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**LAKE WOODRUFF NATIONAL WILDLIFE REFUGE**  
**DRAFT COMPREHENSIVE CONSERVATION PLAN**  
**AND ENVIRONMENTAL ASSESSMENT**

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

*Southeast Region*

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## SECTION A. DRAFT COMPREHENSIVE CONSERVATION PLAN

### I. BACKGROUND

#### INTRODUCTION

Located along Florida's St. Johns River about 25 miles west of the city of Daytona Beach in Volusia and Lake Counties, Lake Woodruff National Wildlife Refuge (NWR) was established for migratory waterfowl and wading birds (Figure 1). The refuge is part of a 70-mile-long wildlife corridor of ecologically sensitive lands along the St. Johns River, stretching from the Wekiva River to Lake George. The 21,574-acre refuge supports a diversity of wildlife and plant species, including a variety of waterfowl, shorebirds, and neotropical migratory birds, as well as numerous Federal- or State-listed species through a mix of freshwater marshes, rivers, impounded wetlands, and upland shrublands and forests. The refuge includes two major water bodies, which are part of the St. Johns River system: Lake Woodruff and Lake Dexter. The refuge supports at least two pairs of bald eagles, foraging habitat for wood storks, the second largest premigration roosting colony in the southeastern United States for swallow-tailed kites with over 900 individuals, and manatee habitat. It is an overwinter and stopover site for a variety of waterfowl, shorebirds, and neotropical migratory birds. The refuge includes over 1,000 acres of wilderness. Furthermore, the refuge protects historical and archaeological sites. A growing human population, along with ongoing development and other human activities, currently threaten the largest river in Florida and the refuge. The refuge is part of a larger Refuge Complex in central and southeast Florida, including Merritt Island and St. Johns NWRs in Titusville; Archie Carr NWR between Melbourne and Wabasso Beaches; Pelican Island NWR near Sebastian; and Lake Wales Ridge NWR in Highlands and Polk Counties, near Sebring.

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

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

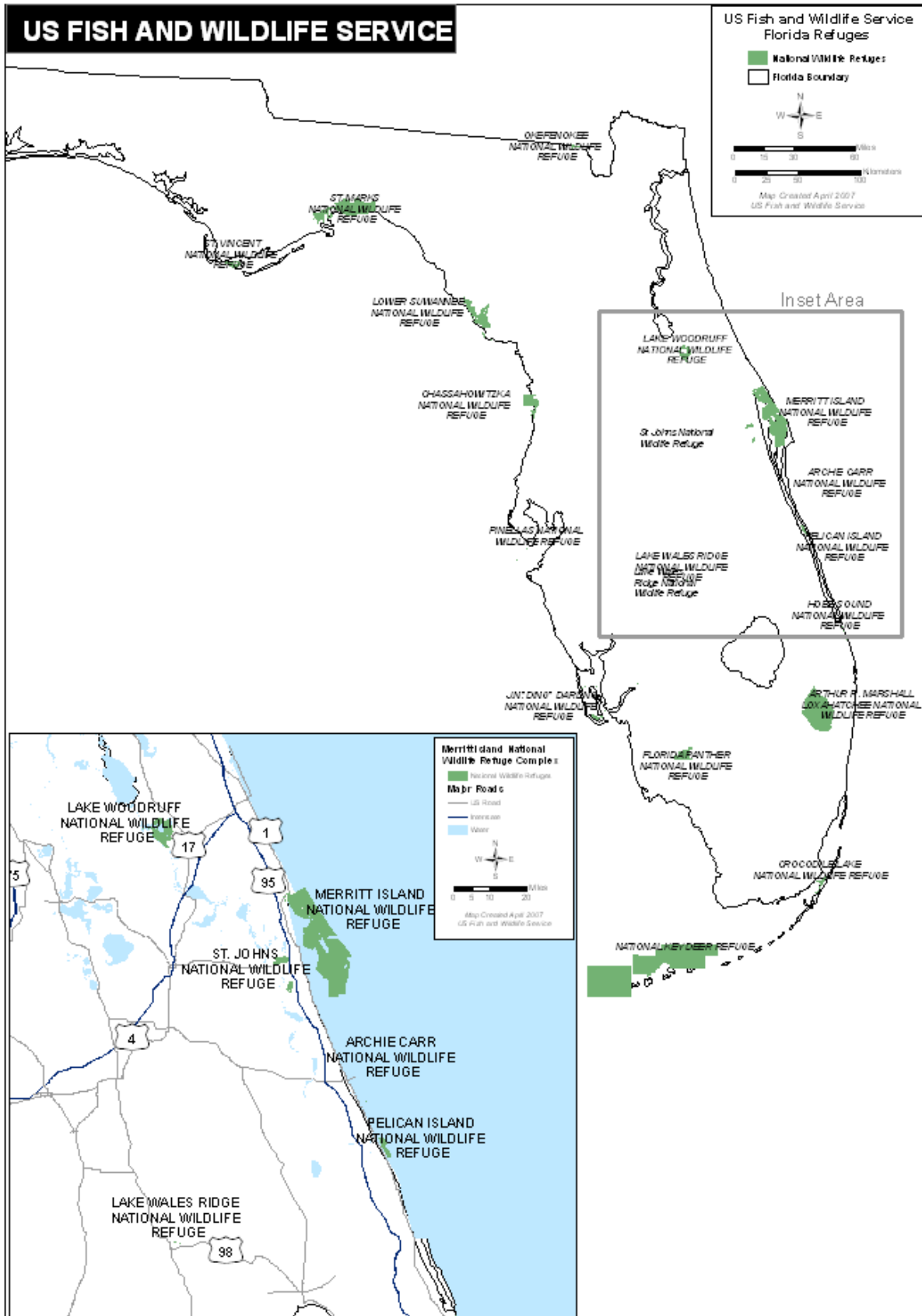
#### PURPOSE AND NEED FOR THE PLAN

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

Specifically, the plan is needed to:

- Provide a clear statement of refuge management direction;
- Provide refuge neighbors, visitors, and government officials with an understanding of Service management actions on and around the refuge;

Figure 1. Lake Woodruff NWR vicinity map



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Ensure that Service management actions, including land protection and recreation/education programs, are consistent with the mandates of the National Wildlife Refuge System; and

- Provide a basis for the development of budget requests for operations, maintenance, and capital improvement needs.

## **FISH AND WILDLIFE SERVICE**

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

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

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

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

The Service is the principal Federal agency responsible for conserving, protecting and enhancing fish, wildlife and plants and their habitats for the continuing benefit of the American people. The Service manages the 97-million-acre National Wildlife Refuge System, which encompasses 545 national wildlife refuges, thousands of small wetlands, and other special management areas. It also operates 69 national fish hatcheries, 63 fish and wildlife management offices and 81 ecological services field stations. The Service enforces Federal wildlife laws; administers the Endangered Species Act; manages migratory bird populations; restores nationally significant fisheries; conserves and restores wildlife habitat, such as wetlands; and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program, which distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to State fish and wildlife agencies.

## **NATIONAL WILDLIFE REFUGE SYSTEM**

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

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

The National Wildlife Refuge System Improvement Act of 1997 established, for the first time, a clear legislative mission of wildlife conservation for the National Wildlife Refuge System (Refuge System). Actions were initiated in 1997 to comply with the direction of this new legislation, including an effort to complete CCPs for all refuges. These CCPs, which are completed with full public involvement, help guide the future management of refuges by establishing natural resources and recreation/education

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programs. Consistent with this Act, approved CCPs will serve as the guidelines for refuge management for the next 15 years. The Act states that each refuge shall be managed to:

- Fulfill the mission of the National Wildlife Refuge System;
- Fulfill the individual purposes of each refuge;
- Consider the needs of wildlife first;
- Fulfill requirements of comprehensive conservation plans that are prepared for each unit of the Refuge System;
- Maintain the biological integrity, diversity, and environmental health of the Refuge System;
- Recognize that wildlife-dependent recreation activities including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation are legitimate and priority public uses; and
- Allow refuge managers the authority to determine compatible public uses.

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

Approximately 37 million people visited national wildlife refuges in 2004, most to observe wildlife in their natural habitats, creating almost 24,000 private sector jobs and producing about \$454 million in employment income (Caudill and Henderson 2005). Further, recreational spending on refuges generated nearly \$151 million in tax revenue at the local, county, State, and Federal levels (Caudill and Henderson 2005). As the number of visitors grows, local communities realize important economic benefits. In 2001, 82 million people, 16 years and older, fished, hunted, or observed wildlife, generating \$108 billion. In a study completed in 2002 on 15 refuges, visitation had grown 36 percent in 7 years. At the same time, the number of jobs generated in surrounding communities grew to 120 per refuge, up from 87 jobs in 1995, pouring more than \$2.2 million into local economies. The 15 refuges in the study were Chincoteague (Virginia); National Elk (Wyoming); Crab Orchard (Illinois); Eufaula (Alabama); Charles M. Russell (Montana); Umatilla (Oregon); Quivira (Kansas); Mattamuskeet (North Carolina); Upper Souris (North Dakota); San Francisco Bay (California); Laguna Atacosa (Texas); Horicon (Wisconsin); Las Vegas (Nevada); Tule Lake (California); and Tensas River (Louisiana)—the same refuges identified for the 1995 study. Other findings also validate the findings that communities near refuges benefit economically. Expenditures on food, lodging, and transportation grew to \$6.8 million per refuge, up 31 percent from \$5.2 million in 1995. For each Federal dollar spent on the Refuge System, surrounding communities benefited with \$4.43 in recreation expenditures and \$1.42 in job-related income (Caudill and Laughland, unpubl. data).

Volunteers and friends groups continue to be a major contributor to the success of the Refuge System. In 2005, volunteers contributed more than 1.4 million hours on refuges nationwide, a service valued at more than \$25 million and representing a full-time employee equivalent of over 700 (U.S. Fish and Wildlife Service 2006). And, in 2005, nine new friends groups were

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formed to support refuge management programs and operations, bringing the Refuge System's total to over 200 (U.S. Fish and Wildlife Service 2006).

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

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

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

## **LEGAL AND POLICY CONTEXT**

### *LEGAL MANDATES, ADMINISTRATIVE AND POLICY GUIDELINES, AND OTHER SPECIAL CONSIDERATIONS*

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

Treaties, laws, administrative guidelines, and policy guidelines assist the refuge manager in making decisions pertaining to soil, water, air, flora, fauna, and other natural resources; historical and cultural resources; research; and recreation on refuge lands, and provide a framework for cooperation between Lake Woodruff NWR and other partners, such as the Florida Fish and Wildlife Conservation Commission (FWC), St. Johns River Water Management District (SJRWMD), National Park Service (NPS), United States Department of Agriculture Forest Service (USDA Forest Service), U.S. Army Corps of Engineers (Corps), Florida Department of Environmental Protection (FDEP), De Leon Springs State Park, organizations, private landowners, businesses, and the public.

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

- Contribute to ecosystem goals, as well as to refuge purpose(s) and goals;
- Conserve, manage, and restore fish, wildlife, and plant resources and their habitats;
- Monitor the trends of fish, wildlife, and plants;

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- Manage and ensure appropriate visitor uses as those uses benefit the conservation of fish and wildlife resources and contribute to the enjoyment of the public; and
  - Ensure that visitor activities are compatible with refuge purposes.

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

### *BIOLOGICAL INTEGRITY, DIVERSITY, AND ENVIRONMENTAL HEALTH POLICY*

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

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

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

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

#### *NORTH AMERICAN BIRD CONSERVATION INITIATIVE*

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

#### *NORTH AMERICAN WATERFOWL MANAGEMENT PLAN*

The North American Waterfowl Management Plan (NAWMP) is an international action plan to conserve migratory birds throughout the continent (NAWMP 2004). NAWMP's goal is to return

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waterfowl populations to their 1970s' levels by conserving wetland and upland habitat. Canada and the United States signed the NAWMP in 1986, in reaction to critically low numbers of waterfowl. Mexico joined in 1994, making it a truly continental effort. The NAWMP is a partnership of Federal, Provincial/State and municipal governments, non-governmental organizations, private companies, and many individuals, all working towards achieving better wetland habitat for the benefit of migratory birds, other wetland-associated species, and people. NAWMP projects are international in scope, but implemented at regional levels. These projects contribute to the protection of habitat and wildlife species across the North American landscape. Lake Woodruff NWR plays a positive role in NAWMP through wetlands protection and multi-species habitat management.

#### *PARTNERS-IN-FLIGHT BIRD CONSERVATION PLAN*

Managed as part of the Partners-in-Flight Plan (PIF), the North Florida Ecosystem physiographic area represents a scientifically based land bird conservation planning effort that ensures long-term maintenance of healthy populations of native land birds, primarily non-game land birds (Rich et al., 2004). Non-game land birds have been vastly under-represented in conservation efforts, and many are exhibiting significant declines. PIF is voluntary and non-regulatory, and focuses on relatively common species in areas where conservation actions can be most effective, rather than the frequent local emphasis on rare and peripheral populations. Lake Woodruff NWR contributes to several PIF landbird conservation objectives, including the protection of migratory and breeding habitat and multi-species habitat management.

#### *U.S. SHOREBIRD CONSERVATION PLAN*

The U.S. Shorebird Conservation Plan (SCP) is a partnership effort throughout the United States to ensure that stable and self-sustaining populations of shorebird species are restored and protected (Brown et al., 2001). The SCP was developed by a wide range of agencies, organizations, and shorebird experts for separate regions of the country, and identifies conservation goals, critical habitat conservation needs, key research needs, and proposed education and outreach programs to increase awareness of shorebirds and the threats they face. Lake Woodruff NWR plays a role in the SCP through the protection and management of shorebird habitat and monitoring programs.

#### *NORTH AMERICAN WATERBIRD CONSERVATION PLAN*

The North American Waterbird Conservation Plan (NAWCP) provides a framework for the conservation and management of 210 species of waterbirds in 29 nations (Kushlan et al., 2002). Threats to waterbird populations include destruction of inland and coastal wetlands, introduced predators and invasive species, pollutants, mortality from fisheries and industries, disturbance, and conflicts arising from abundant species. Particularly important habitats of the Southeast Region include pelagic areas, marshes, forested wetlands, and barrier and sea island complexes. Fifteen species of waterbirds are federally listed, including breeding populations of wood storks, Mississippi sandhill cranes, whooping cranes, interior least terns, and Gulf Coast populations of brown pelicans. A key objective of the NAWCP is the standardization of data collection efforts to better recommend effective conservation measures. Lake Woodruff NWR contributes toward several of the NAWCP goals by helping maintain waterbird diversity and protecting and managing waterbird habitat.

#### **RELATIONSHIP TO STATE WILDLIFE AGENCY**

A provision of the Improvement Act, and subsequent agency policy, is that the Service shall ensure timely and effective cooperation and collaboration with other State fish and game agencies and Tribal governments during the course of acquiring and managing refuges. State wildlife management areas

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and national wildlife refuges provide the foundation for the protection of species, and contribute to the overall health and sustainment of fish and wildlife species in the State of Florida.

Lake Woodruff NWR's State agency partners include: Florida Fish and Wildlife Conservation Commission (FWC), Florida Department of Environmental Protection (FDEP), Florida Division of Forestry (FDOF), and St. Johns River Water Management District (SJRWMD). Management of State fish and wildlife is administered by the FWC and the FDEP. These State agencies are charged with enforcement responsibilities relating to migratory birds, trust species, and fisheries, as well as with management of natural resources of the state. Both FWC and FDEP manage the State's lands and waters. The FWC manages 4.3 million acres of public lands and 220,000 acres of private lands for recreation and conservation purposes. The FDEP manages 150 State parks, covering nearly 600,000 acres and 57 coastal and aquatic managed areas, totaling over 5 million acres of submerged lands and coastal uplands. The SJRWMD has some form of interest in approximately 640,000 acres of property through ownership, management, or conservation easement rights. And further acquisitions are planned by the SJRWMD.

Various State agencies have participated in a series of refuge projects, including the planning process to develop a 15-year management plan for the refuge. An integral part of the CCP process is integrating common mission objectives, where appropriate. The State's participation and contribution throughout this planning process will provide for ongoing opportunities and open dialogue to improve the ecological sustainment of fish and wildlife in the State of Florida. An essential part of comprehensive conservation planning is integrating common mission objectives where appropriate.



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## ***II. REFUGE OVERVIEW***

### **INTRODUCTION**

Lake Woodruff NWR consists of ~21,574 acres in central Florida along the St. Johns River, Florida's largest river (Figure 1). The St. Johns River is a series of interconnected lakes that stretches 310 miles from its southern formation in Indian River County's swamps north to Jacksonville in Duval County near the Florida-Georgia border. The geographical position of the refuge, straddling the zone of overlap between the temperate and subtropical biotic provinces, contributes to the vast species richness of the area. The refuge is uniquely situated to support a wide variety of resident and migratory species. The refuge derives its name from Lake Woodruff, a 2,200-acre waterbody formed during the Pleistocene [100,000 years before present (BP)] when the St. Johns River basin was a large coastal lagoon complex. The eastern boundary of the refuge is part of an ancient dune system known as the Atlantic Coastal Ridge (Schnable, and Goodell 1968) which formed when sea levels fell sharply during glaciation. The resulting differences in elevation present on the refuge, from prehistoric dunes to shallow lakes, have created a variety of habitats, including freshwater marshes, hardwood swamps, and a variety of upland habitats. These diverse refuge habitats support numerous plant species and are utilized by many fish and wildlife species, including seven regularly occurring Federal listed threatened and endangered species, as well as numerous State protected species. Although the refuge is important to a variety of species, it is especially important to swallow-tailed kites. The refuge supports the second largest pre-migration roost of swallow-tailed kites in the United States.

Primary habitat management activities on the refuge involve applying prescribed fire, using mechanical treatments in upland scrub, employing chemical control of exotic plants, and managing water levels in impounded wetlands. Low-intensity prescribed burning activities help to enhance and maintain vegetative communities that are dependent upon or positively influenced by fire, for the benefit of wildlife; to promote nutrient cycling; and to reduce an unnatural buildup of fuels that could otherwise create hazardous, high-intensity wildfires. The refuge's three impounded wetlands are seasonally manipulated to benefit migratory waterfowl, wading birds, shorebirds, and other wildlife. Additional upland management activities include the periodic thinning of pine flatwoods to enhance nesting habitat for bald eagles and gopher tortoises, as well as the control of exotic, invasive, and nuisance species.

### **REFUGE HISTORY AND PURPOSES**

Lake Woodruff NWR is located near the historic Ponce DeLeon Springs, which was discovered in 1513 by Ponce DeLeon, an infamous Spanish explorer and the former governor of Puerto Rico. Development of this area dates back to when the Spaniards cleared a small area, planted it in sugar cane, and built a mill to process the cane. Prior to Spanish exploration, this area was occupied by the Timucuan Indians and their predecessors dating back 8,000 years. Numerous Indian mounds and middens are located throughout this area.

In more modern times, cattle were grazed on Jones and Tick Islands for at least 75 years. An orange grove and farming operations were on Tick Island during the late 1800s. According to local sources, in 1804, William Williams moved from New Smyrna Beach to settle at Spring Garden, now known as DeLeon Springs, and was the first to raise corn and cotton. After Florida became a United States territory in 1821, Major Joseph Woodruff bought out Williams' 2,020-acre share of Spring Garden in 1823. The lake became known as Lake Woodruff and the refuge was later named accordingly.

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In 1952, a private land developer made an abortive attempt to develop about 3,000 acres east of Lake Woodruff for agriculture. Levees were constructed and two 2,400 gallons per minute (GPM) pumps were installed to drain the land. This venture was found to be impractical and was abandoned. The pine timber was removed from Jones Island in 1957-58. Pine, cypress, and oak timber were removed from Tick and Dexter Islands before the Federal Government bought the land. Prior to acquisition, timber and shell removal operations occurred on Tick Island. Though not associated with management of the refuge, these activities continued to be conducted on Tick Island per previous land-use agreements.

In 1964, the Service began purchasing land for the refuge. The Wilderness Act was established that same year. Additional land was incorporated into the area presently occupied by the refuge. Lake Woodruff NWR was established in 1964 as a migratory bird refuge to offset losses of wetland habitat in central Florida. The refuge contains ~21,574 acres and is comprised of approximately 11,100 acres of freshwater marsh; 7,200 acres of hardwood swamps; 2,400 acres of uplands; and more than 800 acres of lakes, streams, and canals. Lake Woodruff NWR also administers an additional nearly 660 acres of Farm Service Agency (FSA) conservation easements (Figure 2).

Approximately one mile from the main entrance, the refuge's headquarters office is located in the town of DeLeon Springs, Florida, which is 25 miles west of Daytona Beach. This headquarters office also serves as a visitor contact station, with a few displays, information, maps, and a small sales outlet operated by the Friends of Lake Woodruff National Wildlife Refuge. Lake Woodruff NWR encircles the State-owned water of Lake Woodruff and the St. Johns River forms much of the western boundary. The majority lies within Volusia County with only a very minor portion in Lake County. The Ocala National Forest lies west and the Lake George State Forest and DeLeon Springs State Park are immediately to the north and northeast of the refuge.

Wildlife diversity is typical of that associated with central Florida wetlands. Lake Woodruff NWR's bird list names 234 species, which can be seasonally found in the area. In addition to the numerous wetland species, several Federal listed species also use the refuge, including: West Indian manatee, snail kite, wood stork, eastern indigo snake, American alligator, and whooping crane. In the early years of the refuge, some of the existing marsh was impounded to attract waterfowl and wading birds. Three impoundments, totaling ~450 acres, now exist at Lake Woodruff NWR and provide loafing and foraging areas for migratory birds. The impoundments are the most popular areas for public use, including bird watching, hiking, and fishing.

Recognizing the high migratory bird benefits served by the lands and waters of the refuge, the Service administratively designated Lake Woodruff NWR in 1963 under the Migratory Bird Conservation Act, outlining a primary purpose of these lands and waters:

- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)

In addition, the refuge has several additional purposes, as listed.

- "...suitable for (1) incidental fish and wildlife-oriented recreation development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. § 460k-1 (Refuge Recreation Act)
- "...the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. § 460k-2 (Refuge Recreation Act)

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- “...wilderness areas...shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness...” 16 U.S.C. § 1131 (Wilderness Act)
  - “...for the development, advancement, management, conservation, and protection of fish and wildlife resources...” 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)
  - “...for the benefit of the United States Fish and wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant or condition of servitude...” 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)
  - “...conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans...” 16 U.S.C. § 668dd(a)(2) (National Wildlife Refuge System Administration Act)
  - “...to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants...” 16 U.S.C. § 1534 (Endangered Species Act)

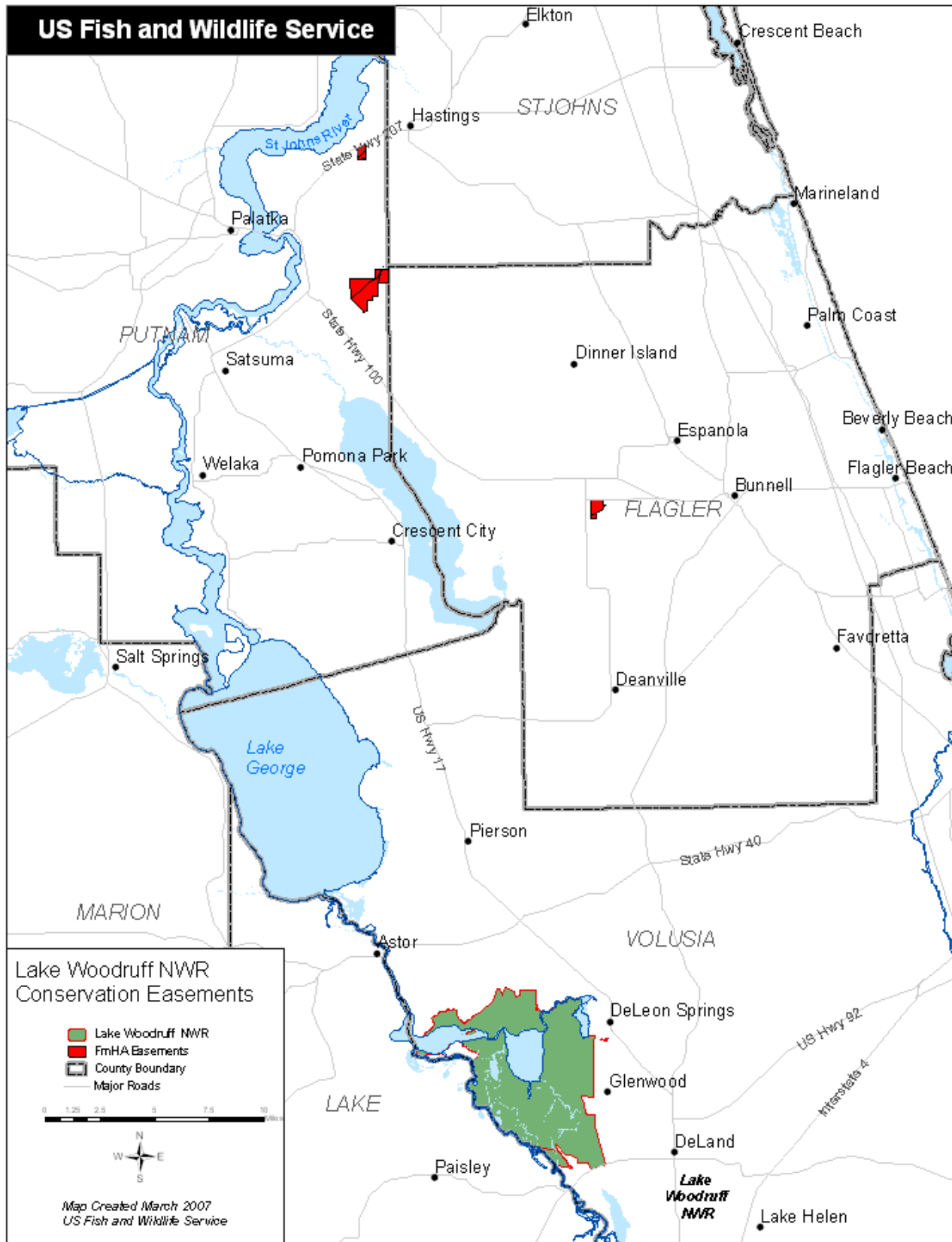
## **SPECIAL DESIGNATIONS**

Lake Woodruff NWR holds two special designations: Research Natural Area and Wilderness Area, totaling about 914 hectares (ha)/2,258.64 acres (which represent about 10.5 percent of the total refuge area). And the St. Johns River that flows through the refuge is designated as an American Heritage River.

### *RESEARCH NATURAL AREA*

Research natural areas are part of a national network of reserved areas under various federal ownerships. Research natural areas are intended to represent the full array of North American ecosystems with their biological communities, habitats, natural phenomena, and geological and hydrological formations. Lake Woodruff NWR has 461 ha (1,140 acres) of designated Research Natural Area along Honey Creek, in the southern part of the refuge (Figure 3). This area represents native southern cordgrass prairie habitat. Management guidelines are not dictated for research natural areas, instead natural processes are allowed to predominate without human intervention. Under certain circumstances, deliberate manipulation may be used to maintain the unique features for which the research natural area was established. Research natural areas receive minimal management consisting of sporadic controlled burns of marsh grasses and occasional law enforcement.

**Figure 2. Farm Service Agency conservation easement properties managed by Lake Woodruff NWR**



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## *WILDERNESS AREA*

The Wilderness Act of 1964 established the National Wilderness Preservation System and established guidelines for management of those areas. In the 1970s proposals were considered for Wilderness on the refuge, ranging from 1,146 acres to 2,200 acres to 8,606 acres. Ultimately, under Public Law 94-557 (see 16 U.S.C. Chapter 23 §1132), Congress designated an estimated 1,146 acres as Wilderness on the refuge on October 19, 1976 (which includes Audubon and Bird Islands, Dexter Island, and St. Francis Island; Figure 3). This original acreage figure was estimated and current estimates total 1,066.41 acres: the 49.52-acre Audubon Island; the 2.92-acre, 0.15-acre, and 0.05-acre Bird Islands; 707.85-acre Dexter Island; and the 305.92-acre St. Francis Island. Although addressed in the 1976 designation of wilderness, the northwest tip of Dexter Island (~59 acres) was private lands in 1976. This small piece of Dexter Island was added to the Wilderness Area with its acquisition in 1979. Adjacent to the refuge and to the refuge's Wilderness Area is the ±7,985-acre Alexander Springs Wilderness Area and nearby is the ±3,120-acre Billies Bay Wilderness Area, both of which were designated in 1983, and which are managed by the USDA Forest Service as part of Ocala National Forest (Figure 3).

The Wilderness Area is comprised of remote areas that offer limited access to the public. Active management of these areas is restricted by guidelines contained in the Wilderness Act. Refuge wilderness areas are located along the southwest boundary and consist of four islands (Audubon, Bird, Dexter, and St. Francis). They cover a combined total of 1,066 acres. Wilderness areas receive minimal management consisting of occasional law enforcement, usually during hunting seasons.

## *AMERICAN HERITAGE RIVER*

The St. Johns River is an important feature of the refuge both in terms of the area it covers, as well as its influence on low-lying habitats. The St. Johns River was designated by executive order as an American Heritage River in 1998. The American Heritage Rivers' initiative has three objectives: natural resource and environmental protection, economic revitalization, and historic and cultural preservation. Only 14 rivers in the United States have this designation.

## **ECOSYSTEM CONTEXT**

Comprising one of the 52 ecosystems around the country, the Service's North Florida Ecosystem includes portions of southern Georgia and most of northern and central Florida (Figure 4), spanning 33 Florida counties and 19 Georgia counties. The North Florida Ecosystem includes several important areas with protective designations, including Ocala National Forest and Okefenokee and Lake Woodruff NWRs. Thirteen national wildlife refuges and one national fish hatchery are located in the North Florida Ecosystem. Various other local, State, and Federal conservation areas are also located within the North Florida Ecosystem. The ecosystem spans temperate and subtropical climates, numerous physiographic districts, and a wide variety of habitats. These include barrier islands, xeric scrub, pine flatwoods, freshwater marshes, lakes, streams, 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. The ecosystem serves a variety of native wildlife, including over 100 federal listed species, as well as interjurisdictional fishes, neotropical migratory birds, non-game waterbirds, and waterfowl. The biggest problem facing the ecosystem is habitat loss and fragmentation caused by development and other human activities. The predominant stresses for the ecosystem are: population growth, tourism, agriculture, silviculture, mining, water channelization, urbanization, aquifer depletion, fire suppression, exotic species, non-point source pollution, and point source pollution (U.S. Fish and Wildlife Service 1996). The actions of the ecosystem team are guided by two categories: trust resources and management issues. The trust resources include: migratory birds,

Figure 3. Lake Woodruff NWR natural research and wilderness areas

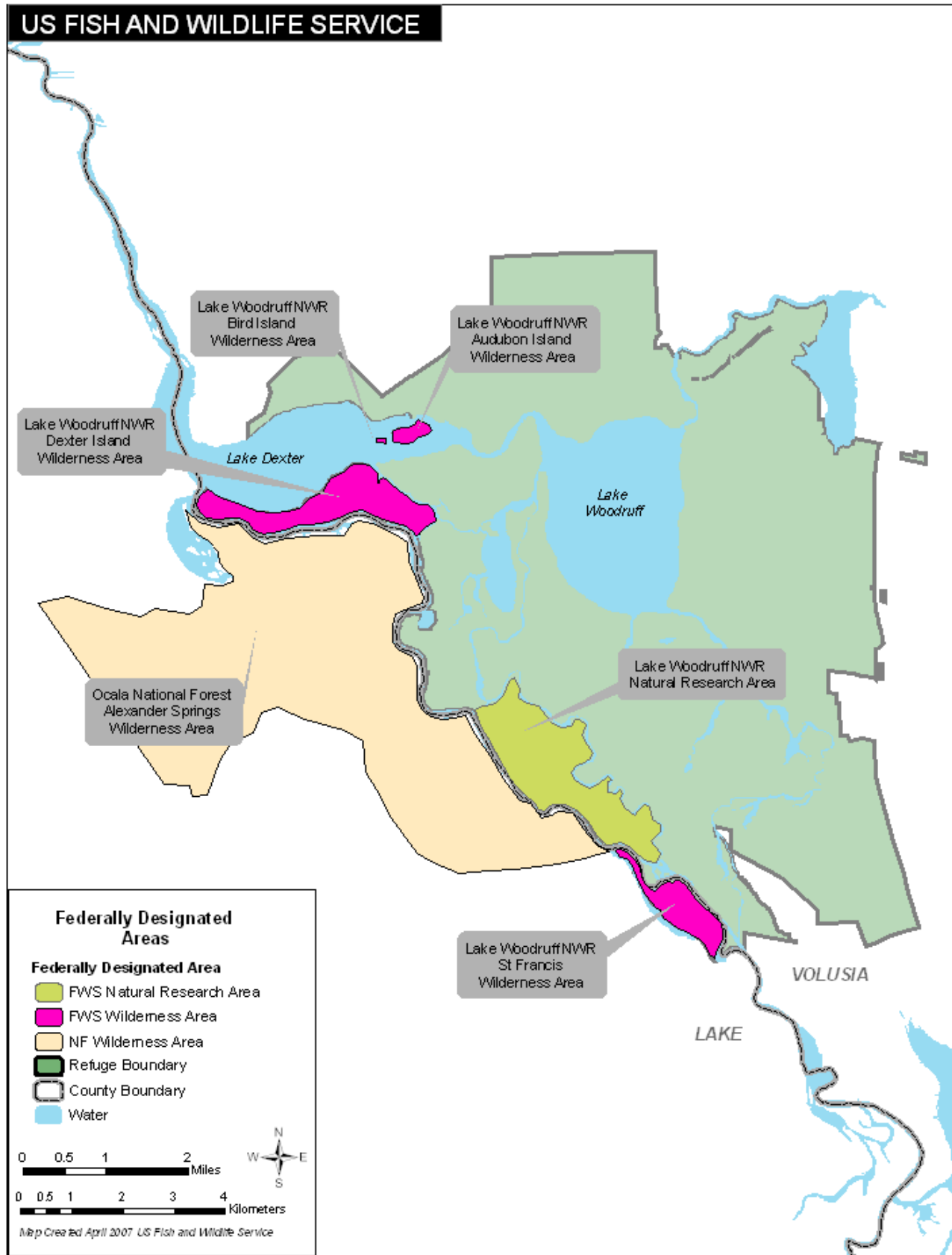
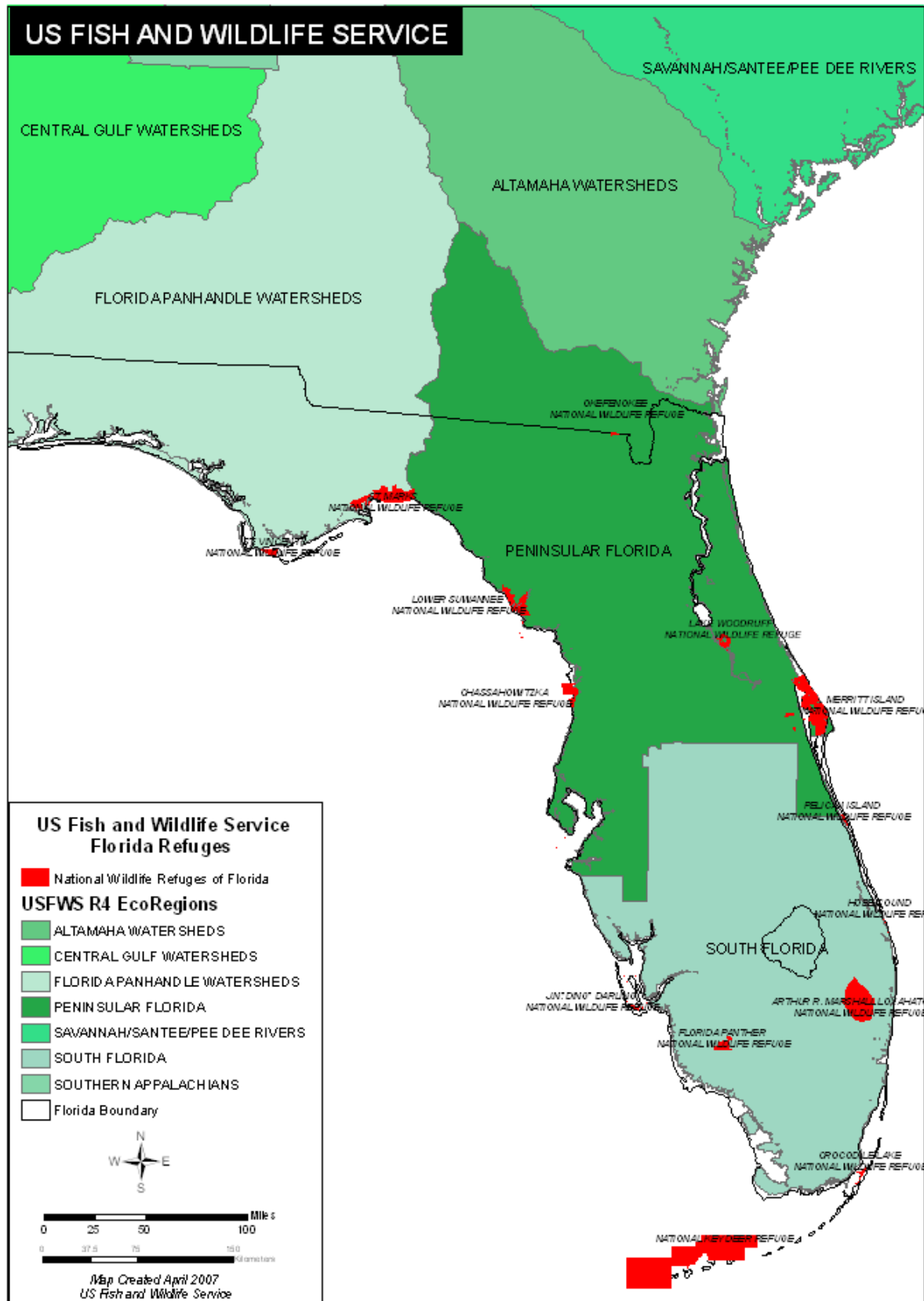


Figure 4. North Florida ecoregions



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anadromous fish, endangered species, and marine mammals. The management issues focus on: habitat protection and management, habitat restoration, contaminant reduction, regulatory compliance, law enforcement, and biodiversity maintenance.

To address these threats, management issues, and needs of the trust resources, the ecosystem team pursues a variety of objectives under five goals:

- Protect, conserve, and enhance migratory birds and their habitats in the North Florida Ecosystem;
- Protect, conserve, recover, and restore fish, aquatic species, and their habitats in the North Florida Ecosystem;
- Protect, conserve, and enhance wetlands in the North Florida Ecosystem;
- Protect, conserve, enhance, and recover listed and candidate threatened and endangered species and their habitats; and
- Protect and manage units of the National Wildlife Refuge System and the National Fish Hatchery System (U.S. Fish and Wildlife Service 1996).

## **REGIONAL CONSERVATION PLANS AND INITIATIVES**

Numerous regional conservation plans and initiatives affect the refuge, in particular, Florida's Comprehensive Wildlife Conservation Strategy. Florida's Wildlife Legacy Initiative – Comprehensive Wildlife Conservation Strategy – is part of a nationwide conservation effort in which State fish and wildlife agencies collaborate with the Service to protect vulnerable habitat and species. It addresses many of Florida's conservation threats and management issues. In addition, several regional level conservation plans and initiatives also impact the management of the refuge's resources, including those listed (Figure 5 outlines conservation lands around the refuge).

- Future land use plans of Brevard and Volusia Counties
- State of Florida Greenway Plan
- SJRWMD Surface Water Improvement and Management Plan
- South Atlantic Marine Fisheries Council Fisheries Management Plan
- South Atlantic Marine Fisheries Council Ecosystem-Based Fisheries Management Plan

These plans were reviewed to ensure that common conservation goals would be included in the CCP development process.

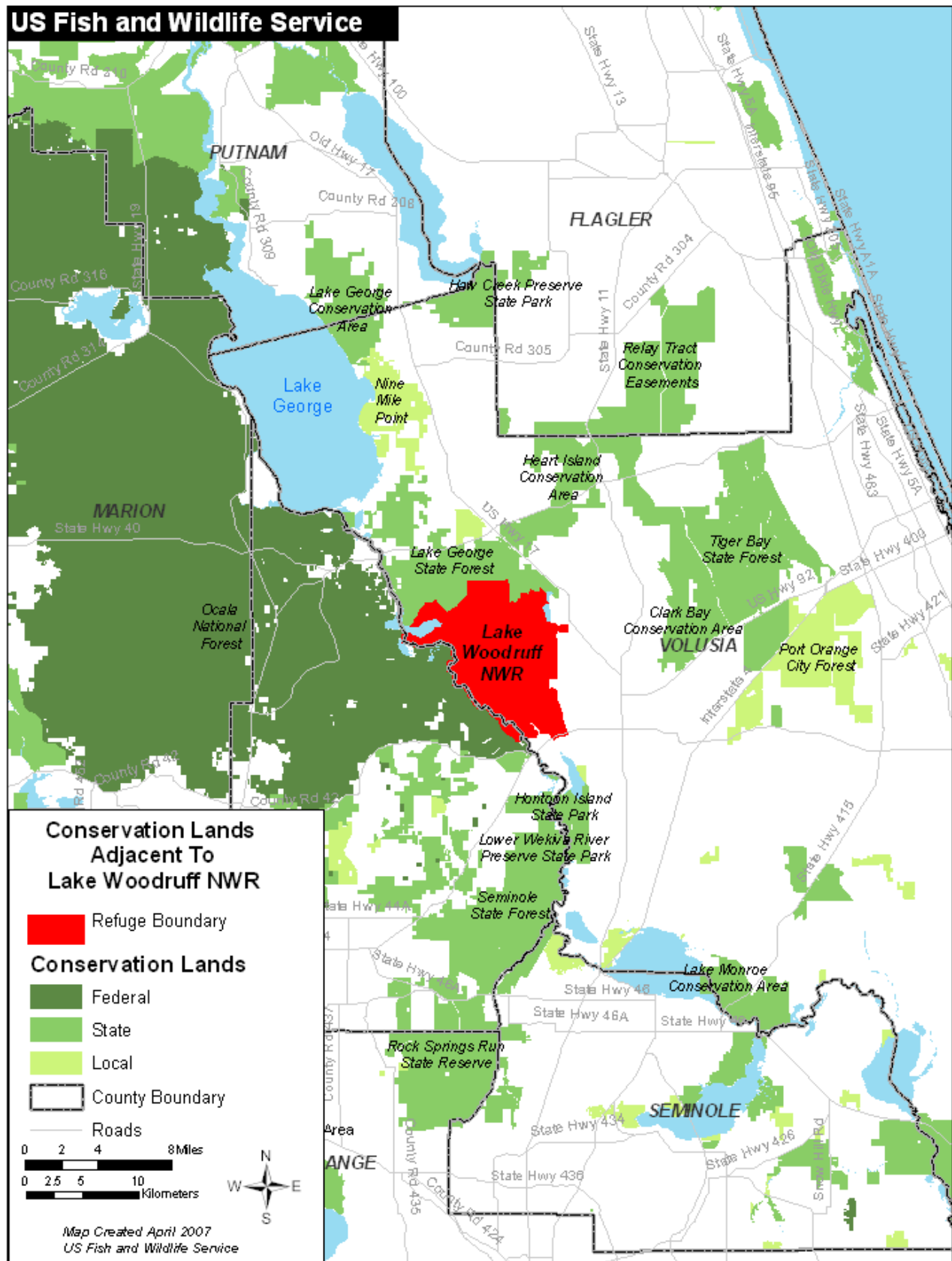
## **ECOLOGICAL THREATS AND PROBLEMS**

Lake Woodruff NWR is in a key location, not only to serve and support biological diversity in the St. Johns River basin and central Florida, but also to serve continental populations of migratory birds along the Atlantic Flyway. Human impacts and underlying threats to biological diversity on and off the refuge include the listed items.

- Direct loss of habitat due to development and other human activities;
- Simplification and degradation of remaining habitats, including habitat alteration and fragmentation;
- Loss and decline of species and biological diversity;
- Effects of constructing navigation and water diversion facilities;
- Introduction and spread of non-native and nuisance species;
- Lack of environmental regulation and enforcement;
- Cumulative effects of land and water resource development projects;
- Ongoing wildlife disturbance due to development and other human activities; and
- Impacts of non-point sources of pollution and water quality degradation.



Figure 5. Regional area conservation lands



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As a result of these threats, some species endemic to the ecosystem have become extinct, threatened, or endangered under the Endangered Species Act. Lake Woodruff NWR supports seven federally threatened or endangered species that regularly occur on the refuge (eastern indigo snakes and snail kites have not been documented on the refuge). Further, the refuge supports an additional 10 species listed by the State of Florida as either threatened, endangered, or of special concern. (See Appendix D for a complete listing of these species.) [Nationally, 1,262 species are federally listed with 986 listed as endangered (including 388 animals and 598 plants) and 276 listed as threatened (including 129 animals and 147 plants). In addition, at least 257 species are listed as candidates for Federal listing.]

Lake Woodruff NWR serves to protect, maintain, and enhance the high productivity and biological diversity within the ecosystem. Increasing human population growth and impact have altered many ecological characteristics of the St. Johns River basin. Lake Woodruff NWR faces ongoing threats from contaminated air, soil, and water; from erosion and sedimentation; and from cumulative habitat impacts from land and water resource development activities adjacent to the refuge. Rapid population growth and development have resulted in long-term negative impacts to Lake Woodruff NWR. These include increased boat traffic in the shallow waters of the St. Johns River and associated lakes; increased use and development of natural resources in the area; habitat fragmentation; and the introduction and spread of exotic species. Native terrestrial habitats that once dominated uplands include hardwood hammocks, which are very important for mammals and migratory birds. Urbanization and agricultural operations (e.g., ferneries) now dominate land uses in upland areas along the DeLand Ridge. Historically sugar cane and other agricultural operations such as cattle pastures dominated the area's landscape, but these are quickly being replaced by urban and suburban sprawl. Stormwater inputs, pollution, habitat destruction, and continual land and water use practices are constant threats to fish and wildlife resources in this area. By the year 2015, Florida is expected to have over 20 million residents, while the two-county (Lake and Volusia) area around the refuge is anticipated to reach over 850,000 (Florida Housing Data Clearinghouse 2007).

## **PHYSICAL RESOURCES**

The climate, geology and topography, soils, air quality, and hydrology and water quality form the foundation of the physical environment of the refuge.

### *CLIMATE*

#### **General Climatic Conditions**

The main factor influencing climate at Lake Woodruff NWR is its latitude. Its proximity to the Atlantic Ocean also has an influence, but to a lesser extent. Generally, the climate can be described as subtropical marked by short, dry and mild winters and hot, humid summers, lacking appreciable spring or fall seasons.

#### **Temperature**

January is typically the coldest month of the winter season with average lows of 46°F and highs near 71°F. Below freezing temperatures occur several days each season, but generally last only a few hours each day. Severe cold events with lows less than 20°F occur on average every decade. The latest locally severe freeze was in 1985, when a record low of 16°F was established. During the spring temperatures quickly rise with lows averaging almost 63°F and highs reaching 90°F towards the end of the season. Average summer maxima are 90°F and average minima reach 71°F. Temperatures above 100°F are rare, most recently occurring in 2001 (102°F). The fall is characterized by cooler temperatures and average highs and lows are 82°F and 61°F, respectively.

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### **Relative Humidity**

The relative humidity (RH) is typically high on the refuge due to the presence of numerous freshwater bodies and the proximity to the Atlantic Ocean. Mean dawn RH is between 88 and 95 percent throughout the year, while readings in the mid-afternoon are between 55 and 67 percent. Very low RH can occur with the passage of cold fronts in the winter. Readings in the 30 to 40 percent range are common and a RH as low as 26 percent has been recorded. On the other end of the spectrum, an RH of 100 percent is not uncommon with fog occurring 90 days per year on average.

### **Precipitation**

Precipitation at DeLand averaged 55.5 inches/year with a standard deviation of 9.3 inches during the period 1931-2005 (Southeast Regional Climate Center 2006). Of this average, over half falls during June-September, with other months averaging between 2.2-4.5 inches. Summer precipitation is driven mainly by convective activity, while frontal storms comprise the majority of rainfall events during the winter.

### **Lightning**

Because of its importance in fire management, a major refuge management activity, lightning deserves a special mention. The National Weather Service (NWS) Office in Melbourne, Florida states that Florida is the "lightning capital of the United States" (National Weather Service 2005). The NWS data estimate that over 7,000 lightning strikes occur in Volusia County each year. Since the establishment of Lake Woodruff NWR, lightning-induced fires have burned over 10,000 acres of marsh. In addition, Lake Woodruff NWR's headquarters has been struck at least three times, resulting in damage to the telephone, base radio, and other electronic systems.

### **Wind**

Wind is another important weather condition that greatly impacts Lake Woodruff NWR. Wind patterns change throughout the day due to faster heating and cooling of the land relative to the ocean, as well as due to erratic winds around thunderstorms. High winds commonly associated with cold fronts or low-pressure systems, above 20 miles per hour (mph), are common in the winter and spring months, with occasional days with 35 to 40 mph winds. Several days of light and variable winds can occur in summer months when subsiding air is entrenched over the central Florida area. The "Storm of the Century," which affected large areas of the eastern seaboard, hit Lake Woodruff NWR during the early morning hours of March 13, 1993. Winds were recorded near 80 mph, and the community was without power for days. The high winds blew eaglets from both active nests, and three injured bald eaglets were taken to the Audubon Bird of Prey Center for care and rehabilitation. In addition, tropical storms and hurricanes have the potential to cause the most wind damage.

### **Tropical Cyclones**

Tropical depressions, storms, and hurricanes can impact refuge activities and infrastructure. Large amounts of rainfall can accompany tropical cyclones. In addition, wind and wave (lakeshore) action can result in major damage to important refuge habitats. The refuge has been affected by over 15 tropical cyclones of various intensity since 1964, including three hurricanes in 2004 (Charley, Frances, and Jeanne) and Hurricane Wilma in 2005. Storm effects include downed limbs and trees and flooding of impoundments and public area parking areas.

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## **GEOLOGY AND TOPOGRAPHY**

### **Geology**

Florida has a complex geologic history with repeated periods of deposition when the Florida Plateau was submerged and with erosion during periods of lower sea level when the land was exposed (Randazzo 1997). The course of the St. Johns River follows three geologic fault zones. These structures are all post-Late Miocene (5.3 million years ago) in age. The Sanford-Palatka Offset, one of the three faults, has a different history from the upper and lower St. Johns River. This older part of the valley is incised in higher land cut during a low sea-level stand in Late Tertiary (1.6 million years ago) or early Pleistocene times by what was believed to be an entrenched tributary of the Oklawaha River (White 1958). The Oklawaha River flows out of still higher ground to the west and should therefore antedate the St. Johns River. When sea levels rose the lowered surfaces were inundated to become estuaries or sounds. The sediments deposited in them have become part of the modern day floodplains of the St. Johns, Wekiva and Lower Oklawaha Rivers. Upon retreat of the inundating sea, the St. Johns became an integrated stream flowing along the relict beach ridge plain to Lake Harney and then veered westward to enter the Sanford-Palatka Offset. Lake Woodruff NWR is in the northern portion of the Sanford-Palatka Offset, just south of Lake George. At Palatka, it re-enters the same lower beach-ridge plain and follows it north again until it is deflected seaward by the delta of the sediment-bearing St. Mary's River at Jacksonville. The presence of numerous beach ridges characterizes the sediments in the basin as mostly sands, with very little clay and silt.

The boundary between the DeLand Ridge and the Sanford/Palatka Offset is mapped as a north trending fault that is down thrown to the west. DeLeon Springs is close to or on the fault where an east/west fracture crosses the fault. The two probably form permeability channels that funnel the water to the spring. The spring, itself, appears to be an old sinkhole formed by dissolution of the underlying limestone.

The average spring flow at DeLeon Springs from 1980 through 1992 is 16 million gallons per day and ranges from 11 to 24 million gallons per day. The average annual trend indicates a decline in stream flow since 1980. The spring-fed creek flows westward through a series of three shallow-water lakes (Spring Garden, Woodruff, and Dexter) to the St. Johns River, 10 miles away, and is approximately one foot above sea level (Denson 1995).

### **Topography and Soils**

The eastern side of the refuge basically forms a transition area between the sandhills of the karst DeLand Ridge System and the wetland floodplain of the St. Johns River. The topography generally slopes zero to five degrees from east to west, from elevations of 35 feet above mean sea level (MSL) on the refuge's eastern boundary to five feet above MSL at the east edge of Lake Woodruff. The average elevation of the marsh areas is approximately 6.5 feet above sea level.

Roughly 5,800 acres of hardwood swamps and drainages exist on the refuge. These wooded swamps merge at the edge of the marshes and are also found where persistent drainages are formed through the flatwoods. The elevations range from 12 inches to eight feet above sea level for this forest type.

The pine flatwoods and longleaf pine savannas are typically in areas of flat terrain on poorly drained soils. Shallow drainages and ephemeral ponds exist throughout the area. Elevations on the refuge for these forest types range from 10 to 30 feet above MSL.

The relatively small amount of xeric scrub oak/sand pine forest type is found only on the highest elevations of the refuge, along the transition area between the flatwoods and the DeLand Ridge

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System. Elevations are generally 30 to 35 feet above MSL. A small portion of this forest type is within the headquarters unit with elevations between 50 and 80 feet above MSL.

Five orders and 17 soils series are found on the wooded areas of the refuge. The soils can generally be classified as either wetland or upland.

#### *Wetland Soils*

Three soil orders are represented in the wetland areas of the refuge: Alfisols, Histisols, and Mollisols. Alfisols are soils with loamy or clayey (alkaline) subsoils that underlie horizons with less clay. The Histisols are soils with an organic horizon such as peat or muck. The water table is usually at or above the surface during the wet season and within 10 inches of the surface during the rest of the year. Organic matter content is high and natural fertility is moderate. The native vegetation is marsh grasses, maple, gums, cypress, and other swamp species. The Mollisols are found on the low terraces along the St. Johns River. They are frequently flooded and are saturated to the surface for much of the year. Fertility is high and organic matter content is moderate. The natural vegetation is water plants and/or marsh grass types, but some areas have hammocks populated by cabbage palm and live oak.

#### *Upland Soils*

Three soil orders (Alfisols, Entisols, and Spodosols) are found in the upland areas of the refuge. The Alfisols are characterized by a higher pH in the upper horizons or an increasing pH as one goes down through the soil profile. There are three soil series in this order on the refuge: the Holopaw, Pineda, and Riviera. All of these soils are nearly level with water tables within 10 inches of the surface most of the year. Fertility and organic matter content are low. The natural vegetation can be hardwoods along the floodplains or slash pine with an understory of palmetto, wax myrtle, and wiregrass on the higher sites.

Entisols are soils that either have none of the diagnostic horizons found in the other soils or have only the beginnings of them. There are three Entisols on the refuge: Orsina, Satellite, and Tavares series. The Orsina and Tavares soils are well-drained deep sands with slopes ranging from zero to five percent. Water tables are deep, 40 to 60 inches during the wet season, and greater than 60 inches in dry periods. Fertility and organic matter contents are low. The natural vegetation is sand and longleaf pine with an understory of scattered palmetto and other species. Currently, areas where these soils are found are dominated by mature oak/sand pine scrub with small pockets of longleaf pine flatwoods. The Satellite soil is somewhat poorly drained sand with slopes less than two percent. The water table is within 10 to 40 inches of the surface during the wet season and around 60 inches during the dry season. Fertility and organic matter content are low. The native vegetation is longleaf pine with an understory of palmetto and wiregrass. At present, these soils are supporting mixed conifer/hardwood stands with scrub oak and palmetto understories.

The third soil order in the wooded uplands is the Spodosols. These soils have a spodic horizon, which is a zone of deposition within the soil profile where clay, iron, and aluminum oxides and organic matter have accumulated. The Spodosols are the soils of the typical Florida flatwoods, although they are sometimes found in the low sandy ridges. There are seven Spodosols found on the refuge: the Cassia, Daytona, Farmton, Immokalee, Myakka, Pomona, and Wabasso soil series. All of these soils have slopes less than five percent. The Cassia and Daytona soils are found in areas between the true flatwoods and the sand ridges. The water table is generally below 10 inches, even in the wettest times, and can reach depths of from 40 to 70 inches during the dry season. Natural fertility is low, as is organic matter content. The natural vegetation is sand, longleaf and slash pine, with some oaks and palmetto. The Farmton, Immokalee, Myakka, and Wabasso soils are found in the true flatwoods. Slopes are two percent or less. Water tables can be at or above the surface during the wet season, and are generally above 40 inches throughout the year. Fertility and organic matter content are low. The natural vegetation is slash and longleaf pine, with an understory of palmetto, oak, gallberry, and

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wiregrass. The majority of the longleaf pine savannahs are found growing on these soil types. The Pomona soil is found between the true flatwoods and the swamps, in poorly drained depressions. This soil is nearly level. Water tables can be as much as 10 inches above the surface during the wet season, and the soil is usually saturated to within 10 inches of the surface the rest of the year. Fertility is low, and organic matter content is moderate. The natural vegetation varies, and can be a mix of pond and slash pine with hardwoods.

## **Hydrology**

### *St. Johns River*

The primary surface waters on and around the refuge are part of the middle St. Johns River basin. The St. Johns River is over 300-miles-long and encompasses a watershed of approximately 8,700 square miles. It flows from its origin near Vero Beach north to Jacksonville where it empties into the Atlantic Ocean. The river's total drop from beginning to end is less than 30 feet, or about one inch per mile, making it one of the "laziest" rivers in the world. The river's low flow rate makes it susceptible to a build-up of nutrients and other pollutants.

### *Upland Sheet Flow*

Runoff from the refuge occurs in the form of sheet flow that concentrates into streams or groundwater discharge such as that at DeLeon Springs. The gentle topography and permeable soils of the refuge suggest that much precipitation is evaporated, transpired by plants or percolates to groundwater relative to the amount that runs off. This is supported in general by Rutledge (1985). Water moves through sheet flow from upland refuge areas toward the marshes and impoundments. Construction of the railroad bed has impeded this natural flow, creating isolated ponds and wetlands east of the tracks which drain via culverts onto the refuge.

### *Ground Water Hydrology*

The refuge, including all of Lake Woodruff, is thought to be the recharge region for DeLeon Springs. This second magnitude spring has a mean discharge of 27 cubic feet per second (CFS), with maximum and minimum flows of 61.6 and 12.2 CFS over the period of record from 1961 to 2005. Discharge does not vary greatly from month-to-month, but has been declining in recent years. This is thought to be related to the general decrease in precipitation in Florida (FDEP 2000). The correlation with precipitation, combined with water chemistry data collected by the SJRWMD, indicates this spring water has a mixture of "young" water (less than 30 years old) mixed with water that has been in the Floridan Aquifer for over 1,000 years (Toth 1999).

Gross-scale modeling has also been conducted that shows the entire refuge lies within a discharge region, suggesting that during an average year, more water discharges from the ground than is added to the aquifer (Rutledge 1985; Boniol et al., 1993). Nearby areas determined to be the recharge regions for the Floridan Aquifer include all the ridge areas east and south of the refuge in the vicinity of DeLand, as well as other relatively high-elevation parts of the region (Boniol et al., 1993).

## **Water Quality and Quantity**

### *Water Quality*

Water quality is a measure of the physical and chemical characteristics of water. All animals and plants have certain water quality requirements, depending on their life history stages, the season, and other attributes. Water quality can be negatively influenced by humans through pollution.

No water body on Lake Woodruff NWR is currently listed as impaired under Section 303d of the Clean Water Act, though the St. Johns River between Lake Dexter and Lake George is listed for low dissolved

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oxygen and non-point source pollution limits known as total maximum daily loads (TMDLs) are being developed for this reach of the river for nutrients, total dissolved solids, and dissolved oxygen.

Most groundwater in Florida is formed by rainwater percolating through soils and collecting in large underground caves or reservoirs, called aquifers. Florida's aquifers are increasingly threatened by human activities. In Florida, groundwater is particularly susceptible to contamination because the water table is close to the surface and the limestone bedrock is permeable. Human and animal bacteria, agricultural activities, pesticides and fertilizers, fuel spills, salt, and methane gas are human impacts affecting groundwater quality. In certain areas of Florida, groundwater reaches the surface naturally, via springs (e.g., DeLeon Springs). Pollution in areas where groundwater is formed (recharge areas) can affect water quality in springs that may be many miles away.

#### *Water Quantity*

Water quantity in the form of rain, surface water, and groundwater has profound effects on vegetative communities and associated wildlife species. On the refuge, water quantity generally decreases with an increase in elevation.

Kinser and Minno (1995) conducted a study of soils and vegetation communities and the potential for changes in these communities if groundwater levels were to be lowered. They found that although the refuge has soils that are highly subject to dewatering and that these soils support vegetation communities that are dependent upon these waters, the likelihood that there would be significant changes to the communities is low because the refuge has low elevation and is located near large, relatively stable water bodies. The study only addressed the question of groundwater withdrawals, leaving open the question of changes due to increased surface withdrawals from the St. Johns River.

#### **Air Quality**

The air pollutants of major concern in Florida are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide (FDEP 2004). The primary sources of these pollutants are vehicle emissions, power plants, and industrial activities. In 2004, all areas of Florida were air quality attainment areas (FDEP 2004). The Deland area is considered to have good air quality. However, occasional temperature inversions lasting up to 48 hours can temporarily degrade local air quality below acceptable levels

Lake Woodruff NWR is considered an attainment or clean area, under the Clean Air Act. The ambient air quality is influenced by land management practices such as prescribed burning, vehicle traffic, and off-site emission sources.

### **BIOLOGICAL RESOURCES**

#### *HABITAT*

The habitats on the refuge and their conditions are the end result of both the physical environment and past human activities. The influence of human activity on the landscape has been ongoing for thousands of years in certain parts of Florida. Native Americans probably did little to modify the physical landscape, but may have modified ecological processes through their use of fire. Native Americans used fire for various purposes, such as hunting and warfare (Robbins and Myers 1992). The upland areas of Lake Woodruff NWR are considered to be part of a fire driven ecosystem. Certain vegetation types are dependent on periodic fires. Habitats and their respective acreages are listed in Table 1.

When European settlers arrived, they also varied the natural fire regime. They began to modify the physical landscape, starting with the construction of roads, drainage ditches, and canals. The use of the land for agriculture increased the construction of infrastructure, but major alterations to the landscape did not occur until the 1950s. During the next several decades, fire was excluded from the landscape. The vegetation on the land which is now the refuge became overgrown, reducing its utility for some native wildlife.

Since the refuge was founded, much management has been conducted, including activities directed towards restoring portions of the landscape to more natural conditions. Other management activities maintained or modified the existing structures, such as the impoundments, to increase their function and value to wildlife. The mix of upland, wetland, and aquatic habitats that are the end result of the various natural and anthropologic phenomena are described. See Figure 6 for existing impoundment management units and Figure 7 for the burn units.

**Table 1: Habitat types and their associated acreages (based on GIS calculations from 2004 SJRWMD DOQQ's)**

Habitat Type	Acres
<b>Wetlands</b>	
Marsh	10,014
Willow Shrub	1,113
Impounded Marsh	445
Ephemeral Ponds	31
Hardwood Forests	6,767
<b>Uplands</b>	
Pine/Palmetto Flatwoods	1,132
Hardwood/Mixed Conifer	404
Longleaf/Wiregrass Savannah	323
Hardwood Hammock	250
Palm Hammock	150
Oak/Sandpine Scrub	145
<b>Aquatic</b>	
Open Water	757
Pond/Lake	43
<b>Total</b>	<b>21,574</b>



Figure 6. Lake Woodruff NWR impoundment management units

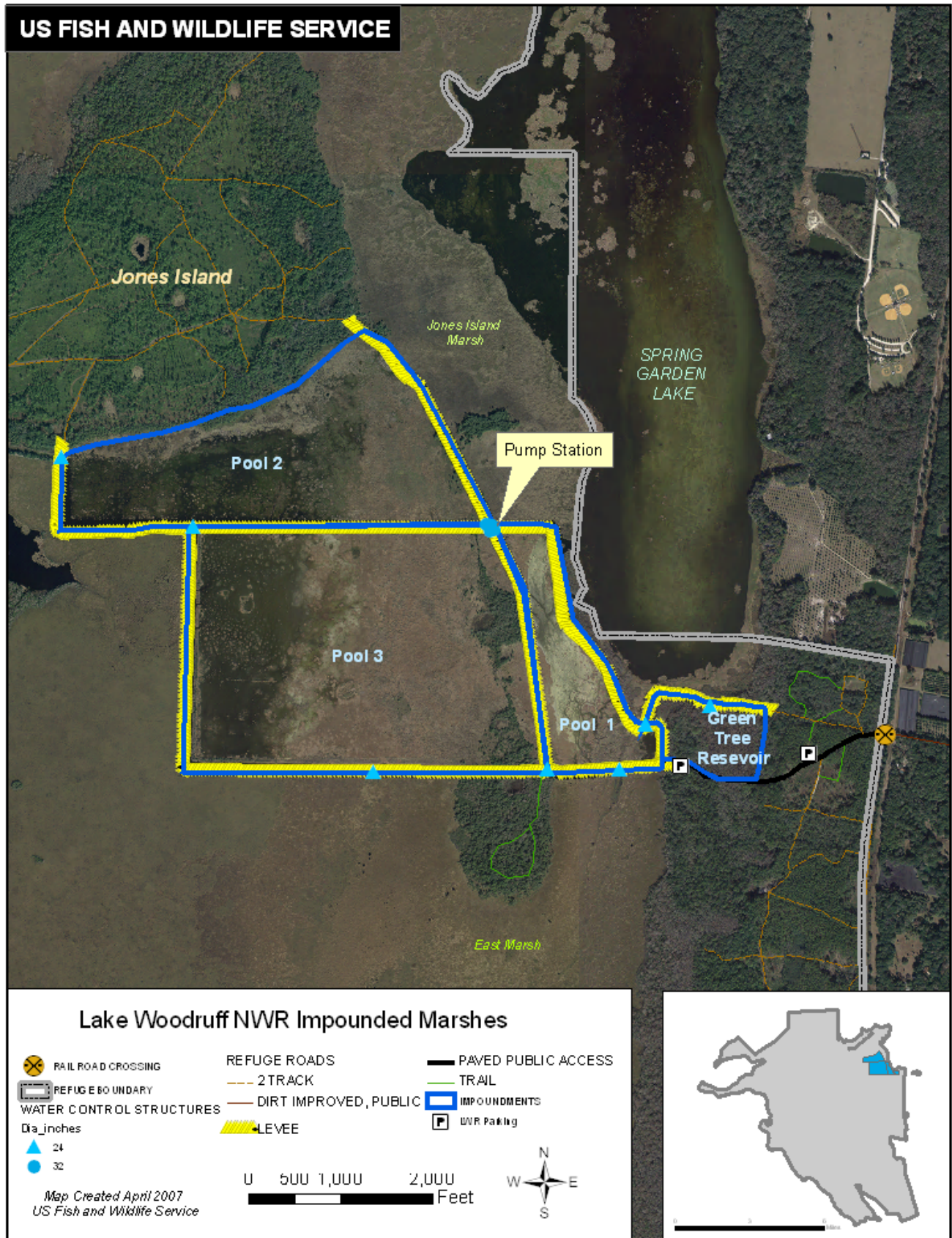
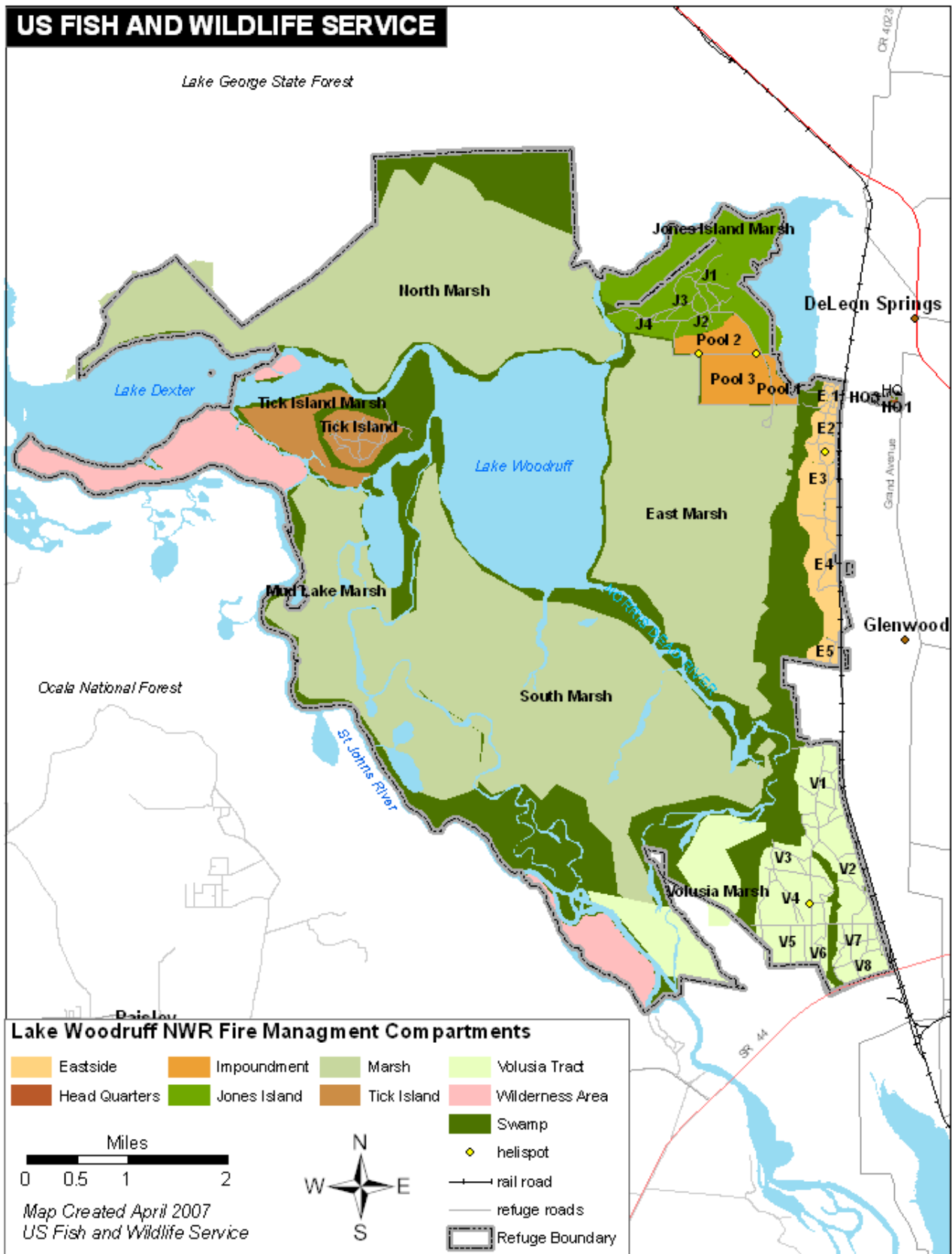


Figure 7. Lake Woodruff NWR fire management units



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## Uplands

Areas are considered uplands if they are not subject to flooding on a regular basis or have standing water for only limited periods of time. The transition from uplands to wetlands is gradual and, in some cases, it is hard to determine into which category one should place some habitat types. Vegetation types are shown in Figure 8.

### *Pine and Palmetto Flatwoods*

Nearly one half of the upland forest on the refuge (~1,132 acres) is considered pine flatwoods. The flatwoods range from mesic sites to scrubby flatwoods, depending upon soil type and elevation. Flatwoods are characterized by a pure or predominate pine overstory (including slash, longleaf, and pond pines), little midstory, and a dense, yet variable, understory. Mesic sites tend to have a higher saw palmetto/gallberry component in the understory, whereas, scrubby flatwoods have a significant oak component in the understory. In areas where fire has occurred infrequently or has been suppressed, hardwoods may comprise up to 25 percent of the overstory. Fire suppression and/or exclusive use of winter burning have led to saw palmetto becoming a dominant understory component most of the flatwoods.

### *Longleaf Pine/Wiregrass Savanna*

The longleaf pine/wiregrass savanna communities are found only within the southeast corner of the refuge, within the southern half of the Volusia Tract Unit. The savannas are open pine stands (with 30 to 40 basal area) dominated by uneven-aged longleaf and slash pine of 80 to 100 feet tall with little to no midstory trees and with a diverse herbaceous understory that is one to three feet tall. The savannas on the refuge were most likely remnant grazing lands prior to establishment of the refuge.

### *Oak-Sand Pine Scrub*

The oak-sand pine scrub forest type occurs on well-drained sandy soils found within the Eastside Unit of Lake Woodruff NWR. This community is representative of a climax vegetative community for sandhill soil areas that has been suppressed from fire. Fire suppression results in a prolific reproduction of oak species, including *Quercus virginiana*, *Q. geminata*, *Q. incana*, *Q. chapmanii*, *Q. hemisphaeric*, and *Q. margaretta*, as well as many other woody shrubs, such as *Lyonia ferruginea*, *Vaccinium arboretum*, *V. stamineum*, *Hypericum cistifolium*, and *Ilex glabra*.

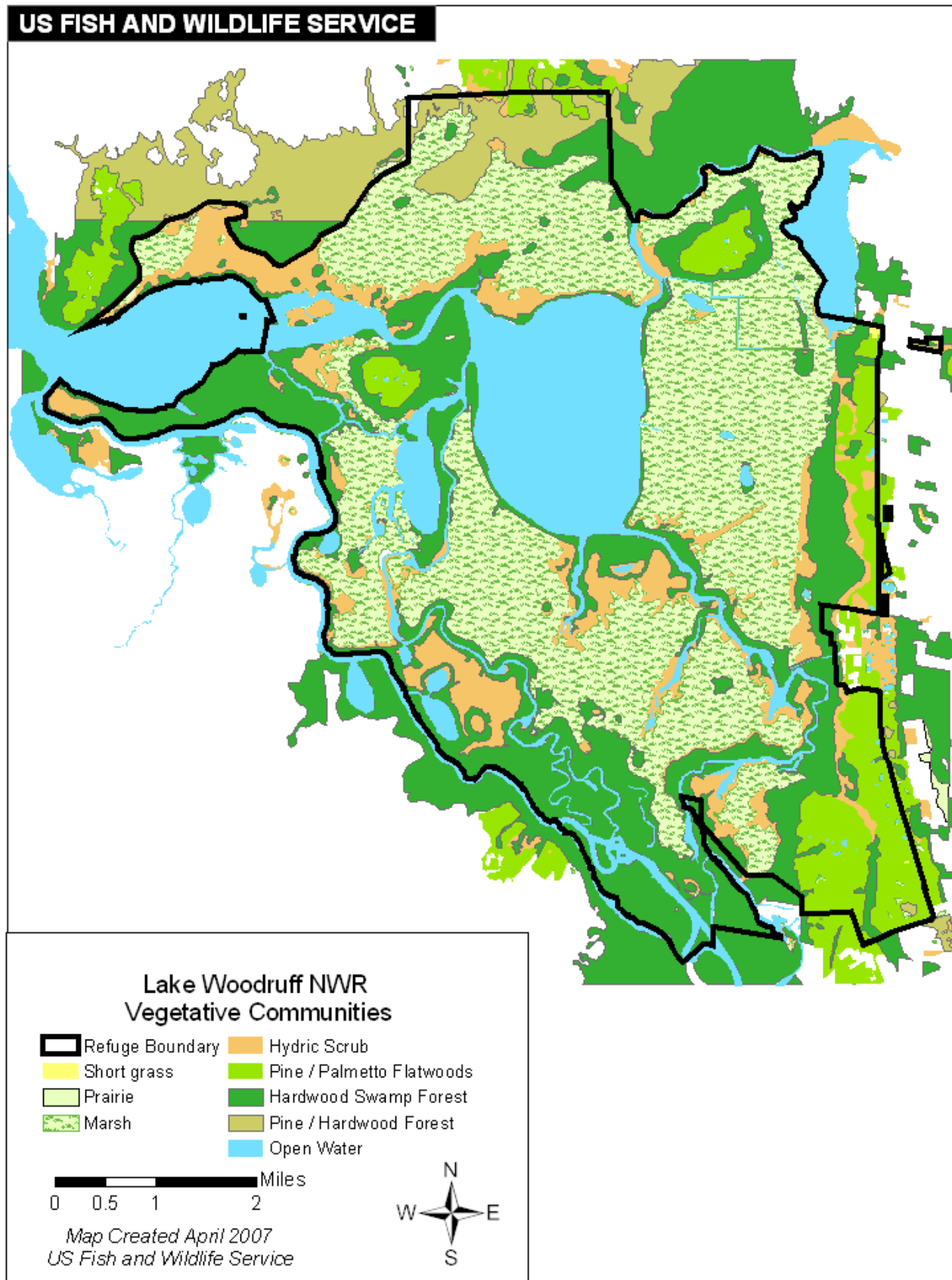
The canopy is formed primarily of live oak, sand live oak, and sand pine, 30-50 feet tall, forming a dense, mainly closed canopy that limits understory diversity. Understory vegetation consists of patchy saw palmetto, woody shrubs, and grasses. Ground cover is hardwood leaf litter, scattered grasses, and herbaceous plants, including patchy areas of wiregrass and deer moss. Leaf litter is one to three inches deep forming a continuous ground cover, while grasses and other forbs only form about 10 percent of the ground cover.

### *Mixed Hardwood/Conifer*

This forest type typically is formed in ruderal areas and in flatwoods that are transitioning to hardwood forest due to fire suppression. This forest type is found primarily within the Eastside Unit. The dominant tree species are typically slash pine and laurel oaks. The understory is sparse with patchy saw palmetto.



Figure 8. Lake Woodruff NWR vegetation types



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## **Hammocks**

### *Hardwood Hammocks*

Hardwood hammocks occur on mesic to xeric soils and represent a climax forest community. The overstory in the hammock is typically mature live oak, 40 to 60 feet tall, forming a continuous canopy cover, resulting in an open understory and leaf litter ground cover. This forest type provides excellent mast production for wildlife. Fire return is infrequent and generally results in low-intensity ground fire when it does burn.

### *Palm Hammocks*

Palm hammocks occur in mesic and hydric transitional areas between wetlands and upland soils. On the refuge, they are found primarily on Jones and Tick Islands and along marsh edges. The dominant tree species is cabbage palm, forming 80 percent canopy closure and growing at maturity to 70 feet. The understory can vary from sparse clumps of saw palmetto with leaf litter ground cover, to a dense herbaceous cover of grasses and vines.

## **Wetlands**

There are three distinct types of wetland vegetative communities represented on the refuge, each dominated by unique vegetation: marshes, impoundments, and hardwood communities.

### *Open Marshes*

The open grass marsh systems represent one of the largest and most expansive habitat types (~10,000 acres) of the refuge. Marshes have fluctuating water levels, driven by surface water levels and precipitation. They generally have unimpeded water flow on at least one side from an open body of water. They are comprised primarily of cordgrass (*Spartina bakerii*) and sawgrass (*Cladium jamaicense*), typically growing five to seven feet tall and forming dense, continuous beds. Many small open water ponds and distinct drainages occur throughout the marshes.

### *Impounded Marshes*

Impounded water totaling 445 acres in three pools was created by the construction of dikes within the cordgrass marsh and subsequent flooding. The resulting habitat is hemi-marsh, with 40-60 percent open water and a dispersion of emergent vegetation. Water is manipulated seasonally in these impoundments for the benefit of multiple species, including wading birds, waterfowl, and cranes.

### *Streams and Permanent and Ephemeral Wetlands*

Scattered wetland areas are associated with the upland areas of the refuge. Many of the streams on the eastern edge of the refuge are artificial and are a result of the culverts and drainage flows from the CSX railroad bed. Grassy ponds are found in the flatwoods and are shallow depressions that are seasonally or permanently flooded. In some cases, these areas have been invaded by wax myrtle, willow, and other shrubs due to the lack of fire.

## **Wetland Hardwood Communities**

### *Hardwood Swamp*

The hardwood swamp areas have standing water for most, or all, of the year. They are dominated by red maple and elm (*Ulmus* spp.), but may have cabbage palm, water-tolerant oaks, and water hickory. This community makes up the greentree reservoir, an impounded bottomland forest.

### *Willow Swamp*

Willow stands generally have standing water on them for most of the year and often occur on edges and transitional areas. They are dominated by Carolina willow with some red maple and wax myrtle.

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Often, willow encroaches into marsh habitats due to the lack of fire or to changes in hydrology. The refuge has experienced a loss of open grass marsh habitat (~1000 acres) due to the encroachment of willow and other shrubs since 1983.

## WILDLIFE

Lake Woodruff NWR supports a high diversity of fish and wildlife species. This high biodiversity is, in part, the result of the refuge's location on an elevation gradient from the ancient DeLand Ridge dunes down to the St. Johns River. The change in elevation corresponds to different hydrological regimes and soils, which in turn support unique vegetative communities. However, the undeveloped nature of the refuge's landscape and diversity of habitats also contributes the high biodiversity. Upland and freshwater wetland areas provide additional habitats to support a variety of species.

The refuge serves as a key area for biodiversity, species richness that is very important to the overall ecological integrity and health of the St. Johns River and the North Florida Ecosystem. The Service manages refuge resources and coordinates with neighboring land managers and agencies to conserve biological diversity.

### Invertebrates

No comprehensive survey of terrestrial or aquatic invertebrates present in refuge aquatic habitats has been conducted. An invertebrate species of particular note occurring in refuge freshwater marshes and impoundments is the freshwater snail known as the Florida apple snail (*Pomacea paludosa*). The Florida apple snail is an important component in the food web of Florida's freshwater marshes, serving as the primary food source for the endangered snail kite (Snyder and Snyder 1969, Hurdle 1973, Bennetts et al., 1994), as well as a food source for limpkins (Snyder and Snyder 1969), white ibis (Kushlan 1974), boat-tailed grackles (Snyder and Snyder 1969), a variety of fish (Darby et al., 1997), alligators (Delany 1986), and turtles (Dalrymple 1977). At least one Service report indicates that one of the reasons for building impoundments on the refuge was to create habitat for the Florida apple snail (U.S. Department of the Interior 1974).

### Fish

The fish assemblages in aquatic habitats on the refuge are diverse, as would be expected from the diversity of aquatic habitats present and the access to the Atlantic Ocean via the St. Johns River. Approximately 101 species are thought to occur on the refuge, of which 6 are diadromous and 35 are estuarine-dependent, with the remainder being resident freshwater native or exotic species. Diadromous species are those that either reside in the ocean and spawn in inland freshwaters (anadromous), or spawn in the ocean and use inland freshwaters as a nursery habitat (catadromous). The American eel (*Anguilla rostrata*) and American shad (*Alosa sapidissima*) are two diadromous species found on the refuge. Some marine species spawning offshore or in the downstream St. Johns River estuary have estuarine- or riverine-dependent larval or juvenile stages which are likely found in the lakes and stream runs that flow through the refuge. Representative families of estuarine-dependent fishes which have been found on the refuge include *Atherinopsidae* (New World silversides), *Clupeidae* (herrings), *Mugilidae* (mulletts), *Engraulidae* (anchovies), *Scianidae* (drums), *Paralichthyidae* (sand flounders), *Gobiidae* (gobies), and *Eleotridae* (sleepers). Resident freshwater species conduct their life cycles entirely within refuge waters. Common resident species include blue gill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), Florida gar (*Lepisosteus platyrhincus*), bowfin (*Amia calva*), and brown bullhead (*Ameiurus nebulosus*). A subset of resident species such as blackbanded sunfish (*Enneacanthus chaetodon*), eastern mosquitofish (*Gambusia holbrooki*), pigmy killifish (*Leptolucania ommata*), and swamp darter (*Etheostoma fusiforme*) is found in the blackwater (waters resembling tea, heavily stained by tannin compounds from decaying vegetation) habitats present in refuge swamp forests and some small streams. The final group

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present includes species from other continents (i.e., non-native or exotic species) which have established breeding populations, including blue tilapia (*Oreochromis aureus*), brown hoplo (*Hoplosternum littorale*), and vermiculated sailfin catfish (*Pterygoplichthys disjunctivus*).

### **Reptiles and Amphibians**

The refuge provides habitat to over 70 species of reptiles and amphibians. These include several Federal listed species (i.e., American alligator and eastern indigo snake), as well as those listed by the State as species of special concern (i.e., Florida pine snake, gopher frog, and gopher tortoise) (See Appendix D).

#### *Amphibians*

A May (2006) report states that frogs and toads are the most common and likely observed amphibians on the refuge, in both aquatic and upland habitats. Some salamanders are likely present in upland woods, but are not commonly observed. Sirens and amphiumas are present in refuge canals and impoundments, but rarely seen. Amphibian species present or expected on the refuge include 18 species of frogs and toads and 7 species of salamanders.

#### *Frogs and Toads*

Frogs and toads are abundant and diverse on the refuge (May 2006). May (2006) reports that southern toads are fairly common in mesic hammock habitats on the refuge and can be seen hunting after dark in grassy areas on the dikes adjacent to hammock habitat. They commonly breed on the refuge. Oak toads are also present on the refuge, in open, scrubby woodlands with pines and oaks. They also occur on Jones Island. Narrow-mouthed toads spend much of their time under cover in hammock habitats. They are small, secretive frogs which prey on ants.

At least five species of tree frogs are present on the refuge. Green tree frogs are common in hammocks and marshes and along the edges of canals. They are generally found in vegetation near permanent water bodies (Behler and King 1979). Squirrel tree frogs are found in the same habitats as green tree frogs. Both green and squirrel tree frogs may be found on dwellings during warmer weather, at night around exterior lights, hunting insects. The pinewoods tree frog tends to occur in pine-dominated woods, or in hammocks near pine habitats. The spring peeper may be found in mesic and hydric hammocks and in bottomland swamp habitats, calling from the wetter areas as early as December (May 2006). The little grass frog is common in hammocks and in thick vegetation around the edges of wetter habitats.

Pig frogs are large aquatic frogs that are abundant in the refuge's canals and impoundments. They may venture out onto dikes to feed after dark. The leopard frog is probably the most abundant frog on the refuge, and is found in both permanent and semi-permanent wetlands. They also may feed on impoundment dikes after dark. The refuge is within the reported range of the bullfrog, but it has not been seen or heard on the refuge (T.M. Farrell, Department of Biology, Stetson University, personal communication 2006).

#### *Salamanders*

Seven species of salamanders are thought to occur on the refuge: dwarf salamander (*Eurycea quadridigitata*), Southeastern slimy salamander (*Plethodon grobmani*), two-toed amphiuma (*Amphiuma means*), greater siren (*Siren lacertian*), dwarf siren (*Pseudobranchius striatus*), lesser siren (*Siren intermedia*), and peninsula newt (*Notopthalmus viridescens*).

### **Reptiles**

The refuge hosts 11 species of lizards, 1 species of worm lizard, 12 species of turtles, 27 species of snakes, and 1 crocodylian. The most commonly observed reptiles on the refuge include basking

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American alligators and turtles, and the brown and green anole lizards, the latter often seen on the ground in the impoundment parking lot and adjacent to refuge trails.

### **Lizards**

Several species of lizard are found on the refuge, including two non-native species, the brown anole (*Anolis sagrei*) and Indopacific gecko (*Hemidactylus garnotii*). Native species include the arboreal green anole (*Anolis carolinensis*), as well as ground-dwelling species, such as broad-headed skinks (*Eumeces laticeps*), glass lizards (*Ophisaurus* spp.), and fence lizards (*Sceloporus undulates*).

The Florida worm lizard (*Rhineura floridana*) is a legless, pink lizard which resembles an earthworm. It is rarely seen. It lives primarily underground and searches for earthworms and termites, but also preys on spiders (Behler and King 1979). Its preferred habitat is dry, sandy soil (Conant 1975).

### **Snakes**

Twenty-seven species of snakes are presently documented on the refuge, including four venomous species. The refuge has a particularly healthy population of dusky pigmy rattlesnakes (*Sistrurus miliarius barbouri*), which have been the subject of research for many years (T.M. Farrell, personal communication; Aycrigg et al., 1997; Bishop et al., 1996; Cheatwood et al 2003; Farrell 2006; Farrell et al., 1995; Glaudus et al., 2005; Greene et al., 2002; Jemison et al., 1995; May 2006; May et al., 1996, 1997; May and Farrell 1997; Rabatsky and Farrell 1996; Roth et al., 1999; and Rowe et al., 2002). Their population density on the refuge is especially high. Individuals are active all year-round (May et al., 1996) and are found primarily in drier habitats, often utilizing gopher tortoise burrows. Other venomous snakes include the eastern coral snake (*Micrurus fulvius*), eastern diamondback rattlesnake (*Crotalus adamanteus*), and Florida cottonmouth (*Agkistrodon piscivorus*) (May 2006).

Aquatic snakes that occur on the refuge include the banded water snake (*Nerodia fasciata pictiventris*), brown water snake (*Nerodia taxispilota*), Florida green water snake (*Nerodia floridana*), and striped crayfish snake (*Regina alleni*) (May 2006). Terrestrial species include the yellow rat snake (*Elaphe obsoleta quadrivittata*), rough green snake (*Opheodrys aestivalis*), southern ring-necked snake (*Diadophis punctatus*), Florida red-bellied snake (*Storeria occipitomaculata*), Florida crowned snake (*Tantilla relicta*), scarlet snake (*Cemophora coccinea*), scarlet king snake (*Lampropeltis triangulum*), pinewoods snake (*Rhadinea flavilata*), black racer (*Coluber constrictor*), and coachwhip (*Masticophis flagellum flagellum*) (May 2006).

### **Turtles**

Turtles are another highly visible component of the refuge's herpetofauna and include mostly aquatic and semi-aquatic species such as the Peninsula cooter (*Pseudemys floridana peninsularis*), Florida red-bellied turtle (*Pseudemys nelsoni*), chicken turtle (*Deirochelys reticulata*), Florida box turtle (*Terrapene carolina bauri*), snapping turtle (*Chelydra serpentina*), striped mud turtle (*Kinosternon bauri*), stinkpot (*Sternotherus odoratus*), and Florida soft-shell turtle (*Apalone ferox*), as well as the gopher tortoise (*Gopherus polyphemus*), which is the only truly terrestrial species.

### **Birds**

Part of the Atlantic Flyway, the refuge is an important overwinter and stopover area for waterfowl, shorebirds, and neotropical migratory birds. The refuge's impoundments also serve an important role for waterfowl, since no hunting is allowed. In total, over 230 species of birds can be found using the refuge seasonally (Appendix D). This includes a number of Federal and State listed bird species (Appendix D).



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### *Landbirds*

Through its conservation assessment process, Partners-in-Flight has identified numerous landbird priorities for Bird Conservation Region 31 – Peninsular Florida. Priority landbirds found at Lake Woodruff NWR, and to which the refuge can contribute meaningfully to the conservation of, include swallow-tailed kite, American kestrel (*Paulus* sp), Chuck-will's-widow, and Northern bobwhite. Numerous other species are identified as priorities for Peninsular Florida that are known or likely to occur within the refuge, but because of their inconspicuousness or due to a general lack of quantitative abundance data, it remains unclear to what extent they occur on the refuge or how the refuge might contribute to their conservation. These species include brown-headed nuthatch, prothonotary warbler, Bachman's sparrow, Henslow's sparrow, grasshopper sparrow, LeConte's sparrow, painted bunting, and common ground dove.

### *Shorebirds*

Lake Woodruff NWR was identified in the Southeastern Coastal Plain – Caribbean Shorebird Conservation Plan (Southeast SCP) as a refuge with the potential to provide important stopover habitat for shorebird migration through Florida. Shorebird species of concern identified in the Southeast SCP include snowy plover, Wilson's plover, piping plover, American oystercatcher, marbled godwit, red knot, semipalmated plover, stilt sandpiper, buff-breasted sandpiper, and short-billed dowitcher. None of these species are likely to breed at Lake Woodruff NWR, however, the refuge provides excellent foraging habitat for spring and fall migrating, and for any over-wintering birds. Although the refuge does not support breeding populations of the highest priority species, its role in providing stopover habitat during spring and (especially) fall migrations should not be understated. Availability of foraging habitats during key migratory periods has been shown to be critical for the persistence of long-distance migratory shorebird species. Thus, one habitat goal stated in the Southeast SCP is to provide dedicated, high-quality managed habitat to support energetic requirements of in-transit migratory birds.

### *Waterfowl*

Lake Woodruff NWR was originally established as a waterfowl refuge. Twenty-two species of ducks and geese have been recorded, but waterfowl have never used the refuge in large numbers. The most common species are blue-winged and green-winged teal that may number several thousand during fall and winter (September – March). Wood ducks are a year-round resident species, utilizing hardwood swamp habitats for breeding and foraging. It is difficult to estimate numbers of this species and it is not known what the wood duck population may be on the refuge (breeding or wintering). Hooded mergansers and ring-necked ducks occur as wintering species, although not frequently or in large numbers. The refuge's impoundments and natural marshes have the potential to provide foraging and nesting habitat for these and other waterfowl species.

### *Wading Birds*

Several species of wading birds (e.g., egrets, herons, and ibises) can be found on the refuge. Wading birds utilize a broad range of wetland habitat types for foraging, roosting, and nesting. Refuge habitats frequented by wading birds include both natural and man-made features, including natural freshwater wetlands, impoundments, and roadside ditches where they search for prey, including fishes, amphibians, small reptiles, and insects. Wading birds on the refuge include a variety of species, ranging from the large great blue heron (*Ardea herodias*) and great egret (*Ardea alba*) to medium-sized species which include snowy egrets (*Egretta thula*), little blue heron (*Egretta caerulea*), and non-native cattle egrets (*Bubulcus ibis*). The smallest egret species on the refuge is the secretive, green heron (*Butorides virescens*). Two rare wading bird species which are found on the refuge include wood stork (*Mycteria Americana*) and limpkin (*Aramus guarana*).

## Mammals

The mammalian fauna of the refuge is characteristic of the North Florida Ecosystem. Thirty mammal species are known to occur on the refuge, including a marine mammal, the West Indian manatee which frequents the St. Johns River and nearby spring waters. Another aquatic mammal, the otter (*Lutra Canadensis*) is a carnivore which feeds on fishes and crayfish in refuge streams, ditches, and impoundments. Large terrestrial carnivores include white-tailed deer (*Odocoileus virginianus*), and bobcat (*Lynx rufus*). Medium-sized mammals commonly found on the refuge include raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), and rabbits (*Sylvilagus floridanus*). Small mammals include several species of moles, voles, shrews, mice, rats, and bats.

## Rare, Threatened, and Endangered Species

Seven federally listed species occur on the refuge, as well as a number of state-imperiled species and species of management concern (Table 2). Federally listed species include the West Indian manatee, snail kite, wood stork, eastern indigo snake, American alligator, and whooping crane.

**Table 2: Lake Woodruff NWR listed species**

Common Name	Scientific Name	Status	
		FWC	FWS
<b>REPTILES</b>			
Gopher Tortoise	<i>Gopherus polyphemus</i>	SSC(1,2,3)	
Florida Pine snake	<i>Pituophis melanoleucus mugitus</i>	SSC (2)	
Eastern Indigo Snake	<i>Drymarchon corais couperi</i>	T	T
American Alligator	<i>Alligator mississippiensis</i>	SSC (1,3)	T (S/A)
<b>MAMMALS</b>			
Florida Manatee	<i>Trichechus manatus</i>	E	E
Florida Black Bear	<i>Ursus americanus floridanus</i>	T	
<b>BIRDS</b>			
Limpkin	<i>Aramus guarauna</i>	SSC (1)	SMC
Snowy Egret	<i>Egretta thula</i>	SSC (1)	
Little Blue Heron	<i>Egretta caerulea</i>	SSC (1,4)	SMC
Tricolored Heron	<i>Egretta tricolor</i>	SSC (1,4)	
White Ibis	<i>Eudocimus albus</i>	SSC (2)	SMC
Florida Sandhill Crane	<i>Grus Canadensis pratensis</i>	T	
Whooping Crane	<i>Grus Americana</i>	E, SSC (5)	E, EXPN
Wood Stork	<i>Mycteria Americana</i>	E	E
Roseate Spoonbill	<i>Platalea ajaja</i>	SSC(1,4)	

Common Name	Scientific Name	Status	
		FWC	FWS
American Bittern	<i>Botaurus lentiginosus</i>		SMC
Black Rail	<i>Laterallus jamaicensis</i>		SMC
Semipalmated Sandpiper	<i>Calidris pusilla</i>		SMC
Short-billed Dowitcher	<i>Limnodromus griesus</i>		SMC
Black Tern	<i>Chlidonias niger</i>		SMC
Snail Kite	<i>Rostrhamus sociabilis plumbeus</i>	E	E
Swallow-tailed Kite	<i>Elanoides forficatus</i>		SMC
Southeast American Kestrel	<i>Falco sparverius paulus</i>	T	SMC
Common Ground-Dove	<i>Columbina inca</i>		SMC
Chuck-will's-widow	<i>Caprimulgus carolinensis</i>		SMC
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>		SMC
Loggerhead Shrike	<i>Lanius ludovicianus</i>		SMC
Brown-Headed Nuthatch	<i>Sitta pusilla</i>		SMC
Yellow-throated Warbler	<i>Dendroica dominica</i>		SMC
Prairie Warbler	<i>Dendroica discolor</i>		SMC
Bachman's Sparrow	<i>Aimophila aestivalis</i>		SMC

#### *American Alligator*

The American alligator (*Alligator mississippiensis*) is federally listed as threatened only as a result of its similarity in appearance to the federally endangered American crocodile. The species is not regulated under Section 7 of the Endangered Species Act and is not in danger of becoming extinct. The species is listed as one of special concern by FWC. American alligators are abundant on the refuge, with an estimated population of over 3,000 individuals (Allan Woodward, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Gainesville, pers. comm., July 2006).

American alligators are abundant in all the impoundments and canals of the refuge (May 2006) and in Lake Woodruff and the associated spring runs (Allan Woodward, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Gainesville, personal communication). The population in Lake Woodruff is used as an alligator reference area by the FWC and the United States Geological Survey Florida Cooperative Fish and Wildlife Research Unit (FCFWRU). Research on the alligator population has been conducted since 1981 on alligator harvest effects (1981-1991), alligator egg viability, and adult alligator mortality.

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The population is relatively dense, with all size classes well represented and with moderate nest densities. The lake has a relatively clean drainage, with low levels of agriculture and no major sources of industrial pollution. Poaching protection is provided by FWC law enforcement and habitat protection is provided due to the presence of the refuge.

Annually, FWC conducts alligator nest surveys on Lake Woodruff NWR. Favorite sites are Tick Island, Mud Lake, and Spring Garden Lake, as well as banks of the man-made canal adjacent to Spring Garden Run. The alligators use cordgrass and saw grass as the primary nesting materials, and prefer marsh habitat for nesting. A major prey species of the Lake Woodruff alligator population is largemouth bass (Allan Woodward, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Gainesville, pers. comm., 2006)

Overall, despite some chemical contamination in their tissue, the alligator population at Lake Woodruff NWR is very healthy (Allan Woodward, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Gainesville, pers. comm., 2006.). Hunting of alligators and egg collections are presently prohibited on the refuge, but are allowed in adjacent areas.

#### *Eastern Indigo Snake*

Although the eastern indigo snake (*Drymarchon corais couperi*) is documented from Volusia, Lake, Marion and Putnam Counties, literally surrounding the refuge (Ashton and Ashton 1988), no valid documented records exist from the refuge itself (T.M. Farrell, pers. comm. 2006). The one reported specimen is thought to have been a released animal. Despite the lack of documented records, reference literature reports the species is present on the refuge (see Alden et al., 1998, page 394, which states that the refuge supports the species).

#### *Bald Eagle*

The refuge currently supports an annual average of two to three breeding pairs of the recently delisted southern bald eagle. And, nearby nesting eagles are known to use the refuge. Eagles are known to use various pine flatwoods habitats within the refuge and have used mature live pine for nest sites. Bald eagles have been shown to nest within the vicinity of large water bodies, particularly with abundant access to fish and migratory waterfowl. The refuge's wetlands provide a diversity of excellent foraging habitats.

#### *Snail Kite*

Lake Woodruff NWR is not known to regularly support a significant portion of the snail kite population. However, maintaining favorable foraging habitat conditions will allow for use of the area and may provide critical foraging areas during periods when the southern Florida wetlands, that snail kites normally rely upon, are unsuitable due to regional drought or other factors.

#### *Wood Stork*

The federally endangered wood stork (*Mycteria americana*) is of special interest to the Service. Wood stork populations have declined sharply in Florida, from 60,000 in the 1930s to 5,000 pairs today (USFWS 1986). Lake Woodruff NWR at one time supported a wood stork nesting colony. Currently two colonies' core foraging areas include the refuge. One colony is six miles to the northeast of the refuge at Lake Disston and the other is five miles to the south at Hontoon Island. The Lake Disston colony currently supports over 100 nesting pairs of wood storks and the Hontoon Island colony supports over 50 nesting pairs.

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### *Whooping Crane*

Two separate whooping crane reintroduction projects target central Florida habitats. The FWC's non-migratory whooping crane reintroduction project is centered in south-central Florida (in the Kissimmee Prairie Basin), however, dispersal includes the upper and middle reaches of the St. Johns River basin. The Whooping Crane Eastern Partnership's (WCEP) project targets central Wisconsin as the breeding area, with a migration to western central Florida as the wintering area. These birds disperse throughout central and north Florida, including the middle reaches of the St. Johns River and Lake Woodruff NWR. A whooping crane pair from the migratory flock has established its winter territory on the refuge. It utilizes the impoundments and marshes of pools 2 and 3, as well as nearby agricultural lands, for roosting and foraging. The pair of whooping cranes that utilizes the refuge for its winter territory is reproductively active and may be one of the first pairs from the migratory flock reintroduction project to bring the historic first wild born chick on a fall migration to Florida. Whooping crane chicks normally stay with their parents through the winter. During the winter, the parents teach the chicks where and how to forage and also to roost in water at night to reduce the risk of predation. Wild whooping crane juveniles normally separate from their parents either during the spring migration or shortly after arrival on the nesting grounds, as observed in the birds from Aransas, Texas.

Whooping and sandhill cranes prefer open wet prairie, wet pasture, and large shallow water wetlands and impoundments. Much crane habitat in central Florida has been lost to development in recent years and it continues to be targeted for future development. Three of the four release sites the FWC has used for its reintroduction project are now in various stages of development, as are other large ranches known to be used by whooping cranes. Crane habitat appears to be on the decline in Florida.

### *West Indian Manatee*

Refuge waters serve primarily as a safe harbor and feeding site for several West Indian manatees (*Trichechus manatus*) year-round. The largest source of manatee mortality is boat collisions. Navigable waterways on the refuge have established manatee protection zones (boat speed limits). These areas are identified by signs and FWC is responsible for enforcement.

The portion of the St. Johns River that flows through the refuge is known as the Upper St. Johns River Manatee Management Unit. The Upper St. Johns River has shown strong manatee population growth between 1990 and 1999, increasing at an annual rate of 6.2 percent (Runge et al., 2004). This growth rate is supported by high survival and reproductive rates. This is the smallest of the four management units, contributing less than 5 percent of the total Florida manatee population, but the Upper St. Johns is the fastest growing management unit (FWC 2007). Blue Spring is the primary warm-water refuge used by the vast majority of the Upper St. Johns River Management Unit manatees, with winter counts regularly exceeding 100 animals (FWC 2007). The stable 23°C warm-water habitat provided by Blue Spring is a key factor in this population growth. Manatees also utilize DeLeon Springs, though in much smaller numbers than Blue Spring. During the winter of 2006, 25 animals were observed using DeLeon Springs, while four were counted in the winter of 2007 (D. Collins, DeLeon Springs State Park, pers. comm., April 19, 2007). The continued recovery of this portion of the manatee population is dependent upon adequate warm-water delivery to this system. The tenuous nature of artificial warm-water refugia in the Atlantic region, which exchanges a few individual manatees with the Upper St. Johns region, elevates the importance of Blue Spring and nearby springs to sustain a healthy manatee population into the foreseeable future.

### *Gopher Tortoise*

Gopher tortoises (*Gopherus polyphemus*) live in dry, upland habitats where they dig burrows. Several other species (collectively called "commensals") utilize these burrows, such as frogs, other turtles, poisonous and non-poisonous snakes, many small mammals, and even some birds like the Florida scrub-jay and burrowing owl. Some of these commensals are legally protected species,

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which adds to the ecological value that the tortoise burrow has in the ecosystem. Gopher tortoises are protected under State law due to their decline in Florida. Threats to these long-lived animals include habitat destruction, road mortality, disease, and predation. Several dozen gopher tortoises are found on the refuge, primarily along the eastern boundary and Volusia Tract.

#### *Sandhill Crane*

Sandhill cranes (*Grus canadensis*) are primarily birds of open freshwater wetlands and shallow marshes, but may utilize a broad range of other habitat types, from bogs, sedge meadows, and fens to open grasslands, pine savannahs, and cultivated lands. Sandhill cranes are omnivorous, feeding on a wide variety of plant materials, including waste grains, and small vertebrates and invertebrates, both on land and in shallow wetlands. The leading threat to this State listed species is the loss and degradation of wetland habitats, especially ecological and hydrological changes in important staging areas. Lead and mycotoxin poisoning, abnormal predation pressures, and collisions with fences, vehicles, and utility lines are of local concern for various populations. At Lake Woodruff NWR, sandhill cranes are found primarily in the freshwater marshes and impoundments, and occasionally breed on the refuge.

#### *Florida Pine Snake*

The Florida pine snake (*Pituophis melanoleucus mugitus*) is a State protected species, which lives in areas with relatively open canopies and dry sandy soils, in which it burrows. Habitats include sandhill, oldfields, and pastures, but also sand pine scrub and scrubby flatwoods. It often coexists with pocket gophers and gopher tortoises. Threats include collection for pets (now restricted); highway mortality; and habitat loss and fragmentation from development, intensive agriculture, and mining. This species has not been documented on Lake Woodruff NWR, but it is found in its vicinity and suitable habitat does exist on the refuge.

#### *Florida Black Bear*

The Florida black bear (*Ursus americanus floridanus*) is State listed and Florida's largest land animal. A wide variety of forested communities are needed to support the varied seasonal diet of black bears. Forested wetlands are particularly important for diurnal cover. This species requires a large home-range, which makes it particularly vulnerable to habitat destruction and fragmentation, and resulting road mortality. Several Florida black bears utilize portions of the refuge.

#### *Swallow-tailed Kite*

Swallow-tailed kites (*Elanoides forficatus*) are State listed birds which utilize a variety of wetlands to feed on large insects. This species has declined due to destruction and alteration of freshwater marshes. The refuge is home to the second largest pre-migratory roost of swallow-tailed kites in the United States. Kites congregate and feed on the refuge in the summer before beginning their migratory journey to South America. Therefore, it is an international area of importance for this imperiled species.

#### *Limpkin*

The limpkin (*Aramus guarauna*) is a secretive bird of swamps and marshes. This bird reaches the northern limits of its breeding range in Florida. There, it feeds almost exclusively on apple snails, which it extracts from their shells with its long bill. This species can be found in open freshwater marshes; swamp forests; and shores of rivers, lakes, and ponds. Once abundant in Florida, the limpkin was almost eradicated by humans hunting for food. Conversion of wetlands for agriculture, flood control, and development has further contributed to the species' decline in Florida. It is a State listed species which can be found on the refuge.

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## Plants

The refuge includes a diverse number of habitats, which each support a large number of herbaceous and woody plants. However, no exhaustive floral inventory of the refuge exists, and therefore information on refuge plants is scarce. A 2002 wetlands inventory revealed a threatened endemic, State listed scrub species, *Garberia heterophylla* (USGS 2002). It is likely that several other endemic and rare plants occur on the refuge, but their occurrences are unknown.

## Exotic, Invasive, and Nuisance Species

Exotic or non-native species are those which have colonized areas outside their natural range (usually through human actions). Having left their original predators and disease behind, the populations of many exotic species grow unchecked in their new environments, often becoming an ecological threat to native biological communities. Lake Woodruff NWR has several non-native plants and animals (Table 3).

Lake Woodruff NWR is located in north-central Florida, and due to periodic freezes, is located well north of the ranges of many of the problematic species found in south Florida, which include Brazilian pepper, melaleuca (*Melaleuca quinquenervia*), and Australian pine (*Casuarina* spp.). However, there may be some non-native plants and animals that make their way down from the north, and therefore the refuge has the potential to be impacted by the spread of both temperate and sub-tropical species. The spread of many of these non-natives is increasing every year, and it is just a matter of time before the occurrence of these species increases. Most of the terrestrial non-native plants such as air potato (*Dioscorea bulbifera*), kudzu (*Pueraria lobata*), and Johnson grass (*Sorghum halepense*) invade the refuge from the eastern boundary, where human development is increasing, and a highly disturbed railroad easement allows non-native species to flourish. Non-native aquatic plants, such as water hyacinth (*Eichhornia crassipes*), water lettuce (*Pistia stratiotes*), and hydrilla (*Hydrilla verticillata*) are managed by the Army Corps of Engineers' use of herbicides.

The Florida Exotic Pest Plant Council has categorized non-native plants in terms of their ecological threats. Category 1 exotics are those which alter native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. Category 2 invasive exotics have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category 1 species. Many of the non-native exotics found on the refuge are either Category 1 or 2 plants (Table 3).

Exotic animals are also found on the refuge and have colonized a range of habitats from aquatic areas to upland forests. The Asian clam (*Corbicula fluminea*) inhabits the waterways and impoundments. Non-native fish, such as armored catfish (*Pterygoplichthys* spp.), brown hoplo (*Hoplosternum littorale*), and tilapia (*Oreochromis* spp.), have been documented on the refuge and are prevalent throughout the waters of the St. Johns River. They are impossible to eradicate, and their effects on native fauna are not fully understood. Terrestrial species include feral hogs (*Sus scrofa*), cats (*Felis silvestris catus*), dogs (*Canis lupus familiaris*), coyote (*Canis latrans*), armadillos (*Dasypus novemcinctus*), Cuban tree frogs (*Osteopilus septentrionalis*), brown anoles (*Anolis sagrei*), and Eurasian collared doves (*Streptopelia decaocto*). These non-native animals can alter habitats, prey on native species, and may compete for food and nesting sites with native wildlife.

**Table 3: Lake Woodruff NWR non-native plants and animals**

Scientific Name	Common Name	Category
<i>Plants</i>		
<i>Albizia julibrissin</i>	Mimosa, Silk Tree	I
<i>Ardisia crenata</i>	Coral Ardisia	I
<i>Bambusa</i> spp.	Bamboo	NA
<i>Broussonetia papyrifera</i>	Paper Mulberry	II
<i>Cinnamomum camphora</i>	Camphor-tree	I
<i>Dioscorea bulbifera</i>	Air-Potato	I
<i>Eichhornia crassipes</i>	Water-Hyacinth	I
<i>Hydrilla verticillata</i>	Hydrilla	I
<i>Imperata cylindrical</i>	Cogon Grass	I
<i>Lantana camara</i>	Lantana	I
<i>Lygodium japonicum</i>	Japanese Climbing Fern	I
<i>Melia azedarach</i>	Chinaberry Tree	II
<i>Myriophyllum spicatum</i>	Eurasian Water-milfoil	II
<i>Panicum repens</i>	Torpedo Grass	I
<i>Paspalum notatum</i>	Bahia Grass	NA
<i>Pistia stratiotes</i>	Waterlettuce	I
<i>Pueraria Montana</i>	Kudzu	I
<i>Sapium sebiferum</i>	Chinese Tallow Tree	I
<i>Sorghum halepense</i>	Johnson grass	NA
<i>Urena lobata</i>	Caesar's weed	II
<i>Animals</i>		
<i>Anolis sagrei</i>	Brown Anole	NA
<i>Bubulcus ibis</i>	Cattle Egret	NA
<i>Canis familiaris</i>	Feral Dog	NA
<i>Canis latrans</i>	Coyote	NA
<i>Corbicula fluminea</i>	Asian Clam	NA
<i>Dasyopus novemcinctus</i>	Armadillo	NA
<i>Felis silvestris catus</i>	Feral Cat	NA
<i>Hoplosternum littorale</i>	Brown Hoplo	NA



Scientific Name	Common Name	Category
<i>Oreochromis</i> spp.	Tilapia	NA
<i>Osteopilus septentrionalis</i>	Cuban Tree Frog	NA
<i>Passer domesticus</i>	English Sparrow	NA
<i>Pterygoplichthys</i> spp.	Armored Catfish	NA
<i>Streptopelia decaocto</i>	Eurasian Collard Dove	NA
<i>Sturnus vulgaris</i>	Starling	NA
<i>Sus scrofa</i>	Feral Hog	NA

## CULTURAL RESOURCES

Archaeological evidence suggests that the St. Johns River basin, which includes the refuge, has been inhabited for over 12,000 years (Milanich 1998). Paleoindians were nomadic hunters who made use of the riparian habitats during the much drier glacial period, which ended approximately 9,500 years before present (BP). This period was followed by the Archaic Period (9,500 – 4,000 BP), which was characterized by a significant warming of the global climate during which sea-levels rose and estuaries and rivers expanded. The mega-fauna of the glacial periods disappeared from Florida. In response, native inhabitants switched to utilizing aquatic resources and established more permanent settlements. It was during this period that shell middens, large aggregations of shellfish refuse, were created. On Tick Island (which is not developed for visitors), researchers have found a large sand mound that served as a major burial site. Excavations in the 1960s by Ripley Bullen revealed single, double, and multi-person graves - altogether 175 burials. Anthropologists theorize that the bodies were stored temporarily, until burial time, at a charnel house to protect them from the elements and from animals. An area next to the mound may have been used for ritual feasting. The graves at Tick Island contained ceremonial antler headgear, remains of feasts for the dead and projectile points and knives. The latter may have been meant to accompany the departed, or they may have caused the deaths. Several people buried here had been killed by spear points.

The Archaic Period marks the beginning of agriculture by Florida's Indians and the arrival of European conquerors, with the resulting decline of Indian cultures. The colonial forces gained access both over land and via the St. Johns River by use of sail and steamboats. Alternating Spanish and British colonial powers ruled the area encompassed by the refuge from 1565 to 1821. Spanish forces ceded to U.S. Territorial rule in 1821. Spanish, British, and U.S. powers raised cattle and operated indigo, rice, cotton, and sugar plantations in the area. In the area where the refuge lies, there was a sugar plantation built by Major Joseph Woodruff in 1823 (Lake Woodruff is named after him). By 1834, Mr. and Mrs. Woodruff died of sickness in Charleston, and only two of their eight children survived. The ownership of the plantation went to the Woodruff's nephews, Joseph and Henry Woodruff. The Indian Revolt of 1835 resulted in the mass-burning of sugar cane plantations across central Florida. The local sugar industry never recovered and thus ended the period of large plantations as a form of land use in east central Florida.

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## SOCIOECONOMIC ENVIRONMENT

### DEMOGRAPHICS

According to the 2000 U.S. Census, Volusia County had a population of 453,449 and Lake County 210,528. Over 80 percent of the people in Volusia County live in the coastal cities along the Atlantic coast, such as Daytona Beach and urban centers in the southwest portion of the county (near Orlando) which include cities such as Casselberry and Sanford. Areas in the immediate vicinity of the refuge are decidedly rural, with a population of approximately 4,822 people (U.S. Census 2006).

The unincorporated areas of DeLeon Springs are younger with over 70 percent age 49 or less. Males and females are represented equally, but ethnicity is skewed. At least 70 percent of the population is white, 24 percent Hispanic, 5 percent black, and less than 1 percent Asian and American Indian. The younger, more diverse population (Florida's statewide Hispanic population is 14 percent) further points at a shift to a more urban and mobile population. Deland and surrounding areas are within commuting distance of the Daytona and Orlando metro population centers that have a rural character.

While Florida continues to grow, the area around the refuge continues to grow even faster. From 1990 to 2000 the State of Florida grew 23.5 percent to 16 million people (U.S. Census Bureau 2000). It is estimated that Florida currently hosts over 77 million annual visitors (Florida Department of Transportation 2006). From 1990 to 2000, the counties in and around the refuge averaged a growth of 28.5 percent, ranging from 19.4 percent to 73.6 percent (Table 4). However, population growth along the eastern boundary of the refuge is expected to increase more rapidly for the foreseeable future. For example, the number of building permits issued for all types of homes in Deland has increased by over 800 percent since 2000 (93 permits) compared to 2005 [812 permits, U.S. Department of Housing and Urban Development (HUD) 2006]. Deland is located less than five miles from the eastern refuge boundary.

**Table 4: Populations of the refuge's home counties and nearby counties**

County	2000 Population	% Increase 1990-2000	Predicted 2015 Population*
Volusia County	443,343	19.6%	560,100
Lake County	210,528	38.0%	300,200
Marion County	258,916	32.9%	336,300
Sumter County	53,345	68.9%	76,700
Flagler County	49,832	73.6%	87,700
Seminole County	365,196	27.0%	480,700

County	2000 Population	% Increase 1990-2000	Predicted 2015 Population*
Orange County	896,344	32.3%	1,258,800
Polk County	483,924	19.4%	593,200

US Census Bureau 2000 \*Lenze 2002

The cities within 20 miles of the refuge grew at an average rate of 40.7 percent from 1990 to 2000, ranging from 17 percent to nearly 117 percent growth with a 2000 total population of 117,711 for these six cities (Table 5).

**Table 5: Populations of cities of Volusia County, Florida**

Nearby City	2000 Population	% Increase (1990-2000)
DeLeon Springs (0 miles)	2,358	59.2%
DeLand (~3 miles)	20,904	26.8%
Lake Helen (~8 miles)	2,743	17.0%
Orange City (~8 miles)	6,604	23.5%
Deltona (~12 miles)	69,543	36.8%
DeBary (~14 miles)	15,559	116.8%

US Census Bureau 2000

## REFUGE ADMINISTRATION AND MANAGEMENT

### *RESOURCE PROTECTION*

#### **FSA Easements**

The refuge administers management responsibility over three Farm Service Agency conservation easements, two within Putnam County, Florida, and one in Flagler County, Florida. The total area of the three separate easement tracts is 659.85 acres. These easements were established as perpetual conservation easements through a conveyance of property interest from the USDA Farm Service Agency (formerly Farmers Home Administration) under the provisions of the Food Security Act of 1985 (Farm Bill) to the U.S. Fish and Wildlife Service, National Wildlife Refuge System, with the authority to administer these lands under the National Wildlife System Administration Act, 16 U.S.C., 668dd.

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Management of these lands is administered by the Lake Woodruff NWR under the authorities heretofore stated and provisions mentioned within the Conservation Easement Reservation agreements. The primary vegetative association of all three easement tracts is palustrine, forested wetlands dominated in the over story by cypress, black gum, sweet gum, red maple and American elm. Wetlands such as these provide habitat for locally nesting wood ducks and other migratory waterfowl and wading birds. These wetlands are important breeding sites for a variety of herpetofauna as well. Within each easement tract there are also small areas of transitional mesic forest types with an overstory of mixed hardwood and pine species that may provide habitat for migratory birds, herpetofauna, and mammalian wildlife species.

Since the establishment of the easements, the refuge has had little direct management of the properties, due primarily to nature of the forest types that dominate each of these easements, and undisturbed hydric hardwood forest, which requires minimal direct management to maintain the systems integrity and health. Resources have also been a limiting factor in applying land management on these sites.

#### *FSA Easement: Putnam #1*

This property is located within Putnam County Florida approximately 6.8 miles northeast of Palatka, off State Highway 207. The parent parcel totals 97 acres with the conservation easement comprising 52.257 acres of the southern portion of the parent parcel. The management of this easement was conveyed to the Service on February 12, 1990. The majority of the parent parcel is currently being utilized for agricultural crop production.

#### *FSA Easement: Putnam #2*

This property is located within Putnam County Florida approximately 6.3 miles southeast of Palatka, Florida. The southern boundary of the easement can be accessed from East End Road. The parent parcel totals 1,855 acres with the conservation easement comprising 598.1 acres of the southern and western portion of the parent parcel. The management of this easement was conveyed to the Service on December 6, 1991. The majority of the parent parcel currently remains in a natural forested state.

#### *FSA Easement: Flagler #1*

This property is located within Flagler County Florida approximately 6.2 miles west of Bunnell. The northern side of the parent parcel can be accessed from State Road 100. The parent parcel totals 96 acres with the conservation easement comprising 9.5 acres of the southern portion of the parent parcel. The management of this easement was conveyed to the Service on January 28, 1994. The majority of the parent parcel is currently being utilized for agricultural crop production.

#### *State-owned Navigable Waters*

There are 2,974 acres of State-owned navigable waters, including Lake Woodruff, Mud Lake, Norris Dead River, Ziegler Dead River and a portion of St. Johns River between the St. Francis Island and the South Marsh unit of the refuge (Figure 9). These waters are managed by the State of Florida and the Army Corps of Engineers.

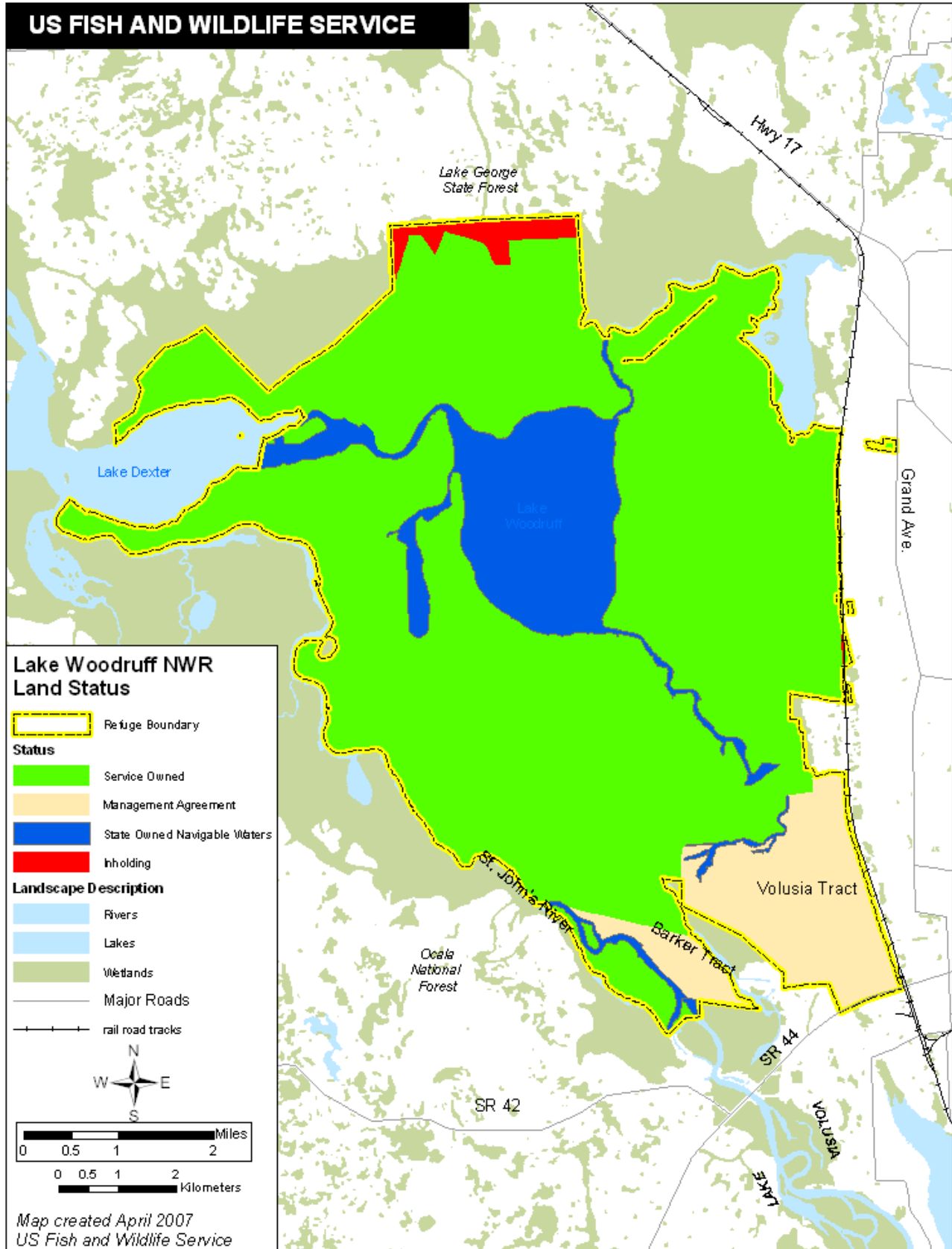
#### *Inholdings*

There is an approximately two-acre wetland inholding located on the eastern side of the Jones Island Marsh Unit, adjacent to Spring Garden Lake. This inholding is owned by a private individual.

#### *Lands under Management Agreement*

Lands located within the refuge acquisition boundary include the Lake George State Forest unit, the Volusia Tract Compartment, and the Evans/Barker Tract.

Figure 9: Lake Woodruff NWR land status map



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There are approximately 361 acres of upland forested habitat along the northern boundary of the refuge. The land is currently owned and managed by the State of Florida, Department of Agricultural Services, Division of Forestry, Lake George State Forest and the State of Florida, Fish and Wildlife Conservation Commission.

*Inholding under Management Agreement (inholdings include the Volusia Tract Compartment and the Evans/Barker Tract)*

The Volusia Tract Compartment consists of 2,100 acres of pine flatwoods, hardwood swamp, and cordgrass marsh within the acquisition boundary of Lake Woodruff NWR. The land is owned by the State of Florida, SJWMD, and managed by the refuge under a perpetual management agreement signed in 1998 between the Service and SJRWMD. The management agreement allows the refuge to implement wildlife habitat and forestry management practices that are covered within all approved refuge management plans. The refuge currently performs and regulates prescribed fire and wild fire suppression, timber management, law enforcement, archery deer hunting, horseback riding, hiking, and wildlife viewing within the Volusia Tract.

The Evans/Barker Tract consists of approximately 300 acres of hardwood swamp within the acquisition boundary of Lake Woodruff NWR. The land is co-owned by the State of Florida and Volusia County and managed by the refuge under the authority of a 20-year management lease agreement signed in 1991 between the Service and the State of Florida and Volusia County. The management agreement allows the refuge to implement wildlife habitat and forestry management practices that are covered within all approved refuge management plans. The parcels of land that make up the Evans/Barker Tract are located near the southern boundary of the refuge and are situated between the St Johns River to the west, and the Ziegler Dead River to the east. The refuge currently performs minimal management activities within the tract, due primarily to the reason that the integrity of the swamp system in which the tract is located is considered to be in a healthy state. Management activities that are conducted within and around the tract are boundary posting and law enforcement patrols.

## **VISITOR SERVICES**

The purpose of the visitor services program is to provide opportunities for appropriate and compatible wildlife-dependent recreation to enable the public to enjoy the refuge. Several trails and parking areas facilitate opportunities for observing and photographing wildlife, fishing, hunting, and participating in environmental education and interpretation for over 50,000 annual refuge visitors.

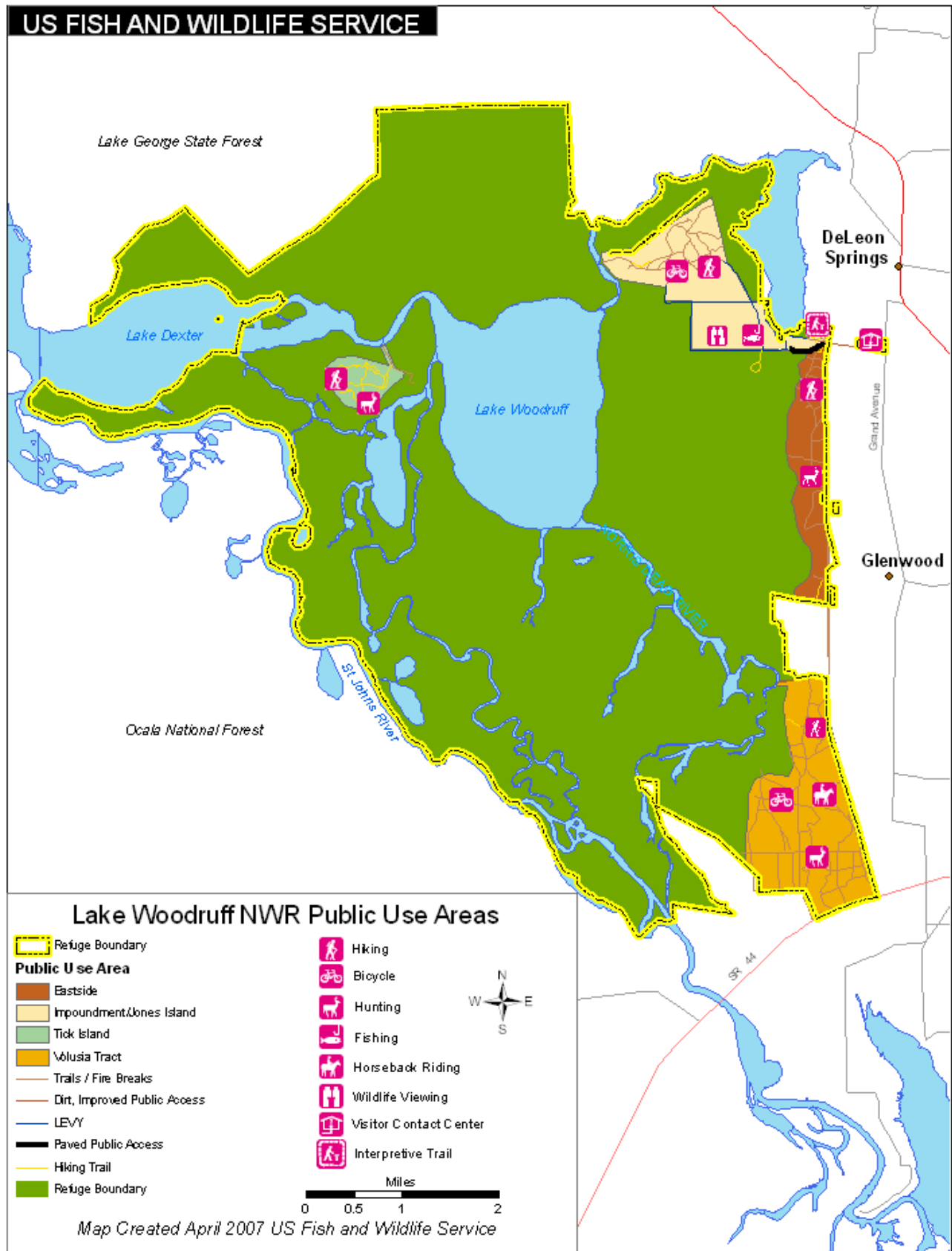
### **Visitor Use Areas**

Primary visitor use areas on the refuge include the refuge's administrative offices, impoundment areas, lakes and waterways, and trails (Figure 10). The refuge's administrative offices also house the visitor contact station, which includes several interactive displays, informational materials, and a shop, which is managed by the Friends of Lake Woodruff National Wildlife Refuge. The refuge currently does not have an entry fee. The impoundment areas include three water-management areas, which are used for walking, observing wildlife, and fishing. Waterways are used for boating, fishing, and sightseeing. Trails are used for hiking, observing wildlife, and hunting.

### **Environmental Education**

The refuge currently addresses educator needs on an individual basis and includes approximately 200 participants per year. The refuge does have loaner binoculars, scopes, and dip nets for educators to check out for on-site visits. The refuge staff is currently working on building a relationship with local Boy Scout troops.

Figure 10. Lake Woodruff NWR public use areas



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## **Interpretive Programs**

The refuge lacks interpretive staff to take on interpretive/informational needs, so these duties fall to present staff. The exhibits, some of which were inherited from other refuges, at the administrative offices are the main source of interpretive information for the refuge. The exhibits feature a new wetlands diorama with an audio-phone and a wall panel. Presently, no printed text is available for the hearing impaired to accompany the exhibit. There is also a standing exhibit featuring Lake Woodruff NWR's habitats. There is a television in the visitor contact area and many Service videos for orientation to the Service and Refuge System are available for viewing. The refuge also provides maps and brochures at its administrative offices for visitors. The refuge brochure is presently informational with outdated maps. A portable exhibit can be used on site or for outreach activities. The refuge has developed a Refuge System orientation and a PowerPoint presentation for outreach programs. Interpretive programs reach approximately 100 participants annually. In addition, a teacher will call and request assistance with a tour or a talk and the refuge staff responds as resources allow.

## **Fishing**

Recreational fishing is permitted year-round in accordance with State regulations and requires the possession of a Florida fishing license. Approximately 6,500 people fish on the refuge annually. Most fishing is from boats and many water access points exist for boats to enter the refuge. No boat ramps exist on the refuge. Only non-motorized boats are allowed in the impoundments and not during the migratory seasons. Bank fishing is popular in the three impoundment areas totaling 445 acres. Fish species that can be caught include largemouth bass, bream, and catfish. Most fish in the impoundments and canals are introduced when water is pumped in for water level management purposes. For this reason it is difficult to maintain a balanced quality sport fishery. The refuge has conducted a Kids Fishing Day event during National Fishing Week.

## **Hunting**

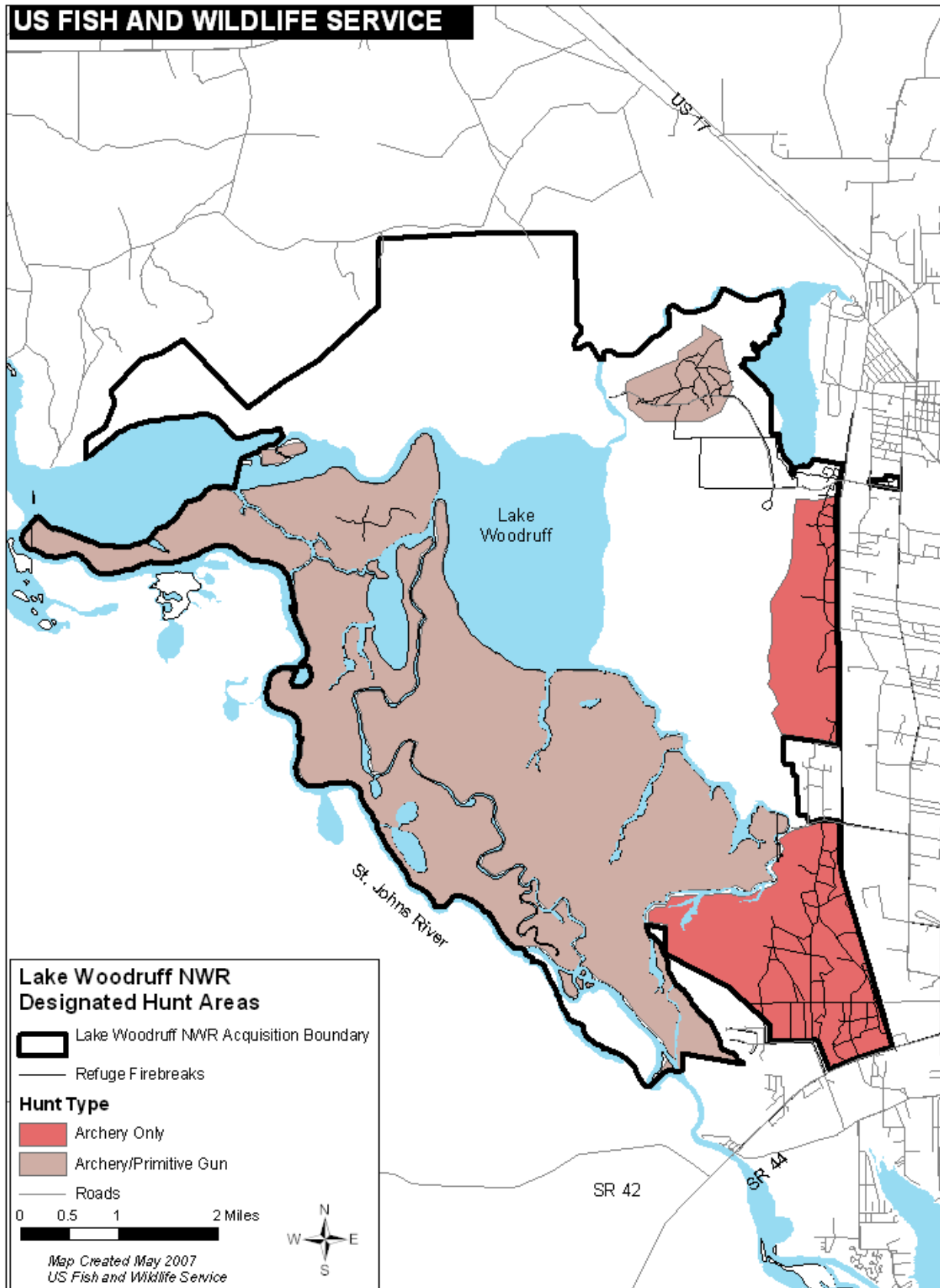
Approximately 11,000 acres of refuge lands are seasonally open to deer hunting (Figure 11). The refuge has three 9-day quota deer hunts per year. Feral hogs can be killed during all deer hunts. In 2004, an archery hunt was held in September and another in October. The third hunt was a muzzleloader hunt held later October-early November. In order to hunt, a refuge hunt permit and a signed copy of the hunt brochure are required of all hunters. All three hunts are limited to 100 permits each. Permits are sold on a first-come basis for \$12.50. Hunters can get up to one archery permit and one muzzleloader permit. In 2004, all permits were sold. For the three hunts, a total of 66 hunters hunted 194 hunt days and harvested 22 deer. Hunters were required to fill out a Hunter Activity Card after each hunt. The staff estimated 50 percent compliance with these activity cards.

## **Wildlife Viewing and Photography**

The refuge provides several trails (approximately 15 miles in total trail length) both in uplands and swamp areas that offer observation opportunities. Walking along the dike reveals a myriad of wading birds and waterfowl such as sandhill cranes, great blues herons, little blue herons, common moorhens, rails, limpkins, and a variety of ducks. An observation tower is located 1/2 mile from the parking area at a point that allows viewing of Spring Garden Lake, the canals, and two of the three impoundments managed by the refuge. Informational panels sit beneath the tower for on-the-spot reference. The total distance of the levees allow for six miles of hiking/wildlife observation. This distance may be too far for a large percentage of the retired visitors in the area. Bicycling the dike's rough terrain to farther points may be difficult for some. The refuge participates in the Great Florida Birding Trail and has binoculars to loan for those interested. No sign drawing attention to this optics program is posted in the visitor contact station or on map panels in parking areas. The Mayaca Trail



Figure 11: Lake Woodruff NWR hunt areas

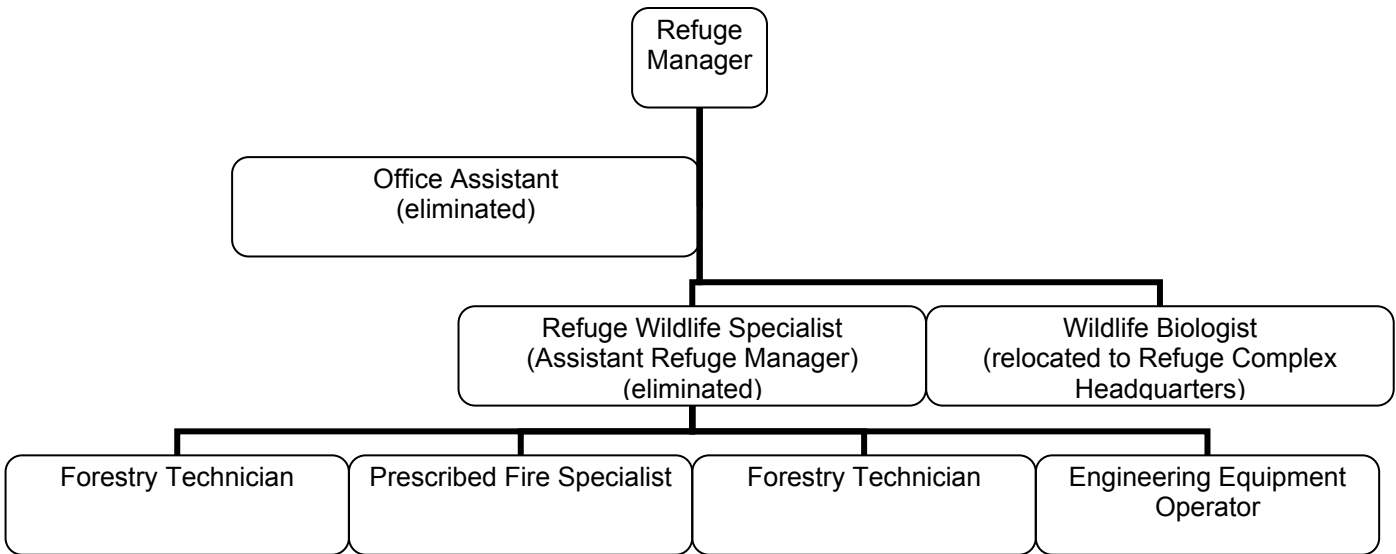


gazebo and old fernery site provides an open wildflower field, as well as tree cover for viewing butterflies, passerines, and early morning deer browsing the area. There are plans for a handicapped accessible component of this trail. At the south end of the Volusia Tract, several firebreaks loop adjacent to the access firebreak road. Used as trails, they provide wildlife observation and photography opportunities, especially in early morning and twilight hours. There is also a good scenic location for wildlife viewing at Outlaw Landing just north of the Volusia Tract. This is also a serene kayak/canoe location for observation and photography.

*PERSONNEL, OPERATIONS, AND MAINTENANCE*

The refuge staff has grown from the three employees when the refuge was first established in 1964 to its current number of six approved positions (two of which are seasonal), including the refuge manager, biologist, prescribed fire specialist, engineering equipment operator, and two career seasonal forestry technicians (Figure 12). The refuge had also employed a maintenance worker, but this position and the assistant refuge manager position were identified for reduction under the Work Force Planning Initiatives of 2006. The maintenance worker position was vacant as of July 2006, and, under current directives, will not be filled. The assistant refuge manager position became vacant in February 2008 and, under current directives, also will not be filled. Following a retirement in 2007, the office assistant position was also eliminated.

**Figure 12: Lake Woodruff NWR current organizational chart**



The headquarters building includes administrative offices, a conference room, wildlife store, and visitor services' area. The education building is located nearby, which includes administrative offices and a large conference room. Other refuge facilities include a pole shed and maintenance facility.

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The national fire program has increased ten-fold during the last two decades with attentions raised as a result of lost lives, destroyed personal property, and the destruction of thousands of acres of natural lands across the country, caused by wildfires igniting and sweeping through areas heavily laden with accumulated fuels. Additional funding has increased fire crews on several southeast refuges, including Lake Woodruff NWR. Trained fire personnel, as well as state-of-the-art prescribed and wildfire suppression equipment, have been made available to aid in controlling and prescribing scheduled burns to efficiently and successfully suppress potentially hazardous wildfire situations and to manage valuable wildlife habitat. In 1998, a John Deere 550 dozer with fire plow was purchased and added to help with the fire fighting responsibilities. In 2000, fire funds acquired a Type-6 fire engine. In 2002, an International flatbed truck was acquired to transport the dozer equipment, and in 2003 an additional Type-6 fire engine truck was added. Since then, new all-terrain vehicles, including a Honda 4-wheeler and a Polaris Ranger 6X6 vehicle, equipped with small water tank and hose reel, have been added to the fleet. New fire fighting specifications on dozer/plow fire-suppression equipment have since required upgrading of the dozer. With a special fire-funded package, the refuge replaced the 1998 JD-550-G dozer with a JD-650-J dozer that maneuvers safer and more efficiently during fire-management operations.

The Friends of Lake Woodruff NWR was founded in 1999, and has approximately 100 members. The members and volunteers support the refuge in a variety of ways, including building trails, assisting in research, publishing newsletters, and educating the general public.

A collaborative effort between the Service, Ducks Unlimited, Progress Energy, and the Friends Group of Lake Woodruff NWR completed a long over-due project of replacing a dilapidated pump station and diesel pump system with a new system, which facilitates three refuge impoundments totaling 450 acres. The new water distribution system gives the refuge the ability to divert water to each of the impoundments whenever necessary and better manage the area for waterfowl and other migratory birds.



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## III. PLAN DEVELOPMENT

### OVERVIEW

Although Lake Woodruff NWR has had several step-down management plans in the past, no comprehensive management plan existed to address all refuge programs. This Draft CCP/EA process allowed the Service, the governmental and non-governmental partners, and the public the opportunity to take a comprehensive look at the refuge and its management, resources, and future. Plans are revised every 15 years, or earlier, if monitoring and evaluation determine that changes are needed to address new information and/or to achieve refuge purposes, vision, goals, and/or objectives. The basic steps of the planning process involve gathering information, scoping for public input, developing the Draft CCP/EA, gathering public input on the Draft CCP/EA, developing the Final CCP, and implementing and monitoring the actions identified in the Final CCP.

### PUBLIC INVOLVEMENT AND PLANNING PROCESS

The planning process began with various data-gathering sessions. As part of this process, the Service conducted the following reviews: Wildlife and Habitat Management, Visitor Services, and Wilderness. In addition, the Service developed a Core CCP Planning Team, which took input from the public and from an Intergovernmental Coordination Planning Team.

The core planning team consisted exclusively of refuge and contract staff, and a Service natural resource planner. Key tasks of this team involved defining and refining the vision; identifying, reviewing, and filtering the issues; defining the goals; outlining the alternatives; and providing a reality check. The core planning team members consisted of the listed Service staff and a representative from the Service contractor.

- Cheri M. Ehrhardt, AICP, Natural Resource Planner, Fish and Wildlife Service
- Harold Morrow, former Refuge Manger, Lake Woodruff NWR, Fish and Wildlife Service
- Deisha Norwood, Assistant Refuge Manager, Lake Woodruff NWR, Fish and Wildlife Service
- Oliver van den Ende, Contractor, Dynamac Corporation
- Mike Ward, Prescribed Fire Specialist, Lake Woodruff NWR, Fish and Wildlife Service

Members of the core planning team met regularly to review public comments, data, and information collected to write the plan. Professional reviews of the refuge were conducted to determine the status, trends, and conditions of refuge resources and facilities. Experts from the Service (including other refuges, Migratory Birds, Fisheries, Resource Management, and Ecological Services), State of Florida (including FWC, FDEP, and SJRWMD), Stetson University, USFS, USACE, Avian Conservation and Research Institute, and Archbold Biological Station participated in Wildlife and Habitat Management reviews of the refuge in 2006. A Wilderness Review was conducted in 2006 by Service staff. In review of the federally owned lands within the legislatively defined boundary of the refuge, no additional lands were found suitable for designation as wilderness (Appendix H). A Visitor Services' Review was conducted in 2005, involving Service staff from other refuges and the Southeast Regional Office, along with park and public outreach managers from DeLeon State Park and Volusia County. This review focused on existing activities and provided specific recommended actions to improve program development and public use facilities. The information garnered from these reviews helped the planning team analyze and develop recommendations for this Draft CCP/EA.

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Following the initial gathering of information, a notice of intent to prepare a CCP was published in the *Federal Register* on July 26, 2006. The Service also placed ads in local newspapers, posted information on the refuge's web site, and at the refuge's offices/visitor contact station regarding the upcoming meeting and how to submit comments, posted meeting information in the local community (e.g., local shops, public boat ramps, refuge's Visitor Center, Stetson University, and local libraries), and sent out more than 200 flyers announcing the public meetings. During September 2006, at least two CCP-related articles appeared in two local papers: *Daytona Beach News-Journal* and the *DeLand Beacon*, and an advertisement placed in the *West Volusia County Pennysaver*. A public scoping meeting was held in DeLand on September 7, 2006, with 33 attendees. During public scoping beyond the public meeting, over 30 written comments were submitted by individuals and organizations, spanning several states. Planning updates kept the public informed of the progress of the CCP. To date, nearly 200 people are on the refuge's CCP mailing list.

An Intergovernmental Coordination Team also provided invaluable input throughout this planning process. Involved agencies included: FWC, SJRWMD, FDEP, Volusia County, USDA Forest Service, Florida Department of Agriculture and Consumer Services, USGS, and USACE.

The Service is seeking comments regarding this Draft CCP/EA as the next stage of public involvement. Adjustments will be made to the Draft CCP/EA accordingly, in preparation for the Final Plan.

## **SCOPING OF ISSUES AND CONCERNS**

The planning team identified a number of issues, concerns, and opportunities related to fish and wildlife protection, habitat restoration, recreation, and management of threatened and endangered species. Additionally, the planning team considered Federal and State mandates, as well as applicable ordinances, regulations, and plans. All public and Intergovernmental Coordination Team comments were considered; however, some issues fall outside the scope of the decision to be made within this planning process. The planning team developed a Draft CCP/EA that attempts to consider the most important issues facing the refuge. These issues are:

- Impacts of human population growth and increased development adjacent to the refuge's boundary;
- Threats to threatened, endangered, and other rare species;
- Lack of a comprehensive habitat management program;
- Lack of baseline data and coordinated research;
- Need for enhanced interagency coordination; and
- Lack of sufficient Service access onto refuge properties.

In addition to these priority issues, other issues include the trust responsibilities of the refuge. The issues to be addressed during the 15-year life of the CCP are divided into four categories: wildlife and habitat management; resource protection; visitor services; and refuge administration.

## **ISSUES**

### *WILDLIFE AND HABITAT MANAGEMENT*

The refuge is biologically diverse with over 200 species of fish and wildlife and numerous species of plants occurring on the refuge. The habitat diversity and location of the refuge offer fish and wildlife, including federal and state listed species, migratory birds, and native species, an undeveloped landscape of prime habitat. However, increased human population growth, urbanization, and

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suburbanization, and the development of lands around the refuge, will eventually increase public use demands on the refuge and are expected to increase associated impacts to the refuge. Direct and indirect activities that may impact the refuge include commercial, residential, and recreational uses (e.g., potentially resulting in reduced water quality, the spread of exotic species, and increased wildlife and habitat disturbance). Ongoing development of the landscape is consuming and fragmenting remaining off-refuge habitats, which are also used and needed by many refuge wildlife (e.g., for breeding, nesting, loafing, feeding, migrating, and dispersing). The spread of exotic, invasive, and nuisance species; the threats to threatened, endangered, and other imperiled species; the management/maintenance of impounded wetlands; and the decline in migratory birds and associated habitats are priority wildlife and habitat management issues to be addressed in the 15-year life of the plan.

### **Rare, Threatened, and Endangered Species**

The protection and recovery of threatened and endangered plants and animals are important responsibilities of the Service and of national wildlife refuges. Several federally listed threatened and endangered species utilize the refuge, including the snail kite (rarely seen), West Indian manatee, whooping crane, and wood stork. Certain upland habitats could potentially be used by eastern indigo snakes. In addition, several State listed species, consisting predominantly of wading birds, but also including the gopher tortoise, are commonly found on the refuge. All of these rare species utilize a variety of habitats, including open water, wetlands, and upland communities. Manatees find shelter in many of the refuge's protected waterways and lakes. Bald eagles (recently de-listed) nest in upland pines and hunt in the refuge's wetlands and associated aquatic habitats. Whooping cranes, part of an experimental flock, have started utilizing the impoundments during their migration. The refuge's large component of freshwater marshes has become increasingly important on a regional scale due the loss of this important habitat in northern central Florida, while the refuge's uplands will become more important as a sanctuary for species whose habitat is being lost due to accelerating development along the eastern boundary of and nearby the refuge. Without conservation lands and waters and protection measures, these species are likely to continue to decline.

### **Exotic, Invasive, and Nuisance Species**

Non-native (exotic, introduced), invasive, and nuisance (destructive) species have the potential to negatively influence native species through habitat alteration (which can change ecological processes), resource competition, predation, or any combination of these factors. Although exotic, invasive, and nuisance species are not extensively present on the refuge, all major habitats on the refuge have non-native and nuisance species. In upland habitats feral cats prey on native wildlife species, while Ceasar's weed (*Urena lobata*), air potato (*Dioscorea bulbifera*), Johnson grass (*Sorghum halepense*), coral ardesia (*Ardisia crenata*), asparagus ferns (*Asparagus aethiopicus*), and kudzu (*Pueraria montana*) crowd out native plants. Refuge wetlands and aquatic habitats are inhabited by hydrilla (*Hydrilla verticillata*), water hyacinth (*Eichhornia crassipes*), water lettuce (*Pistia stratiotes*), parrot feather (*Myriophyllum aquaticum*), and cattails (*Typha spp.*). Refuge waterways and impoundments are known to support armoured catfish, brown holpo catfish, and tilapia. Some species, such as armadillos, cats, and feral hogs, utilize a variety of upland and wetland habitats, increasing their potentially destructive impacts. Several non-native species, which are problematic in other parts of Florida but are expected to begin colonizing areas of the refuge within the 15-year life of the CCP include: Nile monitor lizard (*Varanus niloticus*), Old World and Japanese climbing ferns (*Lygodium spp.*), Brazilian pepper (*Schinus terebinthifolius*), Chinese tallow (*Sapium sebiferum*), and cogongrass (*Imperata cylindrica*). Given the extent to which exotic, invasive, and nuisance species are a problem for Florida's conservation lands and the currently low incidence of these species on the refuge, the refuge must continue to limit the impacts from these species.

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## **Migratory Birds**

A variety of migratory birds utilize the relatively undisturbed upland and wetland habitats of the refuge. The refuge serves as an overwinter and stopover site for a variety of waterfowl, shorebirds, and neotropical migratory birds. Regional landscape development and habitat fragmentation and degradation will place greater emphasis on the refuge as one of the remaining undeveloped tracts along the Atlantic Flyway.

The refuge currently plays an important role for several species of wading birds, marshbirds, shorebirds, waterfowl, and passerines. Impoundments and backwaters are important habitats for wading bird species such as great blue heron, great egret, snowy egret, tricolor heron, night herons, ibis species, roseate spoonbill, and wood stork. The extensive marshes, which have declined dramatically elsewhere in Florida, likely support secretive marshbirds, such as rails, bitterns, and limpkin. The refuge was identified in the Southeastern Coastal Plain - Caribbean Shorebird Conservation Plan as a refuge with potentially important shorebird stopover habitat (primarily in the impoundments) for plover and sandpiper species, American oystercatcher, marbled godwit, red knot, and short-billed dowitcher. The refuge was originally established as a waterfowl refuge and over 22 species of ducks and geese have been recorded, though most species occur only in small numbers. However, blue-winged and green-winged teal have been estimated as numbering several thousand, primarily on refuge waterways. Wood ducks are found inhabiting the hardwood forests year-round. Various upland habitats are utilized by passerines including vireo, warbler, sparrow, wren, thrush, and flycatcher species, as well as the painted bunting, American robin, brown thrasher, and eastern phoebe. These habitats will increase in conservation value as the surrounding landscape becomes increasingly fragmented, developed, and less suitable for foraging and resting.

## **Resident Wildlife**

A wide variety of protected habitats, ranging from dry upland areas to wetlands and open waters support a diversity of species. Outside of the refuge, many of these habitats are being developed, fragmented, or otherwise altered as a result of large-scale land use changes, leaving them unsuitable for many wildlife species and making conservation areas, such as the refuge, more and more important to these species, especially into the future. Large or conspicuous invertebrates include butterflies which utilize many terrestrial habitats, while crayfish, freshwater mussels, apple snails, and blue crab inhabit the freshwater habitats. Over 80 species of fishes inhabit the waterways on the refuge. Small fishes, such as killifish, gobies, and shiners, reside in small streams and in the shallow, weedy areas of canals and lakes. Meanwhile, larger predatory fishes such as bass, bowfin, bluegill, and catfish inhabit the deeper waters. Amphibians consisting of over 25 species of frogs and salamanders use wetland areas, such as small upland ephemeral ponds and the vast marshes and waterways of the refuge. Reptiles represent a diverse group of animals and at least 50 species of turtles, lizards, snakes, and an amphisbaenid (worm lizard) utilize all habitats of the refuge. Common refuge mammals include deer, bobcat, fox, raccoon, opossum, rodents, and bats. Resident birds include turkey; raptors, including hawks and owls; and woodpeckers, doves, and grackles. Several diminutive birds, such as blackbirds and warblers, also nest on the refuge.

## **Data Needs and Comprehensive Habitat Management**

The refuge lacks much baseline data upon which to base management decisions. Further, the refuge lacks a comprehensive habitat management plan, which would enable improved decision-making. The refuge's topography and other factors have created a habitat gradient that is comprised of xeric upland plant communities which grade into wetter lowland forest types. These, in turn, connect to wetlands and open water. Each habitat is sustained by different ecological processes, primarily fire regimes and hydrology. Much of the ecology of species and their responses to fire and hydrological conditions need to be quantified through the collection and analysis of baseline data and coordinated research. This information will be invaluable in building a comprehensive habitat management



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program, including fire and impoundment management plans needed to maintain the ecological integrity and diversity of refuge habitats and the wildlife species that these areas support.

### **Impounded Wetlands**

The 450 acres of impounded wetlands provide relatively undisturbed habitat for many species of migratory birds, as well as for resident birds and many other wildlife and fish species. Wetlands are declining or being degraded nationwide, including Florida with its high population numbers and growth. The conservation values of the refuge's impoundments will increase over time as similar habitat becomes less available due to increasing human impacts across the landscape.

### **Freshwater Marshes**

The refuge has some of the largest contiguous tracts of freshwater marshes remaining in Florida. This unique habitat supports many wildlife species, including declining birds of several rail species. As marshes continue to decline regionally, the freshwater marshes of the refuge will continue to play an increasingly important role in the long-term population health of these secretive marshbirds and other species dependent on this habitat.

### **Water Quality and Quantity**

Increased demand for water for human uses and the degradation of water supplies from pollution and runoff negatively impact water quality and quantity. These issues will intensify as a growing population occupies more land in the immediate vicinity of the refuge and upstream areas of the St. Johns River watershed. The water dominates a large proportion of the habitats on the refuge, and at least 90 percent is comprised of wetlands and open water connected to the St. Johns River. In addition, historical sheet flow influenced much of the upland habitats. Therefore, ensuring appropriate water quality and quantity will be critical to the long-term ecological health of the refuge.

## *RESOURCE PROTECTION*

Resource protection issues consist of cooperative management agreements relating to the State-owned navigable waters, refuge access, and law enforcement.

Currently, the refuge has no cooperative management agreements for any of the navigable waterways on the refuge, including Lake Woodruff. Working with partners to develop appropriate cooperative management agreements for the state-owned navigable waters will help ensure the future health of these resources and further protect wildlife that depend on them.

Lack of sufficient Service land access onto refuge properties is a concern. Most of the refuge is only accessible by water, and the eastern edge of the refuge is bounded by a railroad with only one unguarded crossing. Reliable and safe access is required for the continued operation, management and protection of the refuge.

The accelerating population in the region surrounding the refuge will likely result in increased impacts from inappropriate and illegal activities on the refuge. The refuge contains large, relatively remote areas which are difficult to patrol. Increased law enforcement and patrols will be required to maintain the refuge's resources.

## *VISITOR SERVICES*

The growing human population will increase use of the refuge as undeveloped and natural areas dwindle in the region. Higher visitation rates will result in increased use of existing facilities, roads, and parking areas. The quantity of litter may rise. Controlling the impacts of increased use to ensure

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that uses of the refuge remain appropriate and compatible will become more important. The need for environmental education, outreach, and interpretation will increase, particularly for those programs focused on helping the public increase awareness, appreciate nature, and foster environmentally sound behaviors.

#### *REFUGE ADMINISTRATION*

Important issues related to refuge administration involve resources and intergovernmental coordination. Given the complexity of management of the refuge and the need for the involvement of multiple partners in developing and implementing solutions, intergovernmental coordination was identified as one of the priority issues to be addressed in the CCP.

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## ***IV. MANAGEMENT DIRECTION***

### **INTRODUCTION**

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

Four alternatives for managing the refuge were considered: A) Current Management (No Action); B) Migratory Birds; C) Rare, Threatened, and Endangered Species; and D) Wildlife and Habitat Diversity. Each of these alternatives is described in the Alternatives section of the Environmental Assessment. The Service chose Alternative D, Wildlife and Habitat Diversity, as the proposed management direction.

Implementing the proposed alternative would result in an increase in the refuge's wildlife and habitat diversity. Migratory birds, listed species, and other wildlife species and habitats would continue to be protected and managed for optimal biodiversity. Resource protection activities would be enhanced, including the cooperative management agreements relating to the state-owned navigable waters, increased easement management, and access to the refuge. Visitor services in the six major public uses would improve and accommodate the expected rise in visitation. And finally, refuge administration activities would focus on improving wildlife and habitat diversity through streamlined efforts and the strengthening of local and regional partnerships.

### **VISION**

Lake Woodruff NWR occupies a unique location, which connects aquatic habitats of the St. Johns River with the upland areas of an ancient dune ridge. The refuge will conserve and manage native wildlife and plant populations, including threatened and endangered species, species of management concern, and interjurisdictional fish. Refuge staff and volunteers will protect the diverse habitats typical of the St. Johns River basin and surrounding habitats within which the refuge is situated, including open and impounded marshlands, fish nursery areas, longleaf/wiregrass pine uplands, scrub habitat, and bottomland hardwood forests. Through active enhancement and management, the refuge will provide high-quality habitat for migratory birds and other priority species. The Service will encourage visitors to the refuge to participate in appropriate and compatible wildlife-dependent recreational activities. The refuge will enhance its presence in the local community by partnering with agencies, developing research groups, and organizing friends groups and volunteers. Working with others, Lake Woodruff NWR staff, partners, and volunteers will manage and protect the refuge's natural and cultural resources to conserve a legacy of native fish, wildlife, and plants for people to experience and appreciate in the years to come.

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

The goals, objectives, and strategies presented are the Service's response to the priority issues, concerns and needs expressed by the planning team, refuge staff, partners, and the public. They are presented in a hierarchical format and organized in the following major categories: Wildlife and Habitat Management; Resources Protection; Visitor Services; and Refuge Administration. Chapter V, Plan Implementation, identifies the projects associated with the various strategies.

These goals, objectives, and strategies reflect the Service's commitment to achieve the mandates of the National Wildlife Refuge System Improvement Act of 1997, the mission of the National Wildlife

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Refuge System, and the purposes and vision of Lake Woodruff NWR. The Service intends to accomplish these goals, objectives, and strategies within the next 15 years.

## *WILDLIFE AND HABITAT MANAGEMENT*

Wildlife and habitat management goals address rare, threatened, and endangered species; migratory birds; exotic, invasive, and nuisance species; wildlife and habitat diversity; and water resources.

### **Goal I. RARE, THREATENED, AND ENDANGERED SPECIES**

Conserve, protect, and enhance populations of rare, threatened, and endangered species of plants and animals at existing or increasing levels on the refuge, and conserve, restore, protect, and manage their native central Florida habitats occurring on the refuge to contribute to recovery goals.

*Discussion:* Listed species are plants or animals that have been listed by a State and/or Federal agency with special protection or conservation designations. Those species with regulatory protection are protected by law, such as State and Federal threatened and endangered species. The refuge's expansive and protected habitats provide for many species, such as wood storks, bald eagles (recently de-listed), and West Indian manatees. Listed plant species have not been documented on the refuge. Various rare species of management concern occur in the refuge. Due to its location, size, and diversity of undisturbed habitats, level of Federal protection, and unique landscape features, the refuge lends itself to possible future utilization by a number of species.

#### *I.A. Gopher Tortoise*

Objective I.A.1: Within five years of CCP approval, document gopher tortoise populations on the refuge, habitat use, and health.

*Discussion:* A relatively small area of the refuge consists of uplands suitable for gopher tortoises. This species occurs primarily along the refuge's eastern border and the Volusia tract. These are also areas most prone to unauthorized access, increasing the risk of gopher tortoise poaching and harassment. In addition, the open access may also put resident gopher tortoises at risk from illegally relocated tortoises infected with upper respiratory tract disease (URD). Strategies would include monitoring population status and trends, evaluating URD incidence, and creating a GIS database of burrows.

Objective I.A.2: Throughout the life of the CCP, conduct management practices on refuge habitats in such a manner as to minimize adverse impacts to gopher tortoises.

*Discussion:* Management practices in upland areas where gopher tortoises may be found include prescribed burning, roller-chopping, and selected timber harvesting. Gopher tortoises live in areas frequented by wildfire and should not be negatively impacted by prescribed fires. Roller-chopping and timber harvesting have the potential to injure or kill tortoises. Prior to these operations, gopher tortoise areas should be surveyed and temporarily marked buffer zones established. Minimizing the use of roller-chopping for vegetation control or scheduling roller-chopping during cold weather when gopher tortoises are most likely to be underground would help reduce the potential impacts to gopher tortoises.

#### *I.B. Bald Eagle*

Objective I.B.1: Over the 15-year life of the CCP, support and protect the two to three bald eagle nests on the refuge with minimal disturbance around the nest sites.

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*Discussion:* During the nesting season, bald eagles are sensitive to a variety of human activities. However, not all bald eagle pairs react to human activities in the same way. Some pairs nest successfully just dozens of yards from human activity, while others abandon nest sites in response to activities much farther away. This variability may be related to a number of factors, including visibility, duration, noise levels, extent of the area affected by the activity, prior experiences with humans, and tolerance of the individual nesting pair. If agitated by human activities, eagles may inadequately construct or repair their nest, may expend energy defending the nest rather than tending to their young, or may abandon the nest altogether. Activities that cause prolonged absences of adults from their nests can jeopardize eggs or young. Depending on weather conditions, eggs may overheat or cool too much and fail to hatch. Unattended eggs and juveniles are subject to predation. Young nestlings are particularly vulnerable because they rely on their parents to provide warmth or shade, without which they may die as a result of hypothermia or heat stress. If food delivery schedules are interrupted, the young may not develop healthy plumage, which can affect their survival. In addition, adults startled while incubating or brooding young may damage eggs or injure their young as they abruptly leave the nest. Older nestlings no longer require constant attention, but they may be startled by loud or intrusive human activities and prematurely jump from the nest before they are able to fly or care for themselves.

Disruption, destruction, or obstruction of roosting and foraging areas can also negatively affect bald eagles. Nesting bald eagles may inadequately feed their young if the adults are prevented or discouraged from feeding at preferred sites. Migrating and wintering bald eagles congregate at specific sites for purposes of feeding and sheltering. Bald eagles rely on established roost sites because of their proximity to sufficient food sources. Roost sites are usually in mature trees where the eagles are somewhat sheltered from the wind and weather. Human activities near or within communal roost sites may prevent eagles from feeding or taking shelter, especially if there are not other undisturbed and productive feeding and roosting sites available. Disruptive activities in the flight path between nesting and roosting sites and important foraging areas can interfere with feeding. Activities that permanently alter eagle habitat can altogether eliminate the elements that are essential for feeding and sheltering eagles. Where a human activity agitates or bothers roosting or foraging bald eagles to the degree that interferes with or interrupts breeding, feeding, or sheltering behavior, causing injury, death, or nest abandonment, it constitutes a violation of the Bald and Golden Eagle Protection Act (USFWS 1983).

Eagles are unlikely to be disturbed by routine use of roads, homes, and other facilities where such use pre-dates the eagles' successful nesting activity in a given area. Therefore, in most cases, ongoing existing uses may proceed with the same intensity with little risk of disturbing bald eagles. However, some intermittent, occasional, or irregular uses that pre-date eagle nesting in an area may disturb bald eagles. For example: a pair of eagles may begin nesting in an area and subsequently be disturbed by activities associated with a county fair, even though the county fair has been held annually at the same location. In such situations, human activity should be adjusted or relocated to minimize potential impacts on the nesting pair.

*Strategies:*

- Work with the partners to identify the locations of active bald eagle nests on the refuge. Retain appropriate mature trees and old growth stands wherever possible, particularly within ½ mile of water.
- Where nests are blown from trees during storms or are otherwise destroyed by the elements, continue to protect the site in the absence of the nest for up to three complete breeding seasons. Many eagles will rebuild the nest and reoccupy the site.

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- Avoid excessive groundwater pumping and river diversion that can lead to destruction of nest trees, roosts, and foraging areas.
  - Protect nesting and foraging habitat disturbance by adhering to activity-specific guidelines listed in the Bald Eagle Recovery Plan (USFWS 1983).

### *I.C. Whooping Cranes*

Objective I.C.1: Over the 15-year life of the CCP, assist in the recovery of whooping cranes in Florida by continuing to maintain and improve habitat for cranes, and by minimizing human disturbance.

*Discussion:* There are two separate whooping crane reintroduction projects that target central Florida habitats. The FWC's non-migratory whooping crane reintroduction project is centered in south-central Florida (Kissimmee Prairie Basin); however, dispersal includes the upper and middle reaches of the St. Johns River basin. The Whooping Crane Eastern Partnership's (WCEP) project targets central Wisconsin as the breeding area with a migration to western central Florida as the wintering area; these birds disperse throughout central and north Florida, including the middle reaches of the St. Johns River system and the Lake Woodruff NWR. A whooping crane pair from the migratory flock has established its winter territory on the refuge. The pair utilizes the impoundments, adjacent marshes, prescribed burn areas of pools 2 and 3, and nearby agricultural lands for roosting and foraging. The pair of whooping cranes that utilizes the refuge for its winter territory is reproductively active and may be one of the first pairs from the migratory flock reintroduction project to bring the "historic" first wild born chick on a fall migration to Florida. Whooping crane chicks normally stay with their parents through the winter. During the winter, the parents teach the chicks where and how to forage and also to roost in water at night to reduce the risk of predation. Wild whooping crane juveniles normally separate from their parents either during the spring migration or shortly after arrival on the nesting grounds, as observed in the birds from Aransas, Texas.

Three of the four release sites the FWC has used for its reintroduction project are now in various stages of development as are other large ranches known to be used by whooping cranes. Management plans should be developed to identify and improve crane habitat on managed lands to assist in the recovery of whooping cranes. Management plans should also include guidelines to minimize human disturbance, as the winter-time parent/chick behaviors are extremely important to providing chicks with the survival skills they will need.

#### *Strategies:*

- Current management activities that benefit cranes and should be continued at the refuge. These include impoundment management and the use of prescribed fire to create a mosaic of wetlands and to keep vegetation low and open.
- Guidelines should be developed to minimize human disturbance when whooping cranes are utilizing the impoundments and refuge, including implementing closed areas and buffers.

### *I.D. Sandhill Cranes*

Objective I.D.1: Over the 15-year life of the CCP, continue to maintain and improve habitat for sandhill cranes and minimize human disturbance.

*Discussion:* Sandhill cranes prefer open wet prairie, wet pasture, and large shallow water wetlands and impoundments. Crane habitat in central Florida has been lost to development in recent years and continues to be targeted for future development. Crane habitat appears to be

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on the decline in Florida, and the protection of important crane habitat will be a large component of sandhill crane conservation efforts. Management should also include guidelines to minimize human disturbance as the winter-time parent/chick behaviors are extremely important to providing chicks with the survival skills they will need.

*Strategies:*

- Current management activities that benefit cranes and should be continued at the refuge. These include impoundment management and the use of prescribed fire to create a mosaic of wetlands and to keep vegetation low and open.
- Guidelines should be developed to minimize human disturbance when sandhill cranes are utilizing the impoundments and refuge.

*I.E. Manatees*

Objective I.E.1: Within five years of CCP approval, minimize manatee disturbance, harassment, injury, and mortality.

*Discussion:* Manatees found in Lake Woodruff NWR's lakes, rivers, creeks, and associated waters include the upper St. Johns River subpopulation of manatees. This subpopulation includes about 190 manatees and is characterized by the animals' winter-use of Blue Springs, located upstream of the refuge.

Biologists studying these animals have characterized them as part of a locally growing subpopulation, with a population growth rate of about 6.2 percent per year and annual adult survival rate of 96 percent. It is believed that most, if not all, of this subpopulation uses the refuge (it is not known what portion of the animals may use the refuge at any one point in time, although it is extremely unlikely that they would all be on refuge at once).

While the number of manatee deaths and injuries occurring on the refuge are thought to be few in number, manatees are vulnerable to watercraft collisions and monofilament fishing line entanglements. For adult manatees in the upper St. Johns River, watercraft collisions are the leading cause of death [and second-most predominant cause of death for manatees less than 180 centimeters (cm) in length]. Manatees appearing in Blue Springs each fall continue to show up entangled in fishing line and some entanglements are so severe that animals are rescued and disentangled. Entanglements are a leading cause for manatee rescues. Pending losses of and changes to warm water habitats along Florida's east coast may result in increasing use of the St. Johns River, its warm water springs, winter foraging areas, and other use sites. Lake Woodruff NWR, with its proximity to springs and good foraging habitat, will increase in importance to manatees in the coming years and every effort should be made to protect these animals and their habitat on the refuge.

*Strategies:*

- Maintain existing, on-refuge manatee protection areas in an enforceable condition. To be enforced, markers should be easily understood by the public, properly located, and in good repair. Properly enforced and posted protection areas will minimize the effects of boating and other public activities on manatees.
- Support manatee law enforcement efforts on the refuge and in adjoining waters. Service law enforcement officers should enforce local measures when on the water and should participate in law enforcement task force initiatives when scheduled in the region.

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- Manatee protection areas should be evaluated for effectiveness and adequacy. If problems are observed, these problems should be documented and recommendations made to the FWC Office of Waterways and Boating Safety and staff at the Service's North Florida Ecological Services' Field Office. For example, increasing manatee use of DeLeon Springs during the winter may necessitate the designation of protection measures in Spring Garden Run.
  - Harassment, such as feeding and pursuing, in aggregation areas should be monitored and addressed, as appropriate.
  - To reduce the incidence of manatee entanglement in monofilament fishing line and other gear, the refuge should promote the recycling of monofilament at entry points to the refuge (e.g., at local boat ramps, marinas, and boat rental concessions). Recycling may be promoted through the use of outreach materials and participation in the statewide recycling program that provides recycling bins and volunteers to collect fishing gear.
  - To minimize and monitor causes of injury and death, FWC's Fish and Wildlife Research Institute rescues distressed manatees and salvages manatee carcasses. When these animals appear on the refuge, staff should report them to FWC and provide assistance.

Objective I.E.2: Within five years of CCP approval, identify and protect manatee habitats, and then annually monitor at least 75 percent of manatee habitats within the refuge's approved acquisition boundary.

*Discussion:* Manatees are known to use refuge waters throughout the year. During the winter, manatees prefer to use the warm waters of Blue Springs during the coldest periods, leaving the spring to forage on plants when temperatures begin to climb. During these foraging bouts, manatees will feed on the refuge; if temperatures start to cool during these times, manatees may use DeLeon Springs as a thermal buffer during periods of moderate cold weather.

As spring approaches and temperatures rise, manatees from Blue Springs and adjacent waters begin to head north, down the St. Johns River and through its adjoining water bodies. The animals head north to about Palatka, then spread out throughout the region. In spring and into the summer, manatees will range the area, foraging, traveling, calving, mating, resting, and cavorting. These behaviors will continue throughout the summer and into late fall and early winter, when the animals will once again head to Blue Springs to winter.

*Strategies:*

- Public and refuge staff sightings of manatees using refuge waters should be documented and maintained in a database in order to summarize information regarding manatee use of refuge habitat (records should include timing, location, behaviors, and other pertinent information). These records will facilitate the identification of manatee use sites (habitat), will provide a monitoring component, and should provide records in the event that habitat protection measures need to be adopted.
- Various groups assess manatee behavior, habitat use, and other biological elements throughout the region through various research projects, including tracking studies and photo-identification studies. When feasible, staff should participate in these studies to better enable them to protect manatees and their habitat.
- Because manatees use refuge waters as foraging habitat during the winter and other times of the year, the refuge should participate in the Blue Springs Aquatic Plant Management Working Group. This group is committed to ensuring the adequacy of manatee forage throughout the region and the group emphasizes balancing aquatic plant control activities with the needs of manatees.



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- Given the manatee's dependence on refuge and regional waterways, including critical warm water springs, staff should participate in the State's development of Minimum Flow and Level regulations for the Upper St. Johns River and its critical warm water springs, including Blue Springs, DeLeon Springs, and Silver Glen Springs. By ensuring water adequacy and quality on the refuge and throughout the region, refuge manatees will be protected for years to come.
  - Work with partners to develop a GIS database of important manatee habitats within the refuge acquisition boundary.
  - Protect manatee habitat by minimizing shoreline erosion and subsequent impacts to manatee foraging areas.
  - Work with partners to monitor the water temperature on the refuge and at DeLeon Springs.

Objective I.E.3: Facilitate manatee recovery through public awareness and education and create awareness in at least 50 percent of the residents of DeLand and DeLeon Springs during the first five years following CCP approval.

*Strategies:*

- The refuge office, website, kiosks, and other venues should be used as distribution points for manatee education and outreach materials.
- The staff, when available, should participate in outreach programs that educate local residents, students, user groups, and others about manatees, threats, and steps that can be taken to reduce causes of manatee disturbance, harassment, injury, and mortality.

*I.F. Florida Pine Snake*

Objective I.F.1: Within 10 years of CCP approval, document the presence or absence of Florida pine snakes and maintain refuge habitats favorable for this species.

*Discussion:* Florida pine snakes are currently not known to occur on the refuge, although potentially suitable habitat is present in uplands areas. Florida pine snakes typically inhabit xeric areas that support populations of pocket gophers, the primary prey base.

*Strategies:*

- Work with the partners (including Stetson University) to conduct monitoring to determine status and trends.
- Work with partners to perform pocket gopher (prey base) surveys.
- Continue rotational prescribed burning of approximately ~250 acres of xeric habitat annually.

*I.G. American Alligator*

Objective I.G.1: Within 10 years of CCP approval, obtain an estimate of the total alligator population on the refuge as well as population health, status, and trends.

*Discussion:* Lake Woodruff has a relatively large population of alligators which also utilize the waters of the refuge. Alligator populations should be monitored more closely to determine overall health, status, and trends. FWC conducts alligator surveys statewide, counting nests and/or individual animals. USGS, FWC's Alligator Research Unit, and University of Florida researchers have studied alligators using Lake Woodruff and the refuge for over 15 years as part of their ecotoxicology and population studies.

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*Strategy:*

- Continue to coordinate with the FWC's Alligator Research Unit regarding long-term alligator monitoring on the refuge and in Lake Woodruff.

*I.H. Florida Black Bear*

Objective I.H.1: During the 15-year life of the CCP, document the refuge habitats utilized by Florida black bear, annually maintain at least 1,000 acres of suitable den habitat, and work with partners to create at least one habitat corridor.

*Discussion:* Relatively high Florida black bear populations exist on conservation lands surrounding the refuge, and bears are known to utilize the refuge. Bears have large home-ranges, and can travel considerable distances to find suitable habitats for foraging, denning, and other life-history requirements. Habitat corridors allow bears to travel undisturbed between habitats and minimize traffic mortality and other harmful interactions with humans.

*Strategy:*

- Coordinate with FWC to monitor bear movements on the refuge.

Objective I.H.2: Within 10 years of CCP approval, at least 50 percent of the residents in DeLand and DeLeon Springs will be aware of the ways in which to minimize human impacts to bears.

*Discussion:* In an increasingly urbanized landscape, bears inevitably come in contact with humans, often with negative results. Through coordination with partners, mailings of brochures, workshops, and various other educational outreach programs, a greater awareness of bears can be promoted. The impact of humans on bears can be ameliorated through increased public awareness of the conservation status of bears.

*I.I. Wood Stork*

Objective I.I.1: Within 10 years of CCP approval, evaluate the historical wood stork nesting area on the refuge, continue current weekly surveys, and support nearby colonies whose core foraging areas include the refuge.

*Discussion:* Wood storks are federally endangered in Florida, but there has been no observed nesting on the refuge. Lake Woodruff NWR, at one time, supported a wood stork nesting colony (1980s). Wood stork use of the refuge is limited to occasional foraging. Currently, there are two colonies whose core foraging areas includes the refuge. One colony is six miles to the northeast of the refuge at Lake Disston and the other is five miles to the south at Hontoon Island. The Lake Disston colony currently supports over 100 nesting pairs of wood storks and the Hontoon Island colony supports over 50 pairs. However, the breeding center for Florida wood storks has been moving northward from the Everglades, and the potential exists for nesting to occur if the habitat conditions are adequate.

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*Strategies:*

- Include strategies to benefit wood storks within the impoundment management plan.
- Time impoundment draw-downs to provide foraging areas for nearby wood stork colonies.
- Continue weekly surveys (November – March), biweekly surveys (April – November), and monthly surveys (April – October) in the impoundments.
- Survey the historical nesting colony and evaluate the potential of additional nesting sites.

*I.J. Eastern Indigo Snake*

Objective I.J.1: During the 15-year life of the CCP, document the presence or absence of eastern indigo snakes on the refuge.

*Discussion:* Eastern indigo snakes are not known to exist on the refuge, but suitable habitat is thought to exist. Eastern Indigo snakes are known to inhabit upland habitats, especially if there are places providing shelter (such as gopher tortoise burrows).

*Strategies:*

- Document the presence or absence of eastern indigo snakes on the refuge.
- If documented on refuge, monitor status and trends.

*I.K. Swallow-tailed Kite*

Objective I.K.1: During the 15-year life of the CCP, protect congregations of pre-migratory swallow-tailed kites, and continue to annually monitor their population level and use of the refuge.

*Discussion:* The refuge provides important roosting areas for swallow-tailed kites in cypress stands along Lake Woodruff. Currently, these areas are accessible to the public and roosting kites are at risk to increasing disturbance as human use of these areas increases. Though it cannot be predicted where and for how long post-breeding kites may continue to assemble on the refuge, this behavior can best be promoted through careful monitoring, regulation, and enforcement of boating and other potential disturbances. More caution will need to be exercised in years when kites roost closer to a main channel. Several pairs of kites are known to nest adjacent to Lake Woodruff NWR and staff should remain aware for possible nesting on the refuge in the future.

*Strategies:*

- Continue pre-migration roosting surveys (four surveys are conducted from July to August).
- Work with partners to minimize disturbance, including the creation of seasonally closed areas near roosting sites.
- Identify and minimize threats to swallow-tailed kites utilizing the refuge.

*I.L. Limpkin*

Objective I.L.1: Within the 15-year life of the CCP, document the population status and trends of limpkin and work with partners to reduce disturbance to this species.

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*Discussion:* The limpkin is a species in decline across Florida, which has resulted in it being protected by the State. These secretive wetland birds feed predominantly on apple snails. Loss of habitat is thought to be a major factor in the reduction of limpkin numbers. Protecting habitat and prey base will aid in halting the decline of this species.

*Strategies:*

- Continue prescribed burning and manage 450 acres of impoundments to provide suitable limpkin habitat.
- Continue monthly limpkin surveys.
- Through regular periodic visual surveys, assess wading bird use (i.e., numbers of birds, species, and locations) of any navigable water zones to determine if restrictions on boating use are necessary to minimize potential disturbance to foraging limpkins.

*I.M. Snail Kite*

Objective I.M.1: Within the 15-year life of the CCP, document the population status and trends of snail kites.

*Discussion:* Lake Woodruff NWR is not known to regularly support a significant portion of the snail kite population in Florida. However, maintaining favorable foraging habitat conditions will allow for use of the area, and may provide critical foraging areas during periods when the southern Florida wetlands, that snail kites normally rely upon, are unsuitable due to regional drought or other factors. A snail kite monitoring program would provide valuable data upon which the refuge could base future management decisions.

*I.N. Red-cockaded Woodpecker*

Objective I.N.1: Within ten years of CCP approval, document the presence or absence of red-cockaded woodpeckers near and on the refuge and adapt management as required on at least 900 acres of refuge uplands annually.

*Discussion:* Although the species has not been documented breeding on the refuge, red-cockaded woodpecker colonies exist on conservation lands adjacent to the refuge, and potentially suitable habitat exists on Lake Woodruff NWR. As red-cockaded woodpecker populations expand on nearby protected lands the potential increases for new colonies to become established on the refuge. Reintroduction of this listed species may be an option as suitable refuge habitat becomes available.

*Strategies:*

- Continue prescribed fire and timber management of approximately 900 acres annually of uplands on the refuge.
- Integrate red-cockaded woodpecker monitoring into other refuge bird surveys to document presence or absence of red-cockaded woodpeckers on the refuge.
- Coordinate with partners to monitor the proximity of active colonies on nearby lands.
- Adapt management as necessary if colonies become established on the refuge.
- Consider opportunities for reintroduction.

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## GOAL II. MIGRATORY BIRDS

Maintain and actively manage refuge habitats to meet migratory bird priorities of the refuge and Peninsular Florida Physiographic Area, while providing consistency with regional and national goals.

*Discussion:* Lake Woodruff NWR's location and diversity of habitats make it suitable for a range of native and migratory birds, including waterfowl, shorebirds, wading birds, marshbirds, and land birds. The importance of the refuge will increase for migratory birds as their key habitats are degraded or lost regionally due to increasing development. Priority goals of the refuge will mirror those of various regional conservation plans and partnerships in that they will be regionally based and biologically driven, as well as utilize landscape-oriented partnerships and rely on science-based management of migratory birds.

### II.A. Waterfowl

Objective II.A.1: Within the 15-year life of the CCP, protect and encourage natural foods and foraging habitat for wintering waterfowl and evaluate increasing the acreage of impounded marshes.

*Discussion:* Lake Woodruff NWR was originally established as a waterfowl refuge. Twenty-two species of ducks and geese have been recorded, but waterfowl have never used the refuge in large numbers. The most common species are blue-winged and green-winged teal that may number several thousand during fall and winter (September – March). Wood ducks are a year-round resident species, utilizing hardwood swamp habitats for breeding and foraging. It is difficult to estimate numbers of this species and it is not known what the wood duck population may be on the refuge (breeding or wintering). Hooded mergansers and ring-necked ducks occur as wintering species, although not frequently or in large numbers. As with wood ducks, estimating their breeding numbers is difficult, but would assist management decisions. The refuge impoundments provide foraging and resting habitats for wintering ducks, even though they are not managed as moist-soil units. Though not optimal from the standpoint of producing high volumes of waterfowl plant foods (i.e., seeds), the patches of emergent marsh vegetation interspersed with open water represent the perfect balance for supporting foraging waterfowl, wading birds, and marshbirds. Moving management more towards intensive production of moist-soil plants is not necessary, nor practical, and would reduce the suitability of impoundment habitats to other suites of birds. It is recommended that the current open-marsh characteristics of the impoundments be perpetuated, with the exception of considering the potential for providing some shorebird foraging habitat within impoundments as discussed below under the shorebird section.

#### *Strategies:*

- Where practical and compatible with other objectives, experiment with providing patches of favored waterfowl food plants within extensive *Spartina* marshes.
- Through prescribed burns or mechanical techniques (e.g., using the Marsh Master), set back *Spartina* marsh in small patches (1-10 ha) especially in shallowly inundated or similar areas that might favor colonization by moist soil plant species utilized by waterfowl. Invertebrate communities that inhabit such areas can also be an important food resource.
- Where plant community and waterfowl responses seem to be favorable, periodic disturbance (e.g., three to five-year cycles) may be warranted to promote plant species considered to be of good food value for these birds.

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Objective II.A.2: Within the 15-year life of the CCP, annually monitor and protect wintering waterfowl.

*Discussion:* Excessive human disturbance is a potential problem in the management of wintering waterfowl on any refuge. Relative to other bird groups, waterfowl are skittish, exhibit large flush distances, and tend to remain airborne for longer periods. They are also more cautious in returning to areas from which they are repeatedly disturbed. Thus, hunting, fishing, boating, wildlife observation, and other recreational activities can all pose disturbance threats to waterfowl if not properly managed. In addition to causing waterfowl to abandon otherwise suitable habitat, disturbance can negatively impact survival and productivity through the complex interrelationships of elevated energy demands, increased susceptibility to hunting or predation, foraging efficiency, diminished physiological condition, prolonged molt, and interruption of courtship activities and rest periods. Although waterfowl hunting is prohibited in the marshes of the refuge, it is allowed on the State-owned lakes and waterways. Therefore, the managed marshes in the impoundments provide necessary refuge for waterfowl away from adjacent hunting pressures (e.g., Spring Garden Lake). It is unknown if pedestrian use of the impoundment levees represents a disturbance concern (e.g., flushing resting waterfowl). If so, public use restrictions may need to be considered, especially during waterfowl seasons and particularly in Pool 1, which is adjacent to public parking and susceptible to more disturbances. Otherwise, the State regulates hunting in the open waterways, where it would be labor intensive (and not a priority) to track hunter use and levels of harvest. Therefore, with the exception of possible disturbance issues in more actively hunted areas, it must be assumed that hunting activity is not detrimental to wintering waterfowl populations or other management objectives.

*Strategies:*

- Conduct aerial waterfowl surveys.
- Monitor waterfowl use throughout refuge habitats to assess disturbance and if certain limited-disturbance areas (e.g., areas with public use restrictions) may be warranted.
- Work with the partners to develop appropriate agreements for Service management of waterways within the refuge boundary (see Resource Protection Objective I.A.1).
- Consider, if needed, establishing areas off-limits to the public on a seasonal basis (e.g., during peak waterfowl use) to provide disturbance free refugia for waterfowl.

Objective II.A.3: Provide an inviolate sanctuary for migratory waterfowl, and limit disturbance stress of waterfowl from incompatible public use throughout the life of the CCP.

*Discussion:* Hunting is prohibited in impoundments, but not in the adjacent areas, making the impoundments important resting places for waterfowl. The impoundments are currently open to hiking, fishing, bicycling, and canoeing year-round, which may be impacting waterfowl. Pool 1 (50 acres) is the smallest, most open pool and receives the most visitors. Consider leaving Pool 1 as the main public use area and adjusting management for the remaining two pools (400 acres). Refer to previous sections on migratory birds and endangered species for more considerations on impoundment management.

*Strategies:*

- Re-examine current public uses to determine long-term compatibility by initiating a study of public use effects.
- Consider closing areas of the impoundments seasonally to public access for the benefit of waterfowl.
- Limit mowing of vegetation around impoundment edges to provide a visual buffer for waterfowl. Maintain only small gap openings for public viewing.

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## II.B Shorebirds

Objective II.B.1: Within the 15-year life of the CCP, manage water levels within the impoundments to provide shorebird foraging habitat during spring and fall migrations.

*Discussion:* Although the refuge does not support breeding populations of the highest priority shorebird species and employs multi-species management techniques, its role in providing stopover habitat during spring and (especially) fall should not be understated. Availability of foraging habitats during key migratory periods has been shown to be critical for the persistence of long distance migratory shorebird species. Thus, one habitat goal stated in the Southeast SCP is to provide dedicated, high-quality managed habitat to support energetic requirements of in-transit migratory birds. If resources or conditions permit only one drawdown per year, a late summer/fall drawdown would take priority.

### *Strategies:*

- Incorporate shorebirds into multi-species management of the impoundments.
- Maintain water levels to maximize availability of peak foraging conditions in portions of the impoundments (bare substrate or sparse vegetation and water depths 0-16 cm) from mid-March to late-May and early-July to late-October.
- Promote the build-up of invertebrate prey between migration seasons (late-May through early-July and late-October through early-March) by holding water in the impoundment as high as possible. Decreased shorebird use, despite optimal water levels, might indicate the need to rest the impoundment for a cycle to revitalize the prey base.

Objective II.B.2: Within the 15-year life of the CCP, monitor and protect shorebirds utilizing the refuge.

*Discussion:* Shorebird use of the refuge varies seasonally, and continued data collection and analysis is required to determine population trends on the refuge. In addition, shorebirds are susceptible to disturbance. Human disturbance can result in decreased foraging rates among shorebirds, resulting in reduced fat reserves required for migration.

### *Strategies:*

- Continue weekly surveys (November – March), biweekly surveys (April – November), and monthly surveys (April – October).
- Minimize public use impacts to shorebirds, including implementing any needed seasonal closures of key areas.

## II.C. Wading Birds

Objective II.C.1: Within the 15-year life of the CCP, manage refuge impoundments to provide high-quality foraging habitat for wading birds using prescribed fire and water level manipulation.

### *Strategies:*

- Use prescribed fire to periodically set back succession within the impoundments and create areas of open water for foraging wading birds. To the extent possible, vegetation buffers along dikes should be retained to maintain visual barriers and minimize disturbance. A two to three-year burn rotation would be necessary to keep open areas within the vegetation.

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- Application of herbicide prior to burning will improve fuel removal and extend the period of time between fires necessary to keep open areas. After burning, raise water levels such that at least 15 cm of water covers the ground to prevent invasion of open areas by exotic or upland (disturbance) vegetation.
  - Use water level manipulation to increase foraging habitat especially late in the nesting season. Maintain portions of the impoundments to promote depths of 18-28 cm from late-April until June.
  - When using prescribed fire or mechanical means to remove encroaching woody vegetation from the impoundments, consider leaving small patches (~1 acre) to provide or develop into potential nest sites for wading birds. Likely patches would be in areas where human or other disturbance would be minimal and where impoundment operations would remain un-impacted.

Objective II.C.2: Within the 15-year life of the CCP, manage for open marsh conditions and target approximately 2,000 acres of natural wetlands to be managed at a 50:50 ratio of vegetated to open water habitat to support foraging habitat for wading birds.

*Discussion:* Approximately 10,000 acres of natural marsh exist on the refuge. Use prescribed fire on a two to three-year burn rotation to periodically set back succession in readily managed compartments of the natural freshwater marsh habitat. Increase foraging opportunities for wading birds by managing for an approximate 50:50 ratio of vegetated to open water habitat in each burn unit of the marsh.

Objective II.C.3: Within the 15-year life of the CCP, protect nesting wading birds from excessive human disturbance.

*Strategies:*

- Annually survey the refuge for nesting wading birds. Work with the partners to conduct potential aerial surveys.
- If wading birds begin nesting in the impoundments, maintain a 100-meter (300-foot) buffer zone around nest sites to restrict human encroachment, including foot traffic, during active nesting.
- If wading birds begin nesting in the natural areas of the refuge, especially near waterways used by watercraft, a 100-meter (300-foot) buffer around the wading bird colony should be established. Signage can be obtained from FWC.

Objective II.C.4: Within the 15-year life of the CCP, work with Atlantic Coast Joint Venture and the Service's Southeast Regional Migratory Bird Program to develop population and/or habitat objectives that more explicitly link the refuge's contributions to Joint Venture objectives for priority wading bird species.

*Discussion:* Lake Woodruff NWR provides foraging and potential nesting habitat for a variety of colonial nesting wading birds. Primary species include great blue heron, great egret, snowy egret, tricolored heron, little blue heron, green heron, black-crowned and yellow-crowned night herons, white ibis, glossy ibis, roseate spoonbill, and wood stork. Several of these are identified as priorities for conservation attention in national and regional waterbird plans due to declining trends, threats to habitats, and other factors impacting these species.

Colonial wading birds forage for small aquatic organisms in the open portions of freshwater marshes, creeks, and shallow lake habitats of the refuge. The three refuge impoundments offer the best opportunity for active management focused on wading birds. Here, the mosaic of vegetation and open water provides excellent foraging habitat for all of the wading bird species mentioned above. In addition, this area is used by nesting sandhill cranes and wintering whooping cranes. For wading



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birds, the most important management activity for the refuge is providing high-quality foraging habitat during the nesting season (March through June). This is particularly important late in the nesting season when adult wading birds have large young in the nest and energetic requirements are at their highest. Timing of breeding and peak nesting varies by species, and may vary annually based on weather, habitat conditions, and food resource availability. However, most species are well into the breeding cycle by late-April.

Several planning documents address wading bird conservation and provide specific recommendations on habitat management, disturbance management, and survey implementation that are relevant for Lake Woodruff NWR. The North American Waterbird Conservation Plan, the Southeastern U.S. Waterbird Conservation Plan, and the Florida Comprehensive Wildlife Conservation Strategy all identify priority wading bird species and conservation actions that can be taken to contribute to State, regional, and larger scale population goals. These plans also identify key habitats and provide recommendations for management activities to enhance wading bird use, as well as methodology and protocols to properly conduct surveys. As with all management actions recommended in this report, the effectiveness of techniques used to generate desired plant community responses and bird use should be fully documented and evaluated. Based on these evaluations, approaches should be continued, adjusted, or no longer used, as warranted.

Because Lake Woodruff NWR provides excellent potential to enhance wading bird foraging opportunities through habitat management – especially in the impoundments – the development of specific population or habitat goals for wading bird conservation on the refuge is possible. The aforementioned planning documents are helpful in providing an appropriate context for considering the refuge's waterbird conservation role within the greater landscape, but more specific guidance will be needed to translate higher scale habitat or population objectives into meaningful objectives for Lake Woodruff NWR. The Atlantic Coast Joint Venture and the Service's Migratory Bird Program can provide assistance in this respect.

The Atlantic Coast Joint Venture is moving towards development of more spatially explicit and quantitative population and/or habitat objectives that will help define the conservation role of individual partners and management entities within the overall partnership. Similarly, the Service's Migratory Bird Program has plans to work even more closely with the Division of Refuges to hold habitat objective workshops geared towards helping individual refuges more clearly define their roles in the bird conservation landscape. In the interim, Lake Woodruff NWR should continue to generally support population and habitat goals of existing waterbird plans through protecting (quality and quantity) foraging habitats and increasing potential nesting habitat availability.

#### *II.D. Marshbirds*

Objective II.D.1: Within the 15-year life of the CCP, enhance structural heterogeneity in approximately 10,000 acres of natural marsh habitats through periodic disturbance, and target approximately 2,000 acres of natural wetlands to be managed at a 50:50 ratio of vegetated to open water habitat to support foraging habitat for marshbirds.

#### *Strategies:*

- Experiment with the use of prescribed fire in creating small openings (50-100 ha) in otherwise uninterrupted marsh. Smaller patches (2-20 ha) may be more appropriate when using mechanical methods. Each year, rotate treated areas across the marsh landscape unless wading bird use suggests certain areas are more favorable. At least one of these burns

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should occur in the months of August or September, which is between the nesting season and the arrival of winter migratory birds. Timing the burn during these months minimizes possible mortality to marsh nesting species.

- Give special consideration to protection and/or active management of high marsh as breeding habitat for black and king rail, to include prescribed fire or mechanical disturbance to maintain young (three to five years post-burn) marsh.

Objective II.D.2: Within five years of CCP approval, develop and implement a marshbird monitoring program.

*Strategies:*

- Implement regular call-response surveys following the standardized methods outlined in the National Marshbird Monitoring Program to evaluate distribution, presence, and abundance of marshbirds during breeding and/or non-breeding seasons.
- Evaluate effectiveness of any marsh management efforts by assessing responses of marshbirds (presence, abundance, and nesting) and marsh plant communities.
- Work with partners to secure a light-weight airboat capable of accessing the marsh interior, for the purpose of monitoring bird use.

Objective II.D.3: Within three years of CCP approval, work with Atlantic Coast Joint Venture, the Service's Migratory Bird Program, and other partners to develop population and/or habitat objectives that more explicitly link the refuge's contributions to Joint Venture objectives for priority marshbirds – especially black rail.

Objective II.D.4: Within 10 years of CCP approval, work with partners to acquire and analyze remotely sensed data (e.g., laser remote sensing technologies and aerial photographs) to determine presence and extent of nesting microtopography for secretive marshbirds.

*Discussion:* Among wetland inhabiting birds, those categorized as marshbirds - rails, bitterns, cranes, coots, and moorhens - have been the subject of much recent research, monitoring, and management attention across the southeast. Concern over several species stems from extensive loss and degradation of interior (fresh) and coastal (brackish to estuarine) marsh habitats (especially high marsh), as well as a general lack of information regarding status and trends due to the inconspicuous habits of these birds and the need for specialized surveys to track populations. Several of these species are hunted throughout their range, presenting the additional concern of setting responsible harvest limits in the face of limited population information.

In Bird Conservation Region 31 – Peninsular Florida – black rail, yellow rail, and king rail are among the highest of marshbird priorities. American and least bitterns and limpkin are also of concern. All of these species are likely to be present at Lake Woodruff NWR, both in the impoundments and also in the unimpounded marshes. Management activities, such as prescribed fire and water level manipulation, would promote continued use of the refuge impoundments by marshbirds.

The extensive *Spartina/Cladium* marshes of Lake Woodruff NWR clearly provide suitable habitat (both breeding and nonbreeding) for key species of marshbirds, but little is known about the relative abundance or population size of these species on the refuge, or whether some even occur with sufficient frequency to be of management concern. This represents an obvious need for implementing survey protocols designed to understand distribution and habitat use on the refuge and

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to establish a baseline for indexing abundance. The Southeastern U.S. Waterbird Conservation Plan outlines recommendations for marshbird conservation and monitoring. Monitoring for marshbirds should follow protocols established as part of the National Marshbird Monitoring Program.

It is realistic to expect species, such as black and king rail, sora, Virginia rail, and least bittern, to be abundant enough on the refuge to benefit from management activities that promote favored microhabitats. Unfortunately, other than maintaining higher elevation marsh habitats through prescribed fire or other disturbance, there is little in the way of specific recommendations that can be offered when it comes to managing extensive tracts of unimpounded natural marsh for these species. Still, it is generally held that promoting structural heterogeneity within large acreages of otherwise homogeneous marsh will be beneficial. In particular, creating or maintaining dense patches of high marsh (i.e., three to five years post-treatment) may promote conditions favored by black rails and other marshbird species. Variety in topography, successional stage of marsh plants, degree and frequency of inundation, and other factors will all contribute to ensuring a diversity of sites for foraging, nesting, and concealment.

Prescribed fire and mechanical methods (e.g., mowing, roller chopping, and using the Marsh Master) can be used to set back succession and encourage structural heterogeneity, but fire is the preferred method whenever possible. *Spartina* and *Cladium* marshes are highly susceptible to burning and likely will not require mechanical means to increase open areas beyond what prescribed burning will produce. Conducting a few small (100-acre) prescribed burns each year should be used to encourage desired plant community and marshbird responses particularly in transition areas along marsh-upland edges. Unlike impoundment management for wading birds, the objective for marshbirds is not to attain open marsh-like conditions, but rather to promote patchiness within marshes such that age, stature, and/or vegetative composition of marsh habitats vary over large areas. When burning, attempt to avoid peak nesting and wintering periods – all things being equal, July, August, and September are preferable in this respect. It is understood that the constraints inherent in smoke management and the juxtaposition of suitable fire breaks may require considerable latitude in applying fire to the marsh landscape.

As with wading birds, the Southeastern U.S. Waterbird Conservation Plan outlines recommendations for priority marshbirds and sets regional population objectives for these species. Additionally, a national marshbird conservation plan is currently under development and may provide guidance useful at the refuge level in the near future. It is apparent that Lake Woodruff NWR can meaningfully contribute to the conservation objectives for king rail, black rail, yellow rail, and others, but at this time it would be difficult to quantify refuge-level population objectives. It is more appropriate to consider implementing management actions that are assumed to have a high likelihood for advancing marshbird conservation, while simultaneously initiating surveys and other data collection efforts to provide a stronger basis for future management decisions.

## *II.E. Land Birds*

Objective II.E.1: Within 10 years of CCP approval, restore and maintain approximately 2,500 acres of xeric pine, pine flatwoods, and other upland habitats on Jones Island, Tick Island, and along the DeLand Ridge (e.g., Eastside Unit and Volusia Tract) to support landbirds.

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*Strategies:*

- Define future desired conditions of various upland habitats, especially pine-dominated uplands. Absent specific desired characteristics, average initial target conditions across pine-dominated habitats should approximate basal areas of 30-50 square feet/acre, ≥60 percent grass/forb cover, and <40 percent shrub/palmetto in the midstory. The basal area recommendation is offered in the context of maintaining relatively low stem densities.
- Apply growing season prescribed burns to approximately 500-600 upland acres per year on a three-year average burn interval to begin restoring (or otherwise maintaining) habitats to above conditions.
- On sites with heavy midstory encroachment (>60 percent coverage), consider following up initial dormant season burns with a growing season burn 12-18 months later. Alternatively, consider sparing use of mechanical methods (e.g., chopping and mowing) subsequent to growing season burns to physically control the midstory.
- Continue aggregating burn units into larger compartments to add efficiency to burn operations and promote patchier burns. Favor hand ignition over aerial ignition; or use sparser ignition rates in aerially applied burns. Continue elimination of slash/loblolly plantations. Identify sites where conditions favor restoration of longleaf pine; promote this species accordingly.
- Explore management options for protecting important oak hammocks or shrub stringers during burn operations to maintain important resource components within the pine upland matrix. Ensure that these components are not severely reduced or eliminated from the landscape, but manage them where their dominance becomes excessive. Hammocks should not exceed 20 percent of the overstory stand composition; similarly for shrub cover in the midstory.
- Conduct assessments to develop baseline estimates of current stand characteristics (e.g., overstory and midstory composition, basal area, and percent grass cover). Periodically assess management effectiveness relative to this baseline and desired future conditions.
- Integrate the strategies outlined here into existing or revised refuge-wide forest management plans.

Objective II.E.2: Within the 15-year life of the CCP, work with Atlantic Coast Joint Venture, Northern Bobwhite Conservation Initiative, the Service's Migratory Bird Program, and other partners to develop population and/or habitat objectives that more explicitly link the refuge's contributions to landscape-scale objectives for landbirds.

Objective II.E.3: Within five years of CCP approval, monitor landbird presence, abundance, distribution, and responses to management activities.

*Discussion:* Through its conservation assessment process, Partners in Flight has identified numerous landbird priorities for Bird Conservation Region 31 – Peninsular Florida. Priority landbirds found at Lake Woodruff NWR, and to which the refuge can contribute meaningfully to the conservation of, include swallow-tailed kite, American kestrel, Chuck-will's-widow, and northern bobwhite. There are many other species identified as priorities for peninsular Florida that are known or likely to occur within the refuge, but because of their inconspicuousness or a general lack of quantitative abundance data, it remains unclear to what extent they occur on the refuge or how significantly the refuge might contribute to their conservation. These species include brown-headed nuthatch, prothonotary warbler, Bachman's sparrow, Henslow's sparrow, grasshopper sparrow, LeConte's sparrow, painted bunting, and common ground dove.

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Refuge habitats of importance to landbirds include the few scattered grassy habitats (for breeding and wintering sparrows), open pine and pine flatwoods (for sparrows, American kestrel, brown-headed nuthatch, and northern bobwhite), forested wetlands (for swallow-tailed kite and prothonotary warbler), and live oak hammocks (for wintering migratory birds). Principal landbird conservation and management considerations involve:

- prescribed burning of pine habitats to remove excessive hardwood midstory, to encourage more mature stands with herbaceous/grassy ground cover, and to promote longleaf pine where appropriate (for northern bobwhite, American Kestrel, Chuck-will's-widow, brown-headed nuthatch, and breeding and wintering sparrows);
- continued monitoring to better document and quantify occurrence of priority landbird species on the refuge (including breeding season surveys, as well as nonbreeding surveys for wintering sparrows and painted buntings);
- protection of an important post-breeding swallow-tailed kite roost;
- better defined linkages between national and regional landbird conservation plans and refuge objectives for landbird conservation; and
- fulfillment of priority information gaps and assessment of management effectiveness through research, inventories, and monitoring (for all priority species).

Unlike many refuges that primarily play a role in supporting breeding populations of priority species, Lake Woodruff NWR potentially plays a very important role in supporting populations of several of the species mentioned above through provision of essential wintering habitat (e.g., sparrows and painted bunting). Because wintering landbirds are more difficult to monitor and factors limiting their populations during non-breeding periods remain poorly known, land managers and conservation planners are only just beginning to consider incorporation of wintering landbird needs into objective setting and management activities. Consequently, recommendations for wintering landbirds typically reflect attempts to balance the uncertainties with practical advice for what seems like the right thing to do. Implementation of such recommendations must recognize that uncertainties can affect whether anticipated conservation benefits are realized. This gives renewed importance to monitoring and assessment of management effectiveness in such cases; not only to justify continued refuge resource allocations in these directions, but to ensure that objectives are being met and to further assist in the general quest for information on how best to support bird conservation during non-breeding seasons. Fortunately, most of the management activities that would be presumed to afford benefits to wintering landbirds at Lake Woodruff NWR are geared principally toward restoration (or maintenance) of upland pine and pine-oak systems. Undertaking these management actions is therefore based on an overall expectation for ecosystem benefits that goes far beyond expectations for wintering landbirds.

As referred to above, the quantitative importance of these habitats to priority landbirds has yet to be defined, but qualitatively it is reasonable to assume that management could enhance its ability to support northern bobwhite, American kestrel, Bachman's sparrow, brown-headed nuthatch, Chuck-will's-widow, wintering LeConte's sparrow, and possibly wintering painted bunting species. Presently, the scarcity of grassy and herbaceous ground cover – or conversely, the encroachment by palms and hardwood mid-story – is a principal limitation in the ability of such habitats to support these species, but there are other factors, too. Availability of mature pines that afford nesting cavities will affect suitability for American kestrel (true also for brown-headed nuthatch, but less-so given their smaller size), whereas presence of shrubby "stringers" and scattered oak hammocks can be a determinant of suitability for the painted bunting, eastern towhee, and a variety of frugivorous and insectivorous species that may overwinter or pass through during migration.

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Approximately 5,000 acres of uplands and wetlands are burned on the refuge each year. Assuming an average return interval of three years, a maximum of approximately 800 acres of upland (i.e., 2,500 total upland acres/three years) would need to be burned each year. Given logistical and physical constraints of completing a burn, as well as acknowledgement that many upland acres need not be considered for regular burning, a total of 500-600 upland acres burned per year are probably more realistic. There is the difference between management activities designed to restore degraded habitats and those designed to maintain habitats that more closely approximate desired conditions. The above burn intervals and acreages speak to averages that are most appropriate under a maintenance mode. Initial restoration activities may involve more (and more frequent) burning, as well as additional midstory removal, fuel reduction, or other activities (see below).

In general, growing season (late March-August) burns will be more conducive to reducing hardwood and cabbage palm encroachment, and may be more reflective of natural burn regimes (e.g., summer, lightning-ignited burns). In areas where hardwood and palmetto encroachment really needs to be knocked back, it may be necessary to follow up initial dormant season burns with a growing season burn 18 months later. This burn pattern should not be sustained indefinitely; it is a short-term recommendation to advance restoration of pine habitats more rapidly into a maintenance mode where growing season burns on a three-year average return interval are the norm. Reduction of midstory encroachment may also be accelerated through sparing use of mechanical means (e.g., mowing and chopping). Though less desirable than fire, these may be cost-effective solutions when burning is not an option, or to periodically enhance the hardwood reduction effects of prescribed burns. Mowing can decrease saw palmetto height while conserving and even promoting wiregrass and other groundcover species. Rollerchopping of roots and stems can be used in tall, thick, monotypic areas of saw palmetto to increase understory diversity. Soil disturbance and compaction in such operations are potential drawbacks, and should be minimized so as to avoid conditions favored by less desirable native and exotic herbs and grasses.

The more that prescribed burns promote a grassy-herbaceous understory, the more likely they are to provide conditions suitable for breeding (e.g., Bachman's) and wintering (e.g., Henslow's) sparrows, northern bobwhite, American kestrel, Chuck-will's-widow, and other species that either forage in these substrates, or require the openness they afford for foraging/hunting. Wetter, grassy depressions within flatwood habitats are where the wintering LeConte's sparrow is likely to occur. In conducting burns, it should be stressed that patchiness is preferred over cleanliness. Larger burns should promote diversity and patchiness in burn patterns on the landscape, and the continued aggregation of burn units into larger compartments (e.g., on the Volusia Tract) should facilitate this. Patchiness will help ensure that hardwood and shrub components important to a number of bird and wildlife species are not entirely excluded from the landscape. Aerial ignition (at least at high-ignition densities) may not afford desired patchiness, as numerous ignition points seem to result in cleaner burns. As a general consideration in refuge burn operations, the multitude of ignition points typical of aerial ignition techniques may also make it more difficult for wildlife to find suitable cover during or after fires. Hand ignition should be considered whenever practical. Some target habitat objectives for burns in upland pine systems (including flatwoods and areas with longleaf pine) would be to achieve a basal area of approximately 30-50 square feet/acre (and low stem densities),  $\geq 60$  percent grass/forb cover, and  $<40$  percent shrub/palmetto in the midstory. Longleaf pine should be promoted in areas where it could potentially be a dominant overstory species. Removal of slash and slash/loblolly plantations (e.g., Eastside Unit) should continue, with subsequent management to return habitats to the conditions described here. All of these objectives for system restoration complement nicely the considerations for landbird conservation in these habitats.

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The forested wetlands and hardwood forests (including tupelo, bay, cypress, red maple, and elm) that fringe Lake Woodruff and adjoining lakes comprise nearly 6,800 acres. Important landbird considerations here are the maintenance of breeding neotropical migratory passerines, such as prothonotary warbler. Active management of these habitats is not required. Rather, the role that these habitats play locally (on the refuge) and regionally (on the landscape) in supporting priority species, such as these, needs to be recognized in actions on and off the refuge that might impact their integrity (e.g., water use, water quality, forestry, adjacent burning, and public use).

As with waterfowl, shorebirds, wading birds and marshbirds, there exists relevant conservation planning material for landbirds in Bird Conservation Region 31 – Peninsular Florida. Although Partners in Flight has not developed an ecoregional conservation plan specifically for Peninsular Florida, FWC has recently hired staff to develop an integrated statewide plan. This would increase coordination of nongame bird conservation and would increase agency representation in bird conservation initiatives and programs dedicated to conservation and management of nongame birds at international through state levels. It would be appropriate for Lake Woodruff NWR and other national wildlife refuges in Florida to proactively engage FWC and let their needs and interests be known. At still larger scales, the Atlantic Coast Joint Venture expends considerable energies to coordinate and promote landbird conservation with all of its many partners throughout the southeastern coastal plain and Florida. Although the Joint Venture is still working towards spatially explicit, quantitative objectives for nongame bird conservation, it would benefit individual refuges, and the refuge program, as a whole, to actively participate and help steer this effort. In the interim, the Atlantic Coast Joint Venture is still a valuable source of information on priority landbird species. The Northern Bobwhite Conservation Initiative has developed state-by-state habitat conservation objectives for quail, and coordination with this initiative can help specify acreage goals for the refuge in support of quail restoration goals. Finally, the Partners in Flight North American Landbird Conservation Plan is helpful in identifying continental level landbird priorities and providing a relevant context for landbird conservation efforts at successively smaller scales. Though not prescriptive in its objectives and recommendations for local level (e.g., refuge specific) landbird conservation efforts, this plan will provide much of the basis for ecoregion planning efforts that will clarify the specific landbird conservation roles of local partners, including refuges.

*Strategies:*

- Monitor bird population responses to prescribed burning and other management actions in pine uplands, giving particular attention to breeding northern bobwhite, American kestrel, Bachman's sparrow, and wintering sparrows.
- Continue to conduct refuge's breeding bird surveys (point counts) in these habitats on a consistent basis with an objective of linking bird responses to management actions. Add additional survey points to adequately cover refuge pine habitats and areas where burning and other management are taking place.
- Where not already part of other monitoring efforts to assess management effectiveness, employ transect surveys to document general occurrence and abundance of wintering sparrows in pine-grassland portions of the refuge.
- The following techniques could be employed and are listed from most rigorous (and most intensive) to least: Breeding Biology Research and Monitoring Database (BBIRD) plots (a measure of both relative abundance and nest productivity, ideal for localized assessments of management efforts); point counts or transects within specific habitats of interest (measure of relative abundance); and checklist development/random searches (incorporate method of acquiring information from local birdwatchers, including migration monitoring and occurrences of wintering birds).

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### **GOAL III. EXOTIC, INVASIVE, AND NUISANCE SPECIES**

Control and eliminate, where feasible, exotic, invasive, and nuisance species impacting the refuge to maintain and enhance the biological integrity of the refuge.

*Discussion:* The occurrence of non-native species and future colonization by these exotic plants and animals on the refuge has been identified by staff and governmental partners as one of the most important management issues facing the refuge. It is important to constantly monitor the occurrence of exotic species on the refuge and to be alert to new species in the State and in the vicinity of the refuge. Exotic, invasive, and nuisance species that were identified as being ecologically important on Lake Woodruff NWR include non-native aquatic and terrestrial plants, exotic aquatic animals, feral hogs, coyote, and feral and free-roaming animals.

#### *III.A. Non-native Aquatic Plants*

Objective III.A.1: Within the 15-year life of the CCP, continue to work with the partners to identify, locate, control, and eliminate, where feasible, aquatic exotic, invasive, and nuisance species on at least 75 percent of the refuge waterways, including state-owned waterways within the refuge's approved acquisition boundary.

*Discussion:* Aquatic invasive plants, such as water hyacinth, water lettuce, and hydrilla are common in refuge waters and State-owned navigable waters within the acquisition boundary. These non-native plants are managed by the U.S. Army Corps of Engineers (USACE), using herbicides. Though non-native aquatic plants may provide forage and shelter for native species; they have negative effects at high densities by crowding out native plants and impeding boat traffic.

#### *Strategies:*

- Coordinate aquatic exotic plants monitoring and eradication efforts with the USACE, FDEP, and SJRWMD.
- Continue to coordinate with the Corps' Invasive Species staff to target or avoid certain areas during ongoing management activities.
- Develop a GIS database for exotic aquatic plants on the refuge.
- Manipulate water levels in impoundments to control exotic aquatic plants in favor of native plants.
- Clean boats and other equipment shared with other refuges or partners to limit the spread of exotic, invasive, and nuisance species.
- Work with the State of Florida to develop appropriate cooperative management agreements for the control of navigable waters within the refuge's approved acquisition boundary.

#### *III.B. Non-native Terrestrial Plants*

Objective III.B.1: Within the 15-year life of the CCP, identify and locate new infestations of Category I and Category II invasive upland plants (as listed by the Florida Exotic Plant Pest Council) and conduct initial attack with an emphasis on elimination.

*Discussion:* Across Florida, non-native terrestrial plants are expanding their ranges every year, and the occurrence of these species on the refuge will likely increase in the future. Currently, exotic terrestrial plants are not impacting a significant portion of the refuge, and management can focus on detecting and eliminating new infestations.



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*Strategies:*

- Routinely inspect refuge uplands for new infestations, especially along the refuge boundary.
- Routinely inspect areas of soil disturbance (e.g., construction areas) for the presence of introduced plants.
- Upon detection of invasive plants, mechanically remove and/or spray plants immediately.
- Work with partners and apply for grants to support these efforts.

Objective III.B.2: Within the 15-year life of the CCP, control the extent and spread of exotic, invasive, and nuisance upland plant species on refuge lands to less than one percent of the total landscape.

*Discussion:* Existing non-native upland plants (e.g., air potato, kudzu, and Johnson grass) are found primarily along the eastern boundary, where human development is increasing, and a highly disturbed habitat along the railroad easement allows exotics to flourish. Management of existing populations of non-native plants would focus on maintaining, and where possible, reducing the areas invaded. Note, the one percent does not include targeting bahia grass in ruderal areas (e.g., in power line easements and rights-of-way).

*Strategies:*

- Conduct education and outreach programs for refuge neighbors concerning exotic, invasive, and nuisance species.
- Use biologically safe herbicides and/or mechanical treatments to control exotic plant infestations.
- Monitor spread of exotic or nuisance species, and develop appropriate control measures to address these individually.
- Clean heavy equipment shared with other refuges or partners to limit the spread of exotic, invasive, and nuisance species.
- Build relationships with personnel at neighboring conservation lands (e.g., Ocala National Forest, Lake George State Forest, and DeLeon Springs State Park) to foster information sharing regarding possible exotic species that may spread to refuge lands and work to develop a coordinated approach to address the spread of these exotic and/or invasive plants.
- Work with partners and apply for grants to support these efforts.

*III.C. Non-native Aquatic Animals*

Objective III.C.1: Throughout the 15-year life of the CCP, document populations of exotic aquatic animal species present in refuge habitats and control or eradicate, where feasible, any populations of exotic aquatic animal species that could impact or that are adversely impacting native habitats or species.

*Discussion:* Much of the refuge encompasses State-owned waterways which are not managed by the refuge. Aquatic fish species, such as brown hoplo, armored catfish, and tilapia, are prevalent throughout the waters of the St. Johns River and are probably impossible to completely eradicate, although management of these species is possible in the impoundments. Their effects on native fauna are not fully understood. Other aquatic animal species, such as nutria and the Nile monitor, are likely to invade the refuge as their populations expand regionally. The refuge should continue to collaborate with researchers on the possible impacts of these species on trust resources.

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*Strategies:*

- Work with partners (e.g., FWC; USGS, Florida Integrative Science Center; and Stetson University Department of Biology) to survey all habitats likely to host exotic aquatic animal species and assess potential for adverse impact to native species (exotic fish species primarily).
- Where possible, control problem fish species through eradication (preferred) or control (e.g., remove fish during impoundment draw-downs and introduce species-specific diseases).

*III.D. Feral Hogs*

Objective III.D.1: Within five years of CCP approval, document feral hog population levels and distributions, and during the life of the CCP, control feral hog populations at or below current levels.

*Discussion:* Feral hogs are found throughout Florida and have been documented on the refuge. These animals can have negative effects on native wildlife and plants through predation and habitat destruction. In addition, their rooting activities and wallows can cause erosion and subsequent degradation of streams and lakes.

Feral hogs are currently controlled on the refuge as part of the deer hunt. This means feral hogs may be shot during deer hunts and are not subject to a quota. Because this is not a targeted hunt, it may not sufficiently control feral hog numbers if these non-native animals increase substantially in the future. Alternative control measures, including trapping, may be required to effectively manage feral hog numbers during the course of the 15-year CCP.

*Strategies:*

- Continue control through managed deer hunt.
- Consider alternative control methods (e.g., trapping).

*III.E. Coyote*

Objective III.E.1: Within five years of CCP approval, document coyote population levels and distributions on the refuge, and during the life of the CCP, control coyote populations at or below current levels.

*Discussion:* Coyote are a canine (in the dog family) originally found predominantly in the western United States. In the last 30 years, this species has colonized the eastern United States, including Florida. It is a generalist and opportunistic predator whose diet can include fish; reptiles; birds; and larger prey, such as deer. They are a top predator on the refuge, but their numbers and distribution are unknown. The refuge currently does not actively manage coyote, but a documented increase in their population may warrant the implementation of control efforts.

*Strategy:*

- Coordinate with the State of Florida to evaluate impacts of coyote on wildlife and habitat diversity and control where necessary.

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### III.F. Feral and Free-roaming Animals

Objective III.F.1: Within five years of CCP approval, coordinate with partners to minimize adverse impacts of feral and free-roaming animals to native wildlife and habitats.

*Discussion:* Feral and free-roaming animals are domesticated animals that have become wild and unsecured pets and livestock, including cats, dogs, goats, horses, cows, and poultry. These animals may have a negative impact on refuge wildlife and habitats through predation, grazing, trampling, disease spread, and unwanted cross-breeding.

*Strategies:*

- Coordinate with partners to control feral and free-roaming animals to minimize adverse impacts to wildlife and habitat.
- Work with partners to perform more outreach to educate landowners about the negative effects of feral and free-roaming animals on refuge habitats and wildlife.

### **GOAL IV: FISH, WILDLIFE, AND HABITAT MANAGEMENT**

Protect, manage, and enhance the natural diversity of fish, wildlife, and habitats within the refuge's environments to ensure that refuge populations remain naturally self-sustaining.

#### IV.A. Mesic Pine Palmetto Flatwoods

Objective IV.A.1: During the 15-year life of the CCP, maintain or restore mesic pine palmetto flatwoods to a high-quality state such that the natural communities function as sustainable and healthy ecosystems that support a diversity of wildlife and native herbaceous and woody plant species.

*Discussion:* Managing the pine flatwoods in the above described desired state will provide quality habitat for a variety of wildlife species. Quality mesic pine flatwoods generally have the following characteristics: an understory plant composition and arrangement with a mosaic cover of 40 to 60 percent saw palmetto and an average total height of 3 feet or less; 40 to 60 percent herbaceous plant species of which 30 percent or greater herbaceous plant species consist of wire grass (*Aristida stricta*) and a mixed species woody shrub component that forms a 15 to 30 percent cover with total average height of 4 feet or less; a middle story of mixed hardwood tree species between 5 and 10 percent canopy cover of trees with average individual tree heights of 45 feet or less; an uneven-aged mixed pine dominated overstory that is predominantly comprised of long leaf pine (*Pinus palustris*), 50 percent or greater species occurrence, having in stand average basal areas between 50 and 80 square feet per acre of pine species; and duff depth should be between 0.1 and 1 inch deep. Wildlife species that are likely to benefit from this management include: migratory neotropical birds, eastern wild turkey, bald eagle, small mammals, white-tailed deer, gopher tortoise, Florida black bear, bobcat, and a variety of reptile and amphibian species, including the eastern indigo snake.

*Strategies:*

- Revise the Forest and Fire Management plans within one year of CCP approval.
- Complete forest-stand inventories by 2010.
- Apply prescribed fire to flatwoods stands on a two- to five-year rotational basis with variation of seasons in which stands are burned in order to maintain understory fuels at levels stated in the objectives and to provide adequate media for naturally dispersed pine seeds to germinate.

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Prescribed burns will be conducted under strict prescriptive parameters, including current and expected climatic conditions, fuel moisture levels, ignition techniques, and sequencing, using typical prescriptive limits for burning flatwoods that are in the condition class described in the objectives.

- Mechanical and/or herbicide treatments may be used in specific areas where prescribed fire is not a likely option. Prescribed burning may be limited due to wildland urban interface issues, situations where fuels are unreceptive to burning under prescribed conditions, or situations where the predicted results of a prescribed burn under prescribed conditions are not likely to meet the management objectives for the stand or would degrade the existing forest stand. Mechanical treatment options range from selective thinning of mature timber to mowing of understory fuels with low ground pressure machinery. Application of mechanical treatments would be conducted under strict prescriptive elements that consider effects of the treatment to existing wildlife utilizing the stand, hydrology, existing and future plant communities, and cultural resources. Herbicide treatments would follow the same prescriptive considerations and constraints. Herbicide treatments could be used for species-specific control, such as exotic tree species or hardwood encroachment. Herbicide treatment may also be utilized for site preparation and seedling release for planted pines in restoration areas. Broadcast herbicide treatments may be utilized for control of exotic herbaceous weed species.
- Planting of pine seedlings, long leaf pine bare root or containerized, would be conducted in restoration areas or where natural seed source is absent or unlikely to regenerate the stand in accordance with management objectives. Thinning of plantation style planted offsite slash pine (*Pinus elliottii*) and pond pine (*Pinus serotina*) may preclude reintroduction of longleaf pine in some stands. Thinning operations will be normally conducted so that a minimum basal area of pine species is 30 square feet per acre in the thinned stand. This will facilitate prescribed burning the stand after planting of longleaf seedlings and provide habitat for various species of wildlife. Site preparation for planting may include roller chopping or other mechanical treatment of understory vegetation and prescribed burning prior to planting. Longleaf seedlings will normally be planted at a density of no more than 660 trees per acre. Seedlings may be planted in dense groups or in row fashion depending on the conditions of the site and existing stand. Planting of containerized wire grass may be required in areas where the herbaceous understory has been crowded out by competing woody vegetation. Other methods and variations on these quantities may be introduced as experience or research dictates.

#### IV.B. Mesic-Xeric Scrubby Flatwoods

Objective IV.B.1: Within the 15-year life of the CCP, restore and/or maintain mesic-xeric scrubby flatwoods as a sheltered and distinctly vertically stratified forest stand type.

*Discussion:* Mesic-xeric scrubby flatwoods usually are defined as having the following characteristics: three well-defined strata include a pine dominated overstory that creates a canopy cover of 30 to 50 percent with canopy heights between 45 and 60 feet, with a stocking rate of 40 to 60 square feet per acre basal area of uneven-aged pine species, favoring longleaf pine where possible. The mid-story canopy is to be comprised of mature scrub associated hardwood tree species, particularly sand live oak (*Quercus geminate*), Chapman's oak (*Q. chapmanii*), blue jack oak (*Q. incana*), laurel oak (*Q. hemisphaerica*), persimmon (*Diospyros virginiana*), sweet bay (*Magnolia virginiana*), and scrub hickory (*Carya floridana*). These middle story species occur throughout the stand in small clusters or domes of 10 to 20 trees and are also found distributed sporadically as individual trees. Middle story canopy height should be between 15 and 35 feet high creating a canopy closure of 20 to 30 percent of total stand area. The understory scrub and palmetto strata should consist of a mixture of shrub type woody vegetation and saw palmetto. Woody shrub species that favor this community type are fetter bush, rusty lyonia, gallberry, myrtle oak, sparkle berry, low

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bush blue berry, and deer berry. The coverage of saw palmetto should be between 25 and 50 percent and cover of woody shrubs around 20 to 30 percent. The understory shrub strata vertical height should range between 2 to 5 feet in a mosaic pattern throughout the stand. Duff depths should be between 0 and 0.5 inches throughout the stand.

*Strategies:*

- Apply prescribed fire as a natural, growing season disturbance on a regular basis every three to seven years in stands that reflect the stand densities referred to in the objectives. Fire return intervals may need to be modified in stands that either have too much or too little saw palmetto or gallberry cover. Prescriptive parameters are similar to those for mesic pine flatwoods.
- Mechanical treatment to middle and understory trees and shrubs may be necessary to meet objective stocking levels. Treatment will include timber harvest of mature pines and/or hardwoods, as well as chopping or mowing middle and understory trees and shrubs. Determination of need for mechanical treatments will be quantified through vegetative sampling techniques.
- Planting of target plant species including longleaf pine, sand live oak, and fetterbush will be utilized to restore areas that are not likely to have a viable seed crop capable of regenerating the stand to meet the management objectives.

*IV.C. Long Leaf Pine and Wiregrass Savanna*

Objective IV.C.1: Within the 15-year life of the CCP, restore and maintain an open canopy longleaf pine-dominated forest with a primarily herbaceous plant, savanna like, understory of predominantly wiregrass.

*Discussion:* Longleaf pine and wiregrass savanna habitats typically have stocking rates for uneven-aged longleaf pine to be between 20 and 50 square feet basal area per acre. Several age and size classes of longleaf should be present throughout the stand, representing good regeneration rates to maintain the stand. The primarily herbaceous understory should support and include a wide variety of herbaceous plants and forbs associated with this forest type. Wiregrass should be the most abundant grass species found, forming a cover between 60 and 90 percent of the forest floor. Woody plant species occurring in the understory should not surpass 2.5 feet in height or form a cover greater than 20 percent of the understory. Saw palmetto is considered in this classification. Understory plant species diversity should be represented through 20 and 40 different species occurring in the stand.

*Strategies:*

- Apply prescribed fire on a one- to four-year rotation between the months of May and August. Burn rotation and frequency will be varied dependent upon optimal longleaf pine seed crop release and wire grass flowering and seed production cycles. Nesting seasons for ground nesting birds such as Bachman's sparrow, bobwhite quail, and eastern wild turkey will also be considered in burn plan preparation.
- Longleaf pine seedlings and containerized wiregrass may be planted in areas where natural regeneration or seed source is not adequate for management objectives. One approach is to plant longleaf seedlings at least 12 feet apart in a non-uniform pattern throughout the area. Wiregrass could be planted systematically at three-foot by three-foot spacing.

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#### *IV.D. Sand Pine-Oak Scrub*

Objective IV.D.1: Within the 15-year life of the CCP, evaluate the usefulness of the sand pine-oak scrub community in a variety of seral stages, dominated by xerophytic herbaceous component, well-drained soils, and minimal grass component.

*Discussion:* The sand pine-oak scrub vegetative community type is considered a fire-dependent community that requires stand replacement type fire on a 15- to 30-year rotation in order to stimulate reproduction of many of the plant species that occur in these communities. The majority of the sand pine-oak scrub on the refuge has not received significant stand replacement fire for over 50 years, resulting in the loss of community integrity. The sand pine-oak scrub communities found on the refuge can be considered to be in the climax successional stage of development, having nearly 100 percent midstory canopy closure consisting of various oak species with an average height within stands of 25-30 feet. This middle canopy can be considered the dominant overstory canopy due to the 80 percent pine mortality in these stands resulting from the 2004-2005 hurricane disturbances. The understory is composed primarily of saw palmetto, fetterbush, and other woody shrub species with an average cover of 70 percent and height of four to five feet. Ground cover is composed primarily of compacted leaf litter. The lack of frequent fire return and the increased fuel loading caused by hurricane disturbance have increased the potential for extreme wildfire activity in these communities.

#### *Strategies:*

- Conduct wildlife and plant surveys throughout the sand pine-oak scrub communities to determine which species are present in this habitat.
- Implement vegetative treatments to selected areas in order to reduce hazardous fuel loads and restore scrub to a more productive secondary successional state.

#### *IV.E. Oak Hammock*

Objective IV.E.1: Within the 15-year life of the CCP, continue management to maintain oak hammocks in conditions similar to their current sizes and forms to minimize their spread.

#### *IV.F. Mesic Hammock*

Objective IV.F.1: Within the 15-year life of the CCP, manage mesic hammocks, dominated by mixed hardwoods and cabbage palms, to maintain these areas in conditions similar to their current sizes and forms to minimize their spread.

#### *IV.G. Wetland Hardwoods*

Objective IV.G.1: Within the 15-year life of the CCP, maintain current wetland hardwood conditions.

*Discussion:* The lands now comprising the refuge were logged for cypress in the early- to mid-1900s, and willows and red maples dominate, especially along the Spring Garden and Tick Island runs. A willow endemic to Florida (*Salix floridana*) is found primarily along spring runs, but the density of relatively young red maples suggests these spring runs have early successional vegetation consistent with logging. Relatively mature forests still exist in more remote areas, such as along Harris Creek, Norris Dead River, St. Johns River, and Scoggin Creek, as well as along the southern edge of Lake Woodruff. This habitat is important for swallow-tailed kites and is within the historic range of the ivory-billed woodpecker.

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*Strategy:*

- Within 10 years of CCP approval, conduct baseline surveys to document existing condition of forested wetlands, including species composition, abundance, and structure in this habitat.

*IV.H. Impoundments*

Objective IV.H.1: Within the 15-year life of the CCP, mimic open marsh conditions in the impoundments, with an interspersions of 50-70 percent open water and 30-50 percent herbaceous and emergent vegetation with patches of desirable submerged aquatic vegetation to support foraging and loafing of migratory birds.

*Strategies:*

- Control exotic, woody, and invasive native vegetation growth by annual herbicide application in the growing season.
- Perform frequent drawdowns (every one to three years) to improve soil conditions and stimulate growth of desirable wildlife plants
- Burn impoundments every two to three years, in combination with drawdowns to retard unwanted vegetation growth and kill woody shrubs. If water levels permit, re-flood after burning to further retard vegetation growth.

Objective IV.H.2: Within the 15-year life of the CCP, maintain deep-water impoundment perimeter canals to facilitate water movement and to provide year-round refugia for fish, reptiles, amphibians, and resident birds.

*Strategy:*

- Develop a schedule to periodically dredge canals to remove accumulated debris and sedimentation (e.g., on a 5- to 10-year rotation).

Objective IV.H.3: Within the 15-year life of the CCP, ensure the ability to manipulate water levels in the impoundments.

*Strategies:*

- Work with partners and the Service to obtain funding to accomplish needed improvements to the stationary pump and existing culverts.
- Maintain the stationary pump and associated water control structures in operating conditions to facilitate water movement.
- Evaluate the need for future pump sites.
- Implement a program to annually document the amount of water pumped into the impoundments. Use these and rainfall data to estimate future water needs.
- On a monthly basis, document water levels in the impoundments, Spring Garden Lake, and the greentree reservoir.

Objective IV.H.4: Within five years of CCP approval, develop an adaptive water level management plan to support multi-species management, based on best available science and knowledge of the local conditions.

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*Discussion:* One of the most important aspects of the impoundments is that their water levels can be tailored to meet the needs of multiple species. Shorebirds require very shallow water, while waterfowl typically utilize deeper areas. Alternating water levels in the different impoundments on a seasonal basis allows the refuge to support the greatest number of species possible.

*Strategies:*

- Obtain a topographical survey of the impoundments to assess water level depth throughout the impoundments and add or adjust staff gauges appropriately.
- Continue bi-monthly impoundment bird use surveys to monitor use of impoundments, to provide long-term trend data, and to enable adaptive management.
- Institute an annual sampling regime for the impoundments, including physical and biotic factors such as water quality, vegetation composition, and prey abundance.

*IV.I. Greentree Reservoir*

Objective IV.I.1: Within the 15-year life of the CCP, maintain the existing 10-acre cypress hammock/mixed hardwood swamp in the greentree reservoir to support wood ducks and neotropical migratory birds through water level modifications to mimic natural-like conditions and the water levels of Spring Garden Lake.

*Discussion:* During the 1800s, the Spring Garden area was settled and developed for agricultural uses. A dike system was constructed, along with large pumps pumping 2,400 gallons per minute (gpm), in an attempt to drain the East Marsh area. The attempt was aborted, but some of these dikes remain, influencing Lake Woodruff and the surrounding marshes. The dike system has impeded the flow of water through the greentree reservoir between Spring Garden Lake and the refuge's East Marsh. Resetting existing culverts, adding culverts, and/or spillways will establish a more natural exchange of water between these two habitat units.

*Strategies:*

- Restore or mimic natural flow from Spring Garden Lake to the refuge's East Marsh.
- Evaluate the size, location, and height of the existing culverts to determine if the system is mimicking natural water levels.
- Reset existing culverts, adding culverts and/or spillways as needed to mimic the natural hydrological flow through the area.
- Ensure that water levels are manipulated to mimic natural hydrology and limit stress to trees from prolonged inundation.
- Install staff gauge to monitor water levels.

*IV.J. Open Emergent Marshes*

Objective IV.J.1: Within the 15-year life of the CCP, maintain and, where necessary, restore the marsh to a high-quality, healthy, species-appropriate, emergent, herbaceous marsh.

*Discussion:* High-quality open emergent marsh would include: Baker's cordgrass (*Spartina bakerii*) – 50-95 percent of total ground cover, often forming near-monotypic stands; sawgrass (*Cladium jamaicensis*) – 20-50 percent of total ground cover, occasionally forming near-monotypic stands; maidencane (*Panicum hemitomon*) – 2-10 percent of total ground cover, occasionally forming near-monotypic stands near the upland-marsh interface near the fringes of Lake Woodruff; cattail (*Typha* spp.) – 0-20 percent of total



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ground cover, with no monotypic stands; woody species – 0-5 percent of total ground cover; open water – 0-5 percent of total ground cover; burned patches – 20-40 percent of the total marsh acreage burned each year, with >90 percent of the marsh burned at least once every four years, and <25 percent of the marsh burned two or more times in four years; and unburned patches (for >90 percent of all prescribed burns, 10-30 percent of the acreage planned for the burn will remain as unburned patches).

Emergent, herbaceous marsh covers approximately 10,000 acres of Lake Woodruff NWR. Kushlan (1990) considers this marsh association to be a wet prairie, given the dominant vegetation (*Spartina bakerii*), flooding that typically lasts <6 months, and has a fire return interval of <10 years with low organic matter accumulation. Secretive marshbirds, several species of which appear to be in serious decline, depend on this habitat for one or more parts of their respective life cycles. Management of this habitat is mainly achieved through the use of prescribed fires, with herbicide and mechanical treatment playing a role only in easily accessible areas.

Prescribed fire is used as a management tool throughout the southeastern United States to maintain and enhance wetland habitats for wildlife. Fire maintained marshes provide habitat for several migratory bird species of management concern, including black rail (*Laterallus jamaicensis*), salt marsh sharp-tailed sparrow (*Ammodramus caudacutus*), and Nelson's sharp-tailed sparrow (*Ammodramus nelsoni*). Quantitative information on the impacts of prescribed fire on these managed saltmarsh and wet prairie habitats is lacking. The vegetative response to prescribed fires of differing intervals and season of burning is not well documented. The ability of secretive marsh bird species to escape prescribed fire and the resulting direct impact of prescribed fires on their populations is unknown. High direct mortality on rails, sparrows, and wrens has been observed during prescribed fires (Legare et al. 1998). Land managers need information on the species' responses to prescribed fire in these emergent wetlands to conduct prescribed fires properly with the frequency, seasonal timing, and conditions that provide appropriate habitat for the species, while limiting direct impacts to wintering and breeding bird populations.

Prescribed burns often do not mimic natural fire regimes due to human constraints such as air quality regulations, wildland-urban interface, and firefighter safety. Possible negative consequences of these prescribed fires that do not mimic natural fires include hotter than normal burns that blacken nearly all habitat, rather than leaving escape habitat for secretive marshbirds and other wildlife. This type of burning has resulted in large kills of several species of birds and other wildlife (Legare 1998). This can be highly detrimental to species such as black and king rails, whose populations are small and restricted to rare habitats. These effects can be addressed to some degree by adjusting burn techniques to provide unburned refugia. Also, the bulk of marsh burning can be conducted during the months of August and September, which is after the peak of nesting, before most migratory birds arrive, and during a wetter period when fires burn cooler. Ring fires should also be avoided, as these provide no escape habitat for wildlife.

It is believed that rails do not use marsh habitat for nesting until it becomes dense enough to preclude most predation, which seems to occur two years after a burn. Beyond four years after a burn the vegetation may become too dense for nesting.

*Strategies:*

- Within five years of CCP approval, experiment with single source ignitions and other burn techniques that more closely simulate the natural spread of fire. This will likely need to be conducted at small scales, and separate from other burn activities until appropriate methods are developed.

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- Within five years of CCP approval, experiment with the intensive use of fire in artificial fire shadows to reduce woody vegetation during spring burns.
  - When fire is not sufficient to control woody vegetation, use herbicides and mechanical treatment as necessary to achieve objectives.
  - Monitor the St. Johns River staff gauge at State Route 44 to predict water levels throughout the refuge.
  - Protect the natural hydrologic cycle and water resources of the refuge and wildlife through coordination with SJRWMD.
  - Monitor water levels and water quality within Lake Woodruff and adjacent emergent marsh lands.
  - Restore the natural marsh topography, where possible, to promote natural sheet flow, reduce the impacts of adjacent ditching, and remove the unused levees.
  - Secure a lightweight airboat to conduct inventory and monitoring activities.

#### *IV. K. Ruderal Areas*

Objective IV.K.1: Within five years of CCP approval, restore at least 50 percent of ruderal areas with native grasses and forbs.

*Discussion:* Rights-of-way and ruderal habitats are characterized as grassy, weedy areas with some low shrubs. They are man-made habitats created by frequent plowing and/or mowing, which prevents larger woody plant species from taking hold. These habitats host insects, as well as small reptiles and mammals. Several smaller bird species may forage in ruderal areas and feed on insects, fruits, and seeds. The largest contiguous ruderal area on the refuge is the powerline right-of-way. Currently ruderal areas are seeded, mowed, burned, and mechanically/herbicidally treated for invasive exotic plants. Ruderal areas can be further enhanced for forage by migratory bird usage.

#### *Strategies:*

- Schedule prescribed fire, mowing, and disking to provide optimal response of native vegetation.
- Seed with native plants.
- Establish a cooperative agreement with Progress Energy to restore the powerline easement through the Volusia Tract to native grasses.
- Rehabilitate all open grass public use areas.
- Eliminate the spreading of non-native grass seeds as ground cover following dirt work on the refuge.
- Limit mowing to fall, spring, and/or as needed to prepare for prescribed burning.
- Maintain the Volusia Tract interior road for vehicle use only by Service vehicles. Public use would remain limited to foot and horse traffic.

#### *IV.L. Native Fishes*

Objective IV.L.1: Within the 15-year life of the CCP, document the native fish species present on the refuge and habitats used by them.

*Discussion:* The refuge has different water resources, ranging from small, ephemeral ponds to canals and streams to shallow lakes. These, in turn, support a variety of fish species, including types that migrate seasonally to and from the ocean via the St. Johns River. More information regarding the types of fish species present and their abundance and distribution is needed in order to help conserve their biological diversity on the refuge.

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*Strategies:*

- Partner with staff of the Service's Panama City, Florida, Fisheries Resources Office; Raleigh, North Carolina South Atlantic Fisheries Coordination Office; Welaka National Fish Hatchery (NFH); FWC, Lower St. Johns River Fisheries Office, DeLeon Springs; SJRWMD; USGS, Florida Integrative Science Center; and Stetson University to obtain historic and existing data for fish and other aquatic species on the refuge (including species lists, distribution in refuge habitats, and population numbers, if available).
- Encourage partners to conduct quantitative surveys for specific aquatic species (e.g., American eel and other diadromous species), or of specific habitats (i.e., isolated ponds).
- Partner with USGS, Florida Integrative Science Center, to survey the refuge for fish diseases.
- Routinely survey appropriate refuge habitats for the presence of exotic aquatic species (e.g., armored catfishes, walking catfish, and tilapia).

*IV. M. Herpetological Species*

Objective IV.M.1: Within the 15-year life of the CCP, document herpetofaunal species present on the refuge, habitats used by them, health, and current population sizes.

*Discussion:* The wide diversity of habitats on the refuge support a correspondingly high number of reptile and amphibian species. Although some reptile species have been studied extensively on the refuge (e.g., pygmy rattlesnake), there are many species whose populations and distributions on the refuge are poorly known. Improving this knowledge base will help in the future management and protection of these species.

*Strategies:*

- Partner with faculty of Stetson University, Department of Biology, to obtain historic and existing data for herptiles on the refuge (including species lists, distribution in refuge habitats, and population numbers, if available).
- Encourage partners to conduct quantitative surveys for specific herpetofaunal species or of specific habitats (e.g., isolated ponds).
- Partner with USGS, Florida Integrative Science Center, to survey the refuge for amphibian diseases.
- Routinely survey appropriate refuge habitats for the presence of exotic herpetofaunal species (e.g., Cuban tree frog and Nile monitor).
- Continue existing mapping program for gopher tortoise burrows.
- Update refuge species list and develop GIS databases documenting herptile sightings.

Objective IV.M.2: Within the 15-year life of the CCP, conduct management practices on refuge habitats in such a manner as to minimize adverse impacts to herpetofaunal species.

*Strategies:*

- Avoid cold weather burns to avoid impacting snakes.
- Work with partners (e.g., Stetson University) to determine when to schedule rollerchopping during times that will least impact herptiles.
- Prohibit hunting with dogs on the refuge (frequently dogs find snakes and hunters then kill them).
- If amphibian disease issues arise, take appropriate measures to eliminate or prevent the spread of amphibian diseases within refuge aquatic habitats.

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## **GOAL V: HYDROLOGY, WATER QUALITY, WATER QUANTITY, AND MINIMUM FLOWS AND LEVELS**

Work with the partners to conserve and, where necessary, restore, the diversity, structure, and function of refuge habitats, while maximizing the refuge's contribution to maintaining or improving water resources.

### *V.A. Water Quantity*

Objective V.A.1: Within 10 years of CCP approval, work with partners to determine and ensure adequate water levels to support wildlife and habitat objectives of the refuge.

*Discussion:* The refuge needs adequate water quantities in order to sustain wildlife, diversity, and high-quality habitats. As regional water use increases, ensuring that future proper water quantities are maintained on the refuge will become increasingly important.

#### *Strategies:*

- Monitor water levels in Spring Garden Lake, greentree reservoir, and impoundments.
- Manage water levels in impoundments and the greentree reservoir.
- Consider additional options, including sub-surface pumping to maintain needed water levels.

Objective V.A.2: Within three years of CCP approval, work with partners to evaluate the impacts of storm water on refuge marshes.

*Discussion:* Accelerating urbanization accompanied by additional areas of impervious surfaces along the eastern boundary of the refuge may be contributing to increasing amounts of storm water runoff flowing into refuge marshes. Large pulses of storm water can cause erosion and suspended sediments can smother vegetation. The extent of potential storm water related effects on refuge marshes is currently unknown and needs to be assessed.

Objective V.A.3: Within three years of CCP approval, work with partners to secure grants to minimize storm water runoff at Outlaw Landing.

*Discussion:* Recent hurricanes have washed out the road leading to the St. Johns River at Outlaw Landing. The gullies continue to erode further, depositing additional sediment into the river with each time it rains.

### *V.B. Water Quality*

Objective V.B.1: Within 10 years of CCP approval, work with the partners to determine and ensure adequate water qualities to support wildlife and habitat objectives of the refuge.

*Discussion:* Adequate water qualities are required by wildlife and plants and need to be maintained on the refuge. Regional land-use changes are likely to result in degradation of water quality on the refuge and steps need to be taken to minimize this trend.

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*Strategies:*

- Within one year of CCP approval, compile all available data on water quality to document baseline conditions. Evaluate the need to implement additional water quality monitoring stations on the refuge to document baseline conditions.
- Within five years of CCP approval, document in a GIS database the location of all culverts on the refuge, and work with qualified engineers and hydrologists to ensure that culverts are properly sized to prevent road washouts and downstream erosion.
- Within the 15-year life of the CCP, consider the use of permeable materials rather than asphalt when planning to upgrade refuge roads.
- Within the 15-year life of the CCP, minimize erosion and sedimentation of streams by ensuring that all existing and any newly constructed ditches, such as those paralleling roads on the refuge, are designed to minimize and dissipate channel flow.

*V.C. Minimum Flows and Levels (MFLs)*

Objective V.C.1: Within two years of CCP approval, work with the regional water rights manager and the Service's Ecological Services' Office to ensure that the MFL in development for the St. Johns River at Lake Monroe, as well as the one recently set for the St. Johns River at State Route 44, are sufficiently protective of refuge resources.

Objective V.C.2: Within two years of CCP approval, work with partners (e.g., SJRWMD, USGS, and The Nature Conservancy) with ecohydrologic expertise to conduct needed hydrologic and water balance studies to determine whether the existing MFLs currently in place are sufficient for protection of Service trust resources.

Objective V.C.3: Upon completion of the above objectives, and if results warrant, work with partners to solicit a review of existing MFLs for water bodies affecting refuge resources.

*Discussion:* More than 30 years ago, the Florida Legislature passed the Water Resources Act of 1972 [Florida Statutes 373.042(1)(a)&(b)]. This Act divided the State into five districts for water management purposes, empowered the water management districts to authorize consumptive use permits, and required them to develop MFLs for surface water bodies and minimum levels of groundwater. These MFLs were intended to represent "the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area" (Beck 2005).

MFLs are developed according to a priority list and schedule available on the SJRWMD website ([www.sjrwmd.com](http://www.sjrwmd.com)), and can be considered when granting consumptive use permits and when determining whether emergency conditions exist for water resources.

Development of MFLs is far from an exact science and may proceed not based on the "ecology of the area", but on standards for human health and safety. The MFL being developed for DeLeon Springs is an example of this. SJRWMD hydrologist Bob Epting explained during the Wildlife and Habitat Management Review for the refuge that the DeLeon Springs MFL, scheduled for completion in 2007, uses "recreation" as the functional value of the springs. This means that the MFL set for the spring must be sufficient to dilute fecal coliform and enterococcus levels below water quality standards. It is not known whether this standard will be sufficiently conservative to protect the refuge and Service trust resources. On the other hand, the SJRWMD usually uses histosols and plant communities as a basis for an MFL. The DeLeon Springs example may be an anomaly due to the fact that it has been developed for swimming and receives heavy human use in the summer.

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MFLs are developed using the best available data. Once established, there is no legislative mandate for regular reviews. However, Mr. Epting stated that the SJRWMD is reviewing all MFLs every five years, and have revised several upon receipt of improved information and/or more explicit guidance regarding methodology. The district will also review an MFL in the case of a specific concern or complaint.

*Strategy:*

- Coordinate with SJRWMD and maintain current on MFLs impacting the St. Johns River in the vicinity of Lake Woodruff NWR.

*V.D. Hydrology*

Objective V.D.1: Within one year of CCP approval, compile all available data on hydrology to document baseline conditions.

Objective V.D.2: Within two years of CCP approval, work with partners and the regional water rights manager to conduct hydrologic and water balance studies to determine current quality, quantity, timing, and distribution of surface and groundwater on the refuge, as well as the impact of existing dikes and canals on the overall drainage system.

*Discussion:* Hydrology describes how water flows through an area, and is a characteristic which helps define the types of vegetation, and consequently, which species of wildlife are likely to be found in the resultant habitat. At Lake Woodruff NWR, water generally moves by means of sheet-flow from the higher uplands towards the St. Johns River floodplain. Understanding and managing the refuge's hydrology will continue to be an important aspect of the refuge's overall management.

*Strategies:*

- Restore sheet-flow to disturbed areas (0.5 - 1 mile per year).
- Within the 15-year life of this CCP, consider the use of permeable materials rather than asphalt when planning to upgrade refuge roads.
- Within five years of CCP approval, document in a GIS database the locations of all dikes and canals on the refuge as a first step toward determining their influence on hydrology and value for Service trust resources.

*V.E. Hydrological Concerns Associated with the Railroad*

Objective V.E.1: Within one year of CCP approval, document the hydrological conditions associated with the railroad and work towards restoring the natural hydrological sheet flow onto the refuge to enhance wildlife and habitat diversity.

*Discussion:* A raised bed railroad track lies adjacent to the majority of the refuge's eastern boundary within the Eastside and Volusia Tract compartments. Based upon topography and soils of the area, the railroad bed imposes a significant impact on the natural hydrology of the area by restricting natural stream and sheet flow from the DeLand Ridge to the St. Johns River floodplain. In order to accommodate drainage of the ridge, the rail company has installed a series of culverts under the rail line and constructed drainage ditches that redirect water to the culverts. The culverts concentrate water flow and direct it onto refuge lands. In some instances the high volume of drainage waters has impacted refuge habitats by causing serious erosion and altering the hydrology of the area. The refuge owns three parcels of land on the eastern side of the tracks, totaling approximately 40 acres,

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which are separated from the main refuge land mass by the rail bed. Although the exact location of these parcels is not currently known, the refuge does know close approximations of these parcels. The majority of the lands where these parcels are located are wetlands that are directly impacted by the drainage system installed by the rail line company.

An emergency repair was made to the CSX railroad in December 2005, as a result of rainfall from two hurricanes and a winter precipitation event. An apparently undersized culvert created a backwater situation upstream of the railroad, resulting in pressurized flow and erosion immediately around the culvert, eventually degrading the rail bed. The rail bed was repaired, the original culvert was replaced by two 48-inch culverts, and riprap was placed from the outflow to approximately 60 feet downstream of the culvert. While this solved the immediate requirement of train passage, it should be considered a temporary solution. Riprap will reduce water velocities in the short term, and sediments will deposit in the channel. However, high flows will slowly move the riprap downstream and toward the deepest part of the channel, allowing more rapid erosion of the underlying sandy soil. An alternative solution that would reduce erosion and minimize habitat degradation would be to replace the riprap with large stone structures to dissipate energy, and then distribute the flow downstream of the structures to restore sheet flow to the greatest extent practicable.

*Strategies:*

- Locate and post refuge owned parcels on the eastern side of the railroad track. Once boundaries are established, conduct wildlife/vegetative surveys to determine appropriate management course.
- Within one year of CCP approval, establish photo plots upstream, at the culverts, and to 200 feet downstream of culverts that are suspected of impacting refuge lands, including the culverts replaced in January 2006 by CSX. Repeat the photo plots after every large rain event, or at a minimum, before and after the rainy season to document changes.
- If erosion occurs on the refuge, work with CSX and the regional refuge ecologist to improve the drainage system to an appropriate design that minimizes erosion, encourages sheet flow, and improves aquatic habitat as appropriate.

**RESOURCE PROTECTION**

Resource protection goals address the acquisition boundary, conservation focus areas, and archaeological and historical resources.

**GOAL I: ACQUISITION BOUNDARY**

Develop appropriate cooperative management agreements for the state-owned navigable waters and document the extent of the refuge boundary.

*Discussion:* A land status map is provided in Figure 9. Dominant state-owned navigable waters include all the navigable waters within the refuge boundary and an area of the Lake George State Forest. Although protected by the State, these are technically inholdings within the refuge's acquisition boundary in that they are not owned or otherwise managed by the Service.

*I.A. State-Owned Navigable Waters*

Objective I.A.1: Within five years of CCP approval, develop appropriate cooperative management agreements with the State of Florida for the navigable waterways within the refuge's approved acquisition boundary.

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*Discussion:* A large component of the refuge consists of navigable waters (e.g., Lake Woodruff) which are state-owned and managed. These waters provide habitat for many wildlife species, including listed species and a variety of water birds. Public use of the navigable waters includes fishing, waterfowl and alligator hunting, and motor-boating. Current management includes State law enforcement, aquatic weed control by USACE, and water level and quality monitoring by SJRWMD. It would be in the interest of the refuge to develop specific cooperative management agreements with the State for these areas to enhance protection of these resources and to enable improved management for these waterways and the adjacent Service properties.

### *I. B. Acquisition Boundary*

Objective I.B.1: Within five years of CCP approval, survey to determine locations of Service-owned properties within the acquisition boundary.

*Discussion:* The status of several properties along the railroad is uncertain. A survey needs to be performed to determine proper ownership and rights-of way so that possible administrative corrections can be implemented.

#### *Strategies:*

- Once located, and if determined to be within the refuge acquisition boundary, conduct an administrative correction and evaluate wildlife and habitat values of the properties east of the railroad.
- Work with Volusia County to determine if any rights-of-way exist on the refuge and work to abandon as appropriate (including Audubon Road and Outlaw Landing).

## **GOAL II: CONSERVATION FOCUS AREAS**

Work to protect important habitats and wildlife corridors connecting the refuge to nearby conservation areas.

Objective II.A.1: Within the 15-year life of the CCP, document important habitats and wildlife corridors connecting the refuge to nearby conservation areas, and work with partners to protect these areas.

*Discussion:* An important conservation strategy is incorporating buffer zones, wildlife corridors, and other protected lands into a regional network of managed lands. Partners have expressed interest in acquiring land (e.g., Volusia Forever) near the refuge. These lands would help protect the refuge from the undesirable urban edge that is rapidly expanding along the eastern boundary. In addition, these lands would function as wildlife corridors for wide-ranging species, such as Florida black bears and bobcats. They would also provide additional protected areas for migratory birds and other priority species.

## **GOAL III: LEASE/MANAGEMENT AGREEMENTS**

Manage Farm Service Agency easements to protect characteristic habitats and wildlife of these sites.

Objective III.A.1: Within the 15-year life of the CCP, manage the Farm Service Agency easements to protect and to conserve the wetland characteristics for the benefit of migratory birds and waterfowl, primarily wood ducks.

*Discussion:* Lake Woodruff NWR has the designated responsibility of managing three conservation easement properties totaling nearly 660 acres in Flagler and Putnam Counties, Florida (Figure 2). One easement, a 52.2-acre forested wetland, is part of a 97-acre property located off Highway 207



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near Hastings, Florida, in Section 49, Township 9 South, Range 27 East, Putnam County, Florida. The small wetland lies within a matrix of agricultural fields that are likely to soon be developed. The second easement, known as the Browning Tract, contains 598 acres of forested wetlands and pine uplands, and is located approximately two miles east of San Mateo, Florida. The property lies within sections 23, 24, 25, and 26, Township 11 South, Range 27 East, Putnam County, Florida. The tract is mostly mesic pine flatwoods, with some seasonally flooded wetlands, bay heads, and cypress domes. The mesic flatwoods portions of this easement have been identified as being in need of timber thinning and understory burning in order to maintain habitat integrity, as well as to reduce hazardous fuels that could contribute to extreme wildfire occurrence. This easement is currently being utilized by the landowner for the harvest of game species. The third easement is 9.5 acres of hydric hardwood forest within a 96-acre parent parcel. It is located within Section 15 of Township 12 South, Range 29 East, Flagler County, and approximately 6.3 miles west of Bunnell, Florida, off of State Highway 302. All easements are administered by the National Wildlife Refuge System under Service, Lake Woodruff NWR, and U.S. authorities. The Refuge System retains the right, at its sole discretion, to manage the easement areas, including the right of ingress and egress to conduct wetlands management, monitoring, and enforcement activities.

*Strategies:*

- The vegetation or hydrology of easement areas will not be altered in any way or by any means or activity on the properties conveyed by the deeds, or property owned or under the control of landowners, including (1) cutting or burning; (2) cultivation; (3) harvesting wood products; (4) burning; (5) placing of refuse, wastes, sewage, or other debris; (6) draining, dredging, channeling, filling, discing, pumping, diking, impounding and related activities; or (7) diverting or affecting the natural flow of surface or underground waters into, within, and out of the easement areas. The above conditions are subject to the discretion of the easement manager (i.e., refuge manager) and can be put into effect or not, depending on the needs of the habitat enhancement operations.
- Reevaluate all current public use activities and permits to confirm compatibility.
- Evaluate appropriateness and compatibility prior to permitting public use activities on any portion of the conservation easements.

**GOAL IV: ARCHAEOLOGICAL AND CULTURAL RESOURCES**

Identify and protect the archaeological and historical resources of the refuge that represent over 10,000 years of history.

Objective IV.A.1: Within the 15-year life of the CCP, work with the Service's Regional Archaeologist and the State Historic Preservation Office and coordinate with the partners, especially DeLeon Springs State Park, St. George State Forest, and Ocala National Forest, to identify and protect the archaeological and historical resources of the refuge.

*Discussion:* Past practices have shaped the landscape and its resources, influencing today's management. Cultural resources of the refuge and the area date back to 8,000 B.C. Shell middens and mounds comprise the majority of the archaeological resources found on the refuge. More recent cultural resources date to the Spaniards and the 1580s. Ponce DeLeon supposedly found the Fountain of Youth in Florida and nearby DeLeon Springs is named after him. The Spaniards began developing the area for sugarcane production, which began the conversion of the landscape. Later, grazing cattle and producing citrus spread to the area and were conducted in the 1800s on Jones Island. On Jones and Tick islands, oak and cypress were substantially harvested prior to the 1900s. Around 1924, this area became popular for tourism and for residential use. Lake Woodruff is actually named after Major Joseph Woodruff, who came to the area during the 1800s and settled in the Spring

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Garden area. The area was later developed again for agricultural uses. A dike system was constructed, along with large pumps, 2,400 gallons per minute (gpm), in an attempt to drain the East Marsh area. The attempt was aborted, but some of these dikes remain, influencing Lake Woodruff and the surrounding marshes.

Cultural resources on Tick Island were mined before and after refuge acquisition, since these rights were reserved. This dramatically altered the cultural resources on the island.

*Strategies:*

- Conduct complete archaeological survey.
- Develop a regular patrol and enforcement program.

**GOAL V: RAILROAD**

Ensure safe and perpetual access onto the refuge in relation to railroad crossings.

Objective V.A.1: Within two years of CCP approval, work with partners and the railroad to develop safe and perpetual public and Service access to the refuge.

*Discussion:* The Mud Lake Road railroad crossing currently does not have a crossing gate, which makes this a potentially unsafe crossing. The refuge is pursuing funding and is coordinating with partners to make this crossing safer. In addition to being a potential danger to humans, the railroad creates a hazard to wildlife crossing the tracks (i.e., gopher tortoises and other animals are occasionally killed). This is a high priority action for the partners, Service, and railroad to address.

*Strategies:*

- Continue to pursue funding and coordinate with partners to install railroad crossing safety equipment.
- Work with partners to protect wildlife movement throughout the railroad right-of-way.
- Survey the eastern refuge boundary along the CSX railroad tract.
- Accurately post the refuge boundary along the CSX railroad tract.
- Establish a cooperative agreement with CSX to ensure continued access to the refuge.
- Establish and maintain a firebreak along the refuge's eastern boundary.
- Coordinate enforcement activities with CSX to address illegal public activities that occur along the railroad tracks.
- Eliminate the north/south road within the Eastside Unit (to decrease fragmentation and hydrology impacts).

**GOAL VI: ACCESS**

Continue to provide reliable public access onto the refuge.

*VI.A. Eastern Boundary*

Objective VI.A.1: Within the 15-year life of the CCP, determine the need and potential for at least one additional public access point onto the refuge along the eastern boundary.

*Discussion:* Access to the refuge is limited due to its location along the St. Johns River. Currently, public access is only via Mud Lake Road, along the eastern border of the refuge (most of which runs alongside a railroad track). A future increase in the regional population and correspondingly higher

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refuge visitation may require additional access points for the public onto the refuge. Increased Service access points may also be required for management purposes.

*Strategies:*

- Continue current projects to establish a fire-break and service road (~4.5 miles).
- Investigate the need for at least one additional access point along the eastern boundary, including a new railroad crossing.
- Evaluate the feasibility and need to develop/design a mass transit system to shuttle visitors in/out of the refuge.

*VI.B. Mud Lake Road Access*

Objective VI.B.1: Within five years of CCP approval, work with landowners and partners to improve the Mud Lake Road access.

*Discussion:* Mud Lake Road was the historic access to this area predating the establishment of the refuge. It is the primary public access onto the refuge. The section of Mud Lake Road which leads onto the refuge is not paved, is very narrow, and is privately owned. Heavy rains create gullies and washouts, and cars heading in opposite directions along this stretch of the road need to make way for each other in order to pass safely. There is no sidewalk for pedestrians or wheelchairs. Improvements to this section of Mud Lake Road would provide more reliable and safer access onto the refuge.

*Strategies:*

- Continue to coordinate with CSX, Volusia County, and adjacent landowners to maintain the existing easement road.
- Monitor public and Service usage.
- Work with the landowners and partners to improve roadway conditions.
- Continue to work towards the Minor Expansion Proposal (MEP) expanding land boundaries onto Mud Lake Road to allow for road improvements/expansion.

*VI.C. Outlaw Landing Access*

Objective VI.C.1: Within five years of CCP approval, work with partners to close vehicular access to the St. Johns River at Outlaw Landing and develop a foot-traffic only trail.

*Discussion:* Outlaw Landing provides river access close to the refuge. Previous hurricanes washed out the dirt road leading to the river, and erosion and the resultant runoff now enter the river. In addition, deep gullies make the site unsafe for vehicular access. The refuge would work with Volusia County to permanently close and abandon this portion of the road to vehicular traffic (including ATVs) and develop nearby recreational access and parking.

*VISITOR SERVICES*

Visitor services goals include welcome and orientation of visitors; hunting; fishing; wildlife observation; wildlife photography; environmental education and interpretation; other recreational opportunities; friends group; volunteer programs; and litter.

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## **GOAL I: VISITOR WELCOME AND ORIENTATION**

The visiting public will feel welcome and find accurate, timely, and appropriate orientation material and information on visitor facilities, programs, and management activities.

### *I.A. Public Information*

Objective I.A.1: Within five years of CCP approval, increase public information and focus the messages on wildlife and habitat diversity.

#### *Strategies:*

- Continue to maintain six kiosks, the visitor contact station, and website, and provide brochures and maps.
- Alter messages to focus on wildlife and habitat diversity.
- Work with partners to add directional and entrance signs (within two years of plan adoption).
- Develop an informational video for the visitor contact station at the refuge's headquarters building.

## **GOAL II: HUNTING**

Hunters will enjoy quality hunting experiences that lead to support for refuge management activities.

*Discussion:* Various units on the refuge provide good habitat for game species such as white-tailed deer and turkey. Achievement of habitat and population management objectives is essential to providing quality hunting opportunities. Reviewing and updating the refuge's Hunt Plan based on recorded biological data is essential to the continuation and expansion of hunting on the refuge. There is currently no hunting for turkey on the refuge. A well-developed hunt program will enable land managers to control population levels, make use of a renewable resource, and provide opportunities for traditional, quality wildlife-dependent recreation activities that will not impact non-game wildlife populations. As of the writing of this CCP, FWC is monitoring for Chronic Wasting Disease and exotic tick infestations. Monitoring is expected to change as different diseases and problems begin to threaten to occur or do occur in Florida. The current Hunt Plan will need to be updated.

### *II.A. Turkey Hunting Opportunities*

Objective II.A.1: Within five years of CCP approval, evaluate the potential to establish turkey hunting opportunities.

*Discussion:* The refuge has been working with the State of Florida and the Wild Turkey Federation to monitor the population status of turkey on the refuge in order to determine the feasibility of establishing a turkey hunt.

#### *Strategy:*

- Continue bi-annual turkey surveys (January and February) to determine population status and trends.

### *II.B. Deer Hunting Opportunities*

Objective II.B.1: Within five years of CCP approval, work with FWC to evaluate the refuge's deer population and health status to set harvest quotas.

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*Discussion:* There are currently 11,000 acres open to deer hunting. Deer hunting opportunities consist of a managed quota hunt which includes two nine-day archery seasons (100 hunters each) and one nine-day primitive gun hunt (100 hunters). Annual deer surveys help determine deer population status and trends.

*Strategies:*

- Update the refuge's Hunt Plan.
- Evaluate deer population for disease issues.
- Provide FWC with deer samples (e.g., head) for disease research coordination.
- Institute cooperative State/refuge hunt regulation and enforcement meetings on an annual basis.
- Estimate the refuge's deer population at the Volusia Tract and on Jones and Tick Islands.
- Establish periodic hunter take check stations or volunteer take reports.
- Close the deer hunt areas to all other users during hunt days.
- Adjust hunting as adverse impacts are experienced by deer, other wildlife, and/or habitats.
- Consider additional alternative control measures, if needed.

**GOAL III: FISHING**

Members of the fishing public will enjoy quality fishing experiences, display ethical behavior, and support refuge management.

*III.A. Fishing Opportunities*

Objective III.A.1: Throughout the life of the CCP, continue to provide quality fishing opportunities consistent with sound biological principles.

*Discussion:* Fishing for largemouth bass, bream, and catfish is excellent and extremely popular among anglers. Bank fishing is a popular activity throughout the refuge's impoundment areas. These impoundments are managed and maintained for multi-species management objectives of the refuge to conserve, improve, and create habitat primarily for migratory birds and waterfowl.

*Strategies:*

- Open navigable refuge waters to boat and bank fishing throughout the Mud Lake Road area year-round consistent with other objectives of this CCP. Fishing will be permitted in accordance with the State of Florida's regulations and licensing requirements.
- In consultation with county, State, and Federal partners, revise and update the refuge's Fishery Management Plan (which expired in 1995) to provide a quality fishing experience.
- Periodically monitor fishing impacts on migratory birds, waterfowl, and threatened and endangered species.
- Evaluate the need for and location of a public boat ramp.
- Maintain and update the fish species list after all fishery investigations are completed.
- Estimate the number of visits and hours spent at the refuge for the purpose of recreational fishing.
- Partner with Welaka National Fish Hatchery and Florida Fish and Wildlife Conservation Commission to mark/tag all fish stocked into refuge impoundments in order to determine their contribution to the wild stock and to the public use program.
- Monitor fish populations by implementing standard sampling techniques, keeping records of public use activities, and conducting creel census when possible.
- Maintain signs directing the public to open fishing areas.

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- Consider the feasibility of hosting fishing events that will offer fishing to groups that might not otherwise have such an opportunity (e.g., National Fishing Week and Take-A-Kid Fishing events).
  - Investigate the possibility of improving fishing access for the handicapped.
  - Keep brochure of maps and fishing regulations available to the public and up-to-date.
  - Update the brochure which provides a list of fish species occurring on the refuge according to the American Fisheries Society Special Publication 29 (Nelson et al., 2004).
  - Continue to use the refuge news release program to inform the public of fishing regulations, refuge policies, and special events.
  - Continue to provide and maintain fishing access areas along canals.
  - Consider the development of a public-based exotic fish control program.

### *III.B. Minimizing Disturbance Caused by Fishing Activities*

Objective III.B.1: Within two years of CCP approval, develop cooperative agreements with the State of Florida to implement any needed closures within the navigable waterways on the refuge to minimize wildlife disturbance.

*Discussion:* Fishing should not have any adverse impacts on the fishery resources, wildlife resources, endangered species, or other natural resources on the refuge. A pre-migratory roost site for swallow-tailed kites is located along a popular navigable waterway frequented by fisherman. If disturbances at this or any other roost/rookery sites are identified as a problem in future years, closed areas will be established at such times as to eliminate this concern. Such closed areas might include buffer areas around roost or rookery sites that are closed when the birds are present (e.g., an hour before dusk to an hour after dawn). A majority of the navigable waterways on the refuge is regulated by the State of Florida as manatee protection zones. If fishing activities are determined to harass manatees, disturbed areas may need to be seasonally closed. If at any time bank fishing is found to cause disturbance to migratory birds; waterfowl; and/or rare, threatened, and endangered species, needed closures of such areas where the disturbance occurs will be set. The refuge would coordinate with the State of Florida to implement any closures within the navigable waterways.

## **GOAL IV: WILDLIFE OBSERVATION AND PHOTOGRAPHY**

Wildlife observers and photographers of all abilities will enjoy and value the diversity of refuge wildlife and will support efforts to maintain high quality habitat on the refuge.

### *IV.A. Wildlife Observation and Photography Opportunities*

Objective IV.A.1: Within the 15-year life of the CCP, work to increase wildlife photography and observation opportunities by adding new photo-blinds, boardwalks, and hiking and canoeing trails.

#### *Strategy:*

- Maintain and enhance observation sites to attract wildlife.

### *IV.B. Limit Disturbance to Wildlife by Photographers and Observers*

Objective IV.B.1: Within two years of CCP approval, develop cooperative agreements with the State of Florida to implement any needed closures within the navigable waterways on the refuge to minimize wildlife disturbance.

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*Discussion:* Wildlife photography and observation activities should not have any adverse impacts on the wildlife, endangered species, or other natural resources on the refuge. A pre-migratory roost site for swallow-tailed kites is located along a popular navigable waterway. If disturbances at this or any other roost/rookery sites are identified as a problem in future years, closed areas will be established at such times as to eliminate this concern. Such closed areas might include buffer areas around roost or rookery sites that are closed when the birds are present (e.g., an hour before dusk to an hour after dawn). A majority of the navigable waterways on the refuge is regulated by the State of Florida as manatee protection zones. If photography and observation activities are determined to harass manatees, disturbed areas may need to be seasonally closed. In addition, if at any time photography and observation activities are found to cause disturbance to migratory birds; waterfowl; and/or rare, threatened, or endangered species, needed closures of such areas where the disturbance occurs will be set. The refuge would coordinate with the State of Florida to implement any closures within the navigable waterways on the refuge.

#### *IV.C. Spring-to-Spring Trail Extension*

Objective IV.C.1: Within five years of CCP approval, investigate the potential to extend the Spring-to-Spring Trail as part of the Florida Trail System through the refuge.

*Discussion:* The Florida Trail System includes a network of trails which connect several natural springs. Many of the major Florida springs are within conservation areas, and further providing connectivity (i.e., through portions of the refuge) would increase the recreational value of the trail system and create potential wildlife corridors.

#### *Strategies:*

- Work with partners and regional landowners to determine the feasibility of extending the Spring-to-Spring Trail through the refuge.
- If connection to the Florida Trail System is determined to be feasible, then evaluate possible routes through the refuge.

### **GOAL V: ENVIRONMENTAL EDUCATION AND INTERPRETATION**

Provide quality, appropriate, and compatible wildlife-dependent environmental education and interpretation opportunities to promote understanding and awareness of the value of the refuge, its natural resources, its role in the landscape, and the human influences on ecosystems.

#### *V.A. Environmental Education Opportunities*

Objective V.A.1: Within five years of CCP approval, develop an environmental education program and train 10 teachers, 10 volunteers, and refuge staff to conduct these programs.

*Discussion:* Environmental education is a cost-effective way of educating the public about the role and importance of the refuge in the landscape. It helps highlight the public's potential role in conservation, while instilling in people the value of minimizing negative human influences on the natural world.

#### *Strategies:*

- Develop on- and off-site curriculum-based educational programs with messages focused on the role and importance of the refuge in the landscape and on the minimization of human impacts.

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- Hire a full-time environmental education/outreach/interpretation park ranger. If a full-time position is not feasible within the first five years, coordinate with other refuges in the Refuge Complex for existing public use staff to develop this program with the five-year time frame.
  - Develop and conduct outdoor classroom activities.
  - Manage the refuge's website from the refuge to improve information provided (e.g., use staff or a volunteer to maintain the refuge's website).
  - Disseminate refuge brochures and environmental education materials.
  - Develop bilingual education materials.
  - Train staff, volunteers, and teachers to conduct on- and off-site educational programs.
  - Develop lesson plans and train local teachers to use the refuge as an outdoor classroom.

#### *V.B. Interpretive Programs*

Objective V.B.1: Within 10 years of CCP approval, develop an interpretive program and train teachers, volunteers, tour operators, and staff to conduct these programs.

*Discussion:* Interpretive programs are aimed at helping the public to understand its potential role in conservation and instilling in people the value of minimizing negative human influences on the natural world.

#### *Strategies:*

- Develop on- and off-site curriculum-based interpretive programs with messages focused on the role and importance of the refuge in the landscape and the minimization of human impacts.
- Hire a full-time environmental education/outreach/interpretation park ranger. If a full-time position is not feasible within the first five years, coordinate with other refuges in the Refuge Complex for existing public use staff to develop this program with the five-year time frame.
- Manage the refuge website from the refuge to improve information provided.
- Disseminate interpretive materials.
- Make inclusion of interpretive messages into eco-tour programs part of the special use permit conditions.
- Develop bilingual environmental interpretation materials.
- Train staff, volunteers, and teachers to conduct on- and off-site interpretive programs.

#### *V.C. Number of Interpretive Trails*

Objective V.C.1: Within five years of CCP approval, evaluate the potential to add at least one hiking trail and one canoeing trail to the refuge.

*Discussion:* The Myacca Trail is currently the only interpretive hiking trail on the refuge. With an expected increase in visitation over the next 15 years, adding an additional hiking trail would help ease traffic on the existing trail. In addition, the many refuge waterways offer a relatively untapped resource for canoeing and kayaking. Consider a canoe/kayak launch at Outlaw Landing and a self-guided paddling trail along the Norris Dead River.

#### *Strategies:*

- Determine the most suitable potential land trail options based on habitat types, minimal disturbances to listed species, access, and potential visitor experience.
- Determine the most suitable potential canoe/kayak trail options based on habitat types, minimal disturbances to listed species, access, and potential visitor experience.



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## **GOAL VI: OTHER RECREATIONAL OPPORTUNITIES**

All public use activities will be appropriate and compatible and visitors will support priority public use activities that minimize wildlife and habitat disturbance.

### *VI.A. Horseback Riding*

Objective VI.A.1: Within one year of CCP approval, limit horseback riding on the refuge to specially designated trails on the Volusia Tract and require a refuge special use permit for this activity.

*Discussion:* Although horseback riding is not one of the priority public uses for refuges, it facilitates wildlife observation in certain areas of the refuge. Potential negative impacts of horseback riding include conflicts between priority public uses and horseback riding, the potential to spread exotic plant species and possibly diseases, erosion, and the growth of undesirable vegetation. None of these effects has been documented on the refuge. It is believed that when carefully controlled and limited to specially designated areas, horseback riding will not result in negative impacts to the refuge. If negative impacts are experienced, the refuge will modify or eliminate the use as appropriate.

#### *Strategies:*

- Create a brochure outlining ways to limit the negative effects of horseback riding on the refuge.
- Position signs at strategic points on the Volusia Tract informing the public of the refuge's policies regarding horseback riding.
- Add information on limiting the negative effects of horseback riding to the refuge's website.
- Require a refuge special use permit for all horseback riding activities. These permits will contain conditions under which these activities must operate to ensure compatibility. A permit will be revoked if the permittee does not conform to the permit requirements. These special use permits are to be issued for a period of time not to exceed one year, where all permits expire on September 30 of the applicable fiscal year.

### *VI.B. Guided Tours*

Objective VI.B.1: Within one year of CCP approval, require that all guided tours operating on the refuge to include interpretive messages in their programs.

*Discussion:* Guided tours occur on the refuge and navigable waters, but only those operations occurring on the refuge require special use permits, which are issued by the Service. (Currently, the navigable waterways on the refuge are managed by the State of Florida and are not under refuge management. So, tour operations only occurring in these waters today are not required to carry a refuge special use permit. However, the CCP proposes that the Service enter into a management agreement with the State of Florida to provide for refuge management of these waterways in the future. At that time, tour operations occurring in these waters would be required to also obtain a refuge special use permit.) A condition of the permit would be to require tour operators to include interpretive messages in their programs. These messages should focus on the role of the refuge in the landscape and the minimization of human impacts. Once informational materials are prepared, the refuge would provide these to the tour operators to use voluntarily, while refuge special use permits are not required.

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*Strategies:*

- Create informational materials that tour guide operators can use in their programs.
- Train tour operators on the conservation importance of protecting wildlife and habitat.

*VI.C. Bicycling and Jogging*

Objective VI.C.1: Within three years of CCP approval, work with partners to monitor these activities and determine the potential effects of bicycling and jogging on wildlife, and modify or eliminate one or both activities if negative impacts are determined.

*Discussion:* Bicycling and jogging are not priority public uses, although they can be used in conjunction with wildlife observation. Most of these activities take place on the levee roads surrounding the impoundments. Although the extent to which these activities are carried out on the refuge has not been quantified, it is believed to be low. However, with increasing urbanization near the refuge, these activities may increase with potentially negative effects (Appendix F, Compatibility Determinations). In order to protect its resources, the refuge would work with the partners to first determine how much of these activities take place on the refuge, especially during the migratory seasons. Next, the refuge would collaborate with partners to study the effects of these activities on migratory birds to determine their effects and take protective action as needed. To limit impacts, these uses may be modified, including limiting their use seasonally, limiting them to certain areas, closing key areas (e.g., a closed area buffer around areas used by whooping cranes and chicks), relocating these uses to less sensitive areas, or shielding these uses through vegetative buffers. Otherwise, these uses may be eliminated.

**GOAL VII: OUTREACH**

Through increased outreach activities, the refuge will be locally recognized and its purposes supported.

Objective VII.1: Within five years of CCP approval, at least 50 percent of regularly sampled local residents will be able to recognize the location of the refuge and will understand the importance of the refuge to wildlife and habitat diversity.

*Discussion:* Residents of DeLand and DeLeon Springs and residents within a 20-mile radius of the refuge are likely to have the greatest potential impact on the refuge through their activities and land uses. Currently, few of these residents are aware of the refuge or know what activities are permitted on the refuge. The refuge and the resources will benefit if more local area residents become aware of the refuge and understand its conservation goals and objectives.

*Strategies:*

- Expand outreach programs via the media, website, and conservation groups.
- Create sampling protocols and data sheets for surveys.
- Work with the friends group and volunteers to assist in sampling efforts.
- Work with adjacent and nearby homeowners' associations to increase awareness of and support for the refuge.

**GOAL VIII: FRIENDS OF LAKE WOODRUFF NWR**

Friends of Lake Woodruff NWR will be an advocate for the refuge, supporting all refuge goals and objectives and providing financial and in-kind support for refuge programs.

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Objective VIII.1: Within the 15-year life of the CCP, the refuge will continue to maintain a close working relationship with the Friends of Lake Woodruff NWR, assisting in promoting the growth in membership and financial revenues, providing guidance on refuge needs, and working to align interests.

*Strategies:*

- Maintain a staff liaison to the Friends of Lake Woodruff National Wildlife Refuge.
- Provide office space and use of office equipment to Friends volunteers over the life of this Plan.
- Encourage involvement in diverse volunteer activities that match volunteer interests.
- Participate in off-site community events.
- Train Friend's members to routinely assist with monitoring public use activities and conducting wildlife surveys on the refuge.
- Communicate frequently with Friend's members so that they are able to promote refuge activities, goals, and objectives throughout the local community.

**GOAL IX: VOLUNTEERS**

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

*IX.A. Use of Volunteers*

Objective IX.A.1: Within 10 years of CCP approval, at least 75 percent of needed volunteer positions will be filled and each individual will receive adequate training to proficiently perform assigned duties with minimal supervision.

*Strategies:*

- Install utility hookups and stable foundations to accommodate four full-sized motor coaches/recreational vehicles for refuge volunteers.
- Actively recruit resident volunteers and interns.
- Develop a volunteer program that consists of resident and local volunteers and interns who each complete a minimum of 120 hours per month for assistance with refuge programs.
- Provide in-depth initial training to refuge volunteers that will enable them to effectively and efficiently complete projects and responsibilities.
- Encourage involvement in diverse volunteer activities that match volunteer interests.
- Train volunteers to provide tours or lessons for visiting school groups.

**GOAL X: LITTER**

The landscape will be free of litter and visitors will report how clean the refuge appears.

*X.A. Control of Trash and Litter*

Objective X.A.1: Within two years of CCP approval, assess the amount of litter on the refuge and develop a phased approach to address litter problems and to change user behavior.

*Discussion:* Trash and litter are unsightly and may cause problems for wildlife in both terrestrial and aquatic environments. Plastic bags can be ingested by larger species, causing suffocation or fatal intestinal blockage. Bottles can cause entrapment of small animals and invertebrates. Six-pack rings and other plastic strapping materials can cause entanglement of birds and other wildlife, leading to amputation or death. Further, most visitors will unfavorably rate their experiences if they experience high levels of trash and litter.

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*Strategies:*

- Increase the number of organized clean-ups through coordination with area service groups and schools.
- Ensure that the refuge, including its waterways, is included in area clean-up projects.

*X.B. Monofilament Fishing Line*

Objective X.B.1: Within two years of CCP approval, implement a monofilament line recycling program to help decrease its presence on the refuge.

*Discussion:* Improperly and illegally discarded monofilament fishing line can cause entanglement and death in many species of fish and wildlife, including threatened and endangered species. Monofilament line degrades slowly and can cause environmental problems for months or years, repeatedly maiming or killing wildlife. It has serious, long-term, negative impacts and needs to be minimized or eliminated on the refuge.

*Strategies:*

- Install monofilament line recycling containers in strategic locations near fishing areas.
- Develop and distribute interpretive materials to educate the public on the dangerous effects of discarded monofilament line on wildlife.

**GOAL XI: FEE PROGRAM**

Provide a fully supported, quality, wildlife-dependent visitor services' program.

*XI.A. Fee Program*

Objective XI.A.1: Within one year of CCP approval, the refuge will evaluate the feasibility of implementing a fee system to enhance visitor services and the visitor experience.

*Discussion:* Fees help maintain refuge visitor facilities and help offset some portion of the operating costs for various programs. Within the first year of CCP approval, the refuge will determine the feasibility of a fee schedule for various programs. If it is determined to be feasible, the refuge will implement fees for various visitor activities.

**REFUGE ADMINISTRATION**

Refuge administration includes infrastructure, staffing, and intergovernmental coordination.

**GOAL I: REFUGE MANAGEMENT**

Provide sufficient refuge infrastructure and staff, and collaborate with intergovernmental partners to implement a comprehensive refuge management program to protect and manage the natural and cultural values of the refuge's wildlife and habitats.

*I.A. Administrative Facilities, Utilities, Equipment, and Signs*

Objective I.A.1: Within one year of CCP approval, focus repairs and/or new administrative facilities, utilities, equipment, and signs on those needed to support management activities that enhance wildlife and habitat diversity.

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*Strategies:*

- Deferred maintenance priorities and Asset Priority Index (API) percentages will be reevaluated to reflect a wildlife and habitat diversity management focus.
- Service Asset Maintenance Management System (SAMMS) project descriptions will be changed to reflect and support the management priorities of the refuge.

*I.B. Unwanted Wildland Fire*

Objective I.B.1: Throughout the life of the CCP, continue to suppress 95 percent of all unwanted wildland fires occurring on the refuge within the first 24 hours to protect refuge resources and facilities and to provide for health and safety of refuge staff, visitors, and adjacent properties.

*Discussion:* The refuge is directed by the 2001 Federal Wildland Fire Management Policy, the Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy, and Fish and Wildlife Service Manual 6RM7 to suppress all unwanted wildland fires that ignite within the boundaries of the refuge through the use of appropriate management response. These policies also state that the refuge shall prepare and implement a fire management plan that encompasses all fire management activities on the refuge including prescribed fire, wildfire suppression, memorandums of understanding, and annual operating plans with cooperators. The refuge works with the Florida Division of Forestry under a Statewide Memorandum of Understanding signed between the Service and the Division of Forestry. The refuge works with the Ocala National Forest under a National Memorandum of Understanding signed between the Service and the USDA Forest Service. There are also local annual operating plans between these agencies and the refuge that are signed between the local agency offices. The refuge has annual operating plans (AOPs) between the Florida Division of Forestry, districts 10 and 8, and the Ocala National Forest and is developing a memorandum of understanding (MOU)/AOP with Volusia County Fire Service, the city of DeLand, and DeLeon Springs State Park. The refuge also provides assistance to other refuges within the Merritt Island Refuge Complex.

*I.C. Staff*

*Discussion:* The refuge recently decreased its staffing level from eight positions to six. Under the Service's work force planning effort, the existing refuge wildlife specialist (assistant refuge manager) position has been targeted for elimination. Also, the office assistant position has been eliminated following a retirement. The currently approved staff includes a refuge manager, biologist, prescribed fire specialist, two forestry technicians, and an engineering equipment operator (Figure 12). The biologist position has been moved to the headquarters of the Refuge Complex in Titusville, Florida. Increases in visitors to the refuge and additional impacts from an increasingly developing landscape surrounding the refuge necessitate the need for additional staffing resources. Five positions are proposed to be added to further the vision, goals, and objectives outlined in the CCP: law enforcement officer, refuge wildlife specialist (assistant refuge manager, replacing the position already eliminated), maintenance worker, park ranger, and biological science technician. And, the biologist position would be moved from Titusville back to DeLeon Springs. Office administration needs will be addressed at the Refuge Complex Headquarters office at Merritt Island National Wildlife Refuge.

*I.C.1 Law Enforcement Officer*

Objective I.C.1: Within one year of CCP approval, hire a full-time law enforcement officer dedicated to protecting refuge resources and supporting refuge needs, such as maintaining gates, fences, and boundary signs.

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*Discussion:* Due to the demographics of the local community, this should be a bilingual position.

*I.C.2 Refuge Wildlife Specialist (Assistant Refuge Manager)*

Objective I.C.2: Within two years of CCP approval, hire a full-time refuge wildlife specialist.

*I.C.3 Maintenance Worker*

Objective I.C.3: Within three years of CCP approval, add one additional maintenance worker to conduct maintenance and equipment operations on the refuge.

*I.C.4. Park Ranger*

Objective I.C.4: Within three years of CCP approval, add a park ranger to carry out education, interpretation, outreach, and volunteer coordination activities.

*I.C.5 Biological Science Technician*

Objective I.C.5: Within four years of CCP approval, add a biological science technician to conduct biological inventorying and monitoring, to monitor hydrology, and to support the refuge's biological program.

*Discussion:* GIS is an invaluable tool for conservation biology and management. Maintaining databases and maps of priority species, refuge habitats, and other important assets greatly improves decision-making and monitoring processes. The refuge's GIS databases would be coordinated by the biological program.

**GOAL II: INTERGOVERNMENTAL COORDINATION**

Foster a strong and effective working relationship with existing partners and new partners for the purposes of accomplishing refuge management goals and protecting natural and cultural resources of the refuge's habitats.

*Discussion:* Government is required to reinvent itself based on the economic conditions, shifting of national priorities, national defense, and hurricane recovery. The public has an expectation that more of the Service's goals can be accomplished through partnerships and that government must become more efficient. The Director of the Service has stated that the Service must emphasize working cooperatively with others; develop a more integrated approach to problem solving and share resources to get the job done; and make choices and find efficiencies in both resource and business management practices. This focus reinvigorates the refuge's current intergovernmental coordination efforts. Numerous Federal, State, and local agencies could be considered partners of the refuge. However, more could be done to inform and educate the partners of the value of the refuge and the refuge's goals. In the same vein, the Service is willing to help other agencies with issues, such as fire management, nuisance wildlife, exotic plant control, and specific wildlife conservation issues. Much of this coordination could be accomplished through regular meetings and by developing personal relationships with individuals within other agencies.

*II.A. Agreement with State of Florida Regarding Lake Woodruff and other Waterways*

Objective II.A.1: Within five years of CCP approval, work with the State of Florida to develop appropriate cooperative management agreements for all public lands and waters within the refuge's acquisition boundary south of St. George State Forest. This will enable the enforcement of Federal

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fish and wildlife regulations on all lands and waters within the refuge, furthering Service and State goals and objectives at Lake Woodruff NWR.

*Discussion:* Lake Woodruff is actually the heart and namesake of the refuge, but it is not included under refuge management. Nearly 3,200 acres within the refuge's acquisition boundary are not managed as part of the refuge (Figure 9). While some of these lands and waters are within St. George State Forest along the refuge's northern border (which would not be included in the proposed management agreement), the remainder are predominantly the navigable waters of Lake Woodruff, Lake Dexter, Mud Lake, St. Johns River, Norris Dead River, Spring Garden Run, and Tick Island Run, as well as the run south of Norris Dead River between the East, South, and Volusia marshes. A cooperative management agreement between the State of Florida and the Service for these areas would serve both State and Service management goals and objectives, enabling more cohesive refuge management, better coordinated wildlife and habitat management and protection, and better coordinated law enforcement activities.

### *II.B. Evolve the Volusia County Land Managers Meeting*

Objective II.B.1: Within two years of CCP approval, evolve the Volusia County Land Managers Meeting into a fully functional working group to meet the common goals and objectives of the partners.

*Discussion:* The public land managers of Volusia County have been meeting twice a year for the past several years to share upcoming activities and changes within each agency. Some minimal coordination efforts have been accomplished at the meetings. The refuge staff will work with these partners to evolve these meetings into an active cooperative conservation working group.





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## V. PLAN IMPLEMENTATION

### INTRODUCTION

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

This chapter outlines the implementation strategy for the purposes, vision, goals, and objectives contained in the Draft CCP for Lake Woodruff NWR. It covers proposed projects, funding and personnel needs, volunteers, partnerships opportunities, step-down management plans, monitoring and adaptive management, and CCP review and revision.

### PROPOSED PROJECTS

The proposed projects reflect the basic needs identified by Service staff, the public, and the governmental partners for the management of fish and wildlife populations, habitats, cultural resources, land protection, public use, outreach, and environmental education at Lake Woodruff NWR. Among these projects is a list of step-down management plans to be updated or developed. Step-down plans are individual and specific and are the blueprint under which refuges operate. The Service prepares step-down plans in conjunction with the provisions set forth in the National Environmental Policy Act (NEPA) of 1969. Step-down management plans step down from a CCP, providing more detailed information, direction, and guidance.

Annual funding for staff, facilities, operations, and maintenance is an integral part of project implementation. General cost estimates are provided in Table 6. These figures will be updated and adjusted annually. Essential needs are addressed, such as eliminating serious biological threats and problems, meeting National Wildlife Refuge System mission requirements, and fulfilling the purposes for which the refuge was established. There are no assurances that these projects will be either partially or fully funded. However, with the help and cooperation of conservation partners, the Service will use this CCP to focus attention on funding the operations and maintenance needs of the refuge.

For the purpose of achieving the goals and objectives developed for the refuge, the CCP has grouped management strategies into specific projects. The CCP describes 16 projects for development and management. Additional staff will be needed to implement these projects. Partnership agreements that will facilitate project implementation are also discussed.

### WILDLIFE AND HABITAT MANAGEMENT

#### **Project 1. Standardize Surveys and Monitoring Program**

Standardize surveys and monitoring of gopher tortoise, Florida pine snake, American alligator, swallow-tailed kite, limpkin, snail kite, red-cockaded woodpecker, migratory birds (including waterfowl, shorebirds, wading birds, marshbirds, and land birds), mammals, fish, and herpetofauna.

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Systematic surveys based on standardized protocols would be conducted to determine presence and distribution of priority wildlife species and to provide baseline data to assist managers in habitat management practices. A full-time biological science technician would be employed to assist in implementing the monitoring program. Information to be collected is the foundation for implementing the CCP, formulating habitat management, and developing adaptive management strategies for species of conservation concern.

**Wildlife and Habitat Management Objectives:** I.A.1, I.E.2, I.F.1, I.G.1, I.H.1, I.I.1, I.J.1, I.K.1, I.K.2, I.L.1, I.M.1, I.N.1, II.A.2, II.B.2, II.D.2, II.D.4, II.E.3, III.A.1, III.B.1, III.B.2, III.C.1, III.D.1, III.E.1, IV.H.4, IV.L.1, IV.M.1, IV.M.2, V.A.1, V.A.2, V.A.3, V.B.1, V.C.1, V.C.2, V.C.3, V.D.1, V.D.2, V.E.1

**Resource Protection Objectives:** I.B.1, II.A.1, IV.A.1

**Visitor Services' Objectives:** II.A.1, II.B.1

**Refuge Administration Objective:** I.C.5

### **Project 2. Develop GIS**

Build and maintain databases containing biological resources, habitat management activities, and spatial relationships for the refuge and surrounding environments.

A fully implemented geographic information system is not in use at Lake Woodruff NWR. This project would develop an up-to-date data management, storage, and retrieval system; obtain spatial information from appropriate sources; develop geographic layers for refuge management programs; and facilitate spatial analysis and creation of maps by the refuge staff.

**Wildlife and Habitat Management Objectives:** I.A.1, I.E.2, II.C.2, II.D.1, II.D.4, III.A.1, IV.A.1, IV.B.1, IV.C.1, IV.D.1, IV.E.1, IV.F.1, IV.G.1, IV.H.1, IV.I.1, IV.J.1, IV.K.1, V.D.2, V.E.1

**Resource Protection Objectives:** I.B.1, II.A.1, III.A.1, IV.A.1

**Refuge Administration Objective:** I.C.5

### **Project 3. Address Exotic, Invasive, and Nuisance Upland Plants**

Identify, locate, and control (eliminate where possible) non-native upland plants.

Lake Woodruff NWR contains several upland habitats. With encroaching development, invasive plant species are expanding onto refuge lands. Current known locations are along refuge roads and trails, especially along the eastern boundary. Spot treatment is ongoing, but without a comprehensive control plan, these exotic plant species would spread into the refuge interiors, degrading habitat for the several listed species, migratory birds, and a variety of herpetofauna. This project would identify invasive upland plant species, determine their distribution, and treat affected areas using appropriate control measures.

**Wildlife and Habitat Management Objectives:** III.B.1, III.B.2

**Refuge Administration Objective:** I.C.5

### **Project 4. Address Exotic, Invasive, and Nuisance Aquatic Plants**

Identify, locate, and control (eliminate where possible) non-native aquatic plants.

Lake Woodruff NWR contains a variety of aquatic and wetland habitats. Exotic plants already threaten many of these areas in southern portions of the State of Florida, and many of these non-native species are likely to invade the refuge. Certain aquatic weeds, such as hydrilla, already clog some refuge waterways and are treated as needed by the refuge and U.S. Army Corps of Engineers. However, without an integrated control strategy, these exotic plant species would colonize more of the refuge, degrading habitat for the several listed species, migratory birds, and a variety of other

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native wildlife and plants. This project would identify invasive aquatic plant species, determine their distribution, and treat affected areas using appropriate control measures.

**Wildlife and Habitat Management Objective:** III.A.1

**Refuge Administration Objective:** I.C.5

#### **Project 5. Maintain/Restore Upland and Mesic Plant Communities**

Use prescribed fire and other forestry techniques to maintain/restore upland and mesic plant communities.

An expanded prescribed burning program is essential to maintain diverse wildlife habitats and to reduce fuel loads that could lead to devastating wildfires. In order to properly manage a wide array of species, including protected species, such as the gopher tortoise, refuge lands should be burned on a regular schedule and under controlled conditions. Lake Woodruff NWR hosts dozens of bird species throughout the year. Restoring key habitats, through the use of controlled burns, reduces the potential of wildfire, while enhancing habitat for priority migratory birds. Prescribed burning is also an effective tool to minimize the spread of invasive exotic plant species. In addition, mesic habitats need to be managed to maintain their plant diversity and usefulness to certain wildlife. A variety of techniques would be used to maintain hardwood forests on the refuge.

**Wildlife and Habitat Management Objectives:** I.A.2, I.B.1, I.F.1, I.H.1, I.J.1, I.N.1, II.E.1, II.E.3, III.B.1, III.B.2, IV.A.1, IV.B.1, IV.C.1, IV.D.1, IV.E.1, IV.F.1, IV.G.1

**Refuge Administration Objectives:** I.B.1, I.C.5

#### **Project 6. Maintain/Restore Freshwater Marshes**

Use prescribed fire to maintain/restore the refuge's freshwater marshes.

Over 75 percent of Lake Woodruff NWR consists of freshwater marshes, a declining habitat in Florida. An ongoing prescribed burning program has been essential in maintaining this habitat type. In order to properly manage a wide array of species in the future, including rare species such as rails, refuge marshes should be burned on a regular schedule and under controlled conditions. Prescribed burning is also an effective tool to minimize the spread of invasive exotic plant species. One full-time permanent biological science technician would be hired to accomplish this project.

**Wildlife and Habitat Management Objectives:** I.C.1, I.D.1, I.I.1, I.L.1, I.M.1, II.C.1, II.C.2, II.D.1, II.D.3, II.D.4, IV.J.1, V.D.2

**Refuge Administration Objective:** I.C.5

#### **Project 7. Manage Impoundments and Greentree Reservoir**

Use techniques such as prescribed fire and water level manipulation to manage impoundments and greentree reservoir and develop a refuge water level management plan.

Lake Woodruff NWR impoundments are utilized by a large number of waterfowl, wading birds, and shorebirds, as well as other wildlife species. Through prescribed fire, water level manipulation, and other techniques, the refuge would help ensure a variety of wetland conditions in the impoundments and impounded bottomland hardwoods needed by a diverse array of bird and other wildlife species. In addition, water resources in Florida are being diverted and degraded through human uses. Ensuring adequate, clean water is critical for the long-term health of the refuge. Developing a water level management plan for the refuge would help establish a framework for protecting and utilizing this precious resource.

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**Wildlife and Habitat Management Objectives:** I.C.1, I.D.1, I.G.1, I.I.1, I.L.1, I.M.1, II.A.1, II.A.3, II.B.1, II.C.1, II.C.2, II.C.3, II.C.4, IV.H.1, IV.H.2, IV.H.3, IV.H.4, IV.I.1, IV.L.1, V.A.1, V.C.1, V.C.2, V.C.3, V.D.2

**Refuge Administration Objective:** I.C.5

#### *RESOURCE PROTECTION*

#### **Project 8. Protect Refuge Resources and Visitors**

Protect refuge resources and visitors.

Lake Woodruff NWR hosts more than 50,000 visitors annually. In recent years, vandalism, encroachment activities, littering, and other inappropriate or illegal activities have increased due to the remoteness of certain areas of the refuge and the lack of regular law enforcement patrols. The presence of a full-time law enforcement officer would result in improved visitor safety and services. Regular law enforcement patrols would deter vandalism, trespass, loitering, and other activities that disturb wildlife, and address law enforcement situations when they occur.

**Wildlife and Habitat Management Objectives:** I.B.1, I.C.1, I.D.1, I.E.1, I.E.2, II.A.2, II.A.3, II.B.2, II.C.3,

**Resource Protection Objective:** IV.A.1

**Visitor Services' Objectives:** III.B.1, IV.B.1, X.A.1, X.B.1

**Refuge Administration Objective:** I.C.1

#### **Project 9. Conduct Cultural Resource Survey and Develop Protection Plan**

Protect cultural resources through survey and planning.

Lake Woodruff NWR has colorful cultural history, however, only a few sites are known to exist and law enforcement protection is not adequate. This project would provide for the completion of an archaeological and historical resources survey and the development of a protection plan for archaeological and historical resources identified by the survey.

**Resource Protection Objective:** IV.A.1

**Refuge Administration Objective:** I.C.1

#### **Project 10. Address Agreements, Easements, and Conservation Focus Areas**

Develop management agreements for State-owned navigable waters, improve oversight of FSA easements, and document conservation focus areas and wildlife corridors.

Lake Woodruff NWR's navigable waterways (including Lake Woodruff) are an integral part of the refuge, but the refuge does not have cooperative management agreements regarding these areas. This project would aim to develop management agreements for portions of these areas with the State of Florida. In addition, the refuge would obtain more information regarding Farm Service Agency easements and work towards improving management of these lands. Furthermore, the refuge would document conservation focus areas and wildlife corridors in the vicinity of Lake Woodruff NWR and work to build conservation management agreements for these lands.

**Resource Protection Objectives:** I.A.1, II.A.1, III.A.1

**Refuge Administration Objectives:** I.C.2, II.A.1, II.B.1

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**Project 11. Conduct Refuge Survey**

Survey the refuge's boundary, ensure safe railroad crossing, and improve refuge access.

The refuge is in need of an updated acquisition and management boundary survey. The railroad crossing at Mud Lake Road needs safety improvements as it is currently unguarded. The potential for implementing safe wildlife crossings would be evaluated. Mud Lake Road is the only permitted public access point to the refuge. At least one other public access point along the eastern refuge boundary would be investigated.

**Resource Protection Objectives:** I.A.1, I.B.1, VI.A.1, VI.B.1, VI.C.1

*VISITOR SERVICES*

**Project 12. Enhance Hunting and Fishing Opportunities**

Improve or expand hunting and fishing opportunities on the refuge.

Currently, fishing and deer hunting are the only consumptive wildlife-dependent uses permitted on designated areas of the refuge. A turkey hunt would be evaluated. As part of this project, refuge hunting and fishing plans would be updated as part of an overall Visitor Services' Plan. One full-time law enforcement officer would be hired to protect the trust resources.

**Visitor Services Objectives:** II.A.1, II.B.1, III.A.1, III.B.1, X.I.1

**Refuge Administration Objectives:** I.C.1, I.C.5

**Project 13. Increase Outreach and Environmental Education and Interpretation Programs**

Increase outreach and environmental education and interpretation programs.

Lake Woodruff NWR hosts more than 50,000 visitors annually. This project would enable the refuge to employ an outreach and visitor services specialist to reach additional residents, tourists, and school children to explain the refuge's role in the North Florida Ecosystem, as well as ecological threats to the refuge and its resources. This position would improve partnership opportunities and expand educational and interpretive programs by working with the friends group, volunteers, and other organizations and individuals. Refuge resources would be appropriately interpreted and communication with outside audiences via news releases and web media and special events would be coordinated. One full-time park ranger (environmental education, interpretation, and outreach) would be hired to develop education, interpretation, and outreach programs and to train staff and volunteers to run the programs.

**Visitor Services' Objectives:** V.A.1, V.B.1, V.C.1, VI.I.1, VII.I.1, IX.A.1

**Refuge Administration Objective:** I.C.4

**Project 14. Expand Recreational Opportunities**

Increase non-consumptive, wildlife-dependent visitor services.

Lake Woodruff NWR hosts more than 50,000 visitors annually. This project would enable the refuge to expand various wildlife-dependent recreational opportunities, such as wildlife observation and photography, as well as investigate the potential to use certain areas of the refuge to provide connectivity as part of the Spring-to-Spring Trail System. The addition of new hiking and canoeing trails, as well as boat access, would be evaluated.

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**Visitor Services' Objectives:** IV.A.1, IV.B.1, IV.C.1, VI.A.1, VI.B.1  
**Refuge Administration Objectives:** I.C.4, II.B.1

#### *REFUGE ADMINISTRATION*

##### **Project 15. Maintain Facilities and Infrastructure**

Improve maintenance operations and facilities management.

This project would provide a maintenance worker to improve refuge operations and facilities maintenance, including trails, parking lots, kiosks, signs, docks, and water control structures. This position would assist with maintenance of refuge buildings infrastructure and facilities.

**Refuge Administration Objectives:** I.A.1, I.C.3

##### **Project 16. Evolve Volusia County Land Managers Meeting**

Evolve the Volusia County Land Managers Meeting.

Lake Woodruff NWR would work to build the Volusia County Land Managers Meeting into a fully integrated, comprehensive working group to help address local and regional land conservation and use issues, as well as to help address a host of related threats and opportunities for the refuge.

**Resource Protection Objective:** II.A.1

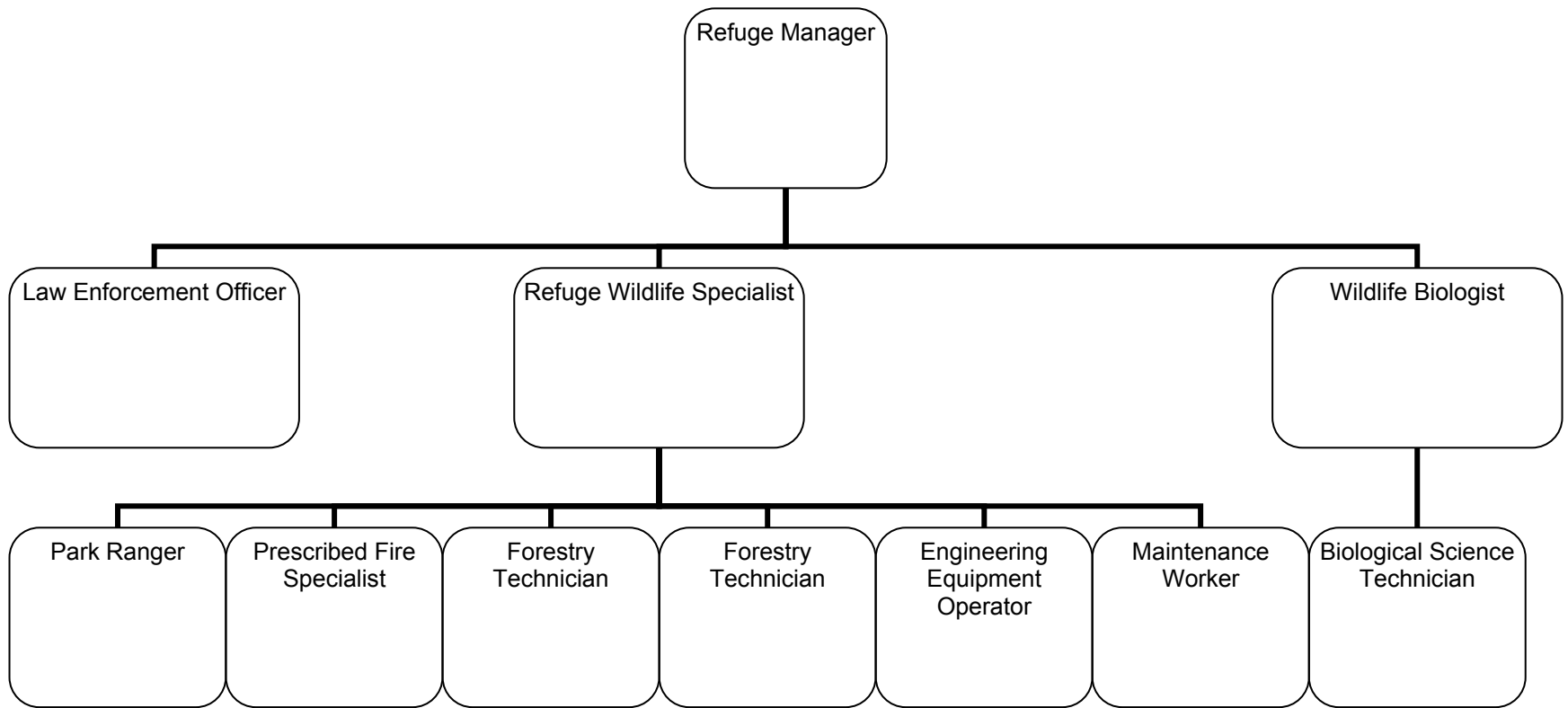
**Refuge Administration Objectives:** I.C.2, II.B.1

#### **FUNDING AND PERSONNEL**

Implementation of this CCP would require increased funding and personnel support that could come from a variety of internal and external sources. New projects are identified in Refuge Operating Needs System (RONS), while maintenance needs for existing facilities and projects are identified through SAMMS. This CCP outlines proposed projects that would require an increase in current budget allocations. The CCP does not constitute a commitment (from Congress) for staffing increases, operational and maintenance increases, or funding for future land acquisition, but provides priorities and direction and represents wildlife resource needs based on sound biological science and input from the public.

According to predictions based on the RONS database, the refuge staff would need to increase from a total of six currently approved positions in Fiscal Year 2008, to a total of 11 within the 15-year life of the CCP (Figure 13). This would also require the relocation of the biologist position for the refuge from the Refuge Complex headquarters office in Titusville back to the refuge in DeLeon Springs. This increase in staff would also necessitate an increase in base funding above standard yearly increases that allow only for inflation.

Figure 13: Lake Woodruff NWR proposed organizational chart



**Table 6: Summary of projects (staff positions indicate partial FTE's - see Figure 13 for proposed staffing level)**

#	PROJECT TITLE	FIRST YEAR COST	RECURRING ANNUAL COST	STAFF
1	Standardize Surveys and Monitoring Program	\$125,000	\$30,000	Biological Science Technician
2	Develop GIS	\$180,000	\$42,000	Biological Science Technician
3	Exotic, Invasive, and Nuisance Upland Plants	\$120,000	\$40,000	Biological Science Technician
4	Address Exotic, Invasive, and Nuisance Aquatic Plants	\$100,000	\$40,000	Biological Science Technician
5	Maintain/Restore Upland and Mesic Plant Communities	\$90,000	\$55,000	Biological Science Technician
6	Maintain/Restore Freshwater Marshes	\$110,000	\$60,000	Biological Science Technician
7	Manage Impoundments and Greentree Reservoir	\$175,000	\$35,000	Biological Science Technician
8	Protect Refuge Resources and Visitors	\$140,000	\$90,000	Law Enforcement Officer
9	Conduct Cultural Resource Survey and Develop Protection Plan	\$75,000	\$31,000	Refuge Wildlife Specialist
10	Address Agreements, Easements, and Conservation Focus Areas	\$79,000	\$34,000	Refuge Wildlife Specialist
11	Conduct Refuge Survey	\$104,000	\$74,000	Refuge Wildlife Specialist
12	Enhance Hunting and Fishing Opportunities	\$145,000	\$95,000	Law Enforcement Officer
13	Increase Outreach and Environmental Education and Interpretation Programs	\$763,000	\$63,000	Park Ranger
14	Expand Recreational Opportunities	\$93,000	\$53,000	Park Ranger
15	Maintain Facilities and Infrastructure	\$680,000	\$180,000	Maintenance Worker
16	Evolve Volusia County Land Managers Meeting	\$30,000	\$26,000	Refuge Wildlife Specialist



The Refuge System currently faces a backlog of project, operational, maintenance, and equipment needs. The current SAMMS system provides a list of proposed projects for the refuge, over and above the base operating budget of the refuge. The refuge's SAMMS needs will continue under this CCP. Once the CCP is approved, the SAMMS databases would be updated to reflect the needs outlined in the CCP.

### **PARTNERSHIP/VOLUNTEERS OPPORTUNITIES**

A key element of this CCP is to establish partnerships with local volunteers, landowners, private organizations, and State and Federal natural resource agencies. In the immediate vicinity of the refuge, opportunities exist to increase partnerships with Friends of Lake Woodruff, volunteers, Stetson University, Audubon (West Volusia County Chapter), Avian Research and Conservation Institute, DeLeon Springs State Park, Ocala National Forest, and Lake George State Forest. At regional and State levels, partnerships may be established or enhanced with organizations such as FWC, Progress Energy, National Wild Turkey Federation, SJRWMD, USACE, USGS, and Ducks Unlimited.

### **STEP-DOWN MANAGEMENT PLANS**

While the CCP is a strategic plan that guides the future direction of the refuge, a step-down management plan provides specific guidance on activities, such as habitat, fire, and visitor services management. These plans (Table 7) are also developed in accordance with the National Environmental Policy Act, which requires the identification and evaluation of alternatives and public review and involvement prior to their implementation.

**Table 7: Lake Woodruff NWR step-down management plans related to the goals and objectives of the CCP**

<b>Step-down Plan</b>	<b>Completion Date</b>
Habitat Management Plan (HMP)	Updated 2007
Wildlife Inventory Plan	2008
Fire Management Plan (Update)	2008
Visitor Services Plan (VSP)	2008
Refuge Hunt Plan (part of VSP)	2008
Refuge Fishing Plan (part of VSP)	2008
Impoundment Management Plan (part of HMP)	2008
Integrated Exotic Plant Management Plan (part of HMP)	2009
Endangered Species Monitoring Plan	2009
Forest Management Plan (part of HMP)	2009
Law Enforcement Plan	2010
Cultural Resource Protection Plan	2011

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## **MONITORING AND ADAPTIVE MANAGEMENT**

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

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

## **PLAN REVIEW AND REVISION**

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

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## SECTION B. ENVIRONMENTAL ASSESSMENT

### *I. BACKGROUND*

#### INTRODUCTION

The U.S. Fish and Wildlife Service (Service) prepared this Environmental Assessment (EA) for Lake Woodruff National Wildlife Refuge (Figure 1) in compliance with the National Environmental Policy Act and the National Wildlife Refuge System Improvement Act of 1997. The National Wildlife Refuge System Improvement Act requires the development of comprehensive conservation plans (CCPs) for all refuges. Following a public review and comment period on the Draft CCP/EA, a final decision will be made by the Service that will guide Lake Woodruff NWR management actions and decisions over the next 15 years, provide understanding about the refuge and management activities, and incorporate information and suggestions from the public and refuge partners.

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

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

The CCP is needed to address current management issues, to provide long-term management direction for the refuge, and to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a CCP for all national wildlife refuges. There is no current plan that identifies priorities and ensures consistent and integrated management of the refuge, thus necessitating the need for the CCP.

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

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## PURPOSE AND NEED FOR ACTION

The purpose of developing the CCP is to ensure that Lake Woodruff NWR:

- serves as an inviolate sanctuary for migratory birds;
- protects natural resources;
- manages, restores, and conserves wildlife and habitat resources;
- conserves and restores the diversity, structure, and function of refuge habitats;
- manages the impoundments to support multiple species, including waterfowl, wading birds, shorebirds, marshbirds, other birds, amphibians, and fishes;
- maintains the greentree reservoir to support wood ducks and other native species;
- conserves rare, threatened, endangered, and other imperiled species;
- controls and eliminates exotic, invasive, and nuisance species;
- contributes to water quality;
- conserves and maintains the natural hydrologic regime;
- supports migrating and overwintering waterfowl, shorebirds, and landbirds;
- supports priority breeding landbirds;
- maintains and protects herpetological diversity and populations;
- supports native fishes and other native aquatic species;
- protects and sustains the values and character of those areas designated as Wilderness;
- maintains the Research Natural Area;
- provides quality opportunities for the enjoyment of appropriate and compatible wildlife-dependent recreation;
- promotes awareness and appreciation of natural resources;
- promotes support for refuge management activities;
- enhances volunteer programs and the friends group;
- coordinates with a wide variety of governmental and non-governmental partners;
- protects and preserves archaeological and historical resources;
- provides staff, volunteers, facilities, and equipment to support refuge management activities, vision, and goals;
- minimizes the impacts of the railroad on wildlife, habitats, visitors, and refuge management activities; and
- provides for appropriate and compatible scientific research.

This EA addresses the need to adopt a 15-year management plan for Lake Woodruff NWR that provides guidance for future refuge management and that meets the requirements of the National Wildlife Refuge System Improvement Act.

## DECISION FRAMEWORK

Based on the EA, the Fish and Wildlife Service will select an alternative to implement the CCP for Lake Woodruff NWR. The Final CCP will include a Finding of No Significant Impact (FONSI), which is a statement explaining why the selected alternative will not have a significant effect on the quality of the human environment. This determination is based on an evaluation of the Service's and the Refuge System's mission, the purposes for which the refuge was established, the vision and goals of the refuge, and other legal mandates. Assuming no significant impact is found implementation of the CCP will begin after the FONSI is signed and will be monitored annually and revised when necessary.

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## **PLANNING STUDY AREA**

Lake Woodruff NWR measures 21,574 acres and is in north-central Florida approximately 30 miles inland from Daytona Beach (Figure 1). The majority of the refuge is owned in fee title by the Service (Figure 9), though some is also managed under a cooperative agreement with the State. Most of the refuge is comprised of forested wetlands and marshes that surround the St. Johns River in Volusia County. The refuge includes over 10,000 acres of high *Spartina* marsh, representing one of the largest remaining intact freshwater marshes of the St. Johns River basin. This EA will identify management on refuge lands, as well as for those lands proposed for management or acquisition by the Service.

## **AUTHORITY, LEGAL COMPLIANCE, AND COMPATIBILITY**

The Service developed this Draft CCP/EA 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 CCP also meet the requirements of the National Environmental Policy Act of 1969. The refuge staff achieved compliance with this Act through the involvement of the public and the incorporation of an EA in the Draft CCP, with a description of the alternatives considered and an analysis of the environmental consequences of the alternatives. When fully implemented, the CCP will strive to achieve the purposes, vision, and goals of Lake Woodruff NWR.

The National Wildlife Refuge System includes Federal lands and waters managed primarily to provide habitat for a diversity of fish, wildlife, and plant species. National wildlife refuges are established under many different authorities and funding sources for a variety of purposes. The purposes for these refuges are established by specific legislation, through presidential orders, or in special agreements. Additional authority delegated by Congress, federal regulations, executive orders, and several management plans guide the operation of a refuge. Appendix C contains a list of the key laws, orders, and regulations that provide a framework for the proposed action.

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

### *COMPATIBILITY*

The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, states that national wildlife refuges must be protected from incompatible or harmful human activities to ensure that Americans can enjoy Refuge System lands and waters. Before activities or uses are allowed on a national wildlife refuge, the uses must be found to be appropriate and compatible. A compatible use "...will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge." In addition, "wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety." Appropriate use forms and compatibility determinations were prepared for boating, camping, collecting, commercial services, horseback riding, jogging/bicycling, off-road vehicle use, swimming/waterskiing, timber harvest, hunting (alligator, waterfowl, turkey, deer/feral hog), fishing, wildlife observation/photography, and environmental education/interpretation (Appendices E and F).

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An interim compatibility determination is a document that assesses the compatibility of an activity during the period of time the Service first acquires a parcel of land to the time a CCP is prepared and adopted. If additional properties are acquired for the refuge, interim compatibility determinations would provide for interim use of the properties until they were added to the CCP, at which time formal compatibility determinations would be prepared or the use(s) would be incorporated into existing compatibility determinations.

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

In accordance with Service guidelines and National Environmental Policy Act recommendations, public involvement has been a crucial factor throughout the development of the Draft CCP for Lake Woodruff NWR. This Draft CCP/EA has been written with input and assistance from interested citizens; conservation organizations; and local, State, and Federal agencies. The participation of these stakeholders and their ideas has been of great value in setting the management direction for Lake Woodruff NWR. The Service is grateful to each one who has contributed time, expertise, and ideas to the planning process. The Service remains impressed by the passion and commitment of so many individuals for the lands and waters administered by the refuge.

Preplanning activities began in 2005. A Visitor Services' Review was conducted in February 2005. This was later followed by a Wildlife and Habitat Management Review held at the refuge in March 2006. Preplanning continued with information gathering and the identification of data gaps. The Notice of Intent (NOI) to develop a CCP was entered into the *Federal Register* on July 26, 2006. A public scoping meeting was held on September 7, 2006, at the Volusia County Agricultural Center in DeLand, Florida. Attendees included 33 members of the public, one Florida Fish and Wildlife Conservation Commission (FWC) representative, five Service personnel, and one Service contractor. In addition to comments taken at the public meeting, email, regular mail, and fax comments were received. On November 20, 2006, an intergovernmental scoping meeting was held at the refuge to identify key issues facing the refuge. Attendees included representatives of U.S. Geological Survey (USGS), U.S. Army Corps of Engineers (USACE), FWC, St. Johns River Water Management District (SJRWMD), Florida Department of Environmental Protection (FDEP), and Volusia County, as well as Service staff from the refuge and Welaka National Fish Hatchery and one Service contractor. Priority issues were identified on December 5, 2006, by Service staff in collaboration with FWC representatives.

A wide range of issues, concerns, and opportunities were identified and addressed during the planning process. Many issues that are very important to the public often fall outside the scope of the decision to be made within this planning process. In some instances, the Service cannot resolve issues some people have communicated to us. We have considered all issues throughout our planning process and have developed a plan that attempts to balance refuge management priorities, best management practices, best available information, and the competing opinions regarding important issues.

A complete summary of these issues and concerns is provided in Section C, Appendix D. For more detailed information about the planning process and the identification of issues, see the Draft CCP (Section A, Chapter III).

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## *II. AFFECTED ENVIRONMENT*

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





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## ***III. DESCRIPTION OF ALTERNATIVES***

### **FORMULATION OF ALTERNATIVES**

Alternatives are different approaches or combinations of management objectives and strategies designed to achieve the refuge's purposes; the vision and goals identified in the CCP; the goals and mission of the Refuge System; and the mission of the Service. Alternatives are formulated to address the priority issues, concerns, and problems identified by the Service and the public during public scoping.

The four alternatives identified and evaluated represent different approaches to provide permanent protection, restoration, and management of the refuge's fish, wildlife, plants, habitats, and other resources, as well as to provide for quality opportunities for appropriate and compatible wildlife-dependent recreation. The Service assessed the biological conditions and analyzed the external relationships affecting the refuge. This information contributed to the development of refuge goals and, in turn, helped to formulate the alternatives. As a result, each alternative represents different sets of objectives for reaching refuge goals. Each alternative was evaluated based on how much progress it would make towards achieving the purposes, vision, and goals of the refuge and how it would address the priority issues related to wildlife and habitat management, resource protection, visitor services, and refuge administration. See Section A, Chapter III, for summaries of the priority issues. A summary of the four alternatives follows the description of alternatives in Table 8.

### **MANAGEMENT COMMON TO ALL ALTERNATIVES**

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

### **DESCRIPTION OF ALTERNATIVES**

Serving as a basis for each alternative, goals were developed to help achieve the refuge's purposes and vision and the mission of the Refuge System. Each alternative represents a different set of objectives under these common goals. Objectives are desired conditions or outcomes that are grouped into sets and, for this planning effort, consolidated under four alternatives. These alternatives represent different management approaches for managing the refuge over a 15-year time frame. Four alternatives were developed and analyzed: Alternative A (Current Management; No-Action Alternative); Alternative B (Migratory Birds); Alternative C (Rare, Threatened, and Endangered Species); and Alternative D (Wildlife and Habitat Diversity; Proposed Action). Alternative A continues current management activities similar to recent activities and levels on the refuge. Alternative B focuses refuge management actions on the needs of migratory birds. Alternative C focuses refuge management actions on the needs of rare, threatened, and endangered species. Alternative D focuses refuge management actions on maintaining and enhancing wildlife and habitat diversity. The four alternatives are summarized and a comparison of the action alternatives (i.e., Alternatives B, C, and D) to the No-Action Alternative (i.e., Alternative A) follows the general descriptions.

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### *ALTERNATIVE A - CURRENT MANAGEMENT (NO ACTION)*

Alternative A continues refuge management activities and programs at levels similar to recent management activities and levels.

#### **Wildlife and Habitat Management**

Wildlife and habitat management activities would continue at programs and levels similar to past management.

The refuge would maintain habitat and future nest trees to support two to three nesting pairs of bald eagles (recently federally de-listed). Freshwater marshes and impoundments would be managed and surveyed for multiple species, including wood storks, sandhill cranes, whooping cranes, and limpkins. In addition, ~900 acres of upland forest would continue to be managed. These areas are inhabited by gopher tortoises (whose burrows are surveyed) and could potentially support red-cockaded woodpeckers, indigo snakes, and Florida pine snakes. Approximately 1,000 acres of den habitat would be maintained for Florida black bear. Occasional enforcement of on-refuge State of Florida manatee protection zones would continue.

For migratory birds, in addition to regular surveys, the refuge would maintain ~450 acres in impounded wetlands and ~10,000 acres of freshwater marshes using a management approach for multiple species, including waterfowl, wading birds, shorebirds, and secretive marshbirds. In addition, ~2,400 acres of uplands would continue to be managed for passerines (subject to breeding bird surveys). Swallow-tailed kite roost surveys would continue.

Management of other wildlife species would include occasional stocking of sport fish, participation in amphibian abnormality surveys, and coordination with partners to survey and research herpetological species.

Water resources would be managed at levels similar to past levels. Water levels in the impoundments and greentree reservoir would be managed for multiple species and sheet flow restoration efforts would continue in upland areas. The refuge would continue to rely on the State of Florida and USACE to control non-native plants in the navigable waterways of the refuge.

#### **Resource Protection**

The refuge would continue to work with the partners to address resource protection issues relating to railroad crossing safety and refuge access, both at Mud Lake Road. Farm Service Agency (FSA) easements would continue without active management or oversight. The extent of cultural resources would continue to remain unknown on the refuge and occasional law enforcement patrols would continue to respond to cultural resource issues as they arise.

#### **Visitor Services**

Visitor services would continue similar to past refuge management activities. The visitation in 2005 was estimated at 40,000, although this number is considered to be much lower than actual numbers that would also include the waterway traffic onto the refuge. The refuge would continue to maintain six information kiosks, the visitor contact station at the refuge's administrative offices, one observation tower, and 12 miles of trails and dikes. About 11,000 acres would continue to be open to three seasonal deer hunts (i.e., two nine-day archery hunts and one nine-day primitive gun hunt). Turkey surveys would continue. Fishing activities would continue with no active management. Horseback riding opportunities on the Volusia Tract would continue to be provided and bicycling/jogging around the impoundments would likely continue. The refuge would continue to annually conduct around 15 educational programs and minimally coordinate with eco-tour boat operators. Limited regional outreach would continue to occur. Friends of Lake Woodruff National Wildlife Refuge membership

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and volunteer numbers would likely remain at current levels and programs. Control of trash and litter would continue to be moderately effective, while illegally discarded monofilament fishing line issues would not be actively addressed.

### **Refuge Administration**

Refuge administration would continue similar to past management with six approved full-time employees (FTEs): wildlife refuge manager, biologist, prescribed fire specialist, engineering equipment operator, and two forestry technicians (career seasonal). (The biologist is currently located at the Refuge Complex headquarters in Titusville, Florida.) Refuge offices would continue to be housed at the administrative office that also includes the visitor contact station and the Learning Resource Center. The refuge would continue to rely on existing utilities, and repairs to equipment and facilities would be made according to funding allocations. The refuge would attempt to maintain refuge boundary signs and signs supporting visitor services. Regular intergovernmental coordination would continue with FDEP. Sporadic coordination would continue with DeLeon Springs State Park of the Florida Park Service (FPS, FDEP). Minimal coordination would continue with other governmental partners, including FWC and SJRWMD.

### *ALTERNATIVE B - MIGRATORY BIRDS*

Alternative B places refuge management emphasis on the needs of migratory birds.

### **Wildlife and Habitat Management**

Wildlife and habitat management activities and priorities of the refuge would focus on migratory birds.

Management of rare, threatened, and endangered species would remain the same or would be decreased. The refuge would maintain two to three nesting pairs of bald eagles. Freshwater marshes and impoundments would be surveyed and managed for wood storks, sandhill cranes, whooping cranes, and limpkins. In addition, ~900 acres of upland forest would continue to be managed. These areas are inhabited by gopher tortoises and could potentially support red-cockaded woodpeckers, eastern indigo snakes, and Florida pine snakes. Approximately 1,000 acres of den habitat would be maintained for Florida black bears. Occasional enforcement of on-refuge State manatee protection zones would continue.

With a management emphasis on migratory birds, the refuge would continue the various multi-species surveying and monitoring programs. Additionally, the refuge would manage intensively for waterfowl by increasing the acreage of managed impounded wetlands and by increasing pumping capabilities. Freshwater marsh management would increase and would include minimization of disturbance by civilian aircraft and control of undesirable woody vegetation. Swallow-tailed kite roost surveys would continue, partnerships would be established to reduce disturbance (including seasonal closures of key areas), and the need to plant more cypress to increase roosting habitat would be evaluated. The refuge would also manage intensively for shorebirds through manipulation of spring and fall impoundment water levels, implementation of seasonal closures to the public, and application of increased monitoring. Management of wading birds would be stepped-up through monitoring breeding sites and by minimizing disturbance by visitors, including closing all or portions of pools 2 and 3. Management of the greentree reservoir would increase by decreasing disturbance through seasonal closures and by installing wood duck nest boxes. The refuge would increase management for neotropical migratory birds by increasing survey, research, monitoring, and restoration activities on the ~2,400 acres of uplands, including controlling non-native plants in high priority habitats and developing comprehensive floral and faunal lists. Control of exotic plants would be coordinated with the USACE, State of Florida, and other agencies. The refuge would assess potential negative impacts of non-native fishes and other exotic aquatic animals on migratory birds. The forage quality for migratory birds would be increased in rights-of-way and other ruderal habitats. Feral hogs would

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continue to be controlled through the managed deer hunt program. Local partnerships would be established to minimize the negative effects of feral and free-roaming animals on migratory birds.

Management of other wildlife species would increase. Stocking of sport fish would be targeted consistent with migratory bird forage needs. Participation in amphibian abnormality surveys would continue, and the negative impacts to ephemeral wetlands (which support various amphibians) would be minimized. The refuge would continue to coordinate with partners to survey and research herpetological species, while management practices would be adjusted to minimize negative effects on herpetological species.

The refuge would work with the State of Florida and other partners to optimize hydrology, water quality and quantity, and minimum flows and levels to support the needs of migratory birds. Restoration of the natural hydrology in freshwater marshes would be achieved by breaching or removing unused levees (e.g., those bordering and impacting Lake Woodruff). Working with partners, upland sheet-flow patterns, which were altered by construction of the railroad, would be restored to mimic natural conditions. Partnerships would help maintain adequate water quality and quantities, as well as appropriate minimum flows and levels on the refuge. Sub-surface pumping would be considered as an option to maintain adequate water quantities. The refuge would ensure sufficient water levels in the greentree reservoir using pumping and/or through connections to Pool 1.

### **Resource Protection**

In addition to current management efforts relating to railroad crossing safety, refuge access issues would be addressed further by adding a Service boat ramp, monitoring Mud Lake Road usage, and evaluating the need for improvements to Mud Lake Road. Other resource protection activities would focus on those habitats serving migratory birds. The refuge would develop cooperative management agreements with the State of Florida for all navigable waters within the refuge's approved acquisition boundary. The Service is not currently pursuing land acquisition, but the refuge would work with partners to help conserve important adjacent habitats and wildlife corridors. Funding for land acquisition from willing sellers within the approved acquisition boundary of Lake Woodruff National Wildlife Refuge could come from a variety of sources, including the Land and Water Conservation Fund; the Migratory Bird Conservation Fund; and donations from conservation and private organizations. Conservation easements and leases could also be used to obtain the minimum interests necessary to satisfy refuge goals and objectives if the Service could adequately manage uses of the areas for the benefit of wildlife. The Service could negotiate management agreements with local, State, and Federal agencies and it could accept conservation easements. Some tracts within the refuge's approved acquisition boundary may be owned by other public or private conservation organizations. The Service would work with interested organizations to identify additional areas needing protection and provide technical assistance, if needed. The acquisition of private lands is contingent on the landowners and their willingness to participate. Mapping information on the FSA easements would be obtained and the contribution that these areas provide to migratory birds would be evaluated. The extent of cultural resources would continue to remain unknown on the refuge, and occasional law enforcement patrols would continue to respond to cultural resource issues as they arise.

### **Visitor Services**

Visitor services would be expanded and directed with a focus on migratory birds. The refuge would continue to maintain six information kiosks, the visitor contact station at the refuge's administrative office, one observation tower, and 12 miles of trails and dikes. Seasonal closures of public use areas would be evaluated to minimize negative effects on migratory birds. Refuge signage would increase, wildlife and habitat information would focus on migratory birds, and an informational video would be developed for the visitor contact station. Areas open to deer hunting would be decreased from

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11,000 to 3,225 acres, where deer hunting would be allowed on Tick and Jones Islands, the Eastside Unit, and the uplands of the Volusia Tract. Public access routes would be changed and the Spring Garden Lake route would be eliminated. The refuge would coordinate with the State of Florida to evaluate deer herd health and trends. Fishing opportunities in other areas of the refuge would remain unchanged. Turkey surveys would continue to ensure there are no adverse impacts on migratory birds. Horseback riding, bicycling, and jogging would be eliminated from the refuge. The refuge would expand educational programs (both on- and off-site) and train staff, volunteers, and teachers to conduct these with an emphasis on migratory bird conservation. All guided tours (including those on navigable waters) would need to be permitted through the refuge with the condition that they include refuge approved messages on migratory bird conservation in their programs. Local and regional outreach efforts would focus on migratory birds. The refuge would work to increase Friends of Lake Woodruff National Wildlife Refuge's membership, volunteer numbers, and the level of activities with an emphasis on migratory birds. Trash and litter control would be focused on protecting migratory birds and increased through scheduled and coordinated clean-ups with area service groups and schools. A monofilament fishing line recycling program would be implemented. In addition, the refuge would develop and distribute interpretive programs and materials emphasizing the harmful effects of discarded fishing line on migratory birds. Under this alternative, the refuge would evaluate the feasibility of implementing a fee program to enhance various visitor services.

### **Refuge Administration**

Refuge administration activities would be changed, focusing on migratory birds. Staff levels would increase to 15 FTEs, and additional staff would consist of: refuge wildlife specialist (assistant refuge manager), office assistant, biologist, two biological science technicians, two maintenance workers, law enforcement officer, and park ranger. Equipment and facility repairs would be focused on those items needed to support migratory bird management activities. Existing deferred maintenance priorities, API percentages, and SAMMS project descriptions would be reevaluated and possibly changed to reflect and support the migratory bird management priorities of the refuge. Work with the partners would expand to: focus exotic plant control efforts on high priority habitats for migratory birds, survey and assess the potential for impacts to migratory birds, control feral and free-roaming animals to minimize adverse impacts to migratory birds, research and evaluate the effects of exotic aquatic plants on migratory birds, develop appropriate cooperative management agreements with the State of Florida for the navigable waterways within the refuge's approved acquisition boundary, conduct aquatic weed control efforts to benefit migratory birds, and survey and assess the potential for negative impacts to migratory birds from exotic aquatic animals. The refuge would help the Volusia County Land Managers Meeting evolve into a fully functional working group to increase coordination and develop joint projects to help serve the common goals and objectives of the partners.

### ***ALTERNATIVE C - RARE, THREATENED, AND ENDANGERED SPECIES***

Alternative C focuses refuge management on the needs of rare, threatened, and endangered species.

### **Wildlife and Habitat Management**

Wildlife and habitat management emphasis would be on rare, threatened, and endangered species.

Management for rare, threatened, and endangered species would be increased. For all listed bird species, the risks of disturbance would be reduced through seasonal closures of key areas to the public. The freshwater marshes and impoundments would be managed (primarily through prescribed burning and water-level manipulation) to increase the forage base and to reduce impacts to eggs and nestlings for several bird species, including whooping and sandhill cranes, that utilize these areas for foraging and breeding. For wood storks, nesting potential on the refuge would be determined and artificial nest structures would be constructed as needed. Habitat would continue to be maintained

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for whooping cranes. Limpkin and snail kite populations would be monitored. Planting of cypress to increase roosting habitat for swallow-tailed kites would be considered.

As part of manatee conservation management efforts, the refuge would coordinate monitoring activities with the Service's North Florida and South Florida Ecological Services' offices, conduct regular patrols for compliance with speed zone regulations, develop cooperative management agreements for key waterways, and create seasonal closures where necessary. Additionally, the refuge would coordinate with the State of Florida to expand manatee protection zones and work with partners to ensure minimum flows and levels. Manatee habitats would be identified, protected, and monitored. The refuge would help increase public awareness and education regarding manatee conservation efforts.

Surveys for American eel and other species of management concern would be implemented. The refuge would survey and develop management measures as appropriate to target any identified rare, threatened, and endangered herpetological species.

In upland areas, timber management would be tailored to ensure future nest sites for the two to three nesting pairs of bald eagles presently utilizing the refuge and for potential new pairs. To enhance habitats suitable for the development of red-cockaded woodpecker colonies, the refuge would maintain frequent fire intervals, monitor status and trends, and consider opportunities for reintroduction of red-cockaded woodpeckers. Management for gopher tortoises would include: employing mechanical vegetation treatments and prescribed burning during the growing season to enhance habitat, monitoring population status and trends, and evaluating the incidence of upper respiratory disease. Furthermore, connections to adjacent conservation lands would need to be created and maintained. In support of eastern indigo and Florida pine snakes, the refuge would conduct research and monitoring to determine status and trends, adapt management as necessary to support resulting objectives, and evaluate opportunities for reintroduction of these species. Florida black bear management would include coordinating with the State of Florida to monitor movement, working with partners to create habitat corridors, and increasing public awareness and education to minimize human impacts to bears.

Under this alternative the refuge would expand management of non-native species with an emphasis on protecting rare, threatened, and endangered species. It would support research and evaluate the effects of exotic aquatic plants and control efforts on listed species. The refuge would develop cooperative agreements with the State of Florida for Service management of all navigable waterways within the refuge's approved acquisition boundary. The refuge would coordinate control efforts to benefit rare, threatened, and endangered species and manipulate water levels in impoundments to control exotic, invasive, and nuisance species in favor of native plants. Aquatic plant control efforts would be designed to minimize impacts to native plants and wildlife. The refuge would work with the partners to survey and assess the potential impacts of non-native aquatic species to listed species and respond as necessary. In upland areas, the refuge would focus exotic plant control efforts on high priority habitats for rare, threatened, and endangered species. Alternative feral hog population control measures, including trapping, would be considered. The refuge would coordinate with the State of Florida to evaluate the impacts of coyotes on the refuge's native wildlife and habitat diversity and conduct control efforts where necessary. In a similar manner, the refuge would coordinate with the partners to control feral and free-roaming animals to minimize their impacts to rare, threatened, and endangered species.

Management for migratory birds would increase with a focus on the rare, threatened, and endangered species. The refuge would continue activities at present levels for the various multi-species surveying and monitoring programs, but it would focus impoundment and greentree reservoir management on

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wood storks. Management for secretive marshbirds would increase, and the refuge would enhance habitat on 11,100 acres of marsh and conduct regular surveys. The effectiveness of marsh management in relation to marshbirds would be evaluated. The refuge's contribution to the Joint Venture objectives would be identified. The presence and extent of nesting micro-topography for marshbirds and the population status of marshbirds (especially king rails) would be evaluated. The refuge would implement adaptive management to protect marshbird breeding, including the use of smaller, lower-intensity, mosaic fires. Swallow-tailed kite surveys would continue, partnerships would be established to reduce disturbance to this species (including seasonal closures of key areas), and the need to plant more cypress would be evaluated to increase roosting habitat. For rare, threatened, and endangered upland migratory birds, the refuge would monitor bird presence, abundance, distribution, and responses to management activities. In addition, the refuge would develop population and habitat objectives to determine the refuge's contribution to regional and national bird conservation plans. Hammocks and the response of rare, threatened, and endangered species to management practices in these areas would be monitored. Ruderal areas would be managed to increase their forage potential for rare, threatened, and endangered species, while mowing and prescribed burning would be adjusted to minimize impacts to rare, threatened, and endangered species.

The refuge would work with the State of Florida and other partners to optimize hydrology, water quality and quantity, and minimum flows and levels to support the needs of rare, threatened, and endangered species. Restoration of the natural hydrology in the freshwater marshes would be achieved by breaching or removing unused levees (e.g., those bordering and impacting Lake Woodruff). Working with partners, upland sheet-flow patterns, which were altered by construction of the railroad, would be restored to mimic natural conditions. Partnerships would help maintain adequate water quality and quantities, as well as appropriate minimum flows and levels on the refuge. Sub-surface pumping would be considered as an option to maintain adequate water quantities.

### **Resource Protection**

In addition to current management efforts relating to railroad crossing safety, refuge access issues would be addressed further by adding a Service boat ramp, monitoring Mud Lake Road usage, and evaluating the need for improvements to Mud Lake Road. In addition, the refuge would work with partners to protect wildlife movement throughout the railroad right-of-way. Other resource protection activities would focus on those habitats serving rare, threatened, and endangered species. The refuge would develop cooperative management agreements with the State of Florida for all navigable waters within the refuge's approved acquisition boundary. The Service is not currently pursuing land acquisition, but the refuge would work with partners to help conserve important adjacent habitats and wildlife corridors. Funding for land acquisition from willing sellers within the approved acquisition boundary of Lake Woodruff NWR could come from a variety of sources, including the Land and Water Conservation Fund; the Migratory Bird Conservation Fund; and donations from conservation and private organizations. Conservation easements and leases could also be used to obtain the minimum interests necessary to satisfy refuge goals and objectives if the Service could adequately manage uses of the areas for the benefit of wildlife. The Service could negotiate management agreements with local, State, and Federal agencies and it could accept conservation easements. Some tracts within the refuge's approved acquisition boundary may be owned by other public or private conservation organizations. The Service would work with interested organizations to identify additional areas needing protection and provide technical assistance, if needed. The acquisition of private lands is contingent on the landowners and their willingness to participate. Mapping information on the FSA easements would be obtained and the contribution that these areas provide to rare, threatened, and endangered species would be evaluated. The extent of cultural resources would continue to remain unknown on the refuge, and occasional law enforcement patrols would continue to respond to cultural resource issues as they arise.

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## **Visitor Services**

Visitor services would be expanded and directed with a focus on rare, threatened, and endangered species. The refuge would continue to maintain six information kiosks, the visitor contact station at the refuge's administrative offices, one observation tower, and 12 miles of trails and dikes. Seasonal closures of public use areas would be evaluated to minimize negative impacts to rare, threatened, and endangered species. Refuge signage would increase; wildlife and habitat information would focus on rare, threatened, and endangered species; and an informational video would be developed for the visitor contact station. The refuge would evaluate adverse impacts of deer hunting on rare, threatened, and endangered species and adjust hunting where unacceptable impacts have been determined. Alternative population control measures for deer would be considered in addition to hunting. The refuge would coordinate with the State of Florida to evaluate deer herd health and trends. Seasonal closures to all boat traffic would be implemented to minimize impacts to rare, threatened, and endangered species (e.g., swallow-tailed kites) and through coordination with the State of Florida, manatee protection zones would be expanded. Fishing opportunities in other areas of the refuge would remain unchanged. Turkey surveys would continue to ensure there are no adverse impacts to rare, threatened, and endangered species. Horseback riding, bicycling, and jogging would be eliminated. The refuge would expand educational programs (both on- and off-site), and train staff, volunteers, and teachers to conduct these with an emphasis on rare, threatened, and endangered species. All guided tours (including those on navigable waters) would need to be permitted through the refuge with the condition that they include refuge approved messages on the conservation of rare, threatened, and endangered species in their programs. Local and regional outreach efforts would focus on rare, threatened, and endangered species. The refuge would work to increase Friends of Lake Woodruff National Wildlife Refuge's membership, volunteer numbers, and levels of activities with an emphasis on rare, threatened, and endangered species. Trash and litter control would be focused on protecting rare, threatened, and endangered species and increased through scheduled and coordinated clean-ups with area service groups and schools. A monofilament fishing line recycling program would be implemented. In addition, the refuge would develop and distribute interpretive programs and materials emphasizing the harmful effects of discarded fishing line on rare, threatened, and endangered species. Within this alternative, the refuge would evaluate the feasibility of implementing a fee program to enhance various visitor services.

## **Refuge Administration**

Refuge administration activities would be changed, focusing on rare, threatened, and endangered species. Staff levels would increase to 18 FTEs, and additional staff would consist of: refuge wildlife specialist (assistant refuge manager), office assistant, two biologists, two biological science technicians, non-fire forestry technician, two maintenance workers, two law enforcement officers, and park ranger. Equipment and facility repairs would be focused on those items needed to support management activities for rare, threatened, and endangered species. Current deferred maintenance priorities, API percentages, and SAMMS project descriptions would be reevaluated and possibly changed to reflect and support the rare, threatened, and endangered species management priorities of the refuge. Work with the partners would expand to focus efforts on the needs of rare, threatened, and endangered species, including: control efforts on high priority habitats impacted by exotic plants; surveys and assessment for potential impacts of feral hogs and coyote; control efforts to address feral and free-roaming animals to minimize adverse impacts; research and evaluations of the effects of exotic aquatic plants; development of appropriate cooperative management agreements with the State of Florida for the navigable waterways within the refuge's approved acquisition boundary; control efforts to benefit rare, threatened, and endangered species; and surveys and assessment of the potential impacts by exotic aquatic animals to rare, threatened, and endangered species. The refuge would help the Volusia County Land Managers Meeting evolve into a fully functional working group to increase coordination and develop joint projects to help serve the common goals and objectives of the partners.



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## *ALTERNATIVE D - WILDLIFE AND HABITAT DIVERSITY (PROPOSED ACTION)*

Alternative D focuses refuge management on native wildlife and habitat diversity.

### **Wildlife and Habitat Management**

Wildlife and habitat management emphasis would be on native wildlife and habitat diversity.

Management for rare, threatened, and endangered species would be expanded under this alternative. Disturbance to rare, threatened, and endangered bird species would be reduced through seasonal closures of key areas to the public (e.g., around whooping crane use areas). The freshwater marshes and impoundments would be managed (primarily through prescribed burning and water-level manipulation) to increase the forage base and reduce impacts to eggs and nestlings for several bird species, including whooping and sandhill cranes, that utilize these areas for foraging and breeding. For wood storks, nesting on the refuge would be determined. Limpkin and snail kite populations would be monitored. Alligator numbers would be monitored.

Refuge manatee conservation management efforts would include coordinating monitoring activities with the Service's North Florida and South Florida Ecological Services' offices, conducting regular patrols for compliance with speed zone regulations, and working with the State of Florida to create additional seasonal closures of key waterways. The refuge would also coordinate with the State of Florida to expand manatee protection zones. Manatee habitats would be identified, protected, and monitored. The refuge would help increase public awareness and education regarding manatee conservation efforts.

In upland areas, timber management would be tailored to ensure future nest sites for the two to three nesting pairs of bald eagles presently utilizing the refuge and for potential new pairs. To enhance habitats suitable for the development of red-cockaded woodpecker colonies, the refuge would maintain frequent fire intervals, monitor status and trends, and consider opportunities for reintroduction of red cockaded woodpeckers. Management for gopher tortoises would include: employing mechanical vegetation treatments and prescribed burning during the growing season to enhance their habitat, monitoring population status and trends, and evaluating the incidence of URD. Furthermore, connections to adjacent conservation lands would need to be created and maintained to support wildlife and habitat diversity. In support of eastern indigo and Florida pine snakes, the refuge would conduct research and monitoring to determine status and trends and adapt management as necessary to support resulting objectives. Florida black bear management would include coordinating with the State of Florida to monitor movement, working with partners to create habitat corridors, and increasing public awareness and education to minimize human impacts to bears.

Under this alternative, the refuge would expand management to control and eliminate exotic, invasive, and nuisance species with an emphasis on identifying and locating them and developing GIS databases. The refuge would control and eliminate, where feasible, exotic aquatic plants to maintain and enhance the biological integrity of refuge waters. Manipulation of water levels in the impoundments to control exotics would favor native plants and aquatic plant controls would be designed to minimize impacts to native species utilizing these areas. In upland areas, the refuge would identify and locate new infestations of Categories I and II invasive plants (as defined by the Florida Exotic Pest Plant Council). The Florida Exotic Pest Plant Council maintains a list of Category I invasive exotic plants that are altering native plant communities and Category II invasive exotic plants that have increased, but that have not yet altered native plant communities (Florida Exotic Pest Plant Council 2005). Initial attack of infestations would be conducted with an emphasis on elimination. The refuge would control the spread of existing invasive, exotic, and nuisance plants to reduce adverse impacts to refuge habitats and wildlife. Working with partners, the refuge would survey and assess the potential for impacts to wildlife and habitats and respond as necessary.

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Alternative feral hog population control measures, including trapping, would be considered. The refuge would coordinate with the State of Florida to evaluate the impacts of coyotes on of the refuge's native wildlife and habitat diversity and control where necessary. In a similar manner, the refuge would coordinate with the partners to control feral and free-roaming animals.

Management for migratory birds would increase under this alternative. Impounded marshes would be more intensively managed to support multiple species. The refuge would work with partners to develop appropriate agreements for Service management of waterways within the refuge's approved acquisition boundary and to conduct aerial waterfowl surveys. It would minimize public use impacts to migratory birds (including through seasonal closures of key areas). The refuge would increase regular patrols and enforcement activities to protect wildlife and habitat diversity. Prescribed burns would be conducted in advance of migration arrivals, and the refuge would intensively manage and monitor impoundments for multiple species.

The refuge would work with the partners to survey fish species present on the refuge, habitats used by them, and their health and current population sizes. It would conduct management practices on refuge habitats in such a manner as to minimize adverse impacts to native fishes. Herpetological species present on the refuge would be surveyed by working with the partners. Surveys would also include habitats used by herpetological species and their health and current population sizes. Refuge habitat management practices would be conducted in such a manner as to minimize adverse impacts to herpetological species. The refuge would work with partners to research and evaluate adverse impacts of exotic aquatic plant control efforts and the effects on water quality.

The refuge would work with the State of Florida and other partners to optimize hydrology, water quality and quantity, and minimum flows and levels to support refuge wildlife and habitat objectives. Restoration of the natural hydrology in the freshwater marshes would be achieved by breaching or removing unused levees (e.g., those bordering and impacting Lake Woodruff). Working with partners, upland sheet-flow patterns, which were altered by construction of the railroad, would be restored to mimic natural conditions. Partnerships would help maintain adequate water quality and quantities, as well as appropriate minimum flows and levels on the refuge. Sub-surface pumping would be considered as an option to maintain adequate water quantities.

### **Resource Protection**

In addition to current management efforts relating to railroad crossing safety, refuge access issues would be addressed further by investigating additional public access routes, including the potential or need for new railroad crossing(s). The refuge would monitor Mud Lake Road usage and evaluate the need for improvements to this roadway. In addition, the refuge would work with partners to protect wildlife movement throughout the railroad right-of-way. Other resource protection activities would focus on important adjacent and nearby habitats and wildlife corridors. The refuge would develop appropriate cooperative management agreements with the State of Florida for the navigable waters within the refuge's approved acquisition boundary. The Service is not currently pursuing land acquisition, but the refuge would work with partners to help conserve important adjacent habitats and wildlife corridors. Funding for land acquisition from willing sellers within the approved acquisition boundary of Lake Woodruff National Wildlife Refuge could come from a variety of sources, including the Land and Water Conservation Fund; the Migratory Bird Conservation Fund; and donations from conservation and private organizations. Conservation easements and leases could also be used to obtain the minimum interests necessary to satisfy refuge goals and objectives if the Service could adequately manage uses of the areas for the benefit of wildlife. The Service could negotiate management agreements with local, State, and Federal agencies and it could accept conservation easements. Some tracts within the refuge's approved acquisition boundary may be owned by other public or private conservation organizations. The Service would work with interested organizations to

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identify additional areas needing protection and provide technical assistance, if needed. The acquisition of private lands is contingent on the landowners and their willingness to participate. Mapping information on the FSA easements would be obtained and the contribution that these areas provide to habitat and wildlife diversity would be evaluated. Protection of cultural resources would increase. A complete archaeological survey would be conducted. And, the refuge would develop a regular patrol and enforcement program to protect the cultural resources of the refuge.

### **Visitor Services**

Visitor services would be expanded and focused on native wildlife and habitat diversity. The refuge would continue to operate six information kiosks, the visitor contact station at the refuge's administrative offices, one observation tower, and 12 miles of trails and dikes. Seasonal closures of public use areas would be evaluated to minimize negative impacts to native wildlife and habitat diversity. Refuge signage would increase, wildlife and habitat information would focus on native diversity, and an informational video would be developed for the refuge's visitor contact station. The refuge would evaluate adverse impacts of deer hunting to habitats and other wildlife species and adjust hunting where adverse impacts have been determined. Alternative population control measures in addition to deer hunting would be considered to help minimize impacts to wildlife and habitat diversity. The refuge would coordinate with the State of Florida to evaluate deer herd health and trends. The refuge would also work with the State of Florida to develop appropriate cooperative management agreements for the navigable water on the refuge, including possible seasonal closures to boat traffic (e.g., to minimize impacts to swallow-tailed kites) and the expansion of manatee protection zones. Fishing opportunities in other areas of the refuge would remain unchanged. Turkey surveys would continue to ensure there are no adverse impacts on wildlife and habitat diversity and rare, threatened, and endangered species. Horseback riding would be permitted in specially designated areas under special use permits. The potential impacts of bicycling and jogging would be studied and these uses would be modified or eliminated to minimize their impacts. Wildlife viewing and photography opportunities would be increased, including through photo-blinds, boardwalks, and hiking and canoeing trails. In addition, the refuge would work with partners to extend the Spring-to-Spring Trail as part of the Florida Trail System through the refuge. The refuge would expand educational programs (both on- and off-site), and train staff, volunteers, and teachers to focus messages on wildlife and habitat diversity and the role and importance of the refuge in the landscape. Guided tours would need to be permitted by the refuge with the condition that they include refuge approved messages on the refuge's conservation role and the minimization of human impacts in their programs. The refuge would train staff, volunteers, teachers, and tour operators to incorporate wildlife and habitat diversity interpretive themes into programs. Local and regional outreach efforts would focus on wildlife and habitat diversity. The refuge would work to increase Friends of Lake Woodruff National Wildlife Refuge's membership, volunteer numbers, and level of activities with an emphasis on wildlife and habitat diversity. Trash and litter control would be focused on wildlife and habitat diversity and increased through scheduled and coordinated clean-ups with area service groups and schools. A monofilament fishing line recycling program would be implemented. In addition, the refuge would develop and distribute interpretive programs and materials emphasizing the harmful effects of discarded fishing line on wildlife species and on their habitats. Under this alternative, the refuge would evaluate the feasibility of implementing a fee program to enhance various visitor services.

### **Refuge Administration**

Refuge administration activities would be changed, focusing on wildlife and habitat diversity. Staff levels would increase to a total of 11 FTEs, and additional staff would consist of: refuge wildlife specialist (assistant refuge manager), biological science technician, maintenance worker, law enforcement officer, and a park ranger. Equipment and facility repairs would be focused on those items needed for meeting refuge management objectives to support wildlife and habitat diversity

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goals. Current deferred maintenance priorities, API percentages, and SAMMS project descriptions would be reevaluated and possibly changed to reflect and support the wildlife and habitat diversity management priorities of the refuge. Work with the partners would expand to focus efforts on the maintaining or increasing wildlife and habitat diversity, including: control efforts on high priority habitats impacted by exotic plants, surveys and assessment for potential impacts of feral hogs and coyote, control efforts for feral and free-roaming animals to minimize adverse impacts, research and evaluations of the effects of exotic aquatic plants, development of appropriate cooperative management agreements with the State of Florida for the navigable waterways within the refuge's approved acquisition boundary, exotic plant control efforts to benefit listed species, and surveys and assessment of the potential impacts by exotic aquatic animals to wildlife and habitat diversity. The refuge would help the Volusia County Land Managers Meeting evolve into a fully functional working group to increase coordination and develop joint projects to help serve the common goals and objectives of the partners.

**Table 8: Comparison of alternatives by management issues for Lake Woodruff NWR**

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>WILDLIFE AND HABITAT MANAGEMENT</b>				
<b>Rare, Threatened, and Endangered Species</b>				
Gopher Tortoise	Rotational Prescribed Burning and timber management approx 900 ac/yr, followed by burrow surveys (Feb - Apr, Jun and Jul).	Same as Alternative A.	Expand Alternative A. Utilize mechanical vegetation treatments and implement prescribed burning during the growing season to enhance gopher habitat, monitor population status and trends, evaluate URD incidence. Create and maintain connection to adjacent conservation lands.	Same as Alternative C.
Bald Eagle	Maintain 2-3 nests, conduct annual nest survey, and protect nest sites during fire.	Same as Alternative A.	Expand Alternative A. Minimize disturbance of nest sites. Tailor timber management to ensure future nest sites.	Same as Alternative C.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Whooping Crane	Monitor activities and adjust impoundment (450 ac) water levels. One mated, migratory pair currently overwinter on refuge.	Same as Alternative A.	Expand Alternative A. Minimize disturbance (including closing key areas), develop whooping crane management plan, assist with reintroduction, and conduct prescribed burns in marshes prior to arrival to support foraging.	Expand Alternative A. Minimize disturbance (including closing key areas). Schedule prescribed burns in marshes prior to arrival to support foraging.
Sandhill Crane	Conduct prescribed burns and manage impoundments (450 ac) for multiple species, including for sandhill crane foraging, nesting, and roosting. Weekly surveys Nov – Mar, biweekly surveys Apr - Nov, monthly surveys Apr - Oct.	Same as Alternative A.	Expand Alternative A. Minimize disturbance (including closing key areas) and conduct prescribed burns in marshes prior to arrival to support foraging; adapt draw-downs and other management to avoid impacts to nesting and chicks. Monitor nest and fledgling activity.	Expand Alternative A. Minimize disturbance (including closing key areas) and adapt draw-downs and other management to avoid impacts to nesting and chicks.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
Manatees	Occasional enforcement of State manatee protection zones	Same as Alternative A.	Expand Alternative A. Coordinate monitoring activities with ES, conduct regular patrols for compliance with speed zone regulations, develop cooperative management agreements for key waterways, and work with the State to create seasonal closures where necessary. Coordinate with State to expand manatee protection zones. Coordinate with partners to ensure minimum flows and levels. Protect, identify, and monitor habitats. Increase public awareness and education.	Expand Alternative A. Protect, identify, and monitor habitats. Increase public awareness and education. Coordinate with State to expand manatee protection zones on the refuge. Conduct regular law enforcement patrols for compliance with speed zone regulations.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Florida Pine Snake	Rotational Prescribed Burning approx 900 ac/yr.	Same as Alternative A.	Expand Alternative A. Conduct research and monitoring to determine status and trends. Adapt management as necessary to support resulting pine snake objectives. Evaluate opportunities for reintroduction.	Expand Alternative A. Conduct monitoring to determine status and trends.
American Alligator	No active management	Same as Alternative A.	Same as Alternative A.	Expand Alternative A. Monitor population levels.
Florida Black Bear	Maintain den habitat (~1,000 ac).	Same as Alternative A.	Expand Alternative A. Coordinate with State to monitor movement, and work with partners to create habitat corridors. Increase public awareness and education to minimize human impacts to bears.	Same as Alternative C.



KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
Wood Stork	Manage impoundments (450 ac) for multiple species, including for wood stork foraging. Weekly surveys Nov – Mar, biweekly surveys Apr - Nov, monthly surveys Apr - Oct.	Same as Alternative A.	Expand Alternative A. Determine if nesting occurs on refuge. Adjust impoundment management to increase foraging habitat and increase available prey. Construct artificial nest structures. Minimize public use impacts to wood stork (including seasonal closures of key areas).	Expand Alternative A. Determine if nesting occurs on refuge.
Eastern Indigo Snake	Rotational prescribed burning of approximately 900 ac/yr; not known to currently occur on the refuge	Same as Alternative A.	Expand Alternative A. Document presence or absence on refuge. If present, monitor status and trends. Evaluate possibilities for reintroduction. Increase public awareness and education.	Expand Alternative A. Document presence or absence on refuge. If present, monitor status and trends.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Swallow-tailed Kite	Survey (4 times) during pre-migration roosting (Jul and Aug).	Expand Alternative A. Work with the partners to minimize disturbance, including creating seasonal closed areas. Evaluate the habitat. Consider the need for cypress plantings. Identify and minimize threats.	Expand Alternative A. Work with partners to minimize disturbance, including creating seasonal closed areas. Evaluate the habitat. Consider the need for cypress plantings. Identify and minimize threats.	Expand Alternative A. Work with partners to minimize disturbance, including creating seasonal closed areas. Identify and minimize threats.
Limpkin	Utilize prescribed burning and manage impoundments (450 ac) for multiple species, including for limpkin foraging. Monthly surveys.	Same as Alternative A.	Expand Alternative A. Monitor population status and trends.	Same as Alternative C.
Snail Kite	No active management.	Same as Alternative A.	Expand Alternative A. Monitor population status and trends.	Same as Alternative C.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
Red-cockaded Woodpecker	Utilize prescribed fire and timber management (900 ac/yr). No active colonies known to exist.	Same as Alternative A.	Expand Alternative A. Enhance habitats suitable for the development of colonies. Maintain a frequent fire interval. Monitor status and trends. Consider opportunities for reintroduction.	Expand Alternative A. Monitor presence or absence. Coordinate with partners to monitor the proximity of active colonies. With the presence of active colonies on the refuge, adapt management as necessary. Consider opportunities for reintroduction.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
<b>Migratory Birds</b>				
Waterfowl	Utilize prescribed burning and manage impoundments (450 ac) and greentree reservoir (10 ac) for multiple species. Monitor wood duck nest box activity (bi-annually in May and Dec). Weekly surveys Nov – Mar, biweekly Apr - Oct.	Expand Alternative A. Increase acreage of impounded marshes. Increase pumping capabilities. Work with partners to develop appropriate agreements for Service management of waterways within the refuge acquisition boundary. Conduct aerial waterfowl surveys. Minimize public use impacts to waterfowl (including seasonal closures of key areas). Increase regular patrol and enforcement. Conduct prescribed burns in advance of migration arrival. Intensively manage and monitor impoundments for migratory birds.	Decrease Alternative A. Utilize prescribed burning and manage impoundments (450 ac) and greentree reservoir (10 ac) for multiple species.	Expand Alternative A. Work with partners to develop appropriate agreements for Service management of waterways within the refuge acquisition boundary. Conduct aerial waterfowl surveys. Minimize public use impacts to waterfowl (including seasonal closures of key areas). Increase regular patrol and enforcement. Conduct prescribed burns in advance of migration arrival. Intensively manage and monitor impoundments for multiple species.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Shorebirds	Utilize prescribed burning and manage impoundments (450 ac) for multiple species. Weekly surveys Nov – Mar, biweekly surveys Apr - Nov, monthly surveys Apr - Oct.	Expand Alternative A. During fall and spring migration manipulate water levels to support shorebird use. Minimize public use impacts to shorebirds (including seasonal closures of key areas). Intensively manage and monitor impoundments for migratory birds.	Decrease Alternative A. Utilize prescribed burning and manage impoundments (450 ac) and greentree reservoir (10 ac) for multiple species.	Expand Alternative A. During fall and spring migration, manipulate water levels to support shorebird use. Minimize public use impacts to shorebirds (including seasonal closures of key areas). Intensively manage and monitor impoundments for multiple species.
Wading Birds	Utilize prescribed burning and manage impoundments (450 ac) for multiple species. Weekly surveys Nov – Mar, biweekly Apr - Oct.	Expand Alternative A. Identify rookeries and conduct nesting surveys. Minimize public use impacts to wading birds (including seasonal closures of key areas).	Expand Alternative A. Focus management on wood stork.	Expand Alternative A. Intensively manage and monitor impoundments for multiple species. Minimize public use impacts to wading birds (including seasonal closures of key areas).

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
Secretive Marshbirds	Utilize prescribed burning and manage marshes for multiple species. Monthly surveys April - June.	Same as Alternative A.	Expand Alternative A. Enhance habitat on 11,100 acres of marsh. Conduct regular surveys. Evaluate effectiveness of marsh management in relation to marshbirds. Identify the refuge's contribution to the Joint Venture Objectives. Determine presence and extent of nesting microtopography for marshbirds. Monitor and determine the status of marshbirds, especially king rails. Evaluate and adapt management to protect marsh bird breeding. Implement smaller, low-intensity, mosaic fires.	Expand Alternative A. Monitor and determine the status of marshbirds, especially king rails. Evaluate and adapt management to protect marsh bird breeding. Implement smaller, low-intensity, mosaic fires.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
Land Birds	Monthly Breeding Bird Surveys (May and June).	Expand Alternative A. Restore and maintain ~ 2,400 acres of xeric pine, pine flatwoods and other upland habitats. Monitor bird presence, abundance, distribution and responses to management activities. Develop population and habitat objectives to determine the refuge's contribution to regional and national bird conservation plans.	Expand Alternative A. Monitor bird presence, abundance, distribution and responses to management activities.	Expand Alternative A. Monitor bird presence, abundance, distribution, and responses to management activities. Develop population and habitat objectives to determine the refuge's contribution to regional and national bird conservation plans.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
<b>Exotic, Invasive, and Nuisance Species</b>				
Control of Exotic Aquatic Plants	Coordinate with State and USACE to control plants in navigable and refuge waterways. Spot treatment in impoundments.	Expand Alternative A. Research and evaluate the effects of exotic aquatic plants on migratory birds. Develop cooperative management agreements with State for the navigable waterways within the acquisition boundary. Coordinate control efforts to benefit migratory birds. Manipulate water levels in impoundments to control exotics in favor of native plants.	Expand Alternative A. Research and evaluate the effects of exotic aquatic plants on rare, threatened, and endangered species. Develop cooperative management agreements with State for the navigable waterways within the acquisition boundary. Coordinate control efforts to benefit rare, threatened, and endangered species. Manipulate water levels in impoundments to control exotics in favor of native plants.	Expand Alternative A. Identify, locate, and develop GIS database. Control and eliminate, where feasible, exotic aquatic plants to maintain and enhance the biological integrity of the refuge. Manipulate water levels in impoundments to control exotics in favor of native plants.



<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Control of Exotic Terrestrial Plants	Spot treatment.	Expand Alternative A. Focus exotic plant control efforts on high priority habitats for migratory birds.	Expand Alternative A. Focus exotic plant control efforts on high priority habitats for rare, threatened, and endangered species.	Expand Alternative A. Identify and locate new infestations of Category I and II invasive upland plants. Conduct initial attack with an emphasis on elimination. Control spread of existing invasive, exotic, and nuisance plants to reduce adverse impacts to refuge habitats.
Control of Exotic Aquatic Animals	No active management.	Expand Alternative A. Work with the partners to survey and assess the potential for impacts to migratory birds and respond as necessary.	Expand Alternative A. Work with the partners to survey and assess the potential for impacts to rare, threatened, and endangered species and respond as necessary.	Expand Alternative A. Work with the partners to survey and assess the potential for impacts to wildlife and habitats and respond as necessary.
Control of Feral Hog	Control through managed deer hunt.	Same as Alternative A.	Expand Alternative A. Consider alternative population control measures, including trapping.	Expand Alternative A. Consider alternative population control measures, including trapping.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Control of Coyote	No active management.	Same as Alternative A.	Expand Alternative A. Coordinate with the State to evaluate and control where necessary if adverse impacts to rare, threatened, and endangered species are determined.	Expand Alternative A. Coordinate with the State to evaluate and control where necessary.
Control of Feral and Free-Roaming Animals	No active management.	Expand Alternative A. Coordinate with the partners to control feral and free-roaming animals to minimize adverse impacts to migratory birds.	Expand Alternative A. Coordinate with the partners to control feral and free-roaming animals to minimize adverse impacts to rare, threatened, and endangered species.	Expand Alternative A. Coordinate with the partners to control feral and free-roaming animals to minimize adverse impacts to wildlife and habitat.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
<b>Wildlife and Habitat Diversity</b>				
<p>Mesic Pine Palmetto Flatwoods Mesic-Xeric Scrubby Flatwoods Longleaf Pine and Wiregrass Savanna Oak-Sand Pine Scrub</p>	<p>Utilize rotational prescribed burning and forest management (see Biological Review)</p>	<p>Expand Alternative A. Restore and maintain ~ 2,400 acres of xeric pine, mesic pine flatwoods, and other upland habitats. Monitor migratory bird presence, abundance, distribution, and responses to management activities. Coordinate forest management project scheduling around peak migratory bird usage times. Develop comprehensive flora and fauna lists for refuge. Implement comprehensive set of GIS databases.</p>	<p>Expand Alternative A. Monitor rare, threatened, and endangered species presence, abundance, distribution, and responses to management activities. Coordinate forest management project scheduling around critical seasons for identified species. Restore and maintain key habitat for identified species. Develop comprehensive flora and fauna list for refuge. Implement comprehensive set of GIS databases.</p>	<p>Expand Alternative A. Restore and maintain ~ 2,400 acres of xeric pine, mesic pine flatwoods, and other upland habitats. Manage pine dominated community types to promote understory plant species diversity. Implement monitoring program to measure and record habitat conditions and effects of management treatments. Develop comprehensive flora and fauna lists for refuge. Implement comprehensive set of GIS databases.</p>

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Oak Hammock Mesic Hammock Wetland Hardwoods	Maintain fire frequency of 20-50 yrs (see Biological Review)	Expand Alternative A. Monitor migratory bird presence, abundance, distribution, and responses to management activities. Coordinate forest management project, scheduling around peak migratory bird usage times. Restore and maintain key habitat for migratory birds.	Expand Alternative A. Monitor rare, threatened, and endangered species presence, abundance, distribution, and responses to management activities. Coordinate forest management project, scheduling around critical seasons for identified species. Restore and maintain key habitat for identified species.	Expand Alternative A. Implement monitoring program to measure and record habitat conditions and effects of management treatments. Develop comprehensive flora and fauna lists for refuge. Implement comprehensive set of GIS databases. Restore and maintain these habitats to enhance wildlife and habitat diversity.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
Impoundments	Maintain 450 acres through water manipulation and fire management. Utilize herbicidal spot treatment of invasive and exotic plants.	Expand Alternative A. Monitor migratory bird presence, abundance, distribution, and responses to management activities. Coordinate impoundment management project, scheduling around peak migratory bird usage times. Implement moist-soil management strategies to enhance wetland habitat conditions. Adjust mowing and management to minimize disturbance to migratory birds. Consider closures of all or portions of pools 2 and 3 to provide disturbance-free areas for migratory birds (e.g., daily, seasonal). Evaluate the potential for the creation of additional impoundments to support migratory birds.	Expand Alternative A. Monitor rare, threatened, and endangered species presence, abundance, distribution, and responses to management activities. Coordinate impoundment management project, scheduling around critical seasons for identified species. Implement moist-soil management strategies to enhance wetland habitat conditions. Adjust mowing and management to minimize disturbance to rare, threatened, and endangered species. Consider closures of all or portions of pools 2 and 3 to provide disturbance-free areas for rare, threatened, and endangered species (e.g., daily, seasonal).	Expand Alternative A. Implement monitoring program to measure and record habitat conditions and effects of management treatments. Develop comprehensive flora and fauna lists for refuge impoundments. Manage water levels in impoundments and implement moist-soil management strategies to provide quality habitat for a variety of native plants and wildlife species. Consider closures of all or portions of pools 2 and 3 to provide disturbance-free areas (e.g., daily, seasonal).

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Greentree Reservoir	Maintain 10 acres of greentree reservoir and influence an additional 12 acres of flooded hardwood forest through water manipulation.	Expand Alternative A. Monitor migratory bird presence, abundance, distribution, and responses to management activities. Minimize public use impacts to migratory birds (including seasonal closures of key areas). Provide for quality wood duck breeding habitat, including installation and maintenance of nest boxes. Ensure sufficient water levels in the greentree reservoir to support migratory bird needs through pumping and/or connections to Pool 1.	Expand Alternative A. Monitor rare, threatened, and endangered species presence, abundance, distribution, and responses to management activities. Minimize public use impacts to rare, threatened, and endangered species, including seasonal closures of key areas.	Expand Alternative A. Inventory and monitor flora and fauna of greentree reservoir impoundment. Manage water levels in the greentree reservoir to support a variety of native plant and wildlife species. Provide for quality wood duck breeding habitat, including installation and maintenance of nest boxes. Ensure sufficient water levels in the greentree reservoir to support enhanced wildlife and habitat diversity through pumping and/or connections to pool 1.
Open Emergent Marshes	Maintain 5,000 acres/year through fire management.	Change Alternative A. Potential for decrease of acreage under Alternative A due to possible conversion of emergent marsh acreage to impoundment. Monitor migratory bird presence, abundance, distribution, and responses to	Expand Alternative A. Inventory and monitor rare, threatened, and endangered species presence, abundance, distribution, and responses to management activities. Minimize impacts to rare, endangered, and	Change Alternative A. Inventory and monitor flora and fauna populations in marshes. Coordinate with partners to monitor and maintain adequate water levels in the marshes to provide for quality habitat for a variety of native plant and

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
		<p>management activities. Minimize impacts to migratory birds by civilian aircraft over marshes. Eliminate inappropriate airboat use in marshes. Develop comprehensive flora and fauna lists for refuge. Implement comprehensive set of GIS databases. Reduce the impacts of ditching and remove unused levees to restore natural topography and hydrology. Control undesirable woody vegetation and promote healthy, species-appropriate emergent herbaceous marsh to support migratory birds.</p>	<p>threatened species by civilian aircraft over marshes. Eliminate inappropriate airboat use in marshes. Develop comprehensive flora and fauna lists for refuge. Implement comprehensive set of GIS databases. Promote healthy, species-appropriate emergent herbaceous marsh to enhance rare, threatened, and endangered species.</p>	<p>wildlife species. Minimize impacts to wildlife and habitat diversity by civilian aircraft over marshes. Eliminate inappropriate airboat use in marshes. Reduce the impacts of ditching and remove unused levees to restore natural topography and hydrology. Control undesirable woody vegetation and promote healthy, species-appropriate emergent herbaceous marsh to enhance wildlife and habitat diversity.</p>

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
Rights-of-way / Ruderal Areas	Utilize seeding of non-native grasses, mowing, prescribed fire, and mechanical/herbicidal spot treatment to control invasive and exotic plants.	Expand Alternative A. Schedule maintenance disturbances, such as prescribed fire and disking and mowing, to provide for optimal response of native vegetation and invertebrates for migratory bird forage habitat.	Expand Alternative A. Schedule maintenance disturbances, such as prescribed fire and disking and mowing, to minimize disturbance to rare, threatened, and endangered species that utilize or are adjacent to these habitats. Maintain adjacent areas to provide habitat for rare, threatened, and endangered species that utilize these type habitats to prevent conflicts between refuge operations and rare, threatened, and endangered species. Provide for optimal response of native vegetation and invertebrates for rare, threatened, and endangered species.	Expand Alternative A. Schedule maintenance disturbances, such as prescribed fire and disking and mowing, to provide for optimal response of native pioneer vegetation and invertebrates.



KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
Native Fishes	Coordinate with Welaka NFH for native sport fish stocking in impoundments when available.	Expand Alternative A. Target fish stocking consistent with migratory bird needs.	Expand Alternative A. Survey for American eel and other fish species of management concern. Adapt management as necessary. Target fish stocking consistent with rare, threatened, and endangered species' needs.	Expand Alternative A. Work with the partners to survey fish species present on the refuge, habitats used by them, and health and current population sizes. Conduct management practices on refuge habitats in such a manner as to minimize adverse impacts to native fishes.
Herpetological Species (e.g., frogs, toads, snakes, and lizards)	Coordinate with partners for research and surveys. Participate in amphibian abnormality surveys.	Expand Alternative A. Conduct management practices on refuge habitats in such a manner as to minimize adverse impacts to herpetological species. Minimize impacts to ephemeral wetlands.	Expand Alternative A. Survey and develop management measures as appropriate to target any identified rare, threatened, and endangered species.	Expand Alternative A. Work with partners to survey herpetological species present on the refuge, habitats used by them, and health and current population sizes. Conduct management practices on refuge habitats in such a manner as to minimize adverse impacts to herpetological species.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Water Quantity	Monitor water levels in Spring Garden Basin and impoundments. Manage water levels in impoundments and greentree reservoir.	Expand Alternative A. Work with the partners to determine and ensure adequate water levels to support migratory bird objectives of the refuge. Consider additional options, including sub-surface pumping.	Expand Alternative A. Work with the partners to determine and ensure adequate water levels to support rare, threatened, and endangered species' objectives of the refuge. Consider additional options, including sub-surface pumping.	Expand Alternative A. Work with the partners to determine and ensure adequate water levels to support wildlife and habitat objectives of the refuge. Consider additional options, including sub-surface pumping to maintain needed water levels.
Water Quality	No active management.	Expand Alternative A. Work with partners to ensure adequate water quality to support migratory bird objectives of the refuge.	Expand Alternative A. Work with partners to ensure adequate water quality to support rare, threatened, and endangered species' objectives of the refuge.	Expand Alternative A. Work with partners to determine and ensure adequate water quality that supports the wildlife and habitat objectives of the refuge.
Minimum Flows and Levels	No active management.	Expand Alternative A. Work with partners to determine and ensure adequate minimum flows and levels to support migratory bird objectives of the refuge.	Expand Alternative A. Work with partners to determine and ensure adequate minimum flows and levels to support rare, threatened, and endangered species' objectives of the refuge.	Expand Alternative A. Work with partners to determine and ensure minimum flows and levels that support the wildlife and habitat objectives of the refuge.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Hydrology	Restore sheet-flow to disturbed areas (1-0.5 mile/yr)	Expand Alternative A. Document baseline conditions and mimic natural conditions to support appropriate habitat for migratory birds.	Expand Alternative A. Document baseline conditions and mimic natural conditions to support appropriate habitat for rare, threatened, and endangered species. Develop additional breaches and/or remove the unused levees to restore marsh hydrology.	Expand Alternative A. Document baseline conditions and mimic natural conditions to support appropriate habitat to enhance wildlife and habitat diversity. Develop additional breaches and/or remove the unused levees to restore marsh hydrology.
Hydrological Concerns Associated with Railroad	No active management.	Expand Alternative A. Work with partners to restore the natural hydrologic sheet flow onto the refuge to support appropriate habitat for migratory birds.	Expand Alternative A. Work with partners to restore the natural hydrologic sheet flow onto the refuge to support appropriate habitat for rare, threatened, and endangered species.	Expand Alternative A. Work with partners to restore the natural hydrologic sheet flow onto the refuge to enhance wildlife and habitat diversity.
<b>RESOURCE PROTECTION</b>				
<b>Acquisition Boundary</b>				
State-Owned Navigable Waters	No active management.	Expand Alternative A. Develop cooperative management agreements with State for the navigable waterways within the acquisition boundary, as appropriate.	Expand Alternative A. Develop cooperative management agreements with State for the navigable waterways within the acquisition boundary, as appropriate.	Expand Alternative A. Develop cooperative management agreements with State for the navigable waterways within the acquisition boundary, as appropriate.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
Refuge Boundary	No active management.	Same as Alternative A.	Same as Alternative A	Expand Alternative A. Survey to determine locations and extent of Service-owned and Service-managed properties and the acquisition boundary. Once located, evaluate wildlife and habitat values of the properties. Work with county to determine if any roadway rights-of-way exist on the refuge and work to abandon these as appropriate.
<b>Conservation Focus Areas</b>				
Important habitats and connections	No active management.	Expand Alternative A. Work with partners to protect the important habitats and connections serving migratory birds.	Expand Alternative A. Work with the partners to protect these important habitats and connections serving threatened and endangered species.	Expand Alternative A. Work with the partners to protect these important habitats and wildlife corridors.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>Lease/Management Agreements</b>				
FSA easements	No active management.	Expand Alternative A. Locate and develop GIS database for these properties. Evaluate the contribution that these areas provide to migratory birds. Ensure that these sites adhere to easement conditions and management objectives.	Expand Alternative A. Locate and develop GIS database for these properties. Evaluate the contribution that these areas provide to rare, threatened, and endangered species. Ensure that these sites adhere to easement conditions and management objectives.	Expand Alternative A. Locate and develop GIS database for these properties. Evaluate the contribution that these areas provide to wildlife and habitat diversity. Ensure that these sites adhere to easement conditions and management objectives.
<b>Archaeological and Historical Resources</b>				
Archaeological and Historical Resources	No active management. Limited archaeological surveys conducted as part of timber sales. Extent of cultural resources is unknown. Occasional law enforcement patrols.	Same as Alternative A.	Same as Alternative A.	Expand Alternative A. Conduct complete archaeological survey. Develop a regular patrol and enforcement program.
<b>Railroad</b>				
Safety Issues	Pursue funding and coordination with partners for railroad crossing safety equipment installation.	Same as Alternative A.	Expand Alternative A. Work with partners to protect wildlife movement throughout the railroad right-of-way.	Expand Alternative A. Work with partners to protect wildlife movement throughout the railroad right-of-way.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>Access</b>				
Eastern Boundary	Establish fire break and service road for access (~4.5 miles).	Expand Alternative A. Improve Service access, including boat ramp access.	Expand Alternative A. Improve Service access, including boat ramp access.	Expand Alternative A. Investigate the potential for additional public access points along the eastern boundary, including new railroad crossings.
Mud Lake Road Access	Coordinate with railroad company, county, and adjacent landowners to maintain existing easement road. A minor expansion proposal added a portion of Mud Lake Road to the acquisition boundary.	Expand Alternative A. Monitor public and Service usage. Evaluate the need for improvements to the roadway.	Expand Alternative A. Monitor public and Service usage. Evaluate the need for improvements to the roadway.	Expand Alternative A. Monitor public and Service usage. Work with landowners and partners to improve roadway conditions.
Audubon Avenue Access to Southern Border of Eastside Unit	No current management or access.	Expand Alternative A. Clear and maintain accessibility through the easement for management purposes.	Expand Alternative A. Clear and maintain accessibility through the easement for management purposes.	Expand Alternative A. Clear and maintain accessibility through the easement for management purposes. Evaluate the need to use this easement for future public access.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
<b>VISITOR SERVICES</b>				
<b>Visitor Welcome and Orientation</b>				
Providing Information to the Public	Maintain 6 kiosks, visitor contact station and website. Provide brochures and maps.	Same as Alternative A. But, alter all messages to focus on migratory birds. Add directional and entrance signs. Develop informational video.	Expand Alternative A. Alter all messages to focus on rare, threatened, and endangered species. Add directional and entrance signs. Develop informational video.	Expand Alternative A. Alter all messages to focus on wildlife and habitat diversity. Add directional and entrance signs. Develop informational video.
<b>Hunting</b>				
Turkey Hunting Opportunities	Bi-annual turkey surveys (Jan and Feb) to determine population status and trends.	Expand Alternative A. Ensure there are no adverse impacts to migratory birds.	Expand Alternative A. Ensure there are no adverse impacts to rare, threatened, and endangered species.	Expand Alternative A. Evaluate potential for turkey hunting.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
Deer Hunting Opportunities	Manage quota hunt. Two 9-day archery seasons (100 hunters ea), one 9-day primitive gun (100 hunters). Monthly surveys (Jun - Sep) to determine population status and trends. 11,000 acres are open to hunting.	Decrease Alternative A. Reduce area open to hunting from 11,000 to 3,225 acres. Hunting would be allowed on Tick Island, Jones land, Eastside Unit, and the uplands of the Volusia Tract. Change access routes (i.e., eliminate boat access via Spring Garden Lake). Coordinate with the State to evaluate status, trends, and herd health.	Same as Alternative A. Evaluate adverse impacts of hunting to rare, threatened, and endangered species. Adjust hunting where adverse impacts have been determined. Consider additional alternative population control measures if required. Coordinate with the State to evaluate status, trends, and herd health.	Change Alternative A. Work with State to evaluate status, trends, and herd health. Adjust hunting as adverse impacts experienced by deer, other wildlife and/or habitats have been determined. Consider additional alternative population control measures as needed.
<b>Fishing</b>				
Fishing Opportunities	Provide/maintain bank fishing sites. Fishing allowed throughout the refuge.	Expand Alternative A. Develop cooperative management agreements with State for the navigable waterways within the acquisition boundary. Coordinate with State to implement seasonal closures within the navigable waterways.	Expand Alternative A. Develop cooperative management agreements with State for the navigable waterways within the acquisition boundary. Coordinate with State to implement seasonal closures within the navigable waterways. Coordinate with State to expand manatee protection zones.	Expand Alternative A. Develop cooperative management agreements with State for the navigable waterways within the acquisition boundary. Coordinate with State to implement seasonal closures within the navigable waterways. Evaluate need for and location of a public boat ramp.



KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
<b>Wildlife Observation and Photography</b>				
Wildlife Viewing and Photography Opportunities	Maintain observation tower, Myacca Trail gazebo, 12 miles of trails and impoundment dikes, 700-foot observation boardwalk with photoblind.	Decrease Alternative A. Develop cooperative management agreements with State for the navigable waterways within the acquisition boundary. Coordinate with State to implement seasonal closures within the navigable waterways. Evaluate seasonal closures of any public use areas if adverse effects to migratory birds have been determined.	Decrease Alternative A. Develop cooperative management agreements with State for the navigable waterways within the acquisition boundary. Coordinate with State to implement seasonal closures within the navigable waterways. Evaluate seasonal closures of any public use areas if adverse effects to rare, threatened, and endangered species have been determined.	Expand Alternative A. Develop cooperative management agreements with State for the navigable waterways within the acquisition boundary. Coordinate with State to implement seasonal closures within the navigable waterways. Evaluate seasonal closures of any public use areas if adverse effects to threatened and endangered species have been determined. Increase the number of photo-blinds, boardwalks, and hiking and canoeing trails. Investigate the possibility to extend the Spring-to-Spring Trail as part of the Florida Trail System through the refuge.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
<b>Environmental Education and Interpretation</b>				
Environmental Education Opportunities	Conduct ~15 programs annually and annual scout leader workshop.	Expand Alternative A. Develop on- and off-site curriculum-based educational programs with messages focused on migratory birds. Train staff, volunteers, and teachers to conduct education programs.	Expand Alternative A. Develop on- and off-site curriculum-based educational programs with messages focused on rare, threatened, and endangered species. Train staff, volunteers, and teachers to conduct education programs.	Expand Alternative A. Develop on- and off-site curriculum-based educational programs with messages focused on the role and importance of the refuge in the landscape. Train staff, volunteers, and teachers to conduct education programs.
Interpretive Programs	Minimal coordination with eco-tour boat operator.	Expand Alternative A. Develop on- and off-site interpretive programs with messages focused on migratory birds and the minimization of human impacts. Train staff, volunteers, teachers, and tour operators to incorporate interpretive themes into programs.	Expand Alternative A. Develop on- and off-site interpretive programs with messages focused on rare, threatened, and endangered species and the minimization of human impacts. Train staff, volunteers, teachers, and tour operators to incorporate interpretive themes into programs.	Expand Alternative A. Develop on- and off-site interpretive programs with messages focused on the role and importance of the refuge in the landscape and the minimization of human impacts. Train staff, volunteers, teachers, and tour operators to incorporate interpretive themes into programs.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Number of Interpretive Trails	Only Myacca Trail exists.	Same as Alternative A.	Expand Alternative A. Consider adding interpretive hiking and canoeing trails that emphasize rare, threatened, and endangered species.	Expand Alternative A. Consider adding interpretive hiking and canoeing trails.
<b>Other Recreational Opportunities</b>				
Horseback Riding Opportunities	Horseback riding opportunities provided on Volusia Tract.	Decrease Alternative A. Eliminate horseback riding.	Decrease Alternative A. Eliminate horseback riding.	Modify Alternative A. Require special use permit and limit horseback riding to specific areas.
Guided Tours	Guided tours occur on refuge and navigable waters. Only those operations occurring on the refuge are required to obtain a valid special use permit from the refuge.	Expand Alternative A. Require as a permit condition that operators include messages focused on migratory birds and the minimization of human impacts.	Expand Alternative A. Require as a permit condition that operators include messages focused on rare, threatened, and endangered species and the minimization of human impacts.	Expand Alternative A. Require as a permit condition that operators include messages focused on the role and importance of the refuge in the landscape and the minimization of human impacts.
Bicycling and Jogging Opportunities	Bicycling and jogging opportunities exist on impoundment roads.	Decrease Alternative A. Eliminate bicycling and jogging.	Decrease Alternative A. Eliminate bicycling and jogging.	Modify Alternative A. The effects of bicycling and jogging on birds would be determined, and these activities would be modified or eliminated as needed.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>Outreach</b>				
Regional	Prepare press releases (~4 per yr)	Expand Alternative A. Focus outreach efforts on migratory birds.	Expand Alternative A. Focus outreach efforts on rare, threatened, and endangered species.	Expand Alternative A. Focus outreach efforts on wildlife and habitat diversity.
Local Residents	No active management.	Expand Alternative A. Focus outreach efforts on migratory birds.	Expand Alternative A. Focus outreach efforts on rare, threatened, and endangered species.	Expand Alternative A. Focus outreach efforts on wildlife and habitat diversity. Increase awareness of the refuge and the Refuge System.
<b>Friends Group</b>				
Friends of Lake Woodruff NWR	~100 members, current projects include Mayaca Interpretive Trail, native plant restoration.	Expand Alternative A. Focus Friends group's efforts and activities to benefit migratory birds. Support increases to the number of Friends members and level of activities.	Expand Alternative A. Focus Friends group's efforts and activities to benefit rare, threatened, and endangered species. Support increases to the number of Friends members and level of activities.	Expand Alternative A. Focus Friends group's efforts and activities to benefit wildlife and habitat diversity. Support increases to the number of Friends members and level of activities.
<b>Volunteers</b>				
Volunteers	~30 total, 5 regularly active (250 - 300 hours/year).	Expand Alternative A. Increase number of active volunteers and focus projects to benefit migratory birds.	Expand Alternative A. Increase number of active volunteers and focus projects to benefit rare, threatened, and endangered species.	Expand Alternative A. Increase number of active volunteers and focus projects to benefit wildlife and habitat diversity.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>Litter</b>				
Control of Trash and Litter	Volunteers perform 4 roadside and 1-2 impoundment clean-ups/year, and coordinate with law enforcement to control illegal dumping.	Expand Alternative A. Focus and schedule trash and litter control efforts to benefit migratory birds. Increase number of clean-ups through coordination with area service groups and schools. Ensure that refuge is included in area clean-up projects.	Expand Alternative A. Focus and schedule trash and litter control efforts to benefit rare, threatened, and endangered species. Increase number of clean-ups through coordination with area service groups and schools. Ensure that refuge is included in area clean-up projects.	Expand Alternative A. Focus and schedule trash and litter control efforts to benefit wildlife and habitat diversity. Increase number of clean-ups through coordination with area service groups and schools. Ensure that refuge is included in area clean-up projects.
Monofilament Fishing Line	No active management.	Expand Alternative A. Establish a fishing line recycling program on the refuge. Develop and distribute interpretive materials to educate the visiting public on the dangerous effects of discarded monofilament line to migratory birds.	Expand Alternative A. Establish a fishing line recycling program on the refuge. Develop and distribute interpretive materials to educate the visiting public on the dangerous effects of discarded monofilament line to rare, threatened, and endangered species.	Expand Alternative A. Establish a fishing line recycling program on the refuge. Develop and distribute interpretive materials to educate the visiting public on the dangerous effects of discarded monofilament line to wildlife.
<b>Fee Program</b>				
Fee Program	Deer hunt permit: \$12.50	Expand Alternative A. Evaluate the feasibility of implementing an expanded fee program.	Expand Alternative A. Evaluate the feasibility of implementing an expanded fee program.	Expand Alternative A. Evaluate the feasibility of implementing an expanded fee program.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
<b>REFUGE ADMINISTRATION</b>				
<b>Refuge Management</b>				
Administrative Facilities, Utilities, Equipment, and Signs	Repairs to refuge equipment and facilities are made as funding is allocated. Facility maintenance projects and improvement that will cost more than the refuge annual maintenance allocation are input into the SAMMS database for consideration of funding under Deferred Maintenance by the Regional and Washington offices. Refuge facilities: Office/Visitor Center Learning Resource Center Facility Pump House Equipment Storage Building Maintenance Building 2 Equipment Storage Sheds Oil Storage Shed 2 Fire Engines 3 Fire ATV's	Expand Alternative A. Equipment and facility repairs will be focused on those items needed for migratory bird management activities. Deferred maintenance priorities and API percentages will be reevaluated to reflect a focus on migratory bird management. SAMMS project descriptions will be changed to reflect and support the migratory bird management priorities of the refuge. Build levee system to expand water level management through the east marsh to Lake Woodruff. Install additional pumping facilities to management water levels throughout the newly impounded areas. Install a boat docking and/or launching	Expand Alternative A. Equipment and facility repairs will be focused on those items needed for habitat management activities as needed for rare, threatened, and endangered species. Deferred maintenance priorities and API percentages will be reevaluated to reflect a focus on managing habitat for the support of rare, threatened, and endangered species. SAMMS project descriptions will be changed to reflect and support the rare, threatened, and endangered species management priorities of the refuge. Install a boat docking and/or launching facility along the Norris Dead River or along Spring Garden Run.	Expand Alternative A. Equipment and facility repairs will be focused on those items needed for habitat management activities to enhance wildlife and habitat diversity. Deferred maintenance priorities and API percentages will be reevaluated to reflect a focus on management activities that enhance wildlife and habitat diversity. SAMMS project descriptions will be changed to reflect and support the management priorities of the refuge. Install a boat docking and/or launching facility along the Norris Dead River or along Spring Garden Run. Develop interpretive canoeing trails along the Norris Dead River and Spring Garden Run. Equipment

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
	Transport truck Dozer with plow 3 Tractors with implements Batwing mower Bushhog 2 Rotovators Backhoe 4 Work boats Work barge Airboat 11 Work trucks Water Pumping Facility 6 Culverts with water control structures ~3.5 miles of levees surrounding 3 water level management impoundments.	facility along the Norris Dead River or along Spring Garden Run. Equipment storage facility and fire cache building. Four RV pads at Refuge Headquarters.	Develop interpretive canoeing trails along the Norris Dead River and Spring Garden Run. Equipment storage facility and fire cache building. Four RV pads at Refuge Headquarters.	storage facility and fire cache building. Four RV pads at Refuge Headquarters.

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
Staff	<p>6 total FTEs positions approved</p> <p>Wildlife Refuge Manager Biologist Prescribed Fire Specialist Engineering Equip Operator 2 forestry technicians (career seasonal)</p> <p>Total Staff = 6 FTE</p> <p>Total Recurring Cost = \$490,000</p>	<p>Expand Alternative A. In addition to current staff:</p> <p>Refuge Wildlife Specialist (Assistant Refuge Manager) Office Assistant Biologist 2 biological science technicians 2 maintenance workers Law Enforcement Officer Park Ranger (education/outreach and volunteer coordination)</p> <p>Total Staff = 15 FTE</p> <p>Total Recurring Cost = \$768,000</p>	<p>Expand Alternative A. In addition to current staff:</p> <p>Refuge Wildlife Specialist (Assistant Refuge Manager) Office Assistant 2 biologists 2 biological science technicians Non-fire Forestry Technician 2 maintenance workers 2 law enforcement officers Park Ranger (education/outreach and volunteer coordination)</p> <p>Total Staff = 18 FTE</p> <p>Total Recurring Cost = \$965,000</p>	<p>Expand Alternative A. In addition to current staff:</p> <ul style="list-style-type: none"> <li>• Refuge Wildlife Specialist (Assistant Refuge Manager)</li> <li>• Biological Science Technician</li> <li>• Maintenance Worker</li> <li>• Law Enforcement Officer</li> <li>• Park Ranger (education, outreach, interpretation, and volunteer coordination)</li> </ul> <p>Total Staff = 11 FTE</p> <p>Total Recurring Cost = \$680,000</p>



KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
<b>Intergovernmental Coordination</b>				
Intergovernmental Coordination	Attend 8-10 annual coordination meetings.	Expand Alternative A. Work with partners to focus exotic plant control efforts on high priority habitats for migratory birds, survey and assess the potential for impacts to migratory birds, control feral and free-roaming animals to minimize adverse impacts to migratory birds, research and evaluate the effects of exotic aquatic plants on migratory birds, develop appropriate cooperative management agreements for certain aspects of the navigable waterways within the refuge acquisition boundary, control efforts to benefit migratory birds, and survey and assess the potential for impacts by exotic aquatic animals to migratory birds. Evolve the Volusia County Land Managers	Expand Alternative A. Work with partners to coordinate monitoring activities, conduct regular patrols for compliance with speed zone regulations, develop appropriate cooperative management agreements for certain aspects of the navigable waterways within the refuge acquisition boundary, and create seasonal closures of key waterways. Coordinate with State to expand manatee protection zones. Coordinate with partners to ensure minimum flows and levels. Coordinate with State to monitor movement of rare, threatened, and endangered species. Work with partners to create habitat corridors. Research and evaluate the effects of exotic aquatic plants on rare,	Expand Alternative A. Coordinate with State to monitor movement, work with partners to create habitat corridors. Coordinate with partners to monitor the proximity of active colonies. Work with partners to develop appropriate cooperative management agreements for certain aspects of the navigable waterways within the refuge acquisition boundary. Conduct aerial waterfowl surveys. Minimize public use impacts to waterfowl (including seasonal closures of key areas). Increase regular patrol and enforcement. Work with partners to survey and assess the potential for impacts of exotic aquatic animals to wildlife and habitats. Coordinate with the State to evaluate coyote control where necessary. Coordinate

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
		<p>Meeting into a fully functional working group to meet the common goals and objectives of the partners.</p>	<p>threatened, and endangered species. Develop appropriate cooperative management agreements with State for navigable waterways within the acquisition boundary. Coordinate control efforts to benefit rare, threatened, and endangered species. Work with the partners to survey and assess the potential for impacts of exotic aquatic animals to rare, threatened, and endangered species. Coordinate with the State to evaluate and control where necessary if adverse impacts of coyotes to rare, threatened, and endangered species are determined. Coordinate with partners to control feral and free-roaming animals to minimize adverse impacts to rare, threatened, and endangered species.</p>	<p>with the partners to control feral and free-roaming animals to minimize adverse impacts to wildlife and habitat. Evolve the Volusia County Land Managers Meeting into a fully functional working group to meet the common goals and objectives of the partners.</p>

KEY TOPICS	Alternative A: Current Management (No Action Alternative)	Alternative B: Migratory Birds	Alternative C: Rare, Threatened, and Endangered Species	Alternative D: Wildlife and Habitat Diversity (Proposed Action)
			Evolve the Volusia County Land Managers Meeting into a fully functional working group to meet the common goals and objectives of the partners.	



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## IV. ENVIRONMENTAL CONSEQUENCES

### OVERVIEW

This section analyzes and discusses the potential environmental effects or consequences that can be reasonably expected by the implementation of each of the four alternatives described in Chapter III of this EA. Specific environmental and social impacts of implementing each alternative are discussed in Table 9 under four broad management categories: wildlife and habitat management; resource protection; visitor services; and refuge administration. Outlined are the anticipated impacts over the 15-year life of the CCP that could result from the implementation of the actions described in Alternatives A, B, C, and D. The action alternatives (i.e., B, C, and D) are compared to the No Action Alternative (A).

### EFFECTS COMMON TO ALL ALTERNATIVES

A few potential effects would be the similar under each alternative. These are summarized under six categories: environmental justice, climate change, other management, cultural resources, Refuge Revenue Sharing Act payments, and other effects.

#### *ENVIRONMENTAL JUSTICE*

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

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

#### *CLIMATE CHANGE*

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

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

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

Conserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges such as Lake Woodruff WNR. The refuge will continue to play a role in carbon sequestration, primarily in its marsh habitats (Pant et al., 2003). All the alternatives proposed in this CCP would conserve or restore land and water, and would thus enhance carbon sequestration. This, in turn, contributes positively to efforts to mitigate human-induced global climate changes.

The impacts of climate change on Lake Woodruff NWR during the first 15 years of implementation are likely to include an increased risk of tropical cyclones or hurricanes (Webster et al., 2005), drought (Dai et al., 2004), and vegetation shifts (Box et al., 2004), as well as the spread of non-native species (Mooney and Hobbs 2000).

- Tropical cyclones can negatively affect Lake Woodruff NWR through flooding and tree damage. Flooding can damage refuge infrastructure and affect habitat. The proposed removal of levees may help minimize some of the effects of flooding by allowing waters to retreat faster to normal levels. Nesting birds, including listed species, may be adversely affected by high winds and tree-falls. Known nest sites of listed species can be checked after storms to assess damage and potentially rescue fledglings.
- Droughts can affect the refuge in two major ways: by reducing water quantity and increasing the risk of wildfires. Improved coordination with the State of Florida to maintain adequate water levels will help safeguard this valuable resource on the refuge. A comprehensive prescribed burning plan would help minimize the frequency and intensity of wildfires during periods of drought.
- Changes in temperature, rainfall, wind patterns, and other factors that affect the distribution of plant communities are affected by climate and will respond accordingly. Vegetation communities are predicted to shift, although the exact manner in which the various habitats found on the refuge will respond to climate change is unknown. Although the refuge will not be able to prevent the shift of habitat, the various management techniques outlined in the proposed action would help protect the vegetation communities found on the refuge and minimize loss of biological diversity.
- Since most non-native species in Florida are of tropical or sub-tropical origin, as a group they are expected to expand their range north as the result of global warming. Non-native plant species currently not found on the refuge, such as Melaleuca and Brazilian pepper, will likely colonize areas of the refuge. The development and implementation of a non-native species management planned called for in the proposed action would help minimize the adverse effects of non-native plants and animals on the refuge.

#### *OTHER MANAGEMENT*

All management activities that could affect the refuge’s natural resources, including subsurface mineral reservations, utility lines and easements, soils, water, and air would be managed to comply with all laws and regulations. In particular, any existing and future oil and gas exploration, extraction,

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and transport operations on the refuge would be managed identically under each of the alternatives. Thus, the impacts would be the same. Under each of the alternatives, the Service would work to minimize the impacts of any such activities.

### *CULTURAL RESOURCES*

The Fish and Wildlife Service is responsible for managing archaeological and historical resources found on refuge lands. Since cultural resource surveys on the refuge have been limited, additional surveys would be conducted prior to any new construction or excavation, satisfying provisions of the National Environmental Policy Act of 1969 and all applicable cultural resource laws and policies. Potentially negative impacts from construction of trails or facilities would require the review by the Service's Regional Archaeologist and consultation with the Florida State Historic Preservation Office. Determining whether a particular management action has the potential to affect cultural resources is an on-going process that would occur during the detailed planning stages of every project. Service acquisition or management of land with known or potential archaeological or historical sites would provide three major types of protection for these resources: protection from private development (e.g., into single-family homes), protection from damage by Federal activities, and protection from vandalism or theft. Service policy is to preserve these resources in the public trust, avoiding impacts whenever possible. Minimal or no negative impacts are anticipated for any particular cultural resources of the refuge under any of the alternatives. As a whole, positive impacts are expected due to management and protection of these resources under all of the alternatives.

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

### *REFUGE REVENUE SHARING ACT PAYMENTS*

The Service provides Volusia and Lake Counties with Refuge Revenue Sharing Act payments in lieu of property tax income. Annual Refuge Revenue Sharing Act payments to Volusia and Lake Counties would continue at similar rates under each alternative. If lands are acquired and added to the refuge, the payments would increase accordingly.

### *OTHER EFFECTS*

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

### **SUMMARY OF EFFECTS BY ALTERNATIVE**

The following section describes the environmental consequences of implementing each refuge management alternative. Table 9 summarizes and addresses the likely outcomes for the specific issues and is organized by broad issue categories.

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Each of the alternatives is anticipated to result in net positive environmental benefits. Impacts anticipated under the implementation of each alternative are summarized for soils, air quality, hydrology and water quality, and biological resources.

*ALTERNATIVE A – CURRENT MANAGEMENT (NO ACTION)*

Implementation of Alternative A is anticipated to result in net positive environmental benefits.

The management activities outlined under Alternative A are anticipated to have net neutral to positive impacts on soils.

The management activities outlined under Alternative A would help to improve air quality. Minor, short-term negative air quality impacts could be experienced during controlled burns or wildfires. However, these impacts are offset by the positive impacts of the resultant higher quality native habitats.

The management activities outlined under Alternative A are anticipated to have net positive impacts to hydrology and water quality. Minor restoration activities of upland sheet flow, impounded wetlands, and the greentree reservoir are anticipated to positively impact hydrology and water quality.

The management activities outlined under Alternative A are anticipated to have net positive impacts to biological resources. Habitat management activities would result in high-quality habitats supporting native wildlife and habitat diversity.

*ALTERNATIVE B – MIGRATORY BIRDS*

Implementation of Alternative B is anticipated to result in net positive environmental benefits.

The management activities outlined under Alternative B are anticipated to have net neutral to positive impacts on soils. Restoring the area's natural hydrology and managing habitats would have a positive impact on soils. Expanding impounded wetlands would have discrete negative impacts on soils and soil formation processes.

The management activities outlined under Alternative B would help to improve air quality. Minor, short-term negative air quality impacts could be experienced during controlled burns or wildfires. However, these impacts are offset by the positive impacts of the resultant higher quality native habitats.

The management activities outlined under Alternative B are anticipated to have net positive impacts to hydrology and water quality. Restoration of the natural upland sheet flow and water flow through the marshes are anticipated to positively impact hydrology and water quality. Potential conversion of marshes to impounded wetlands would have a neutral overall effect on the area's water quality. And positive hydrology and water quality impacts would result from the acquisition, protection, and management of additional lands.

The management activities outlined under Alternative B are anticipated to have net positive impacts to biological resources. Habitat management activities would result in high-quality habitats supporting increased numbers of migratory birds and native wildlife and wildlife diversity.

*ALTERNATIVE C – RARE, THREATENED, AND ENDANGERED SPECIES*

Implementation of Alternative C is anticipated to result in net positive environmental benefits.

The management activities outlined under Alternative C are anticipated to have net positive impacts on soils. Restoring the area's natural hydrology and managing habitats would positively impact soils and soil formation processes.



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The management activities outlined under Alternative C would help to improve air quality. Minor, short-term negative air quality impacts could be experienced during controlled burns or wildfires. However, these impacts are offset by the positive impacts of the resultant higher quality native habitats.

The management activities outlined under Alternative C are anticipated to have net positive impacts to hydrology and water quality. Restoration of the natural upland sheet flow and water flow through the marshes are anticipated to positively impact hydrology and water quality. And positive hydrology and water quality impacts would result from the acquisition, protection, and management of additional lands.

The management activities outlined under Alternative C are anticipated to have net positive impacts to biological resources. Habitat management activities would result in high-quality habitats supporting increased numbers of threatened and endangered species and native wildlife and wildlife diversity.

#### *ALTERNATIVE D – WILDLIFE AND HABITAT DIVERSITY (PROPOSED ACTION)*

Implementation of Alternative D is anticipated to result in net positive environmental benefits.

The management activities outlined under Alternative D are anticipated to have net positive impacts on soils and soil formation processes. The positive effects of restoring upland areas and more intensively managing habitats would offset the moderately negative effects of creating additional impounded wetlands.

The management activities outlined under Alternative D would help to improve air quality. Minor, short-term negative air quality impacts could be experienced during controlled burns or wildfires. However, these impacts are offset by the positive impacts of the resultant higher quality native habitats.

The management activities outlined under Alternative D are anticipated to have net positive impacts to hydrology and water quality. Restoration of the natural upland sheet flow and water flow through the marshes are anticipated to positively impact hydrology and water quality. And positive hydrology and water quality impacts would result from the acquisition, protection, and management of additional lands.

The management activities outlined under Alternative D are anticipated to have net positive impacts to biological resources. Habitat management activities would result in high-quality habitats supporting native wildlife and wildlife diversity.

### **COMPARISON OF EFFECTS FROM IMPLEMENTING ALTERNATIVES**

While the four alternatives share similarities, their differences result in varying types and levels of impacts. None of the proposed management activities would lead to a violation of Federal, State, or local laws imposed for the protection of the environment. Alternative A does not propose any change in the present management direction. As such, Alternative A serves as the baseline for comparing the other alternatives. Without funding and staffing to support needed programs and to provide protection for the resources, Alternative A provides the least support for long-term productivity and sustainability of the refuge. Alternative D provides the most benefits to the refuge, the natural resources supported by the refuge, and the local community, supporting long-term productivity and sustainability of the refuge. Alternative D was selected as the proposed action based on the analysis in the EA and its ability to best serve the purposes, vision, and goals of the refuge.

Adaptive management is a key component of each alternative. As such, the actions outlined would not establish a precedent for future actions with significant effects, nor represent a decision in

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principle about future considerations. Refuge management activities are constantly adapted as new research, data, and information become available.

See Table 9 for a comparison of the environmental consequences under four categories: wildlife and habitat management, resource protection, visitor services, and refuge administration.

**Table 9: Consequences of management alternatives**

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>WILDLIFE AND HABITAT MANAGEMENT</b>				
<b>Rare, Threatened and Endangered Species</b>				
Gopher Tortoise	Neutral. No change in gopher tortoise habitat acreage. Current populations would be maintained.	Same as Alternative A.	Positive. Moderate increase in gopher tortoise habitat and subsequent populations. Increased information. Decreased isolation of local populations.	Same as Alternative C.
Whooping Crane	Neutral. No change in whooping crane habitat.	Same as Alternative A.	Positive. Decreased disturbance. Active management to increase whooping crane populations. Increased available foraging habitat acreage.	Positive. Decreased disturbance. Increased available foraging habitat acreage.
Sandhill Crane	Neutral to Positive. Habitat management to maintain stable to increasing populations.	Same as Alternative A.	Positive. Decreased disturbance. Active management to support increased sandhill crane foraging, nesting, and fledgling habitat. Increased information.	Positive. Decreased disturbance. Active management to support increased sandhill crane foraging, nesting, and fledgling habitat.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Manatee	Neutral to Negative. Manatees remain at risk to disturbance, injuries, or fatalities.	Same as Alternative A.	Positive. Increased protection of manatees and their habitat to support stable or increasing populations. Increased information and public awareness.	Positive. Increased information and public awareness. Increased protection of manatees to support stable populations.
Florida Pine Snake	Neutral. Maintain potentially suitable habitat at current acreage.	Same as Alternative A.	Neutral to Positive. Increased information. Active management to enhance potentially suitable habitat and establish population.	Neutral. Maintain potentially suitable habitat at current acreage. Increased information.
American Alligator	Neutral to Negative. Alligator populations may increase without active management.	Same as Alternative A.	Same as Alternative A.	Neutral to Positive. Increased information. Active management to support healthy population levels in support of increasing wildlife diversity.
Florida Black Bear	Neutral to Positive. Bear populations may increase with minimal management.	Same as Alternative A.	Positive. Increased information. Decrease isolation of populations. Increase public awareness to protect increased populations.	Positive. Increased information. Decrease isolation of populations. Increase public awareness to protect vulnerable populations.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Wood Stork	Neutral No active nesting by wood storks. No change in wood stork habitat to support stable population.	Same as Alternative A.	Positive. Increased information. Active management to support increasing populations. Neutral to positive to nesting pairs. Decreased disturbance.	Neutral. No active nesting by wood storks. No change in wood stork habitat to support stable population. Increased information.
Eastern Indigo Snake	Neutral Not known to currently occur on the refuge.	Same as Alternative A.	Neutral to Positive. Increased information. Active management to enhance suitable habitat and establish population.	Neutral. Increased information.
Swallow-tailed Kite	Neutral to Negative. No active management. Continue to monitor population.	Positive Decreased disturbance. Increased habitat to support roosting birds.	Same as Alternative B.	Positive. Decreased disturbance.
Limpkin	Neutral to Negative. Continue current management to support limpkin populations.	Same as Alternative A.	Positive. Increased information. Active management of forage base to support increasing limpkin populations.	Positive. Increased information.
Snail Kite	Neutral to Negative No active management.	Same as Alternative A.	Neutral to Positive Increased information.	Same as Alternative C.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Red-cockaded Woodpecker	Neutral No active management. No active colonies known to exist.	Same as Alternative A.	Neutral to Positive Active management to support natural recruitment or reintroduction. Increased information.	Same as Alternative C.
<b>Migratory Birds</b>				
Waterfowl	Positive. Management of impoundments and greentree reservoir supports increasing waterfowl populations.	Positive. Active management of increased available habitat would support increasing waterfowl populations. Increased protection of waterfowl utilizing State waters within the refuge. Increased information and decreased disturbance.	Neutral. Emphasis of management for multiple species may decrease suitable habitat for waterfowl.	Positive. Increased protection. Increased information and decreased disturbance.
Shorebirds	Neutral. Management of impoundments maintains variable habitat acres and fluctuating numbers of shorebirds.	Positive. Active management of impoundments to support increasing populations of shorebirds. Decreased disturbance and increased information.	Neutral. Emphasis of management for multiple species may decrease suitable habitat for shorebirds.	Positive. Active management of impoundments to support increasing populations of shorebirds. Decreased disturbance and increased information.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Wading Birds	Neutral. Management of impoundments maintains stable populations of wading birds.	Neutral to Positive. Increased information. Decreased disturbance.	Neutral to Positive. Increased management for wood storks to support stable to increased populations of wading birds.	Positive. Active management to support increasing populations of wading birds. Decreased disturbance.
Secretive Marshbirds	Neutral to Negative Multi-species management may decrease suitable habitat for secretive marshbirds. Prescribed burning activities may have negative impacts.	Same as Alternative A.	Positive. Increase in suitable habitat and active management should support increasing populations. Increased information.	Positive. Increased information. Adaptive management and protection of breeding birds should result in stable or increasing populations.
Land Birds	Neutral. No active management.	Positive. Increase in suitable habitat and active management should support increasing populations. Increased information.	Neutral to Positive. Increased information. Increased management should result in stable or increasing populations.	Same as Alternative C.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>Exotic, Invasive, and Nuisance Species</b>				
Control of Exotic Aquatic Plants	Neutral to Positive. Current management results in stable or decreasing populations of exotic aquatic plants thereby keeping State waters on the refuge navigable and impoundments suitable for wildlife that utilize these areas.	Positive. Increased information. Increased coordination with State and active management should result in decreased exotic aquatic plant populations benefiting migratory birds.	Positive. Increased information. Increased coordination with State and active management should result in decreased exotic aquatic plant populations benefiting rare, threatened, and endangered species.	Positive. Increased information. Active management should result in decreased exotic aquatic plant populations benefiting wildlife and habitat diversity.
Control of Exotic Terrestrial Plants	Neutral to Positive. Spot treatment of exotic plants.	Positive. Active management should control terrestrial exotic plants.	Positive. Active management should control terrestrial exotic plants and benefit rare, threatened, and endangered species.	Positive. Increased information. Active management should eliminate or control exotic plants resulting in an increase in wildlife and habitat diversity.
Control of Exotic Aquatic Animals	Neutral to Negative. No active management.	Neutral to Positive. Increased information. Implementing control measures could reduce potential impacts of exotic aquatic animals.	Neutral to Positive. Increased information. Implementing control measures could benefit rare, threatened, and endangered species.	Neutral to Positive. Increased information. Implementing control measures could benefit wildlife and habitat diversity.



<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Control of Feral Hog	Neutral. Incidental control helps reduce negative impacts of feral hogs.	Neutral to Positive. Incidental control helps reduce negative impacts of feral hogs to migratory birds.	Neutral to Positive. Feral hog control would help reduce negative impacts to rare, threatened, and endangered species.	Neutral to Positive. Increased information. Feral hog control would help reduce negative impacts to wildlife and habitat diversity.
Control of Coyote	Neutral to Negative. Without active management, increasing coyote populations could negatively affect refuge species and habitats.	Neutral to Negative. Without active management, increasing coyote populations could negatively affect migratory birds.	Neutral to Positive. Increased information. Coyote control would help reduce negative impacts to rare, threatened, and endangered species.	Neutral to Positive. Increased information. Coyote control would help reduce negative impacts to wildlife and habitat diversity.
Control of Feral and Free-Roaming Animals	Negative. Without active management, increasing feral and free-roaming animal populations could negatively affect refuge species and habitats.	Positive. Concerted control of harmful feral and free-roaming animals would help increase populations of migratory birds.	Positive. Concerted control of harmful feral and free-roaming animals would benefit populations of rare, threatened, and endangered species.	Positive. Concerted control of harmful feral and free-roaming animals would help increase wildlife and habitat diversity.
<b>Wildlife and Habitat Diversity</b>				
Mesic Pine Palmetto Flatwoods Mesic-Xeric Scrubby Flatwoods Longleaf Pine and Wiregrass Savanna Oak-Sand Pine Scrub	Neutral. Active management would continue to maintain current acreage of upland habitats.	Positive. An increase in suitable upland habitat and active management would help increasing populations of migratory birds. Increased information.	Positive. Increased information. Active management would maintain stable or help increase populations of rare, threatened, and endangered species.	Positive. An increase in upland habitat and active management would help increase wildlife and habitat diversity. Increased information.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Oak Hammock Mesic Hammock Wetland Hardwoods	Neutral. Current fire management would help maintain mesic/hydric hardwood habitats at current acreage.	Positive. Increased information. Active management would improve the qualities of these habitats.	Positive. Increased information. Active management would support an increase in rare, threatened, and endangered species' populations.	Positive. Increased information. Active management would support an increase in wildlife and habitat diversity.
Impoundments	Neutral. Current management would maintain impoundments at stable levels.	Positive. Increased information. Increase in impoundment acreage.	Positive. Increased information. Active management and decreased disturbance would lead to increasing populations of rare, threatened, and endangered species utilizing these areas.	Positive. Increased information. Active management and decreased disturbance
Greentree Reservoir (GTR)	Neutral. Current management would maintain present GTR and flooded hardwood forest acreage.	Positive. Increased information. Decreased disturbance. Active management to support increasing migratory bird populations.	Neutral to Positive. Increased information. Decreased disturbance. Active management to support stable or increasing rare, threatened, and endangered species.	Positive. Increased information. Decreased disturbance. Active management to support increasing wildlife and habitat diversity.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Open Emergent Marshes	Neutral. Current management would maintain stable acreage of marsh habitat.	Neutral to Negative. An emphasis on migratory bird management would increase impoundments and decrease marsh acreage. Increased information. Active management and increased impoundment habitat would support increasing migratory bird populations. Decreased disturbance. Decrease in damage by inappropriate airboat use to marshes.	Neutral to Positive. Increased information. Decreased disturbance to rare, threatened and endangered species. Decrease in damage by inappropriate airboat use to marshes. Enhanced marsh habitat would support increasing populations of rare, threatened, and endangered species.	Neutral to Positive. Increased information. Active management would support increasing wildlife and habitat diversity. Decreased disturbance. Decrease in damage by inappropriate airboat use to marshes.
Rights-of-way/Ruderal Areas	Neutral to Negative. Habitat quality in many of these areas is poor.	Positive. Improved foraging habitat to support increasing migratory birds.	Positive. Improved foraging and breeding habitat to support rare, threatened, and endangered species.	Positive. Active management would support an increase in wildlife and habitat diversity.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Native Fishes	Neutral to Positive. Current incidental stocking would continue to maintain or increase native sport fish populations.	Neutral. Stocking with an emphasis on providing migratory birds with increased forage would not increase overall populations of native fishes (an increase in forage base would support increasing populations of migratory birds).	Positive. Increased information. Active management would support increasing populations of rare, threatened, and endangered species.	Positive. Increased information. Minimizing negative impacts of management practices to support increasing wildlife and habitat diversity.
Herpetological Species (e.g., frogs, toads, snakes, and lizards)	Positive. Increased information.	Positive. Increased information. Minimizing negative impacts of migratory bird management practices to support increasing populations.	Positive. Increased information. Active management to support increasing populations of rare, threatened, and endangered species.	Positive. Increased information. Minimizing negative impacts of management practices to support increasing wildlife and habitat diversity.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>Water Quantity and Quality; Minimum Flows and Levels; Hydrology; and Hydrological Concerns Associated with Railroad</b>				
Water Quantity	Neutral to Negative Increased information. Active management to maintain optimal water quantities in impoundments.	Positive. Increased cooperation with partners. Increased information. Active management to maintain optimal water quantities. Secure adequate water supplies to support increasing populations of migratory birds.	Positive. Increased cooperation with partners. Increased information. Active management to maintain optimal water quantities. Secure adequate water supplies to support increasing populations of rare, threatened, and endangered species.	Positive. Increased cooperation with partners. Increased information. Active management to maintain optimal water quantities. Secure adequate water supplies to support increasing wildlife and habitat diversity.
Water Quality	Negative. No active management.	Positive. Increased cooperation and information. Adequate water quality would support increasing migratory bird populations.	Positive. Increased cooperation and information. Adequate water quality would support increasing rare, threatened, and endangered species' populations.	Positive. Increased cooperation and information. Adequate water quality would support increasing wildlife and habitat diversity.
Minimum Flows and Levels	Neutral to Negative. No active management.	Positive. Increased cooperation and information. Minimum flows and levels would support increasing migratory bird populations.	Positive. Increased cooperation and information. Minimum flows and levels would support increasing rare, threatened, and endangered species' populations.	Positive. Increased cooperation and information. Minimum flows and levels would support increasing wildlife and habitat diversity.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Hydrology	Positive. Current restoration efforts would return normal hydrological processes to altered areas.	Positive. Increased information. Return of natural hydrological conditions would support increasing populations of migratory birds.	Positive. Increased information. Return of natural hydrological conditions would support increasing populations of rare, threatened, and endangered species.	Positive. Increased information. Return of natural hydrological conditions would support increasing wildlife and habitat diversity.
Hydrological Concerns Associated with Railroad	Negative. No active management.	Positive. Return of natural hydrological conditions would support increasing populations of migratory birds.	Positive. Return of natural hydrological conditions would support increasing populations of rare, threatened, and endangered species.	Positive. Return of natural hydrological conditions would support increasing wildlife and habitat diversity.
<b>RESOURCE PROTECTION</b>				
<b>Acquisition Boundary</b>				
State-owned Navigable Waters	Neutral to Negative. Refuge does not have cooperative management agreements for these areas.	Positive. Cooperative management agreements would allow opportunities to support increasing populations of migratory birds.	Positive. Cooperative management agreements would allow opportunities to support increasing populations of rare, threatened, and endangered species.	Positive. Cooperative management agreements would allow opportunities to support increasing wildlife and habitat diversity.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Refuge Boundary	Negative. No active management.	Same as Alternative A.	Same as Alternative A.	Positive. Increased information. Active management of properties would support increasing wildlife and habitat diversity.
<b>Conservation Focus Areas</b>				
Important habitats and connections	Negative. Development threatens these sites.	Positive. Protecting migratory bird habitat and corridors would support increasing populations.	Positive. Protecting rare, threatened, and endangered species' habitat and corridors would support increasing populations.	Positive. Protecting habitat and wildlife corridors would increase biodiversity.
<b>Lease/Management Agreements</b>				
FSA easements	Negative. No active management.	Positive. Increased information and protection.	Same as Alternative B.	Same as Alternative B.
<b>Archaeological and Historical Resources</b>				
Archaeological and Historical Resources	Negative. No active management. Vandalism, disturbance, and theft are all threats.	Same as Alternative A.	Same as Alternative A.	Positive. Increased information. Increased protection of archaeological and historical resources.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>Railroad</b>				
Safety Issues	Unknown. Would be negative without resources/agreement; positive with resources/agreement.	Same as Alternative A.	Positive. Increased public safety. Increased protection of rare, threatened, and endangered species.	Positive. Increased public safety. Increased protection of wildlife.
<b>Access</b>				
Eastern Boundary	Positive. Increased fire protection and access required to conduct refuge management operations.	Same as Alternative A.	Same as Alternative A.	Positive. Increased fire protection and access required to conduct refuge management operations. Increased public access opportunities.
Mud Lake Road Access	Negative. Improvement of road conditions.	Neutral to Negative Improvement of road conditions. Increased information.	Neutral to Negative Improvement of road conditions. Increased information.	Positive. Improvement of road conditions. Increased information.
Audubon Avenue Access to Southern Border of Eastside Unit	Negative No current access.	Positive Access for refuge management.	Positive Access for refuge management.	Positive Access for refuge management. Possible future access for public.



<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>VISITOR SERVICES</b>				
<b>Visitor Welcome and Orientation</b>				
Providing Information to the Public	Positive. Information available to visitors.	Positive. Visitors will gain increasing awareness and understanding of migratory birds.	Positive. Visitors will gain increasing awareness and understanding of rare, threatened, and endangered species.	Positive. Visitors will gain increasing awareness and understanding of wildlife and habitat diversity.
<b>Hunting</b>				
Turkey Hunting Opportunities	Neutral to Positive. Turkey hunting opportunities. Increased information.	Positive. Increased information.	Same as Alternative B.	Same as Alternative B.
Deer Hunting Opportunities	Neutral to Positive. Limited deer hunting opportunities on refuge.	Neutral to Negative. Increased information. Reduced deer hunting opportunities on refuge.	Neutral to Negative. Increased information. Potential for reduced or eliminated deer hunting opportunities on refuge.	Neutral to Positive. Limited deer hunting opportunities on refuge. Increased information.
<b>Fishing</b>				
Fishing Opportunities	Positive. Current fishing opportunities exist on refuge.	Positive. Increased acreage open to fishing.	Negative. Reduced fishing opportunities on navigable waterways.	Neutral to Positive. Stable or increased fishing opportunities on navigable waterways.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>Wildlife Observation and Photography</b>				
Wildlife Viewing and Photography Opportunities	Positive. Current wildlife viewing and photography opportunities exist.	Negative. Reduced wildlife viewing and photography opportunities.	Same as Alternative B.	Positive. Increased wildlife viewing and photography opportunities.
<b>Environmental Education and Interpretation</b>				
Environmental Education Opportunities	Positive. Current environmental education opportunities would be maintained.	Positive. Increased environmental education opportunities.	Same as Alternative B.	Same as Alternative B.
Interpretive Programs	Neutral. Current interpretive programs would be maintained.	Positive. Increase in interpretive programs.	Same as Alternative B.	Same as Alternative B.
Number of Interpretive Trails	Positive. Current interpretive trail would be maintained.	Same as Alternative A.	Neutral to Positive. Number of interpretive trails might be increased.	Same as Alternative C.
<b>Other Recreational Opportunities</b>				
Horseback Riding Opportunities	Positive. Horseback opportunities exist on refuge.	Negative. Horseback riding opportunities eliminated from refuge.	Same as Alternative B.	Neutral to Positive. Horseback riding opportunities maintained on refuge.
Guided Tours	Positive. Guided tours would continue to exist on refuge.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
Bicycling and Jogging Opportunities	Positive. Bicycling and jogging opportunities exist on refuge.	Negative. Bicycling and jogging would be eliminated.	Same as Alternative B.	Neutral to Negative. These activities could be eliminated.
<b>Outreach</b>				
Regional	Positive. Regional outreach would continue.	Neutral to Positive. Regional outreach would continue.	Same as Alternative B.	Same as Alternative B.
Local Residents	Negative. No active management.	Positive Local outreach would increase.	Same as Alternative B.	Same as Alternative B.
<b>Friends Group</b>				
Friends of LWNWR	Neutral to Positive. Friends of LWNWR membership and activity level would remain stable or increase.	Positive. Friends of LWNWR membership and activity level would increase.	Same as Alternative B.	Same as Alternative B.
<b>Volunteers</b>				
Volunteers	Neutral to Positive. Volunteer activity level and number of projects would remain stable or increase.	Positive. Volunteer activity level and number of projects would increase.	Same as Alternative B.	Same as Alternative B.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>Litter</b>				
Control of Trash and Litter	Negative. Litter clean-up and control would be maintained at current levels.	Positive. Litter clean-up and control would increase.	Same as Alternative B.	Same as Alternative B.
Monofilament Fishing Line	Negative. No active management.	Positive. Monofilament fishing line clean-up would increase. Reduction in illegally discarded line.	Same as Alternative B.	Same as Alternative B.
<b>Fee Program</b>				
Amount of Revenue Generated by Fees	Neutral. Stable fee program.	Positive. Increased revenue.	Same as Alternative B.	Same as Alternative B.
<b>REFUGE ADMINISTRATION</b>				
<b>Refuge Management</b>				
Administrative Facilities, Utilities, Equipment, and Signs	Neutral to Negative. Additional facilities, utilities, equipment, and signs are needed.	Positive. Increased facilities, utilities, equipment, and signs.	Same as Alternative B.	Same as Alternative B.
Staff	Neutral. No change in the levels of biological support and wildlife and habitat protection.	Positive. Increased staff in all refuge programs. Enhanced information and habitat management.	Same as Alternative B.	Same as Alternative B.

<b>KEY TOPICS</b>	<b>Alternative A: Current Management (No Action Alternative)</b>	<b>Alternative B: Migratory Birds</b>	<b>Alternative C: Rare, Threatened, and Endangered Species</b>	<b>Alternative D: Wildlife and Habitat Diversity (Proposed Action)</b>
<b>Intergovernmental Coordination</b>				
Intergovernmental Coordination	Neutral. Maintain current level of intergovernmental coordination.	Positive. Increased level of intergovernmental coordination.	Same as Alternative B.	Same as Alternative B.

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## UNAVOIDABLE IMPACTS AND MINIMIZATION MEASURES

Under Alternative A—the no-action alternative—there are numerous unavoidable impacts, including law enforcement that is not adequate for protecting existing and increasing visitor use; continued degradation of the biological functions of native plant communities and wildlife habitat due to the invasion of exotic, invasive, and nuisance species; and a continued decrease in biodiversity. Over time, if these issues are not addressed, they will continue to negatively impact refuge resources.

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

### *WATER QUALITY FROM SOIL DISTURBANCE AND USE OF HERBICIDES*

Soil disturbance and siltation due to water management activities; road and levee maintenance; and the construction of boardwalks, trails, and photo-blinds are expected to be minor and of short duration. To further reduce potential impacts, the refuge will use best management practices to minimize the erosion of soils into water bodies.

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

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

### *WILDLIFE DISTURBANCE*

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

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

### *VEGETATION DISTURBANCE*

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

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

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on the trails. Further, through environmental education and interpretive programs, the refuge and the partners will be able to increase awareness and understanding of the impacts of exotic, invasive, and nuisance species, which will help minimize their introduction, spread, and impacts.

#### *USER GROUP CONFLICTS*

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

#### *EFFECTS ON ADJACENT LANDOWNERS*

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

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

#### *LAND OWNERSHIP AND SITE DEVELOPMENT*

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

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

#### **CUMULATIVE IMPACTS**

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

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

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sum of the individual effects, such as when one more reduction in a population crosses a threshold of reproductive sustainability and threatens to extinguish the population.

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

The refuge is not aware of any past, present or future planned actions that would result in a significant cumulative impact when added to the refuge's proposed actions, as outlined in the proposed action. Hunting, fishing, increased visitation, and prescribed burning are anticipated to have negligible cumulative impacts.

- Deer and turkey hunting would not have any long-term or far-reaching effects on the regional populations of these species, since the home ranges of deer and turkeys limit them primarily to the refuge. Hunting seasons would not coincide with breeding and nesting seasons of migratory birds, so cumulative effects caused by hunting-induced disturbance would be minimal. There would be minimal negative effects to other wildlife, including listed species. Conflicts between hunters and other consumptive and non-consumptive users are not expected to occur. Experience has proven that time and space zoning (e.g., separate use areas and use periods) are effective tools in eliminating conflicts between user groups. Potential turkey hunts are unlikely to incur any negative cumulative impacts for the same reasons outlined above.
- Fishing would not cause any cumulative effects. State catch limits and periodic stocking would ensure that fish stocks on the refuge would not be depleted. Fishing would be limited to certain areas to minimize any associated wildlife disturbance effects. The monofilament line recycling program would help reduce the amount of waste fishing line littering the refuge.
- The cumulative impacts of increased visitation would be minimal. Although non-consumptive users can impact wildlife through disturbance, the seasonal closure of vulnerable areas (e.g., where wildlife are foraging or nesting) and use of natural screens (vegetation barriers) would minimize these adverse effects.
- The cumulative effects of prescribed burning would be minimal. The use of relatively small, prescribed burns timed with favorable winds would maintain air pollution at acceptable levels. These managed burns would reduce fuel loads and help prevent or manage catastrophic wild fires that have the potential to cause serious air quality problems in the short term.

## **DIRECT AND INDIRECT EFFECTS OR IMPACTS**

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

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



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

None of the direct or indirect effects are anticipated to be significant.

### **SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY**

The habitat protection and management actions outlined under the proposed action are dedicated to maintaining the long-term productivity of refuge habitats. The benefits of the proposed action for long-term productivity far outweigh any impacts from short-term actions, such as the creation of new trails. While these activities could cause short-term negative impacts, the educational values and associated public support gained from the improved visitor experience would produce long-term benefits for the refuge's entire ecosystem.

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



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## V. CONSULTATION AND COORDINATION

### INTRODUCTION

The Lake Woodruff NWR comprehensive conservation planning process involved a wide variety of participants, including: Federal, State, and local governments; universities and other researchers; private non-profit groups; and the Friends of Lake Woodruff National Wildlife Refuge, as well as a wide variety of local residents, local businesses, concerned citizens from all over the country, universities, and State and national organizations. Outreach efforts by the refuge and news coverage by the media have spread across the country. The list of participants, beyond those individuals and organizations providing comments during the public scoping process, includes the Core CCP Planning Team, the Wildlife and Habitat Management Review Team, the Visitor Services Review Team, the Wilderness Review Team, the Intergovernmental Coordination Planning Team, and other parties.

### CCP CORE PLANNING TEAM

The Core Planning Team included representatives from the Service (i.e., from the refuge) and the FWC, as well as the Service's contractor for the project, Dynamac. The team met as a whole to review all the issues, determine the priority issues, and identify potential solutions or approaches. A subset of the Core Planning Team, consisting of the refuge's staff and the Service contractor, developed the Draft CCP/EA, based on the information and direction provided by the Core Planning Team.

#### Fish and Wildlife Service

- Cheri M. Ehrhardt, AICP, Natural Resource Planner
- Harold Morrow, former Refuge Manager, Lake Woodruff NWR
- Deisha Norwood, Assistant Refuge Manager, Lake Woodruff NWR
- Kristina Sorensen, former Biologist, Lake Woodruff NWR
- Mike Ward, Prescribed Fire Specialist

#### Florida Fish and Wildlife Conservation Commission

- Larry Perrin, Program Coordinator (Wild Turkey Management)
- Steve Rockwood, Wetland Habitat Specialist/Waterfowl Biologist

#### Dynamac Corporation (Contractor)

- Oliver van den Ende, Environmental Scientist/Ecologist

### WILDLIFE AND HABITAT MANAGEMENT REVIEW TEAM

Organized by staff at the refuge and the Service's Southeast Regional Office, the Wildlife and Habitat Management Review Team included a core group of Service staff with invited participants. The invited participants included local and regional experts, researchers, and individuals with intimate knowledge of and experience regarding the resources of the refuge. These participants included representatives from: U.S. Army Corps of Engineers, USDA Forest Service, Florida Fish and Wildlife Conservation Commission, St. Johns River Water Management District, Florida Department of Environmental Protection, Archbold Biological Station, Avian Research and Conservation Institute, and Stetson University. The Wildlife and Habitat Management review was conducted in February 2006.

#### Fish and Wildlife Service

- Boyd Blihovde, Fire Management Specialist, Lake Wales Ridge NWR, Merritt Island NWR Complex

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- Bill Brooks, Wildlife Biologist, Ecological Services, North Florida Field Office
  - Dean Demarest, Non-game Migratory Bird Coordinator
  - Stephen Earsom, Regional Refuge Ecologist, Southeast Region
  - Cheri M. Ehrhardt, AICP, Natural Resource Planner
  - Chuck Hunter, Chief, Division of Planning and Resource Management, Southeast Region
  - Wilson Laney, South Atlantic Fisheries Coordinator
  - Mike Legare, former Deputy Refuge Manager, Lower Suwannee NWR
  - Stefani Melvin, Assistant Non-game Migratory Bird Coordinator, Southeast Region
  - Harold Morrow, former Refuge Manager, Lake Woodruff NWR, Merritt Island NWR Complex
  - Deisha Norwood, Assistant Refuge Manager, Lake Woodruff NWR, Merritt Island NWR Complex
  - Kristina Sorensen, former Biologist, Lake Woodruff NWR, Merritt Island NWR Complex
  - Kelley Stratton, Forestry Technician, Lake Woodruff NWR, Merritt Island NWR Complex
  - Jim Valade, Fish and Wildlife Biologist, Ecological Services, North Florida Field Office
  - Oliver van den Ende, Environmental Scientist, Dynamac Corporation (Service contractor)
  - Mike Ward, Prescribed Fire Specialist, Lake Woodruff NWR, Merritt Island NWR Complex
  - Fred Wetzel, Forester/Fire Management Officer, Okefenokee NWR

#### USDA Forest Service

- Carrie Sekerak, Wildlife Biologist, Ocala National Forest

#### U.S. Army Corps of Engineers

- Tim Harris, Biologist

#### Florida Fish and Wildlife Conservation Commission

- Mike Orlando, Wildlife Biologist
- Steve Rockwood, Wetland Habitat Specialist/Waterfowl Biologist
- Allan Woodward, Research Administrator

#### Florida Department of Environmental Protection

- Alice Bard, District Biologist, Florida Park Service

#### St. Johns River Water Management District

- Bob Epting, Senior Regulatory Scientist
- Jane Mace, Environmental Scientist
- Maria Zondervan, Biologist

#### Other Invited Experts

- Kevin Main, Land Manager, Archbold Biological Station
- Ken Meyer, Director/Research Ecologist, Avian Research and Conservation Institute
- Cindy Bennington, Professor of Biology, Stetson University
- Terry Farrell, Professor of Biology, Stetson University
- Missy Gibbs, Professor of Biology, Stetson University
- Kirsten Work, Professor of Biology, Stetson University

### **VISITOR SERVICES REVIEW TEAM**

The Visitor Services' Review Team consisted of Service staff from the Merritt Island NWR, Southeast Regional Office, and other refuges. The team met with Harold Morrow; former Refuge Manager,

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Deisha Norwood, Assistant Refuge Manager; and Kristina Sorensen, former Biologist; as well as with Steve Blanton, Park Manager, DeLeon Springs State Park; Bonnie Carey, Outreach Coordinator, Volusia County Land Acquisition and Management; and representatives from the Friends of Lake Woodruff, Kathy Barnard (President) and Mary Jean Rodgers (Vice President). The Public Use Review for the refuge was conducted in February 2005.

#### Fish and Wildlife Service

- Cheri M. Ehrhardt, AICP, Natural Resource Planner
- Garry Tucker, Visitor Services and Outreach, Southeast Regional Office
- Robin Will, Refuge Ranger/Public Use Specialist, St. Marks NWR
- Pam Darty, Park Ranger, Lower Suwannee NWR

### **WILDERNESS REVIEW TEAM**

The Wilderness Review Team involved Service staff from the Lake Woodruff NWR and the planner, with input from the regional wilderness coordinator. The Wilderness Review was completed in August 2006.

- Cheri M. Ehrhardt, AICP, Natural Resource Planner
- Harold Morrow, former Refuge Manager, Lake Woodruff National Wildlife Refuge
- Deisha Norwood, Assistant Manager, Lake Woodruff National Wildlife Refuge
- Kristina Sorensen, former Biologist, Lake Woodruff National Wildlife Refuge

### **INTERGOVERNMENTAL COORDINATION PLANNING TEAM**

The Intergovernmental Coordination Planning Team participants included local, State, and Federal government field staff representatives involved with the resources at the local and regional levels, including representatives from Fish and Wildlife Service, U.S. Army Corps of Engineers, Florida Fish and Wildlife Conservation Commission, Florida Department of Environmental Protection, St. Johns River Water Management District, and Volusia County. An intergovernmental scoping meeting was held in November 2006.

#### Fish and Wildlife Service

- Cheri M. Ehrhardt, AICP, Natural Resource Planner
- Harold Morrow, former Refuge Manager, Lake Woodruff NWR
- Deisha Norwood, Assistant Refuge Manager, Lake Woodruff NWR
- Mike Ward, Prescribed Fire Specialist, Lake Woodruff NWR
- Allan Brown, Manager, Welaka National Fish Hatchery
- Oliver van den Ende, Environmental Scientist, Dynamac Corporation (Service contractor)

#### Army Corps of Engineers

- Tim Harris, Biologist

#### Florida Fish and Wildlife Conservation Commission

- Larry Perrin, Program Coordinator (Wild Turkey Management)
- Steve Rockwood, Wetland Habitat Specialist/Waterfowl Biologist

#### Florida Department of Environmental Protection

- Alice Bard, Environmental Specialist, Florida Park Service
- Brian Polk, Park Manager, DeLeon Springs State Park, Florida Park Service
- Graham Williams, Environmental Specialist, Florida Park Service

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St. Johns River Water Management District

- Steve Miller, Director of Land Management

Volusia County

- Ed Isenhour, Planner
- Graham Williams, Land Manager

In addition, a variety of other governmental representatives were kept informed throughout the process and provided input to the Team, including the Miccosukee Tribe of Indians of Florida, the Seminole Tribe of Florida, the USDA Forest Service, the U.S. Geological Survey, and the Florida Department of Agriculture and Consumer Services.

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SECTION C. APPENDICES

*APPENDIX A. GLOSSARY AND ABBREVIATIONS*

GLOSSARY

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

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



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

<b>Informed Consent:</b>	The grudging willingness of opponents to “to along” with a course of action that they actually oppose (Bleiker).
<b>Invasive Species:</b>	Introduced species or non-indigenous species that are rapidly expanding outside of their native range. Invasive species can alter ecological relationships among native species and can affect ecosystem function and human health.
<b>Issue:</b>	Any unsettled matter that requires a management decision, e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or other presence of an undesirable resource condition (Service Manual 602 FW 1.6K).
<b>Management Alternative:</b>	See Alternative
<b>Management Concern:</b>	See Issue
<b>Management Opportunity:</b>	See Issue
<b>Migration:</b>	The seasonal movement from one area to another and back.
<b>Mission Statement:</b>	Succinct statement of the unit’s purpose and reason for being.
<b>Monitoring:</b>	The process of collecting information to track changes of selected parameters over time.
<b>National Environmental Policy Act of 1969 (NEPA):</b>	Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making (40 CFR 1500).
<b>National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57):</b>	Under the Refuge Improvement Act, the U.S. Fish and Wildlife Service is required to develop 15-year Comprehensive Conservation Plans for all National Wildlife Refuges outside Alaska. The Act also describes the six public uses given priority status within the NWRS (i.e., hunting, fishing, wildlife observation, photography, environmental education, and interpretation).

<b>National Wildlife Refuge System Mission:</b>	The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.
<b>National Wildlife Refuge System:</b>	Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; games ranges; wildlife management areas; or waterfowl production areas.
<b>National Wildlife Refuge:</b>	A designated area of land, water, or an interest in land or water within the System.
<b>Native Species:</b>	Species that normally live and thrive in a particular ecosystem.
<b>Notice of Intent (NOI):</b>	A notice that an environmental impact statement will be prepared and considered (40 CFR 1508.22). Published in the Federal Register.
<b>Noxious Weed:</b>	A plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States, according to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or had adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.
<b>Nuisance Species:</b>	A species potentially injurious to humans, fish, or wildlife or their habitats, or to the interests of agriculture, horticulture or forestry in the United States. Frequently associated with exotic (non-native) species.
<b>Objective:</b>	A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Making objectives attainable, time-specific, and measurable (Service Manual 602 FW 1.6N).
<b>Plant Association:</b>	A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.

<b>Plant Community:</b>	An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community.
<b>Preferred Alternative/ Proposed Action:</b>	This is the alternative determined [by the decision maker] to best achieve the refuge purpose(s), vision, and goals; contributes to the Refuge System mission, addresses the priority issues; and is consistent with principles of sound fish and wildlife management.
<b>Prescribed Fire:</b>	The application of fire to wildland fuels to achieve identified land use objectives (Service Manual 621 FW 1.7). May be from natural ignition or intentional ignition.
<b>Priority Species:</b>	Fish and wildlife species that the Washington Department of Fish and Wildlife believe require protective measures and/or management guidelines to ensure their perpetuation. Priority species include the following: (1) State-listed and candidate species; (2) species or groups of animals susceptible to significant population declines within a specific area or statewide by virtue of their inclination to aggregate (e.g., seabird colonies); and (3) species of recreation, commercial, and/or tribal importance.
<b>Public Involvement Plan:</b>	Broad long-term guidance for involving the public in the comprehensive planning process.
<b>Public Involvement:</b>	A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.
<b>Public:</b>	Individuals, organizations, and groups; officials of Federal, State, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in service issues and those who do or do not realize that Service decisions may affect them.
<b>Purposes of the Refuge:</b>	“The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge sub-unit.” For refuges that encompass Congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge (Service Manual 602 FW 106 S).

<b>Recommended Wilderness:</b>	Areas studied and found suitable for wilderness designation by both the Director and Secretary, and recommended for designation by the President to Congress. These areas await only legislative action by congress in order to become part of the Wilderness System. Such areas are also referred to as “pending in Congress” (Draft Service Manual 610 FW 1.5).
<b>Record of Decision (ROD):</b>	A concise public record of decision prepared by the Federal agency, pursuant to NEPA, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).
<b>Ruderal</b>	Weedy, compacted, plowed, or otherwise disturbed land.
<b>Refuge Goal:</b>	See Goal.
<b>Refuge Purposes:</b>	See Purposes of the Refuge
<b>Silviculture:</b>	Tree farming.
<b>Songbirds:</b> (Also Passerines)	A category of birds that are medium to small, perching landbirds. Most are territorial singers and migratory.
<b>Step-down Management Plan:</b>	A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives (Service Manual 602 FW 1.6 U).
<b>Strategy:</b>	A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 602 FW 1.6 U).
<b>Study Area:</b>	The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this CCP/EIS the study area includes the lands within the currently approved Refuge boundary and potential Refuge expansion areas.
<b>Threatened Species (Federal):</b>	Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
<b>Threatened Species (State):</b>	A plant or animal species likely to become endangered in the state within the near future if factors contributing to population decline or habitat degradation or loss continue.

<b>Tiering:</b>	The coverage of general matters in broader environmental impact statements with subsequent narrower statements of environmental analysis, incorporating by reference, the general discussions and concentrating on specific issues (40 CFR 1508.28).
<b>U.S. Fish and Wildlife Service Mission:</b>	The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.
<b>Unit Objective:</b>	See Objective
<b>Vegetation Type, Habitat Type, Forest Cover Type:</b>	A land classification system based upon the concept of distinct plant associations.
<b>Vision Statement:</b>	A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System Mission and specific refuge purposes, and other mandates. We will tie the vision statement for the refuge to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates (Service Manual 602 FW 1.6 Z).
<b>Wilderness Study Areas:</b>	<p>Lands and waters identified through inventory as meeting the definition of wilderness and undergoing evaluation for recommendation for inclusion in the Wilderness System. A study area must meet the following criteria:</p> <ul style="list-style-type: none"> <li>▪ Generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable</li> <li>▪ Has outstanding opportunities for solitude or a primitive and unconfined type of recreation</li> <li>▪ Has at least 5,000 contiguous roadless acres or is sufficient in size as to make practicable its preservation and use in an unimpaired condition (Draft Service Manual 610 FW 1.5)</li> </ul>
<b>Wilderness:</b>	See Designated Wilderness
<b>Wildfire:</b>	A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).
<b>Wildland Fire:</b>	Every wildland fire is either a wildfire or a prescribed fire (Service Manual 621 FW 1.3)

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## ABBREVIATIONS

ac	acres
AOP	Annual Operating Plan
AICP	American Institute of Certified Planners
API	Asset Priority Index
BBIRD	Breeding Biology Research and Monitoring Database
°C	degrees Celsius
CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
CFS	cubic feet per second
cm	centimeters
DOQQ	Digital Ortho Quarter Quads
E	Endangered
EA	Environmental Assessment
EIS	Environmental Impact Statement
EXPN	Experimental
°F	degrees Fahrenheit
FCFWRU	Florida Cooperative Fish and Wildlife Research Unit
FDEP	Florida Department of Environmental Protection
FDOF	Florida Division of Forestry
FONSI	Finding of No Significant Impact
FSA	Farm Service Agency
FTE	full-time equivalent
FPS	Florida Park Service
FW	Fish and Wildlife
FWC	Florida Fish and Wildlife Conservation Commission
FWS	U.S. Fish and Wildlife Service (also Service and USFWS)
GPM	gallons per minute
GIS	Global Information System
ha	hectares
HMP	Habitat Management Plan
HUD	U.S. Department of Housing and Urban Development
LWNWR	Lake Woodruff National Wildlife Refuge
mph	miles per hour
MEP	Minor Expansion Proposal
MOU	Memorandum of Understanding
MSL	mean sea level
NABCI	North American Bird Conservation Initiative
NAWCP	North American Waterbird Conservation Plan
NAWMP	North American Waterfowl Management Plan
NEPA	National Environmental Policy Act
NFH	National Fish Hatchery
NOI	Notice of Intent
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
pH	measure of acidity
PIF	Partners-in-Flight
RH	Relative Humidity
RNA	Research Natural Area
ROD	Record of Decision

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RONs	Refuge Operating Needs System
SAMMS	Service Asset Maintenance Management System
SCP	Shorebird Conservation Plan
SJRWMD	St. Johns River Water Management District
SMC	Species of Management Concern
SSC	Species of Special Concern
T	Threatened
T (S/A)	Threatened by Similarity of Appearance
TMDL	total maximum daily loads
URD	upper respiratory disease
USACE	United States Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VSP	Visitor Services Plan
WCEP	Whooping Crane Eastern Partnership
yr	year



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## APPENDIX B. REFERENCES AND LITERATURE CITATIONS

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## APPENDIX C. RELEVANT LEGAL MANDATES AND EXECUTIVE ORDERS

STATUTE	DESCRIPTION
Administrative Procedures Act (1946)	Outlines administrative procedures to be followed by Federal agencies with respect to identification of information to be made public; publication of material in the Federal Register; maintenance of records; attendance and notification requirements for specific meetings and hearings; issuance of licenses; and review of agency actions.
American Antiquities Act of 1906	Provides penalties for unauthorized collection, excavation, or destruction of historic or prehistoric ruins, monuments or objects of antiquity on lands owned or controlled by the United States. The Act authorizes the President to designate as national monuments objects or areas of historic or scientific interest on lands owned or controlled by the United States.
American Indian Religious Freedom Act of 1978	Protects the inherent right of Native Americans to believe, express, and exercise their traditional religions, including access to important sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites.
Americans With Disabilities Act of 1990	Intended to prevent discrimination of and make American Society more accessible to people with disabilities. The Act requires reasonable accommodations to be made in employment, public services, public accommodations, and telecommunications for persons with disabilities.
Anadromous Fish Conservation Act of 1965, as amended	Authorizes the Secretary of the Interior and Commerce to enter into cooperative agreements with states and other non-Federal interest for conservation, development, and enhancement of anadromous fish and contribute up to 50 percent as the Federal share of the cost of carrying out such agreements. Reclamation construction programs for water resource projects needed solely for such fish are also authorized.
Archaeological Resources Protection Act of 1979, as amended.	This act strengthens and expands the protective provisions of the Antiquities Act of 1906 regarding archaeological resources. It also revised the permitting process for archaeological research.
Architectural Barriers Act of 1968	Requires that buildings and facilities designed, constructed, or altered with Federal funds, or leased by a Federal agency, must comply with standards for physical accessibility.
Bald and Golden Eagle Protection Act of 1940, as amended	Prohibits the possession, sale or transport of any bald or golden eagle, alive or dead, or part, nest, or egg except as permitted by the Secretary of the Interior for scientific or exhibition purposes, or for the religious purposes of Indians.

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



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

STATUE	DESCRIPTION
Estuaries and Clean Waters Act of 2000	This law creates a Federal interagency council that includes the Director of the Fish and Wildlife Service, the Secretary of the Army for Civil Works, the Secretary of Agriculture, the Administrator of the Environmental Protection Agency and the Administrator for the National Oceanic and Atmospheric Administration. The Council is charged with developing a national estuary habitat restoration strategy and providing grants to entities to restore and protect estuary habitat to promote the strategy.
Food Security Act of 1985, as amended (Farm Bill)	The Act contains several provisions that contribute to wetland conservation. The Swampbuster provisions state that farmers who convert wetlands for the purpose of planting after enactment of the law are ineligible for most farmer program subsidies. It also established the Wetland Reserve Program to restore and protect wetlands through easements and restoration of the functions and values of wetlands on such easement areas.
Farmland Protection Policy Act of 1981, as amended	The purpose of this law is to minimize the extent to which Federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. Federal programs include construction projects and the management of federal lands.
Federal Advisory Committee Act (1972), as amended	Governs the establishment of and procedures for committees that provide advice to the federal government. Advisory committees may be established only if they will serve a necessary, nonduplicative function. Committees must be strictly advisory unless otherwise specified and meetings must be open to the public.
Federal Coal Leasing Amendment Act of 1976	Provided that nothing in the Mining Act, the Mineral Leasing Act, or the Mineral Leasing Act for Acquired Lands authorized mining coal on refuges.
Federal-Aid Highways Act of 1968	Established requirements for approval of Federal highways through wildlife refuges and other designated areas to preserve the natural beauty of such areas. The Secretary of Transportation is directed to consult with the Secretary of the Interior and other Federal agencies before approving any program or project requiring the use of land under their jurisdiction.
Federal Noxious Weed Act of 1990, as amended	The Secretary of Agriculture was given the authority to designate plants as noxious weeds and to cooperate with other Federal, State and local agencies, farmers associations, and private individuals in measures to control, eradicate, prevent, or retard the spread of such weeds. The Act requires each Federal land-managing agency including the Fish and Wildlife Service to designate an office or person to coordinate a program to control such plants on the agency's land and implement cooperative agreements with the States including integrated management systems to control undesirable plants.

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

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

STATUE	DESCRIPTION
Migratory Bird Treaty Act of 1918, as amended	This Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Except as allowed by special regulations, this Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export or import any migratory bird, part, nest, egg or product.
Mineral Leasing Act for Acquired Lands (1947), as amended	Authorizes and governs mineral leasing on acquired public lands.
Minerals Leasing Act of 1920, as amended	Authorizes and governs leasing of public lands for development of deposits of coal, oil, gas and other hydrocarbons, sulphur, phosphate, potassium and sodium. Section 185 of this title contains provisions relating to granting rights-of-ways over Federal lands for pipelines.
Mining Act of 1872, as amended	Authorizes and governs prospecting and mining for the so-called "hardrock" minerals (such as gold and silver) on public lands.
National and Community Service Act of 1990	Authorizes several programs to engage citizens of the U.S. in full-and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Among other things, this law establishes the American Conservation and Youth Service Corps to engage young adults in approved human and natural resource projects, which will benefit the public or are carried out on Federal or Indian lands.
National Environmental Policy Act of 1969	Requires analysis, public comment, and reporting for environmental impacts of Federal actions. It stipulates the factors to be considered in environmental impact statements, and requires that Federal agencies employ an interdisciplinary approach in related decision-making and develop means to ensure that unqualified environmental values are given appropriate consideration, along with economic and technical considerations.
National Historic Preservation Act of 1966, as amended	It establishes a National Register of Historic Places and a program of matching grants for preservation of significant historical features. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register.
National Trails System Act (1968), as amended	Established the National Trails System to protect the recreational, scenic and historic values of some important trails. National Recreation Trails may be established by the Secretaries of Interior or Agriculture on land wholly or partly within their jurisdiction, with the consent of the involved State(s), and other land managing agencies, if any. National Scenic and National Historic Trails may only be designated by an Act of Congress. Several National Trails cross units of the National Wildlife Refuge System.

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

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

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



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

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

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



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## *APPENDIX D. PUBLIC INVOLVEMENT*

### **SUMMARY OF PUBLIC SCOPING COMMENTS**

A public scoping meeting was held on September 7, 2006, to solicit comments from the public regarding development of a CCP for Lake Woodruff NWR. The meeting provided information about current refuge management and the CCP planning process. The meeting was well attended.

Comment forms were made available at the scoping meeting and at the refuge headquarters. In addition, periodic refuge planning updates were posted on the Lake Woodruff NWR website to provide the public with information on the CCP's progress and upcoming milestones. Individuals could also sign up to be on a mailing list and obtain information via regular mail.

Comments received are summarized below. Generally, comments were supportive of the refuge and its management actions. These comments were used by the planning team to help guide development of the goals, objectives, and strategies found in the CCP.

- Wildlife and Habitat Management (including controlling exotic plants and animals, addressing the problems associated with sustaining apple snails on the refuge, improving water quality, improving fish spawning habitat, increasing tree thinning, and stopping herbicide treatments, as well as opposition to prescribed burning activities)
- Resource Protection (including addressing illegal baiting activities and acquiring additional lands for the refuge)
- Visitor Services (including adding equestrian trails, improving public awareness, addressing litter and discarded monofilament line, and increasing public access)
- Refuge Administration (including increasing staffing and funding, building more partnerships, providing volunteer programs, increasing cooperative research, and increasing interagency planning)



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# APPENDIX E. APPROPRIATE USE DETERMINATIONS

## Lake Woodruff National Wildlife Refuge Appropriate Use Determinations

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

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

- Six wildlife-dependent recreational uses - As defined by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act), the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) are determined to be appropriate. However, the refuge manager must still determine if these uses are compatible.
- Take of fish and wildlife under State regulations - States have regulations concerning take of wildlife that includes hunting, fishing, and trapping. We consider take of wildlife under such regulations appropriate. However, the refuge manager must determine if the activity is compatible before allowing it on a refuge.

### Statutory Authorities for this policy:

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

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standards set in the Administration Act by providing enhanced consideration of priority general public uses and ensuring other public uses do not interfere with our ability to provide quality, wildlife-dependent recreational uses.

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

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

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

#### **Definitions:**

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

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

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

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

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

- Promotes safety of participants, other visitors, and facilities.
- Promotes compliance with applicable laws and regulations and responsible behavior.
- Minimizes or eliminates conflicts with fish and wildlife population or habitat goals or objectives in a plan approved after 1997.
- Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation.
- Minimizes conflicts with neighboring landowners.



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- Promotes accessibility and availability to a broad spectrum of the American people.
  - Promotes resource stewardship and conservation.
  - Promotes public understanding and increases public appreciation of America's natural resources and our role in managing and protecting these resources.
  - Provides reliable/reasonable opportunities to experience wildlife.
  - Uses facilities that are accessible and blend into the natural setting.
  - Uses visitor satisfaction to help define and evaluate programs.

*Wildlife-Dependent Recreational Use:* As defined by the Improvement Act, a use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Lake Woodruff National Wildlife Refuge

Use: Boating

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes X No**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate**

**Appropriate X**

Refuge Manager: \_\_\_\_\_

Date: \_\_\_\_\_

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: \_\_\_\_\_

Date: \_\_\_\_\_

**A compatibility determination is required before the use may be allowed.**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Lake Woodruff National Wildlife Refuge    

Use:     Camping and Picnicking    

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		X
(d) Is the use consistent with public safety?		X
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		X
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?		X
(h) Will this be manageable in the future within existing resources?		X
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		X

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.      **Yes X No**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate   X**

**Appropriate**

Refuge Manager: \_\_\_\_\_

Date: \_\_\_\_\_

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: \_\_\_\_\_

Date: \_\_\_\_\_

**A compatibility determination is required before the use may be allowed.**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Lake Woodruff National Wildlife Refuge    

Use:     Rock, Fossil, and Artifact Collecting and Metal Detector Use    

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		X
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		X
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?		X
(h) Will this be manageable in the future within existing resources?		X
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		X

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.      **Yes X No**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate X**

**Appropriate**

Refuge Manager: \_\_\_\_\_

Date: \_\_\_\_\_

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: \_\_\_\_\_

Date: \_\_\_\_\_

**A compatibility determination is required before the use may be allowed.**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Lake Woodruff National Wildlife Refuge    

Use:     Commercial Services (e.g., Boat Tours and Professional Photography)    

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.      **Yes X No**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate**

**Appropriate   X**

Refuge Manager: \_\_\_\_\_

Date: \_\_\_\_\_

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: \_\_\_\_\_

Date: \_\_\_\_\_

**A compatibility determination is required before the use may be allowed.**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Lake Woodruff National Wildlife Refuge    

Use:     Horseback Riding    

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.      **Yes X No**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate**                      **Appropriate   X**

Refuge Manager: \_\_\_\_\_ Date: \_\_\_\_\_

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: \_\_\_\_\_ Date: \_\_\_\_\_

**A compatibility determination is required before the use may be allowed.**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Lake Woodruff National Wildlife Refuge    

Use:     Jogging    

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.      **Yes X No**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate**

**Appropriate   X**

Refuge Manager: \_\_\_\_\_

Date: \_\_\_\_\_

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: \_\_\_\_\_

Date: \_\_\_\_\_

**A compatibility determination is required before the use may be allowed.**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Lake Woodruff National Wildlife Refuge    

Use:     Bicycling    

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.      **Yes X No**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate**                      **Appropriate   X**

Refuge Manager: \_\_\_\_\_ Date: \_\_\_\_\_

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: \_\_\_\_\_ Date: \_\_\_\_\_

**A compatibility determination is required before the use may be allowed.**



## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Lake Woodruff National Wildlife Refuge    

Use:     Off-road Vehicles    

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		X
(d) Is the use consistent with public safety?		X
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		X
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?		X
(h) Will this be manageable in the future within existing resources?		X
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		X

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.      **Yes X No**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate   X**

**Appropriate**

Refuge Manager: \_\_\_\_\_

Date: \_\_\_\_\_

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: \_\_\_\_\_

Date: \_\_\_\_\_

**A compatibility determination is required before the use may be allowed.**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Lake Woodruff National Wildlife Refuge    

Use:     Sunbathing, Swimming, and Waterskiing    

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		X
(d) Is the use consistent with public safety?		X
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		X
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?		X
(h) Will this be manageable in the future within existing resources?		X
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		X

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.      **Yes X No**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate X**

**Appropriate**

Refuge Manager: \_\_\_\_\_

Date: \_\_\_\_\_

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: \_\_\_\_\_

Date: \_\_\_\_\_

**A compatibility determination is required before the use may be allowed.**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Lake Woodruff National Wildlife Refuge    

Use:     Timber Harvesting    

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.      **Yes X No**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate**

**Appropriate X**

Refuge Manager: \_\_\_\_\_

Date: \_\_\_\_\_

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: \_\_\_\_\_

Date: \_\_\_\_\_

**A compatibility determination is required before the use may be allowed.**

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Lake Woodruff National Wildlife Refuge    

Use:     Research    

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies.      **Yes X No**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

**Not Appropriate**     

**Appropriate**     X    

Refuge Manager: \_\_\_\_\_

Date: \_\_\_\_\_

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: \_\_\_\_\_

Date: \_\_\_\_\_

**A compatibility determination is required before the use may be allowed.**

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## APPENDIX F. COMPATIBILITY DETERMINATIONS

### Lake Woodruff National Wildlife Refuge Compatibility Determinations

**Uses:** The following uses were found to be appropriate and considered for compatibility determination reviews: boating; deer and feral hog hunting; turkey hunting; fishing; wildlife observation and photography; environmental education and interpretation; bicycling and jogging; commercial services; horseback riding; and timber harvesting. A description and anticipated biological impacts for each use are addressed separately in this appendix.

**Refuge Name:** Lake Woodruff National Wildlife Refuge.

**Date Established:** 1964.

**Establishing and Acquisition Authorities:** Migratory Bird Conservation Act, Refuge Recreation Act, Wilderness Act, Fish and Wildlife Act of 1956, National Wildlife Refuge System Administration Act, and Endangered Species Act.

#### Refuge Purposes:

- "...for use as an inviolate sanctuary, or for any other management purposes, for migratory birds." 16 USC §715d (Migratory Bird Conservation Act)
- "...suitable for (1) incidental fish and wildlife-oriented recreation development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 USC §460k-1 (Refuge Recreation Act)
- "...wilderness areas...shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness..." 16USC §1131 (Wilderness Act)
- "...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." 16 USC §742f(a)(4) (Fish and Wildlife Act of 1956)
- "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant or condition of servitude..." 16 USC § 742f(b)(1) (Fish and Wildlife Act of 1956)
- "...conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 USC §668dd(a)(2) (National Wildlife Refuge System Administration Act)
- "...to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants..." 16USC §1534 (Endangered Species Act)

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## **National Wildlife Refuge System Mission:**

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

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

## **Other Applicable Laws, Regulations, and Policies:**

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

Compatibility determinations for each description listed were considered separately. Although for brevity, the preceding sections from “Uses” through “Other Applicable Laws, Regulations and Policies” are only written once within this appendix, they are part of each descriptive use and become part of that compatibility determination if considered outside of the CCP.

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## Public Review and Comment Period

Lake Woodruff NWR compatibility determinations will be available for public review as part of the Draft CCP/EA review, scheduled for early 2008. The public will be notified of the exact date via a notice of availability in the *Federal Register*, the refuge website, postings, and newspaper articles. In addition, the Friends of Lake Woodruff NWR will help assist in the outreach effort.

## Description of Use:

### *Boating*

Boating is not one of the Refuge System's six priority public uses. However, a significant portion of Lake Woodruff NWR can only be accessed or viewed via the navigable waters of the St. Johns River, Lake Woodruff, and associated streams and canals. Therefore, boating is an important facilitator of several priority public uses on the refuge. There is no public boat launch/landing on the refuge. Currently, the navigable waters of the refuge are State-owned and are not managed as part of the refuge. One of the goals of the CCP is to work with the State to develop cooperative management agreements for specific areas and resources of interest to the Service that are part of the State-owned, navigable waters on the refuge. Motorized and non-motorized boating is analyzed in this compatibility determination.

**Availability of Resources:** Operation and maintenance funds to support boating would be taken from the refuge's annual budget. Funds would primarily be needed to support law enforcement to ensure that the boating public adheres to manatee zone speed limits and adheres to refuge rules and regulations. These salaries come out of the refuge's operating budget and are adequate to sustain the program at current levels. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Anticipated Impacts of Use:** Boating has been shown to alter wildlife distribution, reduce use of particular habitats by birds, alter feeding behavior, and cause premature departure from areas. Impacts of boating can occur even at low densities, given the ability of powerboats to cover extensive areas in a short amount of time, the noise they produce, and their speed (Sterling and Dzubin 1967, Bergman 1973, Speight 1973, Skagen 1980, Korschgen et al., 1985, Kahl 1991, Bauer et al., 1992, Dahlgren and Korschgen 1992). Wildlife responds differently to boats based on their size, speed, the amount of noise they make, and how close the crafts get to wildlife. Boats increase the access of visitors to areas not open to most other visitors, thus having a greater potential to cause wildlife disturbance if not managed properly. The speed and manner in which a boat approaches wildlife can influence wildlife responses. Rapid movement directly toward wildlife frightens them, while movement away from or at an oblique angle to the animal is less disturbing (Knight and Cole 1995). Dahlgren and Korschgen (1992) categorized human activities in order of decreasing disturbance to waterfowl:

1. rapid over water movement and loud noise (e.g., power-boating, water skiing, and aircraft),
2. over water movement with little noise (e.g., sailing, wind surfing, rowing, and canoeing),
3. little over water movement or noise (e.g., wading and swimming), and
4. activities along shorelines (e.g., fishing, birdwatching, hiking, and traffic).

Hume (1976 as cited by Dahlgren and Korschgen 1992) observed a similar differential response of waterfowl to human activities. Common goldeneyes often flew when people on the shore approached within 100 or 200 meters, but settled elsewhere on the water. A single sailing dingy was sufficient to cause more than 60 common goldeneyes to take flight and for most to leave the vicinity within a few minutes. Remaining birds then flew up each time the boat approached to within 300 to 400 meters and generally left the area within an hour. The appearance of a powerboat caused

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instantaneous flight by most birds. If the boat traversed the length of the reservoir, all remaining birds left within minutes. Hume reported that waterfowl abundance decreased over time as a result of the increased frequency of boating. In Germany, Bauer et al., (1992) concluded that boating pressure on wintering waterfowl had reached such a high level that it was necessary to establish larger sanctuaries and stop water sports and angling from October to March. Likewise, on numerous occasions Thornburg (1973) observed boaters causing mass flights of diving ducks on the Mississippi River. He believed that increased boating could pose a serious threat to the continued use of the area by great numbers of migratory waterfowl. Thornburg (1973) concluded that eventually restrictions on boating activity may be necessary and that establishing a sanctuary should be considered. Rodgers and Schwikert (2002) compared flushing distance of three species of birds in response to a slow versus fast approach using the same outboard-powered boat. A fast approach resulted in significantly larger flush distances for brown pelicans, anhingas, and great egrets. They concluded that water bird staging areas along migratory corridors and frequently used foraging sites of resident birds merit protection from human activity. In another study, Rodgers and Smith (1997) recommended that the establishment of 150-meter buffer zones around colonial bird rookeries would help minimize disturbance. Increasing the predictability of boating patterns to help wildlife habituate to non-threatening human disturbance can also be accomplished by establishing well-marked routes of travel. Boating impacts on wildlife can be classified based on the form of boating activity (Korschgen and Dahlgren 1992, Knight and Cole 1995), the season of use (Burger 1995), and species tolerance to the activity (Jahn and Hunt 1964). For example, motorboat activity likely has more disturbances on wildlife than non-motorized boat travel because motorboats produce a combination of movement and noise (Knight and Cole 1995). Even canoes can cause disturbance based on the ability to access shallower areas of the marsh (Speight 1973). However, compared to motorboats and airboats, canoe travel appears to have the least disturbance (Jahn and Hunt 1964).

If waterfowl populations begin declining or other wildlife impacts occur, additional actions could be taken, such as implementing additional closed areas or adding other boat restrictions.

**Determination:**

- Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** To ensure compatibility of boating activities on the refuge, several stipulations are necessary in addition to State regulations, as listed.

- Determine the maximum allowable speed to minimize wildlife impacts.
- No operator or person in charge of any boat shall operate or knowingly permit any other person to operate a boat in a reckless manner, or in a manner so as to endanger or be likely to endanger any person, property, or wildlife.
- Boaters will utilize only areas open to the public and not venture into closed areas.
- Boaters are not allowed to tie off to shoreline vegetation or pull onto refuge lands to access trails.

As necessary, the Service will implement additional restrictions and/or regulations to address boating. In the future, it may be necessary to focus additional management actions to reduce disturbance or injury to wildlife species. Other strategies, such as restricting motor boat use in some areas, establishing additional seasonal sanctuaries, and implementing noise or speed restrictions on boats are additional measures the refuge could use to protect wildlife populations.



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**Justification:** Although not a priority public use, boating supports priority public uses, most notably fishing. At current and anticipated levels of use and with restrictions to minimize impacts to wildlife and habitats, boating is determined to be appropriate and compatible. Fishing, as described in the Fishing Compatibility Determination, was determined to be compatible, in view of the potential impacts that it and the supporting activities (e.g., boating) can have on the Service's ability to achieve the purposes and goals of the refuge, because: (1) angler densities and use levels would be relatively low, (2) sufficient restrictions have been established to ensure that an adequate amount of high-quality feeding and resting habitat would be available to accommodate the needs of waterfowl and other wetland birds using the refuge that may potentially be disturbed by fishing activities, and (3) sufficient opportunities would be available for other priority wildlife-dependent recreation during the waterfowl season. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Mandatory 10-Year Re-evaluation Date:**

**Description of Use:**

*Deer and Feral Hog Hunting*

Hunting has been identified as a priority wildlife-dependent activity under the National Wildlife Refuge System Improvement Act. With the implementation of the CCP, the Service would take the steps necessary [e.g., develop needed regulations and publish the appropriate *Federal Register* notice(s)] to modify the existing hunt program to provide for upland hunting for deer and feral hogs in a portion of the refuge's upland habitat in cooperation with the State of Florida. This would provide additional opportunities for a priority recreational activity and help to reduce the feral hog population on the refuge. Implementing the upland hunt would first require preparing a hunt plan; posting appropriate notice in the *Federal Register*; and establishing regulations in Title 50, Code of Federal Regulations.

Upland hunting for white-tailed deer and feral hogs would be designated in the upland and marsh areas on approximately 11,000 acres of the refuge's more than 21,574 acres. Hunt areas would be accessed through existing roads and fire breaks by foot and through navigable waterways by boat. A quota would be established for the number of hunters. The remainder of the refuge would remain closed to deer and feral hog hunting to minimize conflicts with other priority uses. The Eastside unit has the highest deer population. The upland game hunt would be conducted in cooperation with the FWC.

**Availability of Resources:** The details for administering changes to the program have not been determined, but are anticipated to be similar to the existing hunt program. It is assumed that a quota permit would be charged for the hunting opportunity to cover the costs of managing the program. Funds would be needed annually to mow, grade, and fix roads and parking areas open to hunter access; to maintain signs; and to print leaflets. The selection process for permits would likely be processed through the existing FWC system. Management of the program has a biological, administrative, maintenance, and law enforcement components. Partnering with FWC would help provide the needed components. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Anticipated Impacts of Use:** Anticipated impacts were identified and evaluated based on best professional judgment and published scientific papers. Many of the impacts associated with upland hunting are similar to those considered for other public use activities, such as wildlife viewing and

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photography, with the exception of direct mortality to game species, short-term changes in the distribution and abundance of game species, and unrestricted travel through the hunt area. Direct mortality can impact isolated, resident game species populations by reducing breeding populations to a point where the isolated population can no longer be sustained. This can result in localized extirpation of isolated populations. The hunt would be conducted in upland habitats; therefore, minimal disturbance to migratory birds is anticipated. Use of lead shot could be allowed for deer and feral hogs, but considering the separation between the upland hunt and wetland habitat, the ingestion of lead shot by migratory birds should be minimal. The walk-in hunters would use existing fire breaks and roads for access. No soil compaction or vegetation disturbance is expected. Parking would occur in sites already designated as such. Hunting would not occur within 1,500 feet of any active eagle nest.

Cumulative effects of deer hunting are expected to be minimal. Almost all of the deer harvested would be from the Lake Woodruff NWR population. The hunt will be managed to ensure that the long-term size of the herd remains stable.

The refuge does not have an active hog removal program. Although feral hogs are not known to be on the refuge, they occur on neighboring lands and it is reasonable to assume that they will begin invading the refuge within the near future. The primary intentions of feral hog hunts would be to increase pressure on any new population and assist in the population control of this unwanted species. Feral hogs are exotic species which are documented to have serious negative effects on native wildlife and habitats. The cumulative effects of a feral hog hunt would be positive with long-term benefits to native plants and animals of the refuge.

**Determination:**

- Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** Several stipulations would be necessary to ensure compatibility of this use. Additional stipulations may be added, as the program is developed with the State. Known stipulations are listed. The hunt would be conducted in accordance with State regulations and seasons. Additional restrictions may be listed in the refuge's hunt plan.

- The methods of hunting to be considered include primitive weapons, archery, and shotguns.
- Hunting will be limited to designated areas.
- Quota hunt permits will be issued.
- Hunting densities no greater than one hunting party per 100 acres will be allowed.
- The number of deer permitted to be taken will be based on annual population estimates.
- Check stations will be used to collect hunt data and to monitor the quality of the hunt.
- Vehicle access and parking will be limited and confined to existing fire lanes and unimproved roads.
- Climbing spikes and permanent stands will not be permitted.
- Off road vehicles or ATVs will not be permitted.
- If required, liberal bag limits or extended seasons may be established for feral hogs as part of a wider effort to eliminate this non-native species.
- No flagging or trail marking will be permitted.

Upland hunting would have little impact on other visitor activities. Hunt areas will be closed to other uses during hunting season to provide a safe buffer distance around all public use facilities.

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**Justification:** Hunting is a priority wildlife-dependent use under the National Wildlife Refuge System Improvement Act. Upland hunting, as described, was determined to be compatible, in view of the potential impacts that hunting can have on the Service's ability to achieve purposes and goals of the refuge, because: (1) hunter densities and use levels would be relatively low during days the refuge is open to hunting, (2) sufficient restrictions have been established to ensure that an adequate amount of high-quality habitat would be available to accommodate the needs of deer and other wildlife using the refuge, and (3) sufficient opportunities would be available for other priority wildlife-dependent recreation during the upland hunt season. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Mandatory 15-Year Re-evaluation Date:**

**Description of Use:**

*Turkey Hunting*

Hunting has been identified as a priority wildlife-dependent activity under the National Wildlife Refuge System Improvement Act. With the implementation of the CCP, the Service would take the steps necessary [e.g., develop needed regulations and publish the appropriate Federal Register notice(s)] to open the refuge to upland hunting for turkey in a portion of the refuge's upland habitat in cooperation with the State of Florida. Implementing the turkey hunt will first require updating the existing Hunt Plan; posting appropriate notice in the *Federal Register*; and establishing regulations in Title 50, Code of Federal Regulations. Upland hunting for turkey will be designated in the Volusia Tract area on approximately 2,000 acres of the refuge's more than 21,574 acres. Hunt areas would be accessed through existing roads and fire breaks by foot. A quota would be established for the number of hunters. The remainder of the refuge would remain closed to turkey hunting to minimize conflicts with other priority uses. Turkey hunts would be conducted in cooperation with the FWC.

**Availability of Resources:** The details for administering the program have not been determined, but are not anticipated to be significantly higher than the existing hunt program. It is assumed that a quota permit would be charged for the hunting opportunity to cover the costs of managing the program. Funds would be needed annually to mow, grade, and fix roads and parking areas open to hunter access; to maintain signs; and to print leaflets. The selection process for permits would likely be processed through the existing State system. Management of the program has a biological, administrative, maintenance, and law enforcement component. Partnering with FWC would help provide the needed components. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Anticipated Impacts of Use:** Anticipated impacts were identified and evaluated based on best professional judgment and published scientific papers. Many of the impacts associated with upland hunting are similar to those considered for other public use activities, such as deer hunting and wildlife viewing and photography, with the exception of direct mortality to game species, short-term changes in the distribution and abundance of game species, and unrestricted travel through the hunt area. Direct mortality can impact isolated, resident game species' populations by reducing breeding populations to a point where the isolated population can no longer be sustained. This can result in localized extirpation of isolated populations. The hunt would be conducted in upland habitats; therefore, minimal disturbance to migratory birds is anticipated. Use of lead shot could be allowed for turkey, but considering the separation between the upland hunt and wetland habitat, the ingestion of lead shot by migratory birds should be

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minimal. The walk-in hunters would use existing fire breaks and roads for access. No soil compaction or vegetation disturbance is expected. Parking would occur in sites already designated as such. Hunting would not occur within 1,500 feet of any active eagle nest.

The cumulative effects of turkey hunting are expected to be minimal. Almost all of the game harvested would be from the Lake Woodruff NWR population. The hunt would be managed to ensure that the long-term population size of this species remains stable.

**Determination:**

Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** Several stipulations would be necessary to ensure compatibility of this use. Additional stipulations may be added as the program is developed with the State. Known stipulations are listed. The hunt would be conducted in accordance with State regulations and seasons. Additional restrictions may be listed in the refuge's hunt plan.

- The methods of hunting to be considered include primitive weapons, archery, and shotguns.
- Hunting will be limited to designated areas.
- Quota hunt permits will be issued.
- Hunting densities no greater than one hunting party per 100 acres will be allowed.
- The number of turkey permitted to be taken will be based on annual population estimates.
- Check stations will be used to collect hunt data and to monitor the quality of the hunt.
- Vehicle access and parking will be limited and confined to existing fire lanes and unimproved roads.
- Climbing spikes and permanent stands will not be permitted.
- Off-road vehicles or ATVs will not be permitted.
- No flagging or trail marking will be permitted.

Upland hunting would have little impact on other visitor activities. Hunt areas will be closed to other uses during hunting season to provide a safe buffer distance around all public use facilities.

**Justification:** Hunting is a priority wildlife-dependent use under the National Wildlife Refuge System Improvement Act. Turkey hunting, as described, was determined to be compatible, in view of the potential impacts that hunting can have on the Service's ability to achieve purposes and goals of the refuge, because: (1) hunter densities and use levels would be relatively low during days the refuge is open to hunting, (2) sufficient restrictions have been established to ensure that an adequate amount of high-quality habitat would be available to accommodate the needs of game birds and other wildlife using the refuge, and (3) sufficient opportunities would be available for other priority wildlife-dependent recreation during the upland hunt season. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Mandatory 15-Year Re-evaluation Date:**

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**Description of Use:***Fishing*

Fishing has been identified as a priority wildlife-dependent activity under the National Wildlife Refuge System Improvement Act and is a traditional use at the refuge. Fishing areas include various canals and the refuge's three impoundments. Fishing is allowed in accordance with State regulations. Additionally, the refuge has implemented refuge-specific fishing regulations which can be updated annually in Title 50 Code of Federal Regulations. The listed items are a summary of refuge-specific fishing regulations.

- A refuge sports fishing permit is required
- Fishing is allowed only during daylight hours, except under a refuge special use permit.
- Night fishing from boats would be allowed under a valid refuge Sports Fishing Permit in the open waters of the refuge.
- Motorized vessels would have to observe manatee speed zones.
- Motorized vessels are not permitted in the impoundments.
- Airboats, personal watercraft, or hovercraft are not allowed.
- Fishermen must attend their lines.

The Service would also work with the State of Florida to add the navigable waterways within the refuge's approved boundary to refuge management. These areas would be subject to the conditions of the management agreement and to all applicable Service and refuge requirements.

**Availability of Resources:** Operation and maintenance funds to support fishing are taken from the refuge's annual budget, which is adequate to sustain the program at the current level. Funds are needed annually to mow, grade, and fix roads, parking lots, and boat ramps open to fishing; paint, repair, and replace signs; and to develop and print brochures. The refuge's Biologist would be needed to spend up to two months a year managing the fishing program. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Anticipated Impacts of Use:** Anticipated impacts were identified and evaluated based on best professional judgment and published scientific papers. Overfishing has been known to cause ecological extinction of certain fish species and precedes all other human disturbance (Jackson et al., 2001). In recent history, overfishing in Florida has led to the decline of certain species. But today, the State monitors fish populations and has set seasons, slot and size limits, and total bag limits for most sports fish, making the likelihood of overfishing and depleting fish stocks minimal. The closed areas of the refuge also serve to recharge local waters. Collectively, the State fishing regulations should minimize the likelihood of fish stocks declining on the refuge. Since fishing is facilitated by boating on much of the refuge, boat impacts are an important component of this use. (See the Boating Compatibility Determination for more information.)

Under Service policy, fishing tournaments cannot originate within the refuge, but, because the quality of fishing is better within the refuge, tournament fisherman originating from a tournament outside the refuge travel into refuge waters. Tournaments have become big businesses and can substantially increase the level of fishing activity in the refuge. This can have negative impacts on other sports fisherman, wildlife, and habitat.

**Determination:**

- Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

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**Stipulations Necessary to Ensure Compatibility:** Fishing is allowed on the refuge in accordance with State regulations. In addition, the refuge has listed sports fishing regulations, which are paraphrased.

- A refuge sports fishing permit is required
- Fishing is allowed only during daylight hours, except under a refuge special use permit.
- Night fishing from boats is allowed under a valid refuge Sports Fishing Permit in the open waters of the refuge.
- Airboats, personal watercraft, or hovercraft are not allowed.
- Fishermen must attend their lines.
- Special off-limit areas may seasonally be designated to limit disturbance to swallow-tailed kite roosts.

Boating impacts to wildlife include noise and speed, as well as disturbance from increased access to more parts of the refuge (i.e., boats can disturb more birds than bank fishing, since boats would access more of the refuge). Manatee speed zones have been established in most portions of the navigable waters of the St. Johns River, which will help reduce some of the disturbance impacts. Under certain planned cooperative management agreements with the State, certain areas of Lake Woodruff and adjacent nearby waterways would likely be closed seasonally to reduce disturbance to swallow-tailed kite roosts. Monitoring will help the Service to determine the effectiveness of refuge management actions in maintaining migratory birds, endangered species, and other wildlife populations on the refuge. The refuge has little control over fishing tournaments which originate off the refuge. However, the staff will work with the organizers of these events to educate them to the impacts boating can have on wildlife, discuss limiting the size of the tournament, and brief them on refuge regulations. It is anticipated that refuge sanctuary areas, manatee speed zones, and seasonally closed areas of the navigable waters will be adequate to sustain migratory bird and endangered species populations and adequate stocks of fish and provide for a quality fishing experience which has little impact on other visitors. If wildlife populations suffer as a result of fishing activities, the quality of fishing declines, or other wildlife or habitat impacts occur, additional restrictions may be implemented. The refuge will modify or eliminate any use with unacceptable impacts.

**Justification:** Fishing is a priority wildlife-dependent use under the National Wildlife Refuge System Improvement Act. Fishing, as described, was determined to be compatible, in view of the potential impacts that fishing and supporting activities (e.g., boating) can have on the Service's ability to achieve purposes and goals of the refuge, because: (1) fishing densities and use levels would be relatively low during most days; (2) sufficient restrictions have been established to ensure the protection of manatees and that an adequate amount of high-quality feeding and resting habitat would be available to accommodate the needs of waterfowl, migratory birds, and other resident birds using the refuge; and (3) sufficient opportunities would be available for other priority wildlife-dependent recreation. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Mandatory 15-Year Re-evaluation Date:**

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**Description of Use:*****Wildlife Observation and Photography***

Wildlife observation and photography are considered simultaneously in this compatibility determination. Wildlife observation and photography have been identified in the National Wildlife Refuge System Improvement Act of 1997 as priority wildlife-dependent recreational uses. This compatibility determination applies only to personal photography. Commercial photography or videography, if allowed, would be covered under the Commercial Services Compatibility Determination and would require a special use permit issued by the refuge with specific restrictions. Wildlife observation and photography may occur during daylight hours throughout all open areas of the refuge. Wildlife viewing and photography improvements have been made along hiking trails and at other locations to provide exposure to different refuge habitat types and diverse flora and fauna. In addition, numerous refuge dikes and trails are open year-round or seasonally to provide different wetland or upland habitats for wildlife viewing. Approved forms of access for wildlife viewing and photography include driving licensed vehicles, hiking, and using motorized and non-motorized boats. Certain areas may be closed to specific forms of transportation. Motor boat restriction zones are in place in several locations to provide protection for manatees, to increase the quality of fishing opportunities, and/or to limit propeller damage. Refuge brochures and maps provide the public with the locations of visitor facilities.

**Availability of Resources:** Operation and maintenance funds to support wildlife viewing and photography are taken from the refuge's annual budget, which is adequate to sustain the program at the current level. Funds are needed annually to mow, grade, and fix roads open to the public; fix, repair, and replace trails; paint, repair, and replace signs; and develop and print brochures. Up to seven staff months are required to support this program. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Anticipate Impacts of Uses:** This section is to critically and objectively evaluate the potential effects that wildlife observation and photography could have on the wildlife, habitat, and other public use activities based on available information and best professional judgment. Each activity has the potential to have impacts, but the focus is to minimize impacts to within acceptable limits. This is based on the impacts at the existing and projected levels of use.

**Short-term Impacts:** Wildlife observation trails have the potential to disturb wildlife species. Among wetland habitats, approaches can reduce time spent foraging and can cause water birds to avoid foraging habitats adjacent to the areas of disturbance (Klein 1993). Walking on wildlife observation trails tends to displace birds and can cause localized declines in the richness and abundance of wildlife species (Riffell et al., 1996). Bicycling and people walking causes more disturbances to waterfowl than vehicles (Pease et al., 2005). Wildlife photographers tend to have the largest disturbance impacts (Klein 1993, Morton 1995, Dobb 1998). While wildlife observers frequently stop to view wildlife, wildlife photographers are much more likely to approach wildlife (Klein 1993). Even slow approach by wildlife photographers tends to have behavioral consequences to wildlife (Klein 1993). Other impacts include the potential for some photographers to remain close to wildlife for extended periods of time (Dobb 1998) and the tendency of casual photographers with low power lenses to get much closer to their subjects than other activities would require (Morton 1995). Some visitors may use boats to facilitate this activity, and boating impacts are listed in the Boating Compatibility Determination.

**Long-term Impacts:** Considering the high level of use and variety of activities occurring at the refuge, appropriate solutions to minimize impacts need to be developed and monitored. For example, during the fall migration and over-wintering season, wildlife observation, wildlife photography, and environmental education and interpretation are all occurring simultaneously and are at the highest

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levels of the year. Techniques to limit disturbance must be evaluated, implemented, and monitored. This stems from the hypothesis that prolonged and extensive disturbance may cause migratory birds to abandon the wetlands most disturbed by humans and winter elsewhere. Current public use may not be at a level to cause this shift, but anticipated increases relative to the expansion of the population and growth of visitor opportunities could result in seasonal shifts in migratory bird use of the refuge's wetland habitats.

**Determination:**

Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** By design, wildlife observation and photography should have minimal wildlife and habitat impacts. However, as use increases, wildlife impacts are more likely to occur. Evaluation of the sites and programs would be conducted annually to assess if objectives are being met, if habitat impacts are minimized, and if wildlife populations are not being adversely affected. If evidence of unacceptable impacts begins to appear, it will be necessary to change the activity or the program, move the activity or program, or eliminate the program. Stipulations that may be employed include those listed. The Visitor Services Plan may contain additional restrictions to minimize impacts to wildlife and habitats.

- Establishing buffer zones that minimize disturbance around sensitive areas and establishing additional no-entry zones.
- Vegetation that effectively conceals visitors and provides cover for birds can help minimize impacts of people in busy areas, such as the dikes along the impoundments.
- Impacts from wildlife viewing and photography can be reduced by providing observation blinds.
- Re-routing, modifying, or eliminating activities which have demonstrated direct wildlife impacts should also be employed.
- Education is critical for making visitors aware that their actions can have negative impacts on birds.
- Establishing well-marked trails where human use is more predictable will lessen wildlife impacts.

**Justification:** Wildlife observation and photography are priority public uses of the National Wildlife Refuge System. Providing quality, appropriate, and compatible opportunities for these activities contributes toward fulfilling provisions of the National Wildlife Refuge System Improvement Act. Wildlife observation and photography would provide excellent forums for promoting increased awareness, understanding, and support of refuge resources and programs and of the Service. The stipulations outlined above should minimize potential impacts relative to wildlife/human interactions. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them. At the current and anticipated levels 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.

**Mandatory 15-Year Re-evaluation Date:**



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**Description of Uses:*****Environmental Education and Interpretation***

Environmental education and interpretation programs consist primarily of youth and adult education and interpretation of the natural resources of the refuge. Activities include on- or off-site staff-, volunteer-, or teacher-led environmental education programs; off-site teacher-led classroom programs; teacher workshops; and interpretation of wildlife, habitat, other natural features, and/or management activities occurring on the refuge. These activities seek to increase the public's knowledge and understanding of wildlife and their habitats and to contribute to wildlife conservation and support of the refuge. Environmental education and interpretation have been identified in the National Wildlife Refuge System Improvement Act as priority public use activities. The CCP identifies an expansion of the environmental education program to a curriculum-based program that focuses on habitat diversity. Over time the program would grow to provide a diverse range of on-site staff-led education programs. The programs would explore various habitats of the refuge (i.e., wetlands, scrub, and pine flatwoods), leading to a better understanding of the value of these habitats to fish and wildlife resources, the human influence on the ecosystem, the importance of the refuge in the landscape, and the importance of these resources to society. The refuge has developed facilities to support the program and would be developing curricula that allow students to explore and experience these habitats firsthand. The proposed interpretation program strives to increase awareness and understanding of the refuge's natural features, habitat diversity, wildlife, human history, and refuge management activities. The CCP proposes minor changes, such as adding new signs, revising brochures, and developing new interpretive panels and kiosks. The Plan also calls for more extensive improvements, such as further development of the Myacca Trail. Proposed changes in the environmental education and interpretation program are planned for areas currently open to the public. Current interpretive sites include the Visitor Center and the Myacca Trail. Supervised activities would encourage the exploration of the environment. Collection of specimens is limited to approved research activities and is subject to applicable laws, regulations, policies, and permits (see the Research Compatibility Determination for more information).

**Availability of Resources:** Annual refuge operation and maintenance funds support the Visitor Service program and activities. Costs for improvements identified in the CCP would typically come from grants or endowments and refuge budget increases. Volunteers and the Friends of Lake Woodruff NWR typically provide the staffing to support these uses. A park ranger position is proposed in the CCP to support these programs. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Anticipated Impacts of Uses:** Environmental education and interpretation activities on the refuge primarily occur at the Learning Resource Center and the primary public use areas. The expansion of the program, as proposed, would increase disturbance in several new sites, however, impacts would be considered short-term and discrete due to the low anticipated frequency of use and due to the ability to move sites to a new area if the habitat showed signs of impacts. Vegetation trampling, altering structure and species composition, and temporal wildlife impacts to species would be anticipated to occur at a minimal level. This unavoidable impact associated with running the environmental educational program is anticipated to be minimal and is acceptable. Impacts associated with interpretive activities generally occur at developed facilities, such as the trails or other improved facilities. Adding the new interpretive sites would have some wildlife or habitat impacts. The new proposed trail would utilize an existing fire break and only minimal clearing would be required for a parking lot (about one tenth of an acre).

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**Determination:**

- Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** While anticipated impacts are anticipated to be minimal, stipulations are required to ensure that wildlife resources are adequately protected. The environmental education and interpretation program activities would avoid sensitive sites and sensitive wildlife populations. Built into all curriculums would be a section on wildlife etiquette. Environmental education and interpretation programs and activities would be held at or near established facilities where impacts may be minimized. Evaluations of sites and programs should be conducted annually to assess if objectives are being met and that the natural resources are not being adversely impacted. Impacts associated with interpretive programs are also anticipated to be minimal. One overarching aspect of the interpretive program is to build understanding and appreciation for the refuge and its natural resources. As use increases, wildlife disturbances are unavoidable, but through interpretive material (e.g., brochures, signs, and kiosk panels) proper wildlife etiquette will be stressed. Education is critical for making visitors aware that their actions can have negative impacts on wildlife. Interpretive activities and programs would be conducted at developed sites where impacts can be minimized. Wildlife impacts in areas potentially affected by new programs would be carefully monitored. If impacts are detected, adaptive strategies would be developed, such as approach-zones, to lessen wildlife disturbance. Annual evaluations would be conducted to assess if objectives are being met and that the natural resources are not being adversely affected. The refuge would modify or eliminate any use that results in unacceptable impacts. The Visitor Services Plan may contain additional restrictions to minimize impacts to wildlife and habitats.

**Justification:** Environmental education and interpretation represent two priority wildlife-dependent recreational activities listed under the National Wildlife Refuge System Improvement Act. Environmental education and interpretation are used to encourage all citizens to act responsibly in protecting natural resources. They are tools the refuge can use to build understanding, appreciation, and support for the refuge and the National Wildlife Refuge System. Resources required to run the programs is minimal and is built into the refuge operation and maintenance budget. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them. As long as stipulations to ensure compatibility are followed, the programs should remain compatible with the purposes of the refuge. At such time that the monitoring program identifies that unacceptable wildlife impacts are occurring, the refuge would modify the activity to minimize or eliminate the impacts. Both programs allow the education of the public regarding the refuge's purposes and the missions of the Service and the Refuge System. They highlight the areas which are most in line with the refuge's management philosophy proposed under the CCP. Considering the minimal anticipated impacts through implementation of the environmental education and interpretation programs and the benefits that should arise through public education, participation, and involvement, the programs are deemed compatible.

**Mandatory 15-Year Re-evaluation Date:**

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**Description of Use:*****Bicycling and Jogging***

While not one of the six priority wildlife-dependent recreational uses listed in the National Wildlife Refuge System Administration Act, bicycling and jogging are modes of transportation currently used to facilitate wildlife observation and wildlife photography. This Compatibility Determination provides additional guidance on these specific uses. As proposed, bicycle riding and jogging would occur only on designated roads and trails. These uses occur year-round.

**Availability of Resources:** Operation and maintenance funds to support wildlife viewing are taken from the refuge's annual budget, which is adequate to manage these uses at the current and anticipated levels. Funds would be needed annually to mow, grade, and fix roads open to the public; fix, repair, and replace boardwalks and trails; paint, repair, and replace signs; and develop and print brochures. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Anticipate Impacts of Use:** A critical and objective evaluation of the potential effects that bicycles and jogging could have on the wildlife, habitat, and other public use activities is based on available information and best professional judgment. Although bicycling and jogging have the potential to have impacts, the focus is to minimize impacts. This is based on the impacts at the existing and projected level of use. Bicycling may be an appropriate form of transportation to view wildlife and has been approved in specific locations. However, bicycle riding takes several forms. For example, mountain biking, according to the International Mountain Bicycling Association (IMBA) is the sport of riding bicycles off paved roads. It requires endurance and bike handling skills and is performed on dirt roads, fire breaks, access roads, and public trails. Mountain biking tends to be an activity of a more extreme nature, with the emphasis on speed and difficulty. According to the IMBA, the sport is broken down into several categories: cross country, downhill, street, dirt jumping, and free riding. Although wildlife viewing may be an incidental aspect of the mountain biking activity, it is not considered the main purpose or intent. While mountain bikers and ATV riders may enjoy the outdoor setting found at the refuge, these activities tend to conflict with other wildlife-dependent recreation activities, may disturb migratory birds, and are not specifically aimed at viewing wildlife. Therefore, mountain biking, along with other similar sport activities, such as ATV use, is not appropriate for the refuge. Other forms of bike riding may be appropriate. Bicycle riders are not permitted to ride on refuge hiking trails. This activity disturbs other trail users and will be eliminated from hiking trails.

**Short-term Impacts:** Wildlife disturbance relative to bicycle riding has been poorly studied with most references using other activities, such as walking, hiking, and operating vehicles and their impacts on wildlife; therefore, bicycle impacts are inferred (unless noted). A study conducted at Back Bay National Wildlife Refuge indicated that jogging and bike riding in an open habitat, such as marshes where the activity is highly visible to wading birds, shorebirds, and waterfowl, are disruptive (Pease, et al., 2005). As a result, marshbirds in open areas flee from joggers and bike riders (Laskowski 1999). Wildlife may receive different cues from different modes of transportation, since wildlife do not flee as readily from cars, perhaps because the person is hidden in the vehicle and not perceived as a threat (Klein 1983). A study at Back Bay National Wildlife National Wildlife Refuge (Pease, et al., 2005) compared five different human activities (i.e., motorized tram, slow-moving truck, fast-moving truck, bicyclist, and pedestrian) in relation to waterfowl disturbance. The study found that people walking and biking disturbed waterfowl more than vehicles.

**Long-term Impacts:** Considering the high level of use and variety of activities occurring at the refuge, appropriate solutions to minimize impacts need to be developed. For example, during the fall migration and over-wintering season, wildlife observation, wildlife photography, and environmental education and interpretation are all occurring simultaneously and are at the highest levels of the year.

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Techniques to limit disturbance must be evaluated, and implemented and monitored. This stems from the hypothesis that prolonged and extensive disturbance may cause migratory birds to abandon the wetlands most disturbed by humans and winter elsewhere. Current use may not be at a level to cause this shift, but anticipated increases relative to the expansion of the population and the growth of visitor opportunities could result in seasonal shifts in migratory bird use of the refuge wetland habitat. Bicycling would add to the level of disturbance, especially in wetland habitats; strategies would need to be implemented to limit wildlife impacts.

**Determination:**

Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** All forms of wildlife observation should have minimal wildlife and habitat impacts. However, bicycling and jogging can cause wildlife impacts in open wetland areas, can increase wildlife impacts, and can disrupt other individuals viewing wildlife. Bicycles will not be permitted on established hiking trails and will be limited to paved roads and levee roads. Evaluation of bike riding and jogging will be conducted annually to assess if objectives are being met, if habitat impacts are within a tolerable range, and if wildlife populations are not being adversely affected. If evidence of unacceptable impacts begins to appear, it may be necessary to change the activity or the program, move the activity or program, or eliminate the program. Stipulations that might be employed are listed.

- Establishing buffer zones that minimize disturbance around sensitive areas and establishing additional no-entry zones.
- Vegetation that effectively conceals visitors and provides cover for birds can help minimize impacts of people.
- Impacts from wildlife viewing can be reduced by providing observation blinds.
- Techniques specific to bicycling will include re-routing, modifying, or eliminating bicycle riding activities which have demonstrated direct wildlife impacts in open wetland habitats.
- Education is critical for making bicycle riders and joggers aware that their actions can have negative impacts on birds.
- Posting signs where this use is allowed and contained (impoundment roads and paved roads).

The Visitor Services Plan may contain additional restrictions to minimize impacts to wildlife and habitats.

**Justification:** Bicycling to observe wildlife facilitates priority public uses of the National Wildlife Refuge System. Providing opportunities for these activities contributes toward fulfilling provisions of the National Wildlife Refuge System Improvement Act. Wildlife observation from bicycles in areas where there are few impacts to wildlife would provide an appropriate mode of transportation for promoting increased awareness, understanding, and support of refuge resources and programs. The stipulations outlined above should minimize potential impacts relative to wildlife/human interactions. At the current and anticipated levels of visitation, bicycling and jogging do not seem to conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge. If negative wildlife and/or habitat impacts are found, these uses will be modified or eliminated. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Mandatory 10-Year Re-evaluation Date:**

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**Description of Use:****Commercial Services**

While not one of the six priority wildlife-dependent recreational uses named in the National Wildlife Refuge System Administration Act, commercial services support wildlife observation and photography, environmental education, interpretation, hunting, and fishing and they assist the refuge in providing high quality wildlife-oriented recreational activities. The refuge authorizes commercial services through the issuance of special use permits (SUP). For the purpose of this document, the term, commercial, is defined as a permittee that charges a client a fee for a program or service to generate a profit. This does not include individuals who perform these services for no fee, not-for-profit groups, schools, colleges, or other governmental agencies.

Commercial services can provide wildlife-dependent recreational and educational opportunities for the public who desire a quality experience, but who may lack the necessary equipment, skills, knowledge, ability, or resources to obtain it themselves. Commercial services on the refuge include bicycle tours, boat tours, and guided sports fishing trips. Except for the fee charged to the customer by the commercial provider, the impacts associated with these activities are no different than other activities, which are already occurring on the refuge. The named activities covered by this compatibility determination are similar to the activities covered by the environmental education and interpretation, wildlife observation and photography, hunting, and fishing compatibility determinations, but this compatibility determination provides additional guidance specific to commercial services.

As proposed, most commercial services would be permitted in the open areas of the refuge under a special use permit. Interpretive training and further guidelines may be developed and required in the future. No administrative facilities for the providers of these commercial services will be located on the refuge. The special use permits are likely to contain additional restrictions to ensure compatibility.

**Availability of Resources:** This program cost to refuge operations includes, but is not limited to, development and review of policy and procedure, administration of annual permits (e.g., addressing inquiries, screening applicants, checking on insurance, and issuing permits), and enforcement and monitoring of permit holders. However, the size and scope of the program and the number of permits issued will have to be balanced with the permit fee. Existing infrastructure is adequate to accommodate this use at existing and anticipated levels. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Anticipated Impacts of Use:** To date, the largest single component of the commercial services program is guided boat tours. Boating (especially power boating) has been shown to cause numerous wildlife impacts (see the Fishing and Boating compatibility determinations). The refuge cannot separate the impacts of boat tour guides from recreational fishermen on wildlife, sports fishing, or other users. Although guided boat tours are currently relatively infrequent, a large number of boat tours could disrupt fishermen, hunters, wildlife observers/photographers, and other boaters.

Currently no permits are issued to guided bicycle tours. This activity is expected to have similar impacts as single bicycles, except that a group of bicycles may cause more disturbances. Groups of bicycles may also interfere with the activities of other users. Once the CCP is approved, bicycle tours will be required to also operate under refuge special use permits.

**Determination:**

Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

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**Stipulations Necessary to Make the Use Compatible:** Commercial operators shall be permitted only in the areas open to the public. Seasonal or permanent closures in certain areas may be imposed on commercial operators if the level of use becomes excessive, conflicts occur with other users engaged in priority wildlife-dependent recreation, or wildlife impacts occur. In the future, interpretive training and other stipulations may be required of commercial operators to help the refuge achieve its outreach and educational objectives. Commercial service providers must follow all refuge regulations along with additional special conditions stipulated in their refuge special use permits. The listed special conditions are common to most commercial service providers.

- The permittee will provide proof of general liability insurance in the amount of \$300,000.
- The permittee will provide proof of a state charter license and/or Coast Guard Captain's license.
- The provider will supply the refuge with his/her fee schedule charged per client.
- The provider will supply the refuge with the number of trips provided per year (this will include the number of clients).
- The vessels used by fishing guides will be required to bear the annual guide permit decal.

All conditions of special use permits must be met. A special use permit may be revoked for failure to comply with the conditions or for repeat violations of refuge regulations. These special use permits are to be issued for a period of time not to exceed one year, where all permits expire on September 30 of the applicable fiscal year. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

**Justification:** Commercial operations support wildlife observation and photography, environmental education and interpretation, fishing, and hunting. They provide recreational and educational opportunities for the public who desire a quality wildlife-dependent experience, but who may lack the necessary equipment, skills, knowledge, ability, or resources to obtain it themselves. Providing opportunities for these activities would contribute toward fulfilling provisions of the National Wildlife Refuge System Improvement Act. The stipulations outlined above should minimize potential impacts relative to wildlife/human interactions. At the current and anticipated levels of visitation, commercial operations would not conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge. Identified improvements would not be developed until adequate staff and budget are available to develop and operate them.

#### **Mandatory 10-Year Re-evaluation Date:**

#### **Description of Use:**

##### *Horseback Riding*

While not one of the six priority public uses, horseback riding is often associated with them. Horseback riding would be a self-initiated activity on the refuge, with no amenities provided specifically for this activity. Participants of this activity would be responsible for all aspects of their visit and use of the refuge. This is a popular activity, which has historically occurred on refuge lands and which frequently involves a small group of riders. Horseback riding would be allowed through a special use permit that would contain specific restrictions to minimize wildlife and habitat impacts of this use. The use is limited to fire breaks designated for horseback riding on the Volusia Tract.

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**Availability of Resources:** No additional administrative costs are associated with this activity. The only new infrastructure needed to implement this use would be signs demarking the trails. There would be no additional maintenance or monitoring costs associated with this activity.

**Anticipated Impacts of the Use:** Although horseback riding may cause disturbance to wildlife and interference with other public uses, these impacts are not expected in the specially designated areas where this activity would be permitted to occur. The Volusia Tract consists of pine and mixed-pine forests where disturbance to migratory birds would be minimal. These areas would be closed to horseback riding during the hunting season. In some areas, horses have been determined to introduce exotic plants via their droppings; this has not been documented on Lake Woodruff NWR. By restricting the use to specific trails, trampling of native vegetation would be minimized. Other impacts might include the spread of diseases and increased erosion. To date, these impacts have not been observed on the refuge.

**Determination:**

Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** Horseback riding would be permitted only on specially designated refuge fire breaks on the Volusia Tract and would require a special use permit. The special use permit process would allow the refuge to educate the users on specific rules related to horseback riding on the refuge. It would also provide the refuge with the number of users. Horseback riding would be permitted year-round during daylight hours with the exception of hunt seasons during which horseback riding would not be allowed. Areas closed to the general public for management or safety purposes would be closed to horseback riding as well. If negative impacts associated with this use are determined, additional restrictions would be placed on this activity or it would be discontinued. All conditions of special use permits must be met. A special use permit may be revoked for failure to comply with the conditions or for repeat violations of refuge regulations. These special use permits are to be issued for a period of time not to exceed one year, where all permits expire on September 30 of the applicable fiscal year. The Visitor Services' Plan may contain additional restrictions to minimize impacts to wildlife and habitats.

**Justification:** Horseback riding supports wildlife observation by providing an alternative mode of travel on specially designated refuge trails.

**Mandatory 10-Year Re-evaluation Date:**

**Description of Use:**  
*Timber Harvesting*

**Description of Use:** Select trees would be harvested and/or salvaged as part of habitat restoration projects on the refuge. Typically, these operations would involve commercial logging that would be implemented to imitate natural forces, such as fires and hurricanes, that once influenced and maintained representative habitats within Lake Woodruff NWR. In addition, forest areas that have been damaged by fires and hurricanes may be salvaged in order to promote natural regeneration of the forests. Commercial logging and salvage operations are not recognized as wildlife-dependent priority uses by the National Wildlife Refuge System Improvement Act. However, the establishing

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authorities for the refuge recognized that timber management would be required to maintain some of the forests representative of refuge habitats. Therefore, this activity is an important use for the Lake Woodruff NWR. These timber harvest operations would occur in pine forests of the East and Volusia tracts, on approximately 2,000 acres (or on 2,500 acres if Jones Island were included). These operations would be scheduled during times of the year when they would least impact trust species or public use activities.

**Availability of Resources:** Funds needed to support timber harvesting activities are taken from the refuge's annual budget which is sufficient to support this use. In general, refuge costs for timber harvesting activities include the listed items and associated costs.

- Preparation of Habitat Management Plans/Programs: \$1,500
- Pre/Post Treatment Surveys/Assessments: \$ 1,500
- Permit Administration: \$ 500
- Road Repairs/Maintenance \$ 10,000

**Anticipated Impacts of the Use:** The operation of heavy equipment would damage or destroy ground vegetation. These areas would be allowed to grow back following the harvest. Soil compaction by harvesting machinery is not a significant problem due to the high sand composition. The potential exists for heavy machinery to injure or kill gopher tortoises, a State-listed species. To prevent this, surveys would be performed of all proposed treatment areas, and high-risk zones would be flagged as off-limits to tree harvesting machines. Heavy equipment and vehicles would temporarily add emissions to the air. Minor wildlife disturbance would also occur along the roads used to haul timber from the refuge. The probability of catastrophic wildfires and pine beetle infestations on the refuge would be reduced in the treated areas. Ground cover and understory plant densities would go up, increasing forage and cover for many wildlife species.

**Determination:**

Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** Timber sales would not be conducted for economic benefits. Instead, the operation would be merely a tool to implement critical habitat restoration programs for the refuge. Therefore, these timber sales would be consistent with approved forest management plans and programs that outline the habitat restoration needs for the refuge. A maximum of 2,500 acres of pine forests would be available for commercial timber sales. Timber sales would be conducted under special use permit or contract or a combination of the two to specify low ground pressure equipment and other details to minimize impacts and maximize benefits. Gopher tortoises would be protected through surveys and the subsequent flagging of off-limits areas.

**Justification:** The refuge's establishing legislation directed that a timber management program be conducted on the refuge and stated, through the Secretary's report of 1974, that "commercial timbering for the sake of revenue will not be considered as an objective of management". Timber management would be used primarily to imitate natural influences, especially fire that used to shape and maintain the natural biological diversity of Lake Woodruff NWR. Moreover, these sales would also provide economic benefits. All timber management practices performed would be for the primary purpose of achieving restoration and other habitat and wildlife management objectives. It would be to the benefit of the government to accomplish forested habitat restoration goals via commercial timber harvest as opposed to paying a contractor to remove the timber where possible. Timber is not



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harvested on the refuge for any other reason than forest fire fuel management and habitat restoration and management. Timber harvesting would contribute to the achievement of the purposes and mission of the refuge and the National Wildlife Refuge System.

**Mandatory 10-Year Re-evaluation Date:**

**Description of Use:**

*Research*

Research is the planned, organized, and systematic gathering of data to discover or verify facts. In principle, research conducted on the refuge by universities, co-op units, non-profit organizations, and other research entities furthers refuge management and serves the purposes, vision, and goals of the refuge. The refuge hosts research from a variety of research institutions, including various universities and private research groups. All research activities, whether conducted by governmental agencies, public research entities, universities, private research groups, or any other entity, shall be required to obtain special use permits from the refuge. Approved refuge special use permits will contain conditions under which researchers must operate to help minimize negative impacts to refuge resources. All research activities will be overseen by the refuge biologist and refuge manager. Projects that are fish and wildlife management-oriented, which will provide needed information to refuge operation and management, will receive priority consideration and will even be solicited.

**Availability of Resources:** Other than the administration of associated special use permits, no refuge resources are generally required for this use.

**Anticipated Impacts of the Use:** Generally, adverse impacts from research are minimal. Occasionally, slight or temporary wildlife or habitat disturbances may occur (e.g., minor trampling of vegetation may occur when researchers access monitoring plots). However, these impacts are not significant, nor are they permanent. Also, a small number of individual plants or animals might be collected for further scientific study, but these collections are anticipated to have minimal impact on the populations from which they came. All collections will adhere to the Service's specimen collection policy (Director's Order 109, dated March 28, 2005).

**Determination:**

Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** All research conducted on the refuge must further the purposes of the refuge and the mission of the National Wildlife Refuge System. All research will adhere to established refuge policy on research and policy on collecting specimens (Directors Order Number 109). To ensure that research activities are compatible, the refuge requires that a special use permit be obtained before any research activity may occur. Research proposals and/or research special use permit applications must be submitted in advance of the activity to allow for review by refuge staff to ensure minimal impacts to the resources, staff, and programs of the refuge. Each special use permit may contain conditions under which the research will be conducted. Each special use permit holder will submit annual reports or updates to the refuge on research activities, progress, findings, and other information. Further, each special use permit holder will provide copies of findings, final reports, publications, and/or other documentation at the end of each project. The refuge will deny

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permits for research proposals that are determined to not serve the purposes of the refuge and the mission of the National Wildlife Refuge System. The refuge will also deny permits for research proposals that are determined to negatively impact resources or that materially interfere with or detract from the purposes of the refuge. All research activities are subject to the conditions of their permits. All conditions of special use permits must be met. A special use permit may be revoked for failure to comply with the conditions or for repeat violations of refuge regulations.

**Justification:** Research activities provide important benefits to the refuge and to the natural resources supported by the refuge. Supporting management, research conducted on the refuge can lead to new discoveries, new facts, verified information, and increased knowledge and understanding of resource management, as well as track current trends in fish and wildlife habitat and populations to enable better management decisions. Research has the potential to further the purposes and goals of the refuge and the mission of the National Wildlife Refuge System.

**Mandatory 10-year Re-evaluation Date:**

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## Approval of Compatibility Determinations

The signature of approval is for all compatibility determinations considered within the Comprehensive Conservation Plan for Lake Woodruff National Wildlife Refuge. If one of the descriptive uses is considered for compatibility outside of the Comprehensive Conservation Plan, the approval signature becomes part of that determination.

Refuge Manager: \_\_\_\_\_  
(Signature/Date)

Regional Compatibility  
Coordinator: \_\_\_\_\_  
(Signature/Date)

Refuge Supervisor: \_\_\_\_\_  
(Signature/Date)

Regional Chief, National  
Wildlife Refuge System,  
Southeast Region: \_\_\_\_\_  
(Signature/Date)

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## APPENDIX G. INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

Originating Person: Refuge Manager  
Telephone Number: 386 / 985-4673  
E-Mail: FW4RWLakeWoodruff@fws.gov  
Date: 4/24/2007

### **PROJECT NAME: Lake Woodruff National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment**

- I. Service Program:
- Ecological Services
  - Federal Aid
  - Clean Vessel Act
  - Coastal Wetlands
  - Endangered Species Section 6
  - Partners for Fish and Wildlife
  - Sport Fish Restoration
  - Wildlife Restoration
  - Fisheries
  - Refuges/Wildlife
- II. State/Agency: Florida / U.S. Fish And Wildlife Service
- III. Station Name: Lake Woodruff National Wildlife Refuge, Deleon Springs, FL 32130
- IV. Description of Proposed Action: The Lake Woodruff National Wildlife Refuge is in the process of preparing a Comprehensive Conservation Plan (CCP) that will provide strategic management direction over the next 15 years, by
- providing a clear statement of desired future conditions for habitat, wildlife, visitor services, and facilities;
  - providing refuge neighbors, visitors, and partners with a clear understanding of the reasons for management actions;
  - ensuring that refuge management reflects the policies and goals of the System and legal mandates;
  - ensuring the compatibility of current and future public use, and
  - providing long-term continuity and direction for refuge management.

The purposes of developing a CCP for the refuge is to meet the requirement of the Refuge Improvement Act for all national wildlife refuges to have a CCP in place by 2012 to help fulfill

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the mission of the System. Also, this refuge lacks a master plan that clearly establishes priorities and ensures consistent, integrated management directives.

V. Pertinent Species and Habitat:

A. Include species/habitat occurrence map:

B. Listed species and/or their critical habitat within the action area:

Federal-Designated Endangered (E) and Threatened (T) Species:

- |                               |   |       |
|-------------------------------|---|-------|
| 1. Mississippi sandhill crane | ( <i>Grus canadensis pulla</i> )          | (E)   |
| 2. Whooping crane             | ( <i>Grus Americana</i> )                 | (E)   |
| 3. West Indian manatee        | ( <i>Trichchus manatus</i> )              | (E)   |
| 4. American alligator         | ( <i>Alligator mississippiensis</i> )     | (SAT) |
| 5. Wood stork                 | ( <i>Mycteria americana</i> )             | (E)   |
| 6. Eastern indigo snake       | ( <i>Drymarchon coris couperi</i> )       | (T)   |
| 7. Everglade snail kite       | ( <i>Rostrhamus sociabilis plumbeus</i> ) | (E)   |

VI. Location (See map section of CCP)

A. Ecoregion Number and Name: North Florida Ecosystem

B. County and State: Volusia and Lake Counties, Florida

C. Section, township, and range (or latitude and longitude):  
Latitude 29° 06', Longitude 81° 22'

D. Distance (miles) and direction to nearest town: Refuge Headquarters is located in Deleon Springs, Florida; 1 mile west of U.S. Highway 17, on Mud Lake Road.

E. Specie/habitat occurrence:

1. Bald eagles (recently de-listed): Wintering and nesting bald eagles use the refuge. At times there are active bald eagle nests on the refuge and others are known to exist on lands adjacent to refuge boundary. The Florida Fish and Wildlife Conservation Commission's monitoring efforts regularly survey active nests to determine status of existing nests and to locate new ones.
2. Sandhill cranes: Wintering and nesting sandhill cranes use the refuge. They primarily use the freshwater impoundments for loafing feeding and roosting during the winter months as well as relying on the safety of group numbers and the wide open spaces provided by the man-made pools.
3. Whooping cranes: A pair of whoopers that were of the original experimental flock introduced to Florida in 2000 have migrated to this refuge for the third consecutive year. Originally introduced to Chassahowitzka Refuge from Necedah, Wisconsin behind an ultra-light aircraft, these birds now migrate annually on their own to loaf and feed in the marshland habitat of Lake Woodruff NWR.



4. Manatees use the main waterways within the refuge boundary year round. Numbers are substantially fewer during the summer months however, as they are prone to head for the open waters of the Atlantic Ocean. Waters within refuge boundary are controlled by the state.
5. Wood stork: The wood stork is observed periodically throughout the year on and around the refuge, but it is not known to nest on refuge lands. Strategies to enhance wood stork numbers are identified in Section I.H. of the Chapter IV. Management Directives.
6. Eastern Indigo Snakes have not been observed on the refuge, but upland habitat suitable to their needs is known to exist.
7. Everglade snail kites are specialized feeders known to eat only large snails of the genus Pomacea, i.e. apple snails. Because of their special diet, these kites are limited to marshes where snails can be found. Snail kites are occasionally observed on the refuge singly or in pairs.
8. American alligators exist abundantly on the refuge throughout the year. It's not known how increased visitation may impact their status.

**VII. Determination of Effects:**

**A. Explanation of effects of the action on species and critical habitats:**

<b>SPECIES / CRITICAL HABITAT</b>	<b>IMPACTS TO SPECIES/CRITICAL HABITAT</b>
<b>1. Bald eagle</b>	Not likely to adversely affect
<b>2. Mississippi sandhill crane</b>	Not likely to adversely affect
<b>3. Whooping crane</b>	Not likely to adversely affect
<b>4. West Indian manatee</b>	Not likely to adversely affect
<b>5. American alligator</b>	Not likely to adversely affect
<b>6. Wood stork</b>	Not likely to adversely affect
<b>7. Eastern indigo snake</b>	Not likely to adversely affect
<b>8. Everglade snail kite</b>	Not likely to adversely affect

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

SPECIES / CRITICAL HABITAT	ACTIONS TO MITIGATE/MINIMIZE IMPACTS
1. Bald eagle	Annual surveys will aid in the detection of eagle activity on the refuge. Eagles winter and nest on and around the refuge. Measures can be taken to help protect active nests from visiting public and from potential catastrophic incidents, such as wildland fires.
2. Mississippi Sandhill crane	Both crane species use the freshwater impoundments to loaf, feed, and roost. Two - three sandhill pairs also nest and raise their young for several weeks in the impoundments and along the levees that are open to the visiting public. Precautionary measures may need to be taken to guard crane families against the intrusion of public use activities.
3. Whooping crane	
4. West Indian manatee	Currently, major waterways within the refuge are owned and managed by the State. Acquisition of those waters by the Service may better help safeguard the manatees from increasing boating traffic and collisions.
5. American alligator	Increased surveys of aquatic parameters may increase detection of impacts to the system from outside sources.
6. Wood stork	This would protect the habitat for both the alligator and the wood stork. Understanding the distribution and use pattern of these species may help in protecting them from impacts.
7. Eastern indigo snake	Continued management and protection of upland habitat that is suitable to indigo snakes may enhance the opportunities for this specie to occur.
8. Everglade snail kite	Protecting the wetland and marshland habitat of the refuge will increase or maintain the probability of occurrence by snail kites.

**VIII. Effect Determination and Response Requested:**

SPECIES / CRITICAL HABITAT	DETERMINATION REQUESTED		
	NE	NA	AA
1. Bald eagle	X		
2. Mississippi Sandhill crane	X		
3. Whooping crane	X		
4. West Indian manatee	X		
5. American alligator	X		
6. Wood stork	X		
7. Eastern Indigo snake	X		
8. Everglade snail kite	X		

**DETERMINATION / RESPONSE REQUESTED:**

*NE = no effect. This determination is appropriate when the proposed action will not directly, indirectly, or cumulatively impact, either positively or negatively, any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested is optional but a "Concurrence" is recommended for a complete Administrative Record.*

*NA = not likely to adversely affect. This determination is appropriate when the proposed action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources. Response Requested is a "Concurrence".*

*AA = likely to adversely affect. This determination is appropriate when the proposed action is likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested for listed species is "Formal Consultation." Response Requested for proposed or candidate species is "Conference."*

\_\_\_\_\_  
Signature (originating station)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

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**IX. Reviewing Ecological Services Office Evaluation:**

- A. Concurrence \_\_\_\_\_ Nonconcurrency \_\_\_\_\_
- B. Formal consultation required \_\_\_\_\_
- C. Conference required \_\_\_\_\_
- D. Informal conference required \_\_\_\_\_
- E. Remarks (attach additional pages as needed):

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

\_\_\_\_\_  
Office

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## APPENDIX H. WILDERNESS REVIEW

### **Lake Woodruff National Wildlife Refuge - Executive Summary**

In review of the federally owned lands within the current management boundary of Lake Woodruff NWR, no additional areas were found suitable for designation as Wilderness at this time. The refuge's management boundary totals ±21,574 acres of predominantly contiguous lands and waters, with an estimated 1,066 acres across six islands designated in 1976 as Wilderness. State waterways run through the refuge. Human disturbances are evident throughout and around the refuge in the form of roadways and adjacent development.

No additional units of the refuge meet the minimum Wilderness Area size criteria of 5,000 acres or are otherwise manageable as Wilderness. However, two islands are potentially suitable for designation as Wilderness: Jones and Tick Islands. Located within the refuge's primary public use area, Jones Island has daily visitation, firebreaks, and unpaved roads. The Island was logged and grazed in the past, both of which are still evident. Similarly, Tick Island was logged and grazed in the past. And, cattle dipping tanks still exist on Tick Island. The shell midden on Tick Island was mined. And three structures exist on the Island: a house, pole shed, and boat dock. The Island has firelines and experiences high motorized boat traffic along the waterways controlled by the State.

In review of the federally owned lands and waters within the boundary of Lake Woodruff NWR, no additional areas were found suitable for designation as Wilderness at this time. The lands and waters of the refuge:

- do not meet the wilderness minimum size requirement of 5,000 contiguous roadless acres;
- do not contain any units of sufficient size for preservation as wilderness;
- have outstanding mineral rights on over half of the refuge;
- have been altered by historic and ongoing human activities;
- do not include outstanding opportunities for solitude or for primitive recreation; and
- are fragmented by roadways and human development.



# APPENDIX I. REFUGE BIOTA

## LISTED SPECIES OF LAKE WOODRUFF NWR

Common Name	Scientific Name	Status	
		FWC	FWS
<b>REPTILES</b>			
Gopher Tortoise	<i>Gopherus polyphemus</i>	SSC(1,2,3)	
Florida Pine snake	<i>Pituophis melanoleucus mugitus</i>	SSC (2)	
Eastern Indigo Snake	<i>Drymarchon corais</i>	T	T
American Alligator	<i>Alligator mississippiensis</i>	SSC (1,3)	T (S/A)
<b>MAMMALS</b>			
Florida Manatee	<i>Trichechus manatus</i>	E	E
Florida Black Bear	<i>Ursus americanus floridanus</i>	T	
<b>BIRDS</b>			
Limpkin		SSC (1)	SMC
Snowy Egret	<i>Egretta thula</i>	SSC (1)	
Little Blue Heron	<i>Egretta caerulea</i>	SSC (1,4)	SMC
Tricolored Heron	<i>Egretta tricolor</i>	SSC (1,4)	
White Ibis	<i>Eudocimus albus</i>	SSC (2)	SMC
Florida Sandhill Crane	<i>Grus Canadensis pratensis</i>	T	
Whooping Crane	<i>Grus Americana</i>	E, SSC (5)	E, EXPN
Wood Stork	<i>Mycteria Americana</i>	E	E
Roseate Spoonbill	<i>Platalea ajaja</i>	SSC(1,4)	
American Bittern	<i>Botaurus lentiginosus</i>		SMC
Black Rail	<i>Laterallus jamaicensis</i>		SMC
Semipalmated Sandpiper	<i>Calidris pusilla</i>		SMC
Short-billed Dowitcher	<i>Limnodromus griesus</i>		SMC
Black Tern	<i>Chlidonias niger</i>		SMC
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T	
Snail kite	<i>Rostrhamus sociabilis plumbeus</i>	E	E
Swallow-tailed Kite	<i>Elanoides forficatus</i>		SMC
Southeast American Kestrel	<i>Falco sparverius paulus</i>	T	SMC

Peregrine Falcon	<i>Falcon peregrinus</i>	E	SMC
Common Ground-Dove	<i>Columbina inca</i>		SMC
Chuck-will's-widow	<i>Caprimulgus carolinensis</i>		SMC
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>		SMC
Loggerhead Shrike	<i>Lanius ludovicianus</i>		SMC
Brown-Headed Nuthatch	<i>Sitta pusilla</i>		SMC
Yellow-throated Warbler	<i>Dendroica dominica</i>		SMC
Prairie Warbler	<i>Dendroica discolor</i>		SMC
Bachman's Sparrow	<i>Aimophila aestivalis</i>		SMC
Key: E=endangered, EXPN=experimental populatio, SMC=species of management concern, SSC=species of special concern, T=threatened, T/SA=protected due to similarity of appearance to a threatened species			

For a comprehensive biota list refer to the 2006 LWNWR Wildlife and Habitat Management Review.



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## *APPENDIX J. BUDGET REQUESTS*

Budget requests will be detailed in the Final CCP.



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## *APPENDIX K. LIST OF PREPARERS*

- Cheri M. Ehrhardt, AICP, Natural Resource Planner, U.S. Fish and Wildlife Service
- Harold Morrow, former Refuge Manager, Lake Woodruff NWR, Merritt Island NWR Complex, U.S. Fish and Wildlife Service
- Deisha Norwood, Assistant Refuge Manager, Lake Woodruff NWR, Merritt Island NWR Complex, U.S. Fish and Wildlife Service
- Kristina Sorensen, former Biologist, Lake Woodruff NWR, Merritt Island NWR Complex, U.S. Fish and Wildlife Service
- Mike Ward, Prescribed Fire Specialist, Lake Woodruff NWR, Merritt Island NWR Complex, U.S. Fish and Wildlife Service
- Oliver van den Ende, Contractor, Dynamac Corporation