4. Same as 2.B.2.4.	4.B.2.4. Same as 2.B.2.4.
1.B.2.5. Establish photo points that have been proposed in the major prairies.	2.B.2.5. Monitor the water quality exiting the swamp near the Suwannee River Sill to identify changes as they relate to natural and man-made events, and how water quality relates to data collected downstream by U.S. Geological Survey	3.B.2.5. Same as 2.B.2.5	4.B.2.5. Monitor the water quality exiting the swamp near the Suwannee River Sill to identify changes as they relate to natural and man-made events.
1.B.2.6. Same as 2.B.2.11.	2.B.2.6. Collaborate with a university/college to examine the pH levels through the history of the swamp using appropriate materials within the peat layers.	3.B.2.6. Same as 2.B.2.6.	4.B.2.6. Same as 2.B.2.6.
1.B.2.7. Same as 2.B.2.12.	2.B.2.7. Develop a means of updating the fuel model map on a yearly basis to reflect the effects of fire moving across the swamp landscape.	3.B.2.7. Same as 2.B.2.7	4.B.2.7. Same as 2.B.2.7
1.B.2.8. Create and maintain a multi-layered database for fire, forestry, and biological resource analysis within the swamp including but not limited to soils, hydrology, wildlife distribution, and vegetation.	2.B.2.8. Revise the vegetation map every 10 years (next 2011), using appropriate images and ground truthing and determine percent change of each vegetation class.	3.B.2.8. Same as 2.B.2.8.	4.B.2.8. Same as 2.B.2.8.
1.B.2.9. Same as 2.B.2.16.	2.B.2.9. Establish photo points within each major prairie to illustrate changes in the vegetation structure related to management practices and natural events	3.B.2.9. Same as 2.B.2.9.	4.B.2.9. Same as 2.B.2.9.

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
1.B.2.10. Same as 2.B.2.17.	2.B.2.10. Educate the public on the importance of good air quality, the threats of light and noise to the resources, and the avenues to reduce the negative effects.	3.B.2.10. Same as 2.B.2.10.	4.B.2.10. Same as 2.B.2.10.
1.B.2.11. Rehabilitate old fire lines and continue to disc the Swamp's Edge Break.	2.B.2.11. Continue to restore the river flood plain associated with the Suwannee River that has been influenced by the presence of the Suwannee River Sill by removing the two concrete water control structures and breaching the sill in four places	3.B.2.11. Same as 2.B.2.11.	4.B.2.11. Same as 2.B.2.11.
1.B.2.12. Same as 2.B.2.20.	2.B.2.12. Keep accurate records of water levels and rainfall throughout the swamp and relate them to public use opportunities, fire hazards and occurrence, and wildlife and water distribution. Currently, 10 water monitoring stations are in use. Add additional stations at Breakfast Branch and at the outlet to the St. Marys River. Pursue making this data available on the web.	3.B.2.12. Same as 2.B.2.12.	4.B.2.12. Same as 2.B.2.12.
1.B.2.13. Continue informing cooperators of the refuge's fire management strategies.	2.B.2.13. Investigate the influence of boat trail maintenance on the hydrologic dynamics within hydrologic basins of the swamp.	3.B.2.13. Same as 2.B.2.13.	4.B.2.13. Same as 2.B.2.13.
1.B.2.14. Continue to seek funding for a wetland fuels modeling research project to accurately represent the unique wetland fuels found on the refuge.	2.B.2.14. Expand and maintain a multi-layered database for fire, forestry, and biological resource analysis within the swamp, including but not limited to soils, hydrology, wildlife distribution, and vegetation.	3.B.2.14. Same as 2.B.2.14.	4.B.2.14. Same as 2.B.2.14.
	2.B.2.15. Inventory the old-growth cypress stands (Grand Prairie and Dinner Pond) that remain for baseline information.	3.B.2.15. Same as 2.B.2.15.	4.B.2.15. Same as 2.B.2.15.
	2.B.2.16. Encourage the use of natural fires within the wetlands versus scheduling prescribed fires that may decrease the impact of a future natural fire.	3.B.2.16. Natural fires will be used exclusively within the wilderness area.	4.B.2.16. Same as 2.B.2.16.

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
	2.B.2.17. Using historical water level records, minimize the movement of prescribed fire off wilderness islands and upland management compartments to accomplish stated objectives.	3.B.2.17. Using historical water level records, minimize the movement of prescribed fire leaving the upland management compartments and moving into the adjoining wetlands .	4.B.2.17. Same 2.B.2.17.
	2.B.2.18. Minimize the impacts of corridors on the landscape (i.e., roads, fire lines, and swamps edge break) that alter water flows, seepages, compaction, and wildlife movement by rehabilitating unnecessary lines and considering maintenance practices that minimize soil disturbance.	3.B.2.18. Same as 2.B.2.18.	4.B.2.18. Same as 2.B.2.18.
	2.B.2.19. Collect data from the on-site regional air quality station at the end of each wildland fire event to document levels of fire related pollutants.	3.B.2.19. Same as 2.B.2.19.	4.B.2.19. Same as 2.B.2.19.
	2.B.2.20. At the beginning of each wildland fire event, contact local and state transportation officials to advise of possible smoke production that may adversely impact road visibility.	3.B.2.20. Same as 2.B.2.20.	4.B.2.20. Same as 2.B.2.20.
	2.B.2.21. Finalize the Fire Use Guidebook of the refuge's Fire Management Plan to allow the use of fire for natural resource benefits and amend the Okefenokee NWR Fire Management Plan.	3.B.2.21. Revise the refuge's Fire Management Plan to reflect the exclusive use of natural processes within the wilderness area.	4.B.2.21. Same as 2.B.2.21.
	2.B.2.22. By 2007, complete initial training of refuge personnel and state and federal cooperators in the implementation of Fire Use as the appropriate management strategy on the Okefenokee NWR.	3.B.2.22. Train refuge personnel and state and federal cooperators in the implementation of allowing natural processes such as wildland fire to exclusively govern the landscape within the wilderness area.	4.B.2.22. Same as 2.B.2.22.
	2.B.2.23. By 2007, have a wetland fuels modeling research project to accurately represent the unique wetland fuels found on the refuge in Firebase (the USFWS prescribed fire funding database).	3.B.2.23. Same as 2.B.2.23., although ground-truthing would be limited due to access issues.	4.B.2.23. Same as 2.B.2.23.

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
Conservation of Natural Resources Outside Refuge Boundaries			
1.B.3. Conserve natural resources through partnerships, protection, and land acquisition from willing sellers as it relates to fire management and RCW management.	**2.B.3. Conserve natural resources through partnerships, protection, and land acquisition from willing sellers within the "zones of influence."**	**3.B.3. Conserve natural resources through partnerships, protection, and land acquisition from willing sellers within the "zones of influence."**	**4.B.3. Conserve natural resources through land acquisition of those lands necessary to meet the goals of the refuge.**
1.B.3.1. Continue to support efforts to protect adjacent lands from development that may pose a threat to the natural resources of the area.	2.B.3.1. Assess and prioritize lands within the watershed by 2010 that would protect the resources and/or enhance management opportunities to meet refuge objectives.	3.B.3.1. Same as 2.B.3.1.	4.B.3.1. Same as 2.B.3.1.
1.B.3.2. Same as 2.B.3.2.	2.B.3.2. Establish acquisition priorities based upon habitat values and/or possible threats to existing resources.	3.B.3.2. Establish acquisition priorities based upon "fire buffer zones" surrounding the swamp, habitat values and/or possible threats to existing resources.	4.B.3.2. Same as 2.B.3.2.
1.B.3.3. Acquire land as opportunities arise or enter into agreements to protect resources associated with the health of the refuge's RCW population and to enhance fire management opportunities.	2.B.3.3. Initiate and continue contact with all landowners within the refuge acquisition boundary to determine landowner interest and willing-seller status. Acquire land as opportunities arise or enter into agreements to protect resources associated with the health of the wetlands and native upland communities.	3.B.3.3. Initiate and continue contact with all landowners within the refuge acquisition boundary to determine landowner interest and willing-seller status. Acquire land as opportunities arise or enter into agreements to protect vulnerable resources surrounding the wilderness area.	4.B.3.3. Initiate and continue contact with all landowners within the refuge acquisition boundary to determine landowner interest and willing-seller status. Acquire land as opportunities arise to protect resources associated with the health of the wetlands and native upland communities on the refuge.
1.B.3.4. Same as 2.B.3.4.	2.B.3.4. Continue to utilize and seek partnerships with conservation organizations and others to complete acquisitions.	3.B.3.4. Same as 2.B.3.4.	4.B.3.4. Same as 2.B.3.4.
1.B.3.5. Same as 2.B.3.5.	2.B.3.5. Develop Property Proposals as lands are identified as critical for managing the resources of the Okefenokee NWR.	3.B.3.5. Same as 2.B.3.5.	4.B.3.5. Same as 2.B.3.5.
1.B.3.6. Same as 2.B.3.6.	2.B.3.6. Seek incentives for landowners to grow longleaf pine stands adjacent to the refuge to at least 60 years-old for the benefit of RCWs.	3.B.3.6. Same as 2.B.3.6.	4.B.3.6. Keep abreast of the threats within the "zones of influence." Rely on conservation organizations and others to monitor threats and reduce the negative impacts.
1.B.3.7. Keep abreast of the threats associated with aerial, biota, water, and soil pathways that may impact the resources of the refuge.	2.B.3.7. Through presentations and the distribution of information, encourage other land managers to restore, maintain, and protect native upland and wetland communities, as a part of southeast Georgia's heritage.	3.B.3.7. Through presentations and the distribution of information, encourage other land managers to restore, maintain, and protect native upland and wetland communities as a part of southeast Georgia's heritage and as a fire resistant resource.	4.B.3.7. Same as 2.B.3.10.

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
1.B.3.8. Periodically examine select plant and lichen species for injury due to air quality.	2.B.3.8. Keep abreast of the threats within the "zones of influence" and be proactive in reducing the negative impacts (e.g., aerial, biota, water, soil pathways).	3.B.3.8. Same as 2.B.3.8.	4.B.3.8. Seek ownership of lands currently under MOU's with International Paper Company.
1.B.3.9. Same as 2.B.3.11.	2.B.3.9. Form a network of stakeholders within the surface and groundwater basins associated with the Okefenokee Swamp to protect and restore the natural flows and monitor for changes in flows and water quality. Identify the reason for changes and work toward resolving any detrimental consequences.	3.B.3.9. Same as 2.B.3.9.	
	2.B.3.10. Every 5 years, beginning in 2007, examine select plant and lichen species for injury due to air quality.	3.B.3.10. Same as 2.B.3.10.	
	2.B.3.11. Maintain the annual operation plans for the 2 MOU's with International Paper Company and seek opportunities with other adjoining landowners.	3.B.3.11. Same as 2.B.3.11.	
	2.B.3.12. By 2007, begin to develop a GOAL Fire Management Plan to cover the 1,500,000 acres now contained in the group's zone of influence.	3.B.3.12. Same as 2.B.3.12.	
		3.B.3.13. Develop agreements, partnerships, and advocacy groups to support full implementation of natural processes management.	
		3.B.3.14. Gain understanding and support of "natural processes" management from Congress, state agencies, and others.	
Invasive Plants and Animals			
1.B.4. Reduce non-native invasive plants and animal populations to minimize negative effects to native flora and fauna.	**2.B.4. Investigate presence of and reduce non-native invasive plants and animal populations to minimize negative effects to native flora and fauna.**	**3.B.4. Investigate presence of and reduce non-native invasive plants and animal populations to minimize negative effects to native flora and fauna.**	**4.B.4. Investigate presence of and reduce non-native invasive plants and animal populations to minimize negative effects to native flora and fauna.**

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
1.B.4.1. Same as 2.B.4.2.	2.B.4.1. Develop and maintain, by 2007, a GIS database on known locations within and outside the refuge and the area covered by invasive plants and animals, type and date of the treatment, and the results of treatment.	3.B.4.1. Same as 2.B.4.1.	4.B.4.1. Same as 2.B.4.1.
1.B.4.2. Same as 2.B.4.4.	2.B.4.2. Take measures to eradicate the non-native invasive species. This may include the use of pesticides within the wilderness.	3.B.4.2. Same as 2.B.4.2.	4.B.4.2. Same as 2.B.4.2.
1.B.4.3. Remove non-native animals, such as feral swine and domestic cats and dogs, from refuge lands.	2.B.4.3. Develop a team of refuge staff to revisit known sites and new sites where exotic species have been reported on an annual basis to document the current condition and future needs.	3.B.4.3. Same as 2.B.4.3.	4.B.4.3. Same as 2.B.4.3.
	2.B.4.4. Work with neighbors who are harboring and/or promoting non-native invasive species to reduce the threat of invasion onto the refuge.	3.B.4.4. Same as 2.B.4.4.	4.B.4.4. Monitor refuge boundary for the introduction of invasive plants and eradicate them when they become established.
	2.B.4.5. Remove non-native animals, such as feral swine and domestic cats and dogs, from refuge lands. Educate the local community of the damage done by these animals.	3.B.4.5. Same as 2.B.4.5.	4.B.4.5. Same as 1.B.4.3.
Archeological and Historical Sites			
1.B.5. Protect the known archaeological and historical sites on the refuge from illegal take or damage in compliance with the established Acts.	**2.B.5. Identify and protect the archaeological and historical sites on the refuge from illegal take or damage in compliance with the established Acts.**	**3.B.5. Protect the known archaeological and historical sites on the refuge from illegal take or damage in compliance with the established Acts.**	**4.B.5. Protect the known archaeological and historical sites on the refuge from illegal take or damage in compliance with the established Acts.**
1.B.5.1. Maintain reports of archaeological findings for reference during management activity.	2.B.5.1. By 2007, all known locations will be catalogued using GPS coordinates for inclusion into the refuge GIS database system. Continue to collect location information on historic properties as identified. Sites will be identified as needed when disturbance of soil is proposed or expected during an emergency.	3.B.5.1. Same as 2.B.5.1.	4.B.5.1. Same as 2.B.5.1.
1.B.5.2. Make necessary repairs to the Chesser Island Homestead and buildings on the National Historical Register under the guidance of the regional archaeologist.	2.B.5.2. Educate the public through programs on the significance of archaeological and historical sites	3.B.5.2. Same as 2.B.5.2.	4.B.5.2. Same as 2.B.5.2.

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
	2.B.5.3. Develop and implement a long-term maintenance plan for the Chesser Island Homestead, and buildings on the National Historical Register.	3.B.5.3. Same as 2.B.5.3.	4.B.5.3. Same as 2.B.5.3.
Wilderness Resource			
1.B.6. Preserve the wilderness resource within the designated wilderness area.	**2.B.6. Preserve the wilderness resource within the designated wilderness area.**	**3.B.6. Preserve the wilderness resource within the designated wilderness area by minimizing administrative activities and allowing natural processes to govern the landscape.**	**4.B.6. Preserve the wilderness resources within the designated wilderness area.**
1.B.6.1. Same as 2.B.6.1.	2.B.6.1. Every 5 years, beginning in 2006, survey light and noise pollution on the edge of the swamp and within the interior according to the protocols established by the Georgia Institute of Technology.	3.B.6.1. Same as 2.B.6.1.	4.B.6.1. Same as 2.B.6.1.
1.B.6.2. Rely on USFWS Air Quality Division to comment on new industry and development within the airshed as they relate to visibility impairments and air quality over the Swamp.	2.B.6.2. Identify light and noise sources and, where possible, reduce negative impacts of light and noise pollution.	3.B.6.2. Same as 2.B.6.2.	4.B.6.2. Identify light and noise sources and inform interest groups about our concerns.
1.B.6.3. Same as 2.B.6.4.	2.B.6.3. Review new industry and development within the airshed as they relate to visibility impairments and air quality over the Swamp, and coordinate comments with the USFWS Air Quality Division.	3.B.6.3. Same as 2.B.6.3.	4.B.6.3. Same as 1.B.6.3.
1.B.6.4. Same as 2.B.6.6.	2.B.6.4. Monitor air quality under the guidance of the USFWS Air Quality Division, including the current partnership with the three national programs: National Atmospheric Deposition Program, Mercury Deposition Network, and the Interagency Monitoring of Protected Visual Environments.	3.B.6.4. Same as 2.B.6.4.	4.B.6.4. Same as 2.B.6.4.
1.B.6.5. Follow the Special Operating Procedures established at the refuge for non-emergency wilderness activities.	2.B.6.5. Monitor human disturbance factors within zones of influence to protect the wilderness resource including habitat, wildlife, and human values.	3.B.6.5. Same as 2.B.6.5.	4.B.6.5. Same as 2.B.6.5.

B. Resource Protection			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.B. Restore, maintain, and protect native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality, and preserve the associated cultural sites and wilderness qualities.	*Goal 2.B. Restore, maintain, protect, and promote native habitats and healthy natural systems, where possible, to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.*	*Goal 3.B. Promote native habitats and natural systems using natural processes within the wilderness area. Restore, maintain, protect, and promote native habitats outside the wilderness area to imitate pre-European settlement conditions on and off the refuge and preserve the associated cultural sites.*	*Goal 4.B. Restore, maintain, and protect native habitats on refuge lands to imitate pre-European settlement distribution, frequency, and quality and preserve the associated cultural sites and wilderness qualities.*
1.B.6.6. Allow aerial flights over the wilderness area for wildlife surveys, fire surveillance, and reconnaissance.	2.B.6.6. Continue to consider development of visitor surveys, particularly for overnight canoeists, to assess the overall quality of the wilderness experience and, if appropriate, implement a survey.	3.B.6.6. Same as 2.B.6.6.	4.B.6.6. Same as 2.B.6.6.
1.B.6.7. Same as 2.B.6.9.	2.B.6.7. Use the approved Minimum Requirement Decision Guide for non-emergency wilderness activities that are not covered within this Comprehensive Conservation Plan.	3.B.6.7. To minimize noise disturbance, use hand and primitive tools for all non-emergency wilderness activities.	3.B.6.7. To minimize noise disturbance, use hand and primitive tools for all non-emergency wilderness activities.
1.B.6.8. Same as 2.B.6.10.	2.B.6.8. Plan helicopter flight paths, when possible, to minimize disturbance to wildlife, wilderness, and visitors.	3.B.6.8. Eliminate helicopter flights over the wilderness area except for emergency purposes. (Wildland fire is considered an emergency and therefore, helicopter surveillance is acceptable.)	4.B.6.8. Same as 2.B.6.8.
	2.B.6.9. Conduct emergency operations in a safe manner that addresses wilderness concerns.	3.B.6.9. Same as 2.B.6.9.	4.B.6.9. Same as 2.B.6.9.
	2.B.6.10. Distribute wilderness information to special task teams, volunteers, interns, and researchers to give a clear understanding of the Okefenokee wilderness and the management requirements.	3.B.6.10. Same as 2.B.6.10	4.B.6.10. Same as 2.B.6.10.

C. Wilderness Values			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.C. Protect and preserve the Okefenokee wilderness, while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.	*Goal 2.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee wilderness, leaving it untrammeled by man while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.*	*Goal 3.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee wilderness, leaving it untrammeled by man while providing primitive and unconfined recreation, education, scientific study, conservation ethics, and scenic vistas.*	*Goal 4.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee wilderness, leaving it untrammeled by man while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.*
Primeval Character			
1.C.1. Preserve the primeval character of the Okefenokee wilderness through management and protection from outside threats.	**2.C.1. Preserve the primeval character of the Okefenokee wilderness through management and re-establishment of ecological conditions that allow maximum use of natural processes.**	**3.C.1. Preserve the primeval character of the Okefenokee wilderness through management of primitive use and allowing natural processes to govern the landscape.**	**4.C.1. Preserve the primeval character of the Okefenokee wilderness through management and re-establishment of ecological conditions on refuge lands that allow maximum use of natural processes.**
1.C.1.1. Continue to allow public access at four entrances and evaluating the special requested uses.	2.C.1.1. Monitor and evaluate public impacts and modify management to protect the wilderness resource.	3.C.1.1. Same as 2.C.1.1.	4.C.1.1. Same as 2.C.1.1.
1.C.1.2. Keep abreast of the potential developments on adjacent lands that may pose a threat to the wilderness resource.	2.C.1.2. Be proactive within the "zones of influence" in minimizing potential threats to the wilderness resource.	3.C.1.2. Same as 2.C.1.2.	4.C.1.2. Keep abreast of potential threats within the "zones of influence" and inform environmental stakeholders.
1.C.1.3. Continue to survey natural processes, such as wildfire, and maintain within the boundaries of the refuge.	2.C.1.3. Establish guidelines as in the Fire Use Management Plan to allow maximum benefit for the wilderness resource from natural processes.	3.C.1.3. Allow natural processes such as fire to run their course within the wilderness boundary with no human intervention.	4.C.1.3. Same as 2.C.1.3.
1.C.1.4. Continue to monitor trends in wildlife populations and habitat conditions with ground and aerial modes of transportation.	2.C.1.4. Investigate remote sensing techniques as they become available while using traditional monitoring techniques when determined appropriate through Minimum Requirement Guidelines to monitor wildlife populations and habitat conditions.	3.C.1.4. Investigate remote sensing techniques as they become available while using human-propelled watercraft for monitoring wildlife populations and habitat conditions where feasible.	4.C.1.4. Same as 2.C.1.4.
Recreation			
1.C.2. Provide recreational opportunities in wilderness that emphasize solitude.	**2.C.2. Provide recreational opportunities in wilderness that emphasize solitude.**	**3.C.2. Provide recreational opportunities in wilderness that emphasize primitive and unconfined experiences.**	**4.C.2. Provide recreational opportunities in wilderness that emphasize solitude.**
1.C.2.1. Same as 2.C.2.1.	2.C.2.1. Continue to maintain and use the existing wilderness reservation system, the trail system, and the overnight shelters to ensure solitude.	3.C.2.1. Eliminate the reservation system and permanent structures (platforms/markers) within the wilderness areas and regulate the number of individuals entering the wilderness area so resources will not be compromised.	4.C.2.1. Same as 2.C.2.1.
1.C.2.2. Same as 2.C.2.2.	2.C.2.2. Be sensitive to visitor use when scheduling administrative activities in wilderness.	3.C.2.2. Same as 2.C.2.2.	4.C.2.2. Same as 2.C.2.2
1.C.2.3. Follow established Special Operating Procedures for management activities.	2.C.2.3. Conduct Minimum Requirement Decisions prior to all management activities within the wilderness.	3.C.2.3. As deemed necessary through the Minimum Requirement Decision Guide, use all primitive and hand tools for trail maintenance.	4.C.2.3. Same as 2.C.2.3.

C. Wilderness Values			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.C. Protect and preserve the Okefenokee wilderness, while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.	*Goal 2.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee wilderness, leaving it untrammeled by man while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.*	*Goal 3.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee wilderness, leaving it untrammeled by man while providing primitive and unconfined recreation, education, scientific study, conservation ethics, and scenic vistas.*	*Goal 4.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee wilderness, leaving it untrammeled by man while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.*
1.C.2.4. Same as 2.C.2.4.	2.C.2.4. Encourage, modify, or if necessary, directly control wilderness uses and influences to minimize their impact on solitude.	3.C.2.4. Encourage and modify wilderness use to provide unconfined recreation.	4.C.2.4. Same as 2.C.2.4
1.C.2.5. Fly to avoid designated locations to minimize visitor disturbance.	2.C.2.5. Work with FAA and military installations to alter flight paths of commercial and military overflights.	3.C.2.5. Seek to eliminate overflights over the wilderness area to reduce light, noise, and visual pollution.	4.C.2.5. Same as 2.C.2.5.
1.C.2.6. Maintain at least 500 feet for refuge overflights.	2.C.2.6. Maintain a minimum of 700 feet for administrative overflights. Special use flights will be governed by the Minimum Requirement Decision Guide on the specified activity.	3.C.2.6. Eliminate special use flights and reduce administrative flights to emergencies only.	4.C.2.6. Same as 2.C.2.6.
1.C.2.7. Same as 2.C.2.7.	2.C.2.7. Maintain low vegetation at helispots on interior islands for safety in transporting equipment and workers.	3.C.2.7. Discontinue maintenance of helispots on interior islands.	4.C.2.7. Same as 2.C.2.7.
1.C.2.8. Same as 2.C.2.8.	2.C.2.8. Continue to pursue the use of electric motors for guided tours	3.C.2.8. Same as 2.C.2.8.	4.C.2.8. Same as 2.C.2.8.
Education			
1.C.3. Provide educational enrichment related to wilderness.	**2.C.3. Provide educational enrichment related to wilderness.**	**3.C.3. Provide educational enrichment related to wilderness.**	**4.C.3. Provide educational enrichment related to wilderness.**
1.C.3.1. Same as 2.C.3.1.	2.C.3.1. Continue to waive fees for educational groups.	3.C.3.1. Same as 2.C.3.1.	4.C.3.1. Same as 2.C.3.1.
1.C.3.2. Same as 2.C.3.2.	2.C.3.2. Encourage all visitors to enjoy the Visitor Center services where they can be oriented to Wilderness concepts.	3.C.3.2. Same as 2.C.3.2.	4.C.3.2. Same as 2.C.3.2.
1.C.3.3. Same as 2.C.3.3.	2.C.3.3. Continue to provide Wilderness related environmental education and interpretation programs.	3.C.3.3. Same as 2.C.3.3.	4.C.3.3. Same as 2.C.3.3.
Scientific Study			
1.C.4. Accommodate scientific study for the purpose of protecting the Okefenokee Ecosystem.	**2.C.4. Accommodate scientific study for the purpose of managing the area as wilderness and protecting the Okefenokee Ecosystem.**	**3.C.4. Accommodate scientific study for the purpose of managing the area as wilderness and protecting the Okefenokee Ecosystem.**	**4.C.4. Accommodate scientific study for the purpose of managing the area as wilderness and protecting the refuge resources.**
1.C.4.1. Evaluate purposes and methodology of scientific studies for management contribution and wilderness compatibility.	2.C.4.1. Evaluate the management contribution of proposed studies and use the Minimum Requirement Decision Guide to evaluate the need and wilderness compatibility.	3.C.4.1. Same as 2.C.4.1.	4.C.4.1. Same as 2.C.4.1.
1.C.4.2. Continue to interact with Carhart Wilderness Center and Leopold Institute on wilderness issues.	2.C.4.2. Expand relationships with the Carhart Wilderness Center, the Leopold Institute, colleges and universities to develop needed wilderness research.	3.C.4.2. Same as 2.C.4.2.	4.C.4.2. Same as 2.C.4.2.

C. Wilderness Values			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.C. Protect and preserve the Okefenokee wilderness, while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.	*Goal 2.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee wilderness, leaving it untrammeled by man while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.*	*Goal 3.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee wilderness, leaving it untrammeled by man while providing primitive and unconfined recreation, education, scientific study, conservation ethics, and scenic vistas.*	*Goal 4.C. Restore, preserve, and protect the primeval character and natural processes of the Okefenokee wilderness, leaving it untrammeled by man while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.*
Conservation Ethics			
1.C.5. Promote conservation ethics in wilderness.	2.C.5. Promote conservation ethics in wilderness.	3.C.5. Promote conservation through natural processes in wilderness.	4.C.5. Promote conservation ethics in wilderness.
1.C.5.1. Allow natural processes to occur to the extent possible without jeopardizing surrounding private resources.	2.C.5.1. Manage natural processes to the benefit of the wilderness resource.	3.C.5.1. Allow natural processes exclusively to govern the landscape.	4.C.5.1. Same as 2.C.5.1.
1.C.5.2. Same as 2.C.5.2.	2.C.5.2. Continue to monitor air and water quality and investigate potential threats.	3.C.5.2. Same as 2.C.5.2.	4.C.5.2. Continue to monitor air and water quality.
1.C.5.3. Same as 2.C.5.3.	2.C.5.3. Use interdisciplinary science skills to manage wilderness.	3.C.5.3. Same as 2.C.5.4.	4.C.5.3. Same as 2.C.5.3.
1.C.5.4. Promote "carry in – carry out" principles within the wilderness.	2.C.5.4. Promote and practice wilderness concepts such as Leave No Trace principles.	3.C.5.4. Same as 2.C.5.5.	4.C.5.4. Same as 2.C.5.4.
	2.C. 5.5. Distribute information through printed materials and the Internet about wilderness issues and ethics to local businesses, concessionaires, Stephen C. Foster State Park, and Swamp Park to distribute to their customers for greater awareness of human impacts.		4.C.5.5. Same as 2.C.5.5.
Scenic Vistas			
1.C.6. Provide scenic vistas in wilderness.	**2.C.6. Provide scenic vistas in wilderness.**	**3.C.6. Provide scenic vistas in wilderness.**	**4.C.6. Provide scenic vistas in wilderness.**
1.C.6.1. Same as 2.C.6.1.	2.C.6.1. Allow natural processes to open areas to provide scenic vistas.	3.C.6.1. Same as 2.C.6.1.	4.C.6.1. Same as 2.C.6.1.
1.C.6.2. Same as 2.C.6.2.	2.C.6.2. Continue to maintain boat/canoe trails to provide access and scenic views.	3.C.6.2. Continue to maintain boat/canoe trails for access purposes.	4.C.6.2. Same as 2.C.6.2.
	2.C.6.3. Camouflage equipment or use natural materials to minimize the "hand-of-man."	3.C.6.3. Same as 2.C.6.3.	4.C.6.3. Same as 2.C.6.3.

D. Public Services			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Process**	**Alternative 4. Refuge Focus Management**
Goal 1.D. Provide accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.	*Goal 2.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.*	*Goal 3.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem and emphasize primitive recreation within the Okefenokee Wilderness Area.*	*Goal 4.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the refuge, while maintaining the wilderness resource of the Okefenokee Wilderness Area.*
Promotion of Refuge and Area			
1.D.1. Promote the refuge and the work of the USFWS through brochures, personal contacts, and the refuge's website. Maintain directional information and signage on state and county roads in Georgia and surrounding states to direct interested parties to the refuge. On the refuge, provide clear information of visitor opportunities.	**2.D.1. Promote the refuge, the work of the USFWS, wilderness philosophy, and concepts through brochures, personal contacts, and the refuge's website. Provide clear directional information and signage to lead interested parties to the refuge as well as to visitor opportunities once they have arrived. Opportunities within the Okefenokee Ecosystem will be promoted.**	**3.D.1. Promote the refuge, the work of the USFWS, wilderness philosophy, natural processes, and primitive recreation through brochures, personal contacts, and the refuge's website. Provide clear directional information and signage to lead interested parties to the refuge as well as to visitor opportunities once they have arrived. Opportunities within the Okefenokee ecosystem will be promoted.**	**4.D.1. Promote the refuge, the work of the USFWS, wilderness philosophy, and concepts through brochures, personal contacts, and the refuge's website. Provide clear directional information and signage to lead interested parties to the refuge, as well as to visitor opportunities once they have arrived.**
1.D.1.1. Implement current refuge Sign Plan to direct individuals through their refuge visit.	2.D.1.1. Implement revised refuge Sign Plan to direct individuals through their refuge visit.	3.D.1.1. Same as 2.D.1.1.	4.D.1.1. Same as 2.D.1.1.
1.D.1.2. Maintain current signage at access points to the refuge's hiking trail system.	2.D.1.2. Enhance orientation along the refuge hiking trail system by incorporating informational signs and mile markers.	3.D.1.2. Enhance orientation along the refuge hiking trail system outside the wilderness area by incorporating informational signs and mile markers. Trails within wilderness, such as on Billys Island, will no longer be marked.	4.D.1.2. Same as 2.D.1.2.
1.D.1.3. Same as 2.D.1.3.	2.D.1.3. Continue to maintain routed, painted, wooden signs along the canoe trails to assist visitors in their travels through the swamp.	3.D.1.3. Remove wilderness canoe trail signs, mile markers, directional signs, and place name signs and provide GPS coordinates for identifiable landmarks.	4.D.1.3. Same as 2.D.1.3.
1.D.1.4. Maintain the current wilderness signage along the Suwannee Canal.	2.D.1.4. Clearly mark the wilderness boundary at each entry/access point.	3.D.1.4. Same as 2.D.1.4.	4.D.1.4. Same as 2.D.1.4.
1.D.1.5. Same as 2.D.1.5.	2.D.1.5. Ensure existing traffic signs meet standards as outlined in the Manual on Uniform Traffic Control Devices.	3.D.1.5. Same as 2.D.1.5.	4.D.1.5. Same as 2.D.1.5.
1.D.1.6. Continue updating refuge brochures and web pages to provide the most up-to-date and accurate information possible.	2.D.1.6. Continue updating refuge brochures and web pages to provide the most up-to-date and accurate information possible, including other environmental opportunities within the Okefenokee ecosystem.	3.D.1.6. Same as 2.D.1.6.	4.D.1.6. Continue updating refuge brochures and web pages to provide the most up-to-date and accurate information possible on refuge opportunities.

D. Public Services			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Process**	**Alternative 4. Refuge Focus Management**
Goal 1.D. Provide accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.	*Goal 2.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.*	*Goal 3.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem and emphasize primitive recreation within the Okefenokee Wilderness Area.*	*Goal 4.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the refuge, while maintaining the wilderness resource of the Okefenokee Wilderness Area.*
1.D.1.7. Continue to mention special designations such as "Wetland of International Importance" in brochures and other outreach materials.	2.D.1.7. Revise, expand, and develop brochures and other outreach materials to increase awareness of the wilderness resource and the concept of "Leave No Trace."	3.D.1.7. Revise, expand, and develop brochures and other outreach materials to increase awareness of the wilderness resource, the concept of "Leave No Trace", conservation through natural processes, and an understanding of primitive recreation.	4.D.1.7. Same as 2.D.1.7.
1.D.1.8. Continue providing requested refuge information for travelers at Georgia and Florida interstate, regional, and local visitor centers.	2.D.1.8. Revise brochures and other outreach materials to increase awareness of the Okefenokee NWR's designation as a Wetland of International Importance, Important Birding Area, and the existence of Research and Public Use Natural Areas.	3.D.1.8. Same as 2.D.1.8.	4.D.1.8. Same as 2.D.1.8.
1.D.1.9. Continue to offer introductory visits to welcome center and rest stop personnel to assist them in addressing questions from travelers.	2.D.1.9. Expand and develop contacts with all Georgia and Florida interstate, regional, and local visitor centers to provide refuge information on a regular basis for travelers.	3.D.1.9. Same as 2.D.1.9.	4.D.1.9. Same as 2.D.1.9.
1.D.1.10. Same as 2.D.1.12.	2.D.1.10. Develop "Introduction to Okefenokee NWR" packets including brochures, pictures, and a short orientation video to assist welcome center and rest stop personnel in addressing questions from travelers. Continue to offer introductory refuge visits to these individuals as a supplement to the information packets.	3.D.1.10. Same as 2.D.1.10.	4.D.1.10. Same as 2.D.1.10.
1.D.1.11. Continue providing eco-tourism opportunities for the refuge and local communities in partnership with local businesses and civic organizations to increase the visitors stay in the area.	2.D.1.11. Initiate contact with Alabama, Tennessee, and South Carolina interstate, regional, and local welcome centers as possible outlets for refuge information and offer orientation packets and visits for their personnel.	3.D.1.11. Same as 2.D.1.11.	4.D.1.11. Same as 2.D.1.12.
1.D.1.12. Continue to provide adequate supply of key outreach products (e.g., posters and tattoos).	2.D.1.12. Continue working with Georgia Department of Transportation on refuge informational signage for north and south bound lanes of I-75 near Tifton/Valdosta and I-95 near Brunswick/Kingsland.	3.D.1.12. Same as 2.D.1.12.	4.D.1.12. Same as 2.D.1.13.

D. Public Services			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Process**	**Alternative 4. Refuge Focus Management**
Goal 1.D. Provide accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.	*Goal 2.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.*	*Goal 3.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem and emphasize primitive recreation within the Okefenokee Wilderness Area.*	*Goal 4.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the refuge, while maintaining the wilderness resource of the Okefenokee Wilderness Area.*
1.D.1.13. Same as 2.D.1.17.	2.D.1.13. Initiate discussions with the Florida Department of Transportation about refuge informational signage for the north and south bound lanes of I-75 near Lake City/Valdosta and I-95 near Jacksonville/Yulee.	3.D.1.13. Same as 2.D.1.13.	4.D.1.13. Provide refuge promotional products.
	2.D.1.14. Expand eco-tourism opportunities for the refuge, as well as for regional and local communities in partnership with businesses, civic and conservation organizations by promoting area attractions and by joining together for birding festivals, Earth Day events, canoe clinics, the establishment of extended bike and canoe trails, car tours, etc.	3.D.1.14. Same as 2.D.1.14.	4.D.1.14. Same as 2.D.1.16.
	2.D.1.15. Expand supply of key outreach products (posters, and tattoos).	3.D.1.15. Same as 2.D.1.15.	
	2.D.1.16. Develop public service announcements for radio and television markets to promote refuge events.	3.D.1.16. Same as 2.D.1.16.	
	2.D.1.17. Prepare for emergencies by developing appropriate procedures for quickly contacting and engaging refuge partners with information about rapidly developing refuge and/or local concerns or issues.	3.D.1.17. Same as 2.D.1.17.	
Recreational Fee			
1.D.2. Support the Recreational Fee Demonstration Program.	**2.D.2. Implement a fee demonstration program where revenues will be strategically invested to support the operation and maintenance of hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation opportunities on the refuge.**	**3.D.2. Implement a fee demonstration program where revenues will be strategically invested to support the operation and maintenance of hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation opportunities on the refuge.**	**4.D.2. Implement a fee demonstration program where revenues will be strategically invested to support the operation and maintenance of hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation opportunities on the refuge.**
1.D.2.1. Same as 2.D.2.1.	2.D.2.1. Continue fee-demonstration program that was implemented in 1998 and that was re-authorized in 2004.	3.D.2.1. Same as 2.D.2.1.	4.D.2.1. Same as 2.D.2.1.
1.D.2.2. Continue tracking the use of the fee demonstration funding in support of visitor services.	2.D.2.2. Expand methodologies for tracking use of fee demonstration funding in support of visitor services.	3.D.2.2. Same as 2.D.2.2.	4.D.2.2. Same as 2.D.2.2.

D. Public Services			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Process**	**Alternative 4. Refuge Focus Management**
Goal 1.D. Provide accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.	*Goal 2.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.*	*Goal 3.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem and emphasize primitive recreation within the Okefenokee Wilderness Area.*	*Goal 4.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the refuge, while maintaining the wilderness resource of the Okefenokee Wilderness Area.*
1.D.2.3. Same as 2.D.2.3.	2.D.2.3. Adjust user fees as necessary to ensure that a safe and quality wilderness and recreational experience is provided to the public.	3.D.2.3. Same as 2.D.2.3.	4.D.2.3. Same as 2.D.2.3.
1.D.2.4. Same as 2.D.2.4.	2.D.2.4. Conduct an annual evaluation of the fee collection program.	3.D.2.4. Same as 2.D.2.4.	4.D.2.3. Same as 2.D.2.3.
Hunting			
1.D.3. Continue to provide hunting opportunities on specified upland management compartments, making an effort to provide opportunities for disabled hunters.	**2.D.3. Provide quality hunting opportunities within specified upland management compartments, making every effort to provide hunts for universal accessibility where possible.**	**3.D.3. Provide quality hunting opportunities within specified upland management compartments, making every effort to provide hunts for universal accessibility where possible.**	**4.D.3. Provide quality hunting opportunities within specified upland management compartments, making every effort to provide hunts for universal accessibility where possible.**
1.D.3.1. Continue to coordinate with Georgia Department of Natural Resources for coordination of advertised hunt dates.	2.D.3.1. Evaluate current and potential individualized hunting opportunities on specified upland management compartments in Georgia and Florida. Implement hunts as appropriate.	3.D.3.1. Same as 2.D.3.1.	4.D.3.1. Same as 2.D.3.1.
1.D.3.2. Same as 2.D.3.2.	2.D.3.2. Evaluate and where appropriate expand and develop special hunting opportunities for family-oriented groups (e.g., Father/son; Mother/daughter).	3.D.3.2. Same as 2.D.3.2.	4.D.3.2. Same as 2.D.3.2.
1.D.3.3. Continue to provide a hunt application brochure that summarizes pertinent refuge regulations, shows the hunt areas, and provides an application for the hunt(s) to be submitted by mail or fax.	2.D.3.3. Incorporate into hunting brochures the variability of wildlife populations and hunter success and skill in diverse refuge habitats.	3.D.3.3. Same as 2.D.3.3.	4.D.3.3. Same as 2.D.3.3.
1.D.3.4. Same as 2.D.3.5.	2.D.3.4. Provide a refuge hunt brochure that summarizes all pertinent refuge regulations, discusses each of the designated hunt areas in detail, and provides a means for the public to apply for the hunt(s) by mail, fax, e-mail, or via the refuge website.	3.D.3.4. Same as 2.D.3.4.	4.D.3.4. Same as 2.D.3.4.
1.D.3.5. Continue periodic discussions with Handicapped Sportsmen's groups in Georgia and Florida to improve accessibility to hunts.	2.D.3.5. Evaluate hunting opportunities on newly acquired lands.	3.D.3.5. Same as 2.D.3.5.	4.D.3.5. Same as 2.D.3.5.
1.D.3.6. Monitor hunt programs and summarize the results, making improvements where feasible.	2.D.3.6. Expand and develop contacts with Handicapped Sportsmen's groups in Georgia and Florida to improve accessibility to hunts.	3.D.3.6. Same as 2.D.3.6.	4.D.3.6. Same as 2.D.3.6.

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Goal 1.D. Provide accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.	*Goal 2.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.*	*Goal 3.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem and emphasize primitive recreation within the Okefenokee Wilderness Area.*	*Goal 4.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the refuge, while maintaining the wilderness resource of the Okefenokee Wilderness Area.*
	2.D.3.7. Monitor hunt programs and provide end-of-the-season harvest reports, including suggested improvements, to the state and other interested parties. Gather results of state administered hunts surrounding the refuge.	3.D.3.7. Same as 2.D.3.7.	4.D.3.7. Same as 1.D.3.6.
Fishing			
1.D.4. Continue providing fishing opportunities along the waterways of the swamp.	**2.D.4. Provide quality fishing opportunities on the refuge, making every effort to provide universal accessibility where possible.**	**3.D.4. Provide quality fishing opportunities on the refuge, making every effort to provide universal accessibility where possible.**	**4.D.4. Provide quality fishing opportunities on the refuge, making every effort to provide universal accessibility where possible.**
1.D.4.1. Same as 2.D.4.1.	2.D.4.1. Coordinate with Georgia Department of Natural Resources to maintain year-round fishing seasons.	3.D.4.1. Same as 2.D.4.1.	4.D.4.1. Same as 2.D.4.1.
1.D.4.2. Continue periodic contact with Handicapped Sportsmen groups for suggestions on improving access to fishing opportunities.	2.D.4.2. Survey and evaluate refuge ponds, dip sites, and canals for expansion or deletion of bank fishing opportunities.	3.D.4.2. Same as 2.D.4.2.	4.D.4.2. Same as 2.D.4.2.
1.D.4.3. Continue periodically to provide a fishing derby at Suwannee Canal Recreation Area.	2.D.4.3. Expand and develop contacts with Handicapped Sportsmen's groups in Georgia and Florida for suggestions on improving access to fishing opportunities.	3.D.4.3. Same as 2.D.4.3.	4.D.4.3. Same as 1.D.4.2.
1.D.4.4. Same as 2.D.4.5.	2.D.4.4. Investigate opportunities for youth fishing derbies at sites accessed from all refuge entrances.	3.D.4.4. Same as 2.D.4.4.	4.D.4.4. Same as 2.D.4.4.
1.D.4.5. Continue to provide general fishing information via the refuge website and other refuge publications.	2.D.4.5. Continue to develop fishing access opportunities at the Suwannee River Sill and Kingfisher Landing.	3.D.4.5. Same as 2.D.4.5.	4.D.4.5. Same as 2.D.4.5.
	2.D.4.6. Monitor fishing program through periodic creel surveys and voluntary reporting system at the entrances to the swamp.	3.D.4.6. Same as 2.D.4.6.	4.D.4.6. Same as 2.D.4.6.
	2.D.4.7. Develop fishing brochure and expand refuge website to include maps showing the open fishing areas, regulations, and information on the dynamics of the fish populations.	3.D.4.7. Same as 2.D.4.7.	4.D.4.7. Same as 2.D.4.7.
Wildlife Observation and Photography			

D. Public Services			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Process**	**Alternative 4. Refuge Focus Management**
Goal 1.D. Provide accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.	*Goal 2.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.*	*Goal 3.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem and emphasize primitive recreation within the Okefenokee Wilderness Area.*	*Goal 4.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the refuge, while maintaining the wilderness resource of the Okefenokee Wilderness Area.*
1.D.5. Continue to maintain opportunities and facilities appropriate for wildlife observation and photography at the two main entrances of the refuge.	**2.D.5. Provide quality opportunities and facilities for wildlife observation and photography in different habitats of the refuge.**	**3.D.5. Provide quality opportunities and facilities (outside the wilderness) for wildlife observation and photography in different habitats of the refuge.**	**4.D.5. Provide quality opportunities and facilities for wildlife observation and photography in different habitats of the refuge.**
1.D.5.1. Continue to evaluate and improve facilities at access points as needed.	2.D.5.1. Evaluate all access points for use patterns and the need for additional facilities and improve as needed.	3.D.5.1. Same as 2.D.5.1.	4.D.5.1. Same as 2.D.5.1.
1.D.5.2. Seek funding for linking Chesser Island boardwalk spurs #1 and #2 into a loop boardwalk.	2.D.5.2. Expand and develop plans and associated costs for linking boardwalk spurs #1 and #2 into a loop boardwalk.	3.D.5.2. Same as 2.D.5.2.	4.D.5.2. Same as 2.D.5.2.
1.D.5.3. Continue to maintain the Phernetton Long-leaf Pine and Canal Diggers Trails.	2.D.5.3. Develop a boardwalk and observation point leading from visitor center parking lot into Mizell Prairie.	3.D.5.3. Same as 2.D.5.3.	4.D.5.3. Same as 2.D.5.3.
1.D.5.4. Maintain current hiking trails for optimum wildlife viewing opportunities, while preserving the integrity of the habitat and wildlife.	2.D.5.4. Expand development and interpretation of Phernetton Long-leaf Pine and Canal Diggers Trail extension.	3.D.5.4. Same as 2.D.5.4.	4.D.5.4. Same as 2.D.5.4.
1.D.5.5. Maintain wilderness canoe trails for the purpose of gaining access to the interior of the swamp for wildlife observation and photography opportunities.	2.D.5.5. Investigate, expand, and develop, where feasible, hiking trails outside the wilderness area for optimum wildlife viewing opportunities, while preserving the integrity of the habitat and wildlife.	3.D.5.5. Same as 2.D.5.5.	4.D.5.5. Same as 2.D.5.5.
1.D.5.6. Same as 2.D.5.8.	2.D.5.6. Evaluate and, where feasible, develop one fully accessible trail opportunity at all entrances.	3.D.5.6. Same as 2.D.5.6.	4.D.5.6. Same as 2.D.5.6.
1.D.5.7. Continue to present programs, workshops, activities, and exhibits used to teach and enhance wildlife viewing skills.	2.D.5.7. Maintain wilderness canoe trails for additional wildlife observation and photography opportunities while preserving the integrity of the habitat, wildlife, and wilderness resource.	3.D.5.7. Maintain wilderness canoe trails at a lower standard than currently to promote primitive recreation while observing and photographing wildlife and natural landscapes.	4.D.5.7. Same as 2.D.5.7.
1.D.5.8. Promote the use of Kingfisher Landing and Suwannee River Sill as additional access points to wildlife observation and photography opportunities.	2.D.5.8. Maintain wilderness canoe trail reservation system to promote solitude and enhance opportunities to observe and photograph wildlife in their natural surroundings.	3.D.5.8. Discontinue the wilderness canoe trail reservation system to promote primitive recreation and challenge.	4.D.5.8. Same as 2.D.5.8.
1.D.5.9. Same as 2.D.5.11.	2.D.5.9. Expand program offerings, workshops, activities, and exhibits used to teach and enhance wildlife viewing skills and ethics.	3.D.5.9. Same as 2.D.5.9.	4.D.5.9. Same as 2.D.5.9.

D. Public Services			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Process**	**Alternative 4. Refuge Focus Management**
Goal 1.D. Provide accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.	*Goal 2.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.*	*Goal 3.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem and emphasize primitive recreation within the Okefenokee Wilderness Area.*	*Goal 4.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the refuge, while maintaining the wilderness resource of the Okefenokee Wilderness Area.*
1.D.5.10. Continue to promote wildlife observation and photography opportunities on the refuge through brochures, news releases, displays, special events, and at key points.	2.D.5.10. Investigate the need for expanded wildlife oriented viewing opportunities including trails, exhibits, etc. at Kingfisher Landing and the Suwannee River Sill Area.	3.D.5.10. Same as 2.D.5.10.	4.D.5.10. Same as 2.D.5.10.
	2.D.5.11. Convert the manicured lawn area at Suwannee Canal Recreation Area to a backyard habitat for wildlife observation and photography.	3.D.5.11. Same as 2.D.5.11.	4.D.5.11. Same as 2.D.5.11.
	2.D.5.12. Continue to promote wildlife observation and photography opportunities within the ecosystem through brochures, news releases, displays, special events, and at key points. Include messages on good wildlife observation and photography practices to minimize disturbance.	3.D.5.12. Same as 2.D.5.12.	4.D.5.12. Continue to promote wildlife observation and photography opportunities on the refuge through brochures, news releases, displays, special events, and at key points. Include messages on good wildlife observation and photography practices to minimize disturbance.
	2.D.5.13. Continue to promote the Colonial Coast Birding Trail in partnership with Georgia Wildlife Resources Division.	3.D.5.13. Same as 2.D.5.13.	
Environmental Education			
1.D.6. Continue environmental education on the refuge to enhance public awareness and understanding of the refuge's natural ecology and the influence of humans on the landscape.	**2.D.6. Expand environmental education to a multi-faceted, curriculum based program for use on and off the refuge to enhance public awareness and understanding of the refuge's natural ecology, the human influences on the swamp ecosystem, the wilderness philosophy and concepts, and to inspire action among local, national, and international education groups on behalf of the USFWS, refuge and the ecosystem.**	**3.D.6. Expand environmental education to a multi-faceted, curriculum based program for use on and off the refuge to enhance public awareness and understanding of the refuge's natural ecology, the natural processes that work upon the landscape, the human influences on the swamp ecosystem, the wilderness philosophy and concepts, and to inspire action among local, national, and international education groups on behalf of the USFWS, refuge, and the ecosystem.**	**4.D.6. Expand environmental education to a multi-faceted, curriculum based program for use on and off the refuge to enhance public awareness and understanding of the refuge's natural ecology, the human influences on the swamp ecosystem, the wilderness philosophy and concepts, and to inspire action among local, national, and international education groups on behalf of the USFWS and refuge.**
1.D.6.1. Continue to provide age appropriate environmental education activities and materials.	2.D.6.1. Develop grade appropriate environmental education activities and materials that support the Georgia/Florida approved curricula.	3.D.6.1. Same as 2.D.6.1.	4.D.6.1. Same as 2.D.6.1.

D. Public Services			
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Goal 1.D. Provide accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.	*Goal 2.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.*	*Goal 3.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem and emphasize primitive recreation within the Okefenokee Wilderness Area.*	*Goal 4.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the refuge, while maintaining the wilderness resource of the Okefenokee Wilderness Area.*
1.D.6.2. Continue to utilize Suwannee Canal Recreation Area, the Chesser Island Homestead, and the Chesser Island boardwalk for environmental education activities.	2.D.6.2. Develop environmental education facilities, including outdoor and indoor classroom settings at various entrances and locations to balance environmental education demands on the landscape, and to reduce conflicts between groups and/or activities.	3.D.6.2. Same as 2.D.6.2.	4.D.6.2. Same as 2.D.6.2.
1.D.6.3. Utilize the Cane Pole Trail as an alternative environmental education area.	2.D.6.3. Enhance the existing Cane Pole Trail for an alternative environmental education area by creating an interpretive boardwalk with an observation platform extending out into Mizell Prairie.	3.D.6.3. Same as 2.D.6.3.	4.D.6.3. Same as 2.D.6.3.
1.D.6.4. Maintain a schedule of groups visiting the refuge and provide activities as time, staff, and requests dictate.	2.D.6.4. Develop a plan that deals with the administration of groups seeking environmental education from contact to follow-up activities.	3.D.6.4. Same as 2.D.6.4.	4.D.6.4. Same as 2.D.6.4.
1.D.6.5. Provide environmental education outreach to local schools and other interested groups as requested.	2.D.6.5. Expand and develop environmental education outreach to local schools and other interested groups covering on-going refuge activities.	3.D.6.5. Same as 2.D.6.5.	4.D.6.5. Same as 2.D.6.5.
1.D.6.6. Continue to provide support materials for teachers upon request to use both on and off refuge.	2.D.6.6. Expand and develop environmental education support materials for teachers to use both on and off refuge.	3.D.6.6. Same as 2.D.6.6.	4.D.6.6. Same as 2.D.6.6.
1.D.6.7. Periodically provide teacher workshop materials and host teacher workshops at the refuge.	2.D.6.7. Enhance teacher workshop materials and host teacher workshops at the refuge.	3.D.6.7. Same as 2.D.6.7.	4.D.6.7. Same as 2.D.6.7.
1.D.6.8. Coordinate environmental education groups with concession operations and support any interest in providing environmental education.	2.D.6.8. Encourage concession operations at various entrances to support curriculum based environmental education and sales items.	3.D.6.8. Same as 2.D.6.8.	4.D.6.8. Same as 2.D.6.8.
1.D.6.9. Continue to rely on support from Okefenokee Wildlife League for environmental education programs.	2.D.6.9. Develop a multifaceted Junior Refuge Manager program to all young refuge users, including those off the refuge via the Internet.	3.D.6.9. Same as 2.D.6.9.	4.D.6.9. Same as 2.D.6.9.
1.D.6.10. Coordinate groups from the Okefenokee Education and Research Center similar to other educational groups requesting the use of refuge facilities.	2.D.6.10. Develop yearly environmental education projects that involve the financial support and physical assistance of the Okefenokee Wildlife League.	3.D.6.10. Same as 2.D.6 10.	4.D.6.10. Same as 2.D.6.10.

D. Public Services			
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Goal 1.D. Provide accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.	*Goal 2.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.*	*Goal 3.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem and emphasize primitive recreation within the Okefenokee Wilderness Area.*	*Goal 4.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the refuge, while maintaining the wilderness resource of the Okefenokee Wilderness Area.*
1.D.6.11. Continue to strengthen the partnership with environmental education organizations to develop and present educational programs, activities, and exhibits on the refuge.	2.D.6.11. Develop a partnership with the city of Folkston and the Georgia Wildlife Federation in the coordination of programs offered by the Okefenokee Education and Research Center and utilizing refuge facilities for environmental education to promote the purpose/objectives of the refuge and USFWS.	3.D.6.11. Same as 2.D.6.11.	4.D.6.11. Same as 1.D.6.11.
1.D.6.12. Same as 2.D.6.13.	2.D.6.12. Increase or enhance the partnerships with environmental education organizations to develop and present educational programs, activities, and exhibits on the refuge that promote awareness of the resources.	3.D.6.12. Same as 2.D.6.12.	4.D.6.12. Make appropriate provisions for canoeists traveling from the St. Marys River to the Suwannee River through the swamp.
	2.D.6.13. Continue to participate in the St. Marys to the Suwannee initiative for establishing a canoe trail from the Atlantic Ocean to the Gulf of Mexico.	3.D.6.13. Same as 2.D.6.13.	4.D.6.13. Same as 2.D.6.14.
	2.D.6.14. Evaluate and determine the effectiveness of all environmental education activities and modify as needed to meet refuge needs.	3.D.6.14. Same as 2.D.6.14.	
Interpretation			
1.D.7. Maintain non-personal and personal interpretive media and programs that increase awareness and understanding of the refuge's natural and human influences, habitat diversity, wildlife values, wilderness concepts, and the management activities performed to protect, enhance, restore, and maintain the refuge.	**2.D.7. Provide non-personal and personal interpretive media and programs that increase awareness and understanding of the refuge's natural and human influences, habitat diversity, wildlife values, wilderness philosophy and concepts, and management activities performed to protect, enhance, restore, and maintain the Okefenokee ecosystem.**	**3.D.7. Provide non-personal and personal interpretive media and programs that increase awareness and understanding of the refuge's natural and human influences, habitat diversity, wildlife values, wilderness philosophy and concepts, management principles, and conservation through natural processes.**	**4.D.7. Provide non-personal and personal interpretive media and programs that increase awareness and understanding of the refuge's natural and human influences, habitat diversity, wildlife values, wilderness philosophy and concepts, and management activities performed to protect, enhance, restore, and maintain the refuge habitats.**
1.D.7.1. Same as 2.D.7.1.	2.D.7.1. Promote an understanding of the relationship among all programs of the USFWS, the National Wildlife Refuge System, and Okefenokee NWR through interpretive panels, brochures, signing, etc.	3.D.7.1. Same as 2.D.7.1.	4.D.7.1. Same as 2.D.7.1.

D. Public Services			
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1.D.7.2. Continue to interpret key resource management messages that define and simplify refuge actions to protect, enhance, restore, and maintain the Okefenokee ecosystem.	2.D.7.2. Re-examine and refine key resource management messages that define and simplify refuge actions to protect, enhance, restore, and maintain the Okefenokee ecosystem.	3.D.7.2. Re-examine and refine key resource management messages that define and simplify refuge actions to conserve through natural processes.	4.D.7.2. Same as 2.D.7.2.
1.D.7.3. Continue to interpret swamp ecosystem, the importance of wetlands, and wilderness management through the displays at the Visitor Center.	2.D.7.3. Develop interpretive panels, brochures, signing, etc., that increase awareness of the swamp ecosystem, the importance of wetlands, and wilderness management.	3.D.7.3. Same as 2.D.7.3.	4.D.7.3. Same as 2.D.7.3.
1.D.7.4. Update brochures when re-printing is necessary.	2.D.7.4. Evaluate all brochures for necessity. Eliminate or condense brochures where possible.	3.D.7.4. Same as 2.D.7.4.	4.D.7.4. Same as 2.D.7.4.
1.D.7.5. Same as 2.D.7.5.	2.D.7.5. Evaluate all festivals and special events for appropriateness.	3.D.7.5. Same as 2.D.7.5.	4.D.7.5. Same as 2.D.7.5.
1.D.7.6. Maintain interpretive signs that are currently in place within the wilderness area.	2.D.7.6. Evaluate feasibility of interpretation within the wilderness area and consider the use of backcountry rangers.	3.D.7.6. Remove all interpretation signs within the wilderness area, including place names, and promote interpretation by backcountry rangers.	4.D.7.6. Same as 2.D.7.6.
1.D.7.7. Maintain current kiosks and interpretive panels for upland trails and boardwalks.	2.D.7.7. Expand and develop kiosks and interpretive panels for all upland trails and boardwalks with a trail map and brief description of the trail, including elements of interest.	3.D.7.7. Same as 2.D.7.7.	4.D.7.7. Same as 2.D.7.7.
1.D.7.8. Same as 2.D.7.8.	2.D.7.8. Continue current MOU with International Paper Company for provision of an interpretive trail across its lands.	3.D.7.8. Same as 2.D.7.8.	4.D.7.8. Acquire lands that the trail traverses and interpret refuge management.
1.D.7.9. Continue to interpret history at Chesser Island homestead verbally and with signs.	2.D.7.9. Evaluate and develop, if feasible, other avenues for presenting the living history of the Chesser Island homestead.	3.D.7.9. Interpret man's influence on the natural processes at the Chesser Island homestead.	4.D.7.9. Same as 2.D.7.9.
1.D.7.10. Same as 2.D.7.10.	2.D.7.10. Interpret through various media the conversion of manicured lawn area to a backyard habitat exhibit to promote natural landscapes.	3.D.7.10. Same as 2.D.7.10.	4.D.7.10. Same as 2.D.7.10.
1.D.7.11. Same as 2.D.7.11.	2.D.7.11. Evaluate current MOU with Zoo Atlanta and the potential for partnerships with other zoos and aquariums (e.g., Jacksonville Zoo and Georgia Aquarium) to decide if there are common goals in interpretation and environmental education.	3.D.7.11. Same as 2.D.7.11.	4.D.7.11. Discontinue MOU with Zoo Atlanta.

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1.D.7.12. Utilize local radio stations for promoting a refuge event and/or festival.	2.D.7.12. Examine feasibility of maintaining an interpretive radio station available 24 hours a day to inform visitors of refuge hours, visitor center, trail locations, and a description of all refuge entrances.	3.D.7.12. Same as 2.D.7.12.	4.D.7.12. Same as 2.D.7.12.
1.D.7.13. Continue to write the Blue Goose Corner for Georgia Wildlife Federation quarterly publication and submit news releases on special events to local and regional papers.	2.D.7.13. Develop news releases and magazine articles for weekly and monthly civic and conservation organization publications.	3.D.7.13. Same as 2.D.7.13.	4.D.7.13. Same as 2.D.7.13.
1.D.7.14. Maintain current website with standard information.	2.D.7.14. Enhance website to reach major national and international markets. Establish web site links through civic and conservation organizations.	3.D.7.14. Same as 2.D.7.14.	4.D.7.14. Same as 2.D.7.14.
1.D.7.15. Maintain correct media contact lists.	2.D.7.15. Expand refuge outreach and media relations plan to reach major media markets locally, regionally, and nationally.	3.D.7.15. Same as 2.D.7.15.	4.D.7.15. Same as 2.D.7.15.
1.D.7.16. Same as 2.D.7.16.	2.D.7.16. Continue to cultivate partnerships with community or conservation organizations capable of developing and administering funds to assist in key refuge issues and interpretive themes.	3.D.7.16. Same as 2.D.7.16.	4.D.7.16. Same as 2.D.7.17.
1.D.7.17. Continue to work with the Boy Scouts on special projects.	2.D.7.17. Expand refuge volunteers to include youth groups such as 4-H clubs, Girl and Boy Scouts, etc., working on projects that enhance the refuge while educating youths and their leaders about key refuge issues.	3.D.7.17. Same as 2.D.7.17.	
1.D.7.18. Same as 2.D.7.18.	2.D.7.18. Support off-site outreach programs when feasible and beneficial to the goals of the refuge.	3.D.7.18. Same as 2.D.7.18.	
Commercial Uses			
1.D.8. Continue to administer concession contracts, permits, and other commercial uses of the refuge within the policies and guidelines of the National Wildlife Refuge System and the National Wilderness legislation established for Okefenokee NWR.	**2.D.8. Use concession contracts, permits, and commercial uses within the policies of the National Wildlife Refuge System and the National Wilderness legislation established for Okefenokee NWR to assist in meeting the management goals of the refuge.**	**3.D.8. Use concession contracts, permits and established policies and procedures for managing compatible use of the refuge and Okefenokee wilderness by commercial entities.**	**4.D.8. Use concession contracts, permits, and commercial uses within the policies of the National Wildlife Refuge System and the National Wilderness legislation established for Okefenokee NWR to assist in meeting the management goals of the refuge.**

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Goal 1.D. Provide accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.	*Goal 2.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.*	*Goal 3.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem and emphasize primitive recreation within the Okefenokee Wilderness Area.*	*Goal 4.D. Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, when compatible, to promote public appreciation, understanding, and action on behalf of the refuge, while maintaining the wilderness resource of the Okefenokee Wilderness Area.*
1.D.8.1. Same as 2.D.8.1.	2.D.8.1. Continue to meet regularly with concession supervisors to maintain lines of communication and to clarify policies and issues of interest to each party.	3.D.8.1. Same as 2.D.8.1.	4.D.8.1. Same as 2.D.8.1.
1.D.8.2. Provide training for concession guides on interpretive messages related to the refuge.	2.D.8.2. Investigate the need, feasibility, and impact of concession contracts and facilities at Kingfisher Landing and the Suwannee River Sill area.	3.D.8.2. Same as 2.D.8.2.	4.D.8.2. Same as 2.D.8.2.
1.D.8.3. Follow current commercial outfitter guidelines.	2.D.8.3. As technology becomes available, negotiate concession contracts requiring conversion to battery-operated motors for guided tour boats, and boat and motor rentals.	3.D.8.3. Same as 2.D.8.3.	4.D.8.3. Same as 2.D.8.3.
1.D.8.4. Follow current contracts for Stephen C. Foster State Park.	2.D.8.4. Evaluate the need and feasibility of alternative means of transportation for remote parking areas off refuge and an interpretive tram for tours on the refuge.	3.D.8.4. Same as 2.D.8.4.	4.D.8.4. Evaluate the need and feasibility of an interpretive tram tour on the refuge.
1.D.8.5. Follow current contract for east side concession.	2.D.8.5. Develop specialized training for concession guides concentrating on interpretive messages and environmental education principles relevant to refuge issues and concerns.	3.D.8.5. Same as 2.D.8.5.	4.D.8.5. Same as 2.D.8.5.
1.D.8.6. Follow current contract for Okefenokee Swamp Park.	2.D.8.6. Re-negotiate commercial outfitter guidelines for soliciting, evaluating, awarding, and monitoring overnight and day use of the refuge.	3.D.8.6. Same as 2.D.8.6.	4.D.8.6. Same as 2.D.8.6.
1.D.8.7. Follow current commercial guiding procedures.	2.D.8.7. Re-negotiate Stephen C. Foster State Park's contracts emphasizing compatible recreational activities on the refuge.	3.D.8.7. Same as 2.D.8.7.	4.D.8.7. Same as 2.D.8.7.
	2.D.8.8. Re-negotiate east side concession contract emphasizing interpretation and environmental education.	3.D.8.8. Same as 2.D.8.8.	4.D.8.8. Same as 2.D.8.8.
	2.D.8.9. Re-negotiate Okefenokee Swamp Park contract emphasizing interpretation and environmental education.	3.D.8.9. Same as 2.D.8.9.	4.D.8.9. Same as 2.D.8.9.
	2.D.8.10. Re-evaluate refuge commercial guiding procedures.	3.D.8.10. Same as 2.D.8.10	4.D.8.10. Same as 2.D.8.10.

E. Partnerships			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Process**	**Alternative 4. Refuge Focus Management**
Goal 1.E. Support ecosystem-based cooperation through good communication and partnerships with landowners and land managers immediately adjacent to and downstream from the refuge to facilitate refuge management.	*Goal 2.E. Promote communication, cooperation, and partnerships between local, state, and federal agencies, land managers, and private citizens within the "zones of influence" to conserve the integrity of the pathways associated with resource protection, wildlife populations, and public services.*	*Goal 3.E. Develop support and understanding from local, state, and federal agencies, land managers, and private citizens for maximizing natural processes within the Okefenokee Swamp and develop networks to conserve the integrity of the pathways associated with resource protection, wildlife populations, and public services.*	*Goal 4.E. Rely on adjacent landowners and interest groups to represent views of the refuge and to be proactive in protecting the Okefenokee NWR from outside threats to ensure the health of the refuge resources.*
Natural Resources			
1.E.1. Promote, support, and assist the cooperative efforts of local land managers, interest groups, and government entities to protect and/or enhance the natural resources and processes within the greater Okefenokee ecosystem.	**2.E.1. Promote, support, and assist the cooperative efforts of land managers, interest groups, and government entities to protect and/or enhance the natural resources and processes within the "zones of influence."**	**3.E.1. Promote, support, and assist the cooperative efforts of local land managers, interest groups, and government entities in protecting the natural resources outside the Okefenokee wilderness while allowing all natural processes to occur within the wilderness area.**	**4.E.1. Promote the cooperative efforts of local land managers, interest groups, and government entities to protect and/or enhance the natural resources and processes within Okefenokee NWR.**
1.E.1.1. Continue to work with adjacent landowners in developing management agreements for protecting and enhancing endangered species populations and critical habitat.	2.E.1.1. Examine and develop where feasible, innovative management agreements with adjacent landowners and other land managers within the "zones of influence" to protect the natural resources and processes of the area and promote fire use within the Okefenokee Wilderness Area.	3.E.1.1. Examine and develop where feasible, innovative management agreements with adjacent landowners and other land managers within the "zones of influence" to protect the natural resources and processes of the area, while supporting the sole use of natural processes such as wildfires to govern the landscape within the Okefenokee Wilderness Area.	4.E.1.1. Rely on outside interests to take initiatives in developing management strategies to protect the natural resources and processes within the "zones of influence" of the refuge.
1.E.1.2. Same as 2.E.1.2.	2.E.1.2. Continue to encourage and support the efforts of the Greater Okefenokee Association of Landowners.	3.E.1.2. Same as 2.E.1.2.	4.E.1.2. Rely on the Greater Okefenokee Association of Landowners to develop management strategies to protect the natural resources around the refuge while taking into consideration the management of the refuge.
1.E.1.3. Same as 2.1.3.	2.E.1.3. Continue to support Okefenokee Wildlife League and develop an advocacy group for the refuge.	3.E.1.3. Same as 2.E.1.3.	4.E.1.3. Same as 2.E.1.3.
1.E.1.4. Same as 2.E.1.4.	2.E.1.4. Continue to support the Tri-Agency Agreement with the National Park Service and Forest Service.	3.E.1.4. Same as 2.E.1.4.	4.E.1.4. Continue to develop working relationships with Georgia Forestry Commission and Florida Division of Forestry to assist with fire management, longleaf/wiregrass restoration, and endangered species management on the refuge.
1.E.1.5. Same as 2.E.1.5.	2.E.1.5. Continue to support the Suwannee River Interagency Alliance with the Suwannee River Water Management District and Georgia Department of Environmental Protection as partners.	3.E.1.5. Same as 2.E.1.5.	4.E.1.5. Work with local and State governments to develop an understanding of the management of the Okefenokee NWR and the importance of environmentally friendly development.

E. Partnerships			
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1.E.1.6. Same as 2.E.1.6.	2.E.1.6. Continue to develop working relationships with Georgia Forestry Commission and Florida Division of Forestry in fire management, longleaf/wiregreass restoration, and endangered species management.	3.E.1.6. Continue to develop working relationships with Georgia Forestry Commission and Florida Division of Forestry in protection of natural resources surrounding the Okefenokee wilderness while allowing natural processes such as wildfire to govern the wilderness landscape.	4.E.1.6. Identify potential influences to the refuge from non-traditional sources and allow others to investigate impacts and take action on reducing negative influences.
1.E.1.7. Same as 2.E.1.7.	2.E.1.7. Continue to develop working relationships with Georgia Division of Wildlife Resources and the Florida Fish and Wildlife Conservation Commission in an effort to enhance habitat conditions and data collection to promote cooperative management of resident species.	3.E.1.7. Same as 2.E.1.7.	
1.E.1.8. Same as 2.E.1.8.	2.E.1.8. Work with local and state governments to develop an understanding of the importance of the Okefenokee NWR and encourage environmentally friendly development in the "zones of influence."	3.E.1.8. Work with local and state governments to develop an understanding of the management of the Okefenokee NWR with special emphasis on natural processes, and encourage environmentally friendly development in the "zones of influence."	
1.E.1.9. Same as 2.E.1.9.	2.E.1.9. Identify influences to the refuge's natural resources from non-traditional sources and distances, and develop partnerships to reduce negative influences.	3.E.1.9. Same as 2.E.1.9.	
Natural Processes			
1.E.2. Develop partnerships to support implementation of natural process management within the Okefenokee wilderness in concert with other agency and refuge missions.	**2.E.2. Develop agreements, partnerships, and advocacy groups to support implementation of natural process management within the Okefenokee wilderness in concert with other agency and refuge missions.**	**3.E.2. Develop agreements, partnerships, and advocacy groups to support full implementation of natural process management within the Okefenokee wilderness at the exclusion of other agency and refuge mandates.**	**4.E.2. Develop agreements, partnerships, and advocacy groups to support implementation of natural process management within the Okefenokee wilderness in concert with other agency and refuge missions.**
1.E.2.1. Consult with fire use specialists.	2.E.2.1. Identify experts in natural process management, particularly in the southeast.	3.E.2.1. Same a 2.E.2.1.	4.E.2.1. Same as 2.E.2.1.
1.E.2.2. Gain support for natural fire use through wildfire review process.	2.E.2.2. Sponsor a workshop on natural process management, agency mission, and refuge objectives to obtain ideas, techniques, and support for management decisions.	3.E.2.2. Sponsor a workshop on natural process management to obtain ideas, techniques, and support.	4.E.2.2. Same as 2.E.2.2.

E. Partnerships			
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1.E.2.3. Same as 2.E.2.3.	2.E.2.3. Hold workshops and training sessions with professional natural resource managers, local citizens, local governments, state agencies, and congressional leaders to gain understanding and support for the integration of natural process management to meet the objectives of the agency and refuge.	3.E.2.3. Hold workshops and training sessions with professional natural resource managers, local citizens, local governments, state agencies, and congressional leaders to gain understanding and support for exclusive natural process management.	4.E.2.3. Hold workshops and training sessions for the staff to gain insight into managing natural processes to meet the objectives of the agency and refuge.
Research			
1.E.3. Maintain current relationships with nationally recognized universities and colleges to provide valuable scientific data that will enhance refuge management decisions while providing research and education opportunities for their students.	**2.E.3. Maintain current relationships and encourage new partnerships with nationally recognized organizations, universities and colleges, and other agencies to provide valuable scientific data that will enhance natural resource management within the greater Okefenokee ecosystem while providing research and education opportunities for students.**	**3.E.3. Maintain current relationships and encourage new partnerships with nationally recognized universities and colleges to provide valuable scientific data that will enhance natural resource management within the greater Okefenokee ecosystem while providing research and education opportunities for their students.**	**4.E.3. Maintain current relationships and encourage new partnerships with nationally recognized universities and colleges to provide valuable scientific data that will enhance refuge management decisions, while providing research and education opportunities for their students.**
1.E.3.1. Consult with past refuge researchers and other professionals to determine research needs of the refuge.	2.E.3.1. Organize a diverse group of multi-disciplinary professionals to determine the boundaries of the "zones of influence."	3.E.3.1. Same as 2.E.3.1.	4.E.3.1. Organize a diverse group of multi-disciplinary professionals to establish parameters to measure on the refuge that may be influenced by outside threats.
1.E.3.2. Allow government agencies, colleges, universities, private institutions, and non-government offices to perform management and problem-based research, especially in the areas of hydrology, fisheries, and contaminants.	2.E.3.2. Encourage government agencies, colleges, universities, private institutions, and non-government offices to perform management and problem-based research within the "zones of influence" and issues related to wilderness management.	3.E.3.2. Encourage government agencies, colleges, universities, private institutions, and non-government offices to perform management and problem-based research with emphasis on management through natural processes and wilderness issues.	4.E.3.2. Work with government agencies, colleges, universities, private institutions, and non-government offices to encourage management and problem-based research, focusing on specific refuge and wilderness management needs.
1.E.3.3. Same as 2.E.3.3.	2.E.3.3. Establish an agreement with all researchers conducting research on the refuge through the Special Use Permit procedure to determine the benefit of the research, the appropriate techniques and methods, coordination needed, and the deliverables required, considering whether the research will be conducted within or outside the wilderness area.	3.E.3.3. Same as 2.E.3.3.	4.E.3.3. Same as 2.E.3.3.

E. Partnerships			
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Goal 1.E. Support ecosystem-based cooperation through good communication and partnerships with landowners and land managers immediately adjacent to and downstream from the refuge to facilitate refuge management.	*Goal 2.E. Promote communication, cooperation, and partnerships between local, state, and federal agencies, land managers, and private citizens within the "zones of influence" to conserve the integrity of the pathways associated with resource protection, wildlife populations, and public services.*	*Goal 3.E. Develop support and understanding from local, state, and federal agencies, land managers, and private citizens for maximizing natural processes within the Okefenokee Swamp and develop networks to conserve the integrity of the pathways associated with resource protection, wildlife populations, and public services.*	*Goal 4.E. Rely on adjacent landowners and interest groups to represent views of the refuge and to be proactive in protecting the Okefenokee NWR from outside threats to ensure the health of the refuge resources.*
1.E.3.4. Same as 2.E.3.4.	2.E.3.4. Monitor air quality under the guidance of the USFWS Air Quality Division, including the current partnerships with the three national programs: National Atmospheric Deposition Program, Mercury Deposition Network, and the interagency Monitoring of Protected Visual Environments.	3.E.3.4. Same as 2.E.3.4.	4.E.3.4. Same as 2.E.3.4.
	2.E.3.5. Establish a liaison as part of an organized collaborative process within the Okefenokee Education and Research Center to promote sound scientific management-based research on issues concerning the refuge and the "zones of influence."	3.E.3.5. Same as 2.E.3.5.	4.E.3.5. Establish a liaison as part of an organized collaborative process within the Okefenokee Education and Research Center to promote sound scientific refuge management-based research.
	2.E.3.6. Serve as an advisor or member of a board for the Okefenokee Education and Research Center to promote integrated ecosystem-based research.	3.E.3.6. Same as 2.E.3.6.	
Environmental Education			
1.E.4. Enhance environmental education opportunities within the greater Okefenokee ecosystem.	**2.E.4. Enhance and promote innovative environmental education opportunities within the greater Okefenokee ecosystem.**	**3.E.4. Enhance and promote innovative environmental education opportunities within the greater Okefenokee ecosystem emphasizing natural processes in the landscape.**	**4.E.4. Enhance and promote innovative environmental education opportunities about the refuge.**
1.E.4.1. Same as 2.E.4.2.	2.E.4.1. Develop partnerships with environmental education organizations to promote assistance with programs, activities, and exhibits on the ecosystem's resources.	3.E.4.1. Same as 2.E.4.1.	4.E.4.1. Same as 2.E.4.6.
1.E.4.2. Keep abreast of the environmental education opportunities available at each entrance to the swamp.	2.E.4.2. Develop partnerships with the city of Folkston and the Georgia Wildlife Federation for coordinated operation of the Okefenokee Education and Research Center, utilizing refuge facilities for environmental education.	3.E.4.2. Same as 2.E.4.2.	
	2.E.4.3. Coordinate, integrate, and promote environmental education opportunities at the refuge with Okefenokee State Park and Swamp Park.	3.E.4.3. Same as 2.E.4.3.	

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1.E.4.4. Same as 2.E.4.4.	2.E.4.4. Continue partnership with Zoo Atlanta to promote the ecosystem's resources through environmental education and interpretation.	3.E.4.4. Same as 2.E.4.4.	
1.E.4.5. Promote Okefenokee Wildlife League as a major contributor towards environmental education on the refuge.	2.E.4.5. Investigate potential for partnerships with Jacksonville Zoo, Georgia Aquarium, and others to facilitate environmental education on the area's natural resources and implement if feasible.	3.E.4.5. Same as 2.E.4.5.	
	2.E.4.6. Continue to expand Okefenokee Wildlife League's contribution towards environmental education.	3.E.4.6. Same as 2.E.4.6.	
Funding			
1.E.5. Identify and secure funding through grants and other available sources for research projects that will aid in the protection and management of refuge resources.	**2.E.5. Identify and secure funding through grants and other available sources for research projects that will aid in the protection and management of those area resources influencing the health of the greater Okefenokee ecosystem.**	**3.E.5. Identify and secure funding through grants and other available sources for research projects that will aid in the protection of the wilderness resource and natural processes within the Okefenokee Wilderness Area.**	**4.E.5. Identify and secure funding through grants and other available sources for research projects that will aid in the protection and management of refuge resources.**
1.E.5.1. Same as 2.E.5.1.	2.E.5.1. Annually seek information and apply for grants from both inside and outside the USFWS.	3.E.5.1. Same as 2.E.5.1.	4.E.5.1. Same as 3.E.5.1.
1.E.5.2. Same as 2.E.5.2.	2.E.5.2. Work with non-government organizations and private institutions to identify potential partners in support of management-based research.	3.E.5.2. Work with non-government organizations and private institutions to identify potential partners in support of research related to wilderness and natural processes.	4.E.5.2. Same as 2.E.5.2.
Data Sharing			
1.E.6. Identify cooperators within the areas of concern to share information and data that would enhance the protection and restoration of the area's resources.	**2.E.6. Identify partners and cooperators within the "zones of influence" and develop a network for sharing and analyzing data that would enhance the protection and restoration of the area's resources.**	**3.E.6. Identify partners and cooperators within the "zones of influence" and develop a network for sharing and analyzing data that would enhance the protection of the area's resources with emphasis on allowing natural processes to govern the wilderness area.**	**4.E.6. Identify organizations and individuals supportive of the Okefenokee NWR to share information on potential threats to the resources on the refuge.**
1.E.6.1. Participate in regional and national surveys, when appropriate, and network with Georgia Department of Natural Resources and other area refuges on surveys in common.	2.E.6.1. Contribute to regional and national surveys where appropriate and develop a network among land managers within the "zones of influence" to share wildlife distribution data.	3.E.6.1. Same as 2.E.6.1. with emphasis on species found outside the wilderness area.	4.E.6.1. Contribute to regional and national USFWS surveys as appropriate.

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1.E.6.2. Maintain lines of communication to keep abreast of potential threats.	2.E.6.2. Identify through a cooperative effort with other USFWS groups, local and State governments, universities, communities, and others the potential negative impacts within the "zones of influence" and lines of communication to keep abreast of potential threats.	3.E.6.2. Same as 2.E.6.2.	4.E.6.2. Identify through the refuge staff the potential negative impacts within the "zones of influence" and the lines of communication to keep abreast of potential threats.
1.E.6.3. Maintain communications with St Johns and Suwannee River Water Management Districts for the purpose of sharing hydrologic information and expertise.	2.E.6.3. Develop a partnership with the Water Management Districts for the purpose of encouraging hydrologic and environmental research and information sharing within the "zones of influence."	3.E.6.3. Same as 2.E.6.3.	4.E.6.3. Continue to contribute to national fire databases and promote and support fire behavior research on the refuge.
1.E.6.4. Continue to contribute to national fire databases and support fire research by sharing data with other agencies and organizations.	2.E.6.4. Continue to contribute to national fire databases and promote and support fire behavior research through partnerships.	3.E.6.4. Same as 2.E.6.4.	4.E.6.4. Monitor the health and status of the fisheries population using refuge resources.
1.E.6.5. Continue to survey the fisheries through agreements with USFWS Fisheries Resource Office, Florida and Georgia Department of Natural Resources.	2.E.6.5. Continue to monitor the health and status of the fisheries population through cooperation and support from USFWS Fisheries Resource Office, Georgia Department of Natural Resources, and other fish specialists.	3.E.6.5. Monitor the health and status of the fisheries population through creel surveys in cooperation with Georgia Department of Natural Resources.	
Cultural Resources			
1.E.7. Consult with pertinent federal and state agencies and professional archaeologists to aid in the management of cultural resources.	**2.E.7. Facilitate partnerships with other pertinent federal and state agencies, professional archaeologists, descendents of early settlers, Native American and other communities, and the general public to aid in the management of cultural resources.**	**3.E.7. Facilitate partnerships with other pertinent federal and state agencies, professional archaeologists, descendents of early settlers, Native American and other communities, and the general public to aid in the management of cultural resources.**	**4.E.7. Consult with other pertinent federal and state agencies, professional archaeologists, descendents of early settlers, Native American and other communities, and the general public to aid in the management of cultural resources.**
1.E.7.1. Investigate violations of the Archaeological Resources Protection Act using refuge law enforcement officers and report findings to the USFWS's regional archaeologist.	2.E.7.1. Investigate potential agreements with federal agencies, such as the U.S. Forest Service and the National Park Service, that facilitate investigations related to violations of the Archaeological Resources Protection Act.	3.E.7.1. Same as 2.E.7.1.	4.E.7.1. Same as 1.E.7.1.
	2.E.7.2. Identify potential institutions specializing in archaeological and historic investigations and promote interdisciplinary research.	3.E.7.2. Same as 2.E.7.1.	4.E.7.2. Same as 2.E.7.2.

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	2.E.7.3. Negotiate an agreement with the University of Georgia, or other appropriate facilities, for the permanent curation of archaeological collections and associated documentation derived from archaeological investigations on the refuge.	3.E.7.3. Same as 2.E.7.3.	4.E.7.3. Consult with curators to establish protocol for maintaining an archaeological collection at the refuge.
Public Services			
1.E.8. Maintain partnerships that promote eco-tourism.	**2.E.8. Develop partnerships that promote and expand eco-tourism opportunities and the enrichment of the human spirit.**	**3.E.8. Develop partnerships that promote and expand eco-tourism opportunities and the enrichment of the human spirit.**	**4.E.8. Support eco-tourism through expanding opportunities on the refuge.**
1.E.8.1. Promote eco-tourism through coordination with the cities and counties surrounding the refuge.	2.E.8.1. Develop and promote eco-tourism opportunities within the greater Okefenokee ecosystem through partnerships with businesses, civic and conservation organizations, and city, county, and state governments.	3.E.8.1. Same as 2.E.8.1.	4.E.8.1. Provide public use opportunities on the refuge in support of eco-tourism within the ecosystem.
1.E.8.2. Seek outside funding for specific interpretation projects.	2.E.8.2. Develop agreements with partners who support the interpretation of the area's natural resources and are capable of securing funds.	3.E.8.2. Same as 2.E.8.2.	4.E.8.2. Seek funding sources for interpretation of the refuge's natural resources.
1.E.8.3. Same as 2.E.8.3.	2.E.8.3. Continue supporting the St. Marys to the Suwannee initiative to establish a canoe trail from the Atlantic Ocean to the Gulf of Mexico.	3.E.8.3. Same as 2.E.8.3.	4.E.8.3. Maintain watercraft trail system within the refuge in support of the St. Marys to the Suwannee initiative.
	2.E.8.4. Continue to support the Colonial Coast Birding Trail in partnership with Georgia Wildlife Resources Division.	3.E.8.4. Same as 2.E.8.4.	
	2.E.8.5. Take an active role in community improvements that promote natural resources and/or the enrichment of the human spirit.	3.E.8.5. Same as 2.E.8.5.	
Trail Maintenance			
1.E.9. Develop partnerships with groups to provide a work force for maintaining trails and conducting other natural resource management functions.	**2.E.9. Develop partnerships with groups to provide a supplemental work force for maintaining trails and conducting other natural resource management functions following the Minimum Requirement Decision Guidelines.**	**3.E.9. Develop partnerships with groups to provide a work force for maintaining trails and conducting other natural resource management functions using primitive and hand tools.**	**4.E.9. Develop partnerships with groups to provide a work force for maintaining trails and conducting other natural resource management functions following the Minimum Requirement Decision Guidelines.**

E. Partnerships			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Process**	**Alternative 4. Refuge Focus Management**
Goal 1.E. Support ecosystem-based cooperation through good communication and partnerships with landowners and land managers immediately adjacent to and downstream from the refuge to facilitate refuge management.	*Goal 2.E. Promote communication, cooperation, and partnerships between local, state, and federal agencies, land managers, and private citizens within the "zones of influence" to conserve the integrity of the pathways associated with resource protection, wildlife populations, and public services.*	*Goal 3.E. Develop support and understanding from local, state, and federal agencies, land managers, and private citizens for maximizing natural processes within the Okefenokee Swamp and develop networks to conserve the integrity of the pathways associated with resource protection, wildlife populations, and public services.*	*Goal 4.E. Rely on adjacent landowners and interest groups to represent views of the refuge and to be proactive in protecting the Okefenokee NWR from outside threats to ensure the health of the refuge resources.*
1.E.9.1. Continue to maintain and develop relationships with AmeriCorps, scouts, 4-H, and other groups to assist in the maintenance of all trails.	2.E.9.1. Continue to maintain and develop relationships with AmeriCorps, scouts, 4-H, and other groups, and develop "Leave No Trace" and other wilderness skills.	3.E.9.1. Maintain and develop relationships with AmeriCorps, scouts, 4-H, and other groups to assist in maintenance of wilderness trails using primitive and hand tools.	4.E.9.1. Same as 2.E.9.1.
1.E.9.2. Continue to purchase appropriate tools for wilderness trail maintenance.	2.E.9.2. Develop partnerships with canoe clubs to solicit help with wilderness canoe trail maintenance.	3.E.9.2. Same as 2.E.9.2.	4.E.9.2. Same as 2.E.9.2.
1.E.9.3. Provide a clear understanding of wilderness ethics to all staff and volunteers.	2.E.9.3. Develop partnerships with wilderness organizations to encourage participation in the refuge's trail maintenance program.	3.E.9.3. Develop partnerships with wilderness organizations that specialize in primitive and hand tool methods.	4.E.9.3. Same as 2.E.9.3.
	2.E.9.4. Develop a cache of appropriate tools for wilderness maintenance.	3.E.9.4. Purchase or build a cache of primitive tools.	4.E.9.4. Same as 2.E.9.4.
	2.E.9.5. Train all staff and volunteers in "Leave No Trace" and other wilderness skills along with providing a clear understanding of the Minimum Requirement Decision process.	3.E.9.5. Train all staff and volunteers in the use of primitive and hand tools and methods.	4.E.9.5. Same as 2.E.9.5.

F. Administration			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.F. Provide adequate staff, facilities, and equipment in a healthful work environment to support refuge goals and objectives in a safe manner.	*Goal 2.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 3.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 4.F. Provide adequate staff and volunteers with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics.*
Staffing (Current staff = 31)			
1.F.1. Add an additional 20 staff (4 support, 1 law enforcement, 7 public service, and 8 resource management). Develop and train expanded staff to support the comprehensive refuge management programs of the refuge.	**2.F.1. Add an additional 98 staff (25 support, 8 law enforcement, 15 public service, 41 resource management, and 9 facilities management). Develop and train expanded staff to support the comprehensive refuge management programs of the refuge.**	**3.F.1. Add an additional 129 staff (26 support, 8 law enforcement, 15 public service, 41 resource management, and 39 facilities management). Develop and train expanded staff to support the comprehensive refuge management programs of the refuge focusing on wilderness.**	**4.F.1. Add an additional 84 staff (25 support, 8 law enforcement, 14 public use, 28 resource management, and 9 facilities management). Develop and train expanded staff to support the comprehensive refuge management programs of the refuge.**

F. Administration			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.F. Provide adequate staff, facilities, and equipment in a healthful work environment to support refuge goals and objectives in a safe manner.	*Goal 2.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 3.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 4.F. Provide adequate staff and volunteers with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics.*
1.F.1.1. Expand staff as opportunities arise to levels appropriate for accomplishing the goals of the refuge.	2.F.1.1. Develop an implementation plan for increasing the staffing to levels appropriate for accomplishing the strategies proposed within the comprehensive conservation plan.	3.F.1.1. Same as 2.F.1.1.	4.F.1.1. Same as 2.F.1.1.
1.F.1.2. Advertise vacancy announcements using standard position descriptions.	2.F.1.2. Advertise vacancy announcements showing wilderness goal requirements as they relate to duties.	3.F.1.2. Advertise vacancy announcements showing wilderness goal and primitive tool requirements as they relate to duties.	4.F.1.2. Same as 2.F.1.2.
1.F.1.3. Provide continuing education and training opportunities to all staff as opportunities arise.	2.F.1.3. Develop an Individual Development Plan for each employee and provide continuing education and training opportunities to meet individual goals and ensure a highly competent and motivated team.	3.F.1.3. Same as 2.F.1.3.	4.F.1.3. Same as 2.F.1.3.
1.F.1.4. Same as 2.F.1.4.	2.F.1.4. Provide wilderness training as part of new employee/volunteer/intern orientation.	3.F.1.4. Same as 2.F.1.4.	4.F.1.4. Same as 2.F.1.4.
1.F.1.5. Recruit volunteers to support all programs on the refuge.	2.F.1.5. Provide program cross-training to all employees, interns, and volunteers.	3.F.1.5. Same as 2.F.1.5.	4.F.1.5. Same as 2.F.1.5.
	2.F.1.6. Encourage the further development of volunteer services to support all programs within the "zones of influence."	3.F.1.6. Encourage the further development of volunteer services to support natural processes and maintenance conducted with hand and primitive tools.	4.F.1.6. Encourage the further development of volunteer services to support all programs on the refuge.
	2.F.1.7. Provide on-going wilderness awareness training/workshops/seminars to staff to improve decisions made by program managers at refuge.	3.F.1.7. Provide on-going training/workshops/seminars to staff on management through natural processes and the use of primitive tools.	4.F.1.7. Same as 2.F.1.7.
	2.F.1.8. Continue to enhance wilderness awareness at regular monthly staff/safety meetings. Encourage staff to express any concerns or questions regarding wilderness in relation to on-going projects.	3.F.1.8. Same as 2.F.1.8.	4.F.1.8. Same as 2.F.1.8.
	2.F.1.9. Create a staff advisory team to evaluate and determine if an administrative action is necessary using the Minimum Requirements Decision Guide.	3.F.1.9. Create a staff advisory team to evaluate and determine if hand and primitive tools are feasible to accomplish the task.	4.F.1.9. Same as 2.F.1.9.
Volunteers			
1.F.2. Continue to recruit, retain, and reward volunteers to work with all program areas.	**2.F.2. Recruit and retain high quality volunteers to work in all refuge programs.**	**3.F.2. Recruit and retain a large group of high quality volunteers to work in all refuge programs. Physical ability will be emphasized.**	**4.F.2. Recruit and retain high quality volunteers to work in all refuge programs.**
1.F.2.1. Continue to evaluate outreach efforts for volunteer recruitment and training.	2.F.2.1. Investigate sources for recruiting volunteers with specific skills.	3.F.2.1. Same as 2.F.2.1.	4.F.2.1. Same as 2.F.2.1.

F. Administration			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.F. Provide adequate staff, facilities, and equipment in a healthful work environment to support refuge goals and objectives in a safe manner.	*Goal 2.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 3.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 4.F. Provide adequate staff and volunteers with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics.*
1.F.2.2. Same as 2.F.2.2.	2.F.2.2. Continue to evaluate the role of interns within the overall volunteer program.	3.F.2.2. Same as 2.F.2.2.	4.F2.2. Same as 2.F.2.2.
1.F.2.3. Maintain volunteer involvement within the limits of facilities and equipment.	2.F.2.3. Develop a volunteer management plan.	3.F.2.3. Same as 2.F.2.3.	4.F2.3. Same as 2.F.2.3.
1.F.2.4. Evaluate volunteer program as issues dictate.	2.F.2.4. Evaluate annually the volunteer program.	3.F.2.4. Same as 2.F.2.4.	4.F.2.4. Same as 2.F.2.4.
1.F.2.5. Provide basic safety related training to volunteers.	2.F.2.5. Provide advanced and basic training opportunities for volunteers in safety, first aid, and various techniques.	3.F.2.5. Same as 2.F.2.5.	4.F.2.5. Same as 2.F.2.5.
1.F.2.6. Include volunteers in wilderness discussions and workshops when appropriate.	2.F.2.6. Develop a series of day programs for volunteers on wilderness issues and concepts.	3.F.2.6. Develop a series of day programs for volunteers on wilderness management and conservation through natural processes.	4.F.2.6. Same as 2.F.2.6.
1.F.2.7. Encourage feedback from volunteers.	2.F.2.7. Develop volunteer newsletter, news releases, and video and audio public service announcements concerning volunteering at the refuge.	3.F.2.7. Same as 2.F.2.7.	4.F.2.7. Same as 2.F.2.7.
1.F.2.8. Same as 2.F.2.9.	2.F.2.8. Develop a written evaluation process for volunteers and supervisors to complete to gain feedback on the volunteer program.	3.F.2.8. Same as 2.F.2.8.	4.F.2.8. Same as 2.F.2.8.
1.F.2.9. Nominate volunteers periodically for local, regional, and national awards.	2.F.2.9. Evaluate periodically the volunteer-incentive program.	3.F.2.9. Same as 2.F.2.9.	4.F.2.9. Same as 2.F.2.9.
	2.F.2.10. Develop procedures for nominating and following through on local, regional, and national awards for volunteers, interns, and Americorps.	3.F.2.10. Same as 2.F.2.10.	4.F.2.10. Same as 2.F.2.10.
Facilities and Equipment			
1.F.3. Provide facilities, equipment, and training to support the refuge management programs of the refuge.	2.F.3. Provide facilities and equipment as appropriate for the growing number of staff in support of the goals presented in the comprehensive conservation plan.	3.F.3. Provide facilities and equipment as appropriate for the growing number of staff in support of the goals presented in the comprehensive conservation plan.	4.F.3. Provide facilities and equipment as appropriate for the growing number of staff in support of the goals presented in the comprehensive conservation plan.
1.F.3.1. Same as 2.F.3.1.	2.F.3.1. Expand administrative office and maintenance facilities to accommodate additional staff. Approximately 110 square feet are needed per person plus additional common work/meeting areas.	3.F.3.1. Expand administrative office and maintenance facilities to accommodate additional staff. Approximately 110 square feet are needed per person plus additional common work/meeting areas. In addition, construct wilderness maintenance facilities at three entrances (East, West and Kingfisher Landing) for wilderness maintenance staff.	4.F.3.1. Same as 2.F.3.1.
1.F.3.2. Provide housing for approximately 20 volunteers.	2.F.3.2. Provide up-to-date facilities for biological staff to set up and test new equipment, store supplies, and conduct in-house research.	3.F.3.2. Same as 2.F.3.2.	4.F.3.2. Same as 2.F.3.2.

F. Administration			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.F. Provide adequate staff, facilities, and equipment in a healthful work environment to support refuge goals and objectives in a safe manner.	*Goal 2.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 3.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 4.F. Provide adequate staff and volunteers with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics.*
1.F.3.3. Maintain the refuge's current database/GIS.	2.F.3.3. Develop housing facilities for the growing number of volunteers, interns, and researchers. Consider off-refuge sites, as well as at the east and west entrances, and evaluate the need at Kingfisher Landing.	3.F.3.3. Same as 2.F.3.3.	4.F.3.3. Same as 2.F.3.3.
1.F.3.4. Use vehicle maintenance records and work orders to track needed and completed maintenance on vehicles.	2.F.3.4. Create a centralized database network compatible with GIS to house information on fires, forestry inventories, biota, water, weather, soil, and public use so information is readily accessible by the management staff.	3.F.3.4. Same as 2.F.3.4.	4.F.3.4. Same as 2.F.3.4.
	2.F.3.5. Obtain and use up-to-date computer-based maintenance software available from either USFWS or open market sources to keep track of preventive and needed maintenance on facilities, equipment, and vehicles.	3.F.3.5. Same as 2.F.3.5.	4.F.3.5. Same as 2.F.3.5.
	2.F.3.6. Investigate, purchase, and maintain appropriate tools to be used in wilderness as established by the minimum requirement decisions.	3.F.3.6. Investigate, purchase, and maintain hand and primitive tools to be used in wilderness.	4.F.3.6. Same as 2.F.3.6.
Funding			
1.F.4. Increase refuge funding to support the appropriate staff, facilities, and equipment to accomplish the proposed goals.	**2.F.4. Increase refuge funding to support comprehensive refuge operations, maintenance, facilities management, endangered species, wilderness, habitat, and partnership programs.**	**3.F.4 Increase refuge funding to support comprehensive refuge operations, maintenance, facilities management, endangered species, wilderness, habitat, and partnership programs.**	**4.F.4. Increase refuge funding to support the appropriate staff, facilities, and equipment to accomplish the proposed goals.**
1.F.4.1. Same as 2.F.4.1.	2.F.4.1. Use the comprehensive conservation plan to promote refuge and ecosystem needs through grant writing and networking with other entities.	3.F.4.1. Same as 2.F.4.1.	4.F.4.1. Use the comprehensive conservation plan to promote refuge needs through grant writing.
1.F.4.2. Same as 2.F.4.2.	2.F.4.2. Analyze existing RONS and MMS projects to determine consistency with the comprehensive conservation plan. Update project needs every six months.	3.F.4.2. Same as 2.F.4.2.	4.F.4.2. Same as 2.F.4.2.

F. Administration			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.F. Provide adequate staff, facilities, and equipment in a healthful work environment to support refuge goals and objectives in a safe manner.	*Goal 2.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 3.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 4.F. Provide adequate staff and volunteers with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics.*
1.F.4.3. Same as 2.F.4.3.	2.F.4.3. Develop Memorandums of Understanding and other agreements with other federal and state agencies and private stakeholders to share equipment, staff, and services.	3.F.4.3. Develop Memorandums of Understanding and other agreements with other federal and state agencies and private stakeholders to share equipment, staff, and services on lands adjacent to the swamp to allow natural processes to occur within the swamp.	4.F.4.3. Develop Memorandums of Understanding and other agreements within the USFWS to share equipment, staff, and services on refuge projects.
1.F.4.4. Same as 2.F.4.4.	2.F.4.4. Promote partnerships in support of fish and wildlife resources, recreational opportunities, and educational programs and seek challenge cost share grants.	3.F.4.4. Same as 2.F.4.4.	4.F.4.4. Promote partnerships in support of fish and wildlife resources, recreational opportunities, and educational programs on the refuge and seek challenge cost share grants.
Law Enforcement			
1.F.5. Ensure resource protection, enforcement of all refuge-related acts and regulations, and the safety of visitors, staff, volunteers, interns, and researchers.	**2.F.5. Ensure resource protection, enforcement of all refuge-related acts and regulations, and the safety of visitors, staff, volunteers, interns, and researchers.**	**3.F.5. Ensure resource protection, enforcement of all refuge-related acts and regulations, and the safety of visitors, staff, volunteers, interns, and researchers.**	**4.F.5. Ensure resource protection, enforcement of all refuge-related acts and regulations, and the safety of visitors, staff, volunteers, interns, and researchers.**
1.F.5.1. Same as 2.F.5.1.	2.F.5.1. Continue to provide up-to-date training and equipment to all full-time and collateral duty officers.	3.F.5.1. Same as 2.F.5.1.	4.F.5.1. Same as 2.F.5.1.
1.F.5.2. Same 2.F.5.2.	2.F.5.2. Develop Memorandums of Understanding with state and county enforcement agencies to facilitate cooperation and assistance in law enforcement activities.	3.F.5.2. Same as 2.F.5.2.	4.F.5.2. All refuge law enforcement activities would be handled by refuge staff on refuge lands.
1.F.5.3. Same as 2.F.5.3.	2.F.5.3. Integrate law enforcement concepts in all aspects of refuge management, including agreements with partners, special use permits, plans, and specific refuge activities.	3.F.5.3. Same as 2.F.5.3.	4.F.5.3. Same as 2.F.5.3.
1.F.5.4. Same as 2.F.5.4.	2.F.5.4. In accordance with the approved law enforcement plan, conduct patrols and visitor compliance checkpoints in addition to regular contacts with visitors to ensure understanding and compliance with laws and regulations.	3.F.5.4. Same as 2.F.5.4.	4.F.5.4. Same as 2.F.5.4.
1.F.5.5. Continue law enforcement presence during refuge activities to assist the public, provide information, and monitor compliance.	2.F.5.5. Assist Public Use and other staff in the development of environmental education and interpretation programs and provide up-to-date information on applicable laws and regulations.	3.F.5.5. Same as 2.F.5.5.	4.F.5.5. Same as 2.F.5.5.

F. Administration			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.F. Provide adequate staff, facilities, and equipment in a healthful work environment to support refuge goals and objectives in a safe manner.	*Goal 2.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 3.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 4.F. Provide adequate staff and volunteers with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics.*
	2.F.5.6. Increase law enforcement presence during refuge activities to educate and assist the public and provide information and monitor compliance.	3.F.5.6. Same as 2.F.5.6.	4.F.5.6. Same as 2.F.5.6.
	2.F.5.7. Provide education and outreach programs in local communities as part of a preventive law enforcement effort to encourage voluntary compliance.	3.F.5.7. Same as 2.F.5.7.	4.F.5.7. Provide educational programs on the refuge as a preventive law enforcement effort.
	2.F.5.8. Train and provide search and rescue operations when appropriate.	3.F.5.8. Same as 2.F.5.8.	4.F.5.8. Same as 2.F.5.8.
Cultural Resources			
1.F.6. Investigate looting and vandalism incidents associated with the refuge's cultural resources.	**2.F.6. Develop and implement law enforcement procedures to protect the refuge's cultural resources and diminish site destruction due to looting and vandalism.**	**3.F.6. Develop and implement law enforcement procedures to protect the refuge's cultural resources and diminish site destruction due to looting and vandalism.**	**4.F.6. Develop and implement law enforcement procedures to protect the refuge's cultural resources and diminish site destruction due to looting and vandalism.**
1.F.6.1. Same as 2.F.6.1.	2.F.6.1. All refuge law enforcement officers will attend the Archaeological Resources Protection Act training course.	3.F.6.1. Same as 2.F.6.1.	4.F.6.1. Same as 2.F.6.1.
1.F.6.2. Same as 2.F.6.2.	2.F.6.2. Pertinent refuge staff will attend the Overview for Cultural Resources Management Requirements course.	3.F.6.2. Same as 2.F.6.2.	4.F.6.2. Same as 2.F.6.2.
	2.F.6.3. Establish and implement a protocol for site damage assessments.	3.F.6.3. Same as 2.F.6.3.	4.F.6.3. Same as 2.F.6.3.
	2.F.6.4. Conduct law enforcement patrols and/or surveillance of archeological sites on a regular basis.	3.F.6.4. Same as 2.F.6.4.	4.F.6.4. Same as 2.F.6.4.
Community Involvement			
1.F.7. Allow staff to participate in community enhancement.	**2.F.7. Enhance awareness of the refuge's socio-economic and biological contribution to the area through enhanced communications, participation, and partnerships.**	**3.F.7. Enhance awareness of the refuge's socio-economic and biological contribution to the area through enhanced communications, participation, and partnerships.**	**4.F.7. Enhance awareness of the refuge's socio-economic and biological contribution through enhanced communications.**
1.F.7.1. Strive to keep surrounding landowners abreast of refuge objectives related to fire.	2.F.7.1. Identify and develop working relationships with stakeholders within the "zones of influence" to keep them informed of refuge objectives.	3.F.7.1. Same as 2.F.7.1.	4.F.7.1. Through information avenues, distribute information on the refuge's contribution to the area.

F. Administration			
Alternative 1. Maintain Current Management	**Alternative 2. Integrated Landscape Management (Preferred Alternative)**	**Alternative 3. Conservation Through Natural Processes**	**Alternative 4. Refuge Focus Management**
Goal 1.F. Provide adequate staff, facilities, and equipment in a healthful work environment to support refuge goals and objectives in a safe manner.	*Goal 2.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 3.F. Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner, while maintaining sensitivity to wilderness ethics and the "zones of influence".*	*Goal 4.F. Provide adequate staff and volunteers with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics.*
1.F.7.2. Continue to promote the Okefenokee Wildlife League and its value to the refuge.	2.F.7.2. Develop Friends Group in neighboring towns of Waycross and Homerville, Georgia.	3.F.7.2. Same as 2.F.7.2.	4.F.7.2. Develop Friends Group in neighboring towns of Waycross and Homerville, Georgia, to promote the refuge.
	2.F.7.3. Encourage refuge staff to be community-friendly and contribute to the enhancement of the surrounding communities.	3.F.7.3. Same as 2.F.7.3.	4.F.7.3. Distribute information on the refuge through the Okefenokee Education and Research Center.
	2.F.7.4. Take an active role in the Okefenokee Education and Research Center programs as a place to distribute information on the importance of the Okefenokee NWR within the whole ecosystem.	3.F.7.4. Same as 2.F.7.4.	4.F.7.4. Develop and promote the Okefenokee Wildlife League for the enhancement of the refuge exclusively.
	2.F.7.5. Continue to develop and promote the Okefenokee Wildlife League to its full potential.	3.F.7.5. Same as 2.F.7.5.	
	2.F.7.6. Provide opportunities for the staff to participate in cooperative activities that exemplify the benefits of working together.	3.F.7.6. Same as 2.F.7.6.	

IV. Environmental Consequences

Section B. III. describes four alternatives for achieving the vision of Okefenokee NWR. These include Alternative 1) Maintain Current Management, Alternative 2) Integrated Landscape Management, Alternative 3) Conservation Through Natural Processes, and Alternative 4) Refuge Focus Management. The purpose of this chapter is to identify, describe, and analyze the impacts that would result from implementing each of the management alternatives. Because of the general nature of the assessment and the lack of numerical or quantitative information regarding refuge resources, impacts are often expressed in relative terms.

The planning team evaluated the impacts of each alternative on the following topics: 1) physical environment; 2) biological environment; 3) special designations; 4) cultural and historic resources; 5) public services; 6) socioeconomic environment; and 7) administration.

Direct, indirect, and cumulative impacts are described where applicable for each alternative. Direct impacts are those that occur immediately or occur at the same place and time. Indirect impacts are those foreseeable effects that occur later in time. Cumulative impacts are a series of individual, seemingly minor effects that may accumulate to create major problems over a period of time.

EFFECTS ON THE PHYSICAL ENVIRONMENT

SOILS

Fire and silviculture are two management techniques that could influence the soils of the refuge. Prescribed fire on upland management compartments is utilized as a management tool under all alternatives. The difference lies in its use on wilderness islands. Alternatives 1, 2, and 4 continue to use prescribed fire on these islands, while Alternative 3 relies solely on wildland fires to shape the habitat within the swamp. Wildland fires are allowed to move across the landscape mostly unimpeded in an attempt to obtain the most benefit from this natural process. However, the difference between Alternative 3 and the rest of the alternatives is the zone where suppression measures are implemented to protect property and resources outside the refuge. The wilderness boundary is the start of suppression in Alternative 3 compared to a fire management unit within the wilderness where conditions are evaluated and suppression is considered as fire approaches the swamp's edge and private property. The effects of fire on the soils would be similar between each alternative because of the high variability in fire intensity and behavior within vegetation communities.

Most fires occurring in the Okefenokee NWR are surface fires that only impact the top few centimeters of soil. Prescribed fires are conducted under controlled conditions when the water table is generally higher than under wildland fire conditions and therefore, have less impact to the soil. The intensity of wildland fires on the other hand are highly variable depending on the vegetation, water levels, and wind conditions. Trees with shallow root systems, due to growing on a wetter site, may be more susceptible to fire mortality during droughts when wildland fires can penetrate the upper layers of soil. According to Maxwell (1989), fire may heat the soil sufficiently to kill soil flora and fauna, alter physical properties of soil, consume organic matter, and release nutrients. Consumption of the understory by fire may expose the mineral soil surface, increasing diurnal heating and cooling effects. Exposure may also subject the soil surface to wind and water erosion. Benefits of burning include release of nutrients bound in duff and litter layers, increase of nitrogen and organic matter in the soil due to the rapid growth of legumes and grasses, and a temporary increase in pH (Wells 1979). Also, the ash from periodic fires is believed to remove toxins from the soil that inhibit root growth (Christenson 1993). The burning of peat within the swamp during a wildfire is recognized as acceptable and desirable for maintaining the mosaic of swamp habitats and for the perpetuation of

the swamp; however, the man-made changes in the landscape surrounding the refuge are less tolerant of wildland fires. Interest in soil changes caused by wildland fires escaping from the swamp onto private property (most likely to occur under Alternative 3) would depend on the consumption of the resources above the soil level.

Preparation for fire in the landscape by disking and plowing the Swamp's Edge Break and fire lines has the same impacts under all the alternatives. Creating depressions and channels along the edge of the swamp alters the flow patterns of water and changes microhabitats. Depending on how this line is maintained and the width of it, determines the degree of impact. Working together through groups such as the Greater Okefenokee Association of Landowners, impacts can be minimized as partners become more aware of the impacts of their actions.

With reduced site preparation on refuge lands for the establishment of longleaf pine, compaction and changing soil moisture become the only issues associated with silvicultural practices. Equipment used for preparing sites for restoration and moving around the trees during harvest operations may cause compaction. Reducing heavy equipment activity around wetlands addresses this concern in Alternatives 2, 3, and 4.

HYDROLOGY

Rainfall is the primary source of water within the swamp. However, man has altered the hydrology of the area over the past 110 years:

- The digging of the Suwannee Canal and mining peat from the Kings Canal have altered the hydrology.
- Removing the timber from the swamp in the early 1900s had an impact on its hydrology.
- The establishment of boat trails changed water flow patterns in some areas.
- The construction of the Suwannee River Sill blocked the natural connection to the river, impounded water in the immediate area, and impacted hydroperiods across 10 percent of the swamp.
- The creation of the Swamps Edge Break altered flows into the swamp from the uplands, as have some other fire lines.
- The drainage of isolated wetlands surrounding the swamp has changed seepages and hydroperiods.

In 1998, an Environmental Assessment of the Future Management of the Suwannee River Sill was completed with the acceptance of the preferred alternative. After four years of study by US Geological Service, no significant impacts downstream are expected and plans are to move forward when funds allow and remove the water control structures and breach the sill at selected locations. This restoration allows the natural hydrologic cycle of a flood plain to return to this area of the swamp. This management decision supports all the alternatives in its attempt to re-establish the natural processes within the swamp and was not revisited.

Boat trails have long been established in the Okefenokee Swamp and special provision was made in the establishing legislation for the Okefenokee Wilderness Area to continue to maintain the watercraft trails and allow 10 hp or less motorboats. It failed, however, to indicate to what extent the trails should be maintained. Therefore to emphasize primitive and challenging recreation opportunities and eliminate mechanical equipment in Alternative 3, the use of the trailcutter would be discontinued. The result of this action would limit motorboats to the major canals during all but extreme high water times. The trails would be difficult to paddle as they grew up with vegetation and more trails may be developed by wilderness users as each party moved through the swamp on the path of their choice. Shallow boat trails through the prairies would gradually fill in reducing the channelization of water within the swamp. Alternatives 1, 2, and 4 provide for the continued maintenance of the 120 miles of

watercraft trails to confine human use impacts to narrow ribbons through the habitats and provide access into the heart of the Okefenokee NWR 90 percent of the time. These alternatives require the periodic use of the trailcutter through prairie areas, keeping the boat channel deeper than the surrounding prairie and maintaining hydrologic alterations. Eliminating blockages from fallen trees or peat blowups would follow the Minimum Requirement Guide for trail maintenance (Public Services Plan) that considers water levels and the minimum tool decision.

Although Okefenokee NWR covers a large area, it cannot be considered an island in itself. It is unknown how it is influenced by the underlying aquifer. Concern exists that development and land-use practices within the watershed are impacting the swamp's hydrology. It is speculated that at one time the Okefenokee Swamp was replenished from the aquifer and now the aquifer may actually be drawing water from the swamp. Alternatives 2 and 3 allow the refuge to look beyond the current concerns to the possibility of the swamp being influenced by the underlying aquifer. This possibility would extend the refuge's involvement with water issues to approximately 100 miles, encompassing the demands along the Georgia coast, as well as the demands along the Suwannee River. Knowing the relationship between the swamp and aquifer is also important for Alternative 4, but only within the refuge. The impacts from outside would be left for refuge supporters to defend. Sharing data would not be necessary because the refuge staff would only be concerned with the hydrologic dynamics of the swamp.

Water, with its fluctuating levels and quality, is the number one factor shaping the Okefenokee ecosystem. Monitoring water levels and quality gives insight into potential influences so that the refuge and others concerned with the health of the system can further investigate and be proactive in the protection of the resources of the Okefenokee NWR. In addition, the water dynamics of the Okefenokee Swamp are critical in determining wildlife distribution, plant species composition and distribution, fire occurrence and behavior, and the accessibility to study areas and public recreation opportunities. Water level monitoring began by reading staff gauges at Suwannee Canal Recreation Area (east) and Billys Lake (west). In 1979, realizing that the swamp was not a flat pool, water monitoring stations to track water levels and rainfall were placed at various locations within the swamp. Their placement and significance were re-evaluated in 1998 using information from Loftin's (1998) study. Twelve sites were identified based on hydrologic basins and flows in and out of the swamp. Ten sites are currently in place. Four of the ten sites are within wilderness. All sites transmit the data remotely via GOES satellites which reduce the number of visits into the wilderness.

All four alternatives recognize the benefit of water monitoring despite the presence of four wooden structures and the necessary equipment within the wilderness. This network provides valuable information but becomes of greater value when tied to information gathered throughout the surface and ground watersheds as proposed in Alternatives 2 and 3. These data are essential for determining and fighting threats to the Okefenokee NWR.

FIRE OCCURRENCE

In all four alternatives, fire is recognized as an integral component of both the wetlands and native upland communities of the area. The persistence of an ecosystem that evolved with and is naturally maintained by fire depends on maintenance of its natural fire regime. However, the landscape has changed since pre-European settlement. Fragmentation of the landscape by roads, houses, and silvicultural practices has contributed to the alteration of the natural fire regime.

Prescribed fire is used within all upland management compartments in all the alternatives to reduce fuel loads, re-establish or maintain the traditional pre-European settlement vegetation conditions, and enhance the habitat for endangered red-cockaded woodpeckers and associated native wildlife. Alternatives 1, 2, and 4 also continue to use prescribed fire on interior wilderness islands. Aerial

ignition is used exclusively for burning these islands due to limited ground access and safety concerns. Helicopter use over the wilderness area has the potential of disturbing any visitor who is under the flight path to the designated island. Wildlife on the islands may be disturbed by prescribed fire in a manner similar to any natural fire event. However, prescribed burning the islands has been essential in maintaining red-cockaded woodpecker habitat. With the use of prescribed fire around and within red-cockaded woodpecker clusters, the trees are less likely to be damaged when a wildfire moves across the landscape. As the fuels on the islands are reduced and the diversity of the native vegetation is restored, less prescribed burns will be necessary to maintain the habitat.

Alternative 3 immediately implements management by natural processes (the use of wildland fire) within the wilderness area and discontinues the use of prescribed fire on the interior upland islands. By not reducing the understory periodically under desirable conditions and waiting for a wildfire to pass over the islands, red-cockaded woodpecker clusters could be at risk. There could be higher potential for igniting cavity trees as the surrounding fuels change composition and structure. The intensity of the wildfire passing over the area would be higher, causing more impact to the resources. Alternative 3 also does not have any provision to slow the movement of fire until it gets to the wilderness boundary, which often coincides with the refuge boundary. Alternatives 1, 2, and 4 have guidelines to help make decisions on managing a wildfire to maximize resource benefits, while protecting the interests of private landowners and companies that are adjacent to the refuge boundary.

The occurrence of fire in the refuge may be greater under Alternative 3 because every lightning strike will be allowed to burn. No suppression actions will be taken until the fire reaches the wilderness boundary. Because wildfire is considered an emergency situation, helicopters will be allowed to do surveillance flights under all the alternatives.

WATER QUALITY

Water quality can be affected by contaminants from atmosphere deposition, run off from the surrounding lands, motorboats, public use, and disturbance of contaminated peat deposits.

The refuge plans to continue monitoring mercury and other elements entering the Okefenokee system as part of a national air quality-monitoring network. Water chemistry would be examined in relation to fire, water levels, weather events, plant composition, public use activities, and land use practices. Water quality monitoring within the swamp is associated with established water monitoring stations and therefore does not require any additional structures within the wilderness. Two additional monitoring stations outside the wilderness area are proposed under Alternatives 2, 3, and 4 to give information on the waters leaving the swamp via the St Marys River and the dynamic flows between the Pinhook Swamp and the Okefenokee Swamp via Breakfast Branch. Under Alternatives 2 and 3, increased monitoring of water quality surrounding the swamp could signal and pinpoint sources of contaminants. Sharing data with others measuring water parameters in the “zone of influence” would provide valuable information on water flows and contaminant levels.

Under all four alternatives, the refuge would continue to minimize the impact of outboard motors by promoting the use of 4-stroke motors, electric motors, or other types as technology becomes available. Alternative 3 would limit the administrative use of outboard motors and the trailcutter through its emphasis of primitive modes of travel. As trail conditions become only appropriate for canoes and kayaks, the use of motorboats by the public may also be reduced. Discontinuing the use of the trailcutter would also remove a piece of equipment that may disturb the peat enough to release contaminants. On the other hand, the removal of the toilets in this wetland environment increases the chance of contamination of water from human waste. In all the alternatives, the refuge would

continue to search for more environmentally friendly products for cleaning public facilities and search for ways to minimize public use and resource management impacts to water quality.

Additional concern exists that increased demands on the Floridan Aquifer could be drawing water from the Okefenokee Swamp at certain times, reversing the natural recharge of the system to a discharge and concentrating contaminants within the system.

Little knowledge of the connectivity of the Okefenokee Swamp to the underlying aquifer exists. With the increased awareness of the potential impacts of groundwater withdrawals and the expansion of the cone of depression associated with increased demands along the coasts of Georgia and northeast Florida, the hydrologic "zone of influence" becomes much larger than the surface watershed that has caused concern in the past. Alternatives 2, 3, and 4 acknowledge the potential of this threat and expand our interest to within 100 miles from the refuge. More attention will be given to the demands on the water resources. Meetings, partnerships, and channels of communication with individuals and groups will be much more important under Alternatives 2 and 3 to keep abreast of the potential impacts. However, under Alternative 4, the refuge would rely on outside entities to address the threats in order to protect the resources of the refuge.

AIR QUALITY

Okefenokee NWR is a Class I airshed giving it high air quality standards. Protecting the scenic beauty of the Okefenokee NWR is associated with the quality of the air. Substances within the air can cause reduced visual enjoyment, health hazards, and negative impacts to the vegetation. The refuge would take an active role in commenting on potential impacts of regional industrial proposals under Alternatives 2 and 3. The refuge staff, under Alternatives 1 and 4, would rely on the USFWS's Air Quality Division and other organizations to comment on regional industrial proposals.

Under all of the alternatives, monitoring air quality would continue through the following national programs: National Atmospheric Deposition Program, Mercury Deposition Network and the Interagency Monitoring of Protected Visual Environments under the guidance of the USFWS Air Quality Division. The air quality monitoring station is outside the wilderness area. It can be used to monitor impacts of local fires on air quality and provides regional air quality information. In addition, the impacts of air pollution on sensitive plant species will be examined every five years.

The refuge fire management practices may negatively affect air quality by reducing visibility and releasing several components through combustion that may cause human respiratory health problems. Using prescribed fire for habitat improvements and fuel reduction is a component of all the alternatives. The refuge will follow all state and federal regulations/guidelines on smoke management and permitting. Three publications (Smoke Management Guide for Prescribed and Wildland Fire 2001 Edition, Southern Forestry Smoke Management Guidebook, and A Guide for Prescribed Fire in Southern Forests) are referenced as standards for air quality management on the refuge. In addition, the refuge is working with the U.S. Forest Service, Southern Fire Lab, to track actual smoke dispersion patterns for improving smoke dispersal modeling for the southeastern United States coastal plain. Any time prescribed fire is used, wind direction, atmospheric mixing, and the ignition sequence are considered to minimize adverse effects to air quality.

All of the alternatives promote the use of wildland fire at various levels for resource benefit. Air quality impacts from wildland fires are highly variable under all alternatives. Because wildland fires would be allowed to burn at full intensity to the wilderness boundary in Alternative 3, there may be higher potential of escape from the confines of the swamp. This could bring issues of visibility and health closer to the highways and towns.

NOISE AND LIGHT POLLUTION

Under all of the alternatives, the refuge will strive to minimize light pollution from its facilities by choosing lights that do not radiate upward and using the recommended lighting and wiring on towers that minimize bird strikes, but meet the sight guidelines. When evaluating activities both outside and within the wilderness area through the Minimum Requirement Decision Guide, noise and its impact on wildlife and the wilderness resource will be considered.

As new businesses move into the area and development increases, monitoring man-made noise levels and light pollution on the refuge would occur every five years under all alternatives. This monitoring would detect changes that may be correlated with activities surrounding the refuge. In order to minimize man-made noise and light disturbance to wildlife populations, as well as the visiting public, the refuge would identify the sources of noise and light pollution in Alternatives 2 and 3 and work to reduce the negative impacts. Avenues for refuge input on placement of new towers that may be visible from within the wilderness area and new development proposals will be established.

Under Alternative 4, changes in light and noise levels and their impacts would be determined. Support groups/organizations and individuals would determine the sources of these changes and negotiate solutions that would minimize light and noise pollution on the refuge.

AESTHETICS

The Okefenokee NWR is a constantly changing mosaic of wetland habitats with pockets of upland pine habitat dispersed within its boundary and around its margins. Through Alternatives 1, 2, and 4, native pre-European settlement habitats are being promoted to give a sense of historic conditions. Man has influenced the natural processes since that time by creating barriers and changes in the landscape. Alternative 1 recognizes the importance of natural processes and their unpredictability. Management currently follows established protocols for handling wildfires depending on their size when discovered. Through Alternatives 2 and 4, the use of natural processes is tempered by designating buffer zones that give added protection to private property surrounding the swamp. A Fire Use for Resource Benefit Plan sets the guidelines for wildland fire management on Okefenokee NWR. Alternative 3 sets the stage for natural processes to exclusively govern the landscape. Under this alternative, the negative impacts of natural processes are more likely to be visible on the edges of the refuge as well as on private property because such natural processes as fire will be allowed to burn without interruption to the wilderness boundary. Buffers to private property would not be available unless the refuge acquired adequate uplands surrounding the wilderness area.

Considering the resources of the Okefenokee NWR as a piece of a much larger system, the staff of the refuge would be most effective in protecting the resources by forming partnerships within the "zones of influence," as specified in Alternatives 2 and 3. Currently, under Alternative 1, partnerships are being developed primarily with interested parties in close proximity to the refuge. Distant issues, such as groundwater withdrawals that may influence the health of the refuge resources, may not be addressed. Alternative 4 focuses more specifically on refuge lands and relies on interest groups to take on the challenge of protecting the resources from outside threats. Depending on other high profile environmental concerns in the nation, the support groups may or may not dedicate their attention to the resources of the Okefenokee NWR.

FACILITIES

Okefenokee NWR currently has an extensive number of buildings, facilities, and equipment, which complements and supports the administrative, forestry/fire, biological, and public use programs.

Alternative 1 continues to use the existing facilities and equipment. This alternative does not give adequate acknowledgement to the refuge's responsibilities as a wilderness area. The other three alternatives involve a substantial growth in staff and will require the expansion of office, storage, and common workspace. With the expansion of programs, research, and maintenance, the accompanying increase in volunteers, work groups, interns, and researchers will require housing beyond what the refuge has available. Placement of additional facilities is critical and will be considered in relation to habitat loss and species concerns.

Public facilities for recreation, environmental education, and interpretation will be expanded in Alternatives 2, 3, and 4. Hunting and fishing opportunities will be evaluated for expansion. Hiking trails and boardwalks will be enhanced. Indoor and outdoor classroom settings are proposed. Alternatives 2 and 3 allow for partnerships with others for the integration of public facility use in the area while Alternative 4 only provides facilities for the promotion of the refuge. All public facility expansion proposed in the alternatives is outside the wilderness boundary. Within the wilderness boundary under Alternative 3, all permanent structures would be removed (e.g., platforms, portable toilets, or trail markers). This promotion of primitive recreation will not ensure solitude since dry places to camp within the wilderness are limited, causing users to concentrate on the few suitable dry sites. Concentrating human use deteriorates the habitat and eliminates the solitude experience. Under Alternative 3, there is greater potential for contamination of waters from human waste without the portable toilets. Additionally, use of the trailcutter to maintain trails would be discontinued and the trails would gradually fill in. The difficult passage may limit the use of the area to those fit enough to meet the challenges without regard for those visitors interested in other recreational opportunities. As a result, the number of visitors using the wilderness area may decrease. However, the area used by humans would be expanded beyond the ribbon of trails because unconfined travel would be allowed. Depending on visitation, more trails or pathways may be visible as visitors explore new areas.

Maintenance of watercraft trails differs between alternatives. The trailcutter would continue to be used regularly in Alternative 1. Alternatives 2 and 4 would maintain the watercraft trails for 90 percent accessibility while considering available options addressed in the Minimum Requirement Decision Guide. The trailcutter would no longer be used in Alternative 3. Crews would maintain the trail system using hand tools. Because of the time necessary to accomplish this task and the discontinued use of all motorized equipment in the wilderness areas, trails would be maintained at a lower standard than currently.

Under Alternatives 2, 3, and 4, the need for concession facilities at other refuge entrances would be evaluated, as would the need for alternative public transportation to and from public recreational opportunities and interpretive tram tours.

EFFECTS ON THE BIOLOGICAL ENVIRONMENT

WETLAND VEGETATION

Similar monitoring of the vegetation is included in all alternatives to provide information on the effects of refuge management practices and natural events. Photo points and periodically updated vegetation maps will be maintained. Vegetation maps are critical for predicting wildfire behavior and wildlife distribution and population potential. The maps are developed from satellite images and ground truthed. Alternative 3 does not allow the use of aircraft for ground truthing vegetation designations, making interpretation of the data less accurate.

Fire will have the same effect on the wetland vegetation under all alternatives since prescribed fire is not used to maintain wetland vegetation and wildland fire is a natural process that moves freely through the wetland habitats. Alternative 2 and 4 utilize wildland fire management units to protect

private property. If vegetation within these zones is prevented from burning, a denser ring of scrub/shrub may develop around the edge of the swamp.

Disturbance to the vegetation from public use may be greater under Alternative 3 because of the opportunities for unconfined recreation, allowing visitors to explore the swamp freely. Under the other alternatives, use is confined to the established trail system.

UPLAND VEGETATION

Alternatives 1, 2, and 4 strive to restore and maintain the native flora of the uplands, both on the wilderness islands and within the management compartments surrounding the swamp. The management goal in Alternatives 1 and 2 is to maintain the integrity of the natural ecosystem while Alternative 4 focuses on simply maintaining examples of the area's native vegetation communities. Alternative 3 has the same goal for upland management compartments as Alternative 1 and 2, but differs in the approach of the uplands associated with wilderness islands. Despite the altered conditions of the habitat due to past human activity, Alternative 3 uses natural processes to move forward from the conditions that are currently present.

Prescribed fire is used to manage the vegetation within the upland management compartments under all the alternatives. Alternatives 1, 2, and 4 also use it to enhance native habitat conditions on wilderness islands, while wildland fire exclusively determines the condition of vegetation on wilderness islands in Alternative 3. Under this alternative, the unpredictability of vegetation conditions and intensity of wildland fires may be highly variable and may not meet the needs of the endangered red-cockaded woodpecker or other wildlife inhabitants. With prescribed fire, the results can be tailored to meet specified objectives and somewhat control wildland fire behavior.

Tree planting is another technique used to restore selected species on wilderness islands under Alternatives 1, 2, and 4. Regeneration of longleaf pine on some islands is limited. Planting trees creates a new age class and restores the native species most appropriate for the site.

To restore the habitat within the upland management compartments, other techniques, such as selective timber harvesting, timber stand improvement, and management of understory species, may be used under all the alternatives. The requirements of the red-cockaded woodpecker are linked to the restoration of the upland communities. Short-term goals for providing habitat for the red-cockaded woodpecker by encouraging rapid growth of trees may not be advantageous to the restoration of a slow growing longleaf pine forest.

EXOTIC PLANTS AND ANIMALS

At the present time, no known nuisance exotic plants are on the refuge. If reported, the refuge staff would investigate and take appropriate action to eradicate the plant. In preparation of finding an exotic plant on the refuge, Alternatives 2, 3, and 4 require the development of a GIS database, which would include fields for location, quantity, treatment type, and results. The alternatives also call for follow-up visits by a team to monitor the need for additional treatment.

Alternative 3 allows unconfined travel through the swamp, which exposes more area to exotics that may be transported from one wetland to another via boats. This type of introduction could go undetected for a long time, making eradication more difficult.

Removal of non-native animals, such as feral swine, cats and dogs, from refuge lands will continue under all four alternatives because they destroy habitat, introduce diseases, and kill native wildlife.

Alternatives 2 and 3 include educating the public on the need to preserve our native habitat and wildlife species and how non-native species are detrimental to the natural processes.

WILDLIFE AND PROTECTED SPECIES

Upland habitat management strategies for wildlife and protected species outside the wilderness are best addressed by strategies in Alternatives 2 and 3. Management of upland compartments for red-cockaded woodpeckers and their native habitat, which includes use of prescribed fire to control understory vegetation, will benefit numerous species of birds, amphibians, reptiles, and invertebrates associated with longleaf pine and wiregrass communities. Alternatives 2 and 3 also provide the best strategies for new partnerships/agreements or continued cooperation with adjacent landowners. Forestland conservation to promote older growth pine stands on private lands may be the only way to ensure the viability of red-cockaded woodpecker populations within the Okefenokee region. Restoration and protection of isolated wetlands associated with the uplands is important for many amphibian species. The specific emphasis of refuge-focused management outlined in Alternative 4 may preclude any land management agreements with landowners adjacent to refuge boundaries. Alternative 1 provides little support for partnerships, focusing on the few existing agreements currently in place for wildlife habitat conservation.

However, under Alternative 3, use of prescribed fire within wilderness would be discontinued and infrequent wildland fires would maintain wilderness uplands. The long-term effect of this management strategy on interior islands could result in poor quality habitat for red-cockaded woodpeckers, indigo snakes, Bachman's sparrow, and other species associated with longleaf–wiregrass communities. The other alternatives would utilize prescribed fire for fuels reduction and habitat maintenance. Red-cockaded woodpecker trees would be treated to reduce the risk of injury during a wildland fire. The general habitat conditions following a fire with reduced understory would increase the potential for longleaf pine regeneration that would, over the long term, provide quality habitat.

Resource management within the swamp habitat is similar throughout the alternatives. No prescribed fire is purposely used within swamp habitat, although Alternatives 2 and 4 use Maximum Management Areas to explain an acceptable level of fire escaping from the uplands. The Maximum Management Areas are most important for habitat management around the swamp's edge to reduce the build up of heavy fuels.

Active manipulation of the habitat within the wilderness area is only conducted along the watercraft trails. These trails provide corridors for wildlife travel as well as pathways for increased human disturbance. The frequency of trail maintenance and the equipment used determines the impacts to wildlife species. Alternatives 1, 2, and 4 continue to use the trailcutter to maintain the trail system. The water levels when this tool is used determine the mortality of alligators, frogs, and fish that cannot escape from the waterway. Maintaining access via the existing trail system limits the disturbance factor to the wildlife since humans are limited to these pathways through the swamp. Alternative 3, however, does not use the trailcutter and allows the visitor to travel freely throughout the swamp. Wildlife may be disturbed more frequently under Alternative 3, since the common tendency is to get as close as possible for wildlife observation and photography.

Through Alternatives 2 and 3, the refuge's contribution to regional and national populations of wildlife is recognized. Birds that are highly mobile, as well as those species that have large home ranges, such as bears, would benefit from the networking and partnerships that are incorporated into Alternatives 2 and 3. Alternative 1 contributes data to regional and national efforts as instructed with little regard for the significance of the data obtained. Alternative 4 treats the refuge as an island and does not address regional issues that may impact fish and wildlife species at the refuge.

Information obtained through monitoring and surveys within the wilderness may be limited in Alternative 3 due to self-imposed restrictions on modes of travel. This may in turn limit the contribution the refuge can make to the regional and national efforts mentioned above.

MONITORING AND SURVEYS

Monitoring the resources is recognized as important under all the alternatives, with particular emphasis on those species that are indicators of ecosystem health. It has been stated by a Biological Review Team that "Okefenokee NWR would seem large enough that a passive management approach should be adequate for protecting the ecosystem and trust resources for which the Refuge was established. For many reasons this is not the case." Evidence of several resource changes "suggest that the natural resources for which the Okefenokee had been identified as a special place are rapidly being lost. The Team may not be describing a crisis at the same level we now have with the Everglades, we believe there are growing signs of major problems that if left un-addressed will lead to the complete loss of the Okefenokee Swamp as a unique ecosystem. We believe that before proclaiming that a crisis is nearly upon us at Okefenokee, that we encourage significant research investment to determine the level of problems and better define the level of crisis we may be facing in the near future"(Hunter 2001).

Methods used for monitoring and surveys will be analyzed through the Minimum Requirement Decision Guide based on the need for the data. Changes in what is monitored and the techniques used occurs between Alternative 1 and Alternatives 2 and 4 because of the evaluation process, identification of the critical components to give insight into protecting the many resources of the Okefenokee NWR, and the minimum tool analysis process. It is expected that greater time will be needed to conduct surveys under Alternatives 2, 3, and 4 because of the refuge's recognition of wilderness responsibilities. Some surveys, particularly for highly mobile avian species, are time limited and need to be done in a short amount of time to obtain accurate distribution and habitat use data and reduce the chances of recounting the same birds. Therefore, some modes of transportation are more feasible. Monitoring under Alternative 3 is reduced based on the goals emphasizing primitive modes of transportation and primitive tools rather than evaluating the activities entirely through the Minimum Requirement Decision Guide.

Under Alternative 3, inventory and management of threatened and endangered species populations within the wilderness, primarily red-cockaded woodpeckers, would be minimal. Access to interior islands for population monitoring would be discontinued. Thus, the status of red-cockaded woodpecker populations on wilderness islands within the refuge would be uncertain and efforts to aid in recovery of red-cockaded woodpeckers would be fruitless. It is likely that island clusters provide birds that disperse to perimeter clusters; a decrease in productivity of island red-cockaded woodpecker populations may significantly affect recruitment in these high-risk perimeter groups. Additionally, without information on the status of island clusters, population viability models would be completely inadequate for projecting future refuge population estimates of red-cockaded woodpeckers. Alternatives 1, 2, and 4 provide more monitoring options for determining population trends of red-cockaded woodpeckers, especially in relation to impacts from prescribed fire activities and natural occurrences.

Alternative 4 focuses primarily on management of habitat within the refuge boundary and would not address the potential for agreements with adjacent landowners to conserve habitat for red-cockaded woodpeckers on private lands. Given the level of fragmentation of perimeter uplands within the refuge borders, there is a critical need to either continue the development of cooperative agreements with private landowners or step up efforts to purchase lands bordering the refuge. Agreements are encouraged in Alternatives 1, 2, and 3.

Okefenokee NWR provides habitat for a number of avian species throughout the winter months and during periods of fall and spring migration. Historically, avian point counts have been conducted to monitor species diversity within the forested and wetland habitats on the refuge. Alternatives 2, 3, and 4 provide the opportunity to expand the current monitoring program, which should offer a more complete picture of habitat use by migratory birds within the Okefenokee region. Mist netting and banding could be included in future efforts to augment study designs for non-wilderness areas.

Alternatives 1, 2, and 4 provide the most complete set of strategies for censusing colonial waterbird and sandhill crane populations within the refuge. The essential element for determining use patterns of these highly mobile species and correlating them with environmental factors is completing a survey in a timely manner. Aerial strip-transect surveys over the appropriate habitat are generally thought to be the most robust method to determine habitat use patterns and to estimate the size of wading bird and crane populations. However, visibility of dark colored wading birds and sandhill cranes is difficult against the large expanse of dark water flecked with aquatic vegetation that is present in the Okefenokee Swamp. In the past, aerial surveys have not provided reliable data. Extensive low-level flying may be necessary. Airboats, which have been used in the past to conduct colonial waterbird surveys on the refuge, are another possible tool for consistently accessing waterways that are too shallow or congested with aquatic vegetation for other types of watercraft. Visibility is good on an airboat with the capability of stopping for identification if necessary. Both aerial and airboat uses create a wildlife and human disturbance factor that will be evaluated through a Minimum Requirement Decision Guide. In these decisions, the purpose of the data is critical. In most cases, the refuge is not just looking for abundance trends but more importantly use patterns associated with environmental parameters that may give insight into the health of the swamp and changes that may be connected to outside threats.

Under Alternative 3, surveys for wading birds, greater sandhill cranes, and osprey nests would be eliminated because a canoe survey would not allow the collection of data over a large area in a relatively short period of time to determine distribution and use patterns. Use of non-motorized methods for wildlife surveys within the swamp would take at least a week to cover the prairie areas. During this time, waterbirds and cranes could shift locations resulting in inaccurate data.

All four alternatives offer some research and monitoring initiatives for fisheries populations, primarily in terms of identifying limiting factors. Alternatives 2, 3, and 4 afford better methods of identifying limiting factors for Okefenokee fish populations. Fish population dynamics are likely to be affected by changes in water quality, as well as water levels, within the swamp. Thus, a comprehensive fisheries monitoring program would provide biologists and managers with another tool to assess overall health of the Okefenokee wetlands system.

The need for amphibian and reptile population monitoring programs has increased in recent years due to the importance of some species as indicators of wetland health. Physical deformities at other locations have been linked to elevated levels of environmental contaminants. Monitoring populations of reptiles and amphibians is addressed under Alternatives 2, 3, and 4. Strategies for monitoring are the same for each of the alternatives with the area of interest confined within the refuge boundary for Alternative 4. Alternatives 1 and 4 are likely to restrict or limit research partnerships, which may be necessary for a successful monitoring program.

Under Alternatives 2, 3, and 4, monitoring of black bear populations would be conducted more thoroughly than by current methods. Under these alternatives, monitoring efforts for Okefenokee black bear populations may be expanded to include sampling hair or other genetic material for tracking population status. To provide a more complete depiction of bear population dynamics, sampling sites should include areas within the wilderness. Non-motorized methods may be used to

access some interior islands within the swamp for more intensive black bear surveys. In some cases, work on interior islands may require occasional use of helicopters for access or equipment transport. Under Alternative 3, monitoring of black bears within the wilderness would be restricted to those islands that can be accessed by non-motorized means. Monitoring under Alternatives 1, 2, and 3 would be enhanced through collaboration with Georgia and Florida wildlife agencies.

All four alternatives provide some level of monitoring environmental contaminants within the Okefenokee system. Under the current level of monitoring covered in Alternative 1, the refuge would put minimum effort into identifying levels of ecotoxins in the region. Alternatives 2, 3, and 4 would improve the level of monitoring that currently exists and hopefully minimize or prevent any long-term impacts related to elevated contaminant levels.

Water monitoring will continue under all alternatives through ten remote-accessed stations, four of which are located in the wilderness. The physical presence of these four stations reduces scenic potential; however, since they are remotely accessed, the number of trips necessary to service the equipment would be minimal and disturbance to visitors would be limited. Two additional stations outside the wilderness are proposed in all alternatives.

RESEARCH

The refuge staff examines long-term trends while outside entities look at more intense, short-duration studies. Twenty to thirty researchers request Special Use Permits to conduct research on the refuge annually. Their methods and possible impact on the resources are examined closely and modified or denied if not compatible with refuge management policies. The refuge has secured funds for five multi-year studies over the past 10 years. Under Alternatives 2, 3, and 4, more research funding would be sought and research would be expanded to meet the needs of resource management and protection. Research within the wilderness under Alternative 3 would concentrate on natural processes and areas that would benefit the wilderness resource. Outside the wilderness area, Alternatives 2 and 3 would be similar, taking an integrated approach to protect the resources of the refuge. The support of research off the refuge, within the various zones of influence, would be appropriate to gain knowledge of the effects on the refuge's natural resources.

Although research under Alternative 4 would be concentrated solely on refuge lands, it would be similar to the on-refuge research of Alternative 2. Recognizing the many designations (e.g., Wetland of International Importance, Wilderness, and Natural Research Areas), it is clear the swamp is a valuable environment for the study of natural resources. Research will be allowed if criteria are met through the Minimum Requirement Decision Guide. Research that benefits refuge management will be favored.

EFFECTS ON SPECIAL DESIGNATION

RESEARCH NATURAL AREAS

All alternatives will continue to protect the eight Research Natural Area's (RNA) and five Public Use Natural Areas (PUNAs) from further development and logging. There are six RNAs and three PUNAs within the wilderness area. Prescribed fire will be used to mimic the natural fire return period on all upland management compartments outside the wilderness to reduce hazardous fuels buildup and enhance the habitat restoration process. Cowhouse Island RNA is the only site outside wilderness that has limited prescribed fire. Naturally, this hardwood hammock does not burn very well; however, prescribed fire has been eliminated from this area for a number of years and a shrub ring has developed around it, which would bring more intense fire close to the hammock if it were allowed to burn. This ring needs to be burned carefully and then prescribed fire can be allowed to burn more

naturally through the compartment without isolating the site totally from the burning operation. Within the wilderness, Blackjack, Number One, and Floyds Islands are associated with RNAs and a PUNA. These islands are periodically prescribed burned under Alternatives 1, 2, and 4. This brings more frequent fire to the islands and may lessen the intensity of a wildland fire moving over the landscape. Alternative 3 does not allow prescribed burning of the islands, which could increase the fuels on these islands and, in turn, increase the intensity of a wildland fire.

The other sites within the wilderness are in areas that are not conducive to burning. Under all alternatives, no prescribed fire will be directly planned for these sites. Wildland fire under extreme dry conditions may reach the edges of these sites and creep around. Exposure to wildland fire would be guided by the Fire Use management strategy under Alternatives 1, 2, and 4.

WILDERNESS

Currently (Alternative 1), administrative management activities in the wilderness area are considered in relation to the Endangered Species Act and other laws, policies, and regulations of the Department of the Interior, the Fish and Wildlife Service, the National Wildlife Refuge System, and Okefenokee Refuge. Standard Operating Procedures have been adopted to guide decisions. This has allowed the use of motorized equipment (e.g., trailcutter, airboats, helicopters, chainsaws, and brush-cutters), mechanical transport (e.g., bicycles and carts), motorboats up to 25 hp, landing of aircraft (e.g., helicopters on interior islands in conjunction with fire management and threatened and endangered species management), and permanent structures (e.g., overnight shelters, day use shelters, and composting toilets). Motorized equipment, motorboats, and aircraft introduce noise disturbance that may influence the distribution of wildlife and reduce the wilderness experience for public visitors. The trailcutter and motorboats open trails for better public access and, in turn, disturb the peat along the waterways, altering the hydrologic flows and the availability of some contaminants that may be deposited in the peat. Using aircraft for fire purposes, endangered species monitoring, and wildlife surveys has broadened the staff's knowledge of the swamp and how management actions affect the resources. The permanent structures interfere with the scenic beauty of the landscape but also provide raised camping sites to minimize repeated disturbance to the limited suitable dry ground within the swamp. Having designated camping sites in combination with a reservation system enhances the opportunities for solitude. Toilets at selected sites also minimize the contamination of the water by providing a controlled human waste site.

Alternatives 2 and 4 embrace the wilderness philosophy, incorporate the public law designating Okefenokee NWR as wilderness, and balance these with the other resources that the refuge is mandated to protect and maintain. The public law allows for the use of powered watercraft propelled by motors of ten horsepower or less and requires the USFWS to maintain approximately 120 miles of watercraft trails. The maintenance level of the trail system is focused on accessibility for public opportunities. Accessibility is dependent also on natural events, such as rainfall and plant growth. Balancing accessibility, maintenance techniques, and the wilderness resource are strived for in these alternatives. With all management actions, a Minimum Requirement Decision Guide will be conducted to identify the need and the method of implementation. Solitude and the public's impact on the land are emphasized rather than unconfined recreation in the public use management within the wilderness. For these reasons, the toilets and shelters would remain under these two alternatives. Because of the trail maintenance specifications within the wilderness legislation, public access is emphasized rather than challenged at normal water levels. This requires a certain level of maintenance and may require mechanical equipment. During drought conditions however, no trails are closed and no additional maintenance is undertaken. Without restricting those users who are confident in their skills, challenge becomes the emphasis.

Alternative 3 takes a narrower look at the wilderness designation, which may be detrimental to some resources the refuge is mandated to protect. The focus is on primitive recreation and minimum management practices. The removal of the established canoe reservation system, overnight platforms, composting toilets, and signage opens the door to uncontrolled visitor use, which has the potential to reduce solitude values, create areas of overuse because of the lack of suitable dry sites for camping, and increased pollution associated with human waste. Although the Wilderness Act allows management actions to be evaluated through the Minimum Requirement Decision Guide, Alternative 3 is more restrictive by designating that there will be no mechanical equipment, trailcutter, helicopter, or prescribed burning. These restrictions could eliminate some surveys due to the need to cover the area in a short time frame to gain knowledge of patterns of use related to changing environmental factors. Fuels on the wilderness islands could accumulate without prescribed fire creating conditions more susceptible to high intensity wildland fires. The refuge's responsibilities for protecting red-cockaded woodpecker populations and their habitats would be restricted to the upland management compartments outside the wilderness area. Half of the existing active red-cockaded woodpecker clusters (38) are located on wilderness islands and would not be managed through Alternative 3.

Management of the wilderness area exclusively with natural processes (Alternative 3) does not allow for the establishment of fire management zones to protect adjacent private property. Alternatives 2 and 4 utilize fire management zones to make management decisions based on hazards and potential property damage, while using fire to the maximum benefit for all resources. The legal aspect of allowing wildland fires to approach the refuge boundary without suppression options and threatening private property may actually force the establishment of fire management zones in Alternative 3.

Within the Okefenokee Wilderness Area, the public is currently allowed to use outboard motors, up to 10 hp, in designated areas (about 62 miles of the 120 mile total); fish in designated areas according to state regulations; observe and photograph wildlife; and make reservations up to two months in advance to stay one to four nights on permanent overnight platforms on the Wilderness Canoe Trail System. Disturbance to the wilderness resource from administrative trips is greatest in Alternative 1 where more motorized equipment is allowed. Although it appears that Alternative 3 would allow the least disturbance, this may not be the case. The larger number of work crews that would be required under Alternative 3 would be on the trails for a longer period of time. This may conflict with visitor experiences and disturb wildlife. With unconfined recreation in Alternative 3, more trampling of vegetation may result as visitors explore new areas of the swamp. Alternatives 2 and 4 force the evaluation of management actions and their impact on visitor use, wildlife, vegetation, and air, water, and noise pollution. Wilderness values may be impacted to accomplish other resource objectives, but through the decision process, the negative impacts should be kept to a minimum.

WETLAND OF INTERNATIONAL IMPORTANCE-RAMSAR

All the alternatives recognize the significance of the designation "Wetland of International Importance" and its layer of legislative protection for the refuge. Under Alternatives 2, 3, and 4, there will be an increase in public exposure to Ramsar status through brochures, programs, news releases, interpretive panels, and the refuge website. This exposure may lead to greater international interest by researchers, writers, and visitors.

EFFECTS ON CULTURAL AND HISTORIC RESOURCES

Under all four alternatives, all known or found historic or archaeological sites will be protected under federal ownership as defined in the National Historic Preservation Act of 1966, as amended through 1992 (16 USC 431-433), the Archaeological Resources Protection Act of 1979 (16 USC 470aa-470mm), the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001-3013),

other applicable state and federal regulations, and Department of the Interior and USFWS policy. The degree of protection remains constant throughout each alternative; however, opportunities to conduct research, pursue partnerships, and interpret past cultures vary slightly from Alternative 1.

All alternatives incorporate ground disturbing activities and the use of prescribed fire. Alternatives 2, 3, and 4 are potentially the most destructive to cultural resources due to expanded management activity and increased construction of educational, interpretive, and staff facilities. All new ground-disturbing activities require review by the USFWS's Regional Archaeologist, who will determine appropriate procedures to protect cultural resources and specify any necessary mitigation. Prescribed fire itself offers little threat to buried archaeological resources; however, certain ground disturbing activities, such as firebreak construction, done in conjunction with accepted prescribed fire practices, could threaten sensitive sites. Prescribed fire has the potential to threaten historic structures as well. All known historic structures will be protected prior to ignition. Floyds Island cabin may be impacted by the lack of prescribed fire in Alternative 3 to reduce hazardous fuels surrounding it. However, under all alternatives, wildland fire is treated as an emergency giving fire teams authority to do what is necessary to protect a historical structure.

Each alternative incorporates existing and new technologies to identify and store data on cultural sites within a Geographic Information System. These data would enhance the refuge's ability to monitor and protect cultural resources under their jurisdiction. Each alternative also includes increased law enforcement officer training so that recorded archaeological sites can be monitored and protected from looting or vandalism and to conduct Archaeological Resource Protection Act related investigations when necessary.

With Alternatives 2, 3, and 4, an emphasis on environmental education would provide increased public awareness of the region's past cultural histories. Only under Alternatives 1 and 4 would partnerships with other agencies, institutions, and communities not be actively pursued and fostered.

EFFECTS ON PUBLIC SERVICES

RECREATION

Although the Okefenokee NWR is primarily managed for wildlife, public use is also an important aspect of the refuge. Under all alternatives, recreational opportunities must be compatible with the mission of the National Wildlife Refuge System and at levels that do not impact the wildlife and other resources of the refuge. Adaptive management, which gives flexibility to the decision-making process, is critical in addressing human carrying capacity of an area/activity within all the alternatives.

The priority uses of the refuge include hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The fee demonstration program, a means of collecting entrance fees from the refuge user, supports funding for the recreation program. Concession contracts, permits, and other commercial uses of the refuge that are compatible recreational uses would continue. Relaxation, family togetherness, interacting with nature, learning-discovery, escape from work-related pressures, and exercising are human benefits recognized from recreational opportunities.

Visitor facilities provide a place where wildlife, wild lands, and people are brought together. Visitor facilities are primarily outside the Okefenokee Wilderness Area; however, maintained watercraft trails and wooden platforms with composting toilets are present within the wilderness. The legislation that established the Okefenokee Wilderness Area allows for the use of powered watercraft, propelled by motors of ten or less horsepower, and requires the USFWS to maintain approximately 120 miles of watercraft trails.

Under Alternative 1, public recreational use of existing facilities would continue, while Alternatives 2 and 4 proposes to expand the recreational use of the existing facilities and evaluate other opportunities. Enhancing visitor appreciation of the resources may be accomplished by expanding the refuge hiking trail system and incorporating interpretive signs. A boardwalk extending into Mizell Prairie and connecting the existing boardwalk spurs into Chesser Prairie is also proposed. Other enhancements will be investigated related to hunting, fishing, and conveniences at currently unstaffed areas such as Kingfisher Landing and Suwannee River Sill area. Increased opportunities may alleviate congestion at some entrances by distributing visitation throughout the refuge. Alternative 3 would provide the same recreational opportunities as described for Alternatives 2 and 4 outside the wilderness.

Managing the wilderness resource for public enjoyment is addressed in all alternatives with different qualities of wilderness emphasized. The most pronounced difference impacting the human use of the wilderness is between Alternative 3 and the other alternatives. Alternative 3 emphasizes challenging, primitive, and unconfined recreation while the other alternatives ensure solitude. This difference in emphasis creates changes in the facilities provided, impacts at available campsites, the number of trails, the level of maintenance of trails, the extent of wildlife disturbance, and the administration of the area along with the type of visitor that enjoys the Okefenokee NWR. Under Alternatives 1, 2,and 4, the wilderness canoe trail system provides managed facilities, such as platforms and composting toilets, that would continue to protect the Okefenokee resources from water pollution and degradation of the vegetation. In contrast, platforms and composting toilets on the wilderness canoe trail system would be removed under Alternative 3 for the purpose of emphasizing primitive and unconfined recreation. Pollution issues and trampling of vegetation may result. Due to the limited number of dry campsites within the swamp, concentrated use may result in impacts to the soil, vegetation, and wildlife at the site. The canoe reservation system would be discontinued, which may result in concentrated use in camping areas and lack of solitude due to the limited availability of dry ground in the wilderness. After monitoring impacts, a means of limiting numbers of visitors may need to be established to keep visitation at or below the carrying capacity of the area. Alternatives 1, 2, and 4 continue to use the reservation system to ensure a level of solitude. Under Alternative 3, there would be a greater chance of meeting other canoe parties along the trails and at campsites. Signs would be removed to encourage challenge and not impair scenic vistas.

Maintenance of watercraft trails would be similar in Alternatives 2 and 4. Trail conditions would be evaluated and maintenance procedures would follow guidelines established through a Minimum Requirement Decision Guide. The use of the trailcutter may be less but would not exceed current levels of use (Alternative 1). Motorboats, chainsaws, and other mechanical means have the potential of being used to maintain the trail system when determined appropriate under a minimum tool decision. With more or larger work crews maintaining the trails with more hand tools, the visitor may come in contact more frequently with refuge staff. This frequent contact with work crews would also occur under Alternative 3. With all work being conducted by hand in Alternative 3, the cycle of trail maintenance could be longer and a lower standard of accessibility would be accepted. This lower standard would facilitate the possible restoration of the trails, eliminating the impacts of channelization. Alternative 3 also emphasizes unconfined recreation that would expand the pathways through the swamp. Constant use would maintain these trails. No additional maintenance would occur on these newly created trails. With wilderness users able to venture off the trail system in Alternative 3 to investigate a group of birds, explore an alligator nest, or investigate a sound, wildlife and vegetation disturbance would be greater.

Alternatives 1, 2, and 4 provide wilderness opportunities for a greater cross-section of the human population than Alternative 3. Alternative 3 emphasizes challenging situations and unconfined recreation, requiring a person to be confident in orienteering and self-discovery, and physically able

to confront the unpredictable challenges. Alternatives 1, 2, and 4 emphasize solitude and challenge depending on trail conditions. This allows people seeking solitude, self-discovery, enrichment of the human spirit, and connection with the natural environment the wilderness experience at various levels.

Alternatives 1, 2, and 3 all incorporate partnerships to expand recreational opportunities within the area and entice visitors to stay longer. However, Alternative 4 takes a narrow focus on the refuge and does not require partnerships to accomplish the objectives.

ENVIRONMENTAL EDUCATION AND INTERPRETATION

Alternative 1 limits interpretation and environmental education to current levels, making use of the visitor center, trails, boardwalks, self-guiding brochures, festivals, and various programs. Outreach education would continue through support materials for teachers to use on and off refuge, teacher workshops, and educating school groups and other interested groups.

Alternatives 2, 3, and 4 propose expansion and development of interpretive and environmental educational opportunities. Outdoor and indoor classroom settings at various entrances are proposed to distribute growing environmental education demands. Wilderness philosophy will be woven into the presented messages. All users from local students to website visitors will benefit from increased availability of information.

Alternatives 2 and 3 also incorporate partnerships. For example, the refuge's interpretation and education programs and the Okefenokee Education and Research Center in Folkston can both benefit from a partnership, bringing resources together to reach more visitors and provide a comprehensive view of the ecosystem. Other existing and proposed agreements will enhance the refuge's messages. In contrast, Alternative 4's focus on refuge management limits partnerships and thus, the messages related to the role of the refuge in the larger landscape are lost.

EFFECTS ON SOCIOECONOMIC ENVIRONMENT

ECOTOURISM

Okefenokee NWR, with close to 350,000 visitors per year, is conducive to ecotourism in southeast Georgia. The Department of Industry, Trade, and Tourism estimated in the year 2000 that the economic effect of the refuge on Charlton, Ware, and Clinch Counties amounted to $77 million. Our current management strategy (Alternative 1) allows us to seek out and interact with regional audiences of partners and visitors, primarily in southeast Georgia and northeast Florida. Refuge financial impacts to the economy parallel national economic trends. As the economic outlook for the nation improves, refuge visitation should increase, as well as the benefits to our regional partners.

Alternatives 2 and 3 promote outreach to regional audiences not only in Georgia but also in the surrounding States of Alabama, Florida, South Carolina, and Tennessee. Successful outreach campaigns of this magnitude will yield significant increases in visitation to all refuge entrances. This increase in visitation will cause impacts to the local economy of the tri-county area. Development of additional facilities for expansion of compatible recreational opportunities at all entrances would be evaluated as the demand increases in Alternatives 2 and 3. Facility expansion is proposed for outside the wilderness; however, bringing additional people into the area would also increase the demands on the wilderness. Adaptive management is incorporated to minimize the negative impact to the wilderness resource and experience.

Managing the wilderness for solitude in Alternatives 1, 2, and 4 continues the reservation system ensuring controlled numbers at campsites, minimum site disturbance, and safety for the visitors. Alternative 3 emphasizes primitive and unconfined recreation within the wilderness area. This may reduce the number of casual campers. The need to navigate without signs, to find a dry camping site in a wetland, and the uncertainty of who you may share the dry site with, as well as the uncertainty of trail conditions, may deter some users. This type of wilderness management favors challenge. Over utilizing sites within the swamp may lead to temporary closures. This action may affect the visitor experience negatively and influence more and more visitors to seek out recreational experiences in other areas.

Partnerships with other entities providing visitor services are emphasized in Alternatives 2 and 3 to encourage visitors to stay in the area longer. The refuge would be an integral part attracting regional, national, and international visitors.

Alternative 4 proposes management of the refuge within the established boundaries with very little outreach or increased opportunity to pursue new recreational opportunities with area partners. Economic impacts of the alternative are predicted to be negative. The refuge would be highlighted and publicized in relation to its wildlife oriented recreation opportunities only and other opportunities in the area would not be promoted by the refuge. The refuge would accommodate visitors who were participating in area promotional packages but the promotion of the refuge would be left for others to carry forth. Instead of cooperative agreements with neighbors, the refuge would seek to purchase lands critical to meeting objectives. The refuge would not pursue an active partnership with the Okefenokee Education and Research Center but instead would work at accommodating the programs that require use of the refuge. Under this alternative, there is duplication of effort, the loss of message continuity, increased cost to all parties, and less enticement to visit other area attractions.

PROPERTY VALUES

Property values could increase under Alternatives 2 and 3 as ecotourism is embraced within the surrounding communities. Jobs may increase to support the tourism businesses and, in turn, more people may be willing to pay to live in healthy, natural environments. The down side of this may be the increased number of people seeking homes. This urban sprawl would affect management of the refuge.

Ecotourism would slowly increase under Alternatives 1 and 4 with the refuge at status quo and the surrounding communities moving forward to improve other opportunities within the area. The result could be a slower increase in property values.

LOCAL REVENUE

Revenue sharing payments to the counties are paid according to the highest of the following three formulas: 1) 25 percent of gross receipts, 2) $0.75 per acre, 3) ¾ of 1 percent (0.75 percent) of the total land plus timber value. It is expected that the 0.75 percent of total land plus timber formula will probably be used under all management alternatives. Payments to counties in lieu of taxes should be very similar between Alternatives 1, 2, and 3. Alternative 4 has the potential of increasing refuge lands because ownership of land is of greater importance than partnerships. Thus payments to counties in lieu of taxes would increase. In addition, the refuge generates sales tax as facilities increase and visitors are encouraged to come to this area of Georgia.

Currently there are approximately 30 employees plus numerous volunteers who live in the 3-county area. The financial contribution to the communities would increase with Alternatives 2, 3, and 4 because of the proposed increase in refuge staff.

Forest management through timber harvesting is similar between alternatives. Timber harvests not only provide raw material for regional sawmills and pulp mills, they also provide employment for local loggers, foresters, etc.

SURROUNDING LANDS

The lands surrounding the refuge will benefit from Alternatives 1 and 2 with emphasis on common fire goals, promotion of area opportunities through partnerships, incentives for enhancing endangered species habitats, and working together towards a healthy ecosystem. On the other hand, as ecotourism is embraced, and more individuals seek home sites in the area, development of adjacent lands could increase and have negative impacts on the wildlife of the area, confining them more to the refuge property.

Alternative 3 would be similar to Alternatives 1 and 2; however, there could be an increased threat of fire on the surrounding lands. Without established buffers or fire management zones within the wilderness to suppress wildfires leaving the wilderness/refuge especially on the east boundary, fire could easily cross over to the adjoining private property.

Alternative 4 attempts to isolate refuge land from the surrounding lands. Partnerships between adjacent landowners and the refuge would not be pursued to work towards common goals. Ecotourism efforts may not have positive impacts on local communities without refuge involvement. By not forming partnerships related to management for endangered species, populations on the refuge could decrease over the next 15 years unless properties could be acquired to join the current refuge uplands.

EFFECTS ON ADMINISTRATION

HEALTH AND SAFETY

All alternatives address health and safety of the refuge staff, volunteers, interns, and others in the same manner, while recognizing the different safety issues between alternatives.

REGULATION

As programs expand in Alternatives 2, 3, and 4, the number of law enforcement staff must also increase. Similar numbers of officers would be present under each alternative; however, their emphasis would be somewhat different. Alternative 3 would employ more backcountry officers because of the unconfined recreation opportunities. With a greater number of officers on duty, their involvement with preventative education and outreach will increase.

STAFF

All alternatives include the expansion of staff, volunteers, facilities, equipment, and training. Each alternative's expansion is relative to its support for the management programs. All increases are dependent upon staffing and funding being obtained.

Alternative 1 assumes no major changes in existing current management goals and objectives. However, accomplishing the current defined goals and objectives has been significantly limited by shortages of staffing and funding. The increase in staffing necessary to carry out the current goals and objectives is presented in Alternative 1. Managing the refuge as part of a larger landscape as in Alternative 2 requires staff and facilities to handle increased outreach and partnerships. Alternative

3 shows the greatest increase in staff because of its emphasis on maintaining wilderness trails with primitive and hand tools and the recognition of the time factor involved with these methods. Alternatives 2 and 4 will also employ these trail maintenance techniques, along with others, because more factors enter into the decision process when other mandates are considered. Alternative 4 focuses on refuge resources with increased recognition of the USFWS's responsibilities in managing wilderness.

Under Alternative 1, the level of law enforcement activity made possible with the addition of one law enforcement officer would be sufficient to react to most visitor protection needs; however, more resource protection would still be needed. The law enforcement program under this alternative would be operating in a reactive mode rather than in a proactive, preventive mode. Under Alternatives 2, 3, and 4, law enforcement efforts can pro-actively deal with visitor safety concerns and resource protection before violations occur. Under these alternatives, increasing refuge law enforcement staffing levels conveys to our neighbors, visitors, and local communities the USFWS's dedication to protection of natural resources and improved public safety.

INTEREST IN LAND

Most of the Okefenokee Swamp is in public ownership, either by the State of Georgia or the USFWS. However, several thousand acres of inholdings are privately owned, but are still naturally protected due to their remoteness and difficult access. Under each alternative, the USFWS remains interested in acquiring an interest in this land; however, it is not a high priority because of low threat potential.

Under Alternatives 1, 2, and 3, the USFWS would be interested in acquiring land from willing sellers within the approved acquisition boundary. Interest in land is not only fee-title ownership but also can include land under shared responsibility. Partnerships would be used to supplement habitat protection and species management both within and outside the approved acquisition boundary. Interest in lands that have direct influence on the swamp with an immediate threat to development would be a high priority for acquisition.

Under Alternative 3, the need for additional interests in lands adjacent to the current refuge boundary would increase because natural process management (e.g., fire and unimpeded water flow) may originate or terminate on these lands. Expanding the refuge boundary 10 miles from the swamp border would allow one of the most important natural processes, fire, to burn uninterrupted into and out of the swamp for at least 24 hours under the most extreme conditions.

Under Alternative 4, all lands within the approved acquisition boundary would be pursued for purchase from willing sellers. In addition, any interest in lands outside the approved acquisition boundary and of value to meet refuge objectives would be purchased from willing sellers when funds are available.

PARTNERSHIPS

Partnerships have proven very effective in the management of the Okefenokee NWR. Alternative 1 maintains the current partnerships that have proven to be beneficial to both natural resource management and the public's perception and understanding of the agency and refuge's mission. The established Greater Okefenokee Association of Landowners partnership is critical in fire management, both on and off the refuge. This partnership has also been instrumental in biological research.

Under Alternative 2, all of the current partnerships will continue with renewed emphasis to enhance relationships and develop new and important initiatives. Additional emphasis would be placed on

partnerships with local and state governments, other federal agencies, universities, and non-government organizations to encourage environmentally friendly planned development, increase the area's public use opportunities, enhance wildlife habitat, and cooperate on data sharing, baseline studies, and management-based research. Effort would be placed on defining "zones of influence" associated with each natural resource where partnerships could be developed to address negative influences and enhance positive influences in the zones. Environmentally friendly planned development is the key to protecting the ecosystem's resources and enhancing eco-tourism. Promoting natural processes, such as fire, to occur to the greatest extent possible within the swamp, while still ensuring protection of the investments of the surrounding landowners, requires partnerships to be in place when a natural event occurs. With limited upland acres, partnerships to enhance wildlife habitat off the refuge are critical for supporting refuge wildlife populations such as the endangered red-cockaded woodpecker and maintaining a healthy black bear population. Through data sharing, the refuge and others' contributions towards the health of the system are realized and critical management questions can be addressed.

Considerable efforts under Alternative 3 would be devoted to developing advocacy groups and partnerships to support conservation through natural processes exclusively to meet the objectives of the agency and refuge.

Alternative 4's focus on refuge management with little effort placed on partnerships reduces its involvement in the ecosystem. Strained relationships with adjacent landowners may result from the lack of communication and/or commitment to common goals.

V. Consultation And Coordination

A planning team consisting of refuge management staff, a private ecology consultant and representatives from Ecological Services, Georgia Wildlife Federation, Georgia Department of Natural Resources - Wildlife Division, Georgia State Parks and Historic Sites, and Osceola National Forest was formed to prepare the Draft Comprehensive Conservation Plan for Okefenokee NWR.
The refuge management staff began meeting regularly on March 16, 2001 to discuss the planning process. The first core planning team meeting was held on July 26, 2001. This planning team met three additional times (December 11, 2001, April 11, 2002, and December 17, 2003).

Five public workshops to identify the important issues, concerns, and suggestions related to the future management of the refuge were conducted in the communities around the refuge in September and October 2001 as stated in Section B.I. Planning Process. In addition, professional reviews of the refuge's forestry/fire, biological, and public service programs were conducted between October 2001 and February 2002.

On July 2, 2003, the refuge staff participated in a wilderness workshop that was facilitated by Nancy Roeper, USFWS Wilderness Coordinator, and Sue Matthews, USFWS liason at the Arthur Carhart National Wilderness Training Center.

The refuge management staff compiled the thoughts and comments from the numerous discussions at all the above gatherings into the writing of this EA and CCP. Team participants are listed below:

Refuge CCP Coordinator: Sara Brown Aicher, Wildlife Biologist, Okefenokee NWR, Folkston, GA

Refuge Management Team:

Skippy Reeves, Refuge Manager
Shaw Davis, Deputy Refuge Manager
Jim Burkhart, Supervisor Ranger
Maggie O'Connell, Ranger (currently Ranger, Bosque del Apache NWR, Socorro, New Mexico)
Gisella Burgos, Ranger
Fred Wetzel, Forester/FMO
Russ Langford, Assistant Forester/AFMO
Cindy Thompson, Biologist (currently NEPA Coordinator, Osceola NF, Olustee, Florida)
Dean Easton, Biologist

Core Planning Team:

Refuge Management Team (above)
John Kasbohm, Ecologist, Ecological Services, Jacksonville, Florida
Frank Cole, Fire Ecology Consultant, Thomasville, Georgia
Jerry McCollum, Georgia Wildlife Federation, Covington, Georgia
Wes Abler, GA-DNR-Wildlife Resources, Fitzgerald, Georgia
Ed Reed, GA State Parks and Historic Sites, Region 2 Office, Brunswick, Georgia
Will Metz, Superintendent, Osceola National Forest, Olustee, Florida
(currently Deputy Forest Supervisor, Six Rivers National Forest, Eureka, California)

FORESTRY/FIRE PROGRAM REVIEW TEAM
(October 29 - November 2, 2001)

Team Leader: David J. Brownlie, Regional Fire Ecologist, U.S. Fish and Wildlife Service, Southeast Region, Tallahassee, Florida
Alan Dozier, GA Forestry Commission, Macon, Georiga
Gary Howell, International Paper, Glen Saint Mary, Florida
Dale Wade, Forestry Science Lab-USFS, Athens, Georgia
Cyndy Loftin, USGS-BRD, Maine Coop Fish and Wildlife Research Unit, Univ of Maine, Orono, Maine

BIOLOGICAL PROGRAM REVIEW TEAM
(November 26 - 30, 2001)

Team Leader: Chuck Hunter, Division of Wildlife and Habitat Management, USFWS, Atlanta, Georgia
Laura Brandt, A.R.M. Loxahatchee NWR, Boynton Beach, Florida
John Robinette, Savannah Coastal Refuges, Savannah, Georgia
Greg Looney, Warm Springs Regional Fisheries Center, Warm Springs, Georgia
Parley Winger, USGS-BRD, University of Georgia, Athens, Georgia
Todd Engstrom, Tall Timber Research Station, Tallahassee, Florida
John Jensen, GA DNR, Nongame-Endangered Wildlife Program, Forsyth, Georgia
Joe Clark, NBS-CPSU, University of Tennessee, Knoxville, Tennessee

PUBLIC SERVICES PROGRAM REVIEW TEAM
(January 28 - February 1, 2002)

Team Leader: Matt Gay, Outdoor Recreation Planner, National Conservation Training Center, Shepherdstown, West Virginia
Donna Stanek, U.S. Fish and Wildlife Service, Fort Snelling, Minnesota
Kimberly King-Wrenn, U.S. Fish and Wildlife Service, Alligator River National Wildlife Refuge, Manteo, North Carolina
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SECTION C. APPENDICES

Appendix I. Relevant Legal Mandates

Departmental Policy

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to tribes. In accomplishing this mission, the Department is committed to the following (105 DM 1):

- Restoring and maintaining the health of federally managed lands, waters, and renewable resources.
- Preserving our Nation's natural and cultural heritage for future generations.
- Providing recreational opportunities for the public to enjoy natural and cultural resources.
- Providing for appropriate commercial use and development of federally managed natural resources in an environmentally sound manner.
- Encouraging the preservation of diverse plant and animal species and protecting habitat critical to their survival.
- Working to transfer Federal program operations to Tribal governments through Indian self-determination and self-governance agreements.
- Protecting and conserving the trust resources of American Indian and Alaska Native tribes and working with these tribes to enhance education, economic opportunities, and the quality of life for their members.
- Advancing scientific research and monitoring to improve our understanding of the interaction of natural and human systems and to reduce the impacts of hazards caused by natural processes and human actions.
- Providing useful scientific information for sound resource decision making.
- Applying laws and regulations fairly and effectively, placing priority on compliance and enforcement, prevention and problem solving.

Service Policy

The U.S. Fish and Wildlife Service is responsible for the administration of the National Wildlife Refuge System. As of September, 1999, 521 National Wildlife Refuges and 1200 Waterfowl Production Areas existed within the National Wildlife Refuge System totaling over 93223 million acres. As one of its administrative responsibilities, the U.S. Fish and Wildlife Service is responsible for developing a program for the restoration, preservation, and management of wildlife and habitat to obtain maximum benefits from these resources. Management guidance for Service lands is provided by the Fish and Wildlife Service Manual (http://policy.fws.gov).

The National Wildlife Refuge System received additional guidance in 1997 with the passage of the National Wildlife Refuge System Improvement Act. The National Wildlife Refuge System Improvement Act of 1997:

- Amends the National Wildlife Refuge System Administration Act of 1966 (the Act) to state as the mission of the National Wildlife Refuge System to administer a national network of lands and waters for the conservation, management, and restoration of fish, wildlife and plant resources and their habitats.
- Adds requirements that, in administering the System, the Secretary of the Interior shall: (1) ensure that the System's mission and policies are carried out, except that if a conflict

exists between the purposes of a refuge and the System mission, it shall be resolved in a manner that first protects the purposes of the refuge; and (2) monitor the status and trends of fish, wildlife, and plants in each refuge.

- Recognizes and supports wildlife-dependent recreation (recreation which involves hunting, fishing, wildlife observation and photography, or environmental education and interpretation) within the System.
- Authorizes the Secretary to enter into cooperative arrangements with State fish and wildlife agencies for the management of programs on a refuge.
- Prohibits the Secretary from initiating or permitting a new refuge use or expanding, renewing, or extending an existing use, unless the Secretary determines that such use is a compatible use which is not inconsistent with public safety.
- Establishes compatibility standards and procedures, including those for wildlife-dependent recreational uses. Requires the Secretary to issue final regulations establishing the process for determining a compatible use. States that the compatibility determination provisions of the Act shall not apply to overflights above a refuge or to activities authorized, funded, or conducted by a Federal agency having primary jurisdiction over a refuge.
- Directs the Secretary to propose comprehensive conservation plans for each refuge in the System except for lands in Alaska (which are governed by the Alaska National Interest Lands Conservation Act). Requires maximum 15-year cycles of plan revision. Sets forth matters to be considered in plan development, including fish and wildlife distribution and migration patterns, plant populations, archaeological and cultural values, habitat problems, and opportunities for compatible wildlife-dependent recreation.
- Authorizes the Secretary to temporarily suspend any refuge activity when necessary to protect the health and safety of the public or any fish or wildlife population.

Enabling Legislation

The executive order establishing government owned lands or lands to be acquired by the United States within the Okefenokee Swamp area as a wildlife refuge is reproduced below.

PRESIDENT OF THE UNITED STATES

Executive Order

Establishing Okefenokee National Wildlife Refuge

Georgia

By virtue of and pursuant to the authority vested in me as President of the United States, and in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 Stat. 1228), it is ordered that all lands, including lands under water, acquired or to be acquired by the United States, lying within the following-described area, and comprising approximately 479,450 acres in Charlton, Clinch and Ware Counties, Georgia, be, and they are hereby, reserved and set apart for the use of the Department of Agriculture, subject to valid existing rights, as a refuge and breeding ground for migratory birds and other wildlife: Provided, That any private lands within the area described shall become a part of the refuge hereby established upon the acquisition of title thereto or lease thereof by the United States:

Beginning at the southeast corner of Ware County, Georgia, in the boundary between the States of Florida and Georgia;

Thence from said initial point, westerly along said State line, with the south boundary of Ware County and in part with the south boundary of Clinch County to a point in the west boundary of lot 564, 13th District, Clinch County;
Thence passing within Clinch County,

Northerly with lot lines through the 13th District to the northwest corner of lot 30 in the north boundary of the 13th District; westerly between lot 29, 13th District, and lot 29, 12th District;

Thence continuing with lot lines in 12th District, Clinch County,

Northerly, between lots 28 and 29;
Westerly, between lots 28 and 45;
Northerly, with the west boundary of lots 45, 100, 117, 172, 189 and 244;
Easterly, between lots 244 and 261;
Northerly, between lots 260 and 261, and lots 316 and 317;
Easterly, between lots 317 and 332;
Northerly, between lots 331 and 332;
Easterly, between lots 331 and 390, 330 and 391, and lots 329 and 392, to the boundary between Clinch and Ware Counties;

Thence, northerly, on county line between lots 392 and 393;
Thence passing within Ware county and continuing with lot lines in 12th District,

Easterly, between lots 393 and 400, and lots 394 and 399;
Northerly, between lots 398 and 399;
Easterly, between lots 398 and 467;
Northerly, between lots 467 and 468, and lots 469 and 470;

Easterly, between 469 and 540, and lots 615 and 616, to the boundary between Ware and Charlton County;

Thence passing within Charlton County, with lot lines in the 4th Section, 10th District,

Easterly, Between lots 3 and 4;
Northerly, between lots 3 and 22;
Easterly, between lots 22 and 23;
Northerly, between lots 23 and 26, and lots 24 and 25, to the boundary between Charlton and Ware Counties;

Thence, easterly, with county line to the southwest corner of lot 523, 8th District, Ware county;
Thence passing within Ware County, with lot lines in the 8th District,

Northerly, between lots 522 and 523, 490 and 491, and lots 476 and 477;
Easterly, between lots 444 and 477;
Northerly, between lots 443 and 444, and lots 431 and 432;
Easterly, between lots 397 and 432, 396 and 433, 395 and 434, 394 and 435, 393 and 436, and lots 392 and 437 to the line between the 8th and 9th Districts;

Thence continuing in Ware County, with lot lines in the 9th District,

Easterly, between lots 18 and 19;
Southerly, between lots 19 and 28;
Easterly, between lots 27 and 28, 65 and 66, 73 and 74, 111 and 112, 119 and 120, and lots 157 and 158;
Southerly, between lots 158 and 165;
Easterly, between lots 164 and 165, and lots 204 and 205;
Southerly, between lots 205 and 210, 206 and 209, and lots 207 and 208, to the boundary between Ware and Charlton Counties;

Thence, easterly, with county line, to the northeast corner of lot 48, 1st Section, 10th District, Charlton County;
Thence passing within Charlton County, with lot lines in 1st Section, 10th District,

Southerly, between lots 48 and 49, 47 and 50, 46 and 51, 45 and 52, 44 and 53, 43 and 54, 42 and 55, 41 and 56, 40 and 57, 39 and 58, and lots 38 and 59 to the south corner of lot 59 in the line between the 1st and 10th Districts;

Thence, southwesterly, with district line, to the southwest corner of lot 26, 1st District, Charlton County;
Thence, continuing in Charlton County, with lot lines in 1st District,

Southeasterly, between lots 26 and 37;
Southwesterly, between lots 36 and 37, 38 and 39, 48 and 49, 50 and 51, 60 and 61, and lots 62 and 63;
Southeasterly, between lots 63 and 70;
Southwesterly between lots 69 and 70, and lots 73 and 74;
Southeasterly, between lots 74 and 79, 75 and 78, and lots 76 and 77, to the line between the 1st District and the Headright Grants;
Southwesterly, with line between lot 77, 1st District, and the Headright Grants, 48.29 chains, to a point;

Thence passing within the Headright Grants with the following described line;

N. 88□ 16' E., 96.73 chains;
S. 28□ 17' W., 22.07 chains;
S. 89□ 10' W., 60.08 chains;
N. 83□ 06' W., 38.04 chains;
to the line between lot 77, 1st District, and the Headright Grants;

Thence, southwesterly, with the southeast boundary of lots 77 and 87;
Then passing within 1st District, with lot lines,

Northwesterly, between lots 86 and 88, and lots 85 and 89;
Southwesterly, between lots 89 and 90, 95 and 96, and lots 104 and 105;
Southeasterly, between lots 104 and 111;
Southwesterly, between lots 111 and 112, and lots 122 and 123;
Southeasterly, between lots 122 and 131;
Southwesterly, between lots 131 and 132, 144 and 145, 154 and 155, 170 and 171, 180 and 181, 198 and 199, 208 and 209, and lots 227 and 226;
Northwesterly, between lots 227 and 237, and lots 228 and 236;
Southwesterly, between lots 235 ad 236;
Northwesterly, between lots 235 and 259, 234 and 260, and lots 233 and 261;
Northeasterly, with northwest boundary of lot 233, to place of beginning.

This refuge shall be known as the Okefenokee Wildlife Refuge.

Franklin D. Roosevelt

The White House,
March 30, 1937.

PUBLIC LAW 84-810 (70 STAT. 668)
OKEFENOKEE NATIONAL WILDLIFE REFUGE
An Act

To provide for the protection of the Okefenokee National Wildlife Refuge, Georgia, against damage from fire and drought.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled. That (a) for the purpose of protecting the natural features and the very substantial public values represented in the Okefenokee National Wildlife Refuge, Georgia, from disastrous fires such as those which swept over 80 per centum of the area between October 1954 and June 1955, and for the purpose of safeguarding the forest resources on more than four hundred thousand acres of adjoining lands recently damaged by wildfires originating in or sustained by the desiccated peat deposits in the Okefenokee Swamp, the Secretary of the Interior shall construct a continuous perimeter road around the Okefenokee National Wildlife Refuge with additional fire access roads (leading from such perimeter road) in and around such refuge; and for the purpose of protecting such refuge against damage from drought he shall construct a sill and dike in the Suwannee River near the point where the river leaves the refuge together with additional sills in the Old Saint Marys River Canal and at such other points within the refuge as he may determine to be necessary to prevent drainage of the Okefenokee Swamp during periods of drought such as those which occurred in 1953-1955 and other years.

(b) The Secretary of the Interior is authorized and directed to conduct such surveys as he deems necessary to provide more adequate protection for the Okefenokee National Wildlife Refuge, through the development and construction of perimeter and fire access roads and the installation of water controls as described in subsection (a), against the damaging effects of fire and drought.

(c) The Secretary of the Interior is authorized and directed to cooperate with State and local authorities in protecting public and private lands from wildfires originating in or sustained by the Okefenokee National Wildlife Refuge by integrating the perimeter road and fire access roads with existing woods roads in such manner as he determines will best carry out the purpose of this Act.

SEC. 2. There are hereby authorized to be appropriated to carry out this Act (1) the sum of $453,500 for the construction of a continuous perimeter road around the Okefenokee National Wildlife Refuge and approximately one hundred and sixty-two miles of fire access roads, together with necessary bridges and culverts, in and around such refuge, and (2) the sum of $275,000 for the construction of a sill and dike in the Suwannee River and sills at other appropriate points in the Okefenokee National Wildlife Refuge.

Approved July 26, 1956.

Wilderness Act

The Wilderness Act sets aside areas of "undeveloped Federal land, retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions--". Lands placed under protection of the wilderness act are administered by the host agency. The act does not alter the objectives for which the unit was established; however, management activities generally must be conducted with minimum tool and without the aid of motorized equipment. The act provides that the area shall be managed "so as to preserve its natural conditions and which -- generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable" (Public Law 88-577; 88th Congress, S.4; September 3, 1964). This implies that management is permitted; however, management actions must appear to have been accomplished by natural forces.

Public Law 93-429 dated October 1, 1974 designated certain lands in the Okefenokee National Wildlife Refuge as wilderness. This Act added 353,981 acres to the National Wilderness System.

Public Law 93-429
93rd Congress, H.R. 6395
October 1, 1974
An Act

To designate certain lands in the Okefenokee National Wildlife Refuge, Georgia, as wilderness.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That, in accordance with section 3(c) of the Wilderness Act (78 Stat.890, 892), certain lands in the Okefenokee National Wildlife Refuge, Georgia, which comprise about three hundred forty-three thousand eight hundred and fifty acres and which are depicted on a map entitled “Okefenokee Wilderness Proposal” dated October 1967, revised March 1971, are hereby designated as wilderness. The map shall be on file and available for public inspection in the offices of United States Fish and Wildlife Service, Department of the Interior.

Sec. 2. Within the wilderness designated by this Act, subject to such restrictions as the Secretary of the Interior deems necessary for public safety and to protect flora and fauna of the wilderness, (1) the use of powered watercraft, propelled by motors of ten or less horsepower, will be permitted, (2) watercraft trails including approximately one hundred twenty miles as delineated on such map will be maintained. Access to watercraft trails in the wilderness area will be provided from the Suwannee River Sill, Steven Foster State Park, Kings Landing, and Suwannee Recreation Area (Camp Cornelia).

Sec. 3. Fishing shall be permitted in the waters of the Okefenokee Wilderness, in accordance with applicable State and Federal regulations, except that the Secretary of the Interior may designate zones and establish periods when no fishing shall be permitted for reasons of public safety, administration, fish and wildlife management, or public use and enjoyment.

Sec. 4. As soon as practicable after the Act takes effect, a map and a legal description of the wilderness area shall be filed with the Interior and Insular Affairs Committees of the United States Senate and the House of Representatives, and such description and map shall have the same force and effect as if included in this Act: ***Provided, however*, That correction of clerical and typographical errors in such description and map may be made.**

Sec. 5. The area designated by this Act as wilderness shall be known as the Okefenokee Wilderness and shall be administered by the Secretary of the Interior in accordance with the provision of the Wilderness Act.

Approved October 1, 1974.

The House Committee on Interior and Insular Affairs in recommending these provisions commented (Report No. 93-872):

"The Committee carefully considered the advisability of prohibiting use of powered watercraft and the maintenance of 'watercraft trails' within the area. However, such a prohibtion would, for all practical purposes, eliminate public use and enjoyment of the entire wilderness. In addition, the Congress recognized that this is a long established and continuing use within the area and that such a use, if properly controlled and regulated, would not materially detract from wilderness values. It was therefore the Committee's position that powered watercraft, propelled by motors of ten horsepower or less, should be permitted to continue to operate within the area. It was also the Committee's position that the 'watercraft trails', including those now designated, should be maintained. However, by authorizing the maintenance of these existing trails and also recognizing that certain relocations or modest additions may be desirable and necessary, the Committee wants it clearly understood that it does not favor any major expansion of the trail system beyond the approximately 120 miles now in existence ... the total mileage of that portion of the trail system devoted to use by motorboats should not be increased at the expense of the mileage of that portion dedicated to non-motorized watercraft."

Other Relevant Mandates

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

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

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

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

Public Law 100-588, approved November 3, 1988, (102 Stat. 2983) lowered the threshold value of artifacts triggering the felony provisions of the Act from $5,000 to $500, made attempting to commit

an action prohibited by the Act a violation, and required the land managing agencies to establish public awareness programs regarding the value of archaeological resources to the nation.

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

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

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

Emergency Wetland Resources Act of 1986: This Act authorized the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. The Act also requires the Secretary of the Interior to establish a National Wetlands Priority Conservation Plan, requires the states to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund an amount equal to import duties on arms and ammunition.

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

Endangered Species Act: The Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884) requires all federal agencies to carry out programs for the conservation of threatened and endangered species. The Act provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend both through federal action and by encouraging the establishment of state programs. The Act authorizes “the determination and listing of species as threatened and endangered; prohibits unauthorized taking, possession, sale, and transport of endangered species; provides authority to acquire land for the conservation of listed species using land and water conservation funds; authorizes establishment of cooperative agreements and grants-in-aid to states that establish and maintain active and adequate programs for threatened and endangered wildlife and plants; authorizes the assessment of civil and criminal penalties for violating the Act or regulations; and authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction of anyone violating the Act and any regulation issued thereunder."

All habitat management actions proposed for Okefenokee's uplands and wetlands are examined through Section 7 consultation to determine that they meet provisions of the endangered species act.

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

and support environmental programs in consultation with other federal natural resource management agencies, including the Fish and Wildlife Service.

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

Executive Order 11988, Flood plain Management: The purpose of this Executive Order, signed May 24, 1977, is to prevent federal agencies from contributing to the “adverse impacts associated with occupancy and modification of floodplains" and the “direct or indirect support of flood plain development." In the course of fulfilling their respective authorities, federal agencies “shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by flood plain.”

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

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

Executive Order 1312 Invasive species (1999): This order seeks to prevent the introduction of invasive species, provides for their control, and minimizes the economic, ecological, and human health impacts that are caused by invasive species.

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

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

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

Fish and Wildlife Improvement Act of 1978: This act was passed to improve the administration of fish and wildlife programs and amends several earlier laws including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary of the Interior to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out volunteer programs.

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

Land and Water Conservation Fund Act of 1948: This act provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources of land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for outdoor recreation projects and for land acquisition by various federal agencies, including the Fish and Wildlife Service.

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

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

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

Migratory Bird Hunting and Conservation Stamp Act (16 U.S.C. 718-718j. 48 Stat. 451) as amended: The "Duck Stamp Act," of March 16,1934, requires each waterfowl hunter, 16 years of age or older, to possess a valid federal hunting stamp. Receipts from the sale of the stamp are deposited in a special Treasury account known as the Migratory Bird Conservation Fund and are not subject to appropriations.

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

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

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

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

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

the existing National Trust for Historic Preservation (16 U.S.C. 468-468d). The Act established an Advisory Council on Historic Preservation, which was made a permanent independent agency in Public Law 94-422, approved September 28,1976 (90 Stat. 1319). The Act also created the Historic Preservation Fund. Federal agencies are directed to take into account the effects of their actions on items or sites listed in, or eligible for listing in, the National Register of Historic Places. As of January 1989, ninety-one such sites on national wildlife refuges are listed in this Register.

National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd-668ee. (Refuge Administration Act): Defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of a refuge provided such use is compatible with the major purposes for which the refuge was established. The Refuge Improvement Act clearly defines a unifying mission for the refuge system; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation); establishes a formal process for determining compatibility; established the responsibilities of the Secretary of the Interior for managing and protecting the System; and requires a Comprehensive Conservation Plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

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

North American Wetlands Conservation Act (103 Stat. 1968; 16 U.S.C. 4401-4412): Public Law 101-233, enacted December 13, 1989, provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on Wetlands between Canada, the United States and Mexico. The Act converts the Pittman-Robertson account into a trust fund, with the interest available without appropriation through the year 2006, to carry out the programs authorized by the Act, along with an authorization for annual appropriation of $15 million plus an amount equal to the fines and forfeitures collected under the Migratory Bird Treaty Act. Available funds may be expended, upon approval of the Migratory Bird Conservation Commission, for payment of not to exceed 50 percent of the United States' share of the cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands). At least 50 percent and no more than 70 percent of the funds received are to go to Canada and Mexico each year.

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

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

Refuge Recreation Act of 1952: This Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife-oriented recreational development or protection of natural resources. It also authorizes the charging of fees for public uses.

Refuge Revenue Sharing Act (16 U.S.C. 715s): Section 401 of the Act of June 15,1935, (49 Stat. 383) provided for payments to counties in lieu of taxes, using revenues derived from the sale of products from refuges. Public Law 88-523, approved August 30,1964 (78 Stat. 701), made major revisions by requiring that all revenues received from refuge products such as animals, timber and minerals, or from leases or other privileges, be deposited in a special Treasury account and net receipts distributed to counties for public schools and roads. Public Law 93-509, approved December 3, 1974 (88 Stat. 1603), required that moneys remaining in the fund after payments be transferred to the Migratory Bird Conservation Fund for land acquisition under provisions of the Migratory Bird Conservation Act. Public Law 95-469, approved October 17, 1978, (92 Stat. 1319) expanded the revenue sharing system to include National Fish Hatcheries and Service research stations. It also included in the Refuge Revenue Sharing Fund receipts from the sale of salmonid carcasses. Payments to counties were established as follows: on acquired land, the greatest amount calculated on the basis of 75 cents per acre, three-fourths of one percent of the appraised value, or 25 percent of the net receipts produced from the land: and on land withdrawn from the public-domain, 25 percent of net receipts and basic payments under Public Law 94-565 (31 U.S.C. 1601-1607, 90 Stat. 2662). This amendment also authorized appropriations to make up any difference between the amount in the fund and the amount scheduled for payment in any year. The stipulation that payments be used for schools and roads was removed, but counties were required to pass payments along to other units of local government within the county which suffer losses in revenues due to the establishment of Service areas.

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

Appendix II. Facilities

Following is a list of facilities on and adjacent to the refuge and the replacement value of each.

U.S. Fish and Wildlife Service

Camp Cornelia	
Field Office/Shop Complex	$1,600,000
Fueling Facility	50,000
Equipment Shelters (3)	450,000
Oil/Paint Building	13,500
Radio Facility	13,500
Log Shop/Office Building	150,000
Fire Cache	125,000
Fire Shower/Pilot Lounge	230,000
Biological Building	50,000
Log Residence	100,000
Volunteer Trailers	80,000
University of Georgia Trailer	50,000
USFWS Trailer	30,000
Suwannee Canal	
Visitors Center	$850,000
Concession Buildings	270,000
Shelter & Restroom Facilities	130,000
Boathouse	140,000
Fee Station	12,000
Chesser Island	
Chesser Residence	$100,000
Homestead Outbuildings (Not Original)	100,000
Boardwalk Comfort Station	50,000
Boardwalk and Tower	550,000
Kingfisher	
Boat House	$140,000
Pocket Sub-headquarters	
Residences (2)	$250,000
Equipment Shelter	75,000
Fueling Facility	25,000
Pump House	5,000
Boathouse	75,000
Shelters	
Maul Hammock	$13,000
Cedar Hammock	14,000
Bluff Lake	12,000
Canal Fork	7,000
Coffee Bay	10,000

Round Top	14,000
Canal Run	10,000
Floyds Cabin	75,000
Monkey Lake	8,000
Big Water	10,000
Minnies Lake	8,000
Dinner Pond	7,000
Okefenokee Swamp Park	
Headquarters Building	$800,000
Shop Building	200,000
Serpentarium	00,000
Living Swamp Center	500,000
Swamp Creation Center	500,000
Boat House and Dock	200,000
Boardwalk and Tower	500,000
Food Center	25,000
Pioneer Island (Restore Bldgs)	800,000
Stephen C Foster State Park	
Office/Concession/Shop	$300,000
Museum	250,000
Residences (2)	200,000
Rental Cabins (9)	300,000
Boardwalk	200,000
Obediah's Okefenok	
Obediah's House/Kitchen	$100,000
Structures/Exhibits	250,000
Boardwalk	140,000

Appendix III. Comparison Of Vegetation Classifications Used At Okefenokee National Wildlife Refuge.

VEGETATIVE CLASSES [Loftin's 6 and (17 class map)]	HAMILTON'S CLASSES	SAF TYPE	KEY SPECIES
BROADLEAVED HARDWOODS (Gum - Maple - Bays) (Gum - Bay - Cypress - Shrub) (Loblolly Bay)	Broad Leaved Evergreens Broad Leaved Deciduous (Black Gum) Bay - Cypress	**SAF 104** (Sweet Bay-Swamp Tupelo-Red Maple) **SAF 103** (Water Tupelo)	Loblolly Bay (*Gordonia lasianthus)* Red Bay (*Persea palustris)* Sweet Bay (*Magnolia virginiana*) Black Gum *(Nyssa sylvatica)* Red Maple *(Acer rubrum)* Pond Cypress *(Taxodium ascendens*)
CYPRESS/HARDWOODS (Ogeechee - Cypress) (Cypress - gum - shrub)	Needle Leaved Deciduous Mixed Cypress Cypress - Shrub - Prairie	**SAF 100** (Pond Cypress - mature)	Pond Cypress *(Taxodium ascendens*) Black Gum *(Nyssa sylvatica)* Slash Pine *(Pinus elliottii)* Ogeechee Tupelo *(Nyssa ogeechee)* Shrub Species (See Scrub-Shrub)
WETLAND PINE Mixed Wetland Pine	Needle Leaved Evergreen (Slash Pine) Mixed Forested Wetland (Pine, Cypress, Bay, Scrub- Shrub)	**SAF 104** **(**Sweetbay-Swamp Tupelo- Redbay)	Slash Pine *(Pinus elliottii)* Pond Pine (*P. serotina*) Pond Cypress *(Taxodium ascendens*) Sweet Bay (*Magnolia virginiana*) Loblolly Bay (*Gordonia lasianthus)* Red Bay (*Persea palustris)* Swamp Tupelo *(Nyssa sylvatica* var. *biflora)* Shrub Species (See Scrub-Shrub) Chain Fern *(Woodwardia virginica)*
SCRUB/SHRUB Young Bay - Shrub Greenbriar - Shrub Shrub	Scrub/Shrub Wetland (Scrub/Shrub) (Shrub - Pine) (Shrub - Cypress) (Shrub - Bay) (Shrub/Prairie) (Scrub - Pine) (Scrub - Prairie)	No specific SAF Type exists for scrub/shrub. However, many wetland areas may contain dominant stands of young or scrub cypress which would be classed as SAF 100.	Shrub Species Swamp Cyrilla *(Cyrilla racemiflora)* Hurrah Bush *(Lyonia lucida)* Fetterbush *(Lucothoe racemiflora)* Virginia Sweetspire *(Itea virginica)* Dahoon Holly *(Ilex cassine)* Greenbriar *(Smilax spp.)* *Waxmyrtle (Myrica cerifera)* Poor Man's Soap *(Clethera alnifolia)* Scrub Species (May be young trees) Pond Cypress *(Taxodium ascendens*) Black Gum *(Nyssa sylvatica)* Loblolly Bay (*Gordonia lasianthus)* Slash Pine *(Pinus elliottii)* Sweet Bay (*Magnolia virginiana*) Red Maple *(Acer rubrum)*
PRAIRIE Water Lilly Sedges - Ferns - Water lily Aquatic Grasses	Herbaceous Prairie Aquatic Macrophyte Prairie	NA	White Water Lily *(Nymphaea odorata)* Bladderworts *(Utricularia spp.)* Spatterdock *(Nuphar luteum)* Sedges *(Carex spp.)* Chain Ferns *(Woodwardia spp.)* Aquatic Grasses *(Lacnanthes, Andropogon, Panicum spp.)*
OPEN WATER			

Appendix IV. Okefenokee National Wildlife Refuge Plant List

Family	Scientific Name	Common Name
Agavaceae	*Yucca aloifolia L.*	Aleo Yucca, Spanish Bayonet, Spanish Dagger
Agavaceae	*Yucca filamentosa L.*	Adam's Needle
Agavaceae	*Yucca gloriosa L.*	Mound Lily Yucca
Anacardiaceae	*Rhus copallinum L.*	Winged Sumac
Anacardiaceae	*Toxicodendron radicans (L.) Kuntze*	Eastern Poison Ivy
Anacardiaceae	*Toxicodendron vernix (L.) Kuntze*	Poison Sumac
Annonaceae	*Asimina angustifolia Raf.*	Slimleaf Pawpaw
Annonaceae	*Asimina incana (W. Bartram)*	Wooly Pawpaw; Polecat Bush
Annonaceae	*Asimina parviflora (Michx.) Dunal.*	Smallflower Pawpaw
Annonaceae	*Asimina pygmaea (W. Bartram) Dunal*	Dwarf Pawpaw
Annonaceae	*Asimina reticulata Shuttlew.ex Chapm.*	Netted Pawpaw
Annonaceae	*Asimina triloba (L.) Dunal*	Common Pawpaw
Apiaceae	*Centella asiatica (L.) Urb.*	Spadeleaf
Apiaceae	*Eryngium aromaticum Baldwin*	Fragrant Eryngio
Apiaceae	*Eryngium prostratum Nutt. Ex DC.*	Creeping Eryngo
Apiaceae	*Eryngium yuccifolium Michx.*	Button Snakeroot Eryngo, Rattlesnake Master
Apiaceae	*Hydrocotyle umbellata L.*	Many Flower Marsh Pennywort
Apiaceae	*Oxypolis filiformis (Walt.) Britt.*	Water Cowbane
Aquifoliaceae	*Ilex ambigua (Michx.)*	Carolina Holly; Sand Holly
Aquifoliaceae	*Ilex cassine L.*	Dahoon
Aquifoliaceae	*Ilex coriacea (Pursh) Chapm*	Sweet Gallberry, Large Gallberry
Aquifoliaceae	*Ilex decidua Walter*	Possumhaw
Aquifoliaceae	*Ilex glabra (L.) A. Gray*	Bitter Gallberry, Inkberry
Aquifoliaceae	*Ilex myrtifolia Walt.*	Myrtle Holly, Myrtle Dahoon
Aquifoliaceae	*Ilex opaca Aiton*	American Holly, Christmas Holly
Aquifoliaceae	*Ilex vomitoria Aiton*	Yaupon
Araceae	*Arisaema dracontium (L.) Schott*	Green Dragon
Araceae	*Orontium aquaticum L.*	Golden Club, Neverwet
Araceae	*Peltandra sagittifolia (Michx.) Morong*	White Arrow Arum; Spoonflower
Araceae	*Peltandra virginica (L.) Schott and Endl.*	Green Arrow Arum, Arrow Arum, Tuckahoe
Araliaceae	*Aralia spinosa L.*	Devil's Walking Stick, Hercules Club
Arecaceae	*Sabal minor (Jacq.) Pers.*	Dwarf Palmetto
Arecaceae	*Sabal palmetto (Walt.) Lodd.ex. Schult & Schult. F.*	Cabbage Palm
Arecaceae	*Serenoa repens (W. Bartram) Small*	Saw Palmetto
Asclepiadaceae	*Asclepias cinerea Walter*	Carolina Milkweed
Asclepiadaceae	*Asclepias humistrata Walter*	Pinewoods Milkweed
Asclepiadaceae	*Asclepias lanceolata Walter*	Fewflower Milkweed
Asclepiadaceae	*Asclepias michauxii Decne.*	Michaux's Milkweed
Asclepiadaceae	*Asclepias pedicellata Walter*	Savannah Milkweed
Asclepiadaceae	*Asclepias perennis Walter*	Swamp Milkweed
Asclepiadaceae	*Asclepias tuberosa L.*	Butterfly Weed,Chipperweed,Pleurisy Root
Asclepiadaceae	*Asclepias viridula chapm.*	Southern Milkweed, Silkweed
Asclepiadaceae	*Matelea pubiflora (Decne.) Woodson*	Trailing Milkvine
Aspleniaceae	*Asplenium platyneuron (L.) Britton et al.*	Ebony Spleenwort
Asteraceae	*Acanthospermum australe (Loe fl.) Kuntze*	Paraguay Starburr
Asteraceae	*Baccharis halimifolia L.*	Silverling, Sea Myrtle, Groundsel Tree
Asteraceae	*Balduina angustifolia(Pursh) B.L. Rob.*	Coastal Plain Honeycomb Head

Family	Scientific Name	Common Name
Asteraceae	*Balduina uniflora Nutt.*	One flower Honeycomb Head
Asteraceae	*Berlandiera pumila (Michx.) Nutt*	Soft Greeneyes
Asteraceae	*Bidens mitis (Michx.) Sherff*	Small Fruit Beggar Ticks
Asteraceae	*Bigelowia nudata (Michx.) DC.*	Pineland Rayless Goldenrod
Asteraceae	*Carphephorus corymbosus (Nutt.) Torr.& A. Gray*	Coastal Plain Chaffhead
Asteraceae	*Carphephorus odoratissiums (J.F. Grnel.) H. Hebert*	Vanilla Leaf; Deer Tongue
Asteraceae	*Chaptalia tomentosa Vent.*	Wooly Sunbonnet; Pineland Daisy; Sunbonnet
Asteraceae	*Chrysopsis mariana (L.) Elliott*	Maryland Golden Aster
Asteraceae	*Chrysopsis scabrella Torr. and Gray*	Coastal Plain Golden Aster
Asteraceae	*Cirsium discolor (Muhl ex Willd.)*	Field Thistle
Asteraceae	*Cirsium horridulum Michx.*	Yellow Thistle
Asteraceae	*Conoclinium coelestinum L.*	Blue Mistflower
Asteraceae	*Coreopsis basalis (A. Dietr.) S.F. Blake*	Goldenmane Tickseed
Asteraceae	*Elephantopus nudatus A. Gray*	Smooth Elephants Foot
Asteraceae	*Elephantopus tomentosus L.*	Devil's Grandmother
Asteraceae	*Erechtites hieracifolia (L.) Raf.ex DC*	American Burnweed; Southern Fireweed
Asteraceae	*Erigeron philadelphicus L.*	Philadelphia Fleabane
Asteraceae	*Erigeron quercifolius Lam.*	Oakleaf Fleabane
Asteraceae	*Erigeron strigosus Muhl. Ex Willd*	Prairie Fleabane
Asteraceae	*Erigeron vernus (L.) Torr. & A. Gray*	Early Whitetop Fleabane
Asteraceae	*Eupatorium capillifolium (Lam)*	Dogfennel; Yankee-Weed
Asteraceae	*Eupatorium compositifolium Walter*	Yankeeweed
Asteraceae	*Eupatorium mohrii Greene*	Mohr’s Thoroughwort
Asteraceae	*Eupatorium rotundifolium L.*	Roundleaf Thoroughwort
Asteraceae	*Facelis retusa (Lam.) Sch.Bip.*	Annual Trampweed
Asteraceae	*Gaillardia aestivalis (Walt) H. Rock*	Lanceleaf Blanketflower
Asteraceae	*Gamochaeta falcate (Lam.) Cabrera*	Narrowleaf Purple Everlasting; Codweed
Asteraceae	*Gamochaeta pensylvanicum (Willd.) Cabrera*	Pennsylvania Everlasting; Pennsylvania Codweed
Asteraceae	*Gamochaeta purpurea (L.) Cabrera*	Spoonleaf Purple Everlasting; Codweed
Asteraceae	*Helenium amarum (Raf.) H. Rock*	Spanish Daisy, Bitterweed
Asteraceae	*Helenium flexuosum Raf.*	Purplehead Sneezeweed
Asteraceae	*Helianthus angustifolius L.*	Narrowleaf Sunflower; Swamp Sunflower
Asteraceae	*Heterotheca subaxillaris (Lam.) Britt and Rusby*	Camphorweed
Asteraceae	*Hieracium gronovii L.*	Queendevil; Hawkweed
Asteraceae	*Iva microcephala Nutt.*	Piedmont Marshelder
Asteraceae	*Krigia virginica (L.) Willd.*	Virginia Dwarf Dandelion
Asteraceae	*Liatris tenuifolia Nutt.*	Shortleaf Gayfeather
Asteraceae	*Lygodesmia aphylla (Nutt.) DC.*	Rose-Rush
Asteraceae	*Marshallia graminifolia (Walt)Sm.*	Barbara's Buttons
Asteraceae	*Marshallia tenuifolia Raf.*	Grassleaf Barbara's Buttons
Asteraceae	*Mikania scandens (L.) Willd.*	Climbing Hempvine
Asteraceae	*Pityopsis graminifolia (Michx.) Nutt.*	Narrowleaf Silkgrass
Asteraceae	*Pluchea foetida (L.) DC.*	Stinking Camphorweed
Asteraceae	*Pluchea rosea R.K. Godfrey*	Rosy Camphorweed
Asteraceae	*Pterocaulon pycnostachyum (Michx.) Ell.*	Blackroot
Asteraceae	*Pyrrhopappus carolinianus (Walt.) DC*	False Dandelion
Asteraceae	*Pyrrhopappus panciflorus (D. Don) DC.*	None Given
Asteraceae	*Oclemena reticulata Pursh*	Pinebaren Whitetop Aster
Asteraceae	*Sericocarpus tortifolius Mich.*	Dixe Whitetop Aster; Dixie Aster

Family	Scientific Name	Common Name
Asteraceae	*Symphyotrichum dumosum L.*	Rice Button Aster
Asteraceae	*Symphyotrichum patens Aiton*	Late Purple Aster
Asteraceae	*Symphyotrichum walteri Alex.*	Walter's Aster
Asteraceae	*Rudbeckia hirta L.*	Blackeyed Susan
Asteraceae	*Rudbeckia mollis Ell.*	Softhair Cornflower
Asteraceae	*Senecio glabellus Poir*	Butterweed
Asteraceae	*Silphium compositum Michx.*	Kidneyleaf Rosinweed
Asteraceae	*Solidago fistulosa Mill.*	Pinebarren Goldenrod
Asteraceae	*Solidago odora* var. chapmanii Torr. & A. Gray Chapman	Goldenrod
Asteraceae	*Solidago odora Aiton* var. odora	Sweet Goldenrod
Asteraceae	*Solidago stricta Aiton*	Wand Goldenrod
Asteraceae	*Soliva sessilis Ruiz and Pavon*	Field Burrweed
Asteraceae	*Sonchus asper (L.) Hill*	Spiny Sowthistle
Asteraceae	*Sonchus oleraceus L.*	Common Sowthistle
Asteraceae	*Taraxacum officinale Weher ex F.H. Wigg*	Common Dandelion
Asteraceae	*Vernonia angustifolia Michx.*	Tall Ironweed
Asteraceae	*Youngia japonica (L.) DC.*	False Hawksbeard
Betulaceae	*Alnus serrulata (Ait.) Willd.*	Hazel Alder, Common Alder
Betulaceae	*Betula nigra L.*	River Birch, Red Birch
Betulaceae	*Carpinus caroliniana Walter*	Musclewood, Blue beech, American Hornbeam
Bignoniaceae	*Bignonia capreolata L.*	Cross vine
Bignoniaceae	Campsis radicans (L.)L	Trumpet Creeper, Cowitch
Blechnaceae	*Woodwardia areolata (L.) T. Moore*	Netted Chain Fern
Blechnaceae	*Woodwardia virginica (L.) Sm.*	Virginia Chain Fern
Brassicaceae	*Lepidium virginicum L.*	Virginia Pepperweed, Poor Man's Pepper
Bromeliaceae	*Tillandsia bartramii Ell.*	Bartram's Airplant
Bromeliaceae	*Tillandsia recurvata (L.)L.*	Small Ball Moss
Bromeliaceae	*Tillandsia setacea Sw.*	Southern Needlefeaf
Bromeliaceae	*Tillandsia usneoides (L.).L*	Spanish Moss
Burmanniaceae	*Burmannia biflora L.*	Northern Bluethread
Cabombaceae	*Brasenia schreberi J.F. Gmel.*	Watershield
Cactaceae	*Opuntia humifusa (Raf.) Raf.*	Devil's Tongue, Prickly Pear
Cactaceae	*Opuntia pusilla (Haw.) Nutt.*	Cockspur Prickly Pear
Cactaceae	*Opuntia vulgaris Mill.*	Common Prickly Pear
Campanulaceae	*Lobelia cardinalis L.*	Cardinal Flower
Campanulaceae	*Lobelia glandulosa Walt.*	Glade Lobelia
Campanulaceae	*Lobelia paludosa Nutt.*	White Lobelia
Campanulaceae	*Wahlenbergia linarioidies (Lam.) A.DC.*	Tuffybells
Campanulaceae	*Wahlenbergia marginata (Thunb.) A. DC.*	Southern Rockbell
Cannaceae	*Canna flaccida Salisb.*	Bandana-of-the-Everglades, Canna
Caprifoliaceae	*Lonicera japonica Thunb.*	Japanese Honeysuckle
Caprifoliaceae	*Lonicera sempervirens L.*	Trumpet Honeysuckle, Coral Honeysuckle
Caprifoliaceae	*Sambucus nigra L. ssp canadensis (L.)R. Bolli*	Elderberry
Caprifoliaceae	*Vibumum obovatum Walt.*	Small-leaf Arrowwood
Caprifoliaceae	*Viburnum nudum L.*	Possumhaw
Caryophyllaceae	*Stipulicida setacea Michx.*	Pineland Scalypink
Celastraceae	*Euonymus americana L.*	Strawberry Bush, Hheart;s Bursting-with-Love
Cistaceae	*Helianthemum canadense (L.) Michx.*	Longbranch Frostweed
Cistaceae	*Helianthemum carolinianum (Walt.) Michx*	Carolina Frostweed
Cistaceae	*Helianthemum corymbosum Michx.*	Pinebarren Frostweed
Cistaceae	*Lechea Torreyi Leggett ex Britt.*	Piedmont Pinweed

Family	Scientific Name	Common Name
Clethraceae	*Clethra alnifolia L.*	Coastal sweet pepper bush, Poor Man's Soap
Clusiaceae	*Hypericum cistifolium Lam.*	Roundpod, St. John'swort
Clusiaceae	*Hypericum crux-andreae (L.) Crantz*	St. Peterswort
Clusiaceae	*Hypericum fasciculatum Lam.*	Peelbark St. Johnswort
Clusiaceae	*Hypericum galioides Lam.*	Bedstraw St. Johnswort
Clusiaceae	*Hypericum gentianoides (L.) B.S.P.*	Orangegrass, Pineweed
Clusiaceae	*Hypericum hypericoides (L.) Crantz*	St. Andrews Cross
Clusiaceae	*Hypericum mutilum L.*	Dwarf St. Johnswort
Clusiaceae	*Hypericum myrtifolium Lam.*	Myrtleleaf St. Johnswort
Clusiaceae	*Hypericum punctatum Lam.*	Spotted St. Johnswort
Clusiaceae	*Hypericum tetrapetalum Lam.*	Fourpetal St. Johnswort
Clusiaceae	*Triadenum virginicum (L.) Raf.*	Va. Marsh St. Johnswort
Commelinaceae	*Commelina erecta L.*	Whitemouth Dayflower
Commelinaceae	*Callisia graminea (Small) G. Tucker*	Grassleaf roseling
Commelinaceae	*Cuthbertia rosea (Vent.) D.R. Hunt*	Piedmont Roseling
Commelinaceae	*Tradescantia ohiensis Raf.*	Bluejacke, Ohio Spiderwort
Convolvulaceae	*Cuscuta compacta Juss.ex Choisy*	Compact dodder, Lovevine
Convolvulaceae	*Dichondra carolinensis Michx.*	Carolina Ponysfoot
Convolvulaceae	*Ipomoea hederacea Jacq.*	Ivyleaf Morningglory
Convolvulaceae	*Ipomoea hederifolia L.*	Scarlet Creeper
Convolvulaceae	*Stylisma patens (Desr.) Myint ssp. patens*	Coastal Plain Dawnflower
Cornaceae	*Cornus asperifolia Michx.*	Toughleaf Dogwood
Cornaceae	*Cornus florida L.*	Flowering Dogwood
Cornaceae	*Cornus foemina P. Mill.*	Stiff Dogwood
Cornaceae	*Nyssa ogeche Bartr. ex Marsh*	Ogeeche Tupelo, Ogeeche Lime, Ogeeche Plum
Cornaceae	*Nyssa sylvatica biflora Walt.*	Swamp Tupelo, Blackgum
Cornaceae	*Nyssa sylvatica Marsh.*	Blackgum,Sourgum
Cupressaceae	*Juniperus virginiana L)*	Eastern Red Cedar
Cyperaceae	*Carex debilis Michx.*	White Edge Sedge
Cyperaceae	*Carex elliottii Schwein and Torr.*	Elliott Sedge
Cyperaceae	*Carex frankii Kunth*	Frank’s Sedge
Cyperaceae	*Carex glaucescens Ell.*	Southern Waxy Sedge
Cyperaceae	*Carex hyalinolepis Steud.*	Shoreline Sedge
Cyperaceae	*Carex joorii Bailey*	Cypress Swamp Sedge
Cyperaceae	*Carex muhlenbergii Schkukr*	Muhlenberg’s Sedge
Cyperaceae	*Carex striata Michx.*	Walter's Sedge
Cyperaceae	*Carex verrucosa Muhl.*	Warty Sedge
Cyperaceae	*Cladium mariscus (L.) Pohl ssp. jamaicense*	Jamica Swamp Sawgrass
Cyperaceae	*Cyperus echinatus (L.) A.W. Wood*	Globe Flatsedge
Cyperaceae	*Cyperus haspan L.*	Haspan Flatsedge
Cyperaceae	*Cyperus plukenetii Fern.*	Plukenet Flatsedge
Cyperaceae	*Cyperus polystachyos Rottb.*	Manyspike Flatsedge
Cyperaceae	*Cyperus pseudovegetus Stewd.*	Marsh Flatsedge
Cyperaceae	*Cyperus retrorsus Chapm.*	Pinebarren Flatsedge
Cyperaceae	*Cyperus surinamensis Rottb.*	Tropical Flatsedge
Cyperaceae	*Dulichium arundinaceum (L.) Britt.*	Threeway Sedge
Cyperaceae	*Eleocharis baldwinii (Tom) Chapm.*	Baldwin's Spikerush
Cyperaceae	*Eleocharis elongata Chapman*	Slim Spikerush
Cyperaceae	*Eleocharis microcarpa Torri*	Small Fruit Spikerush
Cyperaceae	*Eleocharis tuberculosa (Michx.)*	Conecup Spikerush
Cyperaceae	*Eleocharis vivipara Link*	Viviparous Spikerush

Family	Scientific Name	Common Name
Cyperaceae	*Eriophorum virginicum L.*	Tawmy Cottongrass, Virginia Cottongrass
Cyperaceae	*Fuirena breviseta (Coville) Coville*	Saltmarsh Umbrella Sedge
Cyperaceae	*Fuirena scirpoidea Michx.*	Southern Umbrella Sedge
Cyperaceae	*Rhynchospora baldwinii A. Gray*	Baldwin's Beaksedge
Cyperaceae	*Rhynchospora cephalantha A. Gray*	Bunched Beaksedge
Cyperaceae	*Rhynchospora colorata (L.)*	Whitetop
Cyperaceae	*Rhynchospora corniculata (Lam.)*	Shortbristle Starrush;Horned Beaksedge
Cyperaceae	*Rhynchospora fascicularis (Michx.)*	Fascicled Beaksedge
Cyperaceae	*Rhynchospora filifolia A. Gray*	Threadleaf Beaksedge
Cyperaceae	*Rhynchospora inundata (Oakes) Fern.*	Narrowfruit Horned Beaksedge
Cyperaceae	*Rhynchospora latifolia (Bald.)*	Sand Swamp Whitetop
Cyperaceae	*Rhynchospora megalocarpa A. Gray*	Sandy Field Beaksedge
Cyperaceae	*Rhynchospora microcarpa Bald. ex A. Gray*	Southern Beaksedge
Cyperaceae	*Rhynchospora microcephala (Britt.) Britt.ex.SM.*	Bunched Beaksedge
Cyperaceae	*Rhynchospora plumosa Ell.*	Plumed Beaksedge
Cyperaceae	*Rhynchospora wrightiana Boeck*	Wright's Beaksedge
Cyperaceae	*Scirpus cyperinus (L.) Kunth*	Woolgrass
Cyperaceae	*Scleria ciliata Michx.*	Fringed Nutrush
Cyperaceae	*Scleria triglomerata Michs.*	Whip Nutrush
Cyperaceae	*Websteria confervoides (Poir.)*	Algal bulrush
Cyrillaceae	*Cliftonia monophylla(Lam.) Britt.ex Sarg.*	Buckwheat Tree, Black Titi
Cyrillaceae	*Cyrilla racemiflora L. Titi (C. parviflora Raf.)*	Titi
Droseraceae	*Drosera brevifolia Pursh*	Dwarf Sundew
Droseraceae	*Drosera capillaris Poir.*	Pink Sundew
Droseraceae	*Drosera filiformis Raf.*	Dewthreads; Threadleaf; Sundew
Droseraceae	*Drosera intermedia Hayne*	Spoonleaf Sundew
Ebenaceae	*Diospyros virginiana L.*	Common Persimmon
Ericaceae	*Befaria racemosa Vent.*	Tar Flower, Flycatcher
Ericaceae	*Gaylussacia dumosa (Andrews) T. & G.*	Dwarf Huckleberry
Ericaceae	*Gaylussacia frondosa (L.) T. & G. ex Torr.*	Blue Huckleberry
Ericaceae	*Kalnia hirsuta Walter.- Wicky*	Hairy Laurel
Ericaceae	*Leucothoe racemosa (L.) A. Gray*	Swamp Doghobble
Ericaceae	*Lyonia ferruginea (Walter) Nutt.*	Rusty Staggerbush
Ericaceae	*Lyonia fruticosa (Michx.) G.S. Torr.*	Coastalplain Staggerbush
Ericaceae	*Lyonia ligustrina (L.) DC.*	Maleberry
Ericaceae	*Lyonia lucida (Lam.) K. Koch*	Fetterbush, Hurrah Bush
Eriocaulaceae	*Eriocaulon compressum Lam.*	Flattened Pipewort, Hatpins
Eriocaulaceae	*Eriocaulon decangulare L.*	Tenangle Pipewort, Hatpins
Eriocaulaceae	*Lachnocaulon anceps (Walt.) Morong*	Whitehead Bogbutton, Hairy Pipewort
Eriocaulaceae	*Lachnocaulon minus (Chapm.) Sm.*	Small’s Bogbutton, Hairy Pipewort
Eriocaulaceae	*Syngonanthus flavidulus (Michx.) Ruhland*	Yellow Hatpins
Fabaceae	*Albizia julibrissin Durazz.*	Silk Tree, Mimosa
Fabaceae	*Amorpha fruticosa L.*	Desert False Indigo
Fabaceae	*Amorpha herbacea Walter*	Clusterspike False Indigo
Fabaceae	*Astragalus obcordatus Ell.*	Florida Milkvetch
Fabaceae	*Baptisia lanceolata (Walt.) Ell*	Gopherweed, Wild Indigo, False Indigo
Fabaceae	*Chamaecrista fasciculata Michx.*	Partridge pea; Sleeping Plant
Fabaceae	*Centrosema virginianum (L.) Benth*	Spurred Butterfly Pea
Fabaceae	*Cercis canadensis L.*	Eastern Redbud
Fabaceae	*Clitoria mariana L.*	Atlantic Pigeonwings

Family	Scientific Name	Common Name
Fabaceae	*Crotalaria purshii DC. Pursh*	Pursh's Rattlebox
Fabaceae	*Crotalaria rotundifolia J.F. Gmel.*	Rabbit bells, Rattlebox
Fabaceae	*Crotalaria spectabilis Roth*	Showy Rattlebox
Fabaceae	*Dalea carnea (Michx.) Poir.*	White Tassels
Fabaceae	*Desmodium canescens (L.) DC.*	Hoary Beggar's Ticks, Hoary Ticktrefoil
Fabaceae	*Desmodium lineatum DC.*	Sand Ticktrefoil
Fabaceae	*Desmodium paniculatum (L.) DC*	Panicled ticktrefoil; Beggar's Lice
Fabaceae	*Desmodium tenuifolium Torr.& A. Gray*	Slimleaf Ticktrefoil
Fabaceae	*Desmodium tortuosum (Sw.) DC.*	Dixie Ticktrefoil
Fabaceae	*Galactia elliottii Nutt.-Elliott's*	Elliot's Milkpea
Fabaceae	*Galactia regularis (L.) Britt.et al*	Eastern Milkpea
Fabaceae	*Galactia volubilis (L.) Britt.-Downy*	Downey Milkpea (Milkvetch)
Fabaceae	*Gleditsia aquatica Marshall*	Water Locust
Fabaceae	*Gleditsia triacanthos L.*	Honey Locust
Fabaceae	*Indigofera caroliniana Mill.*	Carolina Indigo
Fabaceae	*Lespedeza cuneata (Dum. Gurs.) G. Don*	Sericea Lespedeza
Fabaceae	*Lespedeza hirta (L.) Hornem.*	Hairy Lespedeza
Fabaceae	*Lupinus diffusus Nutt.*	Skyblue Lupine
Fabaceae	*Lupinus perennis L.*	Sundial Lupine
Fabaceae	*Lupinus villosus Willd.*	Lady Lupine
Fabaceae	*Medicago lupulina L.*	Black Medic, Burclover
Fabaceae	*Mimosa microphylla (Dryander) Macbr.*	Littleleaf Sensitive Brier
Fabaceae	*Pediomelum canescens (Michx.) Rydb.*	Buckroot
Fabaceae	*Pueraria montana (Lour.) Merr.*	Kudzu, Kuzu
Fabaceae	*Rhynchosia reniformis (Pursh)DC.*	Dollarleaf
Fabaceae	*Rhynchosia tomentosa mollissima (Elliott) T. and G.*	Twining Snoutbean
Fabaceae	*Robinia hispida L.*	Bristly Locust
Fabaceae	*Robinia pseudoacacia L.*	Black Locust
Fabaceae	*Sesbania punicea (Cav.) Benth.*	Rattlebox, Purple Sesbane
Fabaceae	*Stylosanthes biflora (L.) Britt.et al.*	Sidebeak Pencil flower
Fabaceae	*Tephrosia chrysophylla Pursh*	Scurf Hoary Pea
Fabaceae	*Tephrosia hispidula (Michx.) Pers.*	SprawlingHoary Pea
Fabaceae	*Tephrosia spicata (Walt.) Torr. & A. Gray*	Spiked Hoary Pea
Fabaceae	*Tephrosia virginiana (L.) Pers.*	Virginia tephrosia, Goat's Rue, Devil's Shoestring
Fabaceae	*Trifolium dubium Sibth.*	Low Hop Clover
Fabaceae	*Trifolium incarnatum L.*	Crimson Clover
Fabaceae	*Trifolium pratense L.*	Red Clover
Fabaceae	*Trifolium repens L.*	White Clover, Dutch Clover
Fabaceae	*Vicia acutifolia Ell.*	Fourleaf Vetch
Fabaceae	*Wisteria floribunda (Willd.) DC.*	Japanese Wisteria
Fabaceae	*Wisteria frutescens (L). Poir.*	American Wistaria (Wisteria)
Fagaceae	*Castanea pumila (L.) Mill.*	Chinquapin
Fagaceae	*Quercus alba L.*	White Oak
Fagaceae	*Quercus chapmanii Sarg.*	Chapman's Oak
Fagaceae	*Quercus falcata Michx.*	Southern Red Oak, Spanish Oak
Fagaceae	*Quercus geminata Small*	Sand Live Oak
Fagaceae	*Quercus hemisphaerica W. Bartram ex Willd.*	Darlington Oak, Upland Laurel Oak
Fagaceae	*Quercus incana W. Bartram*	Bluejack Oak
Fagaceae	*Quercus laevis Walter*	Turkey Oak
Fagaceae	*Quercus laurifolia Michx*	Swamp Laurel Oak

Family	Scientific Name	Common Name
Fagaceae	*Quercus lyrata Walter*	Overcup Oak
Fagaceae	*Quercus margaretta Ashe ex Small*	Sand Post Oak
Fagaceae	*Quercus marilandica Munchh.*	Black-jack Oak
Fagaceae	*Quercus michauxii Nutt.*	Cow Oak, Basket Oak, Swamp Chestnut Oak
Fagaceae	Quercus minima (Sarg.) Small	Dwarf Live Oak
Fagaceae	*Quercus myrtifolia Willd.*	Myrtle Oak
Fagaceae	*Quercus nigra L.*	Water Oak
Fagaceae	*Quercus phellos L.*	Willow Oak
Fagaceae	*Quercus pumila Walter*	Running Oak
Fagaceae	*Quercus shumardii Buckley*	Shumard Oak
Fagaceae	*Quercus virginiana Mill.*	Live Oak
Gentianaceae	*Bartonia paniculata (Michx.) Muhl.*	Twining Screwstem
Gentianaceae	*Sabatia bartramii Wilbur*	Bartram's Rosegentian
Gentianaceae	*Sabatia brevifolia Raf.*	Shortleaf Rosegentian
Gentianaceae	*Sabatia campanulata (L.) Torr.*	Slender Rosegentian
Gentianaceae	*Sabatia difformis (L.) Druce*	Lanceleaf Rosegentian
Gentianaceae	*Sabatia gentianoides Ell.*	Pinewoods Rosegentian
Gentianaceae	*Sabatia macrophylla Hook.*	Lanceleaf Rosegentian
Geraniaceae	*Geranium carolinianum L.*	Caarolina Cranesbill
Haloragaceae	*Myriophyllum heterophyllum Michx.*	Twoleaf Watermilfoil
Haloragaceae	*Proserpinaca pectinata Lam.*	Combleaf Mermaid Weed
Hamamelidacea	*Liquidambar styraciflua L.*	Sweetgum
Hydrangeaceae	*Decumaria barbara L.*	Climbing Hydrangea; Woodvamp
Iridaceae	*Iris hexagona Walter.*	Prairie Iris; Dixie Iris
Iridaceae	*Iris virginica L.*	Virginia Iris
Iridaceae	*Sisyrinchium angustifolium Mill.*	Narrowleaf Blue Eyed Grass
Iridaceae	*Sisyrinchium rosulatum E. P. Bick.*	Annual Blue Eyed Grass
Juglandaceae	*Carya glabra(Mill.)*	Pignut Hickory, Broom Hickory
Juglandaceae	*Carya illinoensis (Wangenhi.) K. Koch*	Pecan
Juglandaceae	*Carya alba Nutt.*	Mockernut Hickory
Lamiaceae	*Hyptis alata (Raf.) Shinners*	Clustered Bushmint; Musky Mint
Lamiaceae	*Physostegia purpurea (Walt.) S>F. Blake*	Eastern False Dragonhead
Lamiaceae	*Physostegia virginiana (L.) Benth.*	Obedient Plant
Lamiaceae	*Prunella vulgaris L.*	Common Selfheal, Healall
Lamiaceae	*Pycnanthemum flexuosum (Walt.) Britt.et al*	Appalachian Mountain Mint
Lamiaceae	*Pycnanthemum nudum Nutt.*	Coastal Plain Mountain Mint
Lamiaceae	*Salvia lyrata L.*	Lyreleaf Sage
Lamiaceae	*Scutellaria integrifolia L.*	Helmet Skullcap
Lamiaceae	*Scutellaria multiglandulosa Kearney*	Small's Ckullcap
Lamiaceae	*Teucrium canadense L.*	Canada Germander
Lauraceae	*Persea borbonia (L.) Spreng.* var. borbonia	Red Bay
Lauraceae	*Persea palustris (Raf.) Sarg.*	Swamp Bay
Lauraceae	*Sassafras albidum (Nutt.) Nees*	Sassafras
Lemnaceae	*Lemna valdiviana Phil.*	Valdiva Duckweed
Lentibulariaceae	*Pinguicula caerulea Walter*	Blueflower Butterwort
Lentibulariaceae	*Pinguicula lutea Walter*	Yellow Butterwort
Lentibulariaceae	*Pinguicula pumila Michx.*	Small Butterwort
Lentibulariaceae	*Utricularia cornuta Michx.*	Horned Blatterwort
Lentibulariaceae	*Utricularia gibba L.*	Humped Bladderwort
Lentibulariaceae	*Utricularia inflata Walter*	Floating Bladderwort
Lentibulariaceae	*Utricularia juncea Vahl*	Southern Bladderwort

Family	Scientific Name	Common Name
Lentibulariaceae	*Utricularia purpurea Walter*	Purple Bladderwort
Lentibulariaceae	*Utricularia radiata Small*	Little Floating Bladderwort
Lentibulariaceae	*Utricularia striata Leconte ex. Torr.*	Striped Bladderwort
Lentibulariaceae	*Utricularia subulata L.*	Zigzag Bladderwort
Liliaceae	*Aletris aurea Walt.*	Golden Colicroot
Liliaceae	*Aletris farinosa L.*	White Colicroot, Colicroot, Stargrass
Liliaceae	*Aletris lutea*	Small Yellow Colicroot
Liliaceae	*Aletris obovata Nash*	Southern Colicroot
Liliaceae	*Allium canadense L.*	Meadow Garlic
Liliaceae	*Amianthium muscitoxicum (Walt.) A. Gray*	Fly Poison
Liliaceae	*Chamaelirium luteum (L.) A. Gray*	Devil Bit, Fairywand
Liliaceae	*Lilium catesbaei Walter*	Pine Lily, Catesby Lily
Liliaceae	*Schoenolirion albiflorum (Raf.) R.R. Gates*	White Sunnybell
Liliaceae	*Tofieldia racemosa (Walt.) Britton et al.*	Coastal False Asphodel
Liliaceae	*Zephyranthes atamasca (L.) Herb.*	Rainlily, Atamasco Lily
Liliaceae	*Zigadenus densus (Desr.) Fern.*	Crow Poison, Osceola's Plume
Lycopodiaceae	*Lycopodiella alopecuroides (L.)*	Foxtail Clubmoss
Lycopodiaceae	*Lycopodiella appressa (Chapm.) Lloyd and Underw.*	Southern Bog Clubmoss
Lycopodiaceae	*Lycopodiella caroliniana (L.) Pic. Serm.*	Slender Clubmoss
Malvaceae	*Hibiscus aculeatus Walter*	Comfort Root
Malvaceae	*Hibiscus coccineus Walter*	Scarlet Rosemallow
Malvaceae	*Hibiscus moscheutos L.*	Crimsoneyed Rose Mallow
Malvaceae	*Modiola caroliniana (L.) G. Don*	Carolina Bristlemallow
Malvaceae	*Pavonia hastata Cav.*	Spearleaf Swamp Mallow
Malvaceae	*Sida rhombifolia L.*	Cuban Jute
Mayacaceae	*Mayaca fluviatilis Aubl.*	Stream Bogmoss
Melastomataceae	*Rhexia alifanus Walter*	Savannah Meadowbeauty
Melastomataceae	*Rhexia cubensis Griseb.*	West Indian Meadow Beauty
Melastomataceae	*Rhexia lutea Walter*	Yellow Meadow Beauty
Melastomataceae	*Rhexia mariana L.*	Pale Meadow Beauty
Melastomataceae	*Rhexia nuttallii C.W. James*	Nuttall Meadow Beauty
Melastomataceae	*Rhexia petiolata Walt.*	Fringed Meadow Beauty
Melastomataceae	*Rhexia virginica L.*	Handsome Harry, Virginai Meadow Beauty
Meliaceae	*Melia azedarach L.*	Chinaberry Tree, China Tree, Chinaball Tree
Menyanthaceae	*Nymphoides aquatica (J.F. Gmel.) Kontze*	Big Floatingheart
Menyanthaceae	*Nymphoides cordata (Ell.) Fern.*	Little Floatingheart
Moraceae	*Broussonetia papyrifera (L.) Vent.*	Paper Mulberry
Moraceae	*Ficus carica L.*	Edible Fig
Myricaceae	*Morella caroliniensis Raf.*	Southern Bayberry, Swamp Candleberry
Myricaceae	*Morella cerifera L.*	Wax Myrtle, Southern Bayberry, Candleberry
Moraceae	*Morus alba L.*	White Mulberry
Moraceae	*Morus rubra L.*	Red Mulberry
Nymphaeaceae	*Nuphar lutea (L.) Sm. Subsp.*	Spatterdock, Yellow Pondlilly
Nymphaeaceae	*Nymphaea odorata Sol.*	American White WaterLily, Alligator Bonnet, Star Lily
Oleaceae	*Chionanthus virginicus L.*	Fringe Tree, Grand-Sir-Graybeard, Gransy Graybeard, Old Man's Beard
Oleaceae	*Fraxinus caroliniana Mill.*	Carolina Ash, Pop Ash, Water Ash
Oleaceae	*Ligustrum lucidum W.T. Ait.*	Glossy Privet
Oleaceae	*Ligustrum ovalifolium Hassk.*	California Privet
Oleaceae	*Osmanthus americana (L.) Benth.& Hook f. ex A.Gray*	Devilwood, Wild Olive

Family	Scientific Name	Common Name
Orchidaceae	*Calopogon barbatus (Walt.) Ames*	Bearded Grass Pink
Orchidaceae	*Calopogon tuberosum (L.) Britton et al.*	TuberousGrass Pink
Orchidaceae	*Epidendrum conopseum R.Br.*	Green Fly Orchid
Orchidaceae	*Habenaria nivea (Nutt.) Spreng.*	Snowy Orchid
Orchidaceae	*Habenaria repens Nutt.*	Water Spider Bog Orchid
Orchidaceae	*Malaxis unifolia Michx.*	Green addersmouth Orchid
Orchidaceae	*Platanthera ciliaris (L.) Lindl.*	Yellow Fringed Orchid
Orchidaceae	*Platanthera cristata (Michx.) Lindl.*	Crested Yellow Orchid
Orchidaceae	*Platanthera integra (Nutt.) A. Gray ex.L.C. Beck*	Yellow Fringeless Orchid
Orchidaceae	*Pogonia divaricata (L.) R.Br.*	Rosebud Orchid
Orchidaceae	*Pogonia ophioglossoides (L.) Ker Gawl.*	Rose Pogonia
Orchidaceae	*Spiranthes lacera (Raf.) raf.* var.gracilis (Bigelow) Lver.	Northern Slender Ladies Tresses
Orchidaceae	*Spiranthes praecox (Walt.) S. Watson*	Greenvein Ladies Tresses
Oxalidaceae	*Oxalis corniculata L.*	Creeping Woodsorrel
Oxalidaceae	*Oxalis violacea L.*	Violet Woodsorrel
Passifloraceae	*Passiflora incarnata L.*	Purple Passionflower, Apricot Vine
Passifloraceae	*Passiflora incarnata L.*	Maypop; Passion Flower; Apricot Vine
Pinaceae	*Pinus clausa (Chapm. Ex Engelm.) Vasey ex Sarg.*	Sand Pine
Pinaceae	*Pinus elliottii Engelm.*	Slash Pine
Pinaceae	*Pinus glabra Walt.*	Spruce Pine
Pinaceae	*Pinus palustris Mill.*	Longleaf Pine
Pinaceae	*Pinus serotina Michx.*	Pond Pine
Pinaceae	*Pinus taeda L.*	Loblolly Pine
Platanaceae	*Platanus occidentalis L.*	American Sycamore; American planetree
Poaceae	*Agrostis hyemalis (Walt.) B.S.P.*	Winter Bentgrass
Poaceae	*Andropogon capillipes Nash*	Chalk Bluestem
Poaceae	*Andropogon brachystachyus Chapm.*	Shortspike Bluestem
Poaceae	*Andropogon gyrans Chapm.*	Elliott's Bluestem
Poaceae	*Andropogon glomeratus (Walt.) B.S.P.*	Bushy Bluestem
Poaceae	*Andropogon glaucopsis.* var. glaucopsis (Ell.)Hitchc.	Purple Bluestem
Poaceae	*Andropogon virginicus L.*	Broomsedge; Bluestem
Poaceae	*Aristida beyrichiana Trin. And Rupr.*	Beyrich Threeawn; Wiregrass
Poaceae	*Aristida spiciformis Elliott*	Bottlebrush Treeawn
Poaceae	*Arundinaria gigantea (Walt.) Walt. Ex Muhl.*	Giant Cane, Switchcane
Poaceae	*Axonopus compressus (Sw.) Beauv.*	Broadleaf Carpetgrass
Poaceae	*Axonopus fissifolius (Roddi) Kuhlm.*	Common Carpetgrass
Poaceae	*Axonopus furcatus (Flugge) Hitchc.*	Big Carpetgrass
Poaceae	*Ctenium aromaticum (Walter) A.W. Wood*	Toothache Grass
Poaceae	*Cynodon dactylon (L.) Pers.*	Bermuda Grass
Poaceae	*Dichanthelium aciculare (Desv. ex Poir.)Gould and Clark*	Needleleaf Rosette Grass
Poaceae	*Dichanthelium acuminatum (Sw.) Gould and Clark*	Tapered Rosette Grass
Poaceae	*Dichanthelium commutatum (Schult.) Gould*	Variable Panicgrass
Poaceae	*Dichanthelium dichotomum (L.) Gould and Clark* var. dichotomum	Cypress Panicgrass

Family	Scientific Name	Common Name
Poaceae	*Dichanthelium dichotomum (L.) Gould and Clark* var. ensifolium (Bald. Ex Ell) Gould & Clark	Cypress Panicgrass
Poaceae	*Dichanthelium dichotomum (L.) Gould and Clark* var. tenue (Muhl.)Gould&Clark	Cypress Panicgrass
Poaceae	*Dichanthelium laxiflorum (Lam.) Gould*	Openflower Rosette Grass
Poaceae	*Dichanthelium strigosum (Trin.) Gould and Clark var. leucoblepharis*	Roughhair Rosette Grass
Poaceae	*Dichanthelium ovale (Ell.) Gould and Clark*	Eggleaf Rosette Grass
Poaceae	*Dichanthelium sabulorum (Lam.) Gould and Clark*	Hemlock Rosette Grass
Poaceae	*Dichanthelium scabriusculum (Ell.) Gould and Clark*	Wooly Rosette Grass
Poaceae	*Dichanthelium scoparium (Lam.) Gould*	Velvet Panicum
Poaceae	*Digitaria ciliaris (Retz. Koeler*	Southern Crabgrass
Poaceae	*Eragrostis elliottii S. Wats.*	Field Lovegrass
Poaceae	*Eremochloa ophiuroides (Munro) Hack.*	Centipede Grass
Poaceae	*Saccarum coarctatum Fern.*	Compressed Plumegrass
Poaceae	*Saccarum giganteus (Walt.) Muhl.*	Sugarcane Plumegrass
Poaceae	*Eustachys petraea (Sw.) Desv.*	Pinewoods Fingergrass
Poaceae	*Gymnopogon ambiguus (Michx.) B.S.P.*	Bearded Skeletongrass
Poaceae	*Leersia hexandra Sw.*	Southern Cutgrass
Poaceae	*Luziola fluitans (Michx.) Terrell and H. Robins.*	Southern Watergrass
Poaceae	*Muhlenbergia capillaris (Lam.) Trin.*	Hairawn Muhly
Poaceae	*Panicum anceps Michx.*	Beaked Panicgrass
Poaceae	*Panicum dichotomiflorum Michx.*	Fall Panicgrass
Poaceae	*Panicum hemitomon Schultes*	Maidencane
Poaceae	*Panicum hians Elliott.*	Gaping Panicum
Poaceae	*Panicum rigidulum Bosc. Ex Ness.*	Redtop Panicgrass
Poaceae	*Panicum tenerum Beyrich ex. Trin.*	Bluejoint Panicgrass
Poaceae	*Panicum verrucosum Muhl.*	Warty Panicgrass
Poaceae	*Panicum virgatum L.*	Switchgrass
Poaceae	*Paspalum dissectum (L.) L.*	Mudbank Crowngrass
Poaceae	*Paspalum laeve Michx.*	Field Paspalum
Poaceae	*Paspalum notatum Flugge*	Bahiagrass
Poaceae	*Paspalum setaceum Michx.*	Thin Paspalum
Poaceae	*Paspalum urvillei Steud.*	Vaseygrass
Poaceae	*Phyllostachys aurea Carriere ex C. Riviee*	Yellow Bamboo, Golden Bamboo
Poaceae	*Sacciolepis indica (L.) Chase.*	India Cupscale
Poaceae	*Sacciolepis striata(L.) Nash*	American Cupscale
Poaceae	*Schizachyrium scoparium (Michx.) Nash* var. scoparium	Little Bluestem
Poaceae	*Sorghastrum nutans (L.) Nash*	Indiangrass
Poaceae	*Sorghastrum secondum (Ell.) Nash*	Lopsided Indiangrass
Poaceae	*Sporobolus curtisii (Vasey ex Beal) Small ex. Scribn.*	Curtis's Dropseed
Poaceae	*Sporobolus indicus (L.) R. Br.*	Smutgrass
Poaceae	*Steinchisma repens L.*	Torpedograss
Poaceae	*Triplasis americana P. Beauv.*	Perennial Sandgrass
Poaceae	*Tripsacum dactyloides (L.) L.*	Eastern Gamagrass
Poaceae	*Vulpia octoflora (Walt.) Rydb.*	Sixweeks Fescue
Polygalaceae	*Polygala brevifolia Nutt.*	Littleleaf Milkwort

Family	Scientific Name	Common Name
Polygalaceae	*Polygala cruciata L.*	Drumheads
Polygalaceae	*Polygala cymosa Walt.*	Tall Pinebarren Milkwort
Polygalaceae	*Polygala grandiflora Walter*	Showy Milkwort
Polygalaceae	*Polygala incarnata L.*	Procession Flower
Polygalaceae	*Polygala luteao* L.	Orange Milkwort, Red Hot Poker
Polygalaceae	*Polygala mariana Mill.*	Maryland Milkwort
Polygalaceae	*Polygala nana (Michx.) DC*	Candyroot
Polygalaceae	*Polygala ramosa Ell.*	Low Pinebarren Milkroot
Polygalaceae	*Polygala setacea Michx.*	Coastal plain Milkwort
Polygonaceae	*Eriogonum tomentosum Michx.*	Dog Tongue Buckwheat, Dog Tongue
Polygonaceae	*Polygonum hydropiperoides Michx.*	Mild Water-Pepper, Swamp Smartweed, False Water-Pepper
Polygonaceae	*Polygonum persicaria L.*	Spotted Lady's Thumb
Polygonaceae	*Rumex acetosella L.*	Common Sheep Sorrel
Polygonaceae	*Rumex crispus L.*	Curly Dock, Yellow Dock
Polygonaceae	*Rumex hastatulus Baldwin ex. Ell*	Swamp Dock, Heartwing Dock, Sourdock
Polypodiaceae	*Pleopeltis polypodioides (L.) Watts.*	Resurrection Fern
Pontederiaceae	*Heteranthera reniformis Ruiz & Pavon*	Kidneyleaf Mudplantain
Pontederiaceae	*Pontederia cordata L.*	Pickerelweed
Ranunculaceae	*Clematis crispa L.*	Swawp Leatherflower
Rhamnaceae	*Berchemia scandens (Hill) K. Koch*	Rattan Vine; Supplejack; Alabama Supplejack
Rhamnaceae	*Ceanothus microphyllus Michx.*	Littleleaf Buckbrush
Rosaceae	*Photinia pyrifolia (L.) Pers.*	Red Chokeberry
Rosaceae	*Crataegus aestivalis (Walt.) Torr. A. Gray*	May Haw, May Hawthorn
Rosaceae	*Crataegus marshallii Eqgl.*	Parsley Hawthorn
Rosaceae	*Prunus angustifolia Marshall*	Chickasaw Plum
Rosaceae	*Prunus caroliniana (Mill.) Ait.*	Carolina Laurelcherry
Rosaceae	*Prunus persica (L.) Batsch*	Peach
Rosaceae	*Prunus serotina Ehrh.*	Black Cherry
Rosaceae	*Prunus umbellata Ell.*	Hog Plum; Flatwoods Plum
Rosaceae	*Pyrus communis L.*	Common Pear
Rosaceae	*Rosa laevigata Michx.*	Cherokee Rose
Rosaceae	*Rosa palustris Marshall*	Swamp Rose
Rosaceae	*Rubus cuneifolius Pursh.*	Sand Blackberry
Rosaceae	*Rubus trivialis Michx.*	Southern Dewberry
Rubiaceae	*Cephalanthus occidentalis L.*	Common Buttonbush
Rubiaceae	*Diodia teres Walter*	Poor Joe; Rough Buttonweed
Rubiaceae	*Diodia virginiana L.*	Virginia Button Weed
Rubiaceae	*Galium hispidulum Michx.*	Coastal Bedstraw
Rubiaceae	*Galium pilosum Ait.*	Hairy Bedstraw
Rubiaceae	*Galium tinctorium L.*	Stiff Marsh Bedstraw
Rubiaceae	*Mitchella repens L.*	Partridgeberry; Twinberry
Rubiaceae	*Pinckneya bracteata (W. Bartram) Raf.*	Maiden's Blushes; Fevertree
Rutaceae	*Citrus aurantium L.*	Sour Orange
Rutaceae	*Zanthoxylum clava-herculis L.*	Toothache Tice; Hercules' Club
Salicaceae	*Populus deltoides W. Bartrum ex. Marshall*	Eastern Cottonwood
Salicaceae	*Populus nigra* var. italica Moench	Lombardy Poplar
Salicaceae	*Salix caroliniana Michx.*	Carolina Willow
Salicaceae	*Salix nigra Marshall*	Black Willow
Sapotaceae	*Sideroxylon lanuginosum Michx.*	Gum Bully
Sapotaceae	*Sideroxylon tenax L.*	Tough Bully
Sarraceniaceae	*Sarracenia flava L..*	Yellow Pitcher Plant

Family	Scientific Name	Common Name
Sarraceniaceae	*Sarracenia minor Walt.*	Hooded Pitcher Plant
Sarraceniaceae	*Sarracenia psittancina Michx.*	Parrot Pitcher Plant
Saururaceae	*Saururus cernuus L.*	Lizard's Tail, Water Dragon, Breastweed
Scrophulariaceae	*Agalinis fasciculata (Ell.) Raf.*	Beach False Foxglove
Scrophulariaceae	*Agalinis linifolia (Nutt.) Britt.*	Flaxleaf False Foxglove
Scrophulariaceae	*Agalinis purpurea (L.) Pennell*	Purple False Foxglove
Scrophulariaceae	*Agalinis tenuifolia (Vahl.) Raf.*	Slenderleaf False Foxglove
Scrophulariaceae	*Buchnera americana L.*	American Bluehearts
Scrophulariaceae	*Gratiola aurea Pursh*	Golden Hedge Hyssop
Scrophulariaceae	*Gratiola hispida (Benth. Ex Lindl.) Pollard*	Rough Hedge Hyssop
Scrophulariaceae	*Gratiola pilosa Michx.*	Shaggy Hedge Hyssop
Scrophulariaceae	*Gratiola ramosa Walter*	Branched Hedge Hyssop
Scrophulariaceae	*Nuttallanthus canadensis (L.) Chaz.*	Canada Toadflax
Scrophulariaceae	*Penstemon laevigatus Sol.*	Eastern Smooth Beard Tongue
Scrophulariaceae	*Penstemon multiflorus (Benth.) Chapm. Ex Small*	Manyflowered Beard Tongue
Scrophulariaceae	*Scoparia dulcis L.*	Sweetbroom; Licoriceweed
Scrophulariaceae	*Seymeria cassioides (G>F. Grnel.) S.F.Blake*	Yaupon blacksenna
Scrophulariaceae	*Seymeria pectinata Pursh*	Piedmont blacksenna
Simaroubaceae	*Ailanthus altissima (Mill.) Swigle*	Tree-of-Heaven
Smilacaceae	*Smilax auriculata Walter*	Earleaf Greenbrier
Smilacaceae	*Smilax bona-nox L.*	Bullbrier; Tramp's Trouble;Stretchberry;Saw Greenbrier
Smilacaceae	*Smilax glauca Walter*	Wild Sarsaparilla;Sawbrier; Cat Greenbrier
Smilacaceae	*Smilax laurifolia L.*	Bamboo Vine; Laurel Greenbrier; Blaspheme Vine
Smilacaceae	*Smilax pumila Walter*	Sarsparilla Vine, Wooly Greenbrier
Smilacaceae	*Smilax rotundifolia L.*	Roundleaf Greenbrier; Catbrier; Horsebrier
Smilacaceae	*Smilax smallii Morong*	Lanceleaf Greennbrier
Smilacaceae	*Smilax tamnoides L.*	Bristly Greenbrier; Hogbrier
Smilacaceae	*Smilax walteri Pursh.*	Coral Greenbrier
Solanaceae	*Datura stramonium L.*	Jimson Weed
Solanaceae	*Physalis walteri Nutt.*	Walter’s Ground Cherry
Solanaceae	*Solanum carolinense L.*	Carolina Horsenettle
Styracaceae	*Styrax americanus Lam.*	American Snowbell
Taxodiaceae	*Taxodium ascendens nutans (Ait.) Sweet.*	Pond Cypress
Taxodiaceae	*Taxodium distichum (L.) l.C. Rich. distichum*	Bald or River Cypress
Theaceae	*Gordonia lasianthus (L.) J.Ellis*	Loblolly Bay
Thelypteridaceae	*Thelypteris kunthii (Desv.) C.V. Morton*	Southern Shield Fern
Turneraceae	*Piriqueta citoides (Walter) Urb.*	Stripeseed
Typhaceae	*Typha domingensis Pers.*	Southern Cattail
Typhaceae	*Typha latifolia L.*	Broadleaf Cattail
Ulmaceae	*Planera aquatica J.F. Grnel.*	Water Elm; Planer Tree
Ulmaceae	*Ulmus alata Michx.*	Winged Elm
Ulmaceae	*Ulmus americana L.*	American Elm
Verbenaceae	*Callicarpa americana L.*	American Beautyberry
Verbenaceae	*Glandularia pulchella (Sweet) Tronc.*	Moss Verbena
Verbenaceae	*Lantana camara L.*	Lantana; Shrub Verbena
Verbenaceae	*Phyla nodiflora (L.) Greene*	Turkey Tangle Fogfruit
Violaceae	*Viola lanceolata L.*	Bog While Violet
Violaceae	*Viola palmata L.*	Early Blue Violet
Violaceae	*Viola sororia Willd.*	Common Blue Violet

Family	Scientific Name	Common Name
Vitaceae	*Ampelopsis arborea (L.) Koehne*	Pepper Vine
Vitaceae	*Parthenocissus quinquefolia (L.) Planch.*	Virginia Creeper; Woodvine
Vitaceae	*Vitis aestivalis Michx.*	Summer Grape
Vitaceae	*Vitis rotundifolia Michx.*	Muscadine, Scuppernong
Woodsiaceae	*Onoclea sensibilis L.*	Sensitive Fern
Xyridaceae	*Xyris brevifolia Michx.*	Shortleaf Yelloweyed Grass
Xyridaceae	*Xyris caroliniana Walter*	Carolina Yelloweyed Grass
Xyridaceae	*Xyris fimbriata Ell.*	Fringed Yelloweyed Grass
Xyridaceae	*Xyris platylepis Chapm.*	Tall Yelloweyed Grass
Xyridaceae	*Xyris smalliana Nash*	Small's Yelloweyed Grass

Appendix V. Okefenokee National Wildlife Refuge Wildlife List

Residence: P=Permanent, M=Migrant or Transient, I/A=Incidental/Accidental

MAMMALS (Mammalia)

Family	Scientific Name	Common name	Residence	Status	Exotic
Didelphiidae	*Didelphis virginiana pigna*	Virginia Opossum	P	None	NO
Soricidae	*Barina carolinensis*	Southern Short-Tailed Shrew	P	None	NO
Soricidae	*Cryptotus parva parva*	Least Shrew	P	None	NO
Talpidae	*Scalopus aquaticus australis*	Eastern Mole	P	None	NO
Talpidae	*Condylura cristata*	Starnose Mole	P	None	NO
Vespertilionidae	*Myotis austroriparius austroriparius*	Southeastern Myotis	M	None	NO
Vespertilionidae	*Pipistrellus subflavus subflavus*	Eastern Pipistrelle	M	None	NO
Vespertilionidae	*Eptesicus fuscus fuscus*	Big Brown Bat	M	None	NO
Vespertilionidae	*Lasiurus borealis borealis*	Red Bat	M	None	NO
Vespertilionidae	*Lasiurus seminolus*	Seminole Bat	M	None	NO
Vespertilionidae	*Lasiurus cinereus cinereus*	Hoary Bat	M	None	NO
Vespertilionidae	*Lasiurus intermedius floridanus*	Northern Yellow Bat	M	None	NO
Vespertilionidae	*Nycticeius humeralis*	Evening Bat	M	None	NO
Vespertilionidae	*Plecotus rafinesquii*	Rafinesque's Big-Eared Bat	M	Threatened	NO
Molosidae	*Tadarida brasiliensis cynophala*	Brazilian Free-Tailed Bat	M	None	NO
Dasypodidae	*Dasypus novemcinctus mexicanus*	Armadillo	P	None	YES
Leporidae	*Sylvilgus palustria palustris*	Marsh Rabbit	P	None	NO
Leporidae	*Sylvilagus floridanus mallurus*	Eastern Cottontail	P	None	NO
Sciuridae	*Sciurus carolinensis carolinensis*	Gray Squirrel	P	None	NO
Sciuridae	*Sciurus niger niger*	Fox Squirrel	P	None	NO
Sciuridae	*Glaucomys volans querceti*	Southern Flying Squirrel	P	None	NO
Geomyidae	*Geomys pinetis pinetis*	Georgia Pocket Gopher	P	None	NO
Geomyidae	*Geomys pinetis floridianus*	Southeastern Pocket Gopher	P	None	NO
Castoridae	*Castor canadensis carolinensis*	Beaver	P	None	NO
Cricetidae	*Oryzomys palustris palustris*	Marsh Rice Rat	P	None	NO
Cricetidae	*Reithrodontomys humilus humilus*	Eastern Harvest Mouse	P	None	NO
Cricetidae	*Peromyscus polionotus polionotus*	Oldfield Mouse	P	None	NO

Family	Scientific Name	Common name	Residence	Status	Exotic
Cricetidae	*Peromyscus gossypinus*	Cotton Mouse	P	None	NO
Cricetidae	*Peromyscus nuttalli*	Golden Mouse	P	None	NO
Cricetidae	*Signodon hispidus hispiedus*	Hispid Cotton Rat	P	None	NO
Cricetidae	*Neotoma floridana floridana*	Eastern Woodrat	P	None	NO
Cricetidae	*Microtus pinetorum parvulus*	Woodland Vole	P	None	NO
Cricetidae	*Neofiber alleni exoristus*	Round-Tailed Muskrat	P	None	NO
Cricetidae	*Rattus rattus rattus*	Black Rat	P	None	YES
Cricetidae	*Rattus rattus alexandrinus*	Roof Rat	P	None	YES
Cricetidae	*Mus Musculus musculus*	House Mouse	P	None	YES
Canidae	*Urocyon cinereosrgenteus floridanus*	Gray Fox	P	None	NO
Canidae	*Vulpes fulva fulva*	Red Fox	P	None	NO
Ursidae	*Ursus americanus floridianus*	Black Bear	P	None	NO
Procyonidae	*Procyon lotor elucus*	Raccoon	P	None	NO
Mustelidae	*Mustela frenata olivacea*	Long-Tailed Weasel	P	None	NO
Mustelidae	*Mustela vison mink*	Mink	P	None	NO
Mustelidae	*Mephitis mephitis elongata*	Striped Skunk	P	None	NO
Mustelidae	*Lontra canadensis vaga*	River Otter	P	None	NO
Felidae	*Felis concolor coryi*	Florida Panther	P	Endangered	NO
Felidae	*Lynx rufus floridanus*	Bobcat	P	None	NO
Suidae	*Sus scrofa*	Wild Pig	P	None	YES
Cervidae	*Odocoileus virginianus*	White-Tailed Deer	P	None	NO

REPTILES (Reptilia)

Family	Scientific Name	Common name	Residence	Status	Exotic
Snakes					
Colubridae	*Cemophora coccinea copei*	Northern Scarlet Snake	P	None	NO
Colubridae	*Coluber constrictor priapus*	Southern Black Racer	P	None	NO
Colubridae	*Diadophis punctatus punctatus*	Southern Ring-necked Snake	P	None	NO
Colubridae	*Drymarchon corais couperi*	Indigo Snake	P	Threatened	NO
Colubridae	*Elaphe guttata guttata*	Corn Snake	P	None	NO
Colubridae	*Elaphe obsoleta*	Rat Snake	P	None	NO
Colubridae	*Farancia abacura abacura*	Eastern Mud Snake	P	None	NO
Colubridae	*Farancia erytrogramma*	Rainbow Snake	P	None	NO
Colubridae	*Heterodon platyrhinos*	Eastern Hognose Snake	P	None	NO
Colubridae	*Lampropeltis getula*	Eastern Kingsnake	P	None	NO
Colubridae	*Lampropeltis triangulum elapsoides*	Scarlet Kingsnake	P	None	NO
Colubridae	*Masticophis flagellum flagellum*	Eastern Coachwhip	P	None	NO
Colubridae	*Nerodia cyclopion floridana*	Florida Green Water Snake	P	None	NO
Colubridae	*Nerodia erythrogaster*	Water Snake	P	None	NO

Family	Scientific Name	Common name	Residence	Status	Exotic
Colubridae	*Nerodia fasciata fasciata*	Banded Water Snake	P	None	NO
Colubridae	*Nerodia fasciata pictiventris*	Florida Water Snake	P	None	NO
Colubridae	*Nerodia taxispilota*	Brown Water Snake	P	None	NO
Colubridae	*Opheodrys aestivus*	Rough Green Snake	P	None	NO
Colubridae	*Pituophis melanoleucus*	Florida Pine Snake	P	None	NO
Colubridae	*Regina alleni*	Striped Crayfish Snake	P	None	NO
Colubridae	*Regina rigida rigida*	Eastern Glossy Crayfish Snake	P	None	NO
Colubridae	*Rhadinaea flavilata*	Pine Woods Snake	P	None	NO
Colubridae	*Seminatrix pygaea pygaea*	North Florida Black Swamp Snake	P	None	NO
Colubridae	*Storeria dekayi victa*	Florida Brown Snake	P	None	NO
Colubridae	*Storeria occipitomomaculata obscura*	Florida Red-bellied Snake	P	None	NO
Colubridae	*Thamnophis sauritus sackeni*	Eastern Ribbon Snake	P	None	NO
Colubridae	*Thamnophis sirtalis sirtalis*	Eastern Garter Snake	P	None	NO
Colubridae	*Virginia striatula*	Rough Earth Snake	P	None	NO
Colubridae	*Virginia valeriae valeriae*	Eastern Smooth Earth Snake	P	None	NO
Elapidae	*Micrurus fulvius*	Eastern Coral Snake	P	None	NO
Viperidae	*Agkistrodon piscivorus conanti*	Florida Cottonmouth	P	None	NO
Viperidae	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake	P	None	NO
Viperidae	*Crotalus horridus atricaudatus*	Canebrake Rattlesnake	P	None	NO
Viperidae	*Sistrurus miliarius barbouri*	Dusky Pigmy Rattlesnake	P	None	NO
Turtles					
Chelydridae	*Chelydra serpentina serpentina*	Common Snapping Turtle	P	None	NO
Chelydridae	*Macroclemys temmincki*	Alligator Snapping Turtle	P	None	NO
Emydidae	*Chrysemys nelsoni*	Florida Red-bellied Turtle	P	None	NO
Emydidae	*Deirochelys reticularia reticularia*	Eastern Chicken Turtle	P	None	NO
Emydidae	*Pseudemys floridana floridana*	Florida Cooter	P	None	NO
Emydidae	*Trachemys scripta*	Yellow-bellied Pond Slider	P	None	NO
Emydidae	*Terrapene carolina*	Eastern Box Turtle	P	None	NO
Kinosternidae	*Kinosternon bauri palmarum*	Striped Mud Turtle	P	None	NO
Kinosternidae	*Kinosternon subrubrum subrubrum*	Eastern Mud Turtle	P	None	NO
Kinosternidae	*Sternotherus minor minor*	Loggerhead Musk Turtle	P	None	NO
Kinosternidae	*Sternotherus odoratus*	Stinkpot	P	None	NO

Family	Scientific Name	Common name	Residence	Status	Exotic
Testudinidae	*Gopherus polyphemus*	Gopher Tortoise	P	Threatened	NO
Trionychidae	*Apalone ferox*	Florida Softshell	P	None	NO
		Crocodilians			
Alligatoridae	*Alligator mississippiensis*	American Alligator	P		NO
		Lizards			
Anguidae	*Ophisaurus compressus*	Island Glass Lizard	P	None	NO
Anguidae	*Ophisaurus ventralis*	Eastern Glass Lizard	P	None	NO
Iguanidae	*Anolis carolinensis*	Green Anole	P	None	NO
Iguanidae	*Sceloporus undulatus undulatus*	Southern Fence Lizard	P	None	NO
Scincidae	*Eumeces egregius*	Northern Mole Skink	P	None	NO
Scincidae	*Eumeces fasciatus*	Five-lined Skink	P	None	NO
Scincidae	*Eumeces inexpectatus*	Southern Five-lined Skink	P	None	NO
Scincidae	*Eumeces laticeps*	Broad-headed Skink	P	None	NO
Scincidae	*Scincella laterale*	Ground Skink	P	None	NO
Teiidae	*Cnemidophorus sexlineatus sexlineatus*	Six-lined Race Runner	P	None	NO

AMPHIBIANS (Amphibia)

Family	Scientific Name	Common name	Residence	Status	Exotic
		Frogs and Toads			
Bufonidae	*Bufo quercicus*	Oak Toad	P	None	NO
Bufonidae	*Bufo terrestris*	Southern Toad	P	None	NO
Hylidae	*Acris gryllus dorsalis*	Florida Cricket Frog	P	None	NO
Hylidae	*Hyla chrysoscelis*	Gray Treefrog	P	None	NO
Hylidae	*Hyla cinerea cinerea*	Green Treefrog	P	None	NO
Hylidae	*Hyla crucifer bartramiana*	Southern Spring Peeper	P	None	NO
Hylidae	*Hyla femoralis*	Pine Woods Treefrog	P	None	NO
Hylidae	*Hyla gratiosa*	Barking Treefrog	P	None	NO
Hylidae	*Hyla squirella*	Squirrel Treefrog	P	None	NO
Hylidae	*Pseudocris ocularis*	Little Grass Frog	P	None	NO
Hylidae	*Pseudacris nigrita nigrita*	Southern Chorus Frog	P	None	NO
Hylidae	*Pseudacris ornata*	Ornate Chorus Frog	P	None	NO
Microhylidae	*Gastrophryne carolinensis*	Eastern Narrow-mouthed Toad	P	None	NO
Pelobatidae	*Scaphiopus holbrookii*	Eastern Spadefoot Toad	P	None	NO
Ranidae	*Rana areolata aescpus*	Gopher Frog	P	None	NO
Ranidae	*Rana catesbeiana*	Bullfrog	P	None	NO
Ranidae	*Rana clamitans clamitans*	Bronze Frog	P	None	NO
Ranidae	*Rana grylio*	Pig Frog	P	None	NO
Ranidae	*Rana heckscheri*	River Frog	P	None	NO
Ranidae	*Rana sphenocephla*	Southern Leopard Frog	P	None	NO
Ranidae	*Rana virgatipes*	Carpenter Frog	P	None	NO
		Salamanders			
Ambystomatidae	*Ambystoma cingulatum*	Flatwoods Salamander	P	Threatened	NO
Amphiumidae	*Amphiuma means*	Two-toed Amphiuma	P	None	NO
Plethodontidae	*Desmognathus auriculatus*	Southern Dusky Salamander	P	None	NO
Plethodontidae	*Eurycea quadridigitata*	Dwarf Salamander	P	None	NO

Family	Scientific Name	Common name	Residence	Status	Exotic
Plethodontidae	*Plethodon grobmani*	Slimy Salamander	P	None	NO
Plethodontidae	*Pseudotrition montanus flavissimus*	Gulf Coast Mud Salamander	P	None	NO
Salamandridae	*Notophthalamus perstriatus*	Striped Newt	P	None	NO
Salamandridae	*Notophthalamus viridescens louisianensis*	Central Newt	P	None	NO
Sirenidae	*Pseudobranchus striatus spp.*	Dwarf Siren	P	None	NO
Sirenidae	*Siren intermedia intermedia*	Eastern Lesser Siren	P	None	NO
Sirenidae	*Siren lacertina*	Greater Siren	P	None	NO

FISH

Family	Scientific Name	Common name	Status	Exotic
Lepisosteidae	*Lepisosteus platyrhincus*	Florida Gar	None	
Amiidae	*Amia calva*	Bowfin	None	
Anguillidae	*Anguilla rostrata*	American Eel	None	
Esocidae	*Esox americanus americanus*	Redfin Pickerel	None	
Esocidae	*Esox niger*	Chain Pickerel	None	
Umbridae	*Umbra pygnaea*	Eastern Mudminnow	None	
Catostomidae	*Erimyzon sucetta*	Lake Chubsucker	None	
Catostomidae	*Minytrema melanops*	Spotted Chubsucker	None	
Ictaluridae	*Ictalurus natalis*	Yellow Bullhead	None	
Ictaluridae	*Ictalurus nebulosus*	Brown Bullhead	None	
Ictaluridae	*Ictalurus punctatus*	Channel Catfish	None	
Ictaluridae	*Noturus gyrinus*	Tadpole Madtom	None	
Ictaluridae	*Noturus leptacanthus*	Speckled Madtom	None	
Aphredoderidae	*Aphredoderus sayanus*	Pirate Perch	None	
Poeciliidae	*Fundulus chrysotus*	Golden Topminnow	None	
Poeciliidae	*Fundulus cingulatus*	Banded Topminnow	None	
Poeciliidae	*Fundulus lineolatus*	Lined Topminnow	None	
Poeciliidae	*Fundulus notti*	Starhead Topminnow	None	
Cyprinodontidae	*Leptolucania ommata*	Pygmy Killifish	None	
Poeciliidae	*Gambusia affinis*	Mosquitofish	None	
Cyprinodontidae	*Heterandria formosa*	Least Killifish	None	
Atherinidae	*Labidesthes sicculus*	Brook Silverside	None	
Centrarchidae	*Elassoma evergladei*	Everglades Pygmy Sunfish	None	
Centrarchidae	*Elassoma okefenokee*	Okefenokee Pygmy Sunfish	None	
Centrarchidae	*Acantharchus pomotis*	Mud Sunfish	None	
Centrarchidae	*Centrarchus macropterus*	Flier	None	
Centrarchidae	*Enneacanthus chaetodon*	Blackbanded Sunfish	None	
Centrarchidae	*Enneacanthus gloriosus*	Bluespotted Sunfish	None	
Centrarchidae	*Enneacanthus obesus*	Banded Sunfish	None	
Centrarchidae	*Lepomis auritus*	Redbreast Sunfish	None	
Centrarchidae	*Lepomis gulosus*	Warmouth	None	
Centrarchidae	*Lepomis macrochirus*	Bluegill	None	
Centrarchidae	*Lepomis marginatus*	Dollar Sunfish	None	
Centrarchidae	*Lepomis punctatus*	Spotted Sunfish	None	
Centrarchidae	*Micropterus salmoides*	Largemouth Bass	None	
Centrarchidae	*Pomoxis nigromaculatus*	Black Crappie	None	
Percidae	*Etheostoma barratti*	Scalyhead Darter	None	
Percidae	*Etheostoma fusiforme*	Swamp Darter	None	
Percidae	*Percina nigrofasciata*	Blackbanded Darter	None	

BIRDS (Aves)

c = common (certain to be seen in suitable habitat)
u = uncommon (present but not certain to be seen)
o = occasional (seen only a few times during season)
r = rare (seen at intervals of 2 to 5 years)

Family	Scientific Name	Common name	SP	S	F	W	Residence	Status
Waterfowl								
Anatidae	*Chen caerulescens*	Snow Goose	accidental occurrence				I/A	None
Anatidae	*Branta canadensis*	Canada Goose	o		o	o	M	None
Anatidae	*Cygnus columbianus*	Tundra Swan	accidental occurrence				I/A	None
Anatidae	*Aix sponsa*	Wood Duck	c	c	c	c	P	None
Anatidae	*Anas strepera*	Gadwall	o		o	o	M	None
Anatidae	*Anas penelope*	Eurasian Wigeon	accidental occurrence				I/A	None
Anatidae	*Anas americana*	American Wigeon	u		u	u	M	None
Anatidae	*Anas rubripes*	American Black Duck	o		o	o	M	None
Anatidae	*Anas platyrhynchos*	Mallard	c		c	c	M	None
Anatidae	*Anas discors*	Blue-winged Teal	u	u	u	o	M	None
Anatidae	*Anas clypeata*	Northern Shoveler	u		u	u	M	None
Anatidae	*Anas acuta*	Northern Pintail	u		u	u	M	None
Anatidae	*Anas crecca*	Green-winged Teal	c		c	c	M	None
Anatidae	*Aythya valisineria*	Canvasback	r		r	r	M	None
Anatidae	*Aythya americana*	Redhead	o		o	o	M	None
Anatidae	*Aythya collaris*	Ring-necked Duck	c		c	c	M	None
Anatidae	*Aythya marila*	Greater Scaup	accidental occurrence				I/A	None
Anatidae	*Aythya affinis*	Lesser Scaup	u		u	u	M	None
Anatidae	*Bucephala albeola*	Bufflehead	r		r	r	M	None
Anatidae	*Bucephala clangula*	Common Goldeneye	r		r	r	M	None
Anatidae	*Lophodytes cucullatus*	Hooded Merganser	c	r	c	c	M	None
Anatidae	*Mergus merganser*	Common Merganser	accidental occurrence				I/A	None
Anatidae	*Mergus serrator*	Red-breasted Merganser	r		r	r	M	None
Anatidae	*Oxyura jamaicensis*	Ruddy Duck	o		o	o	M	None
Gallinaceous Birds (Quail, Turkey and Allies)								
Phasianidae	*Meleagris gallopavo*	Wild Turkey	c	u	c	u	P	None
Phasianidae	*Colinus virginianus*	Northern Bobwhite	c	c	c	c	P	None
Loons								
Gaviidae	*Gavia immer*	Common Loon	r		r	r	M	None

Family	Scientific Name	Common name	SP	S	F	W	Residence	Status
Grebes								
Podicipedidae	*Podilymbus podiceps*	Pied-billed Grebe	c	r	c	c	M	None
Podicipedidae	*Podceps auritus*	Horned Grebe	o		o	o	M	None
Pelicans and their Allies								
Pelecanidae	*Pelecanus erythrorhyncos*	American White Pelican	accidental occurrence				I/A	None
Pelecanidae	*Pelecanus occidentalis*	Brown Pelican	accidental occurrence				I/A	Endangered
Phalacrocoracidae	*Phalacrocorax auritus*	Double-crested cormorant	o	r	o	o	M	None
Anhingidae	*Anhinga anhinga*	Anhinga	c	c	c	c	P	None
Herons, Egrets and Allies								
Areidae	*Botaurus lengtiginosus*	American Bittern	u	u	u	c	M	None
Areidae	*Ixobrychus exilis*	Least Bittern	o	o	r		M	None
Areidae	*Ardea herodias*	Great Blue Heron	c	c	c	c	P	None
Areidae	*Ardea alba*	Great Egret	c	c	c	c	P	None
Areidae	*Egretta thula*	Snowy Egret	u	u	u	o	P	None
Areidae	*Egretta caerulea*	Little Blue Heron	c	c	c	c	P	None
Areidae	*Egretta tricolor*	Tricolored Heron	o	o	o	o	P	None
Areidae	*Bubulcus ibis*	Cattle Egret	c	c	c		M	None
Areidae	*Butorides virescens*	Green Heron	c	c	c	o	P	None
Areidae	*Nycticorax nycticorax*	Black-crowned Night-Heron	c	o	c	c	P	None
Areidae	*Nyctanassa violacea*	Yellow-crowned Night-Heron	u	u	u	u	P	None
Ibises, Spoonbills, Storks								
Threskiornithidae	*Eudocimus albus*	White Ibis	c	c	c	c	P	None
Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	r		r	r	M	None
Threskiornithidae	*Platalea ajaja*	Roseate Spoonbill	accidental occurrence				I/A	None
Ciconiidae	*Mycteria Americana*	Wood Stork	o	c	c	o	P	Endangered
Vultures, Hawks and Allies								
Cathartidae	*Coragyps atratus*	Black Vulture	c	c	c	c	P	None
Cathartidae	*Cathartes aura*	Turkey Vulture	c	c	c	c	P	None
Accipitridae	*Pandion haliaetus*	Osprey	u	u	r	r	P	None
Accipitridae	*Elanoides forficatus*	Swallow-tailed Kite	u	u	u		M	None
Accipitridae	*Ictinia mississippiensis*	Mississippi Kite	accidental occurrence				I/A	None
Accipitridae	*Haliaeetus leucocephalus*	Bald Eagle	o		o	o	P	Threatened
Accipitridae	*Circus cyaneus*	Northern Harrier	u		u	u	M	None
Accipitridae	*Accipiter striatus*	Sharp-shinned Hawk	o		o	o	M	None
Accipitridae	*Accipiter cooperii*	Cooper's Hawk	o	r	o	o	M	None
Accipitridae	*Buteo lineatus*	Red-shouldered Hawk	c	c	c	c	P	None
Accipitridae	*Buteo platypterus*	Broad-winged Hawk	r		r		M	None
Accipitridae	*Buteo jamaicensis*	Red-tailed Hawk	u	r	u	u	M	None

Family	Scientific Name	Common name	SP	S	F	W	Residence	Status
Accipitridae	*Buteo lagopus*	Rough-legged Hawk	accidental occurrence				I/A	None
Accipitridae	*Aquila chrysaetos*	Golden Eagle	r		r	r	M	None
Falconidae	*Falco sparverius*	American Kestrel	c	o	c	c	P	None
Falconidae	*Falco columbarius*	Merlin	r		r	r	M	None
Falconidae	*Falco peregrinus*	Peregrine Falcon	r		r	r	M	None
Rails, Gallinules, Coots and Cranes								
Rallidae	*Coturnicops noveboracensis*	Yellow Rail	very rare				I/A	None
Rallidae	*Rallus longirostris*	Clapper Rail	very rare				I/A	None
Rallidae	*Rallus elegans*	King Rail	r	r	r	r	M	None
Rallidae	*Rallus limicola*	Virginia Rail	r		r		M	None
Rallidae	*Porzana carolina*	Sora	r		r		M	None
Rallidae	*Porphyrio martinica*	Purple Gallinule	u	u	u	u	M	None
Rallidae	*Gallinula chloropus*	Common Moorhen	u	u	u	u	M	None
Rallidae	*Fulica americana*	American Coot	u		u	u	M	None
Aramidae	*Aramus guarauna*	Limpkin	accidental occurrence				I/A	None
Gruidae	*Grus canadensis*	Sandhill Crane	c	c	c	c	P	None
Shorebirds								
Charadriidae	*Charadrius semipalmatus*	Semipalmated Plover	accidental occurrence				I/A	None
Charadriidae	*Charadrius vociferous*	Killdeer	c		c	c	M	None
Scolopacidae	*Tringa melanoleuca*	Greater Yellowlegs	u		u	o	M	None
Scolopacidae	*Tringa flavipes*	Lesser Yellowlegs	u		u	o	M	None
Scolopacidae	*Tringa solitaria*	Solitary Sandpiper	o		o		M	None
Scolopacidae	*Catoptrophorus semipalmatus*	Willet	r		r		M	None
Scolopacidae	*Actitis macularius*	Spotted Sandpiper	u		u	o	M	None
Scolopacidae	*Numenius phaeopus*	Whimbrel	accidental occurrence				I/A	None
Scolopacidae	*Calidris alba*	Sanderling	o		o	o	M	None
Scolopacidae	*Calidris pusilla*	Semipalmated Sandpiper	o		o	o	M	None
Scolopacidae	*Calidris mauri*	Western Sandpiper	r		r	r	M	None
Scolopacidae	*Calidris alpina*	Dunlin	r		r		M	None
Scolopacidae	*Limnodromus griseus*	Short-billed Dowitcher	o		o	o	M	None
Scolopacidae	*Gallinago gallinago*	Common Snipe	c		c	c	M	None
Scolopacidae	*Scolopax minor*	American Woodcock	u	r	u	u	M	None
Laridae	*Larus atricilla*	Laughing Gull	accidental occurrence				I/A	None
Laridae	*Larus argentatus*	Herring Gull	r		r	r	M	None
Laridae	*Sterna paradisaea*	Arctic Tern	accidental occurrence				I/A	None
Laridae	*Sterna forsteri*	Forster's Tern	accidental occurrence				I/A	None
Laridae	*Chlidonias niger*	Black Tern	r	r	r		M	None

Family	Scientific Name	Common name	SP	S	F	W	Residence	Status
Pigeons, Doves								
Columbidae	*Columba livia*	Rock Pigeon	accidental occurrence				I/A	Exotic
Columbidae	*Zenaida macroura*	Mourning Dove	c	c	c	c	P	None
Columbidae	*Columbina passerine*	Common Ground-dove	c	c	c	c	P	None
Cuckoos								
Cuculidae	*Coccyzus erythropthalmus*	Black-billed Cuckoo	r		r		M	None
Cuculidae	*Coccyzus americanus*	Yellow-billed Cuckoo	c	c	c		M	None
Owls								
Tytonidae	*Tyto alba*	Barn Owl	very rare					None
Strigidae	*Megascops asio*	Eastern Screech-Owl	u	u	u	u	P	None
Strigidae	*Bubo virginianus*	Great Horned Owl	u	u	u	u	P	None
Strigidae	*Strix varia*	Barred Owl	c	c	c	c	P	None
Goatsuckers								
Caprimulgidae	*Chordeiles minor*	Common Nighthawk	c	c	c	c	M	None
Caprimulgidae	*Caprimulgus carolinensis*	Chuck-will's-widow	c	c	c		M	None
Caprimulgidae	*Caprimulgus vociferous*	Whip-poor-will	o		o	r	M	None
Swifts, Hummingbirds								
Apodidae	*Chaetura pelagica*	Chimney Swift	c	c	c		M	None
Trochilidae	*Archilochus colubris*	Ruby-throated Hummingbird	u	u	u		M	None
Kingfishers								
Alcedinidae	*Ceryle alcyon*	Belted Kingfisher	c	u	c	c	P	None
Woodpeckers								
Picidae	*Melanerpes erythrocephalus*	Red-headed Woodpecker	c	u	c	u	P	None
Picidae	*Melanerpes carolinus*	Red-bellied Woodpecker	c	c	c	c	P	None
Picidae	*Sphyrapicus varius*	Yellow-bellied Sapsucker	c		c	c	M	None
Picidae	*Picoides pubescens*	Downy Woodpecker	c	c	c	c	P	None
Picidae	*Picoides villosus*	Hairy Woodpecker	c	c	c	c	P	None
Picidae	*Picoides borealis*	Red-cockaded Woodpecker	u	u	u	u	P	Endangered
Picidae	*Colaptes auratus*	Northern Flicker	c	c	c	c	P	None
Picidae	*Dryocopus pileatus*	Pileated Woodpecker	c	c	c	c	P	None
Picidae	*Campephilus principalis*	Ivory-billed Woodpecker	Extinct					Extinct
Flycatchers								
Tyrannidae	*Contopus virens*	Eastern Wood-Pewee	c	c	c		M	None
Tyrannidae	*Empidonax virescens*	Acadian Flycatcher	u	u	u		M	None
Tyrannidae	*Sayornis phoebe*	Eastern Phoebe	c		c	c	M	None

Family	Scientific Name	Common name	SP	S	F	W	Residence	Status
Tyrannidae	*Pyrocephalus rubinus*	Vermilion Flycatcher	accidental occurrence				I/A	None
Tyrannidae	*Myiarchus crinitus*	Great Crested Flycatcher	c	c	c		M	None
Tyrannidae	*Tyrannus verticalis*	Western Kingbird	accidental occurrence				I/A	None
Tyrannidae	*Tyrannus tyrannus*	Eastern Kingbird	c	c	c		M	None
Tyrannidae	*Tyrannus dominicensis*	Gray Kingbird	accidental occurrence				I/A	None
Shrikes								
Laniidae	*Lanius ludovicianus*	Loggerhead Shrike	c	c	c	c	M	None
Vireos								
Vireonidae	*Vireo griseus*	White-eyed Vireo	c	c	c	u	M	None
Vireonidae	*Vireo flavifrons*	Yellow-throated Vireo	r	r	r		M	None
Vireonidae	*Vireo solitarius*	Blue-headed Vireo	u		u	u	M	None
Vireonidae	*Vireo olivaceus*	Red-eyed Vireo	u	u	u		M	None
Jays and Crows								
Corvidae	*Cyanocitta cristata*	Blue Jay	c	c	c	c	P	None
Corvidae	*Corvus brachyrhynchos*	American Crow	u	u	u	u	P	None
Corvidae	*Corvus ossifragus*	Fish Crow	c	c	c	c	P	None
Martins and Swallows								
Hirundinidae	*Progne subis*	Purple Martin	r	u	c	o	M	None
Hirundinidae	*Tachycineta bicolor*	Tree Swallow	c		c	c	M	None
Hirundinidae	*Hirundo rustica*	Barn Swallow	c	u	c		M	None
Chickadees and Titmice								
Paridae	*Poecile carolinensis*	Carolina Chickadee	u	u	u	u	P	None
Paridae	*Baeolophus bicolor*	Tufted Titmouse	c	c	c	c	P	None
Nuthatches								
Sittidae	*Sitta canadensis*	Red-breasted Nuthatch	r			r	M	None
Sittidae	*Sitta carolinensis*	White-breasted Nuthatch	r	r	r	r	M	None
Sittidae	*Sitta pusilla*	Brown-headed Nuthatch	c	c	c	c	P	None
Creepers								
Certhiidae	*Certhia americana*	Brown Creeper	o		o	o	M	None
Wrens								
Troglodytidae	*Thryothorus ludovicianus*	Carolina Wren	c	c	c	c	P	None
Troglodytidae	*Thryomanes bewickii*	Bewick's Wren	r		r	r	M	None
Troglodytidae	*Troglodytes aedon*	House Wren	u		u	u	M	None
Troglodytidae	*Troglodytes troglodytes*	Winter Wren	u		u	u	M	None

Family	Scientific Name	Common name	SP	S	F	W	Residence	Status
Troglodytidae	*Cistothorus platensis*	Sedge Wren	u		u	u	M	None
Troglodytidae	*Cistothorus palustris*	Marsh Wren	o		o	o	M	None
Kinglets and Gnatcatchers								
Regulidae	*Regulus satrapa*	Golden-crowned Kinglet	u		u	o	M	None
Regulidae	*Regulus calendula*	Ruby-crowned Kinglet	c		c	c	M	None
Sylviidae	*Polioptila caerulea*	Blue-gray Gnatcatcher	u	u	u	o	M	None
Bluebirds, Thrushes and Robins								
Turdidae	*Sialia sialis*	Eastern Bluebird	c	c	c	c	M	None
Turdidae	*Catharus fuscescens*	Veery	u		u		M	None
Turdidae	*Catharus minimus*	Gray-cheeked Thrush	r		r		M	None
Turdidae	*Catharus ustulatus*	Swainson's Thrush	r		r		M	None
Turdidae	*Catharus guttatus*	Hermit Thrush	u		u	u	M	None
Turdidae	*Hylocichla mustelina*	Wood Thrush	u	u	u		M	None
Turdidae	*Turdus migratorius*	American Robin	c		c	c	M	None
Thrashers								
Mimidae	*Dumetella carolinensis*	Gray Catbird	c	c	c	c	P	None
Mimidae	*Mimus polyglottos*	Northern Mockingbird	c	c	c	c	P	None
Mimidae	*Toxostoma rufum*	Brown Thrasher	c	c	c	c	P	None
Starlings								
Sturnidae	*Sturnus vulgaris*	European Starling	o	o	o	o	I/A	Exotic
Pipits								
Motacillidae	*Anthus rubescens*	American Pipit	o		o	o	M	None
Waxwings								
Bombycillidae	*Bombycilla cedrorum*	Cedar Waxwing	c		u	c	M	None
Warblers								
Parulidae	*Vermivora bachmanii*	Bachman's Warbler	very rare				I/A	None
Parulidae	*Vermivora pinus*	Blue-winged Warbler	r		o		M	None
Parulidae	*Vermivora chrysoptera*	Golden-winged Warbler	o		o		M	None
Parulidae	*Vermivora celata*	Orange-crowned Warbler	u		u	u	M	None
Parulidae	*Parula americana*	Northern Parula	c	c	c	r	M	None
Parulidae	*Dendroica petechia*	Yellow Warbler	u		u		M	None
Parulidae	*Dendroica pensylvanica*	Chestnut-sided Warbler			r		M	None
Parulidae	*Dendroica magnolia*	Magnolia Warbler	r		u		M	None
Parulidae	*Dendroica tigrina*	Cape May Warbler	u		u		M	None

Family	Scientific Name	Common name	SP	S	F	W	Residence	Status
Parulidae	*Dendroica caerulescens*	Black-throated Blue Warbler	u		u		M	None
Parulidae	*Dendroica coronata*	Yellow-rumped Warbler	c		c	c	M	None
Parulidae	*Dendroica virens*	Black-throated Green Warbler	r		r		M	None
Parulidae	*Dendroica fusca*	Blackburnian Warbler	u		u		M	None
Parulidae	*Dendroica dominica*	Yellow-throated Warbler	c	c	c	c	M	None
Parulidae	*Dendroica pinus*	Pine Warbler	c	u	c	c	M	None
Parulidae	*Dendroica discolor*	Prairie Warbler	u		u	o	M	None
Parulidae	*Dendroica palmarum*	Palm Warbler	c		c	c	M	None
Parulidae	*Dendroica striata*	Blackpoll Warbler	u		u		M	None
Parulidae	*Dendroica cerulea*	Cerulean Warbler	r		r		M	None
Parulidae	*Mniotilta varia*	Black-and-white Warbler	u	o	u	o	M	None
Parulidae	*Setophaga reticilla*	American Redstart	c	r	c		M	None
Parulidae	*Protonotaria citrea*	Prothonotary Warbler	c	c	c		M	None
Parulidae	*Helmitheros vermivorum*	Worm-eating Warbler	u		u	r	M	None
Parulidae	*Limnothlypis swainsonii*	Swainson's Warbler	r	r	r		M	None
Parulidae	*Seiurus aurocapilla*	Ovenbird	u		u		M	None
Parulidae	*Seiurus noveboracensis*	Northern Waterthrush	r		r		M	None
Parulidae	*Seiurus motacilla*	Louisiana Waterthrush	o	r	o		M	None
Parulidae	*Oporornis formosus*	Kentucky Warbler	o		o		M	None
Parulidae	*Oporornis agilis*	Connecticut Warbler	o		r		M	None
Parulidae	*Geothlypis trichas*	Common Yellowthroat	c	u	c	c	M	None
Parulidae	*Wilsonia citrina*	Hooded Warbler	u	u	u		M	None
Parulidae	*Wilsonia canadensis*	Canada Warbler	r		r		M	None
Parulidae	*Icteria virens*	Yellow-breasted Chat	r		r		M	None
Tanagers								
Thraupidae	*Piranga rubra*	Summer Tanager	u	u	u		M	None
Thraupidae	*Piranga olivacea*	Scarlet Tanager	r	r			M	None
Sparrows								
Emberizidae	*Pipilo erythrophthalmus*	Eastern Towhee	c	c	c	c	M	None
Emberizidae	*Aimophila aestivalis*	Bachman's Sparrow	c	c	c	c	M	None
Emberizidae	*Spizella arborea*	American Tree Sparrow	accidental occurrence				I/A	None
Emberizidae	*Spizella passerina*	Chipping Sparrow	u		u	u	M	None

Family	Scientific Name	Common name	SP	S	F	W	Residence	Status
Emberizidae	*Spizella pusilla*	Field Sparrow	u		u	u	M	None
Emberizidae	*Pooecetes gramineus*	Vesper Sparrow	u		u	u	M	None
Emberizidae	*Chondestes grammacus*	Lark Sparrow	accidental occurrence				I/AM	None
Emberizidae	*Passerculus sandwichensis*	Savannah Sparrow	u		u	u	M	None
Emberizidae	*Ammodramus savannarum*	Grasshopper Sparrow	o		o	o	M	None
Emberizidae	*Ammodramus henslowii*	Henslow's Sparrow	o		o	o	M	None
Emberizidae	*Ammodramus leconteii*	Le Conte's Sparrow	very rare				I/A	None
Emberizidae	*Passerella iliaca*	Fox Sparrow	u		u	u	M	None
Emberizidae	*Melospiza melodia*	Song Sparrow	c		c	c	M	None
Emberizidae	*Melospiza georgiana*	Swamp Sparrow	c		c	c	M	None
Emberizidae	*Zonotrichia albicollis*	White-throated Sparrow	c		c	c	M	None
Emberizidae	*Junco hyemalis*	Dark-eyed Junco	r			r	M	None
New World Finches								
Cardinalidae	*Cardinalis cardinalis*	Northern Cardinal	c	c	c	c	P	None
Cardinalidae	*Pheucticus ludovicianus*	Rose-breasted Grosbeak	r		r		M	None
Cardinalidae	*Passerina caerulea*	Blue Grosbeak	r	r	r		M	None
Cardinalidae	*Passerina cyanea*	Indigo Bunting	u	o	u		M	None
Cardinalidae	*Passerina ciris*	Painted Bunting	o				M	None
Blackbirds, Grackles, Cowbirds and Orioles								
Icteridae	*Dolichonyx oryzivorus*	Bobolink	r		r		M	None
Icteridae	*Agelaius phoeniceus*	Red-winged Blackbird	c	c	c	c	M	None
Icteridae	*Sturnella magna*	Eastern Meadowlark	c	c	c	c	M	None
Icteridae	*Euphagus carolinus*	Rusty Blackbird	u		u	u	M	None
Icteridae	*Euphagus cyanocephalus*	Brewer's Blackbird	o		o	o	M	None
Icteridae	*Quiscalus quiscula*	Common Grackle	c	c	c	c	M	None
Icteridae	*Quiscalus major*	Boat-tailed Grackle	r		r	r	M	None
Icteridae	*Molothrus ater*	Brown-headed Cowbird	o		o	o	M	None
Icteridae	*Icterus spurious*	Orchard Oriole	u	u	u		M	None
Icteridae	*Icterus galbula*	Baltimore Oriole	r		r	r	M	None
Old World Finches								
Fringillidae	*Carpodacus purpureus*	Purple Finch	u		u	u	M	None
Fringillidae	*Carpodacus mexicanus*	House Finch	very rare				I/A	None
Fringillidae	*Carduelis pinus*	Pine Siskin	r		r	r	M	None

Family	Scientific Name	Common name	SP	S	F	W	Residence	Status
Fringillidae	*Carduelis tristis*	American Goldfinch	c		c	c	M	None
Weaver Finches								
Passeridae	*Passer domesticus*	House Sparrow	r	r	r	r	I/A	Exotic

INSECTS (Arthropods)

Class	Order	Family	Scientific Name	Common name
Crustacea	Amphipoda	Crangonyctidae	*Crangonyx sp.*	Aquatic amphipod
Crustacea	Amphipoda	Gammaridae	*Gammarus sp.*	Aquatic amphipod
Crustacea	Copepoda	Argulidae	*Argulus sp.*	Fish lice
Crustacea	Cladocera	Daphniidae		Water fleas
Crustacea	Decopoda	Palaemonidae	*Palaemonetes*	Palaemonid shrimp
Crustacea	Isopoda	Asellidae	*Caecidotea sp.*	Isopod
Crustacea	Macrura	Cambaridae		Freshwater crayfish
Gastropoda	Basommatophora	Ancylidae		Freshwater pulmonate snail
Insecta	Coleoptera	Bostrichidae		Wood borer
Insecta	Coleoptera	Buprestidae		Metallic wood borer
Insecta	Coleoptera	Cantharidae		Soldier beetle
Insecta	Coleoptera	Carabidae		Ground beetle
Insecta	Coleoptera	Cerambycidae		Long-horned wood borer
Insecta	Coleoptera	Cercopidae		Flat beetle
Insecta	Coleoptera	Chrysomelidae		Leaf beetle
Insecta	Coleoptera	Cicindellidae		Tiger beetle
Insecta	Coleoptera	Cleridae		Checkered beetle
Insecta	Coleoptera	Coccinelidae		Lady beetle
Insecta	Coleoptera	Colydidae		Colydiid
Insecta	Coleoptera	Curculionidae		Weevil
Insecta	Coleoptera	Dermestidae		Carpet beetle
Insecta	Coleoptera	Dytiscidae	*Agabetes sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Celina sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Coptotomus sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Cybister sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Hydroporus sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Hydrovatus sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Hygrotus sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Hybius sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Ilybius sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Laccophilus sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Laccornis sp.*	Predacious diving beetle

Class	Order	Family	Scientific Name	Common name
Insecta	Coleoptera	Dytiscidae	*Neobidessus sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Neoporus sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Matus sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Rhantus sp.*	Predacious diving beetle
Insecta	Coleoptera	Dytiscidae	*Uvarus sp.*	Predacious diving beetle
Insecta	Coleoptera	Elateridae		Click beetle
Insecta	Coleoptera	Endomychidae		Endomychid
Insecta	Coleoptera	Erotylidae		Erotylid
Insecta	Coleoptera	Gyrinidae	*Dineutus sp.*	Whirligig beetle
Insecta	Coleoptera	Gyrinidae	*Gyrinus sp.*	Whirligig beetle
Insecta	Coleoptera	Haliplidae	*Peltodytes sp.*	Water crawling beetle
Insecta	Coleoptera	Histeridae		Fungus beetle
Insecta	Coleoptera	Hydrophilidae	*Berosus sp.*	Water scavenging beetle
Insecta	Coleoptera	Hydrophilidae	*Enochrus sp.*	Water scavenging beetle
Insecta	Coleoptera	Hydrophilidae	*Helocombus sp.*	Water scavenging beetle
Insecta	Coleoptera	Hydrophilidae	*Hydrobius sp.*	Water scavenging beetle
Insecta	Coleoptera	Hydrophilidae	*Phaenonotum sp.*	Water scavenging beetle
Insecta	Coleoptera	Hydrophilidae	*Tropisternus sp.*	Water scavenging beetle
Insecta	Coleoptera	Hydrochidae	*Hydrochus sp.*	Water scavenging beetle
Insecta	Coleoptera	Lagriidae		Lagriid
Insecta	Coleoptera	Lampyridae		Firefly
Insecta	Coleoptera	Lathridiidae		Grain beetle
Insecta	Coleoptera	Meloidae		Blister beetle
Insecta	Coleoptera	Mordellidae		Flower beetle
Insecta	Coleoptera	Mylabridae		Pea weevil
Insecta	Coleoptera	Nitidulidae		Sap beetle
Insecta	Coleoptera	Noteridae	*Hydrocanthus sp.*	Burrowing water beetle
Insecta	Coleoptera	Noteridae	*Suphisellus sp.*	Burrowing water beetle
Insecta	Coleoptera	Ostomidae		Cadell
Insecta	Coleoptera	Passalidae		Horned passalus
Insecta	Coleoptera	Scarabaeidae		Scarab
Insecta	Coleoptera	Scirtidae	*Cyphon sp.*	Marsh beetle
Insecta	Coleoptera	Scirtidae	*Scirtes sp.*	Marsh beetle
Insecta	Coleoptera	Scolytidae		Bark beetle
Insecta	Coleoptera	Silphidae		Carrion beetle
Insecta	Coleoptera	Staphylinidae		Rove beetle
Insecta	Coleoptera	Tenebrionidae		Darkling beetle
Insecta	Collembola	Entomobryidae		Elongate-bodied springtail

Class	Order	Family	Scientific Name	Common name
Insecta	Collembola	Poduridae		Elongate-bodied springtail
Insecta	Collembola	Sminthuridae		Globular springtail
Insecta	Dermaptera	Forficulidae		Earwig
Insecta	Diptera	Anthomyidae		Anthomyid fly
Insecta	Diptera	Bibionidae		Marsh fly
Insecta	Diptera	Calliphoridae		Blow fly
Insecta	Diptera	Ceratopogonidae		Punkies or biting midge
Insecta	Diptera	Chaoboridae	*Chaoborus sp.*	Phantom midge
Insecta	Diptera	Chironomidae	*Chironomus sp.*	Midge
Insecta	Diptera	Chironomidae	*Cladotanytarus sp.*	Midge
Insecta	Diptera	Chironomidae	*Krenopelopia sp.*	Midge
Insecta	Diptera	Chironomidae	*Labrudinia sp.*	Midge
Insecta	Diptera	Chironomidae	*Natarsia sp.*	Midge
Insecta	Diptera	Chironomidae	*Parachironomous sp.*	Midge
Insecta	Diptera	Chironomidae	*Paratendipes sp.*	Midge
Insecta	Diptera	Cordyluridae		Dung fly
Insecta	Diptera	Culicidae	*Aedes sp.*	Mosquito
Insecta	Diptera	Culicidae	*Coquillettidia sp.*	Mosquito
Insecta	Diptera	Culicidae	*Culex sp.*	Mosquito
Insecta	Diptera	Culicidae	*Mansonia sp.*	Mosquito
Insecta	Diptera	Dolichopodidae		Long-legged fly
Insecta	Diptera	Drosophilidae		Fruit fly
Insecta	Diptera	Muscidae		House fly
Insecta	Diptera	Ptychopteridae		Phantom crane fly
Insecta	Diptera	Sarcophagidae		Flesh fly
Insecta	Diptera	Syrphidae	*Eristalis sp.*	Syrphid fly
Insecta	Diptera	Syrphidae		Drone fly
Insecta	Diptera	Tabanidae	*Chlorotabanus sp.*	
Insecta	Diptera	Tabanidae	*Chrysops sp.*	Horse fly
Insecta	Diptera	Tachinidae		Parasitic fly
Insecta	Diptera	Tipulidae	*Helius sp.*	Crane fly
Insecta	Diptera	Tipulidae	*Limnophila sp.*	Crane fly
Insecta	Diptera	Tipulidae	*Pseudolimnophila sp.*	Crane fly
Insecta	Ephemeroptera	Baetidae		Mayfly
Insecta	Ephemeroptera	Caenidae	*Caenis sp.*	Small mayfly
Insecta	Hemiptera	Aradidae		Flat bug
Insecta	Hemiptera	Belostomatidae	*Belostoma sp.*	Giant water bug
Insecta	Hemiptera	Coreidae		Squash bug
Insecta	Hemiptera	Corixidae	*Trichocorixa sp.*	Water boatman
Insecta	Hemiptera	Cydinae		Burrowing bug
Insecta	Hemiptera	Gelastochoridae		Toad-shaped bug
Insecta	Hemiptera	Gerridae	*Aquarius sp.*	Water strider
Insecta	Hemiptera	Gerridae	*Trepobates sp.*	Water strider
Insecta	Hemiptera	Hydrometridae	*Hydrometra sp.*	Water measurer
Insecta	Hemiptera	Mesoveliidae	*Mesovelia sp.*	Water treader
Insecta	Hemiptera	Miridae		Leaf bug
Insecta	Hemiptera	Naucoridae	*Pelocoris sp.*	Creeping water bug
Insecta	Hemiptera	Nepidae	*Ranatra sp.*	Water scorpion
Insecta	Hemiptera	Notonectidae	*Buenoa sp.*	Back swimmer
Insecta	Hemiptera	Notonectidae	*Notonecta sp.*	Back swimmer
Insecta	Hemiptera	Pentatomidae		Stink bug

Class	Order	Family	Scientific Name	Common name
Insecta	Hemiptera	Pleidae	*Neoplea sp.*	Pigmy backswimmer
Insecta	Hemiptera	Pleidae	*Paraplea sp.*	
Insecta	Hemiptera	Reduviidae		Assassin bug
Insecta	Homoptera	Cercopidae		Spittle bug
Insecta	Homoptera	Chermidae		Jumping plant lice
Insecta	Homoptera	Cicadellidae		Leaf hopper
Insecta	Homoptera	Cicadidae		Cicada
Insecta	Homoptera	Coccidae		Scale insect
Insecta	Homoptera	Membracidae		Tree hopper
Insecta	Hymenoptera	Andrenidae		Andrenid bee
Insecta	Hymenoptera	Apidae		Bee
Insecta	Hymenoptera	Bombidae		Bumble bee
Insecta	Hymenoptera	Braconidae		Braconid
Insecta	Hymenoptera	Chrysididae		Cuckoo wasp
Insecta	Hymenoptera	Formicidae		Ant
Insecta	Hymenoptera	Ichneumonidae		Ichneumon
Insecta	Hymenoptera	Megachilidae		Leafcutting bee
Insecta	Hymenoptera	Mutilidae		Velvet ant
Insecta	Hymenoptera	Scoliidae		Scoliid wasp
Insecta	Hymenoptera	Sphecidae		Sphecoid wasp
Insecta	Hymenoptera	Tenthredinidae		Common sawfly
Insecta	Hymenoptera	Vespidae		Vespid wasp
Insecta	Hymenoptera	Xylocopidae	*Xylocopa sp.*	Large carpenter bee
Insecta	Isoptera	Rhinotermitidae		Termite
Insecta	Lepidoptera	Arctiidae	*Crambidia lithosiodes*	Tiger moth
Insecta	Lepidoptera	Arctiidae	*Cisthene plumbea*	Tiger moth
Insecta	Lepidoptera	Arctiidae	*Cisthene subjecta*	Tiger moth
Insecta	Lepidoptera	Arctiidae	*Cisthene packardii*	Tiger moth
Insecta	Lepidoptera	Arctiidae	*Hypoprepia miniata*	Tiger moth
Insecta	Lepidoptera	Arctiidae	*Hypoprepia fucosa*	Tiger moth
Insecta	Lepidoptera	Arctiidae	*Afrida ydatodes*	Tiger moth
Insecta	Lepidoptera	Arctiidae	*Utetheisa ornatrix*	Tiger moth
Insecta	Lepidoptera	Arctiidae	*Holomelina laeta*	Tiger moth
Insecta	Lepidoptera	Arctiidae	*Holomelina rubicundaria*	Tiger moth
Insecta	Lepidoptera	Arctiidae	*Apantesis phalerata*	Tiger moth
Insecta	Lepidoptera	Arctiidae	*Apantesis vittata*	Tiger moth
Insecta	Lepidoptera	Citheroniidae		Royal moth
Insecta	Lepidoptera	Coleophoridae		Case bearer
Insecta	Lepidoptera	Cosmopterigidae		Cosmopterigid moth
Insecta	Lepidoptera	Cossidae	*Prionoxystus sp.*	Carpenter or leopard moth
Insecta	Lepidoptera	Danaidae	*Danaus plexippus*	Monarch
Insecta	Lepidoptera	Gelechiidae		Gelechiid moth
Insecta	Lepidoptera	Geometridae	*Semiothisa transitaria*	Geometer moth
Insecta	Lepidoptera	Geometridae	*Anavitrinella pampinaria*	Geometer moth
Insecta	Lepidoptera	Geometridae	*Protoboarmia porcelaria*	Geometer moth
Insecta	Lepidoptera	Geometridae	*Melanolophia candaria*	Geometer moth
Insecta	Lepidoptera	Geometridae	*Hypagryrtis obtusaria*	Geometer moth
Insecta	Lepidoptera	Geometridae	*Euchlaena madusaria*	Geometer moth
Insecta	Lepidoptera	Geometridae	*Euchlaena amoenaria astylusaria*	Geometer moth
Insecta	Lepidoptera	Geometridae	*Nemoria catachloa*	Geometer moth
Insecta	Lepidoptera	Geometridae	*Idaea demissaria*	Geometer moth

Class	Order	Family	Scientific Name	Common name
Insecta	Lepidoptera	Geometridae	*Idaea tacturata*	Geometer moth
Insecta	Lepidoptera	Geometridae	*Cyclophora myrtaria*	Geometer moth
Insecta	Lepidoptera	Geometridae	*Leptostales pannaria*	Geometer moth
Insecta	Lepidoptera	Geometridae	*Eupithecia miserulata*	Geometer moth
Insecta	Lepidoptera	Heliconiidae	Agraulis vanillae	Gulf fritillary
Insecta	Lepidoptera	Heliozelidae		Shield bearer
Insecta	Lepidoptera	Hesperiidae	*Urbanus proteus*	Long-tailed skipper
Insecta	Lepidoptera	Hesperiidae	*Thorybes bathyllus*	Southern cloudy wing
Insecta	Lepidoptera	Hesperiidae	*Epargyreus clarus*	Silver-spot skipper
Insecta	Lepidoptera	Hesperiidae	*Erynnis martialis*	Horace's duskywing
Insecta	Lepidoptera	Hesperiidae	*Erynnis zarucco*	Zarucco duskywing
Insecta	Lepidoptera	Hesperiidae	*Pyrgus communis*	Checkered skipper
Insecta	Lepidoptera	Hesperiidae	*Hylephila phyleus*	Fiery skipper
Insecta	Lepidoptera	Hesperiidae	*Polites vibex*	Whirlabout
Insecta	Lepidoptera	Hesperiidae	*Polites verna*	Little glassywing
Insecta	Lepidoptera	Hesperiidae	*Wallengrenia otho otho*	Southern broken-dash
Insecta	Lepidoptera	Hesperiidae	*Wallengrenia otho egeremet*	Northern broken-dash
Insecta	Lepidoptera	Hesperiidae	*Atalopedes campestris*	Sachem
Insecta	Lepidoptera	Hesperiidae	*Atyrytone ruricola*	Dun skipper
Insecta	Lepidoptera	Hesperiidae	*Lerodea eufala*	Eufala skipper
Insecta	Lepidoptera	Hesperiidae	*Oligoria maculata*	Twin-spotted skipper
Insecta	Lepidoptera	Hesperiidae	*Panoquina ocola*	Ocola skipper
Insecta	Lepidoptera	Hesperiidae	*Poanes zabulon*	Zabulon skipper
Insecta	Lepidoptera	Hesperiidae	*Ancyloxypha numitor*	Least skipper
Insecta	Lepidoptera	Hesperiidae	*Nastra l'herminier*	Swarthy skipper
Insecta	Lepidoptera	Hesperiidae	*Paones viator*	Broad-winged skipper
Insecta	Lepidoptera	Lasiocampidae	*Tolype notialis*	Tent caterpillar and Lappet moth
Insecta	Lepidoptera	Limacodidae	*Euclea strigalis*	Slug caterpillar
Insecta	Lepidoptera	Liparidae	*Dasychira manto*	Tussock moth
Insecta	Lepidoptera	Mimallonidae	*Cicinnus melsheimeri*	Sack-bearer moth
Insecta	Lepidoptera	Noctuidae	*Zanclognatha theralis*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Bleptina caradrinalis*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Bleptina inferior*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Lascoria ambigualis*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Hypenodes fractilinea*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Dyspyralis sp.*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Schrankia macula*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Ablemma brimleyana*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Pangrapta decoralis*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Metalectra quadrisignata*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Arugisa latiorella*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Anomis erosa*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Epidromia fergusoni*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Cutina sp.*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Mocis latipes*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Mocis marcida*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Argyrostrotis erasa*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Argyrostrotis deleta*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Pseudoplusia includens*	Noctuid moth

Class	Order	Family	Scientific Name	Common name
Insecta	Lepidoptera	Noctuidae	*Paectes abrostoloides*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Meganola minuscula phylla*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Neoerastria apicosa*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Eumicremma minima*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Charadra deridens*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Acronicta deridens*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Harrisimemna trisignata*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Elaphria nucicolora*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Cyanthissa percara*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Amolita obliqua*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Leucania latiuscula*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Schinia trifascia*	Noctuid moth
Insecta	Lepidoptera	Noctuidae	*Schinia sanguinea*	Noctuid moth
Insecta	Lepidoptera	Notodontidae	*Peridea angulosa*	Prominent
Insecta	Lepidoptera	Nymphalidae	*Junonia coenia*	Common buckeye
Insecta	Lepidoptera	Nymphalidae	*Limenitus archippus floridensis*	Viceroy
Insecta	Lepidoptera	Nymphalidae	*Limenitus archippus astyanax*	Red-spotted purple
Insecta	Lepidoptera	Nymphalidae	*Phycoides phaon*	Phaon crescent
Insecta	Lepidoptera	Nymphalidae	*Phycoides tharos*	Pearl crescent
Insecta	Lepidoptera	Papilionidae	*Papilio glaucus*	Tiger swallowtail
Insecta	Lepidoptera	Papilionidae	*Papilio palamedes*	Palamedes swallowtail
Insecta	Lepidoptera	Papilionidae	*Papilio polyxenes*	Black swallowtail
Insecta	Lepidoptera	Papilionidae	*Papilio marcellus*	Zebra swallowtail
Insecta	Lepidoptera	Papilionidae	*Papilio cresphontes*	Giant swallowtail
Insecta	Lepidoptera	Papilionidae	*Papilio troilus*	Spicebush swallowtail
Insecta	Lepidoptera	Pieridae	*Eurema daira*	Barred sulphur
Insecta	Lepidoptera	Pieridae	*Eurema lisa*	Little sulphur
Insecta	Lepidoptera	Pieridae	*Phoebes sennae*	Cloudless sulphur
Insecta	Lepidoptera	Pieridae	*Colius eurytheme*	Orange sulphur
Insecta	Lepidoptera	Pieridae	*Eurema nicipe*	Sleepy orange
Insecta	Lepidoptera	Pieridae	*Colius cesonia*	Dog face
Insecta	Lepidoptera	Pyralidae	*Eudonia strigalis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Munroessa icciusalis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Nymphuliella daeckealis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Parapoynx allionealis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Udea rubigalis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Ategumia ebulialis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Hymenia perspectalis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Diasemiopsis leodoculalis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Anageshna primordialis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Glyphodes sibillalis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Herpetogramma bipunctalis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Syngamia florella*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Argyria lacteella*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Urola nivalis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Herculia infimbrialis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Macalla zelleri*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Tallula atrifascialis*	Pyralid moth

Class	Order	Family	Scientific Name	Common name
Insecta	Lepidoptera	Pyralidae	*Dioryctria zimmermani*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Dioryctria amatella*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Dioryctria clarioralis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Melitara prodenialis*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Acentria sp.*	Pyralid moth
Insecta	Lepidoptera	Pyralidae	*Crambus sp.*	Pyralid moth
Insecta	Lepidoptera	Riodinidae	*Calephelis virginiensis*	Little metalmark
Insecta	Lepidoptera	Satyridae	*Hermeuptychia sosybius*	Carolina satyr
Insecta	Lepidoptera	Satyridae	*Cercyonis pegala*	Common wood nymph
Insecta	Lepidoptera	Sesiidae	*Synanthedon acerni tepperi*	Clear-winged moth
Insecta	Lepidoptera	Theclinae	*Calycopis cecrops*	Red-banded hairstreak
Insecta	Lepidoptera	Theclinae	*Strymon melinus*	Gray hairstreak
Insecta	Lepidoptera	Theclinae	*Atlides halesus*	Great purple hairstreak
Insecta	Lepidoptera	Tortricidae		Tortricid moth
Insecta	Neuroptera	Chrysopidae		Lacewing
Insecta	Neuroptera	Corydalidae	*Chauliodes sp.*	Dobson fly
Insecta	Neuroptera	Corydalidae		Fish fly
Insecta	Neuroptera	Hemerobiidae		Hemerobiid
Insecta	Neuroptera	Myrmeleontidae		Ant lion
Insecta	Neuroptera	Sialidae	*Sialis sp.*	Alder fly
Insecta	Neuroptera	Sisyridae	*Sisyra sp.*	Spongilla fly
Insecta	Odonata	Aeshnidae	*Aeshna sp.*	Darner
Insecta	Odonata	Aeshnidae	*Coryphaeschna sp.*	Pilot darner
Insecta	Odonata	Agrionidae		Black prince damselfly
Insecta	Odonata	Coenagrionidae	*Enallagma sp.*	Narrow-winged damselfly
Insecta	Odonata	Coenagrionidae	*Ischnura sp.*	Narrow-winged damselfly
Insecta	Odonata	Coenagrionidae	*Nahalennia sp.*	Narrow-winged damselfly
Insecta	Odonata	Corduliidae	*Epitheca sp.*	Baskettail
Insecta	Odonata	Lestidae	*Lestes sp.*	Amber-winged damselfly
Insecta	Odonata	Libellulidae	*Ladona sp.*	Common skimmer
Insecta	Odonata	Libellulidae	*Celithemis sp.*	Small pennant
Insecta	Odonata	Libellulidae	*Erythemis sp.*	Pondhawk
Insecta	Odonata	Libellulidae	*Libellula sp.*	King skimmer
Insecta	Odonata	Libellulidae	*Pachydiplax sp*	Blue dasher
Insecta	Odonata	Libellulidae	*Perithemis sp.*	Amberwing
Insecta	Odonata	Libellulidae	*Sympetrum sp.*	Meadowfly
Insecta	Odonata	Libellulidae	*Tramea sp.*	Dancing glider
Insecta	Orthoptera	Acrididae		Short-horned grasshopper
Insecta	Orthoptera	Blattidae		Cockroach
Insecta	Orthoptera	Gryllidae		Cricket
Insecta	Orthoptera	Gryllotalpidae		Mole cricket
Insecta	Orthoptera	Phasmatidae		Walking stick

Class	Order	Family	Scientific Name	Common name
Insecta	Orthoptera	Tettigoniidae		Long-horned grasshopper
Insecta	Plecoptera	Perlidae		Common stonefly
Insecta	Plecoptera	Taeniopterygidae		Winter stonefly
Insecta	Trichoptera	Hydroptilidae	*Oxyethira sp.*	Caddisfly
Insecta	Trichoptera	Leptoceridae		Long-horned caddisfly
Insecta	Trichoptera	Leptoceridae	*Oecetis sp.*	Caddisfly
Insecta	Trichoptera	Limnephelidae		Northern caddisfly
Insecta	Trichoptera	Polycentropodidae	*Polycentropus sp.*	Caddisfly
Insecta	Trichoptera	Psychomyiidae	*Pseudolimnophila sp.*	caddisfly

Appendix VI. Wildlife And Land Cover Associations

Below is a list of wildlife associated with the major habitats of the Okefenokee NWR. The bird species with an * are those that have been identified by Partners in Flight as high priority species.

UPLAND FOREST

Black Bear
Wild Pig
Southern Flying Squirrel
Bobcat
Box Turtle
Striped Newt
Indigo Snake
Canebrake Rattlesnake
Red-headed Woodpecker
Yellow-bellied Woodpecker
Northern “Yellow-shafted” Flicker
American Kestrel
*Northern Bobwhite
Common Nighthawk
Turkey
Hooded Warbler
Yellow-billed Cuckoo
Summer Tanager
Gray Catbird
White-tailed Deer
Fox Squirrel
Gray Fox
Gopher Tortoise
Gopher Frog
Flatwoods Salamander
Eastern Diamondback Rattlesnake
*Red-cockaded Woodpecker
Red-bellied Woodpecker
Pileated Woodpecker
*Bachman’s Sparrow
Brown-headed Nuthatch
Chuck-will’s Widow
Pine Warbler
*Northern Parula
*Yellow-throated Warbler
*Prairie Warbler
Common Ground Dove
Orchard Oriole

BROADLEAFED HARDWOODS

Black Bear
Bobcat
*Yellow-throated Warbler
Cedar Waxwings
White-tailed Deer
Northern Parula
Eastern Wood Pewee
Warblers

WETLAND PINE

Wood Duck
American Kestrel
*Northern Bobwhite
*Swallow-tailed Kite
Pine Warbler
*Wood Stork
Great Egret
Little Blue Heron
Hooded Merganser
*Red-cockaded Woodpecker
*Brown-headed Nuthatch
Chuck-will’s Widow
Prothonotary Warbler
Acadian Flycatcher
*White Ibis
Black-crowned Night-heron
Great Blue Heron
Osprey

CYPRESS

Black Bear den sites
Prothonotary Warbler
Great Egret
*Swallow-tailed Kite
Bald Eagle
Osprey
Pileated Woodpecker
*Yellow-throated Warbler
*White Ibis
Wood Duck
*Wood Stork

SCRUB/SHRUB

Black Bear	Bobcat
Alligators	Tree Frogs
Eastern Towhee	Palm Warbler
White-eyed vireo	Common Yellowthroat
*Northern Parula	Tufted Titmouse
Cedar Waxwings	

OPEN MARSH (PRAIRIE)

Black Bear	White-tailed Deer
Bobcat	Alligator
Frogs	Turtles
Salamanders	Siren
	Warmouth
Pickerel	Flier
Okefenokee Pygmy Sunfish	Bluegill
Largemouth Bass	Black Crappie
	*Sandhill Crane
(Florida and Greater)	Loggerhead Shrike
Eastern Kingbird	Eastern Meadowlark
Bald Eagle	*Wood Stork
*White Ibis	Black-crowned Night-heron
Little Blue Heron	Great Egret
Great Blue Heron	Green-backed Heron
Red-shouldered Hawk	Cooper’s Hawk
Sharp-shinned Hawk	Northern Harrier
Barred Owl	Black Vulture
Turkey Vulture	Common Yellowthroat
Tree Swallow	*King Rail
American Bittern	Least Bittern
Purple Gallinule	Wood Duck
Blue-winged Teal	Ring-necked Duck
Hooded Merganse	

Appendix VII. Cultural History Of The Okefenokee Swamp Area

According to archeological evidence the swamp was uninhabited until about 2500 BC. Prior to this time, the basin was probably too dry (Trowell, 1989). Evidence indicates that small bands of Native American cultures occupied campsites throughout the swamp from this time through the eighteenth century. Several cultures existed during this period, identified by the types of pottery shards they left behind. The following was taken from the detailed descriptions of Native American cultures living around the Okefenokee by Chris Trowell in "*Indians of the Okefenokee"* (1998).

2000 BC to 1000 BC: Fiber Tempered Pottery Period - As sea level increased to its present level and "ponds" began to form in the Okefenokee basin, plants and animals began to invade these new wetland areas. Natives from surrounding areas of the coastal plain established seasonal camps around the shores of the Okefenokee and the islands within the swamp. These natives reinforced their pottery by mixing fibers of grass, moss, or leaves into clay before forming and firing the vessels.

1000 BC to 500 AD: Deptford and Swift Creek Culture - These natives also seasonally occupied the lush hammocks scattered through and around the swamp. This culture is identified by the designs stamped in their pottery with wooden paddles.

500 AD to 1000 AD: Weeden Island Culture - At this time, mound-builders from northwest Florida and southwest Georgia settled in the Okefenokee. The villages of these people were built around one or more burial mounds. These settlements were located in evergreen hammocks of live oak, magnolia and holly trees that had been used by earlier natives. Hunting and collecting continued as a way-of-life, but the village replaced the temporary camp. Weeden Island villages were quite numerous and several of them had a population of several hundred people. Their lives were directed by ruling leaders. Important leaders were buried in the sand burial mounds. Weeden Island pottery is decorated with incised and punctuated designs.

Toward the end of the Weeden Island Period, cord marked pottery, distinctive of coastal natives, began to appear, indicating trade with the coastal natives or settlement by natives of the Cord Marked Culture.

1000 AD to 1200 AD: Cord Marked Cultures - Sometime around 1000 AD, small numbers of natives using cord marked pottery occupied some of the hammock sites on the islands and the swamp perimeter. Some, probably most, of these settlers or campers were associated with the Savannah Culture. (At least one small village site is known to be Savannah.) A few natives associated with the Alachua Culture from north-central Florida and others associated with the Ocmulgee Cord Marked Culture from south-central Georgia occupied or visited some to the sites during this time.

1200 AD to 1700 AD: Miscellaneous Cultures - Near the end of the Weeden Island Period or Cord Marked Culture, small artifact densities suggest that native populations declined sharply. Following the Savannah Period, it appears that a few small bands of natives of the Lamar Culture camped, probably seasonally, in some of the previously occupied hammocks. Some of the St. Johns pottery found on Floyds Island, Chesser Island and several other sites may be associated with the Timucuan-speaking natives that occupied an area of northern Florida and southern Georgia during the Spanish period, 1560 to 1700. Spanish documents indicate the presence of a Spanish mission near the eastern edge of the Okefenokee serving fugitive Timucuan Indians. These documents also report infantry missions to attempt to capture and relocate fugitive Indians from the mission and other locations within the swamp (Worth, 1992; Worth, 1993; Trowell, 1994). The decline of native

populations during the Spanish Period was caused by diseases accidentally introduced by the Spanish, social disorder accompanying Spanish attempt to conscript labor, and a barbarous slaughter of Timucuan and Apalachee natives at Spanish missions by Col. James Moore in 1702-1704, leading South Carolinian militia and Creek warriors. By the time the swamp was occupied by the Seminoles, the early natives had disappeared.

1750 to 1840: The Seminoles were actually remnants of other native tribes including Creeks, Yuchees, Hitchitis and other tribal remnants who took refuge in the swamp following skirmishes with European settlers and military.

The Seminoles settled in a few areas of the Okefenokee between 1750 and 1840, but little archaeological evidence has been found. These people used the swamp as a refuge. During the 1830's, most of the Indians in Georgia moved to Oklahoma, but some fled into the swamps of south Georgia and Florida. The Dade's Massacre in Florida in December 1835 spread violence throughout the area until 1842.

Continued skirmishes between the Seminole Indians and the settlers led to the establishment of several forts around the perimeter of the swamp to protect the settlers. Two forts were built within the swamp, one on The Pocket, another on Billys Island. Campaigns by federal and state militia were conducted to eradicate or move the Seminoles from the area. Several forts remained manned and U. S. Army troops continued to patrol the rim of the swamp until 1842. By 1850 "the age of the Indian" in the Swamp had passed. Only Indian stories, mounds, scattered ceramic and stone artifacts, and several names on the map remained" (Trowell, 1998).

Native American occupation had some effect on Okefenokee habitats. Fire was used as a hunting tool. Huckleberry, blueberry and chinkapin productivity was enhanced by regular burning of islands. Villages, garden sites and other activity areas may have created permanent relict openings. Some of the openings in the swamp may be related to accidentally or intentionally set fires by native Americans (Trowell, 1989).

1850 - 1900: Pioneer families moved in as Native Americans began to disappear, generally settling on isolated farmsteads. A few lived in large, comfortable houses and owned large herds of cattle and hogs. Most lived in rustic cabins. The majority of the settlers lived in the tradition of the Native Americans, using fire for hunting and habitat management. "Their frequent burning of the wire-grass pine woods was probably their greatest legacy. Fire-adapted species of plants, and the creatures that lived in these open woods, became even more dominant. Not only did they burn the upland woods that encircle the swamp, but they burned the islands. This increased visibility for hunting, invigorated the growth of grass for deer, and improved the huckleberry yield. Hunters often set fires on the islands when they left after a hunting trip. Some of the lakes are probably the result of accidentally or intentionally-set fires on tree-houses, especially the prairie lakes near the eastern rim" (Trowell, 1989).

The Okefenokee area was mapped in the early 1800's as part of Wayne County for disposal in land lotteries. Settlement of the area occurred very slowly because of the apparent worthlessness of the land, difficulty of transportation, periodic outbreaks of Indian or outlaw attacks, and the difficulty of protecting the settlements. Most of the original settlers had large families skilled in swamp living. They were highly mobile and usually squatted for a few years on government or unclaimed land and then moved on to a more attractive homestead site (Allen, 1854; Trowell, 1984; Hemperly, 1982).

The first community settled in the Okefenokee area was Traders Hill, established on the banks of the St. Marys River in 1755. In 1811, Fort Alert was established at Traders Hill to protect the settlers from the Seminole Indians. The federal troops left in 1820, but another fort, Fort Henderson was

established at Traders Hill in 1838. It was occupied until 1842. By 1845, Traders Hill had become a busy river port town and for many years was the Charlton County seat. By 1910, Folkston replaced Traders Hill as the county seat and the area's commercial center.

In 1857, railroads began to penetrate the swamp area, and a new settlement, Waycross, was located at an important trail crossing. By 1881, Waycross was the junction for five railways and by 1890 had a population of 3,000. By the turn of the century, railways circled the swamp, helping to build other cities and villages including Folkston, Fargo, Homerville and others (Hurst, 1974).

Up to this point, Native Americans and European settlers were essentially part of the environment, changing only slightly the events that took place naturally. During the late 1800's industrial operations began to take place that forever changed the face of the Okefenokee.

Appendix VIII. Cultural Resource Sites

The following list contains the Master List site number, general geographic area, and recommended management actions for each known cultural resource located within the boundaries of the Okefenokee NWR. This list indicates the presence of cultural resources within a potential prescribed fire, wildfire, of fire use area. If the operations area contains cultural resources, additional information regarding the exact nature and location of the site must be requested from the Refuge Manager or his representative. Detailed site information and location is not available for public distribution.

Suggested initial management action for each listed site is indicated by the number in parenthesis. Suggested initial management actions are as follows:

1. Avoid the site.
2. The site should not be disturbed until archaeological subsurface tests have been conducted.
3. Consult an archaeologist prior to disturbance, e.g. earth moving activity.
4. Consult an archaeologist prior to disturbance if possible; extensive and deep earthmoving activities should be avoided until after consultation.
5. Monitor earth disturbance following the action; record presence of artifacts if discovered (especially in firebreaks).
6. Prescribed fire prescriptions for burns in this area should include avoidance of endangering historic structures by fire.
7. Site is destroyed, paved over, or removed by excavation; no preservation action necessary.
8. Structure and site should be photographed prior to alteration or replacement.

Upland Management Compartments

Area	**Site # (Mgt. Actions)**
C1-1	86 (3, 6)
C1-2	85 (1), 87 (3)
C2-1	None
C2-2	None
C2-3	None
C2-4	38 (4)
C2-5	91 (3)
C3-1	18 (4), 30 (3)
C3-2	
C3-3	None
C3-4	None
C3-5	None
C3-6	None
C3-7	None
C4-1	15 (1)
C4-2	1 (3), 8 (4), 63 (3), 64 (3), 65 (4)
C4-3	None
C4-4	None
C5-1	None
C5-2	None
C5-3	None
C5-4	None

Area	Site # (Mgt. Actions)
C5-5	None
C6-1	None
C6-2	None
C6-3	None
C7-1	None
C7-2	None
C7-3	None
C7-4	None
C7-5	None
C7-6	None
C7-7	None
C8-1	67 (5), 94 (4)
C8-2	None
C8-3	None
C8-4	20 (3), 21 (4)
C8-5	66 (5)
C8-6	6 (1), 13 (7), 14 (7), 19 (2), 22 (3), 81 (4), Unsurveyed—7 sites
C8	Unsurveyed—34 sites
C9-1	None
C9-2	None
C9-3	None
C10-1	68 (3), 69 (4), 70 (4), 73 (4)
C10-2	None
C11-1	42 (2), 43 (3), 72 (4), 75 (4), 76 (4), 77 (4)
C11-2	None
C11-3	None
C11-4	None
C12-1	None
C13-1	24 (5)
C13-2	79 (5), 80 (5)
C13-3	78 (5)
C13-4	None
C14-1	None
C15-1	None
C15-2	None
C15-3	None
C15-4	None
C15-5	None
C16-1	16 (3), 45 (5), 82 (5), 83 (5), 84 (5)
C16-2	None
C16-3	None
C16-4	None

Swamp Interior

Area	Site # (Mgt. Actions)
Billys Island	3 (2), 5 (1), 10(2), 25 (5), 26 (3), 27 (1), 28 (5), 29 (7)
Blackjack Island	46 (5), 52 (1)
Boatlanding Island	None
Bugaboo Island	53 (1), 54 (1), 55 (3), 56 (3), 60 (3)
Cravens Hammock	51 (1)
Cravens Island	31 (1), 32 (1)
Dog Fennel Group	None
Ellicotts Mound Group	None
Floyds Island	2 (2), 7 (1), 12 (3), 36 (5), 89 (3)
Fowls Roost Group	None
Hickory Hammock	9 (2), 37 (5)
Hilliard Island	48 (5)
Honey Island	49 (5)
Minnies Island	17 (1)
Mixons Hammock	11 (1), 23 (2), 39 (4), 40 (4), Unsurveyed—15 sites
Mitchell Island	50 (5)
Number One Island	93 (3)
Pine Island	None
Roasting Ear Island	None
Rowells Island	None
Mitchell Island	50 (5)
Number One Island	93 (3)
Strange Island	44 (4)
Swamps Edge Break (NE)	None
Swamps Edge Break (SE)	None
Swamps Edge Break (SW)	None

Area	**Site # (Mgt. Actions)**
Swamps Edge Break (NW)	47 (5)
Suwannee Canal	33 (3), 41 (3), 55 (3), 56 (3), 57 (3), 58 (3), 92 (3)
Blue Trail	34 (3), 35 (3)
Red Trail	88 (8)
Green Trail	90 (3)
Yellow Trail	94 (8)

Appendix IX. Public Scoping

FACT SHEET

QUESTIONS ON VALUES AND VISION OF OKEFENOKEE NATIONAL WILDLIFE REFUGE

MANAGEMENT QUESTIONNAIRES

FACT SHEET

Comprehensive Conservation Planning for Okefenokee National Wildlife Refuge

CCP
Okefenokee National Wildlife Refuge
Route 2, Box 3330
Folkston, GA 31537

Refuge Manager: M. Skippy Reeves
CCP Coordinator: Sara Aicher

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Comprehensive Conservation Planning
What's it all about?

The National Wildlife Refuge System Improvement Act of 1997 requires each National Wildlife Refuge to prepare a comprehensive plan by the year 2012. **Okefenokee National Wildlife Refuge** (NWR) began the development of the plan in 2001. It is estimated that the process will take two to three years to complete. The plan will address the management of plant species, wildlife and fish populations, endangered species, forests, fire, wetlands, cultural resources, contaminants, public use, education, research, land acquisition, and partnerships.

Purpose of the Plan

Provide a clear statement of direction and continuity for management of the refuge for the next 15 years.
Ensure that the refuge's management actions are consistent with the mandates of the National Wildlife Refuge System.
Ensure that the planned public use of refuge programs and facilities provides maximum benefit to the users without negatively impacting the wildlife resources and habitat that support those uses.
Provide refuge neighbors, visitors, the public, and government officials with an understanding of refuge management actions on and around the refuge.
Ensure that the management of the refuge considers federal, state, and county plans.
Provide the basis for the development of budget requests on the refuge's operational, maintenance, and capitol improvement needs; and land acquisition.

Who will be developing the plan?
The plan will be coordinated and written by the staff at Okefenokee NWR. A planning team will consist of refuge staff, other federal, state and local agency staff and private individuals that have the necessary technical expertise. Throughout the process, the public will have the opportunity to express their thoughts and suggestions.

Background
Okefenokee NWR is one of over 500 refuges within the National Wildlife Refuge System. This system is a network of U.S. lands and waters managed specifically for wildlife and is administered by the Department of the Interior's U.S. Fish and Wildlife Service. The National Wildlife Refuge System Improvement Act of 1997 states the Refuge system 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".

Okefenokee NWR was established by Executive Order in 1937 to preserve the 438,000 acre Okefenokee Swamp and provide "a refuge and breeding ground for migratory birds and other wildlife." Presently, the refuge encompasses 395,080 acres. The Okefenokee Swamp being one of the world's largest intact freshwater ecosystems was designated a Wetland of International Importance by the United Nations under the Ramsar Convention of 1971. In 1974, to further ensure the protection of this unique ecosystem, the interior 353,981 acres of the refuge were designated a National Wilderness Area. The National Register of Historic Landmarks provided additional national status for the protection of the swamp in 1976. The National Recreation Trail Act, administered by the National Park Service, ensured that the refuge canoe trails were maintained for the public for at least ten years after June 8, 1981.

Current mission of the refuge: To manage the Okefenokee NWR as an integral component of the greater Okefenokee ecosystem by restoring and maintaining native fauna and flora and associated natural processes, and by providing educational and compatible recreational opportunities.

Current Refuge Goals (not in priority order):

To maintain the wilderness quality in accordance with the Wilderness Act and the Clean Air Act.
To maintain the dynamic mosaic of wetland habitat types.
To restore and maintain fire-dependent communities.
To provide optimum habitat and protection for endangered and threatened species.
To promote public involvement through environmental education, fish and wildlife-oriented recreation, and off-refuge presentations in order to develop an appreciation and greater awareness of the Okefenokee ecosystem.
To protect visitors and natural and cultural resources through appropriate law enforcement.
To support ecosystem-based partnerships and research.
To provide adequate staff, facilities, and equipment in a healthful work environment to support refuge goals and objectives.

Want to get involved?
Okefenokee NWR is an important component of the ecosystem. It cannot fulfill the National Wildlife Refuge System mission without coordination with other refuges, federal, state and local agencies, and private stakeholders. Public involvement is an integral part of the planning process and will be incorporated through scoping meetings, document review, and public hearings.

Public Meetings: Prior to developing the draft plan, the Service will be holding public workshops to allow interested citizens the opportunity to express their thoughts and suggestions about future management of the Okefenokee NWR. Presentations will be made on current management and the planning process. The presentations will be followed by informal discussions on issues, comments, and possible solutions. Public notices in local papers, notification through mailings, and postings on the refuge's website (http://okefenokee.fws.gov) will inform the public of workshop schedules.

Written Comments: Written comments are welcome. The refuge has prepared brief descriptions of the issues being considered in the CCP to stimulate discussion. These descriptions will be distributed at public events where interested parties may be present, at public workshops, and upon request. Comments may be written directly on these descriptions or submitted in letter format.

Document Review: As draft plans are released to the public, a review period will be designated to allow the public to again submit their comments.

Public Hearing: Just prior to the completion of all documents, a public hearing will allow for formal comments to be presented.

Mailing List: In order to place your name and address on our mailing list we must have your written permission. Federal government mailing lists must be released to the public upon request.

Public Use Opportunities
Wildlife Observation
Wildlife Interpretation
Wildlife Photography
Environmental Education
Fishing
Hunting

Habitat Types
Longleaf Pine
Broadleafed Hardwoods
Prairie (Marsh)
Wetland Pine
Scrub/Shrub
Cypress/Hardwoods
Hardwood Hammocks
Open Water

Issues to be Addressed
Wetland Management
Forestry Management
Fire Management
Wilderness
Wildlife/Fisheries Populations
Cultural Resources
Contaminants
Public Use
Education
Research
Land Acquisition
Partnerships

QUESTIONS ON VALUES AND VISION OF OKEFENOKEE NATIONAL WILDLIFE REFUGE

Your answers to these questions will help us better understand public views and provide guidance for the plan.

1. **What do you value most about Okefenokee National Wildlife Refuge?** (Please check all that apply.)

- ☐ open protected space
- ☐ native fauna and flora
- ☐ scenic quality
- ☐ wilderness qualities
- ☐ hiking trails/boardwalk
- ☐ photographic opportunities
- ☐ wildlife observation opportunities
- ☐ interpretive/educational opportunities
- ☐ hunting opportunities
- ☐ fishing opportunities
- ☐ boating opportunities
- ☐ camping opportunities
- ☐ historic and cultural sites
- ☐ other (please specify)

2. **What do you want the future to hold for Okefenokee National Wildlife Refuge?** (Please check all that apply.)

- ☐ little or no change from today
- ☐ more public use and access
- ☐ less public use and access
- ☐ more recreational opportunities
- ☐ less recreational opportunities
- ☐ improved habitat for _____
- ☐ stricter enforcement of regulations
- ☐ more resource management efforts
- ☐ less resource management efforts
- ☐ more canoeing opportunities
- ☐ less canoeing opportunities
- ☐ other (please specify)

3. **What are your major concerns about Okefenokee National Wildlife Refuge?** (Please check all that apply.)

- ☐ human disturbance
- ☐ incompatible development on neighboring lands
- ☐ contaminants
- ☐ natural disasters
- ☐ wildfires
- ☐ prescribed fires
- ☐ plant succession
- ☐ changes in wildlife/fish populations
- ☐ increased/decreased public use and access
- ☐ loss of traditional uses
- ☐ other (please specify)

4. **Please include any additional comments you wish to make on your values and vision of Okefenokee National Wildlife Refuge.**

5. How frequently do you visit Okefenokee National Wildlife Refuge?

☐ more than 12 times a year
☐ 6 to 12 times a year
☐ 2 to 6 times a year
☐ once per year
☐ once every 5 years
☐ less frequently

6. Which entrances have you visited and approximate number of times per year?
Suwannee Canal Recreation Area (East entrance) _____
Stephen Foster State Park (West entrance) _____
Swamp Park (North entrance) _____

7. When do you visit the refuge?
☐ Spring (March-May)
☐ Summer (June-August)
☐ Fall (September-November)
☐ Winter (December-February)
☐ During Special Events

8. What do you do at the refuge? (Check all that apply.)

☐ Canoe	☐ Camp
☐ Motorboat	☐ Visit interpretive centers
☐ Observe fauna and flora	☐ Picnic
☐ Fish	☐ Photography
☐ Hunt	☐ Other (please specify)
☐ Walk boardwalk/trails	

9. Do you own property that shares a common boundary with the refuge? Yes___ No ___

10. Do you hunt on land adjacent to the refuge? Yes___ No___

11. Did you attend one of the public meetings? Yes ___ No ___

12. In what town do you reside? _____ **State?** _____

The Issues

The following issues will be discussed in the Comprehensive Conservation Plan. Each issue is briefly described on supplement pages with a question to stimulate discussion. Please obtain those pages that interest you the most and let us know your thoughts and suggestions by mailing them to the refuge. If you have a concern that is not listed, please write it down so it can be fully considered.

If you need further clarification on the refuge's management practices and policies, please feel free to contact us. The refuge staff would be glad to talk with you.

- Wetland Management
- Forest Management
- Fire Management
- Wilderness
- Wildlife/Fish Populations
- Cultural Resources
- Contaminants
- Public Use
- Education
- Research
- Acquisition
- Partnerships

Wetland Management / Wilderness Management

Wetland Management

The Okefenokee Swamp is the headwaters of the famous Suwannee and St. Marys Rivers. Ninety one percent of the refuge is wetlands consisting of a mosaic of vegetation communities. Rainfall contributes 80% of the water within the swamp. The other 20% comes from runoff and groundwater. Eighty percent of the water leaving the swamp leaves via evapotranspiration. The remaining 20% leaves via flow to the Suwannee and St Marys Rivers. Thus, water levels depend largely on weather patterns. Water flows through a series of shallow basins separated by naturally occurring ridges or "natural dams." These "natural dams" stair-step down in elevation from the northeast corner of the swamp to the Suwannee River. The refuge staff has no means of controlling water levels. It is a free-flowing system. Water levels are monitored to determine accessibility, wildlife distribution, and fire behavior during prescribed burns and wildfires. Water quality is also being monitored within the swamp.

What makes the Okefenokee Swamp valuable to you?

- ☐ As a place for wildlife and plant observation.
- ☐ As a wild and natural place.
- ☐ As a place for recreation opportunities.
- ☐ As a water storage basin.
- ☐ As a research area.
- ☐ As an educational facility.
- ☐ As a filter of contaminants.
- ☐ As a barrier for managing wildfires.
- ☐ Other (Please specify)

Are there improvements that can be made, recognizing that the character of the Wilderness must be preserved?

Please write your ideas and suggestions on this page, fold in half with the pre-addressed return mailer on the outside, and tape together. Put on the proper postage and drop in the mail before November 30, 2001. Thank you for your help; we really appreciate it. If you have any questions or would like more information about this project, please call us.

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Forest Management/Fire Management

Forest Management

Although upland forests comprise only nine percent of the refuge's land, it is the most intensively managed habitat on the refuge. Thirty-three thousand acres of upland forests are scattered around the perimeter of the swamp and on Wilderness designated islands within the interior of the swamp. Once dominated by fire-dependent longleaf pine communities, changes in fire regime, timber harvesting, stand conversion, clearing and settlement of the area altered the landscape. The primary management objective on these refuge lands is the restoration, maintenance, and protection of longleaf pine communities. This diverse habitat supports a vast association of wildlife species including the red-cockaded woodpecker, Bachman's sparrow, gopher tortoise, indigo snake, flatwoods salamander, gopher frog, and Sherman's fox squirrel. Selective timber harvesting, natural regeneration, planting of longleaf pine, and prescribed burning are the management tools used. Because of Wilderness guidelines and logistics, fire is the primary tool used on islands in the Wilderness.

What aspects of our forest management are most important to you?

- ☐ Native wildlife and plants
- ☐ Timber harvesting/Selective thinning
- ☐ Restoration of longleaf pine
- ☐ Prescribed burning
- ☐ Wildfire control
- ☐ Preservation of Wilderness
- ☐ Endangered species

Please explain further your answers to the above question if you feel that it is necessary:

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Fire Management

The Okefenokee Swamp is located within the second highest lightning-prone area in the nation. Lightning caused wildfires have shaped the natural landscape. Native plants and wildlife have adapted to frequent fires. Disruption of the naturally occurring fire regime has resulted in major changes in upland and wetland habitats in the Okefenokee ecosystem. Although fire is essential for the restoration and management of the Okefenokee upland and wetland communities, remaining habitats and adjoining private property must be protected from uncontrolled, destructive wildfire. Even if all wildfires were allowed to burn, the landscape has become so fragmented that there would not be enough natural fire to replace the natural fire regime.

Dormant and growing season prescribed fires are used to reduce the hazard of existing fuels and restore longleaf pine habitat and its associated grass understory. Along with adjacent landowners, the refuge is developing a fuels management zone around the perimeter of the swamp to allow more natural control of fire within the swamp. There is not currently a plan to use wildfire for resource management purposes within the swamp. However, it is recognized that fires which cannot be quickly controlled with helicopter water drops can most safely and efficiently be controlled by preparing fuel breaks at the edge of the swamp where fire could escape to the uplands.

Are any of the following of interest to you? (Please check all that apply.)

- □ Prescribed burning on refuge forested uplands.
- □ Prescribed burning within wetlands.
- □ Prescribed burning on private timberlands adjacent to the refuge.
- □ Fire prevention and suppression.
- □ Wildfire within the swamp.
- □ Wildfire moving out of the swamp.
- □ Smoke
- □ Impacts of fire on native plants and wildlife.
- □ Soil disturbance from fire lines.
- □ Swamp's Edge Break (Fire break on the edge of the swamp).
- □ Perimeter Road (Access road and second fire break around the swamp).
- □ Fuel Reduction Zone (Area between the Swamps Edge Break and Perimeter Road where fuels are kept low to lessen the intensity of fire moving between the swamp and timberlands.)
- □ Greater Okefenokee Association of Landowners (A team of landowners working together to manage, protect, and promote forest resources in and around the Okefenokee Swamp.)
- □ Other (Please specify.)

Please explain further your answers to the above questions if you feel that it is necessary:

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Wilderness Management/Wetland Management
Wilderness Management

In 1974, to further ensure the protection of this unique ecosystem, the interior 353,080 acres of the refuge were designated a National Wilderness Area. Approximately 120 miles of trails are maintained for boat travel. Approximately 50 miles of this trail system is dedicated for non-motorized boat travel only. To facilitate wilderness access, the trails are cut annually with a trail-cutter. Eight overnight stops (four on platforms and four on land) are established along with four day-use shelters (three platforms and one on land).

Management restrictions apply to the Wilderness Area. Through the evaluation of minimum tool requirements in Wilderness areas and the management guidelines for the endangered red-cockaded woodpecker, the refuge staff has developed Standard Operating Procedures to address airboat, helicopter, and gas-powered weed-eater use. Airboats are used for rescue, maintenance of trails and shelters, and wildlife surveys. Off-trail use of airboats requires prior documentation and evaluation of the purpose. Helicopters land on remote Wilderness islands for red-cockaded woodpecker monitoring and fire management. To minimize time and disturbance to the woodpeckers and other wildlife on the islands, gas-powered weed eaters are used to prepare critical red-cockaded woodpecker trees for prescribed burns. Helicopters are also used to conduct aerial wildlife surveys and prescribed burns. Motor boats are used by refuge staff on “canoe only” trails for maintenance and rescue purposes.

We have decided not to install artificial cavities in the Wilderness for red-cockaded woodpecker management since suitable unused cavities exist and it is one area in the southeast where RCW clusters have not been manipulated. As conditions change, this will continue to be discussed.

Research projects are evaluated as to their impacts on the Wilderness area.

Are any of the following of interest to you in regard to Wilderness designation? (Please check all that apply.)

- ☐ Airboat use
- ☐ Motorboat use
- ☐ Helicopter use
- ☐ Use of minimum tools
- ☐ Wilderness ethics
- ☐ Endangered species management
- ☐ Public Use facilities
- ☐ Wildlife surveys
- ☐ Prescribed burning and wildlife surveillance
- ☐ Other (Please specify)
- ☐

Please provide suggestions on how we can improve the management of the refuge while preserving Wilderness qualities.

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Wildlife/Fish Populations/Contaminants

Wildlife/Fish Populations

The refuge was created for the purpose of providing a sanctuary and breeding ground for migratory birds, endangered and threatened species, and other wildlife. This involves restoring, maintaining, and monitoring the native habitat communities that these species depend on. Incidental sightings and standardized surveys provide long-term data sets as well as identify trends in populations. The red-cockaded woodpecker is the primary focus of habitat management efforts. Monthly surveys of passerine, raptor, waterfowl, marsh and wading birds are conducted. Neotropical migrants, eagles, sandhill cranes, colonial nesters, osprey, alligators, fish, and black bears are surveyed annually. Short-term detailed studies are generally conducted by outside institutions under contract with the U.S. Fish and Wildlife Service.

Are you concerned about the refuge's management and/or monitoring for any of the following wildlife? (Please check all those that are of concern.)

- ☐ Neglect of important species. Which species:_____
- ☐ Threatened and Endangered Species
- ☐ Red-cockaded woodpeckers
- ☐ Colonial birds
- ☐ Wood duck
- ☐ Osprey
- ☐ Waterfowl
- ☐ Songbirds
- ☐ Raptors
- ☐ Sandhill cranes
- ☐ Amphibians
- ☐ Reptiles
- ☐ Alligators
- ☐ Fisheries
- ☐ Black bear
- ☐ Deer
- ☐ Small game species
- ☐ Other (Please specify)

Please explain further your answer to the above question:

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Contaminants/Wildlife/Fish Populations

Contaminants

Pathways leading to the Okefenokee NWR via air, water, and animal have been explored for potential contamination. Current threats include:

- The increased use of fertilizers and pesticides on adjacent timber lands to increase the timber yield by shortening the rotation cycle.
- The influence of paper mills and chemical plants within the airshed.
- The use of gas-powered motorboats by the public and refuge staff to travel into the Okefenokee Swamp.
- The future impact of DuPont mining sand derivatives along the east side of the refuge having the potential to release contaminants from the disturbed soils.

Surface water and dry and wet deposition from the atmosphere are the primary contaminant pathways to the Okefenokee Swamp. Long-term atmospheric monitoring (including both wet and dry deposition) exists on the refuge to preserve the quality (including visual quality) of the Class I Airshed. This site also serves as a regional reference.

In 1998, Okefenokee's monitoring site measured high levels of mercury in rainfall, rating fifth from the highest out of 30 sites. The state of Georgia has issued a fish consumption advisory for the Okefenokee Swamp and the Suwannee River due to elevated mercury levels. Elevated levels of mercury have been found throughout the food chain.

What contaminant issues concern you the most in relation to the health of the Okefenokee Ecosystem? (Please check all that are of concern.)

- ☐ Fertilizers/Nutrients
- ☐ Pesticides
- ☐ Industry (Paper mills, chemical plants, etc.)
- ☐ Motor boats
- ☐ Noise Pollution
- ☐ Light Pollution
- ☐ Mercury
- ☐ Lead
- ☐ Visibility Impairment due to smog
- ☐ Contaminants within the food chain
- ☐ Increased development
- ☐ Mining

Please explain further your answer to the above question:

Please write your ideas and suggestions on this page, fold in half with the pre-addressed return mailer on the outside, and tape together. Put on the proper postage and drop in the mail before November 30, 2001. Thank you for your help; we really appreciate it. If you have any questions or would like more information about this project, please call us.

Okefenokee NWR, Route 2, Box 3330, Folkston, GA 31537 912/496-7366

Public Use/Education

Public Use

The refuge provides educational and compatible recreational opportunities. There are three major entrances to the refuge (East, West, and Swamp Park) and two unstaffed entrances (Kingfisher Landing and the Sill). The policy of the refuge with regard to public use is to provide high quality rather than high quantity experiences to the visitors. Actual access by the public is limited to less than 10% of the total refuge acreage. Over 400,000 people visit Okefenokee National Wildlife Refuge each year. Visitation varies with the seasons of the year, weather patterns, days of the week, and in the past, the availability of gasoline supplies. The peak visitor seasons are March through July and October through November.

A wilderness canoe trail system was organized in 1972. Visitors venturing into the swamp are restricted to the main trail arteries. Approximately 120 miles of trails are maintained. Approximately 50 miles of this trail system is dedicated for non-motorized boat travel only.

Are you concerned with any of the following in relation to public use opportunities: (Please check all that are of concern.)

- ☐ Recreation Use Fees
- ☐ Visitor Centers (East and West entrances)
- ☐ Services provided on-site
- ☐ Environmental Education on and off-refuge
- ☐ Observation Towers
- ☐ Cultural Interpretation/Exhibits
- ☐ Walking Trails
- ☐ Picnic Areas
- ☐ Group Facilities
- ☐ Special Events
- ☐ Public tours
- ☐ Stephen C. Foster State Park facilities and interpretation
- ☐ Access
- ☐ Day Canoeing and boating
- ☐ Overnight Canoe Trips
- ☐ Fishing
- ☐ Wildlife Observation
- ☐ Photography
- ☐ Hunting
- ☐ Biking
- ☐ Camping
- ☐ Concessionaires
- ☐ Okefenokee Swamp Park interpretation

Please explain what concerns you have on the items checked above:

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Education/Public Use

Education

Educating people about the Okefenokee National Wildlife Refuge and its resources is accomplished through various formats. Locally, the recently renovated visitor center at the swamp's east entrance acts as the first introduction to the majority of the visiting public. Interpretive trails also provide information on the area's key fauna/flora and the refuge's management. On-site special events try to draw families, groups, and tourists in from the regional area. The refuge's partnership with Zoo Atlanta provides an opportunity to address state-wide audiences. National and international audiences are reached through newspaper and magazine articles, television broadcasts, and the Internet.

Refuge staff educate teachers to be Okefenokee guides for their students through environmental education workshops. In addition, staff has hosted several programs for the statewide GSAMS (Georgia Statewide Academic and Medical System) program, bringing interactive environmental education programs to elementary and secondary students statewide.

Besides refuge staff, staff at Okefenokee Adventures and private guides are presented with refuge materials to encourage interpretation of the surrounding landscape. Stephen C. Foster State Park, Fargo, GA and privately operated Okefenokee Swamp Park, Waycross, GA have educational facilities and interpreters also.

If the proposed Okefenokee Educational and Research Center is established in Folkston, GA, additional educational opportunities will be available.

What educational opportunities are important to you? (Please check all that are important to you.)

- ☐ Visitor Centers and Displays
- ☐ Interpretive Signs along trails
- ☐ Guided Tours
- ☐ Newspaper/Magazine articles
- ☐ Television Programs
- ☐ Special Events Presentations
- ☐ Internet
- ☐ Off-site education
- ☐ Student education
- ☐ Teacher education
- ☐ GSAMS
- ☐ Educational and Research Center
- ☐ Other (please specify)

Please explain what concerns you have on the items checked above:

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Research/Partnerships/Acquisition

Research

Okefenokee National Wildlife Refuge has attracted a large number of researchers through the past century. Some have studied it in depth while others come to compare it with other research sites. The refuge staff realizes the importance of research as a basis for effective decision making. Refuge management staff monitor long-term trends but seek outside assistance to examine specific aspects of this dynamic system. The refuge staff evaluates the benefits of proposed research along with the legal mandate of determining the compatibility of all research with refuge objectives and other activities being conducted on the refuge. Conducting research in a Wilderness area is important; however, if the nature and purpose of the research is such that it can be done in a non-Wilderness area, a Wilderness area should not be used. Special Use Permits are issued to researchers as an agreement between the researcher and the refuge, outlining conduct, methods approved, and submission of results.

Recently, outside interest groups have proposed to establish an educational and research center in nearby Folkston, GA. This facility would promote expanded research efforts within the refuge and surrounding landscape.

What concerns do you have related to research that is conducted on the refuge? (Please check all that you are concerned with.)

- ☐ Too many researchers
- ☐ Long-term monitoring
- ☐ Specific short-term research
- ☐ Special Use Permit process
- ☐ Proposed Educational and Research Center

Please explain what concerns you have on the items checked above:

What is the top priority research need for Okefenokee Ecosystem in your opinion?

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Cultural Resources

"For centuries, the Okefenokee Swamp was for many people a great common — a public land filled with food and fur and space for those in need. Some fled to it for refuge from hostile neighbors. Indians used the Swamp as a hunting ground. Pioneer settlers grazed cattle and hogs in the Okefenokee and the surrounding pine lands throughout the 19th century. They managed the open long-leaf pine forest with fire, promoting food for game and livestock and enhancing the growth of huckleberries and gallberries.

Lumber and naval stores industries reached the Swamp as early as the 1850's. Entrepreneurs, employing new dredging and logging technology, launched an effort to drain the Okefenokee during the 1890's, but the effort failed.

Nevertheless, the steam-powered sawmills, steamboats, steam dredges, steam-powered logging skidders, and steam railroad locomotives were powerful engines of economic and social transformation on the Okefenokee Swamp frontier in South Georgia in the late 19th century. Between 1880 and 1930, the modern world poured in. New jobs, new goods, new ideas and new people arrived. The area was stripped of its trees and traditions." (Exploring the Okefenokee; Railroads of the Okefenokee Realm, C.T. Trowell and L. Fussell, Research Paper No. 6, December 1995)

What remain are native American mounds and artifacts, old homestead sites, turpentine scars and pots, relict trees, pilings and trails from tramlines, pieces of steam powered vehicles, and rails. With each ground breaking in previously undisturbed areas, the refuge is obligated to conduct a cultural resource survey. Collection of items is not permitted with the understanding that their placement is just as important as the item itself.

Currently, the only buildings on the National Historic Register are Floyds Island Hunt Cabin and Hopkins Cabin within the Camp Cornelia complex.

Are there other areas or buildings that should be considered for additional protection? (Please specify.)

What concerns do you have related to the protection of cultural resources?

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Partnerships/Acquisition/Research

Partnerships

Okefenokee National Wildlife Refuge thrives on its many partnerships. The refuge is a member of the Suwannee Basin Interagency Alliance to promote communication and coordinate management efforts within the Basin. The Greater Okefenokee Association of Landowners has brought industrial and private forest managers, federal and state agencies, and other private landowners together to facilitate communication and cooperation in dealing with forest resource issues. A Tri-Agency Agreement serves as a vehicle to allow for mutual assistance among the Refuge, Osceola National Forest, and Cumberland Island National Seashore. To promote better understanding, appreciation, and conservation of Okefenokee NWR, the Okefenokee Wildlife League, a non-profit cooperating association, was formed. A partnership with Zoo Atlanta was one of the first Zoo-Refuge partnerships that occurred nationally. Partnerships on a smaller scale are just as important where equipment and knowledge is shared to accomplish projects that benefit both parties. Through partnerships, the ecosystem can be looked at as a whole and off-refuge issues affecting the swamp can be addressed.

What types of partnerships and joint projects would you like to see the refuge get involved with?

Acquisition

Acquisition of additional lands has not been a high priority for Okefenokee NWR. Land trades are occasionally considered for purposes of facilitating management. Lands increasing the potential for greater numbers of red-cockaded woodpeckers on the refuge would be considered strongly if there were willing sellers.

Do you have any concerns related to the expansion of Okefenokee National Wildlife Refuge if suitable land was available? (Please explain your answer.)

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Appendix X. Public Comments

PRESENTATIONS

Fish-a-rama
Buck-a-rama – Atlanta, GA
Buck-a-rama – Perry, GA
Pelican Island Celebration
Elder Hostel
East side Hunt Clubs
Okefenokee Wildlife League
Folkston Kiwanis Club
Charlton County Chamber of Commerce
Folkston City Council
Clinch County Commissioners
Charlton County Commissioners
Waycross Tourism Bureau
Waycross Chamber of Commerce
Waycross Downtown Development Authority
Ware County Commissioners
Waycross City Council
Waycross College
Waycross Rotary Club
Waycross Exchange Club
Douglas Kiwanis Club
Stephen C. Foster State Park staff
Okefenokee Swamp Park Board of Directors
Wilderness Training (Camp Weed)
Four Rivers, Two States, One Basin – A Research Symposium

PUBLIC WORKSHOPS

Homerville, GA - September 18, 2001	10 people
St George, GA - September 20, 2001	5 people
Fargo, GA - September 25, 2001	6 people
Waycross, GA - September 27, 2001	9 people
Folkston, GA - October 4, 2001	10 people

SUMMARY OF PUBLIC COMMENTS PRIOR TO THE WRITING OF THE CCP

Public Comment Period: July 15, 2001 - December 1, 2001
25 General Questionnaires completed
22 Letters/Phone calls received

SUMMARY OF GENERAL QUESTIONNAIRE

1. What do you value most about Okefenokee National Wildlife Refuge?

	N=23	Percentage
Open protected space	18	78%
Native fauna and flora	19	82%
Scenic quality	17	74%
Wilderness qualities	17	74%
Hiking trails/boardwalk	13	57%
Photographic opportunities	13	57%
Wildlife observation opportunities	20	87%
Interpretive/educational opportunities	13	57%
Hunting opportunities	9	39%
Fishing opportunities	12	52%
Boating opportunities	12	52%
Camping opportunities	16	70%
Historic and cultural sites	11	48%
Other	4	17%

Other:

a. Eastern Treasure
b. National
c. Natural
d. Public Access

2. What do you want the future to hold for Okefenokee National Wildlife Refuge?

	N=23	Percentage
Little or no change	11	48%
More public use and access	5	22%
Controlled public use and access	1	4%
Less public use and access	1	4%
More recreational opportunities	7	30%
Less recreational opportunities	1	4%
More fish and wildlife	13	57%
Stricter enforcement of regulations	8	35%
More resource management efforts	7	30%
Less resource management efforts	1	4%
More canoeing opportunities	10	43%
Less canoeing opportunities	0	0%
Other	3	13%

Other:

a. More education
b. More visiting hours
c. Don’t burn too much

3. What are your major concerns about Okefenokee National Wildlife Refuge?

	N = 23	Percentage
Human disturbance	19	83%
Incompatible development on neighboring lands	15	65%
Contaminants	17	74%
Natural disasters	2	9%
Wildfires	7	30%
Prescribed fires	2	9%
Plant succession	6	26%
Changes in wildlife/fish populations	9	39%
Increased public use and access	8	35%
Loss of traditional uses	11	48%
Other	3	13%

Other:

a: Awareness
b. DuPont
c. Foot trails, canoe trails

4. Please include any additional comments you wish to make on your values and vision of Okefenokee National Wildlife Refuge.

5. How frequently do you visit Okefenokee National Wildlife Refuge?

	N = 23	Percentage
More than 12 times a year	3	13%
6 to12 times a year	0	0%
2 to 6 times a year	7	30%
Once a year	5	22%
Once every 5 years	2	9%
Less frequently	6	26%

6. Which entrances have you visited and approximate number of times?

	N = 23	Percentage
Suwannee Canal Recreation Area (East entrance)	12	52%
Stephen Foster State Park (West entrance)	15	65%
Swamp Park (North entrance)	8	35%

7. When do you visit the refuge?

	N = 23	Percentage
Spring (March - May)	15	65%
Summer (June - August)	9	39%
Fall (September - November)	8	35%
Winter (December - February)	8	35%
During Special Events	0	0%

8. What do you do at the refuge?

	N = 23	Percentage
Canoe	11	48%
Motorboat	8	35%
Observe fauna and flora	15	65%
Fish	9	39%
Hunt	1	4%
Walk boardwalk/trails	16	70%
Camp	10	43%
Visit interpretive centers	12	52%
Picnic centers	5	22%
Photography	15	65%
Other	4	17%

Other:

a. Educational programs
b. Volunteer
c. Teach groups
d. Peace/tranquility

9. Do you own property that shares a common boundary with the refuge?

	N = 23	Percentage
Yes	1	4%
No	22	96%

10. Do you hunt on land adjacent to the refuge?

	N = 23	Percentage
Yes	2	9%
No	21	91%

11. Did you attend one of the public meetings?

	N = 23	Percentage
Yes	2	9%
No	21	91%

12. In what town do you reside? State?

State	N = 25	Percentage
Georgia	20	80%
Alabama	2	8%
Florida	1	4%
Tennessee	1	4%
North Carolina	1	4%

Forest Management

	N = 7	Percentage
Native wildlife and plants	6	86%
Timber harvesting/selective thinning	3	43%
Restoration of longleaf pine	6	86%
Prescribed burning	6	86%
Wildfire control	4	57%
Preservation of wilderness	4	57%
Endangered species	3	43%

Comments:

a. Education campaign on fire and LLP
b. Harvesting meeting goals?
c. Emphasize
d. Most beautiful area

Fire Management

	N = 7	Percentage
Prescribed burning on refuge forested uplands	5	71%
Prescribed burning within wetlands	5	71%
Prescribed burns on private timberlands adjacent to refuge.	3	43%
Fire prevention and suppression	3	43%
Wildfire within the swamp	3	43%
Wildfire moving out of the swamp	3	43%
Smoke	3	43%
Impacts of fire on native plants and wildlife	3	43%
Soil disturbance from fire lanes	3	43%
Swamps Edge Break (Fire break on the edge of the swamp)	5	71%
Perimeter Road (Access road and second fire break around swamp)	2	29%
Fuel Reduction Zone (Area between the Swamps Edge Break and Perimeter Road where fuels are kept low to lessen the intensity of fire moving between the swamp and timberlands.)	0	0%

	N = 7	Percentage
Greater Okefenokee Association of Landowners (A team of landowners working together to manage, protect, and promote forest resources in and around the Okefenokee Swamp.)	2	29%
Other	3	43%

Other:
a: Wildfires due to insufficient Rx burning
b. Rx burning looks bad
c. Support natural fires

Wildlife/Fish Populations

	N = 8	Percentage
Threatened and endangered species	5	63%
Red-cockaded woodpeckers	3	38%
Colonial birds	3	38%
Wood duck	4	50%
Osprey	4	50%
Waterfowl	3	38%
Songbirds	4	50%
Raptors	4	50%
Sandhill cranes	3	38%
Amphibians	3	38%
Reptiles	3	38%
Alligators	3	38%
Fisheries	4	50%
Black bears	3	38%
Deer	3	38%
Small game species	3	38%
Other:	5	63%

Other:
a: Refuge staff should know species concerns.
b: Some over managed: private profiteering.
c: Natural populations in natural settings
d: Fisheries biologist needed
e: Gopher tortoise and wild cats

Contaminants

What contaminant issues concern you the most in relation to the health of the Okefenokee Ecosystem?

	N =8	Percentage
Fertilizers/Nutrients	6	75%
Pesticides	5	63%
Industry (paper mills, chemical plants, etc.)	5	63%
Motorboats	5	63%
Noise Pollution	4	50%
Light pollution	3	38%
Mercury	4	50%
Lead	4	50%
Visibility impairment due to smog	2	25%
Contaminants within the food chain	5	63%
Increased development	4	50%
Mining	6	75%

Comments:

a. Use sound scientific evidence.
b. Anything harmful, smoke
c. Eliminate the use of internal combustion engines
d. Mining seems likely to be a problem
e. All harm-vs benefit (i.e. motorboats and access)
f. 4-stroke outboard motors

Wetland Management

What makes the Okefenokee Swamp valuable to you?

	N = 7	Percentage
As a place for wildlife and plant observation	7	100%
As a wild and natural place	7	100%
As a place for recreation opportunities	6	86%
As a water storage basin	6	86%
As a research area	5	71%
As an educational facility	6	86%

As a filter of contaminants	5	71%
As a barrier for managing wildfires	4	57%
Other	3	43%

Other:

a. Water storage
b. Current management good
c: Keep open water trails

Wildlife Management

Are any of the following of interest to you in regard to wilderness designation?

Airboat use	2	29%
Motorboat use	3	43%
Helicopter use	2	29%
Use of minimum tools	3	43%
Wilderness ethics	4	57%
Endangered species management	4	57%
Public use facilities	3	43%
Wildlife surveys	4	57%
Prescribed burning and wildfire surveillance	3	43%
Other	6	86%

Other:

a: RCW survive w/out help? Preserve RCW in LLP
b: No motorboats/helicopters. Don't overdue airboat
c: Use most efficient tool - SOP good
d: More and longer foot trails
e: Open middle fork to motors
f: Publication needed

Public Use

Are you concerned with any of the following in relation to public use opportunities?

	N = 9	**Percentage**
Recreation use fees	3	33%
Visitor Centers (East and West entrances)	2	22%
Services provided on-site	2	22%
Environmental education on and off site	3	33%

	N = 9	Percentage
Observation towers	4	44%
Cultural interpretation/Exhibits	3	33%
Walking trails	4	44%
Picnic areas	1	11%
Group facilities	0	0%
Access	3	33%
Day canoeing and boating	5	55%
Overnight canoe trips	4	44%
Fishing	3	33%
Wildlife Observation	5	55%
Photography	4	44%
Hunting	0	0%
Biking	2	22%
Camping	4	44%
Special events	3	33%
Concessionaires	3	33%
Public tours	0	0%
Stephen C. Foster State Park facilities and interpretation	3	33%
Okefenokee Swamp Park interpretation	3	33%

Comments:

a: Love boardwalk/tower, need one on west
b: Excess of use
c: 10% total for public use is good; keep facilities on edge
d: No more concessions; access
e: Current level good
f: More trails; fee mini
g: Wish no motorboats, balance OK
h: T-Plus Notes

Education

What educational opportunities are important to you?

	N = 9	Percentage
Visitor Centers and displays	5	55%
Interpretive signs along trails	5	55%
Guided tours	2	22%
Newspaper/magazine articles	3	33%
Television programs	3	33%
Special Events presentations	4	44%
Internet	1	11%
Off-site education	3	33%
Student education	2	22%
Teacher education	2	22%
GSAMS	1	11%
Educational and research center	4	44%
Other	8	88%

Other:

a: Promote as International attraction
b: Over ed brings undesirable elements
c: Planning good; Remote methods good
d: Educating public on ecosystems
e: VC worth the $
f: Outreach (Atlanta); Volunteer for education
g: Conflict w/more PU and solitude/wilderness
h: One comprehensive book

What concerns do you have related to research that is conducted on the refuge?

	N = 8	Percentage
Too many researchers	0	0%
Long-term monitoring	2	25%
Specific short-term research	4	50%
Special Use Permit process	1	13%
Proposed Educational and Research Center	5	63%

Comments:

a: Ed center great, remove markers, PU capacity
b: Observe as is, time and nature prevail
c: Research acceptable deeper in swamp
d: Center decent idea
e: More if no harm, positive for resources
f: Need understanding to manage; human impact; fire; con
g: Species recovery and surrounding area
h: Impacts of surrounding land use practices

Partnerships

What type of partnerships and joint projects would you like to see the refuge get involved with?

Comments:

a: Positive interest
b: GA Wildlife Federation
c: Better/stronger partnerships/meaningful work for Vol's
d: The Nature Conservancy
e: Look at small Oke oriented businesses as partners

Acquisition

Do you have any concerns relates to the expansion of Okefenokee National Wildlife Refuge if suitable land was available?

Comments:

a: Ecological beneficial; buffer area
b: Is buying an option?
c: Anxious about Dupont
d: Go forward before too late
e: Support adjacent land acquisition

Cultural Resources

Are there other area or buildings that should be considered for additional protection?

Comments

a: Treat like the natural resources
b: Leave as is
c: Good condition OK otherwise no
d: Keep good reminder of the past
e: Honey is hunting shanty
f: Zen philosophy: Let Go
g: CCC camp

COMMENTS RECEIVED VIA LETTER (INCLUDES FAX) AND PHONE

Number	Contact Type	Date	Location	Comments
				No Comment
31	Letter	Sept 27, 2001	Tallahassee, FL	• Florida's Department of Community Affairs
				Hunting
26	Phone	Sept 4, 2001	Jacksonville, FL	• Continue hunting on refuge. • Include an archery hunt on Billys Island.
40	Letter	Nov 29, 2001	Ashville, NC	• Have special hunts to control the wild boars. Eradicate them.
43	Phone	Oct 16, 2001	Jacksonville, FL	• Glad to have hunting on the Pocket again. • Likes to camp at Stephen Foster State Park. • Consider an archery season in November. With the current West Nile Virus scare, hesitant to camp out during warmer weather.
				Wilderness
27	Letter	Oct13, 2001	Grangeville, ID	• No motorized activity including helicopters on islands. • Re-evaluate need for day-use shelters. Use tents. • Fire is a natural thing and should not be extinguished. Reduce fuels near structures. • No predator control.
28	Letter	Oct 10,2001	Boulder, CO	• No motorboats on trails in Wilderness. • Use non-motorized watercraft for maintenance of boat trails and accessing other resources. • Re-evaluate need for day-use shelters. • Use canoe and rowboat for wildlife surveys. No helicopters. • Let burn and establish fuel breaks along the refuge boundary rather than use helicopters for prescribed burns and water drops. • No predator control. • Research carried out in wilderness utilizes compatible methods, unless incompatible methods are absolutely necessary to assure T&E survival. • Comply with "minimum requirements" and "minimum tool analysis" prior to approval of mechanized use.
29	Letter	Oct 13, 2001	Minneapolis, MN	• Same as #28

Number	Contact Type	Date	Location	Comments
30	Letter	Oct 30, 2001	Wilderness Watch, Policy Dir, Missoula, MT	• Same as #28. • Protection of wilderness character be formally recognized in the CCP as one of the refuge's primary purposes. • Remove day-use shelters or provide a written minimum requirement analysis that documents their necessity for protecting the wilderness area. • Prohibit commercial enterprises in Wilderness. • Habitat manipulation allowed if critical to the recovery of a T&E species. • Management-ignited prescribed burns are an intentional manipulation of wilderness and should not be allowed in the Okefenokee Wilderness. It may be used if necessary for the recovery or survival of a T&E species. • Natural processes should prevail.
33	Letter	Nov 1, 2001	GA Chapter Of Wilderness Watch	• Scientific research outside the wilderness if possible. • No predator control. • Let natural fires burn. • Trail maintenance, wildlife surveys and other management activities conduct by canoe, not airboat or helicopters.
34	Letter	Nov 1, 2001	El Cerrito, CA	• First six comments in Letter #28. • Include the following from the USFWS's draft policy in the CCP: "We strongly influence public education and wilderness ethic formation by the way we conduct our business in the wilderness. We must always be aware of the message our activities convey about appropriate wilderness behavior, norms, and attitudes." (610 FW 4.10)
35	Letter	Oct 22, 2001	Bellaire, TX	• Same as letter #28 • People can walk to RCW clusters to conduct monitoring, like they do in Texas. • Oppose use of gas powered weed eaters in RCW areas.
40	Letter	Nov 29, 2001	Ashville, NC	• Fewer motorboats on canoe trails. • Oppose the conversion of the Orange trail between 12-15 mile markers to a motorboat trail.

Number	Contact Type	Date	Location	Comments
45	Letter	Dec 3,2001	Wilderness Society, Atlanta, GA	• SOP's have very little discussion on "minimum requirements" and "minimum tool requirements". • Large number and intrusiveness of non-conforming activities. • Public has not had the opportunity for review and comment on these activities. • Consider hand tools or another device instead of weed-eaters. • Look at options other than helicopters to reach islands. • Motorboats should no longer be used within the wilderness for maintenance of "canoe only" trails. • Use non-motorized watercraft for maintenance of trails and other resources. • Adopt the Carhart model for minimum requirement analysis. • No controlled burns should be done within the Wilderness except for the recovery or survival of a T&E species. • Increase educational program on wilderness. • Daily visitors within the Wilderness should be limited. - Study the number of daily visitors that should be allowed within the wilderness and establish measures to keep the level to reasonable numbers. • There should be few motorized boat trails within the wilderness except those used for RCW management.
			Land Conservation	
32	Letter	Nov 29, 2001	Sierra Club, Middletown, DE	• Purchase or establish conservation easements on areas identified in the DuPont No-Mining Agreement. The 7500 acres along the Suwannee Canal Rd and swamp fingers on the east edge should be permanently protected. • Provide mechanisms to acquire land outside the Perimeter Rd.
41	Letter	Nov 24, 2001	Augusta, GA	• Make acquiring upland land your high priority. • USFWS should purchase land or conservation easements of areas identified in the DuPont No-Mining Agreement. • Link the Okefenokee habitat with the Pinhook Swamp and Osceola National Forest. • Link with the corridor along the Suwannee River.

Number	Contact Type	Date	Location	Comments
44	Letter	Nov 27, 2001	Arlington, VA	• Purchase or establish conservation easements on areas identified in the DuPont No-Mining Agreement. The 7500 acres along the Suwannee Canal Rd and swamp fingers on the east edge should be permanently protected. • Link the Okefenokee habitat with the Pinhook Swamp and Osceola National Forest. • Link with the corridor along the Suwannee River.
				Land Management
32	Letter	Nov 29, 2001	Sierra Club, Middletown, DE	• Management partnerships should be encouraged to protect wildlife on adjacent private lands. • Educate the public on Fire program with neighbors (GOAL). • Include funding needs for the restoration of the “sill area”. • Work with neighboring communities and counties to protect the entire watershed. Sprawl development should not be allowed.
38	Letter	Oct 19, 2001	Georgia Canoeing Association, Inc	• Supports current mission statement. • Supports planned removal of the Suwannee Sill. • Promotes natural fire cycle to prolong the swamp’s wetlands. • Support no-mining option in DuPont agreement.
40	Letter	Nov 29, 2001	Ashville, NC	• Concerned about fertilizers/nutrients, and pesticides used outside the refuge causing water contamination within the refuge. • Water contamination from 2-stroke engines. • Elevated levels of mercury and lead a concern for public health and the health of the ecosystem. • Increased development in north Florida may put constraints on management of fires. • May mining of titanium dioxide never happen. Take steps to prevent it in the future. • Protect waters/soils from further degradation in pH and contaminants which work their way into the food chain to the detriment of the fish and wildlife populations. • Eradicate all invasive exogenous species. • Continue to restore the longleaf pine/wiregrass ecosystem and other native habitats.

Number	Contact Type	Date	Location	Comments
41	Letter	Nov 24, 2001	Augusta, GA	• Encourage partnerships with adjacent landowners for management of wildlife on private lands. • Continue restoration of longleaf pine habitat in upland areas and develop demonstration project for visitors to see restoration of endangered species habitat. • Protect and restore wetlands in neighboring uplands areas surrounding the refuge. • Protect refuge from development in the watershed and in particular storm water run off and septic tanks.
42	Letter	Nov 29, 2001	Athens, GA	• Concern: Ecological damage associated with anthropogenic perturbations of the surficial aquifer. • Oke staff needs to take an aggressively active role in determining the fate of/restoring the regional groundwater resources (Floridan aquifer system). • Include provisions for staff to formally oppose activities proposed exterior to the refuge boundaries that will result in additional groundwater alternations within the refuge. • Contact the director of USGS and the Governors of GA and FL to request information on historic groundwater withdrawals to address the best approach for restoring the groundwater resources that historically supported the Okefenokee Swamp but have been diverted by man for off-site use.
44	Letter	Nov 27, 2001	Arlington, VA	• Make conservation of a greater land area within the watershed a priority by protecting through purchase or partnerships. • Protect the watershed from encroaching development. • Restore habitat for endangered species and publicize these efforts. • Continue your natural fire cycle program and education. • Seek fund to restore the Sill area.
45	Letter	Dec 3,2001	Wilderness Society, Atlanta, GA	• Monitor water quality on a regular basis to compare levels of contamination. • Educate adjacent landowners about the possible effects of agricultural practices on the water quality.

Public Use

Number	Contact Type	Date	Location	Comments
32	Letter	Nov 29, 2001	Sierra Club, Middletown, DE	• Prepare properly for visitation to the area - bathroom space and upgrades to the concession area.
36	Letter	Oct 2, 2001	Orchard Lake, MI	• Need more outreach programs and take the opportunity to give impromptu lectures and tours when situations arise. • There is a lack of a public presence of refuge personnel within the refuge. • Adopt zero tolerance for law enforcement. • Give volunteers magnetic signs for their personal vehicles to give them credibility and deter wildlife harassment. • Interpretive signs needed. (Possibly in stairwell of the tower.) • Okefenokee lacking in interpretative tools. • Construct a new overnight cabin at Big Water for use by motor boat visitors only. • Create a Chesser Island Hiking Trail from cabin site across from the Homestead to Francis Harper's vacation cabin. • Create new swamp boardwalks from Suwannee Canal to Bugaboo Island, and to Cypress head in Grand Prairie. • Build a 10-12 ft observation platform just off the boardwalk at the prairie area before getting to the tower.
37	Letter	Sep 20, 2001	Charlton County Family Connection, Folkston, GA	• Great activities, events, cooperation with educators and children's groups at the refuge. • Still a lack of appreciation for the natural resources in the surrounding area by the local community. More outreach is needed.
38	Letter	Oct 19, 2001	Georgia Canoeing Association, Inc	• Supports gradual addition of overnight canoe-only trails to enable more to experience the Okefenokee.
39	Letter	Sep 4, 2001	Swamp Park, Waycross, GA	• All three entrances need to promote visitation. • Lobby for advertising dollars. • Establish a driving tour around the swamp so all 3 entrances/counties will benefit. • Provide shuttle service package to all 3 entrances during peak times. • Routinely cut all trails with goal of entrance to entrance boat tours during peak water levels. • Make fire reports less destructive to the tourist business.

Number	Contact Type	Date	Location	Comments
40	Letter	Nov 29, 2001	Ashville, NC	• Expand the education of adults and school children. • Education and Research Center is timely. • Separate canoeists from motor boat users. Consider opening old airboat trail. • Phase in 4-stroke engines to minimize pollution. • Okefenokee Adventures doing well in providing quality items and using 4-stroke engines. • Increased development in north Florida will put a burden on resources by visitors. • Okefenokee provides humans a place to relieve the stresses and cares of our hectic lives.
41	Letter	Nov 24, 2001	Augusta, GA	• Bathroom facilities are needed on the eastern side of the refuge with bathroom spaces.
25	Letter	Dec 03, 2001	Okefenokee Pastimes, Folkston, GA	• Entice visitors to stay longer in the area. • 20% of Entrance fee is to high to go to a private business (concession). All Duck Stamp money should go to the USFWS. • First contact at the refuge should be by a refuge staff or uniformed USFWS volunteer. The private business may promote their business over refuge opportunities. • VC is hard to see. VC should be the focus and starting point for the public. • Commercial fee collection process should be re-examined. The concession (as a competing business) should not be responsible for collecting and enforcing commercial fees on their competitors for sales of the same services. • The $25 fee makes it impossible to rent a boat to our guests that do not have a means to transport it. • More and longer walking trails with more substantial interpretive materials are needed. • Establish a bike trail from the entrance all the way to the boardwalk. • Bring back “Sandhill Crane Awareness Day”. “Wings over the Swamp” sounds like a military air show. • Have Friends Group eventually take over the concession. Create more trails for paddlers and loop trails. Create a loop

Number	Contact Type	Date	Location	Comments
				trail in Mizell prairie back to the Orange trail. • The minority cultures (Black and Native American) should be given more of a presence than they currently have.
43	Phone	Oct 16, 2001	Jacksonville, FL	• Cut trail into Blackjack Lake again.

COMMENTS RECEIVED DURING PUBLIC WORKSHOPS

Homerville, GA September 18, 2001 10 people

- Any species needing special protection or emphasis?
- Concern with bass fishery and acid deposition.
- What, if any, land acquisition/wilderness increase is planned?
- Long range plan for Suwannee River Sill?
- Feasibility of public access to Suwannee River and parking lot location?
- Plans for facilities/public use within the swamp?
- Plans for hunting on the refuge?
- Proposed routes for long-distance hiking trails? Overnight routes?
- Air quality measuring?
- How does industry submit paperwork?
- When are we going to get rid of outboard motors in the swamp?
- Public takes this national refuge for granted.
- Would like to see turkey hunting on the Pocket.
- Status of the bear population and close encounters with the public.

St George, GA September 20, 2001 5 people

- Status of the Sill in the CCP.
- What is the optimal amount of public use?
- Current annual visitation?
- Why is visitation going down? Discuss trends, fires, drought, fuel prices.
- Is cultural resources inventory included in plan? Interpret and educate.
- Is there a site on West Side comparable to Chesser Island Homestead?
- Impacts on visitation from new amphitheater and 4-laning of Hwy 40.
- Alternate means of transporting visitors to various refuge entrances, based on historical or interpretive themes.
- Concern with trophy hunting.
- St Marys has lots of garbage that should be dealt with.
- Where is wilderness vs non?
- What is a fire-dependent community?
- How may acres burned on the St George fire? How was the fire started?
- Why do you prescribe burn?
- What is the periodic prescribed burn ratios?
- Do animals get caught in the fire?
- What happens if a fire gets out of control?
- Do the trees burned by the fire get logged?
- Why is there less than 438K acres in refuge?
- When does the 15-year period begin?
- What is land acquisition priority?
- Has refuge land been logged?
- What types of trees would be logged in relation to horse drawn logging operations?
- Describe ecosystem based partnerships and research...
- Hoping OERC will bring long-term research - maybe use private lands for research that may involve habitat damage. Hope there is place for refuge staff on OERC board.
- Research on how to eliminate palmetto and gallberry.
- What is the relationship with wilderness groups?
- How many RCW clusters and where? Any in slash pine areas.
- Do we have partnerships along the south side to connect the refuge with Osceola NF?

- How does Oke rank in RCW compared with other RCW areas?
- Have we altered management in last few years-USFWS, Landowners, Forest Service?
- Do we need artificial inserts to kickstart a colony?

Fargo, GA September 25, 2001 6 people

- Has there been a written management plan before?
- How will the CCP change day-to-day management after it is written?
- Are there any proposed changes to management plan by the refuge?
- Swamp boundary vs refuge boundary?
- Are there plans to add more wilderness? What is not included?
- Are there areas that can be included in wilderness?
- Are there plans for federal ownership of area south of Eddy Tower (Pinhook) (either Forest Service or FWS)?
- What endangered species exist on the refuge?
- Concern with water flows.
- Status of the sill: Good to re-connect river and swamp.
- What is the status of water quality in regard to Fisheries in comparison to Suwannee River, St Marys and Alapaha Rivers?
- Is tanic acid related to burning?
- Discussion on pH levels in the swamp and the Suwannee River, the sources of pH, fisheries studies, effects of droughts, and the changing fish composition.
- Do you test pH throughout the swamp?
- How many monitoring stations in the swamp and where are they?
- When does pH effect non-game species?
- Does high water effect non-game species?
- What is the pH of rain?
- Do shiners respond to low pH?
- Which areas have warmouth been found?
- Will bluegills come from the Swamp?
- Bluegill would be the species that would be used to stock with.
- Are there any indications of small game fish?
- Are prey fish plentiful for wading birds?
- Questions about Toledo property and DuPont's mining proposal status.
- Why has visitation dropped since 1996? Compare with other similar sites nationwide?
- Is recreation addressed in the CCP?
- Increase visibility in St Simons, Jekyll Island, Jacksonville, Savannah, Amelia Island, Tallahassee, St Augustine, Atlanta, Macon, Tifton, Valdosta.
- Need no negative media coverage in regards to fires, droughts, etc.
- Is there a limitation on numbers of visitors? Is there discussions on limiting numbers?
- Are there plans to open additional trails?
- Current and future hunting opportunities.

Waycross, GA September 27, 2001 9 people

- Keep it wild and natural.
- Refuge staff is watching over it with care.
- Remember what refuge was for.
- Work towards restoring longleaf pine communities.
- Work with neighbors to enhance RCW habitat.
- What can be done about the hazards of fire - smoke, escape, changing winds, protecting human interests.

- Current management practices surrounding the swamp and the draining of forest lands.
- Plans for long term water management such as the Sill area?
- Is mercury monitored in downstream release (Sill)?
- What is the status of the DuPont issue?
- Do not allow mining of titanium near or on the refuge.
- Who will own DuPont land if issue is resolved?
- Protect it from outside influences - DuPont, mercury, development
- How can we protect swamp perimeter as rural populations increase?
- Are density control/zoning options feasible?
- Conservation easements?
- Do not allow 4-wheelers, etc., to tear up trails. Start controls now.
- Do not allow the construction of a highway from US 1 to Homerville.
- Do we foresee long-term changes with outboard motor size? Restrictions cause limitations in accessibility.

Folkston, GA October 4, 2001 10 people

- Are other federal agencies involved in the plan?
- Will local communities have the opportunity to comment on the plan before implementation?
- What is the timeline for implementation of the CCP? Funds for implementation?
- How are we promoting wiregrass?
- Are we doing thinning in timber stands and with what?
- Pine thinning is good for habitat and forest health.
- Is longleaf pine being planted along the perimeter of the swamp on private lands?
- Are we improving longleaf pine stands through burning?
- Are we conducting prescribed fires similar to operations off-refuge?
- What is the public response to the fire program?
- Demonstration site on prescribed burning on the wildlife drive is effective for the visitors.
- Prescribed burning has been good for wildlife habitat and the reduction of hazardous fuels.
- How are fires within the swamp (lightning) handled?
- Discussion on RCW and habitat needs.
- What happens to the woodpeckers you re-locate?
- Are they re-located within the refuge?
- How do you get a count of the woodpeckers?
- How many migratory birds come to the swamp?
- What are the results of the black bear study?
- Will the CCP address water quality effects from neighbors? Are we alerted to spraying?
- What is the source of mercury in the swamp/air?
- Are we seeing the effects of acid rain?
- Mercury fish advisory in the swamp-based on consumption frequency, common in blackwater systems of the area.
- Describe the wilderness area on the map.
- Will the impact/use of mechanized equipment in wilderness area be addressed in CCP?
- Describe future land acquisition plans.
- What is the status of acquisition south of the swamp (Rayonier)? Will it be addressed in the CCP?
- What is the status of DuPont mining on the border of the refuge?
- Characterize current partnerships/working relationships, i.e. habitat management and watersheds.
- Advantages of GOAL
- Current water levels and accessibility of the shelters.

- Concern about staffing; management vs. workers.
- The use of AmeriCorps and volunteers to accomplish projects.

Appendix XI. Wilderness Review

I. INTRODUCTION

U.S. Fish and Wildlife Service policy (Sec 602, also Sec 610 of Refuge Manual) requires wilderness reviews to be completed as part of the Comprehensive Conservation Planning process. A wilderness review is the process used to determine if National Wildlife Refuge System lands and waters should be recommended to Congress for wilderness designation. The wilderness review process consists of three phases: inventory, study, and recommendation. The inventory is a broad look at the refuge to identify lands and waters that meet the minimum criteria for wilderness. All areas meeting the criteria are classified as wilderness study areas (WSAs). If WSAs are identified, the review moves on to the study phase.

During the study phase, WSAs are further analyzed for all values (ecological, recreational, cultural), resources (wildlife, water, vegetation, minerals, soils), and uses (management and public) within the Wilderness Study Area. The findings of the study determine whether or not the WSAs merit recommendation from the Service to the Secretary for inclusion in the Wilderness System.

If it is determined during the inventory that no areas qualify as WSAs or if we conclude from the study that we should not recommend any areas as wilderness, we prepare a brief report that documents the unsuitability of the lands and waters for wilderness study or recommendation. The report is submitted to the Director of the Fish and Wildlife Service.

PREVIOUS WILDERNESS REVIEW AT OKEFENOKEE NWR

In 1967, a wilderness study review was conducted for the Okefenokee NWR, which at that time measured 368,950 acres. The study was completed with substantial public involvement. In 1971, 353,981 acres were proposed for wilderness designation. In 1974, Congress designated this area as Okefenokee Wilderness Area.

Five large areas were excluded from the proposed wilderness area and are described below (USFWS, 1967) (Figure 15):

1) “A 2,800-acre swamp area within the refuge in the vicinity of Camp Cornelia. This area, at the east entrance to the swamp, will be required for additional administrative, interpretive, and visitor-use facilities to adequately care for the volume of visitors expected in the future.”

2) “An 8,400-acre swamp area within the refuge at the west entrance into the swamp. This area encompasses the facilities of the Stephen Foster State Park, the Suwannee River sill, and the intervening area affected by these existing developments. It will also provide space for additional administrative, interpretive, and visitor-use facilities needed at this entrance in the future.”

3) “A 6,500-acre swamp area, just north of the refuge, which is owned by the State of Georgia as part of the Waycross State Forest. A portion of this State-owned area is under a long-term lease to the Okefenokee Association, Inc. which operates the Okefenokee Swamp Park, the north entrance to the swamp.”

4) “Refuge management units comprising about 9,800 acres of uplands above the swamp line. These units will continue to be managed for wildlife and timber products as they have been since the refuge was established. They include Cowhouse Island near the Swamp Park, the “Pocket” which

contains the paved access road into Stephen Foster Park, the upland area at Camp Cornelia extending out to State Highway 23, Chesser Island, Soldier Camp Island, and other units along the edge of the refuge."

5) A 3,678-acre area, not specifically mentioned in the 1967 report, lies along the south edge of the refuge in the State of Florida.

Since 1967, additional lands that are contiguous with the wilderness area have been acquired. These lands are evaluated below for inclusion into the Okefenokee Wilderness Area.

II. WILDERNESS INVENTORY

POTENTIAL LANDS

Okefenokee National Wildlife Refuge is surrounded by commercial timberlands accessed through a network of roads. Therefore, this review will focus on refuge wetlands that have been acquired since the review in 1974 and are contiguous with the 353,981 acres of the Okefenokee NWR that was designated as Okefenokee Wilderness Area. Also, this review will examine the potential of the refuge lands in Florida. The seven areas are described below, located on Figure 15, and summarized in Table 13:

Area A is 1,870 acres located on the northeast edge of the swamp. Boat Landing Island lies within this block. A third of this island is already within the Okefenokee Wilderness Area. An unimproved ¼ mile dirt road leads from private property onto Boat House Island. This road is generally not passable since it is normally covered with water from the increased flows from nearby Gum Slough. The island currently has a slash/pond pine stand ranging to 80 years old. The wetlands are natural except for the apron of influence from the Gum Slough inlet that carries water from Green Swamp into the Okefenokee Swamp. The refuge canoe trail system passes through this area but there is no current access from the swamp's edge. Prior to it becoming part of the refuge, there was access from Boat Landing Island to the water trails.

The only users of this area are those using the refuge's watercraft trails. Through the refuge's reservation system for overnight canoe trips, solitude is provided along the watercraft trails. Due to limited suitable camping areas within the wetlands of the Okefenokee NWR and to minimize impacts of public use, primitive and unconfined recreation is not emphasized. There are no additional supplemental values in this area beyond what the Okefenokee Wilderness already protects.

Area B is 416 acres of wetlands on the northeast edge of the swamp. Gum Slough enters into the Okefenokee Swamp at the north end of this property. An old tramline penetrating the swamp a short ways is shown on the topographical map. No current public use occurs on this property with low potential for opportunities related to solitude or primitive recreation. There are no additional values in this area beyond what the Okefenokee Wilderness already protects.

Area C is 879 acres of wetlands and 20 acres of uplands. It includes the main entrance into the northeast portion of the swamp. Several canoe trips originate from Kingfisher Landing. The Kings Canal was excavated prior to refuge ownership. No other trails penetrate the remainder of the wetlands. No additional values beyond what the Okefenokee Wilderness already protects occur in this area.

Area D is 3,342 acres on the east side of the swamp and includes Indian Island and Duck Island. These two islands are refuge managed forestlands. There is a road onto each of these islands. The rest of the area is primarily bay-cypress-shrub habitat. Historically, a boat trail accessed Duck Island

where visitors would camp. Currently, the trail within the wilderness is overgrown. There are no trails present in this area and there are no unique supplemental values.

Area E is 3,678 acres and was excluded from the wilderness designation in 1974. The reason for exclusion was not specified in the 1967 Wilderness proposal. For this reason, it is examined here for inclusion.

Natural conditions without roads still persist on this piece of property. Upland Management Compartment 6 forms the east boundary of this area. State forest and National Forest Service lands border it on the south edge. It is mostly covered with cypress, gum, bay, and shrubs with small patches of open marsh. There are no trails present and there are no unique supplemental values.

Area F is 7,039 acres on the southwest side of the swamp. Historical tram lines penetrated this portion of the swamp and removed the timber. However, since that time, it has not been manipulated. Cypress Creek exits the swamp in this area and drains a portion of the swamp to the Suwannee River. Flows fluctuate based on the height of the river. The vegetation consists of primarily loblolly bay, cypress, gum, and shrubs, similar to other areas of the swamp. There are no channels except for Cypress Creek.

Area G is 1,766 acres on the west side of the swamp. Sweetwater Creek exits the swamp at this location and flows into the Suwannee River. There is no prominent channel providing access into the area. This piece of wetland is a finger surrounded by managed timberlands. It is about one mile wide from north to south. The vegetation is mostly bay-shrub habitat. There are no unique values.

Table 13. Summary of inventory area of the Okefenokee NWR

Refuge Unit	Size (All contiguous with Okefenokee Wilderness Area)	Naturalness	Solitude or Primitive RecreationOpportunities	Supplemental Values
A	1870 ac	One unimproved road. Influenced by improved water inlet (Gum Slough)	Includes portions of the watercraft trail system. No other management currently.	Same as Okefenokee Wilderness Area.
B	416 ac	Influenced by improved water inlet (Gum Slough)	Low potential.	No new values.
C	879 ac	Kings Canal present and main entrance into the northeast portion of the refuge.	Wilderness Canoe Trips originate from here. No new opportunities.	No new values.
D	3342 ac	Old boat trail and camp site. Two managed islands.	It is unlikely the old boat trail originating from this area could be reclaimed.	No new values.
E Florida Acreage - Excluded in 1974	3678 ac	No roads or trails lead into this area. Upland Management Compartment 6 borders the west boundary.	No current use. Access limited.	No new values.
F	7039 ac	No roads or trails	No current use. Access limited.	No new values.
G	1766 ac	No roads or trails.	No current use. Access limited.	No new values.

CONCLUSION

Only Area F meets the minimum 5,000-acres; however, all seven areas listed above are contiguous with the 353,981-acre Okefenokee Wilderness Area. Therefore, the minimum acreage of 5,000 is not critical for excluding a piece of land from wilderness designation.

Naturalness is found in all seven areas. However, the wetlands in all the areas are being managed similar to the other wetlands already included in the Okefenokee Wilderness Area because of their limited access and the recognition that these portions of the Okefenokee Swamp are part of the whole wetland complex and can not be isolated.

Opportunities for solitude exist within Area A as a portion of the trail system of the Okefenokee NWR passes through a corner of this property. Area C provides access to the current trail system. In the other five areas, the potential for solitude and/or primitive recreation is low due to limited access. However, providing opportunities for solitude or primitive recreation is not essential if the land is already contiguous to designated wilderness land.

No unique ecological, geological, or scenic values exist on these seven areas except that they all lie on the edge of the swamp. However, these edge areas may be the most influenced by outside threats including hydrologic alterations, contaminants, and development.

Historically, the impacts of the peat and sphagnum moss industry is evident in Area C. No other historical sites are known in the other areas.

In conclusion, it is recognized through this inventory that all seven areas meet the minimum criteria for naturalness but none of the seven areas stand out as significant wilderness areas on their own. However, their contribution to the Okefenokee Wilderness Area needs to be evaluated through the Wilderness Study evaluation.

III. WILDERNESS STUDY

QUALITY OF WILDERNESS CHARACTERISTICS

The proposed Wilderness Study Areas include all seven areas as described above excluding all managed uplands. This includes Duck Island and Indian Island in Area D and those lands associated with Compartment 6 in Area E. Boat Landing Island in Area A would remain with the Wilderness Study Area since it is not actively managed as part of a compartment and a portion of it is already under wilderness designation.

The wilderness characteristics of the Okefenokee Wilderness Area flow into these adjacent areas. Along with most of the Okefenokee Swamp, these areas were logged in the early 1900's. The imprint of man's work today is substantially unnoticed. The current management and the proposed management of the wetlands as described in the refuge's Comprehensive Conservation Plan supports the natural characteristics of these areas. Natural processes govern the landscape within the interior of the swamp and continue outward as much as possible considering the interests of landowners that border the refuge.

The Okefenokee National Wildlife Refuge, as administrator of the Okefenokee Wilderness Area, has developed a trail system that supports opportunities for wildlife observation, fishing, solitude and challenges. A network of trails and platforms protects against excessive disturbance to the vegetation, soil, and wildlife. Unconfined access is limited by the thick growth of vegetation and the need to disturb the vegetation and soil to reach desired locations. Recreational opportunities within

the wilderness are accessed from Suwannee Canal Recreation Area, Stephen C. Foster State Park, and Kingfisher Landing. Kingfisher Landing is in WSA C. In addition, portions of the trail system pass through WSA A. These portions are designated as a canoe only trail and are proposed in the CCP to be maintained as if they were in wilderness. Besides WSA A and C, none of the rest have the potential of providing enhanced access into the existing wilderness area or excellent wilderness opportunities on their own.

Wildlife values associated with the WSAs are in relation to their importance to migratory birds seeking cover along the edge of the swamp, wildlife escaping from disturbances on the uplands, and animals moving between the swamp and the uplands in search of food and cover. Gum Slough in Area B also provides a suitable location for white ibis, egrets, and herons to nest.

OTHER RESOURCE VALUES

As mentioned in the inventory phase, these WSAs lie within an ecologically significant zone. Both WSA F and G have surface water outflows – Cypress Creek and Sweetwater Creek. Areas A and B may be man-influenced the most by the presence of Gum Slough that drains the privately owned Green Swamp. As a result, this area could be susceptible to increased water flows and contaminants. WSAs A, B, C, and D all have seepages and small drainages flowing into them from the uplands along Trail Ridge. These flows into the swamp can be disturbed from activities on the edge of the swamp. They also may be pathways for contaminants entering the swamp. Designating these areas as wilderness would not prevent the impacts from adjacent property; however, it may limit the environmental monitoring that could be done that may signal hazards to the health of the entire swamp.

These WSAs lying on the edge of the swamp also serve as buffer zones between the uplands and the interior of the swamp. These areas lie within action zones depending on the event and conditions. Resource interests change along the swamp's edge and change again along landownership lines. Management decisions become more critical as more development occurs around the refuge.

PUBLIC USE

In 1974, when the Okefenokee Wilderness Area was designated, visitation was estimated at 280,000. This number was approximately 100,000 visits more than in 1967 when the wilderness proposal was written. Today, visitation to the Okefenokee NWR has increased to almost 400,000. The area around Suwannee Canal Recreation Area and Stephen C. Foster State Park were excluded from the wilderness designation to accommodate the future increase in visitation. Since that time, Kingfisher Landing in WSA C has provided an additional entrance into the swamp.

In addition, there is an increased interest in environmental education, especially with the establishment of the Okefenokee Education and Research Center in Folkston by the Georgia Wildlife Federation. Accommodating students with high quality field experiences and a knowledge about wilderness without an impact to the wilderness will be strived for on the refuge. Although WSA C is the only one that is currently accessible by the public, the other WSAs are important to consider for future outdoor classroom activities.

MANAGEMENT AS WILDERNESS

Managing the wetlands of the seven WSAs is currently being done in accordance with the wilderness standards. WSAs B, D, E, F, and G are inaccessible by the general public and only penetrated by the refuge staff if there is a need such as search and rescue or research. There are no access trails

established. The only access into WSA A and C is along the established trails which are part of the refuge's trail network. Because there are no signs along the trail in WSA A indicating that you are leaving or entering wilderness, the majority of these users probably believe they are within the Okefenokee Wilderness Area the entire trail.

The management of wildland fire around the edge of the swamp as stated in the CCP is similar whether the land is designated wilderness or not. The Fire Use Plan identifies fire management units where different management strategies can be considered when fire is present. Although natural processes such as fire can not run their entire course as would be desirable if there was an isolated island of wilderness, management decisions for the benefit of the resources as well as private property interests can be weighed through the designation of fire management units.

Although the WSA's are currently being managed along with the Okefenokee Wilderness Area, designating the WSA's as wilderness restricts the options for using these areas for environmental education groups and researchers in the future. Certain mechanical equipment may be prohibited and construction of facilities such as simple platforms along the edge may not be allowed. Eliminating these areas from future public use concentrates visitors and students at the few entrances and eventually visitors beyond a certain number may be denied access.

IV. RECOMMENDATION

The Fish and Wildlife Service does not recommend the addition of any of the WSAs presented above for the following reasons:

1) The addition of the above WSAs to the Okefenokee Wilderness Area would not add significantly to the protection of the WSAs or the wilderness area as a whole. The wilderness values of naturalness and untrammeled by man will be protected under the management presented in the CCP. The refuge is committed to maintaining the health of the swamp and not just the area under wilderness designation.

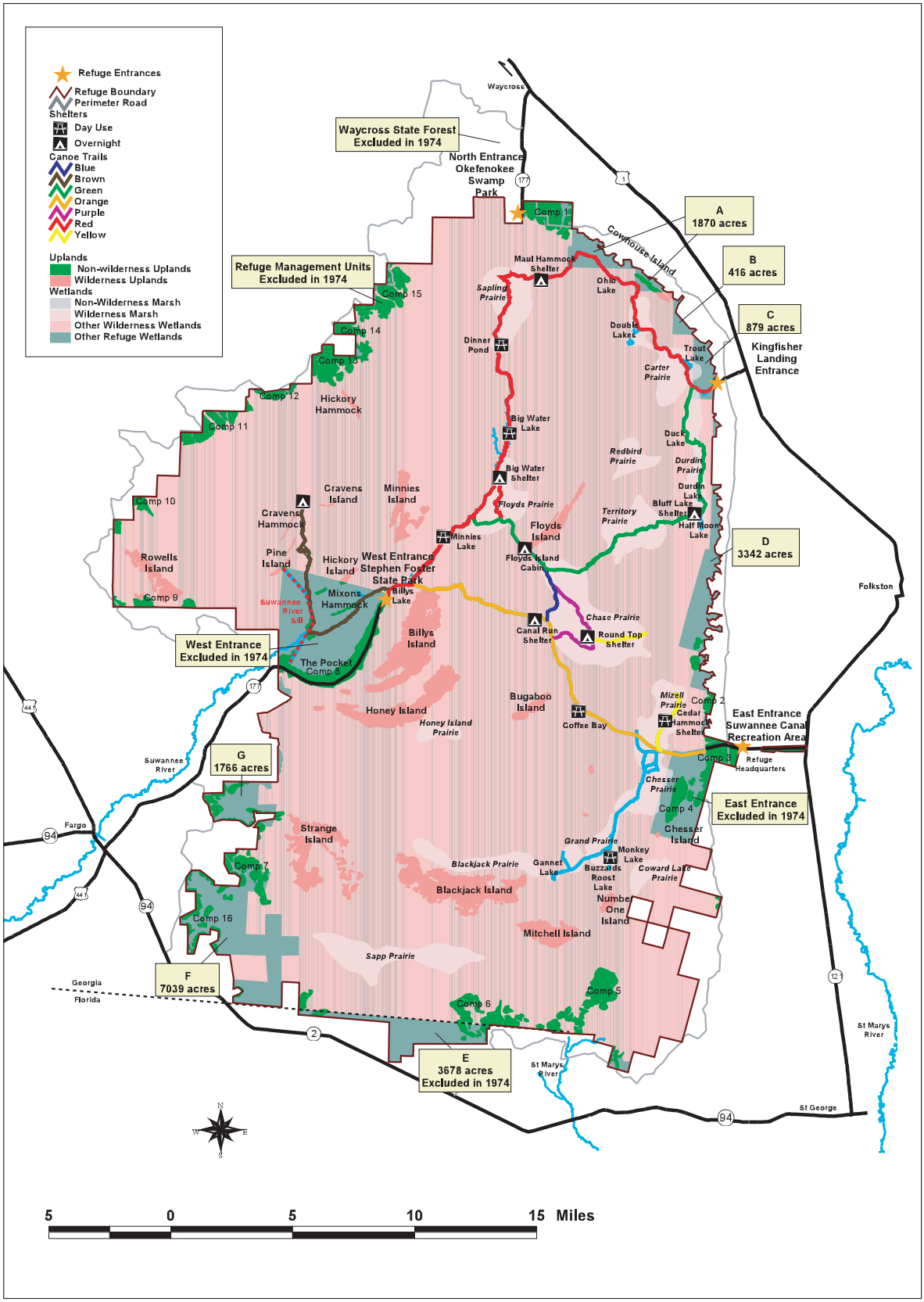
2) The Fish and Wildlife Service fully recognizes the consequences of managing the refuge as an isolated unit rather than a piece of a larger ecosystem. The refuge's CCP emphasizes partnerships, networking and landscape management. This is especially critical in the management of fire where different landowners have different objectives. To reach maximum benefit from fire within the greatest area of the wilderness, zones around the swamp must be identified where man may have to intervene to protect the interests of the neighboring landowner. Portions of these zones may or may not be in the designated wilderness but would be treated as a unit. Therefore, designating these WSAs as wilderness does not alter the fire management strategies as stated in the CCP.

3) Public use and the demands for environmental education are increasing at Okefenokee NWR. Currently 87% of the refuge is designated as wilderness with limited accessibility. Designating the WSA's as wilderness would not enhance the current public use opportunities within the wilderness. They would not be readily usable by the general public, which would limit options for distributing the visitor use in the future. On the other hand, by not including this 5% of refuge land into the wilderness, these areas would serve the wilderness by providing students and researchers an area outside the wilderness to conduct activities while promoting the health of the wilderness. Wilderness values could be incorporated into the education programs.

4) More specifically, WSA C – Kingfisher Landing – has been established as an entrance and facilities may be expanded at this location to promote more use of the area. It also has potential for interpretation of the peat and sphagnum moss industry and its impact to the swamp.

5) WSA G is a finger projecting out from the swamp and is one mile or less from north to south. This configuration lends itself to more influences from outside activities.

Figure 15. Lands for potential inclusion in the National Wilderness Preservation Syst



Appendix XII. Decisions And Approvals

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

COMPATIBILITY DETERMINATION

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: M. Skippy Reeves
Telephone Number: 912-496-7366 **E-Mail:** skippy_reeves@fws.gov
Date: May 15, 2004

PROJECT NAME: Okefenokee National Wildlife Refuge's Comprehensive Conservation Plan

I. Service Program: Refuges

II. State/Agency: Georgia / U.S. Fish and Wildlife Service

III. Station Name: Okefenokee National Wildlife Refuge

IV. Description of Proposed Action: Implement the Comprehensive Conservation Plan for Okefenokee NWR by adopting the proposed alternative. This plan directs the management of the refuge for the next 15 years.

V. Pertinent Species and Habitat:

A. Include species/habitat occurrence map:

Wood storks and American alligators use the wetland habitats of the swamp.

Red-cockaded woodpeckers, flatwoods salamanders, gopher tortoises and indigo snakes are all residents of the native longleaf pine forest. The refuge is striving to restore this important habitat on the uplands. All these species are present except the flatwoods salamander. The refuge is within its historical range.

B. Complete the following table:

SPECIES/CRITICAL HABITAT	STATUS[1]
Wood stork	Endangered
American Alligator	Threatened
Red-cockaded woodpecker	Endangered
Flatwoods salamander	Threatened
Gopher tortoise	Threatened
Eastern indigo snake	Threatened

[1]STATUS: E=endangered, T=threatened, PE=proposed endangered, PT=proposed threatened, CH=critical habitat, PCH=proposed critical habitat, C=candidate species

VI. Location (attach map):

A. Ecoregion Name:
North Florida Ecosystem

B. County and State:
Charlton, Clinch, Ware Counties, Georgia and Baker County, Florida

C. Section, township, and range (or latitude and longitude):
N 30° 44.300 W 82° 07.600

D. Distance (miles) and direction to nearest town:
Refuge headquarters is approximately 11 miles southwest of Folkston, Georgia

E. Species/habitat occurrence:

Wood storks use the open wetland habitats of the Okefenokee NWR for roosting and foraging. No nesting colony has been found since 1977.

The refuge's American alligator population is estimated at 9,000 –12,000 individuals. This number fluctuates depending on water level conditions. They are found throughout the wetlands.

Red-cockaded woodpeckers occupy the suitable upland pine habitat on the refuge. Due to the fragmentation of the landscape, natural and man-caused, four sub-populations exist on the refuge. The majority of the active clusters are on interior wilderness islands.

Flatwoods salamanders are historical residents of the upland pine forest but have not been found in recent years on the refuge.

Gopher tortoises and eastern indigo snakes are residents of the upland longleaf pine habitat found on the refuge. They are most abundant at the east entrance of the refuge.

VII. Determination of Effects:

A. Explanation of effects of the action on species and critical habitats in item V. B (attach additional pages as needed):

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Wood stork	Natural processes govern the wetlands and thus, the use patterns of the wood stork and alligator. The plan strives to protect the wetlands from outside threats by keeping abreast of new developments and demands on the ground water. Public use patterns should not impact these species any further than the current use.
American Alligator	
Red-cockaded woodpecker	Upland management on the refuge continues to move toward an old growth longleaf pine habitat where appropriate. Habitat for the red-cockaded woodpecker will be enhanced. In addition, agreements with surrounding landowners will be pursued to enhance movement of the red-cockaded woodpecker, increase foraging habitat, and possibly expand the populations.
Flatwoods salamander	Management of the longleaf pine habitat and the associated ephemeral ponds will enhance the habitat for the flatwoods salamander. Surveys to identify occurrence of this species will be established.
Gopher tortoise	The management of the longleaf pine forest through prescribed fire will enhance the habitat for the gopher tortoise and all the associated species. Soil disturbances from management operations could destroy a burrow.
Indigo snake	The management of the longleaf pine forest through prescribed fire will enhance the habitat for the indigo snake. Protecting the burrows of the gopher tortoise will assist in protecting the indigo snake. Surveys will identify the current status of this species.

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

SPECIES/ CRITICAL HABITAT	ACTIONS TO MITIGATE/MINIMIZE IMPACTS
Wood Storks And American Alligator	Increased surveys of aquatic parameters may increase detection of impacts to the system from outside sources. This would protect the habitat for both the wood stork and alligator. Understanding the distribution and use patterns of these animals may help in protecting these species from impacts.
Red-cockaded Woodpecker	Prescribed fire will continue to be used on all uplands to maintain suitable habitat conditions. Timber management will enhance the habitat outside the wilderness area. Surveys will monitor the population status to document changes in management or caused by natural events.
Flatwoods Salamander	Protection of ephemeral pools will enhance the habitat for this species.
Gopher Tortoise and Indigo Snake	Burrows of gopher tortoises will be flagged when any management action requiring soil disturbance takes place.

VIII. Effect Determination and Response Requested:

SPECIES/ CRITICAL HABITAT	DETERMINATION[1]			RESPONSE[1] REQUESTED
	NE NE	NA	AA	
Wood Stork	X			
American Alligator	X			
Red-cockaded Woodpecker	X			
Flatwood Salamander	X			
Gopher Tortoise	X			
Indigo Snake	X			

[1]DETERMINATION/RESPONSE REQUESTED:
NE = no effect. This determination is appropriate when the proposed action will not directly, indirectly, or cumulatively impacted, either positively or negatively, any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested is optional but a "Concurrence" is recommended for a complete Administrative Record.

NA = not likely to adversely affect. This determination is appropriate when the proposed action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources. Response Requested is a "Concurrence".

AA = likely to adversely affect. This determination is appropriate when the proposed action is likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested for listed species is "Formal Consultation." Response Requested for proposed or candidate species is "Conference."

_____ _____
signature (originating station) date

_____
title

IX. Reviewing Ecological Services Office Evaluation:

A. Concurrence _____ Nonconcurrence _____

B. Formal consultation required _____

C. Conference required _____

D. Informal conference required _____

E. Remarks (attach additional pages as needed):

_____ _____
signature date

_____ _____
title office

COMPATIBILITY DETERMINATION
Okefenokee National Wildlife Refuge

Introduction

Under the Refuge Recreation Act of 1962, the National Wildlife Refuge System Administration Act of 1966, and the National Wildlife Refuge System Improvement Act of 1997, the Service may not permit secondary uses on a national wildlife refuge unless these uses are first determined to be compatible uses. A description of the each use presented in the Draft Comprehensive Conservation Plan (CCP) and the anticipated biological impacts to the resources are addressed in this Compatibility Determination.

Refuge Name: Okefenokee National Wildlife Refuge

Refuge Uses:
This compatibility determination applies to: 1) wildlife observation and photography; 2) environmental education and interpretation; 3) recreation hunting; 4) recreation fishing; 5) independent research studies; and 6) overnight camping.

Date Established by Executive Order: March 30, 1937

Establishing and Acquisition Authority: Executive Order 7593

Refuge Purpose: The executive order establishing Okefenokee National Wildlife Refuge in 1937 stated the purpose of the refuge as "a refuge and breeding ground for migratory birds and other wildlife."

For lands acquired under the Migratory Bird Conservation Act (16 U.S.C. 715-715r), as amended, the purpose of the acquisition is: "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (16 U.S.C. 715d).

Mission of the National Wildlife Refuge System:
As set forth in the National Wildlife Refuge System Improvement Act of 1997, the mission of the National Wildlife Refuge System is: "…to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

Refuge Goals:

1) Promote and provide optimum habitat and protection for endangered and threatened species and conserve the natural diversity, abundance, and ecological function of native flora and fauna on and off refuge lands.

2) Restore, maintain, protect, and promote native habitats and healthy natural systems to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities.

3) Restore, preserve, and protect the primeval character and natural processes of the Okefenokee Wilderness, leaving it untrammeled by man while providing recreational solitude, education, scientific study, conservation ethics, and scenic vistas.

4) Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation and photography, environmental education, and interpretation when compatible to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area.

5) Promote communication, cooperation, and partnerships between local, state, and federal agencies, land managers, and private citizens within the “zones of influence” to conserve the integrity of the pathways associated with resource protection, wildlife populations, and public services.

6) Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics and the “zones of influence.”

Description of Use: Wildlife Observation and Photography

Wildlife observation and photography have been identified in the National Wildlife Refuge System Improvement Act of 1997 as priority wildlife-dependent recreational uses provided they are compatible with the purpose for which the refuge was established. This compatibility determination applies to personal photography only. Commercial photography or videography, if allowed, would require a special use permit by the refuge with specific restrictions.

The refuge's CCP promotes wildlife observation and photography and proposes to increase opportunities. The greatest number of visitors currently comes to view wildlife. Established hiking and watercraft trails allow visitors access to areas while minimizing disturbance to the flora and fauna of the refuge. Approximately 1% of the refuge lands are impacted directly from visitation. Highest use occurs on 220 acres at the east and west entrances. There are approximately 62 miles of water trails open for day use and motorboat use. Estimating disturbance to an area 150 ft from the trail would result in 2247 acres being considered potentially disturbed. Canoe-only trails add an additional 1679 acres that have the potential of being impacted. Providing additional opportunities helps to distribute visitors to lessen the impacts to the resources. Adaptive management monitors the impacts and adjusts this activity.

Wildlife observation and photography can occur throughout the refuge in locations where the public is allowed. A wildlife drive, boardwalk, two towers, boat basin, and hiking trails provide observation opportunities at Suwannee Canal Recreation Area. Stephen C. Foster State Park provides a boardwalk, boat basin and hiking trails to promote wildlife observation and photography. In addition, each entrance provides access to the interior of the refuge via boat. This allows the public to experience different wetland habitats and catch a glimpse of the fauna. There are no photography blinds currently on the refuge with one purposed at an existing wildlife observation point.

Availability of Resources: Annual refuge operation and maintenance funds support public use activities. The annual cost of operating and maintaining the present wildlife observation and photography programs is approximately $23,000. Therefore, the program is in compliance with the Refuge Recreation Act.

Special equipment, facilities or improvements necessary to support the use: Wildlife Drive, hiking and water trails, boardwalk, signs, kiosks, brochures, etc.

Maintenance Costs: $20,000

Administrative/Law Enforcement Monitoring Costs: $3,000

Offsetting revenues: $25,000

The refuge is a participant in the Recreational Fee Demonstration Program which currently returns 80 percent of fees generated from recreational activities back to the refuge.

Anticipated Impacts of the Use:

Short-term impacts:

The refuge provides habitat for resident and migratory wildlife. Individual animals may be disturbed by human contact to varying degrees during wildlife observation and photography. Examples of potential disturbance include flushing of animals from feeding, resting, or nesting areas and trampling

of plants from observers and photographers along the edge of trails. Disturbance to trust species are expected to be minimal due to the placement of trails in association with recurring wildlife use, limiting access to trails only, and closing areas where necessary to decrease disturbance. Short-term impacts to facilities such as roads and trails can be avoided by special closures due to unsafe or wet conditions. Trails through wetlands are avoided or created by the use of boardwalks to minimize disturbance. The wildlife observation and photography programs have been designed to avoid or minimize impacts anticipated to refuge resources and visitors.

Long-term impacts:

Resident wildlife has greater potential of being impacted over a long time period due to the recurring visitation of wildlife observers. Wildlife can become accustomed to humans. Lack of fear could result in harm to the animal or an animal could become aggressive and need to be relocated or dispatched.

Cumulative impacts:

As visitation increases, more impacts to the landscape may occur. Ways of limiting access or spreading visitor use will be developed. Programs will be modified as necessary to mitigate unforeseen impacts.

Public Review and Comment: This compatibility determination is subject to review along with the refuge's draft CCP and Environmental Assessment. This document was announced in the *Federal Register* and made available for public comment for 30 days. The following methods were used to solicit public review and comment on the CCP:

Post notice in local post office.
Public notice in newspapers with wide local distribution.
Public meeting(s).

Determination (check one below):

__X__Compatible with the following stipulations

_____Not Compatible

Stipulations Necessary to Ensure Compatibility: Opportunities for wildlife observation and photography are designed to minimize impacts to the wildlife and the environment. Evaluations of sites and programs should be conducted periodically to assess if objectives are being met and that the natural resources are not being degraded. If evidence of unacceptable adverse impacts begins to appear, it may be necessary to change the location of the facilities. As visitation increases, additional sites may be developed to lessen the impact to one area.

Justification: These wildlife-dependent uses are priority public uses of the National Wildlife Refuge System. Providing opportunities for wildlife observation and photography would contribute toward fulfilling provisions of the National Wildlife Refuge System Administration Act, as amended in 1997. Wildlife observation and photography would provide an excellent forum for allowing public access and increasing understanding of refuge resources. The stipulations outlined above should minimize potential impacts relative to wildlife/human interactions. At the current level of visitation, these wildlife-dependent uses would not conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

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

Description of use: Environmental Education and Interpretation

Environmental education and interpretation consists primarily of teacher workshops, visitor education, teaching students, and interpretation. Activities would include teacher or staff-led on-site field trips, off-site programs in classrooms, teacher and student workshops, and interpretation of wildlife resources on the refuge. These activities seek to increase the public's knowledge and understanding of wildlife and their habitats and to contribute to wildlife conservation. Environmental education and interpretation have been identified in the National Wildlife Refuge System Improvement Act of 1997 as priority public uses provided they are compatible with the purpose for which the refuge was established.

Expansion of the environmental education program to a multi-faceted, curriculum-based program for use on and off the refuge is presented in the refuge's CCP. It is designed to enhance public awareness and understanding of the refuge's natural ecology, the human influences on the swamp ecosystem, the wilderness philosophy and concepts, and to inspire action among local, national, and international educational groups on behalf of the Service, the refuge, and the ecosystem. The refuge plans to develop facilities to accommodate and distribute students for quality outdoor and indoor experiences. Partnering and networking with other entrances and educators is critical. Developing materials to be used on and off the refuge will increase the exposure to environmental education.

The proposed interpretation strives to increase awareness and understanding of the refuge's natural and human influences, habitat diversity, wildlife values, wilderness philosophy and concepts, and management activities to protect, enhance, restore and maintain the Okefenokee ecosystem. Revising and developing brochures, panels, and signs assists this effort. Also, outreach to interpret refuge messages is key for expanding the public's understanding.

Environmental education and interpretation sites are currently limited to the 1% of refuge lands that is available to the general public. Interpretation sites include visitor centers located at Suwannee Canal Recreation Area, Stephen C. Foster State Park and Swamp Park and information kiosks located along trails and other key sites. Environmental education is a year-round activity, conducted on an as requested basis. These activities are closely coordinated with the refuge ranger.

The refuge serves as an outdoor classroom for a variety of audiences with an interest in wildlife conservation and management. Typically, teachers, students, and other groups will learn from hands-on demonstrations, tours, projects, and activities delivered by refuge staff and volunteers. Most activities will be conducted on-site utilizing existing refuge facilities. Environmental education is primarily concentrated on the 220 acres located at Suwannee Canal Recreation Area and Stephen C. Foster State Park. There are numerous facilities at each site to increase distribution of the groups. Group size is typically limited to ensure effective presentation of desired materials which may be specifically tailored to meet the educational needs of the group. Boat tours are often included in the environmental education experience for older students. Activities involving collection or catch and release of fauna require Special Use Permits in advance.

Availability of Resources: Annual refuge operation and maintenance funds support public use activities. The annual cost of operating and maintaining the present environmental education and interpretation programs is approximately $50,000.

Special equipment, facilities or improvements necessary to support the use: Wildlife Drive, hiking and water trails, boardwalk, signs, kiosks, brochures, etc.

Maintenance Costs: $20,000

Administrative/Law Enforcement Monitoring Costs: $30,000

Offsetting revenues: $8,000. The Okefenokee Wildlife League also supplements environmental education activities on the refuge.

The refuge is a participant in the Recreational Fee Demonstration Program which currently returns 80 percent of fees generated from recreational activities back to the refuge.

Anticipated Impacts of the Use:

Short-term impacts:

Environmental education and interpretation activities generally take place on existing roads, trails, boardwalks, platforms, boats, and within buildings. This minimizes disturbance to the vegetation and soil. Temporary disturbance to wildlife species in the immediate vicinity during the activities can be expected. If roosting and/or nesting is established during a season, public use of the area may be suspended.

Long-term impacts:

Repeated use of an area may compact the soil or cause erosion. Certain plant species may be prevented from growing under these circumstances. Introduction of a non-native species is possible in these disturbed areas also. Occasionally, wildlife that become habituated to a site frequented by humans need to be relocated if they become aggressive or lose their fear of humans. These potential impacts can be mitigated through the messages presented during environmental education and interpretation.

Cumulative impacts:

Any additional facilities for environmental education and interpretation will be evaluated and designed to minimize disturbance to the environment and the wildlife that use the area. Off-site activities will be considered to increase the refuge's audience and lessen the impact on the natural resources of the refuge.

Public Review and Comment: This compatibility determination is subject to review along with the refuge's draft CCP and Environmental Assessment. This document was announced in the *Federal Register* and made available for public comment for 30 days. The following methods were used to solicit public review and comment on the CCP:

Post notice in local post office.
Public notice in newspapers with wide local distribution.
Public meeting(s).

Determination (check one below):

__X__Compatible with the following stipulations

_____Not Compatible

Stipulations Necessary to Ensure Compatibility: On-site activities should be held where minimal impact would occur. Evaluations of sites and programs should be conducted periodically to assess if objectives are being met and that the natural resources are not being degraded. If evidence of

unacceptable adverse impacts begins to appear, it may be necessary to change the location of the outdoor activities.

Justification: Environmental education and interpretation are used to encourage all citizens to act responsibly in protecting a healthy ecosystem. They are tools to use in building a land ethic, developing political support, and decreasing wildlife violations. They constitute one method of increasing visibility in the community and improving the image of the Service.

Okefenokee NWR has two full-time staff dedicated to environmental education and interpretation of refuge programs and issues. Stephen C. Foster State Park staff conducts environmental education and interpretation programs on the west side of the refuge, while Swamp Park at the north end of the refuge is dedicated to the interpretation of the fauna and flora of the Okefenokee Swamp. Only 1% of the refuge is directly impacted from these activities. In turn, the entire area benefits from the public's increased awareness of the area's natural resources and the processes that govern them. No new activity areas are being proposed to accommodate an increase in educational groups. Rather, new locations within the 1% already impacted would be considered to help distribute visitors in relation to the sites' carrying capacity.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

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

Description of Use: Hunting

Hunting, a wildlife-dependent recreational pursuit, has been identified in the National Wildlife Refuge System Improvement Act of 1997 as a priority public use, provided it is compatible with the purpose for which the refuge was established.

In supporting the National Wildlife Refuge System Improvement Act of 1997, Okefenokee NWR offers the following hunt opportunities:

- Small game (rabbit, squirrel, and bobwhite quail) at the Cowhouse Unit.
- Turkey at the Cowhouse Unit.
- Deer and feral hog at the Cowhouse Unit, Suwannee Canal Recreation Area, and the Pocket Unit.

The public is notified of hunts through news releases in local and regional newspapers, public service announcements, inclusion in the State of Georgia hunting publications, and postings on the refuge website.

The Georgia Department of Natural Resources (GA DNR) conducts two hunter education courses annually at the refuge.

Hunter usage is estimated through a "sign-in/sign-out' process, located at both the Pocket and the Cowhouse Unit, and through check-in and check-out at the Suwannee Canal Recreation Area.

An annual two-day (morning) quota deer hunt is administered at the Suwannee Canal Recreation Area in October. Hunting activities are permitted with a valid refuge hunt permit and appropriate state licenses. The Cowhouse Island section hunt dates coincide with Dixon Memorial State Forest (DMSF). The Pocket on the refuge is opened for deer archery season. Refuge hunters in all units are required to follow the Georgia state regulations in addition to refuge-specific regulations.

The refuge hunt program is provides quality recreational opportunities for the public. It provides a public hunting area where private hunt clubs abound. Quality hunting opportunities that are universally accessible are emphasized over quantity. The deer hunt at Suwannee Canal Recreation Area sets aside an area especially for disabled hunters. Current and potential hunting opportunities will be evaluated for expansion.

Availability of Resources: Annual refuge operation and maintenance funds support public use activities. The annual cost of operating and maintaining the present small game, turkey, deer, and feral hog hunting programs is approximately $6,000. Therefore, the program is in compliance with the Refuge Recreation Act.

Special equipment, facilities or improvements necessary to support the use: Brochures, signs

Maintenance Costs: $500

Administrative/Law Enforcement Monitoring Costs: $5,500

Offsetting revenues: $430

The refuge is a participant in the Recreation Fee Demonstration Program which currently returns 80 percent of fees generated from recreational activities back to the refuge. The offsetting revenues are from the sale of hunting permits.

Anticipated Impacts of the Use:

Short-term impacts:

Providing a public hunting area on the refuge allows hunters not able to hunt within a private hunt club an opportunity to hunt. The refuge's hunting opportunities may result in localized disruption of individual animals' daily routines.

The hunt on the Pocket, a narrow peninsula into the swamp, reduces the number of deer in the immediate area resulting in less car-deer collisions.

The deer hunt at the east entrance forces the closure of a public wildlife observation and photography area during two mornings in October for safety reasons. Hunters have exclusive use of this area during the hunt.

Long-term impacts:

The small refuge areas hunted would not significantly impact the total populations of the area. Individual fauna move freely between private and public lands depending on the activity present and the animal's tolerance level.

Should hunting pressure increase on the refuge, alternatives such as quota hunts, a reduction in the number of days of hunting, or restrictions on that part of the refuge open to hunting can be utilized to limit impacts.

Cumulative impacts:

Due to the close proximity to other suitable habitat, the refuge hunts will not have a cumulative impact on deer and small game populations.

Public Review and Comment: This compatibility determination is subject to review along with the refuge's draft CCP and Environmental Assessment. This document was announced in the *Federal Register* and made available for public comment for 30 days. The following methods were used to solicit public review and comment on the CCP:

Post notice in local post office.
Public notice in newspapers with wide local distribution.
Public meeting(s).

Determination (check one below):

__X__Compatible with the following stipulations

_____Not Compatible

Stipulations Necessary to Ensure Compatibility:

Hunting seasons are established annually as agreed upon during the annual hunt coordination meeting with GA DNR personnel. These generally fall within the State framework. The refuge can establish more restrictive seasons to prevent over-harvest of individual species, disturbance to trust

species, and interference with other refuge activities. The special hunt at the east entrance requires a permit obtained through a drawing. A limited number of hunters are allowed because of the small area. Law enforcement patrols are frequently conducted throughout the hunting season to ensure compliance with refuge laws and regulations. Additional LE staff proposed in the refuge's CCP will help in these patrols and ensure compatibility.

Refuge staff working in the field will be reminded of the hunts and required to take safety precautions. Precautions will be taken during prescribed burning operations to alert hunters ahead of time.

Justification:
Hunting is one of the priority uses of the National Wildlife Refuge System. Providing recreational hunting on the refuge provides an area for hunting outside private hunt clubs. Populations will not be impacted due to the size and location of the hunt areas. Deer move freely between private hunt clubs, refuge hunt areas and refuge lands closed to hunting.

No conflict is anticipated with threatened or endangered species, which may utilize the refuge. There are no red-cockaded woodpecker (RCW) clusters on the Cowhouse Unit; there are no active RCW clusters on the Pocket (per biological records); there are active clusters at the Suwannee Canal Recreation Area and Chesser Island. American alligators may be found in the wetland strands, but are unlikely to be impacted by hunters. Gopher tortoises and indigo snakes occupy both areas; however, the restriction on motorized vehicles will reduce any impacts on their habitat. Should it become apparent that hunting activities are or will adversely affect a threatened or endangered species, the hunt will be modified or discontinued by the Refuge Manager as provided in the Code of Federal Regulations Title 50.

Public use conflicts are minimal. No other public use is allowed on Cowhouse Island. The only public use allowed at the Pocket Unit during hunts is travel on Highway 177 into and out of Stephen C. Foster State Park. Traffic is mostly cars and light trucks, with occasional bicyclists using the road. No other public use is allowed at the Suwannee Canal Recreation Area and Chesser Island during hunts.

The refuge provides adequate and appropriate information to the public about the hunts through news release, brochures, etc. This allows for informed decisions about types and timing of other recreational uses.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

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

Description of Use: Fishing

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

Providing universal access to suitable fishing sites and promoting fishing opportunities for youth is emphasized in the CCP.

Recreational fishing is permitted on all refuge waters open to the public. The areas open to fishing include 120 miles of designated waterway trails, natural lakes, and some "gator holes" attached directly to the trail system within the refuge. Recreational fishing is accessible to the public two primary and two secondary entrances:

- Suwannee Canal Recreation Area
- Stephen C. Foster State Park and west entrance

Secondary entrances are located at:

- Kingfisher Landing
- Suwannee River Sill area.

Recreational fishing with conventional line and pole is permitted; however, bush hooks, trot lines, limb lines, seining, and netting are prohibited. To avoid the introduction of non-native species into refuge waters, live minnows are not permitted to be used as bait. Fishing is permitted year round, following statewide seasons and creel limits. Harvesting of frogs, turtles and other species is not permitted.

Refuge fishing regulations (species, limits, and other general regulations) closely follow state guidelines and are coordinated with the state annually. Refuge biologists coordinate with appropriate state fishery biologists in providing the annual electro-fishing survey.

Enforcement of refuge fishing regulations occurs through regular patrols by refuge law enforcement officers and state law enforcement rangers. Infractions of both federal and state fishing regulations are grounds for issuance of citations.

Availability of Resources: Annual refuge operation and maintenance funds support public use activities. The annual cost of operating and maintaining the present recreational fishing program is approximately $2,600.

Special equipment, facilities or improvements necessary to support the use: Boat ramps, signs, brochures

Maintenance Costs: Trail Maintenance

Administrative/Law Enforcement Monitoring Costs: $2,600

Offsetting revenues: $2,000

The refuge is a participant in the Recreational Fee Demonstration Program which currently returns 80 percent of fees generated from recreational activities back to the refuge.

Anticipated Impacts of the Use:

Short-term impacts:

Impacts from litter occur along with gasoline contamination.

Long-term impacts:

Fishing pressure is seasonal; however, the additional motorboat traffic increases gasoline and oil contamination. The refuge concessionaires rent four-stroke engines to lessen the problem with gasoline contamination.

The increased use of motorboats assists with trail maintenance in some areas.

Cumulative impacts:

If the water level is low during with motorboat activity, the sediments may be disturbed and mobilize contaminants. This may have a negative impact on the health of the fisheries.

Public Review and Comment: This compatibility determination is subject to review along with the refuge's draft CCP and Environmental Assessment. This document was announced in the *Federal Register* and made available for public comment for 30 days. The following methods were used to solicit public review and comment on the CCP:

Post notice in local post office.
Public notice in newspapers with wide local distribution
Public meeting(s)

Determination (check one below):

__X__Compatible with the following stipulations

_____Not Compatible

Stipulations Necessary to Ensure Compatibility:

Okefenokee NWR allows fishing on designated areas of the refuge in accordance with State regulations subject to the following conditions:

- The refuge allows motorized boats with motors 10 hp or less.
- The refuge prohibits the possession of live baitfish.
- The refuge allows only the use of pole and line or rod and reel.
- The refuge prohibits fishing in the boat basin.
- The refuge prohibits fishing in ponds and canals along the Swamp Island Drive.
- The refuge reserves the porch and canal area behind the visitor center for youth 15 years of age and under and the physically disabled.

Justification: While the number of participants is limited, fishing has been an important activity of the refuge resulting in only very temporary disturbance to refuge habitats and wildlife populations, and has caused no noticeable impact on the abundance of species sought or other wildlife affected by angler disturbance. Current regulations limit the impacts to trust species and provide a safe and rewarding experience for the refuge visitor.

On the occasion of a drought, fishing may be suspended due to the limited resources for the wildlife dependent on the refuge's fishery.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

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

Description of Use: Resource Research Studies

Resource research studies are not specifically identified as a priority public use within the Service; however, keeping Wildlife First is the primary tenet of the Improvement Act and Fulfilling the Promise. In addition, the Director has mandated that good scientific data is essential and required to make good management decisions.

Scientific research studies will be accommodated for the purpose of managing the area as wilderness and protecting the Okefenokee ecosystem. The purpose and methods will be evaluated to ensure compatibility. This allows university students and professors, non-government researchers, and government scientists to conduct both short- and long-term projects on the refuge. The outcome of this research would be a better knowledge of our natural resources and improved methods to manage, monitor, and protect refuge resources.

Research activities will be conducted throughout the refuge in a variety of habitats. Activities carried out during approved research projects and surveys may be limited to avoid unnecessary disturbance to refuge resources or ongoing management activities.

The activities will vary in scope and duration to satisfy the requirements of the research project or survey. Projects may involve everything from a limited one time sampling or survey to long-term study plots.

Research projects and surveys will be conducted by universities, state, federal, and non-governmental organizations and rarely by private individuals. The refuge will act solely in a supportive role, providing minimal assistance in most cases.

Furthering the knowledge of the impacts and benefits of management decisions, life histories of wildlife species utilizing the refuge, and interrelationships of habitats and wildlife occurring on the refuge is crucial to the effective management of the refuge. The refuge provides secure sites for long-term evaluation of management actions, population trends, and ecological functions.

All research activities conducted by individuals other than refuge staff are subject to review. If the proposed activities are within the Okefenokee Wilderness Area, a Minimum Requirement Decision Guide will be completed prior to issuance of a Special Use Permit.

Availability of Resources: Annual refuge operation and maintenance funds support the administration of research activities. The annual cost of operating and maintaining the present resource research studies program is approximately $5,000.

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

Maintenance Costs: Trail maintenance

Administrative/Law Enforcement Monitoring Costs: $6,000

Offsetting revenues: Miscellaneous grants

Anticipated Impacts of the Use:

Short-term impacts:

There should be no significant adverse impacts from scientific research because each proposal will be reviewed for appropriateness and compatibility before the researcher will be issued a Special Use Permit. The knowledge gained from the research activities would provide information towards improving management techniques for trust resource species. Impacts such as trampling vegetation, removal of small numbers of plants and/or animals, and temporary disturbance to wildlife could occur, but should not be significant.

Long-term impacts:

Long-term benefits associated with species' population trends and improved management techniques would outweigh any negative impacts which may occur.

Cumulative impacts:

No adverse cumulative impacts are anticipated.

Public Review and Comment: This compatibility determination is subject to review along with the refuge's draft Comprehensive Conservation Plan and Environmental Assessment. This document was announced in the *Federal Register* and made available for public comment for 30 days. The following methods were used to solicit public review and comment on the CCP:

Post notice in local post office.
Public notice in newspapers with wide local distribution.
Public meeting(s).

Determination (check one below):

__X__Compatible with the following stipulations

_____Not Compatible

Stipulations Necessary to Ensure Compatibility: Each request for use of the refuge for research would be examined on its individual merits. Questions of who, what, when, where, and why would be asked to determine if the requested proposal contributes to the refuge purposes and could be best conducted on the refuge without significantly affecting the resources. If so, the researcher would be issued a Special Use Permit that would clearly define allowable activities. Progress would be monitored through annual reports. The success and usefulness of the data would be evaluated through final reports, and chronicles in publications derived from the research.

Any research conducted within the Okefenokee Wilderness Area will be reviewed through the Minimum Requirement Decision Guide in addition to the above requirements.

Justification:

The benefits derived from sound research provide a better understanding of resources on the refuge and surrounding area. This knowledge becomes valuable in managing natural systems, establishing thresholds, identifying threats, and better understanding the species and the environmental communities present on the refuge. Research projects would be designed to minimize impacts and disturbance.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

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

Description of Use: Overnight Camping

A camping trip through the Okefenokee Swamp is an experience that many treasure for a lifetime. Since the majority of the refuge is a nationally designated Wilderness Area, campers usually experience solitude. The seven overnight shelters combined with the trail system offer 12 different combinations of trips ranging from two to five days. The overnight shelters include the following: a camping platform with a shelter top that spans most of the platform, a picnic table, and a composting toilet located nearby. "Leave No Trace Skills and Ethics" are required by the refuge. Visitors must carry in all of their gear, food, drinking water, portable toilet for use in canoe, and cooking devices. Reservations can be made up to two months in advance for one party of one to twenty people. Commercial overnight and day-use guides and outfitters (up to 25 and 100, respectively) are required to apply for a Special Use Permit prior to leading trips into Okefenokee NWR. Requirements include proof of liability insurance, basic first aid, and CPR. Once each applicant has been reviewed and approved, they are then required to attend a refuge-sponsored, one-day training session to review special operating procedures, guidelines, rules, regulations, laws and other refuge-specific information.

Availability of Resources: Annual refuge operation and maintenance funds support public use activities. The annual cost of operating and maintaining the present overnight camping program would be approximately $125,000.

Special equipment, facilities or improvements necessary to support the use: Shelters (7), toilets, trailcutter, brochures, permits, etc.

Maintenance Costs: $60,000

Administrative/Law Enforcement Monitoring Costs: $65,000

Offsetting revenues: $65,000

The refuge is a participant in the Recreational Fee Demonstration Program which currently returns 80 percent of fees generated from recreational activities back to the refuge.

Anticipated Impacts of the Use:

Short-term impacts:

Similar to the impacts related to wildlife observation and photography, providing overnight wilderness camping opportunities within the refuge increases the area of potential disturbance and the number of disturbances to the environment and wildlife. Individual animals may be disturbed by human contact to varying degrees during the overnight camping experience. Examples of potential disturbance include flushing of animals from feeding, resting, or nesting areas. Overnight campers are in canoes on established waterways, so disturbance to the vegetation would be minimal. Disturbance to trust species are expected to be minimal unless use shifts to locations adjacent to waterways. Camping facilities are designed to minimize impact to the vegetation and wetland soils. Campfires are only allowed at campsites located on dry ground. Litter increases around the overnight platforms due to wind.

Long-term impacts:

Resident wildlife have greater potential of being impacted over a long time period due to the recurring visitation at campsites. Wildlife can become accustomed to humans. If campers are not

conscientious of keeping a clean camp on and off the platform, food odors and scraps may become attractive to certain wildlife. Lack of fear could result in harm to the animal or an animal could become aggressive and need to be relocated or dispatched.

Cumulative impacts:

As visitation increases, the demand for the overnight camping platforms may extend the peak season beyond March-May and October-November. With only 7 campsites and one party allowed per site per night, minimal impact and solitude is emphasized. No additional platforms are proposed. The use of camping sites will be modified as necessary to mitigate unforeseen impacts.

Public Review and Comment: This compatibility determination is subject to review along with the refuge's draft Comprehensive Conservation Plan and Environmental Assessment. This document was announced in the *Federal Register* and made available for public comment for 30 days. The following methods were used to solicit public review and comment on the CCP:

Post notice in local post office.
Public notice in newspapers with wide local distribution.
Public meeting(s).

Determination (check one below):

__X__Compatible with the following stipulations

_____Not Compatible

Stipulations Necessary to Ensure Compatibility:

The following rules and regulations are in place to provide visitor safety, solitude, and a primitive experience on the trail system:

1. The canoe permit must be carried by the group leader, who is responsible for the party knowing and following all the regulations.

2. Permittee must complete any additions and/or changes to the permit at least one week prior to departure.

3. The canoe permit fees include required entrance fees for the number of days of the trip.

4. Permittee may not lead guided trips without a Special Use Permit.

5. Permittee and their party must launch from each site before 10:00 a.m. to ensure that they reach the next overnight stop before dark.

6. Permittee and their party must register when they enter and leave the swamp and at each overnight stop.

7. Permittee and their party are responsible for bringing a portable toilet with disposable bags for waste disposal and a camp stove and fuel for cooking.

8. Permittee and their party must follow exactly the route described on their permit. Permittee and their party must not stray from the assigned trail. Only one party per stop is permitted.

9. All licenses, permits, equipment, and effects including vehicles and canoes/kayaks, are subject to inspection by county, state, and federal officers.

10. Permittee and their party must obey all state, federal, and county laws regarding alcohol consumption. County regulations prohibit public intoxication.

11. Permittee and their party may not bring pets, swim, or wade in the swamp, due to danger from alligators.

12. Permittee and their party may not bring a motor of any kind on canoe trips.

13. Keep trails free from litter. Please pack out any litter generated from the trip and any found during the course of the trip.

14. Permittee and their party may not bring firearms or other weapons onto the refuge. No hunting is permitted.

15. All wildlife, plants, and artifacts in the refuge are protected. Do not feed or harass any wildlife, or pick any plants.

16. Permittee and their party must remain at the designated overnight area between sunset and sunrise for one night only.

17. Open fires are permitted only at Canal Run, Floyds Island, and Cravens Hammock.

Note: Permittee and any of their party, who leave vehicles overnight in refuge parking areas, must display the Okefenokee Parking Placard in the windshield. This parking placard must be visible through the windshield.

Justification:

The overnight camping program at Okefenokee NWR provides a challenge, an opportunity to experience solitude, observe fauna, flora, and the landscape within the heart of the swamp. The refuge's reservation system provides limitations on party size, travel routes, and the number of nights spent camping. Unconfined access is not allowed to avoid disturbance to the vegetation, increased contamination from human waste, and excessive numbers of people in uncontrolled locations. Managing people within the wilderness area elevates the quality of the experience.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

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

Approval of Compatibility Determination

The signature of approval is for all compatibility determinations considered within the Comprehensive Conservation Plan. If one of the descriptive uses is considered for compatibility outside of the plan, the approval signature becomes part of that determination.

Refuge Manager _____
(Signature/Date)

Regional Compatibility
Coordinator _____
(Signature/Date)

Refuge Supervisor _____
(Signature/Date)

Regional Chief
National Wildlife Refuge System
Southeast Region _____
(Signature/Date)

Appendix XIII. Glossary Of Terms And Acronyms

Adaptive Management	A process in which projects are implement within a framework of scientifically driven experiments to test predictions and assumptions outlined within the comprehensive conservation plan. The analysis of the outcome of project implementation helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.
“Area of Concern”	Lands near the refuge boundary that the Service would prefer to stay undeveloped; remain agricultural or be restored to their natural state. The Service would assist in managing these lands for wildlife through developing partnerships or by entering into license agreements or boundary easements.
Alluvial	Of, relating to, or found in sediment deposited by flowing water, as in a riverbed, flood plain, or delta.
Alternative	A set of objectives and strategies needed to achieve refuge goals and the desired future condition.
Anadromous	Going from salt water to fresh water; such as salmon, shad, snook, or tarpon.
Anthropogenic	Caused by man, such as air pollution.
Approved Acquisition Boundary	A project boundary which the Direction of the Fish and Wild life Service approves upon completion of the detailed planning and environmental compliance process.
Bio-accumulation	The process in which industrial waste, toxic chemicals, or pesticides gradually accumulate in living tissue, or in the food web/chain.
Biological Diversity	The variety of life forms and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.
Biological Integrity	The biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes the shape genomes, organisms, and communities.
Biomass	The total mass, or amount of material, in particular area.

Biota	The plant and animal life of a region.
Buffer	A multi-use transitional area designed and managed to protect core reserves and critical corridors from increased development and human activities that are incompatible to wildlife. In the document, agricultural lands are also considered buffer lands.
Canopy	A layer of foliage; generally the upper-most layer in a forest stand. It can be used to refer to mid- or under-story vegetation in multi-layered stands. Canopy closure is an estimate of the amount of overhead tree cover (also canopy cover).
Catastrophic Wildfire	Fires which historically occurred in the area prior to the 1900's, usually once every 20 years during severe droughts; fires had potential due to their intense nature, to physically alter a particular plant community.
Class I Airshed	A section of wilderness, national park, or international park designated by Congress as critical areas to protect pristine air quality.
Compatible Use	An appropriate wildlife-dependent recreational use or any other use on a refuge that is within the mandates laid down in the National Wildlife Refuge System Improvement Act of 1997; the intent of the Congress in the Act of 1997 or in the "Final Internal Draft" document of appropriate uses on a national wildlife refuge. The refuge manager may also determine if an activity will or will not materially interfere with or detract from the fulfillment of the mission of the System or purposes of the refuge.
Comprehensive Conservation Plan	A document that describes the desired future condition of a refuge and provides long-range guidance and management direction in order to accomplish the purposes of the refuge, contribute to the mission of the refuge system, and meet other relevant mandates.
Cone of Depression	An area surrounding a well or underground mine within which groundwater flow changes direction when water is pumped out and drawing down (lowering) of the water table occurs in the immediate area.
Conservation Easement	A legal document that provides specific land-use rights to a secondary party. A perpetual conservation easement usually grants conservation and management rights to a party in perpetuity.
Cooperative Agreement	A simple habitat protection action in which no property rights are acquired. An agreement is usually long-term and can be modified by either party.

Corridor Resources	A route that allows movement of animal species from one region or place to another.
Cultural Resources	The physical remains of human activity (e.g., artifacts, ruins and burial mounds) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, such as a sacred area of native peoples) of an area. It includes historically, archaeologically, and/or architecturally significant resources.
Ecological Succession	The orderly progression of an area through time in the absence of disturbance from one vegetative community to another.
Ecosystem	A dynamic and interrelated complex of plant and animal communities and their associated non-living environment.
Ecosystem Approach	A strategy or plan to protect and restore the natural function, structure, and species composition of an ecosystem, recognizing that all components are interrelated.
Ecosystem Management	Management of an ecosystem that includes all ecological, social, and economic components which make up the whole of the system.
Ecotone	A transitional zone between two habitat types or adjacent communities.
Elemental Contaminants	Elements such as phosphorus, mercury or selenium that occur in the environment naturally or unnaturally as the result of human actions.
Endangered Species	Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range, and published in the Federal Register.
Endemic Species	Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.
Evapotranspiration	The total water loss from soil, including direct evaporation and that by transpiration from the leaf surface of plants.
Exotic Species	A non-indigenous or alien species, or one introduced, either purposefully (horticulture trade) or accidentally that escaped into the wild where it reproduces on its own, either sexually or asexually. Any introduced plant or animal species that is not native to the area and may be considered a nuisance.
Fauna	All the vertebrate or invertebrate animals of an area.

Fee Title	The acquisition of most or all of the rights to a tract of land. There is a total transfer of property rights with a formal conveyance of a title. While a fee title acquisition involves most rights to a property, certain rights may be reserved or not purchased, including water rights, mineral rights, or use reservation (the ability to continue using the land for a specified time period, or the remainder of the owner's life).
Feral	A wild, free roaming domestic animal; may be a domestic escapee.
FONSI	Finding of No Significant Impact. 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.
Fragmentation	The process of reducing the size and connectivity of habitat patches. The disruption of extensive habitats into isolated and small patches.
Fuel	Living and dead plant material that is capable of burning.
GIS	Geographic Information System. A computer-based system for the collection, processing, and managing spatially-referenced data. GIS allows for the overlay of many data layers and provides a valuable tool for addressing resource management issues.
Goals	Descriptive statements of desired future conditions.
Habitat	The place where an organism lives. The existing environmental conditions required by an organism for survival and reproduction.
Helibase	Central location where helicopters are stationed for refuge operations.
Herbicide	A chemical agent used to kill plants or inhibit plant growth.
Hydrological	Involving water flows or their distributions as related to evaporation, or flow to freshwater marshes, salt marshes, seas, estuaries, etc.
Hydrology	The scientific study of the properties, distribution, and effects of water in the atmosphere, on the earth's surface and in soil and rocks. A hydrologic model is a type of simulation which takes into account the known behavior of water in the form of mathematical formulas and computer models that allows one to mimic the movement of water in a known area.

Hydropattern	A description of water movement change in depth, timing, flow, or location of surface water.
Hydroperiod	A measure of the fluctuation and change of water levels and flow over time. The length of time an area is inundated.
Indicator Species	A species of plant or animal that is assumed to be sensitive to habitat changes and represents the needs of a larger group of species.
In-Holding	Privately owned land inside the boundary of a national wildlife refuge.
Invasive Species	A native, or non-native plant that has flourished beyond its normal constraints, due to changes in its natural environment.
Issue	Any unsettling matter that requires a management decision. For example, a resource management problem, concern, a threat to natural resources, a conflict in uses, or the presence of an undesirable resource condition.
Keystone Species	A species unique to, or dependent upon, a specific habitat; that one of a number of associated parts or things that supports or holds together the others.
Listed Species	Any species of fish, wildlife, or plant that has been determined to be “at risk” by a state or the federal government agency. In this document, at risk may include threatened, endangered, species of special concern, species of management concern, or species included in the Convention of International Trade in Endangered Species.
Midden	A slightly elevated mound composed of shell fragments and other debris left as waste by native Indians; shell mounds found throughout the ecosystem constructed by native Indians.
Migratory	The seasonal movement from one area to another and back.
Minimum Requirements Decision Guide	The 2-step process to identify, analyze, and select management actions that are the minimum necessary for wilderness administration. Step 1 determines whether action is necessary. If action is found to be necessary, then Step 2 provides guidance for determining the minimum action.
Mitigation	Avoiding or minimizing impacts of an action.
Monitoring	The process of collection information to track changes of selected parameters over time.

Monotypic	Consisting of one type or species, such as exotic vegetation. Examples include single crops or Casuarina “heads.” Scientific studies have shown that monotypic stands of vegetation generally provide poor wildlife habitat.
National Environmental Policy Act	Requires all federal agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate this Act with other planning requirements, and prepare appropriate policy documents to facilitate better environmental decision making.
National Wildlife Refuge System	A national network of lands and waters administered 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.
Native	A species already occurring in the area at the time of European contact (1500 AD). With respect to a particular ecosystem, a species that, other than as a result of introduction, historically occurred or currently occurs in that ecosystem.
Natural Terraces	A stair-step of hydrologic pools within the refuge. Water moves with the gradient depending on current water levels within each pool.
Neotropical Migratory Birds	Birds that migrate from North America back and forth to South or Central America. These birds usually breed in North America and “winter” in the Caribbean, or South or Central America. Usually this term is inclusive of many passerines (perching birds) and shorebirds.
Objectives	Actions to be accomplished to achieve a desired outcome.
Old Growth Forest	Forested areas lacking frequent disturbance to vegetation, usually characterized by dominant species entered into a late successional stage; usually associated with high diversity of species, specialization and structural complexity.
Partnerships	A mutually beneficial, joint relationship between two agencies or an agency and landowner, etc.
Partners-in-Flight Initiative	A cooperative effort involving partnerships among federal, state, and local government agencies, conservation groups, academic communities, industry, private organizations and individuals in North, Central, and South America to promote conservation of birds in this hemisphere.

Passerine	The largest bird group composed of small perching birds. Examples include northern cardinals, blue jays, warblers, sparrows, and wrens.
PM10 Particles	Respirable particles in the air that are smaller than 10um. These particles are collected for analysis at the refuge's air quality station.
Preferred Alternative	The Service's selected alternative identified in the Draft Comprehensive Conservation Plan.
Prescribed Fire	A planned or intentional fire set by resource land managers to improve or restore wildlife habitat and reduce potentially dangerous fire fuel loads, also known as "controlled burn."
Public Use Natural Area	A NWRS designation for a relatively undisturbed ecosystem or sub-ecosystem that possesses exceptional value or quality in illustrating or interpreting an element of the natural heritage of our Nation. It is available for use by the public with certain restrictions for protecting the area.
Research Natural Area	Specific natural areas set aside in large refuges of the National Wildlife Refuge System that are protected and preserved from disruptive uses, active or manipulative management, encroachment and development. In this refuge, 2,560 acres of the interior have been set aside and are generally off-limits to all personnel. Potentially, these areas can be used for comparative studies by research scientists and staff.
Restoration Management	Management actions to return a vegetative community or ecosystem to its original, natural condition. To bring a disturbed site or an area changed from its current state back to its historic structure, including water regimes, plant communities, and wildlife components. In this document, restoration can refer to exotic plant removal, planting native plants, and/or reintroductions of native plants or animals.
RONS	Refuge Operating Needs System. A national database which contains the unfunded operational needs of each refuge. Projects included are those required to implement approved plans and meet goals, objectives, and legal mandates.
Scoping	Process for determining the scope of issues to be addressed by a comprehensive conservation plan and for identifying the significant issues. Involved in the scoping process are federal, state, and local agencies, private organizations, and individuals.

Service	Fish and Wildlife Service; the federal agency, under the Department of the Interior, which guides the management of the refuge.
Shrub	A plant usually with several woody stems; a bush. A shrub differs from a tree by its low height.
Species	A group of organisms all of which have a high degree of physical and genetic similarity, generally interbreed only among themselves, and show persistent differences from members of allied groups of organisms.
Species of Management Concern	This is a category assigned to species for which information in the possession of the Service indicated that proposing to list as threatened or endangered was possibly appropriate, but for which sufficient data were not available to support proposed rules.
Stakeholders	Individuals or groups that have an interest in a potential or current issue; could include federal, state, tribal, and local government agencies, academic institutions, the scientific community, non-governmental entities including environmental agricultural, and conservative organizations, trade groups, commercial interests and private landowners.
Step-down Management Plans	Plans which provide the details necessary to implement management strategies and projects identified in the Comprehensive Conservation Plan.
Strategy	A general approach or specific actions to achieve objectives.
Synergy	The interaction of two or more agents or forces so that their combined effect is greater than the sum of their individual effects.
Threatened Species	Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.
Tree Islands	Areas of higher elevation within the Okefenokee ecosystem that characteristically support more upland type shrubs, trees, and woody vegetation, namely pines (longleaf and slash), loblolly bay, titi, willow, wax myrtle, Dahoon holly, and buttonbush. Hundreds of tree islands are found in the refuge.

Trust Species	Specifically, species that are federal responsibility and include migratory birds, threatened and endangered species, anadromous fish, and certain marine mammals. The term is broadly used in this document to include federal, state, and internationally listed species, including threatened, endangered, species of special concern and species of management concern. Also known as “listed species.”
Umbrella Species	Species for which protection of its habitat will protect the habitat and life history requirements of a large number of other plants and animals such as the American alligator.
Understory	Any vegetation with canopy below or closer to the ground than canopies of other plants.
Upland Management Compartment	A defined area of upland habitat within the refuge that receives management actions such as prescribed fire, commercial thinning, and replanting of longleaf pine trees.
Vegetation	Plants in general, or the sum of total plant life in an area.
Watershed	The entire land area that collects and drains water into a stream or stream system.
Wetland	Areas such as lakes, marshes, and streams that are inundated by surface or ground water for a long enough period of time each year to support, and do support under natural conditions, plants and animals that require saturated or seasonally saturated soils.
Wildfire	An uncontrolled fire started naturally by means such as lightning, or accidentally/intentionally by man. Same as wildland fire.
Wildlife Diversity	Measure of the number of wildlife species in an area and relative abundance.
Wildlife Management	The art and science of producing, maintaining, benefiting, and/or enhancing wildlife populations and their associated habitats.
Wildlife-Dependent Recreation	Uses on a national wildlife refuge that involve hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation as identified in the National Wildlife Refuge System Improvement Act of 1997.
Xeric	Of, characterized by, or adapted to an extremely dry habitat

Zone of Influence	A geographic region, typically surrounding a smaller defined area, that has the potential to influence conditions within all areas of the region. An example would be a watershed surrounding a pond or lake.

Acronyms

AMSL	Above Mean Sea Level
CCP	Comprehensive Conservation Plan
EA	Environmental Assessment
FLFWCC	Florida Fish and Wildlife Conservation Commission
FONSI	Finding of No Significant Impact
GASPHS	Georgia State Parks and Historic Sites
GAWRD	Georgia Wildlife Resource Division
GOAL	Greater Okefenokee Association of Landowners
IP	International Paper
MOU	Memorandum of Understanding
MRDG	Minimum Requirements Decision Guide
NEPA	National Environmental Policy Act
NF	National Forest
NWR	National Wildlife Refuge
OERC	Okefenokee Education and Research Center
OWL	Okefenokee Wildlife League
RONS	Refuge Operating Needs System
SCFSP	Stephen C. Foster State Park
SCRA	Suwannee Canal Recreation Area
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WUI	Wildland Urban Interface

Appendix XIV. Literature Cited

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