EVERGLADES HEADWATERS CONSERVATION PARTNERSHIP:

DRAFT ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ESTABLISHMENT OF THE EVERGLADES HEADWATERS NATIONAL WILDLIFE REFUGE AND CONSERVATION AREA

Polk, Osceola, Okeechobee, and Highlands Counties, Florida

U.S. Department of the Interior
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I. PURPOSE AND NEED FOR ACTION

A. INTRODUCTION

The Kissimmee River Basin in south-central Florida is a unique and biologically diverse landscape that is home to rare and unique habitats and wildlife found nowhere else, and an agricultural way of life that is slowly disappearing. With Florida's population expected to double to 36 million from 2010 to 2060 (Zwick and Carr 2006) and many major development projects in the works, the time is now to conserve what is left. Last year, the U.S. Fish and Wildlife Service (Service) helped initiate discussions to form the Greater Everglades Partnership Initiative with a broad array of partners to begin collaborating on the best and most cost-effective ways to achieve conservation across the landscape. This partnership approach is being advanced as a means to collaboratively conserve wildlife and habitats, to protect corridors linking established conservation lands, and to preserve a working cattle-ranching landscape and heritage. The Service hopes to contribute and collaborate with a long list of current agencies and organizations already working to conserve this landscape by establishing a new national wildlife refuge and conservation area.

Widely recognized as a nationally important landscape and area of biological diversity, the Kissimmee River Basin in central Florida contains a network of existing conservation lands that includes state parks, state wildlife management areas, other state lands, agricultural working lands (e.g., with conservation easements), Avon Park Air Force Range, Disney's Wilderness Preserve, and other conservation lands. The proposed Everglades Headwaters National Wildlife Refuge (NWR) and Conservation Area (Conservation Area) would help connect these existing conservation lands, further protecting watersheds and wildlife corridors and enhancing the ecological functioning of the basin. The planning process for the proposed Everglades Headwaters NWR and Conservation Area has helped with coordination and collaboration between the various management entities within the basin to support a more functional conservation landscape into the future, forming the Everglades Headwaters Conservation Partnership. Key conservation partners have a long tradition of working in the Basin landscape, including the Natural Resource Conservation Service (NRCS), U.S. Department of Agriculture (USDA); Avon Park Air Force Range, U.S. Air Force; Florida Fish and Wildlife Conservation Commission (FWC); Florida Department of Agriculture and Consumer Services (FDACS); Florida Division of Forestry (FDOF), FDACS; Florida Department of Environmental Protection (FDEP); Florida Division of State Lands, FDEP; South Florida Water Management District (SFWMD); and The Nature Conservancy. As the Service endeavors to fill in some of the conservation gaps in the basin landscape, coordination and consultation with these partners have been keys in developing this proposal. The Service also works with the Native American tribes to ensure timely and effective cooperation and collaboration. During this planning process, the Service contacted several tribes with interest in this landscape: Seminole Tribe of Florida; Miccosukee Tribe of Indians of Florida; Seminole Nation of Oklahoma; Muscogee (Creek) Nation; and Poarch Band of Creeks. Further, various state and local governmental agencies, organizations, businesses, and the public with interest in this landscape participated in the planning process.

The Service proposes to protect and manage high pine (dry, longleaf pine savanna), Florida scrub, mesic temperate hammock, hydric and mesic pine flatwoods, dry prairie, cutthroat grass communities, wet prairies and freshwater marshes, and freshwater forested wetlands, as well as landscape connectivity in the basin in Polk, Osceola, Okeechobee, and Highlands Counties, Florida, through the establishment of the Everglades Headwaters NWR and Conservation Area. Recognizing the generations of responsible stewardship within this working rural landscape, this proposal seeks to work with willing landowners to secure a legacy of conservation lands for future generations to enjoy. This proposal aims to protect and

restore one of the great grassland and savanna landscapes of the Nation's prime areas of biological diversity. Further, the proposal aims to address threats from habitat fragmentation and urban development, altered ecological processes, and impacts from global climate change. Key species and habitats of concern for this area include Florida grasshopper sparrow, Everglades snail kite, Florida black bear, Audubon's crested caracara, red-cockaded woodpecker, and cutthroat wetlands.

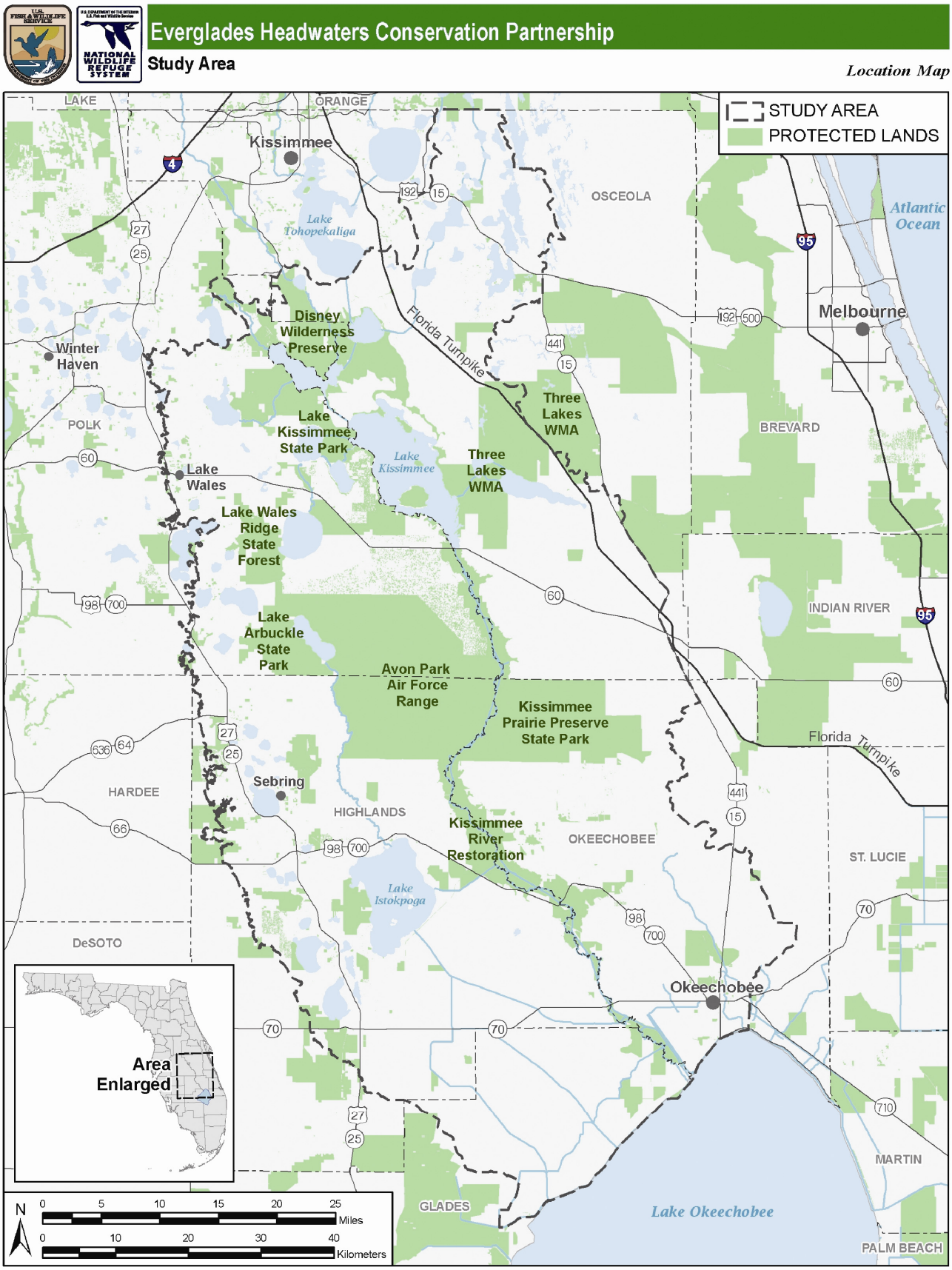
Working with the key partners, as well as with other state and local governments, tribes, businesses, non-governmental organizations, and the public, the Service examined the needs for wildlife habitat protection within the biologically important Kissimmee River Basin of Florida, an approximately 1.8 million-acre general area of interest (Figure 1). During the planning process, this Study Area was further refined to encompass a smaller, approximately 816,000-acre area referred to as a Conservation Partnership Area, wherein the Service proposes to acquire less than fee title interest in up to 100,000 acres and fee title interest in up to 50,000 acres. It is critical to note that the Service's policy is to work with willing landowners.

The Proposed Action identified in this Draft Environmental Assessment (Draft EA) and detailed in the Draft Land Protection Plan (Draft LPP) to establish the Everglades Headwaters NWR and Conservation Area is the Service's first major contribution in this partnership effort. The Greater Everglades Partnership Initiative, which includes other federal agencies, state agencies, and non-governmental organizations, seeks collaborative and cost-effective ways to conserve the land, water, and wildlife resources in central and south Florida, while honoring the legacy of stewardship handed down through generations of Floridians. To further conservation within the basin, three alternatives were analyzed: Alternative A (No Action Alternative, No Refuge and No Conservation Area), Alternative B (Refuge Only Approach), and Alternative C (Proposed Action, Conservation Partnership Approach). The Conservation Partnership Approach Alternative proposes to acquire fee title interest in up to 50,000 acres and to acquire up to 100,000 acres of less than fee title interest to further conservation in this important landscape. The Draft EA analyzes the anticipated impacts of the alternatives, finding that Alternative C best meets the purpose and need, vision, and outlined purposes and goals. The Draft LPP presents the methods the Service, conservation partners, and interested landowners could use to accomplish wildlife and habitat goals and objectives for the proposed Everglades Headwaters NWR and Conservation Area.

PROPOSED CONSERVATION PARTNERSHIP AREA OVERVIEW

During the development of this document, the original 1.8 million-acre Study Area was refined and reduced to an approximately 816,000-acre Conservation Partnership Area. If approved, it is within this Conservation Partnership Area that the Service would have the ability to work with willing landowners and partners on conservation programs and agreements. Within the 816,000-acre Conservation Partnership Area, the Service would be authorized to acquire up to 100,000 acres of less than fee title interest from willing landowners. Once 100,000 acres were acquired for the Conservation Area, any proposal to expand beyond the authorized 100,000 acres would require an additional planning effort by the Service, including public involvement, in accordance with applicable laws and policies. Participation by landowners in the Conservation Area would be voluntary. Landowners within an approved Conservation Partnership Area would be under no obligation to sell interest in their properties to the Service. The Conservation Partnership Area would provide important opportunities for conservation, while at the same time maintaining the ability of the ranching community to persist. Landowners in the proposed Conservation Partnership Area may voluntarily choose to participate and participating lands would remain in private ownership. Private landowners who elected to participate would continue to control activities on their lands. If lands were to be acquired, they would become part of a 100,000-acre Conservation Area, which would reflect the vision, purposes, and goals of the overall project, but would be subject to the terms and conditions of whatever easement, agreements, and/or other tool(s) that would be used for less than fee title acquisition.

Figure 1. Location and boundary of the study area



PROPOSED REFUGE OVERVIEW

The proposal includes an approximately 130,000-acre Conservation Focal Area within which the Service would be authorized to acquire up to 50,000 acres by working with willing landowners. Landowners within an approved Conservation Focal Area would be under no obligation to sell their properties to the Service. The preferred method of protection within the Conservation Focal Area would be fee title acquisitions, however less than fee title acquisition methods could also be employed. The Conservation Focal Area would allow the Service the flexibility to respond to changing landowner interest and acquisition opportunities within the landscape over time, but would limit the acquisition total to 50,000 acres. Any proposal to expand beyond the authorized 50,000 acres would require an additional planning effort by the Service, including public involvement, in accordance with applicable laws and policies.

Public uses proposed to continue on the proposed Everglades Headwaters NWR would be: hunting, fishing, environmental education and interpretation, wildlife observation and photography, research, camping, hiking, horseback riding, bicycling, and grazing. Potential public uses and activities supporting these uses would also be considered (depending on the specifics of a particular property acquired), such as ATV use on existing roads and trails and primitive camping to support hunting and research activities, motorized and non-motorized boating to support fishing activities, and facilities to support any of the approved uses. The Service would commit to working with the FWC to facilitate public use activities, specifically hunting and fishing.

For lands that the Service may come to own in fee title, habitat restoration and management would provide threatened, endangered, and resident wildlife with suitable habitat. Wetland drainage ditches may be filled to restore historic water storage capacity and provide breeding grounds for waterfowl. Prescribed fire would be used to remove excess vegetation and restore native plant communities. Invasive species would be controlled through manual, mechanical, and/or chemical means. Cultural and historical resources would be protected, and the public would be invited to enjoy these resources.

PROPOSED VISION

The vision for this project is to:

> conserve, protect, and manage one of the great grassland and savanna landscapes of eastern North America for current and future generations, protecting the important wildlife and habitats of the working rural landscape of central Florida's Kissimmee River Basin that is home to abundant fish and wildlife resources; that is vital to restoration and protection of the water quality and quantity for the Everglades ecosystem; that is resilient to the effects of global climate change; and that offers outdoor recreational opportunities important to the region's economy.

NATIONAL WILDLIFE REFUGE SYSTEM OVERVIEW

The mission of the National Wildlife Refuge System is:

> "... to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Improvement Act of 1997).

National wildlife refuges provide important habitat for native plants and many species of mammals, birds, fish, insects, amphibians, and reptiles. They also play a vital role in conserving threatened and endangered species. Refuges offer a wide variety of wildlife-dependent recreational opportunities and many have visitor centers, wildlife trails, and environmental education programs. Nationwide, about 25 million visitors annually hunt, fish, observe, and photograph wildlife, or participate in educational and interpretive activities on refuges.

SCOPE OF THE DRAFT ENVIRONMENTAL ASSESSMENT

The scope of this Draft EA is limited to the proposed acquisition, in fee title and in less than fee title, of lands for the establishment of the Everglades Headwaters NWR and Conservation Area. Information and analysis are provided for the initial Study Area. The Draft EA is not intended to cover the development and/or implementation of detailed, specific programs for the administration and management of those lands. A conceptual management plan (Appendix A) and interim compatibility determinations (Appendix B) are attached to provide general outlines on how the proposed lands would be managed. The appendices are provided as general information for the public in its review of the Draft EA. If the Everglades Headwaters NWR and Conservation Area were to be established and the needed lands or interests in lands were to be acquired, the Service would develop a comprehensive conservation plan, a 15-year management plan and needed step-down management plans (e.g., a step-down plan addressing hunting would likely be developed within 3 years of acquisition of property sufficient to support hunting). These plans would be developed and reviewed in accordance with the Departmental requirements of the National Environmental Policy Act.

B. PURPOSE AND NEED

The land, water, and wildlife resources of the Kissimmee River Basin landscape are at risk, especially from development pressures. Florida's population is expected to double from 2010 to 2060 to 36 million, while the 5-county area of the Study Area is expected to more than double in that same time to nearly 2.1 million (Zwick and Carr 2006). Further, many developments of regional impact have been proposed in the Study Area. Therefore, we propose a conservation effort focused on creating and connecting a matrix of natural lands and critical wildlife corridors. This Draft EA presents a proposal for protection of additional wildlife habitat in Polk, Osceola, Okeechobee, and Highlands Counties, through the establishment of the proposed Everglades Headwaters NWR and Conservation Area.

The proposed Conservation Partnership Area and Conservation Focal Area are administrative lines delineating areas in which the Service may work with partners and consider negotiations with willing owners for acquisition of an interest in land. Lands within the Conservation Partnership Area do not become part of the Conservation Area and lands within the Conservation Focal Area do not become part of the Everglades Headwaters NWR unless and until a legal interest is acquired through a management agreement, easement, lease, donation, or purchase. Lands within the Conservation Partnership Area and Conservation Focal Area are not subject to any refuge regulations or jurisdiction unless and until an interest is acquired. Land interests are acquired from willing sellers only. Any landowner that is within an approved acquisition boundary, even though the surrounding parcels may have been purchased by the Service, retains all the rights, privileges, and responsibilities of private land ownership. This includes, but is not limited to, the right to access, hunting, vehicle use, control of trespass; the right to sell the property to any other party; and the responsibility to pay local real estate or property taxes. It is the Service's policy to work with willing sellers to acquire fee title or less than fee title interest in property. (Additional information regarding the Service's land acquisition policy is provided in the Draft LPP, Chapter III, Section E.)

Within approved acquisition boundaries, the Service would be able to enter into negotiations for the protection of environmentally sensitive lands. The most urgent needs for acquiring an interest in these lands are as listed.

The purpose of the proposed Everglades Headwaters NWR and Conservation Area would be to contribute to the mission and goals of the National Wildlife Refuge System (Refuge System) through the listed actions.

- Conducting landscape-scale strategic habitat conservation necessary to conserve the important resources found within the Kissimmee Prairie region through partnerships and responsible stewardship and with the support of the ranching and agricultural interests of this working rural landscape.
- Protecting and enhancing habitats for federal trust species and species of management concern, with special emphasis on species listed under the federal Endangered Species Act (ESA), along with the protection of state-listed species; biological diversity; and prairie, scrub, sandhill, flatwoods, and various wetlands habitats.
- Protecting the headwaters, groundwater recharge, and watershed of the Kissimmee Chain of Lakes, Kissimmee River, and Lake Okeechobee region, which will help improve water quantity and quality in the Everglades watershed.
- Protecting and enhancing habitat corridors and implementing other wildlife adaptation strategies to help buffer the impacts of global climate change.
- Providing opportunities for hunting, fishing, wildlife observation and photography, and environmental education and interpretation, while promoting activities that complement the purposes of the Everglades Headwaters NWR and other protected lands in the region.
- Protecting historic properties; facilitating archaeological and historic investigations regarding human occupation, land use, and paleoecology; and interpreting the region's history and culture.

There is a need for increased resource protection in this part of Florida, as various growing threats are likely to continue to put natural resources at risk. These threats include, but are not limited to the listed items.

- *Habitat Fragmentation and Urban Development*

  Habitat loss continues to negatively impact Florida's wildlife, including numerous federal and state-listed species. Urban and suburban development and other wholesale land clearing are by far the major threats to this area. Existing roadways traverse wildlife corridors and are a leading mortality factor for wide-ranging species such as the Florida panther and Florida black bear. The development and expansion of these roadways would create further barriers to wildlife movements. Further, habitat fragmentation and urban development also help to spread invasive species, negatively impacting native wildlife and habitats. The proposal would protect key habitat and habitat connections in an effort to address the threats associated with habitat fragmentation and urban development.

- *Altered Ecological Processes*

  The alteration of hydrology within the Everglades ecosystem is one of the most devastating and damaging threats facing the Everglades headwaters. Stream channelization, wetland modification and drainage, and sediment and nutrient loading all serve to negatively impact water quality, quantity, and delivery throughout the ecosystem. Many of the habitat types found throughout the Study Area are dependent on frequent low-intensity lightning-caused

fires. Fire suppression has led to changes in plant communities, creating habitat unsuitable for the threatened and endangered plants and animals that require a frequent fire regime. Altered ecological processes also support the spread of invasive species, negatively impacting native wildlife and habitats. The proposal would restore or mimic natural processes to minimize current and historic land use impacts.

- *Impacts from Global Climate Change*

  This proposal has been developed in part to address conservation needs of wildlife in southern Florida that may be highly impacted by the effects of global climate change. As sea levels rise, temperatures increase, and precipitation decreases, lands in the proposed Everglades Headwaters NWR and Conservation Area would be key to the survival and management of many of Florida's rare, threatened, and endangered species. Further, impacts from climate change would likely increase the spread of invasive species, negatively impacting native wildlife and habitats. The proposal would begin to address some of the anticipated impacts associated with climate change, increasing resiliency of the landscape and assisting in wildlife response to climate change and associated stressors.

C. BACKGROUND

The proposed Everglades Headwaters NWR and Conservation Area are located in Polk, Osceola, Okeechobee, and Highlands Counties in central Florida. This area is one of the great grassland and savanna landscapes in eastern North America. Still largely rural, this approximately 1.8 million-acre area is a mosaic of rolling sand hills, lakes and streams, seasonally wet grasslands, longleaf pine savannas, and cattle ranches that sustains one of the most important assemblages of imperiled plant and vertebrate wildlife in the southeast and a large portion of the unprotected natural habitat remaining in peninsular Florida. This proposal would help conserve a rural working landscape; protect and restore habitat; protect, improve, and restore water quality and wetlands; and connect a matrix of existing conservation lands and important wildlife corridors.

Within this landscape, the Service proposes to focus conservation efforts on protecting important habitats such as sandhill and scrub, cutthroat grass communities, pine flatwoods, dry prairie, and a multitude of wetlands. Conservation of these habitats would provide increased opportunity for species such as Florida grasshopper sparrow, Everglades snail kite, and Audubon's crested caracara to persist into the future. Overall, agricultural and residential development represents over half of the Study Area or roughly 948,000 acres. Of the remaining lands, the native communities that make up the greatest extent are freshwater marsh (7.4 percent), lakes (7.2 percent), palmetto prairie (4.5 percent), and wet prairie (4.4 percent). Some of the most important natural communities such as dry prairie and Florida scrub are barely represented with only 5 percent and 2 percent of the overall Study Area acreage respectively.

D. PROPOSED ACTION

The Service proposes to acquire, protect, and manage important natural resources of this landscape through fee title purchases, leases, donations, conservation easements, mitigation and conservation banks, and/or cooperative agreements from willing sellers. All lands and waters acquired would be managed by the Service as the Everglades Headwaters NWR and Conservation Area. The overall objectives of the proposed Everglades Headwaters NWR and Conservation Area would be to provide connectivity of habitat between existing natural areas and opportunities for species to adapt to the impacts from global climate change; restore wetland and upland habitats for a wide range of imperiled species; and provide opportunities for wildlife-dependent outdoor interpretation, education, and recreation.

It is anticipated that funding for this proposal would be provided primarily through the Land and Water Conservation Fund and the Migratory Bird Conservation Fund. The authority for the use of these funds for land acquisition is the National Wildlife Refuge System Administration Act; Endangered Species Act of 1973; Emergency Wetlands Resources Act of 1986; The Migratory Bird Conservation Act of 1929; Fish and Wildlife Act of 1956; and Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended.

E. COORDINATION AND CONSULTATION

During the planning process, the Service coordinated and consulted with a mix of governmental entities with interest in the greater Everglades landscape. Several federal and state agencies serve as key partners in this landscape, including NRCS, USDA; Avon Park Air Force Range, U.S. Air Force; FWC; FDACS; FDOF, FDACS; FDEP; Florida Division of State Lands, FDEP; and SFWMD. These partners were keys in the development of the proposal. Native American Tribes are also important partners in the greater Everglades landscape. The Service also works with the tribes to ensure timely and effective cooperation and collaboration. During this planning process, the Service initiated government-to-government consultation with federally recognized tribes that have interest in this landscape: Seminole Tribe of Florida; Miccosukee Tribe of Indians of Florida; Seminole Nation of Oklahoma; Muscogee (Creek) Nation; and Poarch Band of Creeks. The Service met with the Seminole Tribe of Florida during this planning process to develop an understanding of its concerns, including those related to cultural resources and water rights. And, the Muscogee (Creek) Nation and the Miccosukee Tribe of Indians of Florida have also expressed interest in the project.

F. PUBLIC PARTICIPATION

PUBLIC SCOPING

Public scoping can help the Service identify issues and concerns, potential alternatives, and scientific information regarding the Study Area of the proposal. Preliminary scoping for this project began on August 26, 2010, with an America's Great Outdoors event in Kenansville, Florida. This was followed by preliminary informational presentations to the Arthur R. Marshall Foundation, Pelican Island Audubon Society, Trust for Public Land, Summerplace Garden Club, Osceola County Natural Resource Department, South Florida Water Management District Water Resources Advisory Commission, area ranchers, Osceola County Board of County Commissioners, and Florida Agriculture Commissioner Putnam. A preliminary meeting with the governmental partners was held on November 10, 2010 in Altamonte Springs, Florida, including the Service, NRCS of the USDA, FWC, FDEP, FDOF, and SFWMD. The Nature Conservancy and the National Wildlife Refuge Association also attended this November meeting, acting as agents of the Service.

Secretary of Interior Ken Salazar announced the project at the Everglades Coalition meetings on January 7, 2011. A White House blog appeared the same day to announce the project. The Service created a webpage for the project and posted it on January 10, 2011 (http://www.fws.gov/southeast/greatereverglades). This website was frequently updated to help provide information to interested parties.

A notice of intent appeared in the *Federal Register* on January 12, 2011 (76 FR 2132), announcing the intent of the Service to develop a Land Protection Plan and associated NEPA documents for the proposed Everglades Headwaters NWR and Conservation Area in the Kissimmee Valley area and opening the public scoping period for the proposal. Public scoping comments were requested to be received by February 28, 2011. By mid-February, this deadline was extended to March 31, 2011.

Information about the project was sent to Florida national wildlife refuges' friends groups (1/12/2011); a press release was sent out to local media to announce the public scoping meetings (1/19/2011); public notice was e-mailed to over 500 individuals, organizations, and government agency officials on the mailing list for the proposal (1/19-20/2011); a press release was sent to about 2,400 media outlets in Florida to announce the public scooping meetings (1/19-20/2011); over 650 printed flyers were mailed to individuals, organizations, and government agency officials on the mailing list for the proposal (1/20-21/2011); the Lake Wales Ridge Ecosystem Working Group forwarded a copy of the press release to its members (1/20-21/2011); a follow-up press release was sent to about 2,400 media outlets in Florida to announce the remaining public scooping meetings (2/7/2011); notice of the extension of the public scoping comment period was sent to over 880 e-mail addresses and 500 mailing address of interested individuals, organizations, and government agency officials on the mailing list for the proposal (2/17/2011); and a follow-up press release was sent to about 2,400 media outlets in Florida to announce the public scoping comment period extension (2/17/2011). Informational presentations and discussions about the project also continued, including to the Archie Carr Working Group (1/13/2011), South Florida Water Management District Water Resources Advisory Commission Recreation Issues Workshop (1/13/2011), Osceola County (2/11/2011), Everglades Day (2/12/2011), River Ranch Property Owners Association and local airboat groups (2/18/2011), Okeechobee Economic Council (3/2/2011), South Florida Water Management District Water Resources Advisory Council (3/3/2011), Osceola County Cattleman's Association (3/8/2011), University of Florida Working Across Boundaries Workshop (3/23/2011), Association of County Commissioners (3/25/2011), Conservation Blueprint Pilot Project (3/29/2011), Florida Today Editorial Board (4/5/2011), Palm Beach Post Editorial Board (4/7/2011), and Archbold Biological Station (4/14/2011).

Articles and information about the project have appeared in print, online, and radio media, including Osceola News Gazette (1/5/2011, 1/6/2011), Sun Sentinel (1/7/2011), Miami Herald (1/7/2011), Reuters (1/7/2011), Environmental News Service (1/7/2011), SoutheastAgnet.com (1/8/2011), GardenNews.biz (1/9/2011), SustainableBusiness.com (1/10/2011), Habi-Chat (January 2011), Ft. Myers News Press (1/18/2011), National Public Radio (1/19/2011, 3/7/2011, 3/17/2011), WCTV.com Tallahassee Eyewitness News Channel 6 (1/19/2011), Okeechobee News (1/26/2011, 2/20/2011), Highlands Today (1/29/2011, 2/6/2011), Palm Beach Post (1/29/2011, 1/30/2011), Vero Beach Press Journal (2/5/2011, 2/7/2011, 2/10/2011), Sebring News Sun (2/6/2011, 2/20/2011), WPTV.com West Palm Beach News Channel 5 (2/11/2011), St. Petersburg Times (2/19/2011, 3/13/2011), Sebring News Sun (2/20/2011), Florida Today (2/23/2011), and Gator Tales (Spring 2011).

Public scoping comments were submitted verbally and in writing at public scoping meetings and by mail, fax, and email. Four public scoping meetings were conducted in and around the Study Area: January 26, 2011 at the Kissimmee Civic Center, Kissimmee, Florida, with about 200 attendees; February 4, 2011 at the Sebring Civic Center, Sebring, Florida, with about 325 attendees; February 9, 2011 at Okeechobee High School, Okeechobee, Florida, with about 665 attendees; and February 10, 2011 at the Freshman Learning Center of Vero Beach High School, Vero Beach, Florida, with about 580 attendees. Both verbal and written comments were submitted at the public scoping meetings. Further, over 38,000 written comments were submitted to the Service during the public scoping period in person and by mail, fax, and e-mail.

The Service met with the Seminole Tribe of Florida during this planning process to develop an understanding of its concerns, including those related to cultural resources. The Seminole Tribe of Florida administers a robust tribal government, operates various tourist and other enterprises, and supports the local economy and employment base. The Study Area for the proposed Everglades Headwaters NWR and Conservation Area encompasses numerous sites of interest to the Seminole Tribe of Florida. Sites that might be encountered within the proposed 50,000-acre refuge include green corn dance sites, villages, camps, cemeteries, and historic landscapes, such as the

Okeechobee Battlefield. The Seminole Tribe of Florida also expressed interest in assuring that the project would not impact any preexisting tribal water rights. Further, the Brighton Reservation of the Seminole Tribe of Florida is located in Glades County, adjacent to the Study Area. The Tribal Historic Preservation Officer for the Muscogee (Creek) Nation has requested copies of the Draft LPP and the Draft EA when available for review. And the Miccosukee Tribe has expressed interest in the project, especially in relation to burial sites and tribal cattle grazing lands in Highlands County.

Public scoping comments were categorized into five main categories (i.e., Wildlife and Habitat, Resource Protection, Recreation, Administration, and General), with appropriate subcategories, including those listed.

- Wildlife and Habitat
  - General
  - Florida Panther
  - Water Quality and Quantity
  - Wildlife Corridors and Migration
  - Ecosystem Services

- Resource Protection
  - Land Acquisition/Protection in General
  - Eminent Domain
  - River Ranch Concerns
  - Less than Fee Title Acquisition
  - Contaminants – Evaluation of Properties for Inclusion
  - Specific Properties/Sites
  - Specific Boundary for the Proposed Refuge and Conservation Area
  - Cultural Resources/History
  - Wilderness
  - Florida Panther NWR
  - Proposed Fisheating Creek NWR

- Recreation
  - General
  - Hunting
  - Fishing
  - Wildlife Observation and Photography
  - Airboat Use
  - ATV/ORV Use
  - Camping
  - Public Use on The Nature Conservancy's Lands
  - Access

- Administration
  - General
  - Funding/Budget
  - Property Taxes/Refuge Revenue Sharing Payment
  - Management Plan
  - Partnerships/Outreach

- General
    - Economy
    - Greater Everglades Partnership Initiative
    - Development Patterns/Pressure
    - Other Examples of Federal Management
    - Planning Process
    - General

PUBLIC REVIEW AND COMMENT

In advance of the release of the Draft LPP and Draft EA, the Service e-mailed and mailed postcards to nearly 1,400 interested parties to announce the upcoming availability of the documents for public review and comment and to allow interested parties to request CD and/or paper copies of the documents. Following release of the Draft LPP and Draft EA, the Service will hold a public review and comment period during which public comments will be requested on the documents. A notice of availability in the *Federal Register* will help announce the public review and comment period for the proposed Everglades Headwaters NWR and Conservation Area, along with information posted on the project's website, notices mailed and e-mailed to the mailing list, public meetings, and articles published in various media.

G. SPECIAL CONSIDERATIONS

The Service initially reviewed the designation of Wilderness on May 11, 2011, finding that no areas met the criteria or intent of the Wilderness Act. The Study Area for the proposed Everglades Headwaters NWR and Conservation Area comprises a landscape that is largely rural, with agriculture, forestry, ranching, and outdoor recreation/tourism. Most tracts in the proposed acquisition boundary are impacted by human use throughout the landscape. The extensive network of roadways, altered landscapes.

Lands within the proposed Conservation Focal Area have been reviewed by the Service for inclusion in the National Wilderness Preservation System according to criteria set forth in the Wilderness Act of 1964. Based on the Service's assessment, the proposed Everglades Headwaters NWR was found not to be suitable for wilderness designation since:

- No areas meet the Wilderness minimum size requirement of 5,000 contiguous roadless acres (2,023 ha);
- No areas contain any units of sufficient size for preservation as Wilderness;
- Areas under consideration have been altered by historic and ongoing human activities; and/or
- No areas include outstanding opportunities for solitude or for primitive recreation.

Therefore, wilderness designation for any potential units of the proposed Everglades Headwaters NWR is not appropriate and will not be proposed.

II. AFFECTED ENVIRONMENT

This section describes the environment that would be affected by the implementation of the alternatives. It is organized under the following impact topics, which includes the area's natural vegetation, land use, fish and wildlife resources, related resources, landscape perspective, climate change factors, cultural resources, and socioeconomic and sociocultural conditions.

A. GENERAL

Figure 1 shows the Study Area relative to its major landmarks. It occupies roughly 1.8 million acres within central Florida. It is bounded by the city of Orlando to the north, Lake Okeechobee to the south, on the east by the St John's River watershed, and on the west by the Lake Wales Ridge. The Study Area boundary was determined based on a number of factors including hydrologic basin, the Lake Okeechobee shoreline, and the western edge of the Lake Wales Ridge. The north end of the Study Area was truncated by Orange County's southern border and County Route 580 north of Lake Hatchineha. Minor adjustments to the Study Area boundary elsewhere incorporated logistical considerations, such as following roadways in close proximity to watershed boundaries. The physiographic provinces within the Study Area are the Lake Wales Ridge, Bombing Range Ridge, and Osceola Plain (which encompasses the Kissimmee River).

WEATHER AND CLIMATE

The climate of central Florida is subtropical with warm, wet summers and mild, dry winters. There are two distinctive seasons. The wet season begins around June 1 and usually ends as the dry season begins in late October. The weather and climate of central Florida are driven by a combination of local, regional, and global events, regimes and oscillations.

Local Events

Periodic surges of cool, dry continental air move through Florida during the dry season with short duration rain events followed by long periods of dry weather. These rainfall events are usually from strata form clouds with slow, gentle rain. The Atlantic and Caribbean tropical and sub-tropical air masses dominate Florida during the wet season. During this time the majority of rainfall is in the form of convective thunderstorms produced from the daily sea breezes from both the west coast and east coast of Florida. Another significant source of rainfall during the wet season is from tropical weather systems (i.e., tropical waves, tropical depressions, tropical storms, and hurricanes). The most active times of rainfall in central Florida are during the spring and fall (May, June, September, and October).

The El Nino Southern Oscillation

The El Nino Southern Oscillation (ENSO) occurs every 2-7 years (with an average of 4 years) in three phases – El Nino, Neutral, or La Nina. When equatorial waters of the eastern tropical Pacific Ocean are much warmer than normal, this signifies an El Nino event. When these waters are much cooler than normal, a La Nina occurs. The following are weather and hydrology conditions likely for Florida during each of these events:

El Nino:

- Wetter than normal dry season
- Colder winter than during La Nina or when in a neutral ENSO phase
- Decreased Atlantic Ocean hurricanes
- Above average surface water levels
- Fewer wildfires with smaller burn areas

La Nina:

- Drier than normal dry season
- Below average surface water levels
- Increased Atlantic Ocean hurricanes
- More wildfires with larger burn areas

Neutral ENSO Phase:

- More deep freezes even if winter is not consistently as cool (the jet stream is free to meander north and south through the U.S.)

The Atlantic Multi-decadal Oscillation

The Atlantic Multi-decadal Oscillation (AMO) occurs in warm and cool phases generally lasting 20-40 years each. Florida typically experiences wetter conditions during the warm phase as the Inter-tropical Convergence Zone (ITCZ) moves farther north, closer to Florida, from the equator. The ITCZ is a global band of convective thunderstorms occurring 10-20 degrees north and south of the equator. Other than the local weather drivers and ENSO, the AMO highly influences Florida's extended wet and dry trends. Since 1900, there have been two cool phases and two warm phases of the AMO with each of these phases lasting 20-40 years each (Table 1). The exact year of the phase start and finish is an estimate as each phase goes through a "transition period" of a few years. Figure 2 illustrates the AMO cycles dating back to 1856. Figure 3 shows raw yearly data plotted with cycle averages.

Table 1. Timing and duration of cool and warm AMO phases since 1900

Years	Length of Phase	Phase
1906 – 1926	21 years	Cool Phase
1927 – 1965	38 years	Warm Phase
1966 – 1992	27 years	Cool Phase
1993 – Present	19+ years	Warm Phase

With AMO phases lasting typically 20-30 years, the current AMO warm phase is peaking, but could remain wetter than normal for the next 10-20 years. Thus, the generally wetter than normal conditions that Florida has experienced since the early 1990s should begin to slowly decline. After the peak, the warm phase wave will begin its gradual decline where we should see continually cooler anomalies over the next 10-20 years. As we approach the end of the cycle, Florida should experience an increase in drier years than wet years.

Figure 2. Atlantic multi-decadal oscillation - periods where temperatures are above 0 degrees warmer are in a warm phase; periods where temperatures are below 0 degrees cooler are in a cool phase

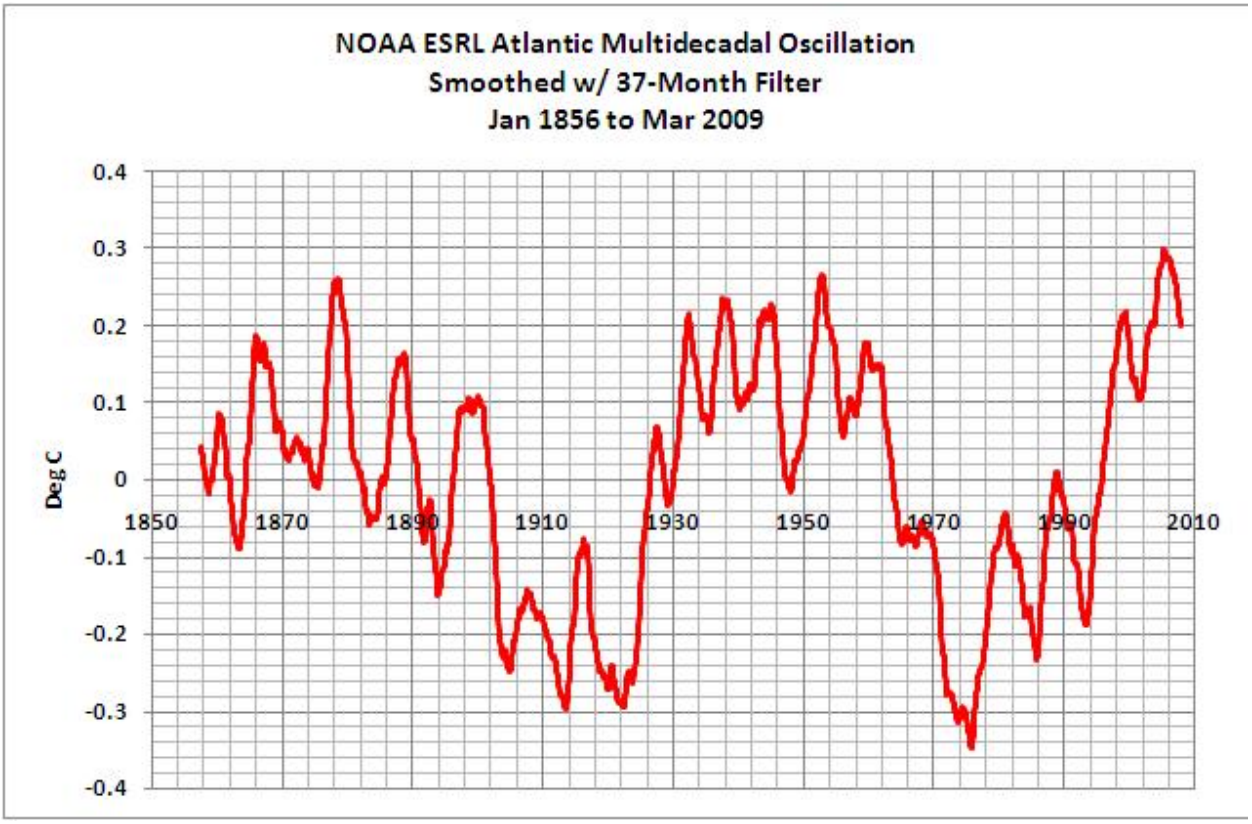


Figure 3. Raw AMO yearly data with the cycle averages (red line)

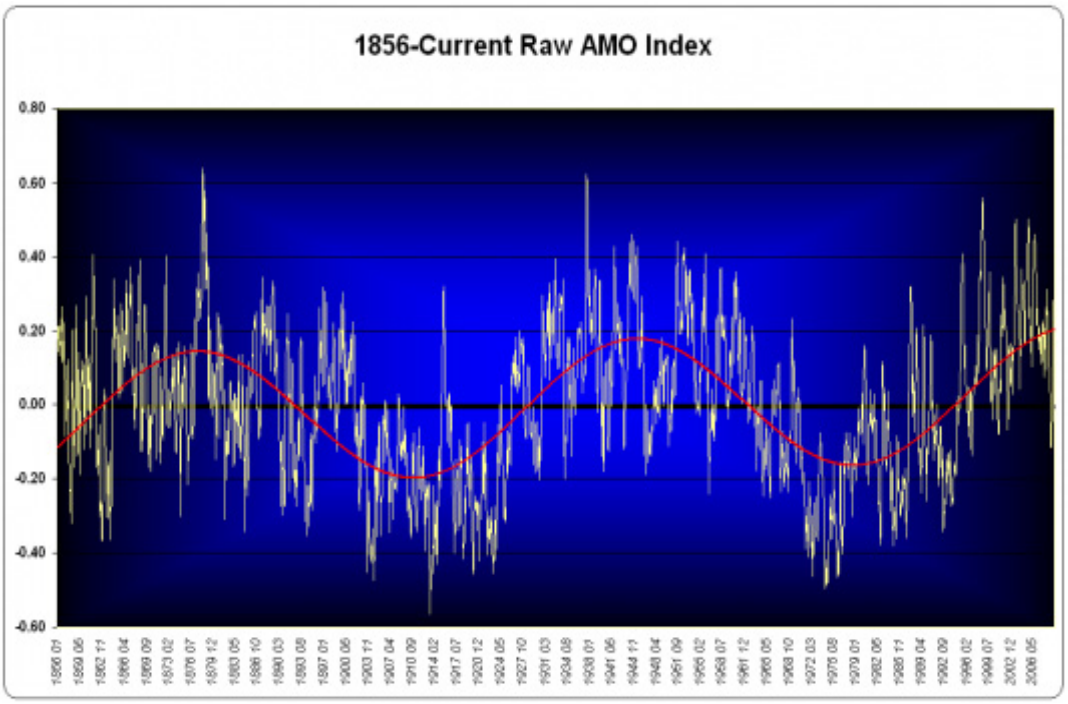
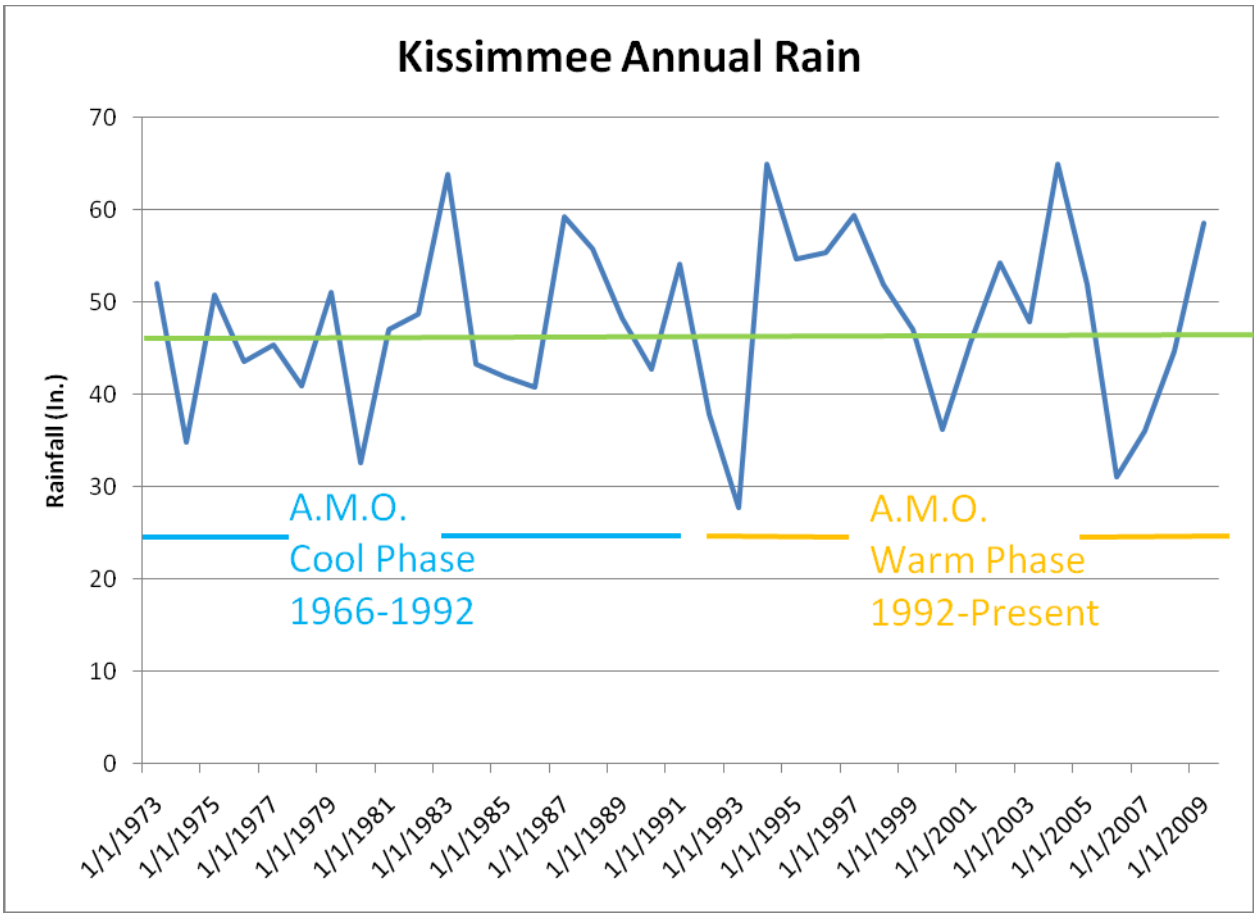


Figure 4 shows the annual rainfall at the SFWMD's Kissimmee Field Station from 1973 to 2010. Conditions were relatively dry during the 1970s, with wetter conditions in the 1980s, and more extreme dry and wet events in the 2000s. For planning purposes, central Florida should remain in a wetter regime for the next 5-10 years. However, low frequency dry years can still occur due to other events such as La Nina.

Figure 4. Kissimmee field station annual rainfall for 1973-2010



AIR QUALITY

The Clean Air Act of 1970 (as amended in 1990 and 1997), required the U.S. Environmental Protection Agency (EPA) to implement air quality standards to protect public health and welfare. National Ambient Air Quality Standards (NAAQS) were established based on protecting health (primary standards) and preventing environmental and property damage (secondary standards). Criteria air pollutants in Florida include carbon monoxide (CO), lead, nitrogen dioxide (NO2), ozone (O3), particulate pollution (2.5 and 10 ug/m3), and sulfur dioxide (SO2) (FDEP 2006). These pollutants are monitored by a network of monitoring stations throughout Florida and analyzed in order to better understand general air quality trends and to locate exceedances. Primary sources of pollutants in Florida are vehicle emissions, power plants, and industrial activities. In 2006, there were 216 ambient monitors in the statewide air monitoring network and the EPA designated Florida an attainment area for all criteria pollutants, based on data collected in the previous 3 years (FDEP 2006a). Air quality is monitored within the Study Area on a regular basis by six monitors in Polk (5)

and Highlands (1) Counties. The Highlands County monitoring station is located at Archbold Biological Station. Table 2 provides air quality data collected for Polk, Osceola, Highlands, nearby counties, and national level standards. Florida's 2006 monitoring results indicate that both Polk and Highlands Counties qualify as attainment areas for all monitored pollutants (FDEP 2006a).

The Air Quality Index (AQI) is a summary index developed by EPA for reporting daily air quality. It indicates how clean or polluted the air is, and what associated health effects might be of concern. The AQI focuses on health effects that may be experienced within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. Lead is also considered a major air pollutant under the Clean Air Act. However, because all areas of the United States are currently attaining the NAAQS for lead, the AQI does not specifically address lead. For each of these pollutants, EPA has established national air quality standards to protect public health (AIRNow 2009).

Highlands County AQI is derived from ozone concentrations recorded at one station. From 2002 through 2006, ozone AQI was in the “good” range (0-50 AQI) from 326 (2004) to 355 (2002) days. The county experienced a low of 3 days in the moderate (51-100 AQI) range in 2002 to a high of 19 days in 2006. Data suggest increasing trends of moderate days in Highlands County with no days in the reporting period reported as “unhealthy.” Polk County AQI over the same reporting period is based on Ozone, PM10 and PM2.5 inputs over five reporting stations. Polk County AQI is in the “good” range a minimum of 326 days (2006 levels) from which 38 days are reported in the moderate range during the same year (FDEP 2006a). Polk County AQI trends indicate decreasing air quality based on increasing moderate days and decreasing good days over the reporting period.

TOPOGRAPHY AND GEOLOGY

The 2,940-square-mile (1.9 million acres) Kissimmee River Basin extends from Orlando southward to Lake Okeechobee. This basin, which is the largest source of surface water to Lake Okeechobee, is about 105 miles long and has a maximum width of 35 miles. The northern portion of the basin (often termed the Chain of Lakes) comprises many lakes, some of which are interconnected by canals. The Chain of Lakes is bounded on the southern end by State Road (SR) 60, where the largest of the lakes, Lake Kissimmee, empties into the Kissimmee River. The southern portion of the basin includes the Lake Wales Ridge lakes, the Kissimmee River itself, and its tributary watersheds (including flow from the Istokpoga watershed) between Lake Kissimmee and Lake Okeechobee. The Kissimmee River was originally a 103-mile-long shallow, meandering river that was reconfigured in the 1960s into a 56-mile-long canal (renamed C-38) for flood control. Historically, water from the river slowly meandered into Lake Okeechobee and exited unimpeded from the Lake southward into the Everglades through small tributaries and broad sheetflow during the rainy season.

The highest elevation is over 300 feet National Geodetic Vertical Datum (NGVD), while the lowest elevation in the region is 40 feet NGVD. Slopes range from nearly level in the bayheads and flatwoods to 12 to 15 percent in the sandhills and sand ridges. Lakes in the region are generally sinkholes, formed by the dissolution and collapse of underlying limestone. Lands in Highlands County are underlain by limestone formations from the Middle Eocene era. These zones are mined in many areas of central Florida; however, there are no phosphate mines within the Study Area. In the prehistoric sand ridge portions of the Study Area, underlying limestone formations are overlain by, a composite of sand, clay, and gravel that is generally red to orange in color. The top of this composite is commonly exposed in clay pits. In the southern portion of the project area, sand and peat are found at the surface and can vary in thickness from 1 to 100 feet (30.5 m).

Table 2. Selected air quality data for the Study Area and surrounding monitoring stations

County	2000 Population	CO 8-hr (ppm)	Pb Qmax (µg/m3)	NO_2 AM (ppm)	O_3 1-hr (ppm)	O_3 8-hr (ppm)	PM_{10} Wtd AM (µg/m3)	PM_{10} 24-hr (µg/m3)	$PM_{2.5}$ Wtd AM (µg/m3)	$PM_{2.5}$ 24-hr (µg/m3)	SO_2 AM (ppm)	SO_2 24-hr (ppm)
Area Counties												
Polk County	483,924	ND	ND	ND	ND	0.077	66	9.3	19	ND	ND	ND
Highlands County	87,366	ND	ND	ND	0.079	0.071	ND	ND	ND	ND	ND	ND
Osceola County	172,493	ND	ND	ND	ND	0.073	ND	ND	ND	ND	ND	ND
Hillsborough County	998,948	2	1.65	0.007	ND	0.083	ND	86	10.1	27	0.004	0.031
Lake County	210,528	ND	ND	ND	ND	O.O78	ND	ND	ND	ND	ND	ND
United States												
National Ambient Air Quality Standards		9	1.5	0.053	0.125	0.085	50	150	15	65	0.03	0.14

CO - Highest second maximum non-overlapping 8-hour concentration (applicable NAAQS is 9 ppm)
Pb - Highest quarterly maximum concentration (applicable NAAQS is 1.5 µg/m3)
NO2 - Highest arithmetic mean concentration (applicable NAAQS is 0.053 ppm)
O3 (1-hour) - Highest second daily maximum 1-hour concentration (applicable NAAQS is 0.125 ppm)
O3 (8-hour) - Highest fourth daily maximum 8-hour concentration (applicable NAAQS is 0.085 ppm)
PM10 - Highest weighted annual mean concentration (applicable NAAQS is 50 µg/m3)
- Highest second maximum 24-hour concentration (applicable NAAQS is 150 µg/m3)
PM2.5 - Highest weighted annual mean concentration (applicable NAAQS is 15 µg/m3)
- Highest 98th percentile 24-hour concentration (applicable NAAQS is 65 µg/m3)
SO2 - Highest annual mean concentration (applicable NAAQS is 0.03 ppm)
- Highest second maximum 24-hour concentration (applicable NAAQS is 0.14 ppm)
ND - Indicates data not available IN – indicates insufficient data to calculate summary statistic
AM - Annual mean
µg/m3 - units are micrograms per cubic meter
Qmax - Quarterly maximum
Ppm - units are parts per million

Notes: Data from exceptional events are not included. The monitoring data represent the quality of air in the vicinity of the monitoring site and, for some pollutants, may not necessarily represent urban-wide or parish/county-wide air quality.
Source: U.S. EPA 2009

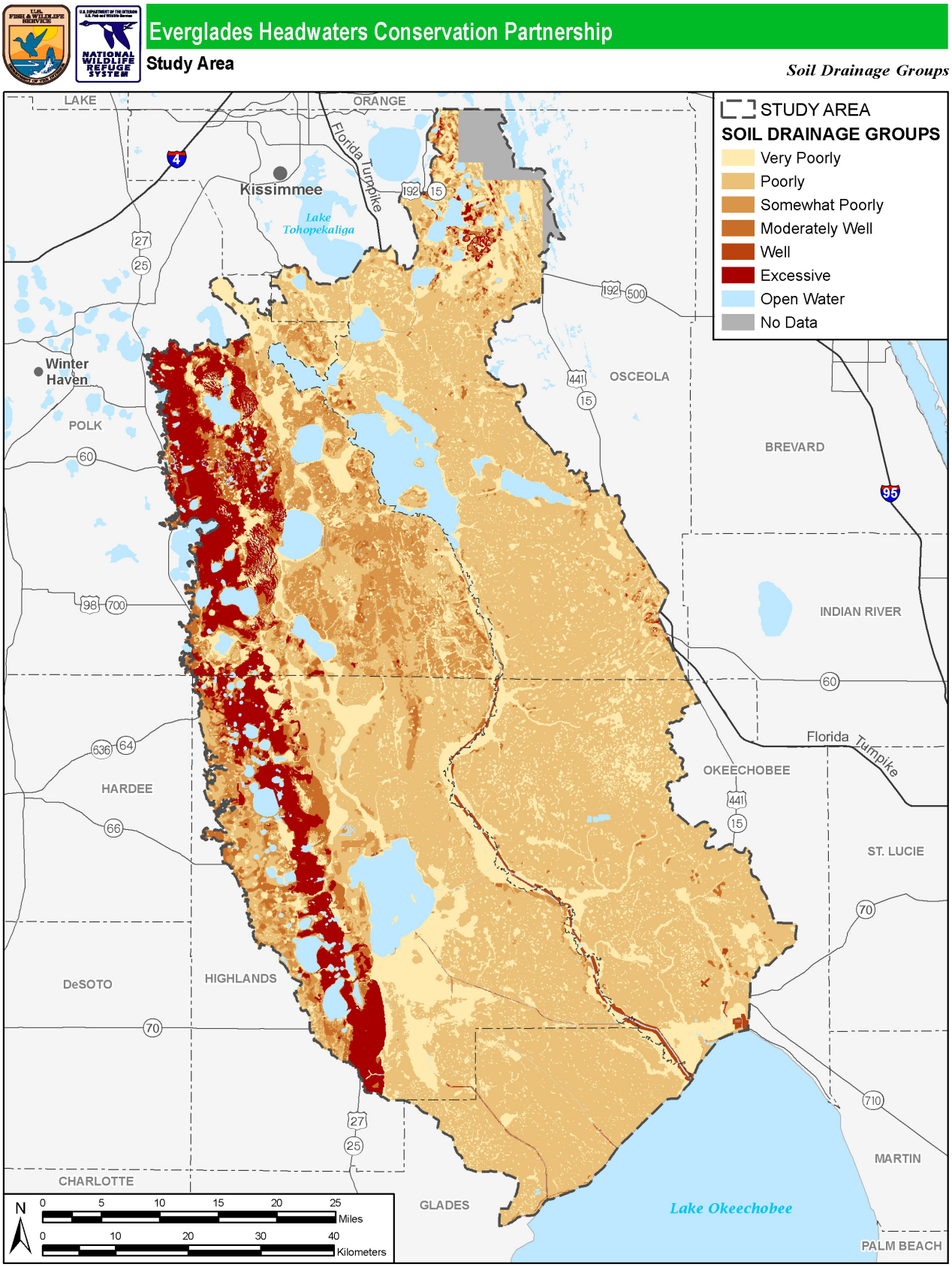
The hill and swale landforms in the prehistoric sand ridges (Lake Wales Ridge, Lakeland Ridge, Winter Haven Ridge, Mt. Dora Ridge, Lake Henry Ridge, Orlando Ridge, Gordonville Ridge, and Bombing Range Ridge) are relict dunes and bays, formed during pre-Pleistocene sea level rises 2 million years ago, when sea level was about 200 feet above its current position. When the ancient ocean levels rose, they covered nearly the entire present-day Florida peninsula, leaving the ridges as island archipelagos whose plants and animals continued to evolve in isolation. This isolation contributed to the evolution of numerous endemic species, and today these ridges may have the highest concentration of rare and endangered plants and animals in the continental U.S., with 24 plants and 19 animals currently having federal or state status as threatened or endangered. However, more than 70 percent of this unique community has been lost to citrus cultivation and residential development.

These relict dune and bay ridges also contains many sinkhole depressions and lakes, formed by the collapse of limestone caverns deep beneath the overlying sands and clays. Due to the resulting topography, lowland plant communities are sometimes in close proximity to upland communities, where scrub and sandhill habitats grade down to seasonal ponds, bayheads, and lake shores. The principle prehistoric sand ridges located between Orlando and Lake Okeechobee are the Lake Wales, Winter Haven, and Lake Henry Ridges. The Lake Wales Ridge is by far the largest and longest of the three. McCartan (1992) dates the beach and dune complex of the Lake Wales Ridge at 2.5 million years old. Over this period there have been several warm wet periods and cool dry periods where the vegetation communities underwent some change. Nonetheless, Florida scrub has been present for tens of thousands of years with flora and fauna possibly going back millions of years. Scrub habitats on the Lake Wales and other central Florida ridges are ancient compared with vegetation elsewhere in eastern North America. The ebb and flow of scrub, resulting from the changing climate, may have created the opportunity for speciation in isolated patches of scrub, resulting in the patterns of endemism seen today, particularly among short-lived plants and those related to disturbance (Menges et al. 2006).

SOILS

The soils within the Study Area grade from excessively drained to well drained to poorly drained to very poorly drained soils that include a composite of upland and hydric soil classifications (Figure 5, Table 3). Upland soils typically include entisols and spodosols, whereas hydric soils generally include histosols and mollisols. The more xeric entisols are soils with little profile development and are characteristically classified as excessive well-drained to well-drained. These soils typically support sandhill and scrub vegetation. The water table is 4 to 6 feet below the surface. These soils are very rarely flooded. Scrubby flatwoods are a type of scrub found on less xeric soils than sandhill or other types of scrub, but have drier soils than flatwoods soils. More mesic flatwood soils are generally composed of spodosols. Spodosols have a well-defined internal profile with a spodic horizon (a zone of accumulated organic matter, clay, and aluminum - a hardpan). The water table is within a foot of the surface during the rainy season, and can be as deep as 40 inches (101.6 cm) during dry periods. Since the spodic horizon is relatively impermeable, perched water tables can occur. The native vegetation is slash pine (*Pinus elliottii* var. *densa*), and longleaf pine (*Pinus palustris*) with gallberry, palmetto, and *Lyonia* spp. in the understory. Hydric soils are found around lake edges, in bayheads, and in the depression marshes. Most of these soils have either a mollic epipedon (mollisols) or are organic soils (histosols). These soils remain flooded for most of the year. Native vegetation varies. In the bayheads, one can find bay trees, maples (*Acer* spp.), and other hydric trees, while in the depression marshes the primary vegetation is grasses and forbs.

Figure 5. Soils within the Study Area color-coded based on drainage class



Minerals

Sand mining is an important sector of Florida's economy. Florida ranks approximately 15th in the country in sand and gravel used or produced. Sand and gravel are subdivided into construction and industrial sand, the bulk of which, in Florida, is construction grade. Within the Study Area, the sand is generally 20 to 50 feet thick. The deposits do not necessarily follow the surface sand ridges and at times occur under large strands of hardwood, cypress, and freshwater swamps. There are six permitted sand mines in the Study Area, three of which are located in the northern portion adjacent to S.R. 60 near the city of Lake Wales. Three additional sand mines are located in the southern portion of the Study Area southwest of the city of Okeechobee, a few miles east of the Kissimmee river and within 3 miles of Lake Okeechobee.

Table 3. Soil series within the Study Area

Soil Series	Order	Vegetation	Acreage	Percent
ADAMSVILLE SAND	Entisol	Sandhills	4,765	<1
ANCLOTE SAND	Mollisol	Lake shore swamp	1,827	<1
ANKONA SAND	Spodosol	Flatwoods	463	<1
APOPKA SAND	Ultisols	Scrubby flatwoods	495	<1
ARCHBOLD SAND	Entisol	Scrubby flatwoods	17,771	1.0
ARENTS SAND	Anthropogenic soils -disturbed		8,089	<1
ASTATULA SAND	Entisol	Sandhills and scrub land	78,538	4.4
ASTOR SAND	Mollisol	Lake shore swamp	2,070	<1
BASINGER SAND	Entisol	Depression marsh	200,318	11.3
BOCA SAND	Spodosol	Flatwoods and scrubby flatwoods	9,424	<1
BRADENTON SAND	Histosol	Bayheads	4,763	<1
BRIGHTON SAND	Histosol	Bayheads	7,622	<1
CANDLER SAND	Entisol	Sandhills and scrub land	34,959	2.0
CASSIA SAND	Spodosol		2,256	<1
CHANLER SAND	Inceptisol	Pine Flatwoods	203	<1
CHOBEE SAND	Mollisol	Swamp	4,160	<1
DAYTONA SAND	Spodosol	Flatwoods and scrubby flatwoods	2,280	<1

Soil Series	Order	Vegetation	Acreage	Percent
DELRAY SAND	Mollisol	Swamp	6,504	<1
DUETTE SAND	Spodosol	Flatwoods and scrubby flatwoods	5,357	<1
EATON SAND	Alfisol	Flatwoods	255	<1
EAU GALLIE SAND	Spodosol	Flatwoods	38,243	2.2
ELECTRA SAND	Spodosol	Flatwoods and scrubby flatwoods	276	<1
FELDA SAND	Alfisol	Sloughs	49,716	2.8
FLORIDANA SAND	Mollisol	Swamp	52,688	3.0
FORT MEADE SAND	Inceptisol	Pine flatwoods	111	<1
FT. DRUM FINE SAND	Inceptisol	Flatwoods	2,854	<1
GATOR MUCK	Histosol	Bayheads	8,441	<1
GENTRY FINE SAND	Mollisol	Swamp	2,196	<1
HALLANDALE & Hallandale POPLE COMPLEX	Entisol & Alfisol	Bayheads, flatwoods	10,516	<1
HICORIA MUCKY SAND	Alfisol	Bayheads	4,132	<1
HOLOPAW FINE SAND	Alfisol	Slough	4,677	<1
HONTOON MUCK	Histosol	Bayheads	29,976	1.7
IMMOKALEE FINE SAND	Spodosol	Flatwoods	167,269	9.4
KALIGA MUCK	Histosol	Bayheads	30,933	1.7
KENDRICK FINE SAND	Ultisols	Pine flatwoods	56	<1
LAUDERHILL MUCK	Histosol	Bayheads	95	<1
LOCHLOOSA FINE SAND	Ultisols	Pine flatwoods	13	<1
LOKOSEE FINE SAND	Alfisol	Flatwoods	8,385	<1
LYNNE SAND	Spodosol	Flatwoods	521	<1
MALABAR sAND	Alfisol	Flatwoods	52,771	3.0
MANATEE, FLORIDANA AND TEQUESTA SOILS,	Mollisol	Swamp	20,423	1.0

Soil Series	Order	Vegetation	Acreage	Percent
MILLHOPPER FINE SAND	Ultisols	Pine flatwoods	348	<1
MYAKKA FINE SAND	Spodosol	Flatwoods	193,448	10.9
NARCOOSSEE FINE SAND	Spodosol	Flatwoods and scrubby flatwoods	8,213	<1
NEILHURST SAND	Entisol	Sandhills and scrub land	528	<1
NITTAW SAND	Mollisol	Swamp	5,183	<1
OKEELANTA MUCK	Histosol	Bayheads	4,121	<1
OLDSMAR FINE SAND	Spodosol	Flatwoods	16,258	<1
ONA FINE SAND	Spodosol	Flatwoods	3,234	<1
ORSINO FINE SAND	Entisol	Sandhills and scrub land	1,766	<1
PAISLEY FINE SAND	Alfisol	Flatwoods	477	<1
PAOLA SAND,	Entisol	Scrub land	13,040	<1
PARKWOOD FIND SAND	Alfisol	Flatwoods	3,741	<1
PINEDA SAND	Alfisol	Flatwoods	21,982	1.2
PITS	Quarries, gravel, water, till		484	<1
PLACID VARIANT FINE SAND	Inceptisol	Swamp	23,356	1.3
PLANTATION MUCK	Inceptisol	Swamp	10	<1
POMELLO FINE SAND	Spodosol	Flatwoods and scrubby flatwoods	18,980	1.1
POMONA FINE SAND	Spodosol	Flatwoods	6,241	<1
POMPANO	Entisol	Flatwoods	12,186	<1
POPLE FINE SAND	Alfisol	Flatwoods	5,434	<1
RIVIERA FINE SAND	Alfisol	Flatwoods	10,811	<1
SAMSULA MUCK	Histosol	Bayheads	45,635	2.6
SANIBEL MUCK	Inceptisol	Swamp	7,145	<1
SATELLITE SAND	Entisol	Flatwoods and depression marsh	32,318	1.8

Soil Series	Order	Vegetation	Acreage	Percent
SLICKENS	Mine tailings		10	<1
SMYRNA SAND	Spodosol	Flatwoods	159,266	9.0
SPARR SAND	Ultisol	Flatwoods	73	<1
ST. AUGUSTINE SAND	Entisol	Filled tidal uplands	784	<1
ST. JOHNS SAND	Spodosol	Flatwoods	2,149	<1
ST. LUCIE SAND	Entisol	Scrub land	4,055	<1
TAVARES - URBAN	Entisol	Sandhills	29,524	1.7
TEQUESTA MUCK	Alfisol	Depression marsh	19,455	1.1
TERRA CEIA MUCK	Histosol	Bayheads	794	<1
UDORTHENTS	Spoil deposition sites		5,123	<1
VALKARIA SAND	Entisol	Flatwoods	66,719	3.8
VERO FINE SAND	Spodosol	Flatwoods	645	<1
WABASSO FINE SAND	Spodosol	Flatwoods	4,314	<1
WAUCHULA FINE SAND	Spodosol	Flatwoods	357	<1
WINDER FINE SAND	Alfisol	Depression marsh	6,124	<1
ZOLFO FINE SAND	Spodosol	Flatwoods and scrubby flatwoods	594	<1
Urban			1,290	<
Open Water			145111	8.2
No Data			19,221	1.1
Unknown Code			5.5	<1

HYDROLOGY

Hydrologic Cycle

The water budget and hydrologic cycle in central Florida consist of rainfall, runoff, evaporation from water surfaces, transpiration from vegetation, infiltration, aquifer recharge, and condensation. The hydrology and hydraulics is a water distribution, timing, and duration process in area lakes, rivers, canals, and marshes. See Table 4 below for a partial list of natural water resources within the Study Area.

Table 4. Acres of natural water resources within the Study Area

Land Use	Acres in Study Area	Percent of Study Area
Wet Prairie	79,663	4.37
Freshwater Marsh	167,520	9.19
Forested Wetlands	129,518	7.10
Open Water	140,531	7.71

Rainfall is a critical driver of "natural" water levels and the hydrology of central Florida. The annual rainfall for the Kissimmee Field Station averaged 47.77 inches/year for the 37-year period of record of 1973-2010 (Figure 4). Thus, rainfall can greatly influence water levels in the vast number of central Florida lakes, wetlands, and flowing waters.

The combination of evaporation from water surfaces and transpiration from vegetation (evapotranspiration) is responsible for a large portion of water losses in central Florida. Evapotranspiration rates vary throughout the year and are affected by temperature, humidity, and wind speed. Rates are highest in the spring when temperatures and wind speeds are higher and humidity is lower. Rates are lowest during the winter months when temperatures and wind speeds are lower. Water losses due to evapotranspiration are similar to input of water from rainfall during an average year.

The groundwater system is another critical hydrologic and hydraulic component and is contained in aquifers in central Florida. The aquifer nearest the land surface is the Surficial aquifer. Beneath the Surficial aquifer system lays the Intermediate Confining Unit (ICU). In turn, the Floridan aquifer system underlies the ICU and is the primary source of nearly all the drinking water in central Florida. The depth of the water table can range from 50 feet or more below land surface (4-7 feet below surface is more common) to above land surface in wetlands and lakes. The hydraulic gradient (water flow direction and volume) between lakes and groundwater creates the paths of water movement below ground.

One common misconception about lakes in central Florida is that they are spring-fed from the deep Floridan aquifer. Some lakes are spring-fed, but the spring's origin of the water is simply specific locations in the lake bottom where water is entering from the adjacent Surficial aquifer. However, central Florida is filled with major springs from the Floridan aquifer and some lakes are directly connected through fractures in the underlying rock.

Rainfall and runoff also creates variations in water clarity among lakes and flowing waters. Water clarity ranges from clear lakes like Lake Butler to the green colored waters of Lake Apopka. But, water clarity is not necessarily an indication of water quality.

Management of lake and river levels using operational structures (e.g., weirs, culverts, flood control gates) can, and often supersedes the natural hydrologic cycle and water budget. Natural drainage systems have also been altered through the addition of canals or by the dredging or straightening of existing outflow channels, rivers, and tributaries, especially within the Kissimmee Chain of Lakes area. Many of the canals connecting lakes in central Florida were constructed during the 1800s and were dug to lower the water levels and provide more valuable land for farming and citrus cultivation. The effect of this type of modification of natural drainage lowers natural lake levels, surface area, and the range of lake level fluctuations, particularly for natural seepage lakes. These canals and structures are operated through a joint effort between the SFWMD and the U.S. Army Corps of

Engineers (USACE). As a result, lake levels can vary by 10 feet or more in some lakes, whereas in other lakes, the water level may vary by only 1 or 2 feet.

Other human activities that affect the fluctuation in water levels include urbanization and water supply. Water is stored and used by residents, agriculture, and businesses for drinking and irrigation. The increased extent of impervious surfaces from urbanization can also cause water levels to rise higher than they did historically due to storm water runoff. This can result in an increase in the rate at which water flows downstream and may cause a greater volume of water to reach lakes and other downstream water bodies.

Surface Water Resources

The basin lies at the northern end of an interconnected Everglades ecosystem. Historically, water from these rivers slowly meandered into Lake Okeechobee and exited unimpeded from the lake southward into the Everglades through small tributaries and broad sheetflow during the rainy season. Prior to the twentieth century, long periods of flooding and hurricanes made most of south Florida inhospitable to development. In an effort to make the land developable for human uses, Hamilton Disston led an effort in 1882 to dredge canals between the Kissimmee Chain of Lakes, and between Lake Okeechobee and the Caloosahatchee River. The latter provided Lake Okeechobee's first outlet to salt water (the Gulf of Mexico) via the Caloosahatchee River. Then the Kissimmee River Navigation Project, authorized by Congress in 1902, resulted in a navigation channel being dredged from the town of Kissimmee downstream to Fort Basinger. The project, with a required depth of 3 feet and a width of 30 feet, included a side channel through Istokpoga Creek. In the early 1900s, the Everglades Drainage District dug the St. Lucie, West Palm Beach, Hillsboro, North New River, and Miami Canals from Lake Okeechobee to the Atlantic Ocean. Together, these projects provided a means to drain the northern Everglades for agricultural and residential uses, forever altering or severing the natural hydrologic connections among the different parts of the Everglades ecosystem. Despite this drainage, today the Study Area still supports significant surface water resources as depicted in Figure 1.

The Study Area overlaps much of the Lake Okeechobee Watershed, which includes sub-watersheds to the north of America's second largest lake, such as the Upper and Lower Kissimmee, Lake Istokpoga, and Taylor Creek. Once a natural lake and wetland system, Lake Okeechobee now functions primarily as a multipurpose regional reservoir storing water during the wet season for use during the dry season (FDEP 1999). The lake is a critical component of south Florida's water supply and flood control and provides a backup water source for urban areas, irrigation water for agricultural land, recharges water for aquifers, and is a major source of water for the Everglades. It provides habitat for migratory waterfowl and several threatened and endangered species and supports a multimillion-dollar recreational and commercial fishery (SFWMD 2011).

Surface Water Quality Classifications

Florida's water quality standards, the foundation of the state's program of water quality management, designate the "present and future most beneficial uses" of the waters of the state [Subsection 403.061(10), Florida Statutes (F.S.)]. Water quality criteria for surface water and groundwater expressed either as numeric or narrative limits for specific parameters describe the water quality necessary to maintain these uses. Florida's surface water is classified using the following five designated use categories (Table 5).

Table 5. Surface water quality classifications in Florida

Class	Description
Class I	Potable water supplies
Class II	Shellfish propagation or harvesting
Class III	Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife
Class IV	Agricultural water supplies
Class V	Navigation, utility, and industrial use (there are no state waters currently in this class)

Within the Study Area, all state water bodies are either Class III or Class IV waters. Class IV waters consist of all secondary and tertiary canals or ditches wholly within agricultural areas behind a water control structure permitted by the water management district under Sections 373.103, 373.413, or 373.416, F.S. All other state water bodies within the Study Area are Class III waters. Lake Okeechobee, just south (and downstream) of the Study Area, is a Class I water.

Outstanding Florida Waters

A number of waterbodies in the basin have been given additional protection through designation as Outstanding Florida Waters (OFWs) (Table 6). OFWs are designated for "special protection due to their natural attributes" (Section 403.061, F.S.). The intent of an OFW designation is to maintain ambient water quality, even if these designations are more protective than those required under the waterbody's surface water classification. Most OFWs are associated with managed areas in the state park system or federal conservation land system, such as aquatic preserves, national seashores, or national wildlife refuges. Other OFWs may also be designated as "Special Waters" based on a finding that the waters are of exceptional recreational or ecological significance, and are identified as such in Rule 62-302, F.A.C.

Table 6. Outstanding Florida waters within the Study Area

County	Location	Outstanding Florida Water
Polk		
	Lake Arbuckle State Park	Lake Arbuckle
	Lake Arbuckle State Park	Livingstone Creek
	Lake Arbuckle State Park	Morgan Hole Creek
	Lake Arbuckle State Park	Blue Jordan Swamp (small part)
	Saddle Blanket Scrub	Lake Livingston drain
	Crooked Lake	Crooked Lake
	Lake Kissimmee State Park	Tiger Creek

County	Location	Outstanding Florida Water
	Lake Kissimmee State Park	Tiger Lake, Tiger Lake Outlet
	Lake Kissimmee State Park	Lake Kissimmee, Lake Kissimmee north drain
	Lake Kissimmee State Park	Rosalie Canal
	Lake Kissimmee State Park	Lake Rosalie, Lake Rosalie Outlet
	Catfish Creek Preserve State Park	Catfish Creek
	Catfish Creek Preserve State Park	Lake Pierce
Osceola		
	Prairie Lakes State Preserve	Jackson Canal
	Prairie Lakes State Preserve	Lake Jackson
	Prairie Lakes State Preserve and Three Lakes Prairie Lakes	Three Lakes– Prairie Lakes
		Lake Marian, Lake Marian Outlet
		Lake Kissimmee South
		Lake Kissimmee (mid drain)
Highlands		
	Placid Lakes	Placid Lakes
		Fisheating Creek
		Lake Placid Outlet
		Placid June Canal
Okeechobee		
		None
Glades		
		None

Surface Water Quality

The following information regarding surface and groundwater quality was largely excerpted from FDEP's Division of Water Resource Management, Water Quality Assessment Report, Kissimmee River and Fisheating Creek (FDEP 2006b). The Study Area is within the basin and contains four water quality planning units: Upper Kissimmee, Lower Kissimmee, Lake Istokpoga, and Lake Placid.

Upper Kissimmee

The major water quality problems in the Upper Kissimmee Planning Unit are elevated nutrients, low dissolved oxygen (DO), and mercury in fish. In addition, there were several detections of the metals iron, lead, silver, and cadmium at various locations, and pesticides in the Reedy Creek drainage area. Elevated nutrient, metal and pesticide concentrations can be attributed to urban and/or agricultural land uses. Mercury contamination is thought to result from atmospheric deposition and mediated by anthropogenic sulfate conditions (which result from fertilizer use).

Point Sources: The Upper Kissimmee Planning Unit has 179 permitted wastewater treatment facilities, of which 174 discharge to groundwater and 5 to surface waters. The planning unit also has 24 permitted landfills and 42 delineated groundwater contamination areas for ethylene dibromide and bromacil (EDB).

Nonpoint Sources: The city of Orlando and Orange, Polk, and Osceola Counties currently have regulated municipal separate storm sewer systems (MS4s) operating in the planning unit. The predominant land uses in the Upper Kissimmee Planning Unit are agriculture (28.5 percent) and wetlands (23.8 percent). Other significant land uses include upland forest (9.5 percent), residential (15.0 percent), and open water (13.7 percent). Of these land uses, the categories most likely associated with nonpoint discharges of pollutants and eroded sediments are agriculture and residential, which together cover more than 43.5 percent of the planning unit.

Lower Kissimmee

The major water quality problems in the Lower Kissimmee Planning Unit are low DO and elevated nutrients, which may be attributable to agricultural nutrient loading. Low DO may also be in part attributable to natural conditions in the area (i.e., swamp drainage). It is important to note that several segments of the channelized Kissimmee River (the C-38 Canal) have either been recently backfilled, or are scheduled to be backfilled in the future, as part of the Kissimmee River Restoration Project.

Point Sources: The Lower Kissimmee Planning Unit has 11 permitted groundwater discharges, no permitted surface water discharges, no delineated groundwater contamination areas for ethylene dibromide (EDB), and no permitted landfills.

Nonpoint Sources: Although the Lower Kissimmee Planning Unit includes a small portion of Polk and Osceola Counties, both of which currently have regulated MS4s, there are no urban areas with such permitted sewer systems operating in the planning unit. The predominant land uses in the planning unit are agriculture (51.2 percent) and wetlands (22.8 percent). Other significant land uses include rangeland (15.8 percent) and upland forest (6.5 percent). Of these land uses, the category most likely associated with the nonpoint discharges of pollutants and eroded sediments is agriculture.

Lake Istokpoga

The major water quality problems in the Lake Istokpoga Planning Unit are low DO, elevated nutrients, and mercury in fish. Elevated nutrients and low DO may be attributable to agricultural or urban nutrient loading. Low DO may also be in part attributable to natural conditions in the area (swamp drainage). Mercury contamination is thought to result from atmospheric deposition.

Point Sources: The Lake Istokpoga Planning Unit has 86 permitted wastewater treatment facilities, with 85 discharging to groundwater and one discharging to surface water. The planning unit also has 25 delineated groundwater contamination areas for EDB and 12 permitted landfills.

Nonpoint Sources: There are no regulated MS4s operating in the planning unit. The predominant land uses in the Lake Istokpoga Planning Unit are agriculture (33.9 percent) and residential (12.9 percent). Other significant land uses include open water (14.3 percent), wetlands (15.3 percent), and upland forests (14.7 percent). Of these land uses, the categories most likely associated with the nonpoint discharges of pollutants and eroded sediments are agriculture and residential, which together comprise more than 46.8 percent of the planning unit.

Lake Placid

The major water quality problems in the Lake Placid Planning Unit are elevated nutrients and mercury in fish.

Point Sources: The Lake Placid Planning Unit has 16 permitted wastewater treatment facilities, all of which discharge to groundwater. The planning unit also has 6 delineated groundwater contamination areas for EDB in citrus areas and no permitted landfills.

Nonpoint Sources: There are no regulated MS4s operating in the planning unit. The predominant land uses in the Lake Placid Planning Unit are agriculture (28.4 percent) and residential (23.5 percent). Other significant land uses include open water (23.1 percent), upland forests (7.3 percent), and wetlands (6.1 percent). Of these land uses, the categories most likely associated with the nonpoint discharges of pollutants and eroded sediments are agriculture and residential, which together comprise more than 51.9 percent of the planning unit.

Lake Okeechobee

The water quality of Lake Okeechobee has been compromised by various sources, with phosphorus-induced eutrophication, a process where water bodies receive excess nutrients that stimulate excessive plant growth, being among the major environmental stressors. Despite various regulatory and voluntary incentive-based programs to limit phosphorus inputs into Lake Okeechobee, phosphorus loads entering the lake did not decline during the 1990s. As a result, the lake continues to become more eutrophic with blooms of noxious blue-green algae (cyanobacteria), loss of benthic invertebrate diversity, and spread of cattail (*Typha* spp.) in shoreline areas (SFWMD 2011). In 2000, the Florida Legislature passed the Lake Okeechobee Protection Act, which requires state water quality standards to be achieved no later than January 1, 2015 (Section 373.4595, F.S.). Total phosphorus (TP) load to the lake from all drainage basins and atmospheric deposition was 478 metric tons (mt) in Water Year (May 1 through April 30) 2010. Major TP contributors included the Kissimmee River Basin. The most recent 5-year average (water years 2006–2010) was 496 mt, which exceeds the Total Maximum Daily Load (TMDL, 140 mt) by 356 mt (SFWMD 2011).

Groundwater Resources

The groundwater resources of the Study Area include a sequence of aquifers and confining units. The uppermost of these is the surficial aquifer system. This system is unconfined. Most of the water contained in this aquifer comes from precipitation although there is some leakage from underlying aquifer in places (Bishop 1956). Most of the water in the surficial aquifer flows downward to recharge the Upper Floridan Aquifer. However, some groundwater flows laterally and is directed by the topography. The thickness of this aquifer varies with the base of the system being defined by the first persistent beds of Miocene or Pliocene age sediments that contain a substantial amount of clay and silt (Spechler and Kroening 2007). The upper limit of the surficial aquifer varies from one physiographic region to another. In low poorly drained areas, such as the bayheads on the refuge, the top of the water table is at or near the surface for much of the year. On the other hand, in some

of the higher sand hills and scrub areas of the refuge the water table may be as much as 100 feet below the surface. An intermediate aquifer can occasionally be found between the surficial aquifer and the Upper Floridan Aquifer. This aquifer is present in much of the northern and eastern parts of Polk County (Spechler and Kroening 2007).

The Floridan Aquifer is the principle groundwater source for both Polk and Highlands Counties. It can be divided into two sub-systems—the Upper Floridan and Lower Floridan Aquifers. In between these two is a less permeable area. The Upper Floridan Aquifer is the primary source of drinking water in many places including Polk and Highlands Counties. The Lower Floridan Aquifer is more mineralized and is rarely used as a water source.

Groundwater Quality

The Surficial aquifer system is primarily insoluble quartz sand and the water generally has low mineral content and hardness. However the Surficial aquifer is open to the surface and contaminants can easily enter the system. Even if no contaminants enter from directly above, there could be lateral movement of contaminants within the aquifer. Iron is a commonly present element in this aquifer. Other chemicals that could be present in high concentrations would include chlorides, sulfur, and nitrates. These all would occur in some amount even if there were no urbanization or agriculture in the area. The presence of human activity would increase the chances of these appearing in higher concentrations. Human activity also increases the risk of pesticide contamination. The Upper Floridan Aquifer is primarily freshwater (Spechler and Kroening 2007). The water here is hard due to the presence of calcium and magnesium. There are some nitrates in the Upper Floridan Aquifer. These enter the system through breaches in the intermediate confining layer caused by sinkholes and other gaps in the confining unit. Sampling from wells has also detected small amounts of chlorides and sulfur. There are few wells that reach into the Lower Floridan Aquifer. Consequently, there are not much sampling data to indicate spatial variation in quality. However, there are a few years of sampling data associated with the Aquifer Storage and Recovery Project wells recently installed along the lower Kissimmee River, about a mile upstream of Lake Okeechobee.

Groundwater Contamination

Lake Wales Ridge
The Lake Wales Ridge area of the Kissimmee River Basin is a well known area of groundwater contamination because the highly vulnerable groundwater setting coincides with the intensive agricultural practices that occur there. Citrus farming in this area has historically required heavy applications of fertilizers and agrichemicals because of sandy soils and other challenges posed by the setting. As a result, nitrate concentrations in groundwater are uniformly elevated and several highly mobile pesticides, most notably EDB and bromacil, have contaminated potable groundwater supplies in many wells within the Lake Wales Ridge citrus area. According to the FDEP's Water Supply Restoration Program (WSRP) database, approximately 1,000 private potable supply wells have been contaminated by nitrate (exceeding the maximum contaminant level [MCL] of 10 milligrams per liter [mg/L]), approximately 800 exceeded the MCL of 0.02 micrograms per liter (µg/L) for EDB, and approximately 60 exceeded the groundwater guidance concentration of 90 µg/L for bromacil. The WSRP, in cooperation with the Florida Department of Health, monitors water quality in private wells and provides treatment systems or alternative water sources for affected well owners. In the past several years, agricultural best management practices have promoted more careful application of fertilizers, EDB has been entirely banned from use, and bromacil has essentially been restricted from citrus applications in this area.

Copper is also a contaminant of concern from citrus groves. It is applied as a fungicide and over time slowly builds up in the soils at the tree's drip line. Once in the soil, copper is not very mobile; however, if that soil becomes inundated, the copper can partition into the water and become bioavailable to aquatic or semi-aquatic organisms. The ability of molluscs to uptake copper is well documented in the literature (Betzer and Pilson 1975; Berger and Dallinger 1989; Eisler 1998) and is of potential concern for molluscan predators, such as the federally endangered Everglades snail kite (Winger et al. 1984). A 2003 ecological risk assessment on the proposed conversion of a citrus grove into a water reservoir as part of an Everglades restoration project predicted that copper-impacted soils might adversely impact the Everglades snail kite (URS Corporation 2003). The predicted risk was a reduction in the body weight of the Everglades snail kite nestlings through the bioaccumulation of copper in their diet, which is almost exclusively the Florida apple snail (*Pomacea paludosa*). These findings resulted in a recommended interim soil screening level of 85 milligrams per kilogram (mg/kg) copper for protection of the Everglades snail kite at all sites to be inundated for Everglades restoration projects.

Another potential contaminant concern is from former row crop areas. Sites that had row crops prior to 1985 could be contaminated with residual organochlorine pesticides especially on muck (i.e., highly organic) soils where these chemical tend to accumulate. Common pesticides on these areas could include toxaphene, chlordane, DDT, endrin, dieldrin, and others. It would be important to closely evaluate the chemical contaminant loads on any parcels for acquisition or easement especially, if they would be inundated with water (i.e., wetlands restoration).

In an interagency groundwater monitoring study (U.S. Geological Survey [USGS], Florida Department of Agriculture and Consumer Services [FDACS], and Southwest Florida Water Management District) on the Lake Wales Ridge, data from 1999 to 2003 showed detections of several other pesticides in groundwater samples. These included norflurazon and desmethyl norflurazon (84 percent of wells), simazine (61 percent), diuron (52 percent), deisopropylatrazine (CEAT) (39 percent), aldicarb sulfoxide (32 percent), aldicarb sulfone (32 percent), metalaxyl (10 percent), aldicarb (6 percent), imidacloprid (6 percent), and thiazopyr monoacid (6 percent). The occurrence and potential adverse effects of these pesticides are being monitored by FDACS.

Urban Setting

Most urban development occurs primarily in the upper Kissimmee River Basin, which comprises the fast-growing southern half of the metropolitan Orlando area. Within the Study Area there are a number of groundwater contamination sites of limited extent, mostly associated with small-scale industries and leaking underground fuel storage tanks. However, this area also contains a number of drainage wells and galleries that divert stormwater into the Upper Floridan Aquifer to compensate for aquifer withdrawals in the urban area, increase recharge, control lake levels, and suppress the upward migration of sub-Floridan mineralized waters. The city of Orlando's water supply wells tap the same aquifer zone in the same geographic areas, without significant degradation of water quality (Schiner and German 1983).

Cattle Dip Vats

Cattle dip vats are ubiquitous to most of Florida, and hundreds of them have been identified in the Kissimmee River and Fisheating Creek Basins. Approximately 3,400 cattle-dipping vats were constructed throughout Florida from 1906 through 1962. These vats were used to eradicate ticks from cattle and other livestock. The vats were constructed of concrete and were typically 30 feet long, 3 feet wide, and 7 feet deep. The vats were generally filled with an arsenic solution that killed the ticks. It is now known that the solutions used are harmful to humans, and areas with the vats may

have contaminated groundwater in their vicinity. Other possible dip vat contaminants are benzene hexachloride (BHC), dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyl dichloroethylene (DDE), and toxaphene (Florida Department of Health 2003). Most of the potential aquifer contamination resulting from cattle-dipping vats is extremely localized, and these facilities are not considered to be hazardous on a regional scale.

Superfund Sites

According to the EPA 2003, there are no National Priority List (Superfund) contaminated sites within the Kissimmee River or Fisheating Creek Basins.

Groundwater Quality Summary

Upper Kissimmee

Overall, median dissolved phosphorus and orthophosphate values for the surficial aquifer in the planning unit are similar to the TP medians in a number of lakes, and there are several examples where phosphorus "spikes" in groundwater coincide with high phosphorus in lakes. Phosphorus concentrations are elevated (above 0.1 mg/L) in shallow groundwater in the vicinity of several of the larger lakes that are listed for nutrients and include Lakes Cypress, Lake Kissimmee, and Lake Marian Outlet. Nitrate and ammonia distribution maps also show evidence of impacts to groundwater in the vicinity of all of these lakes. In the ridge area along the western margin of the Upper Kissimmee Planning Unit, nitrate levels in several surficial aquifer monitoring wells, plus a significant portion of the 1,000 private drinking water wells on the Lake Wales Ridge overall, exceed the drinking water MCL of 10 mg/L. Elsewhere in the planning unit, ammonia levels range between 0.1 and 1 mg/L in most surficial aquifer depth wells. Wells with elevated ammonia (>1 mg/L) are located near Lakes Cypress and Marian Outlet. Available groundwater data show above-background concentrations in many areas of the Kissimmee River Basin for copper and lead. Above-background levels of copper were found in monitoring wells near Reedy Creek North, so groundwater may provide a conveyance for copper in this area if there are sources. There are no wells with lead data in the vicinity of the surface waterbodies listed for lead. Groundwater seepage to the lakes of the Upper Kissimmee Planning Unit has not been quantified, although Lakes Tohopekaliga and Kissimmee have been extensively modeled. Based on a groundwater–surface water comparison of the median concentrations of several conservative ions, groundwater seepage may account for approximately 30 percent of the water in the two lakes.

Lower Kissimmee

In the Lower Kissimmee Planning Unit, phosphorus detections in groundwater are scattered and less prevalent than in the Upper Kissimmee Planning Unit. However, ammonia detections in several cases are greater than 1 mg/L. The predominant land use is agriculture, mostly cattle farming. Livestock wastes generate significant amounts of phosphorus and ammonia. The cattle operations in the Lower Kissimmee Planning Unit could be significant sources of elevated nutrients in shallow groundwater and surface water. No published material was obtained to document the extent of groundwater seepage into the Kissimmee River. However, a groundwater–surface water comparison of median concentrations of alkalinity, chloride, conductivity, and sodium concentrations suggests that groundwater seepage may account for approximately 30 percent of the water in the river. Because the river is a controlled system, hydrograph data could not be used to estimate base flow.

Lake Istokpoga

Most of the Lake Istokpoga Planning Unit includes the Lake Wales Ridge, a major citrus-growing region of the state. Fertilizer application on the sandy ridge has resulted in high levels of nitrate in the surficial aquifer and may have also caused elevated phosphorus in groundwater. Based on the radon survey, there are high levels of radon in an extensive area on the eastern flank of the ridge covering the central part of the Lake Istokpoga Planning Unit. This area may have a natural abundance of phosphate in the soil. Livingston Creek lies in this area and is on the Verified List (for nutrients and low DO), but is also adjacent to a dairy farm. Relatively high concentrations of phosphorus are present in wells near several of the other listed waters in the southern part of the Lake Istokpoga Planning Unit (outside of the high-radon area) and are most likely related to agriculture. Arbuckle Creek is located near wells with elevated phosphorus. The USGS (Sacks, Swancar, and Lee 1998; Sacks 2002) used an isotope mass-balance method to estimate the groundwater contribution to several lakes in the Istokpoga Planning Unit. Lakes Clinch and Angelo both had estimated groundwater contributions of 39 to 44 percent and Lake Josephine, listed for nutrients, had an estimated groundwater input of 80 to 83 percent, according to the USGS study. Comparisons between groundwater and surface water medians for several conservative chemical tracers for lakes in the Lake Istokpoga Planning Unit suggest that 25 to 50 percent of the inflows into the lakes are from groundwater.

Lake Placid

The small Lake Placid Planning Unit consists of a lake area south of the Lake Wales Ridge in which the predominant land uses are urban/residential and citrus groves. Groundwater in the surficial aquifer in the vicinity of Lake Placid, which is listed for nutrients, contains somewhat elevated levels of nitrate and phosphorus. Sacks (2002) provided a groundwater seepage estimate for one lake in the Lake Placid Planning Unit. The chemical mass balance method was used by Sacks to estimate that approximately 12 percent of the total inflows into Grassy Lake were from groundwater.

B. HABITAT AND LAND USE

According to the Myers and Ewel (1990), the historic landscape of the Kissimmee Valley was comprised of a freshwater marsh, which encompassed the Kissimmee River with more expansive wet and dry prairies that occupied slightly higher elevations east and west of the Kissimmee marsh. There is also evidence that pine flatwoods existed interspersed and upslope from the prairies (Davis 1943, Myers and Ewel 1990). Cypress strands or domes also dotted the valley landscape and were probably more concentrated at the northern end of the Study Area. The ridges were dominated by pinelands and scrub, with lesser amounts of hardwoods and open water. Today, these natural areas have been largely displaced by residential and agricultural development, which occupies approximately 943,000 acres (52 percent) of the Study Area. Today, the native communities of greatest areal extent within the Study Area are lakes and ponds (7.0 percent), mesic flatwoods (6.0 percent), freshwater marsh (6.0 percent), dry prairie (4.5 percent), and wet prairie (4.4 percent). Table 7 outlines the land cover types within the Study Area.

Two of the most ecologically damaging impacts of residential and agricultural development within the Study Area are from the loss of scrub habitat (now at only 2 percent of the Study Area), and their associated cutthroat grass communities, and the loss of isolated and depressional wetlands on the Kissimmee Prairie (1 percent of the Study Area). There are 112 different land covers [based on the Florida Natural Areas Inventory (FNAI) 2010 Florida Land Covers Map] within the 1.8 million-acre Study Area. These have been combined into 12 land cover categories for the purpose of analysis in this document (Table 7). Figure 6 shows similarly grouped land uses within the Study Area based on

FNAI land cover codes. Although there are many land covers, approximately 79 percent of the Study Area is comprised of only 16 land uses (Table 8).

Table 7. Land cover types within the Study Area

Land Cover	Currently Protected Acres (estimate)	Unprotected Acres (estimate)	Total Acres (estimate)
Cutthroat Grass Communities	11,025.15	35.29	11,060.44
Dry Prairie	48,150.97	34,451.69	82,602.66
Freshwater Forested Wetlands	47,893.80	81,623.26	129,517.06
High Pine, Florida Scrub, Sandhill	23,548.83	26,073.73	49,622.56
Improved, Unimproved, and Woodland Pasture	47,991.70	536,487.85	584,479.55
Intensive Agriculture	2,952.52	199,254.18	202,206.7
Scrubby Mesic and Hydric Pine Flatwoods	103,715.75	76,837.08	180,552.83
Mesic Temperate Hammock	11,910.91	18,441.77	30,352.68
Open Water	4,302.10	136,224.39	140,526.49
Shrub and Brushland	1,315.61	8,168.01	9,483.62
Urban	20,172.66	135,357.35	155,530.01
Wet Prairie and Freshwater Marshes	98,252.21	148,938.70	247,190.91
TOTAL	**421,232.21**	**1,401,893.3**	**1,823,125.51**

Table 8. Top 16 land cover types that comprise 79 percent of the Study Area

Land Cover Type	Acres in Study Area	Percent of Study Area
183213 - Improved Pasture	445,605.90	24.44
3100 - Natural Lakes and Ponds	126,784.78	6.95
1311 - Mesic Flatwoods	109,888.90	6.03
2120 - Freshwater Marshes	109,727.27	6.02
183214 - Unimproved/Woodland Pasture	102,757.49	5.64
1330 - Dry Prairie	82,602.99	4.53

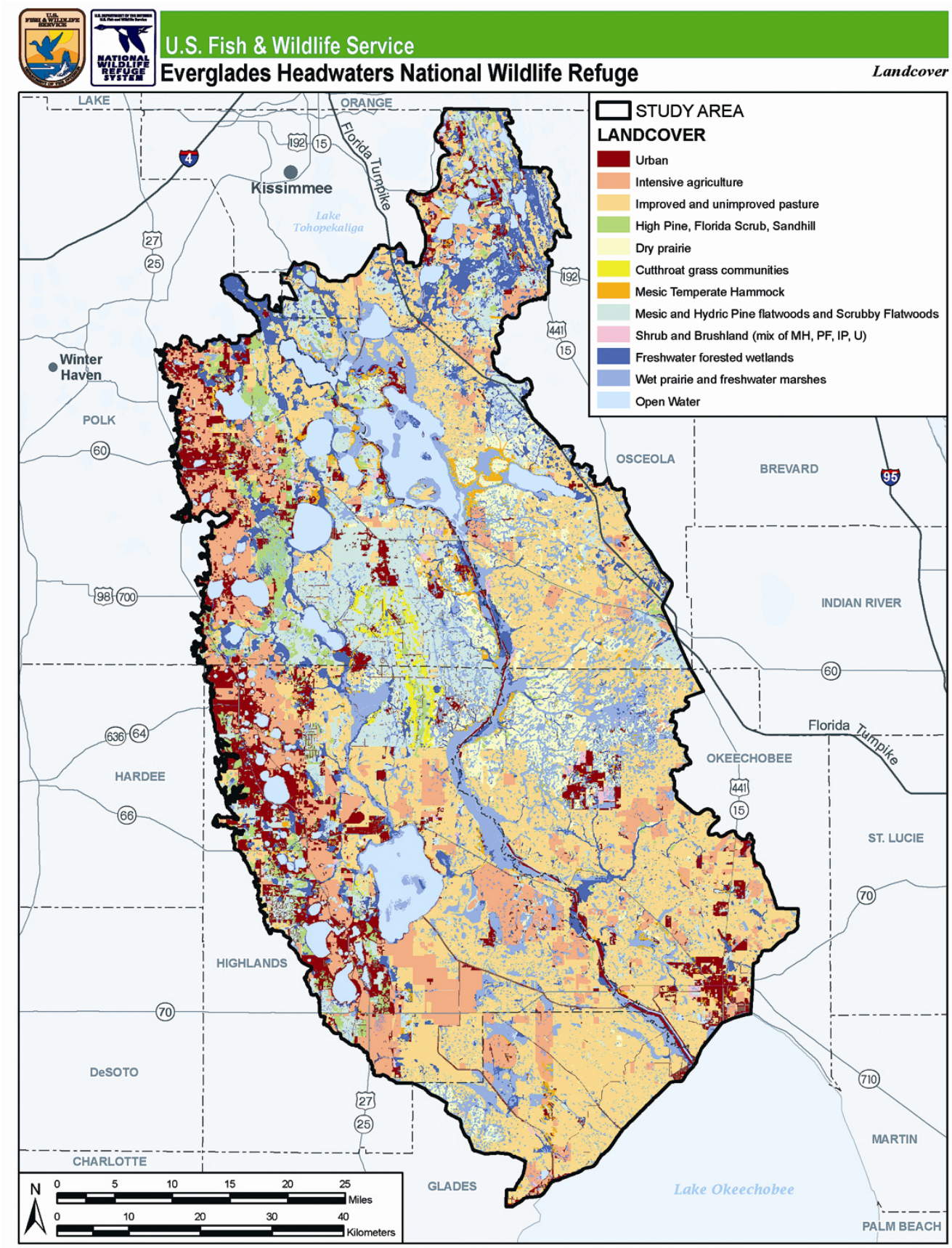
Land Cover Type	Acres in Study Area	Percent of Study Area
18322 - Orchards/Groves	82,477.10	4.52
2111 - Wet Prairie	79,662.87	4.37
183221 – Citrus	57,103.09	3.13
1831 - Rural Open	41,886.47	2.30
18212 - Low Structure Density	39,487.81	2.17
1210 – Scrub	37,467.86	2.06
2233 - Mixed Wetland Hardwoods	32,405.36	1.78
18321 - Cropland/Pasture	31,485.50	1.73
21121 - Shrub Bog	28,183.55	1.55
18221 - Residential, Med. Density - 2-5 Dwelling Units/AC	27,527.60	1.51

The habitats of the south Florida region support an extremely diverse array of flora and fauna. Over 600 species are considered either rare or imperiled in south Florida; 68 of those species are federally listed as threatened or endangered (for which the Service is the lead responsible agency). The Service also has sufficient information on biological vulnerability and threats to support a proposal to list 20 candidate species as threatened or endangered, but for which preparation and publication of a proposal are precluded by higher priority listing actions. Twenty-three of the ecological communities found within this region are inhabited by federally listed species, and are the subject of the ecosystem restoration goals in the Service's recovery plan (1999). These south Florida communities that are within the Study Area include high pine (dry, longleaf pine savanna); Florida scrub, including scrubby flatwoods and scrubby high pine; mesic temperate hammock; tropical hardwood hammock; mesic and hydric pine flatwoods; dry prairie; cutthroat grass communities; freshwater marshes and wet prairies; and forested wetlands including flowing water, pond, and seepage swamps (Service 1999). We have included an additional category for shrub and brushland to facilitate the alternatives analysis. Additionally, we recognize that there are disturbed or developed land uses that may also provide habitat for plants, fish, and wildlife. The following is a description of each community or land use type.

HIGH PINE (DRY, LONGLEAF PINE SAVANNA)

High pine or dry, longleaf pine savannas, characterized by a nearly continuous ground cover of wiregrass (*Aristida stricta* var. *beyrichiana*) and widely spaced longleaf pines, once covered most of the pre-settlement uplands of the southeastern United States from Virginia to Texas and south to central Florida. These savannas included both high pine and pine flatwoods, similar plant communities at opposite ends of the moisture gradient. Today the longleaf pine savanna is almost extinct, the result of harvesting all original-growth longleaf pines and decades of fire suppression. In south Florida, the high pine community is virtually extinct except for a few small, isolated fragmentary remnants that are not large enough to be self-sustaining or to support the full complement of native species. Remaining high pine sites are small and have been degraded by fire suppression. They now are dominated by invasive off-site species such as sand pine (*Pinus clausa*), or by species

Figure 6. Similarly grouped land uses within the Study Area



formerly restricted to the shrub layer such as turkey oak (*Quercus laevis*). In the Study Area, long-leaf pine (which is lumped with xeric oak in the FLUCCS code 4120) is sparsely present on the Lake Wales Ridge west of Lakes Istokpoga and Weohyakapka.

FLORIDA SCRUB

Florida scrub soils are well-drained, nutrient-poor, and sandy. Depending on elevation, scrub has a fire return frequency of 1 to 80 years. Florida scrub can be identified by the dominance of several species of woody shrubs, especially myrtle oak or scrub oak (*Quercus myrtifolia* or *Q. inopina*), sand live oak (*Q. geminata*), Chapman's oak (*Q. chapmanii*), crookedwood (*Lyonia ferruginea*), saw palmetto (*Serenoa repens*) and Florida rosemary (*Ceratiola ericoides*); the absence of a tree canopy; the absence of a continuous vegetative ground cover; and the absence of longleaf pine (*Pinus palustris*), wiregrass, and turkey oak (*Q. laevis*). When sand pines (*Pinus clausa*) are present in scrub, they do not form a continuous canopy, but occur as scattered individuals or clumps of individuals. Scrub occurs on white and yellow sand soils and contains patches of bare sand with or without scattered clumps of ground lichens (Service 1999). The highest elevations of Florida scrub within the Study Area occur on the Lake Wales Ridge. The Lake Wales Ridge is home to many endemic xeric plant species or communities that require burning at intervals of 1 to 8 years (sandhill) and 5 to 12 years (oak-hickory scrub).

MESIC TEMPERATE HAMMOCK

Mesic temperate hammock is a closed canopy forest, dominated by temperate evergreen tree species, primarily live oak and cabbage palm that is naturally protected from fire by its position on the landscape (Service 1999). Tropical species are common in the shrub layer and become increasingly important in the canopy at the southern end of its range. Soils in mesic temperate hammock are moist due to a dense litter layer and the humid conditions that prevail under the closed canopy, but are rarely inundated. Mesic temperate hammocks are important habitat for wildlife and provide secondary habitat for a number of rare, threatened, and endangered plant and animal species. This community has been heavily impacted by human activity, primarily clearing for agriculture and urbanization. Soils and understory vegetation in mesic hammocks, often the only shaded habitat in a landscape of prairie, pasture, pineland, or marsh, are trampled and compacted by cattle. Mesic temperate hammocks have also been adversely affected by nonnative plant and animal species, especially feral hogs (*Sus scrofa*), and by fire suppression and hydrological alterations in adjacent and surrounding communities. Protection measures for mesic temperate hammocks include conservation land acquisition; ecosystem management practices, particularly restoration of natural fire and hydrological regimes; control and eradication of nonnative species; and limits on grazing, development, and recreational uses.

Mesic temperate hammock occurs in a broad zone of peninsular Florida, where it is transitional between the southern mixed hardwood forest of north peninsular and panhandle Florida and the tropical forest of southern Florida (Greller 1980). The southern mixed hardwood forest of north Florida comprises a diverse mix of deciduous hardwoods, such as beech (*Fagus grandifolia*), hickory (*Carya* spp.) and oaks (*Quercus falcata*, *Q. alba*, etc.); broad-leaved evergreens, such as southern magnolia (*Magnolia grandiflora*) and live oak (*Quercus virginiana*); and needle-leaved evergreens (conifers), such as spruce pine (*Pinus glabra*) and loblolly pine (*P. taeda*). Within the Study Area, examples of mesic temperate hammock can be found at Tiger Creek Preserve, Polk County; Upper Lakes Basin Watershed, Polk and Osceola Counties; Avon Park Air Force Range, Polk and Highlands Counties, Highlands Hammock State Park, Highlands County; Kissimmee Prairie Preserve, Okeechobee County; Kissimmee River Valley, Polk, Osceola, Highlands, Okeechobee Counties, and Three Lakes WMA, Osceola County (Service 1999).

HYDRIC, MESIC, AND SCRUBBY PINE FLATWOODS

Pine flatwoods are characterized by level topography and poorly drained sands. They range from open forests of scattered pines with little understory to dense pine stands with a rather dense undergrowth of grasses (particularly wiregrass), saw palmetto (*Serenoa repens*), and other low shrubs. Hydric flatwoods occur in seasonally inundated flatlands with sand substrates and have canopies of slash pine, pond pine (*Pinus serotina*), and/or cabbage palm (*Sabal palmetto*). They have an understory of mixed hydrophytic shrubs, such as wax myrtle (*Myrica cerifera*) and gallberry (*Ilex glabra*), grasses, and forbs that varies with fire frequency. In contrast, mesic flatwoods occupy sandy, seldom inundated flatlands and typically have canopies of slash pine or longleaf pine (*Pinus palustris*) with a dense understory of saw palmetto. Gallberry, rusty lyonia (*Lyonia ferruginea*), wax myrtle, and wiregrass are also usually abundant (Abrahamson and Hartnett 1990). There are approximately 66,000 acres of pine flatwoods scattered throughout the central portion of the Study Area from the ridge west of Lake Istokpoga through Avon Park AFR and north to the eastern side of East Lake Toho.

Hydric and mesic pine flatwoods of south Florida are of critical, regional importance to its biota. They provide essential forested habitat for a variety of wildlife including wide-ranging, large carnivores such as the Florida panther (*Felis concolor coryi*) and the Florida black bear (*Ursus americanus floridanus*); mid-sized carnivores; fox squirrels (*Sciurus niger* spp.); red-cockaded woodpecker (*Picoides borealis*) and white-tailed deer (*Odocoileus virginianus*). They provide tree canopy for canopy-dependent species including neotropical migratory birds, tree-cavity dependent species, and tree-nesting species (Service 1999). In hydric flatwoods, the same habitat seasonally functions as both a wetland and upland. The relatively predictable nature of this hydrologic transformation allows for an abundant diversity of plant life, including both wetland and upland annuals, and supports a diverse invertebrate fauna and, as a result, a diverse vertebrate fauna. Pine flatwoods are also an important habitat for a number of common flatwoods vertebrate species, including the pine woods tree frog (*Hyla femoralis*), oak toad (*Bufo quercicus*), box turtle (*Terrapene carolina*), eastern diamondback rattlesnake (*Crotalus adamanteus*), black racer (*Coluber constrictor*), brown-headed nuthatch (*Sitta pusilla*), pine warbler (*Dendroica pinus*), great horned owl (*Bubo virginianus*), least shrew (*Cryptotis parva*), cotton mouse (*Peromyscus gossypinus*), cotton rat (*Sigmodon hispidus*), and gray fox (*Urocyon cinereoargenteus*) (Layne 1974, Layne et al. 1977).

Scrubby flatwoods is an intermediate habitat between mesic pine flatwoods and scrub, and sometimes occurs as an ecotone between them (Abrahamson and Hartnett 1990). “Scrubby flatwoods are more hydric than scrub, have a higher water table, denser vegetation, and almost never have standing water” (Abrahamson et al. 1984). It also differs from scrub by the presence of scattered wiregrass and a preponderance of flatwoods species such as fetterbush (*Lyonia lucida*), wax myrtle, and gallberry. Shrubby oaks, including sand live oak, Chapman’s oak, and myrtle oak or scrub oak, are often dominant and slash pine, sand pine, or longleaf pine may be present. Plant species typical of scrubby flatwoods that may be considered indicators of the community include tarflower (*Befaria racemosa*), scrub St. John’s wort (*Hypericum reductum*), and pennyroyal (*Piloblephis rigida*) (Service 1999). Scrub habitats in south Florida are important for a number of xeric-adapted species including: Florida gopher frog (*Rana capito*), Florida mouse (*Podomys floridana*), short-tailed snake (*Stilosoma extenuatum*), scrub lizard (*Sceloporus woodi*), rufous-sided towhee (*Pipilo erythrophthalmus*), gopher tortoise (*Gopherus polyphemus*), Florida worm lizard (*Rhineura floridana*), other subspecies of mole skink (*Eumeces egregius* sspp.), and the crowned snakes (*Tantilla* spp). Federally listed scrub inhabitants include 23 species of plants, Florida panther, Florida scrub-jay (*Aphelocoma coerulescens*), eastern indigo snake, blue-tailed mole skink (*Eumeces egregious lividus*), and sand skink (*Neoseps reynoldsi*) (Service 1999).

DRY PRAIRIE

Florida dry prairie is a natural landscape that is endemic to the state, with no similar communities found in adjacent states. It is geographically restricted to the interior of central, south-central, and west-central peninsular Florida. Dry prairie is often (but not exclusively) found on the same soil series, topographic positions, and moisture regimes as mesic flatwoods, with dry prairie being the essentially treeless endpoint of a continuum of variation in canopy cover across pine flatwoods landscapes in central Florida. Dry prairie occurs on nearly level, poorly to somewhat poorly drained, interdrainage flatlands above major river/stream floodplain valleys. Typically, the flatlands characteristic of the Osceola Plain are dotted with numerous small shallow depressions (with ephemeral ponds and marshes), but have very few surface drainage features. Developed on flat plains, the dry prairies at Avon Park AFR are generally below the 19.6 m (65 ft) contour (Bridges 1998). It is unclear why the dry prairie landscape at Avon Park AFR is lower in elevation than the other landscape associations on the Osceola Plain at this site, but it seems to be correlated with the proximity of major drainages such as Arbuckle Creek, Arbuckle Marsh, and the Kissimmee River (Bridges 1998). Dry prairie is a pyrogenic landscape with a ground cover diverse in regionally endemic plant taxa and dominated by wiregrass, scattered, low, stunted saw palmetto, and low-growing runner oak. The typical dry prairie has a mixture of upland and wetland plants, with the most conspicuous indicator of this mixture being the co-occurrence of running oak (*Quercus minima*) and yellow-eyed grass (*Xyris elliottii*). Unlike most other grasslands in the southeastern United States, Florida dry prairie harbors numerous endemic vertebrates. Interior dry prairie is considered to be one of four geographic and/or ecological communities in Florida with a concentration of high-ranked vertebrate taxa. Several of the high-ranked avian taxa are near-endemic to the dry prairie region of south-central Florida. Of these, some are not found exclusively in native prairie habitat, but are capable of persisting in anthropogenic altered landscapes (e.g., semi-improved pastures, improved nonnative pastures, disturbed rangelands, and others). The Florida grasshopper sparrow (*Ammodramus savannarum floridanus*) is a federal and state endangered subspecies which is endemic to the prairie region of south-central peninsular Florida. Frequently burned dry prairie is the preferred natural habitat for this non-migratory subspecies, although it is also documented from degraded prairie and other rangeland sites (Service 1999). The largest concentration of dry prairie within the Study Area is at the Kissimmee Prairie State Preserve, Avon Park AFR, and Three Lakes Wildlife Management Area.

CUTTHROAT GRASS COMMUNITIES

Cutthroat grass (*Panicum abscissum*) is a central peninsular Florida endemic species, found in scattered locations from Orange County south to Palm Beach County. However, it seems to dominate natural communities almost exclusively within Polk and Highlands Counties, in association with the side slopes of the central Florida ridges. Cutthroat grass-dominated communities fall within four distinct natural community classes. Since the landscape position, hydrology, soil types, and community composition differ significantly between each of these types, they are best discussed as distinct sets of natural communities. Cutthroat grass communities are mostly associated with areas of slight to strong groundwater seepage; however, not all cutthroat grass communities are well-developed seepage slopes. Cutthroat grass communities also occur within the community classes of flatwoods, wet prairies, and depression marshes. It is important to recognize these communities to make it clear that not every occurrence of cutthroat grass is by definition, a cutthroat seep slope. Cutthroat grass communities require frequent fire for maintenance of the open, graminoid-dominated character of these areas. The greatest threats to the integrity of cutthroat grass communities are continued fire-suppression and drainage effects. Even on protected lands, many cutthroat grass communities are not fire-managed aggressively enough to conserve the biodiversity of these community types. Cutthroat grass communities cover more than 5,800 ha (14,326 acres) at Avon

Park Air Force Range, the largest areal extent remaining for these communities. Diverse, fire-maintained cutthroat grass vegetation continuums with intact species-rich ecotones are now found only in association with the Bombing Range Ridge in Polk and Highlands Counties. These communities support large populations of the endemic Florida hartwrightia (*Hartwrightia floridana*), and disjunct populations of species which are more common in seepage slopes of the Florida Panhandle, such as swamp bayberry (*Myrica heterophylla*) and featherbristle beaksedge (*Rhynchospora oligantha*).

WET PRAIRIES AND FRESHWATER MARSHES

Wet prairies and freshwater marshes were once a prominent feature of the central portion of the Study Area. The differences between the two are based on hydroperiod. Wet prairies are flooded less than 6 months per year (short hydroperiod). Freshwater marshes can be flooded 6 to 9 months per year (intermediate hydroperiod) or more than 9 months per year (long hydroperiod). As a result, wet prairies are more susceptible to fire, and burn more frequently than marshes. The loss of short-hydroperiod wetlands on the Kissimmee Prairie is a significant ecological consequence of agricultural ditching or residential development in that area. Those wetlands, many times isolated from other surface water bodies, are critical for maintaining amphibian diversity on the prairie, because the occurrence of predators (e.g., fish and alligators) is less than in longer hydroperiod wetlands. These differences in hydroperiod and fire regime are also reflected in the vegetative communities. The common plants of wet prairies are sawgrass (*Cladium jamaicense*), muhly grass (*Muhlenbergia capillaris*), beakrush (*Rhynchospora* spp.), black sedge (*Schoenus nigricans*), wiregrass, and dwarf cypress (*Taxodium* spp.; Service 1999). Freshwater marshes are frequently categorized based on their dominant vegetation [e.g., sawgrass marsh; cattail marsh; flag marsh (*Pontederia lanceolat*a and one or more *Sagittaria* spp.); mixed emergent grass/sedge marsh; maidencane (*Panicum hemitomon*) marsh; beakrush and spike rush (*Eleocharis* spp.) marsh; or floating vegetation marsh (the water lilies *Nymphaea odorata* and *Nuphar luteum* and floating hearts, *Nymphoides aquatica*)]. Marshes can also be categorized based on physiognomy. Flatwoods marshes, also called depressional marshes, are small, elliptical wetlands that occupy the low areas within pine flatwoods. They have moderate to long hydroperiods with depths less than a meter, and are generally disconnected (Kushlan 1990). Conversely, sloughs are larger, linear, connected marshes with deeper water and long hydroperiods (Service 1999). Regardless of their category, marshes and wet prairies are another vital component for the biodiversity of south Florida (Service 1999). Federally listed birds such as the Everglades snail kite (*Rostrhamus sociabilis plumbeus*), wood stork (*Mycteria americana*), whooping crane (*Grus americana*), and Audubon's crested caracara [*Polyborus* (=*Caracara*) *plancus audubonii*], and state listed birds such as Florida sandhill crane (*Grus canadensis pratensis*), roseate spoonbill (*Ajaia ajaja*), little blue heron (*Egretta caerulea*), reddish egret (*Egretta rufescens*), snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), and white ibis (*Eudocimus albus*) all use these habitats for nesting and/or foraging. The growth, maintenance, and/or reproduction of many other species of birds, amphibians, reptiles, fish, invertebrates, and mammals are directly linked to the quality and quantity of these wetland habitats.

FRESHWATER FORESTED WETLANDS

Freshwater forested wetlands are present in the Study Area primarily in the form of pond swamps, but also as seepage and flowing water swamps. In the Study Area, there are approximately 150,000 acres of forested swamps. Pond swamps are seasonally inundated forested wetlands located around or within landscape depressions. They include the lake-border swamps and major wetlands within large landscape basins, as well as smaller cypress domes and gum ponds. Although many small and/or shallow pond swamps have been cleared and converted to agricultural or residential uses, most of the larger systems still exist. Most of the remaining systems have been

degraded to some extent by logging, drainage, impoundment, nonnative plant invasion, and/or pollution. Increased hydroperiods, nutrient enrichment, and contamination from agricultural runoff are major problems, since pond swamps are often surrounded by farmlands and water is typically diverted from these lands into the wetlands. Appropriate timber management and nonnative species control are also significant management concerns.

Seepage swamps are forested wetlands characterized by saturated soils rather than periodic inundation. They include baygalls at the base of seepage slopes, bayheads in peat-filled depressions, and hydric hammocks on low sand or limestone rises within periodically inundated wetland systems. Baygalls and bayheads are dense evergreen forests or shrub thickets with a spongy understory of sphagnum moss and ferns. The canopy is composed of tall, densely packed, generally straight-boled evergreen hardwoods dominated by sweetbay (*Magnolia virginiana*), swamp bay (*Persea palustris*), red bay (*Persea borbonia*), dahoon holly (*Ilex cassine*), and loblolly bay (*Gordonia lasianthus*). There is typically a more or less open understory of shrubs and ferns and a ground surface of sphagnum mats interlaced with convoluted tree roots. Hydric hammocks are open forests dominated by cabbage palms and laurel oaks (*Quercus laurifolia*) mixed with other hardwoods. They often have minimal understory and a floor carpeted by fallen palm fronds (Service 1999). Many animal species utilize these forested wetlands in south Florida including the following federally listed species: Florida panther, wood stork, and eastern indigo snake (*Drymarchon corais couperi*) (Service 1999).

Flowing water swamps can be classified further as floodplain wetlands - those along clearly defined river channels; and strand swamps - those of shallower and more diffuse flow-ways. The vegetative community of flowing water swamps is frequently dominated by bald cypress (*Taxodium distichum*). Pop ash (*Fraxinus caroliniana*) and pond apple (*Annona glabra*) may also be present. Other typical plant species include red maple (*Acer rubrum*), cabbage palm (*Sabal palmetto*), strangler fig (*Ficus aurea*), swamp bay (*Persea palustris*), sweetbay (*Magnolia virginiana*), royal palm (*Roystonea regia*), coastal plain willow (*Salix caroliniana*), wax myrtle, myrsine (*Rapanea* spp.), poison ivy (*Toxicodendron usneoides*), swamp lily (*Crinum* spp.), leather fern (*Acrostichum* spp.), and royal fern (*Osmunda regalis*). The canopy plants are mainly temperate, while the understory and epiphytic plants are generally tropical (Service 1999).

SHRUB AND BRUSHLAND

Shrub and brushland is an unusual category that is not in the MRSP (Service 1999), but was used by FNAI when they created their new land cover layer for Florida. We have examined the aerial photographs for where this land cover occurs within the Study Area and it appears to serve as a “catch-all” category of non-descript areas with land signatures that are similar to pastures, prairies, pine flatwoods, or mesic hammocks. It represents less than 1 percent of the spatial extent of the Study Area.

INTENSIVE AGRICULTURAL AREAS

Intensive agriculture in the Study Area occurs mainly as citrus (90,000 acres) and tree crops (57,000 acres). These nonnative areas are generally less desirable habitats for fish and wildlife. They exhibit habitat uniformity and are subject to disturbance from humans, machinery, and pesticide usage. Still, some wildlife species are usually present in these areas as either residents or transients from native habitats. Mazzotti et al. (1992) reported on wildlife usage in citrus groves southwest of Lake Okeechobee. They found 203 vertebrate species out of a possible total of 380 that were regionally present, however, 78 percent of those were observed not in the production areas, but in associated agricultural reservoirs or wet detention areas. During a 5-day wildlife survey of the Ten Mile Creek citrus grove, Carroll and Associates (1999) found 36 wildlife species including great egret, great blue heron, red-

tailed hawk, merlin, wild turkey, blue jay, downy and hairy woodpeckers, ovenbird, European starling, bobcat, white-tailed deer, butterflies, Cuban anole, and the federally threatened eastern indigo snake. Thirty-three understory plant species were also identified from between the citrus rows.

IMPROVED, UNIMPROVED, AND WOODLAND PASTURES

Approximately 585,000 acres (32 percent) of the Study Area is pasture. Improved pasture is recognizable by the presence of numerous drainage ditches and an almost complete monoculture of planted pasture grasses. Unimproved and woodland pastures usually provide better wildlife habitat than improved pastures, but all ecosystems are generally of higher value than the more intensive agricultural areas mentioned previously and can support a number of federally listed species including the wood stork, Audubon's crested caracara, eastern indigo snake, and snail kite (if sufficient wetlands are present). State-listed pasture inhabitants may include bald eagle, roseate spoonbill, limpkin (*Aramus guarauna*), burrowing owl (*Speotyto cunicularia*), little blue and tricolored herons, snowy and reddish egrets, white ibis, southeastern American kestrel (*Falco sparverius paulus*), Florida sandhill crane, and gopher tortoise (*Gopherus polyphemus*).

Cattle farms by far dominate the landscape within the Study Area. Florida itself is known as one of the top leading cattle producing states in the United States. Livestock grazing was historically the primary economic benefit derived from the dry prairie and flatwoods landscapes of central and south-central Florida. Between 1940 and 1960, many pastures of Bahia grass (*Paspalum notatum*), digit grass (*Digitaria* sp.), and Bermuda grass (*Cynodon dactylon*) were established, as a result of land clearing and drainage alterations of native rangeland. By 1985, Florida had 4 million acres of pasture, an extensive area of which had formerly been dry prairie or flatwoods. Today, grazing occurs on both pasture and rangeland in the Study Area.

While grazing densities and types of cattle operations vary by ranch, several generalizations can be made regarding these operations. Native central and south Florida rangelands are typically burned by ranchers annually or biennially during the winter or early spring months to stimulate forage growth, nutrition, and palatability during the lean winter months. Ranchers also burn to maintain openness, reduce shrub cover, reduce fuel accumulations, and improve wildlife habitat. On average, nutrient runoff of both phosphorous and nitrogen is greater from improved pasture than from semi-native pastures (Archbold Biological Station 2002). It is also recognized that agricultural wetlands are sources of nutrient accretion. Nutrient content of both water column and vegetation is elevated in improved pasture (Swain and Bohlen 2001, 2003). However, it appears that this nutrient loading may be the result of past fertilization and cattle hoof action re-suspending nutrients, rather than stocking rates.

C. VEGETATION

FEDERALLY LISTED PLANT SPECIES

There are approximately 25 federally listed plant species present in the Study Area (Appendix H). The federally listed plant species occur mostly in scrub, though some also occur in high pine (dry, longleaf pine savanna) and flatwoods, or in areas that formerly supported these vegetation types but that have been converted to pasture. Most of the scrub plants are gap specialists whose populations expand after fire and then decline as clonal oaks and palmettos reclaim dominance. Nearly all of the plant species are adapted to the fires that were once frequent in these habitats. The Okeechobee gourd (*Cucurbita okeechobeensis* ssp. *okeechobeensis*) is the only listed plant species associated with water bodies. The following is a brief discussion of each species. For more in-depth information, we refer the reader to the Service's South Florida Multi-species Recovery Plan (1999), species five-

year status reviews, the Third Revision of the Florida Panther Recovery Plan (Service 2008), and the Service's website: *http://www.fws.gov/verobeach/*.

Okeechobee Gourd

The endangered Okeechobee gourd is a vine that was locally common in the extensive pond apple (*Annona glabra*) forest that once grew south of Lake Okeechobee and in hammocks along the rim and islands of the lake (Small 1922). The Okeechobee gourd is now restricted in the wild to two small disjunct populations - one along the St. Johns River which separates Volusia, Seminole, and Lake Counties in north Florida, and a second around the shoreline of Lake Okeechobee. Population trend and abundance of this subspecies are difficult to assess because the gourd is ephemeral by nature, often only growing when habitat conditions are favorable. This subspecies employs a strategy of growing on open organic soils exposed by low water levels with little to no competition, producing numerous seeds with somewhat long viability, and experiencing vegetative decline when competition increases or water levels rise (Moyroud 2009). Currently, the survival of the Okeechobee gourd in south Florida is threatened by the water-regulation practices in Lake Okeechobee, the continued expansion of nonnative vegetation in the lake, aggressive weeds [especially moonflower (*Ipomoea alba*)], habitat degradation, improper use of herbicides, predation of seeds by animals (*e.g.,* rabbits and feral pigs), and, potentially, disease and insect infestation. The Okeechobee gourd could grow in any given year along any suitable shoreline inside the Herbert Hoover Dike or along the rim canal; therefore, it would be present only in the extreme southern portion of the Study Area.

Beautiful Pawpaw

The endangered beautiful pawpaw (*Deeringothamnus pulchellus*) is a low-growing, diminutive shrub rarely exceeding 1.6 feet in height. The current range of the pawpaw is limited to Lee, Charlotte, and Orange (immediately adjacent to the Study Area) Counties, Florida. The occurrences are fragmented and isolated within the range. Historically, beautiful pawpaw occurred on poorly drained sands of slash (*Pinus elliottii*) and longleaf pine (*P. palustris*)-saw palmetto (*Serenoa repens*) flatwoods in southwestern Florida and in Orange County east of Orlando (Kral 1960). However, much of the suitable habitat in the historic range has been destroyed or converted for residential housing, commercial activities, and agriculture, and numbers and distribution of plants have decreased as a result (Service 1999). Habitat loss, fragmentation, degradation, changes in land use, and competition from invasive plants continue to threaten the species. Where habitat remains intact, beautiful pawpaw depends on active management to persist. Land management practices, especially prescribed fire used for the reduction of tall grasses and larger shrubs, are extremely important for maintaining the health of the pine flatwoods ecosystem in which this species occurs. The species limited distribution and its limited reproductive capacity also renders it vulnerable to random natural events, such as hurricanes and drought (Service 2009).

Scrub Lupine

The endangered scrub lupine (*Lupinus westianus var. aridorum*) is an herb endemic to Orange and Polk Counties. This species is known from two distinct areas. In western Orange County (Orlando area), it is found on the southern Mount Dora Ridge from the Apopka-Plymouth area south, past Lake Buena Vista. It is also found in north-central Polk County on the Winter Haven Ridge near Audurndale and Winter Haven (Service 1999). The species is an unusual central Florida scrub plant, because it is absent from the Lake Wales Ridge. Like many other scrub species, however, it is threatened by loss of habitat due to land conversion for agriculture and for residential construction. Scrub lupine is found in open disturbed areas in sand pine and rosemary scrub communities of

central Florida. It grows primarily on well-drained sandy soils of the Lakewood or St. Lucie series (Wunderlin 1984). These soils are very dry and have very little organic accumulation (Lowe et al. 1990). The sands are white or occasionally yellow and generally support sand pine (Wunderlin 1984). They are also quite acidic with a pH from 4.0 to 4.5 (Stout 1996).

Avon Park Harebells

The endangered Avon Park harebells (*Crotalaria avonensis*) is a spreading, perennial herb with one to three moderately hairy, flowering stems that may grow 2 to 10 cm above the surface. It is known from only three locations – Avon Park Lakes Subdivision, The Nature Conservancy's Saddle Blanket Scrub Preserve, and FWC's Lake Wales Ridge Wildlife Management Area (Carter Creek). The Avon Park Lakes Subdivision population continues to be threatened by residential development. This species occupies sparsely vegetated, xeric, white-sand scrub habitat.

Britton's Beargrass

The endangered Britton's beargrass (*Nolina brittoniana*) is a long-lived species of Agavaceae (e.g., agave and yucca) and is found from the south end of the Lake Wales Ridge in Highlands County north to Orange County and northern Lake County, Florida. It is a relatively widespread species with highest concentrations in Polk and Highlands Counties. The species is threatened by habitat loss or modification due to land conversions for agriculture and development (Service 1999). It occurs in a wide range of habitat types, from relatively open scrub to hammocks with closed canopies. It has been reported in scrub, high pine (dry, longleaf pine savanna), and occasionally in hammocks (Christman 1988). The wide range of habitat types that *Nolina brittoniana* occupies are very different in appearance, physiognomy, species composition, fire dynamics, and land use history, but are closely linked ecologically and historically (Myers 1990). In all habitats where *Nolina brittoniana* occurs, soil is droughty and infertile, and all are considered upland sites (Myers 1990, C. Weekly 1996). These habitats are also fire-maintained and fire-dependent ecosystems that are presumably replaced by hardwoods in the absence of fire (Myers 1990, Service 1999).

Carter's Mustard

The endangered Carter's mustard (*Warea carteri*) is a fire-dependent annual herb occurring in xeric, shrub dominated habitats on the Lake Wales Ridge of central Florida. The primary threats to this species are habitat loss to citrus grove operations and residential developments and long-term fire suppression, both of which cause local extirpations (Service 1999). From what is known of the historic distribution of *Warea carteri*, it occurred in scrubby flatwoods and sandhills of the Lake Wales Ridge in Highlands, Polk, and Lake Counties, in south Florida slash pine forests in the Miami area, and in coastal scrub in Brevard County (Service 1999). *Warea carteri* has occurred throughout the entire length of the Lake Wales Ridge, as well as the Winter Haven Ridge (Schultz et al. 1999, Turner et al. 2006). Several populations of *Warea carteri* at Archbold Biological Station (ABS) are adjacent to roads, firelanes, or in areas with historic human disturbance. At Tiger Creek Preserve, *Warea carteri* is found in degraded sandhill habitat where turkey oak is abundant, in scrubby flatwoods, and in xeric hammocks (Menges 1995). *Warea carteri* is found almost exclusively in upland areas and is a soil generalist, being found in yellow, gray, or white sands (Menges et al. 2007). It is found primarily in sandhills and scrubby flatwoods, and often at the ecotone between these two vegetation types. In the northern part of its range, most sites are on sandhill. This is also true for sites at Tiger Creek Preserve, a site in the central part of its range, which supports the greatest number of plants. At this site, the species is found in both high-quality, frequently burned sandhill, as well as in overgrown sandhill that could also be termed xeric hammock (Menges 2008b). Near the end of its

range (e.g., ABS), *Warea carteri* is found primarily in scrubby flatwoods, often just downhill from a ridge of yellow sand (Menges 2008c, Service 2008).

Wide-leaf Warea

The endangered wide-leaf warea (*Warea amplexifolia*) is a summer annual herb endemic to central Florida where it is known from Lake, Polk, and Osceola Counties and historically from Orange County. Less than 30 populations have been documented, but many have been extirpated. Wide-leaf warea is found on the Lake Wales Ridge and is restricted to longleaf pine and scrubby oak forests. Loss of habitat is the primary threat to this species. There are very few remaining areas of upland, dry, open longleaf pine woods in the area of well-drained white sandy soil from the city of Leesburg to Haines City. This area is now covered with citrus groves, with the few remaining wooded areas occupying mainly lowland sites. Many populations of wide-leaf warea are surrounded by citrus groves and/or urban developments, such as Orlando, Tavares, and Leesburg, and are vulnerable to development pressures. The plant's attractive flowers dispose it to picking by vandals and curiosity seekers, and to taking for use as a cultivated ornamental. Additionally, because this species is an annual and extremely restricted in both range and numbers, it is vulnerable to disturbance and natural disasters. The failure of any one of the remaining populations to set seed in the fall could result in the extirpation of that population and a further reduction in the already small genetic variability of the species.

American Chaffseed

The endangered American chaffseed (*Schwalbea americana*) is a hemiparasitic plant that photosynthesizes in addition to acquiring food from a host plant species through haustoria (modified roots that bridge the vascular systems of the host and parasite). It is present in 174 locations in New Jersey, North Carolina, South Carolina, Georgia, Florida, Alabama, and Louisiana (Service 2008). Out of the 10 occurrences of this plant in Florida, 8 had been extirpated by 1995, including a site in Highlands County. By 2008, the Gadsen County site was extirpated; only the Leon County site is known to support this species in Florida. American chaffseed is an early successional species that requires periodic fire or other disturbance for long-term maintenance of its habitat. Destruction of habitat, fire suppression, and incompatible agricultural and silviculture practices are the major threats to this species. Surveys in South Carolina found American chaffseed in areas being managed for red-cockaded woodpeckers. Controlled burning as habitat maintenance for red-cockaded woodpeckers would also support conditions for American chaffseed. While we expect that this species has been extirpated from the study area, there is potential for reintroduction in suitable habitat.

Highlands Scrub Hypericum

The endangered Highlands scrub hypericum (*Hypericum cumulicola*) is a small, short-lived perennial herb reaching 20 to 70 centimeters in height. It is a rare species that is endemic to the Lake Wales Ridge in central Florida and only known from Polk and Highlands Counties. The scrub hypericum is threatened by habitat loss, isolation of populations, and fire suppression. It is limited to upland areas with well-drained, sterile, white sands (Judd 1980). It is almost exclusively found in the sunny openings in rosemary balds. Rosemary balds are unique vegetative communities that occur as patches within the more expansive scrub ecosystems. These habitat patches provide suitable habitat for a number of rare scrub endemics (Christman and Judd 1990). *Hypericum cumulicola* occurs occasionally in openings in well-drained scrubby flatwoods or among turkey/oak scrubs in yellow sands (Quintana- Ascencio 1995).

Florida Bonamia

The threatened Florida bonamia (*Bonamia grandiflora*) is a member of the morning glory family (*Convolvulaceae*), and is the only species of its genus in the continental United States. This endemic scrub is found only on scrub areas of central and south Florida. Destruction of Florida's scrub habitat for residential housing and agricultural expansion has dramatically reduced the size and number of this population. This species formerly occurred in central Florida from Volusia and Marion Counties south to Highlands and Charlotte Counties (Wunderlin et al. 1980). It is a scrub endemic of central Florida where all of its known populations occur within or near scrub or on the edge of scrub habitat in the white sands associated with the ancient Pleistocene dune systems of the central ridge system (Ward 1979). The substrate is associated with a sand pine scrub vegetation consisting of evergreen scrub oak (*Quercus myrtifolia* and *Q. germinata*) and sand pine (*Pinus clausa*), with openings between trees and shrubs occupied by lichens and herbs. The openings are cleared by infrequent fires or by mechanical disturbance. *Bonamia grandiflora* is also known to live in disturbed areas near roadways and clearings caused by logging operations.

Florida Perforate Cladonia

The endangered Florida perforate cladonia (*Cladonia perforata*), commonly called reindeer lichen, is found in high, well-drained sands of rosemary scrub. It is restricted to the high, well-drained sands of Florida scrub. Florida scrub, which is characterized in part by persistent, open patches of sand, supports a relatively rich assemblage of these terrestrial lichens. Up to eight species of reindeer lichens commonly occur in Florida scrub. *Cladonia perforata* is a habitat-specialist, usually restricted to openings in very xeric sites. It can occur in monospecific mats or in mixed-species mats with other *Cladonia* species (Service 1999). The loss of habitat is the primary reason *Cladonia perforata* was listed. Land conversion to citrus and residential development continues to diminish scrub habitat (Service 1999). Typical habitat for *Cladonia perforata* is found on the high sand dune ridges of Florida's peninsula, including the Atlantic Coastal and Lake Wales Ridges. In these areas, *Cladonia perforata* is restricted to the highest, xeric white sands in sand pine scrub, typically in the rosemary phase (Abrahamson et al. 1984). *Cladonia perforata* typically occurs in open patches of sand between shrubs in areas with sparse or no herbaceous cover (Service 1999). In Highlands and Polk Counties on the Lake Wales Ridge, *Cladonia perforata* occurs at relatively higher elevations than surrounding areas, on excessively well-drained, nutrient-poor, white sands of the St. Lucie series (Buckley and Hendrickson 1988, Yahr 1995).

Florida Ziziphus

The endangered Florida ziziphus (*Ziziphus celata*) is a thorny shrub in the Buckthorn family (Rhamnaceae), endemic to the Lake Wales Ridge in Polk and Highlands Counties. All *Ziziphus celata* populations occupy yellow sand sites that historically supported longleaf pine (*Pinus palustris*) wiregrass sandhills or oak (*Quercus myrtifolia*) hickory (*Carya floridana*) scrub, but most have been converted to pastures or other uses (Weekley and Menges 2006). Threats to this species include habitat loss, genetic limitations, and nonnative species. The species was believed to be extinct when it was described in 1984 from a 36-year old herbarium specimen. Between 1987 and 2007, 14 remnant populations were discovered. Ten of the fourteen extant populations are located on private land (Service 2009). In the most recent survey (2008), a total of 1,088 plants were counted in the 14 wild populations. Two introduced populations totaled 396 plants. Habitat fragmentation has likely played a large role in the current abundance and distribution of *Ziziphus celata*. The loss and fragmentation of habitat, which has taken place over the last few decades, have resulted in scattered remnant, genetically depauperate, and largely sterile populations persisting on degraded sites (Service 2009).

Garrett's Mint

The endangered Garrett's mint (*Dicerandra christmanii*) is a partially woody, short-lived (less than 10 years) perennial shrub growing to 50 centimeters (cm) (Huck et al. 1989). Small white flowers with purple splotches are produced July through October. The leaves of this species produce a strong odor of eucalyptus oil when crushed (Huck et al. 1989). *Dicerandra christmanii* is endemic to the Lake Wales Ridge and occurs only in Highlands County, approximately 5 to 8 kilometers (km) southeast of the town of Sebring. It is distinguished from scrub mint by anther color, odor, leaf length, and chemistry of the compounds found in leaves (Huck et al. 1989). Loss of habitat to residential and commercial development, compounded by an extremely small distribution, as well as fire suppression in tracts of remaining habitat, are the principal threats to this species (Service 1999). There are only four locations recorded for *Dicerandra christmanii*. Three of the four known occurrences are located on private land. Habitat for *Dicerandra christmanii* is yellow sand xeric oak-hickory scrub. All populations are found in areas with moderately well-drained Tavares yellow sands (Menges et al. 1999). These soils support scrub and sandhill vegetation, but have largely been converted to citrus cultivation (Menges 1992). Within the habitats where it occurs, *Dicerandra christmanii* is a gap specialist, growing almost exclusively in openings in between shrubs. Occupied microhabitats typically have shallow leaf litter (less than 2 cm) and partial to no canopy cover (Menges et al. 1999).

Lewton's Polygala

The endangered Lewton's polygala (*Polygala lewtonii*) is a short-lived (5- to 10-year) perennial herb that occurs in high pine (dry, longleaf pine savanna) and occasionally in oak scrub or the transitional areas between these two community types (Service 1999). In the Lake Wales Ridge, the south portion of Carter Creek, including the refuge managed unit and the unprotected unit to the south, have the largest known population of *Polygala lewtonii* (Service 1999). Each plant produces one to several annual stems. This species is closely related to the widespread *P. polygama*. *Polygala lewtonii* occurs in scrub and high pine (dry, longleaf pine savanna) communities of Highlands, Polk, Osceola, Orange, Lake, and Marion Counties within the Lake Wales and Mount Dora Ridges of central Florida (Service 1999). *Polygala lewtonii* is not strictly a scrub species and is found in widely scattered populations that frequently occur in transitional habitats between high pine (dry, longleaf pine savanna) and turkey oak barrens. *Polygala lewtonii* also occurs in both habitats (Wunderlin et al. 1981, Christman 1988). It depends on fire to maintain its habitat. It is found in sunny openings and often colonizes disturbed sites, such as roadsides and fire lanes.

Papery Whitlow-wort

The endangered papery whitlow-wort (*Paronychia chartacea*) is a short-lived dioecious herb, forming small mats. There are two geographically isolated subspecies of this small herb: *P. chartacea* ssp. *chartacea* in central Florida and *P. chartacea* ssp. *minima* in northwestern Florida. *Paronychia chartacea* is currently protected on 26 managed areas on the Lake Wales Ridge, including the Carter Creek and Flamingo Villas Units of the Lake Wales Ridge NWR. *Paronychia chartacea* is also known to exist on preserved lands of the Winter Haven Ridge including the Lake Wales Ridge NWR. *Paronychia chartacea* is endemic to the scrub community of the Lake Wales Ridge (Kral 1983), in Highlands, Polk, Osceola, Orange, and Lake Counties (Anderson 1991). The natural habitat for the papery whitlow-wort is rosemary scrub (Abrahamson et al. 1984, Christman 1988, Menges and Kohfeldt 1995). Although soil preferences for *Paronychia chartacea* elsewhere on the Lake Wales Ridge have not been qualified, it is well known from white, gray, and yellow sands throughout its range, but is most abundant on white sands (Service 2008).

Pigeon Wing

The threatened pigeon wing (*Clitoria fragrans*) is an erect perennial herb belonging to the pea family (Fabaceae). The distribution of the species is limited mainly to the rapidly disappearing scrub habitats of the Lake Wales Ridge in Highlands and Polk Counties (Fantz 1977, Wunderlin et al. 1980, Christman 1988). The total number of *Clitoria fragrans* has been estimated to be less than 3,000 in Orange, Polk, and Highlands Counties (Muller et al. 1989). Christman (1988) indicates that the species is found primarily within habitats intermediate with high pine (dry, longleaf pine savanna) and scrub. Christman and Judd (1990) reported the species from scrub, turkey oak barrens, and the edges of high pines (dry, longleaf pine savannas). Others report *Clitoria fragrans* from scrubby high pine, more typical of hickory-dominated scrub (hickory phase of high pineland) (Menges 1997). *Clitoria fragrans* occupies several xeric upland habitats on white, yellow, and gray sands (Menges et al. 2007, Stout and Lewis 2006), and requires the appropriate use of fire to manage and maintain its habitat.

Pygmy Fringetree

The threatened pygmy fringetree (*Chionanthus pygmaeus*) is a large shrub that occurs primarily in scrub, as well as in high pineland, dry hammocks, and transitional habitats in central Florida. Much of this species habitat has been lost because of land clearing for citrus production and residential development. *Chionanthus pygmaeus* is known from west of Lake Apopka in Lake County, northwestern Osceola County, and the Lake Wales Ridge in Polk and Highlands Counties. One of the largest populations is in the Carter Creek scrubs in Highlands County, where is occurs with turkey oak (*Quercus laevis*), a species more typical of high pine community (Service 1996). *Chionanthus pygmaeus* inhabits excessively drained sandy soils on the Lake Wales Ridge (and historically on the Mount Dora Ridge which is part of its historic range, but where it is no longer found). This species is found on the low-nutrient St. Lucie fine sand which is subject to rapid drying (Wunderlin et al. 1981, Service 1999).

Sandlace

The endangered sandlace (*Polygonella myrophylla*) is found in open scrub sites. It is a sprawling shrub that forms many branches that zigzag along the ground and root at the nodes, forming low mats. The species occurs in scrub habitats along the Lake Wales Ridge in the Davenport-Poinciana area in Polk County and in Highlands County south to ABS. *Polygonella myriophylla* has also been found in Orange and Osceola Counties (Service 1999). This species thrives in areas of bare white or yellow sand created by moderate disturbance. *Polygonella myriophylla* is an allelopathic species (Richardson 1985).

Scrub Blazing Star

The endangered scrub blazing star (*Liatris ohlingerae*) belongs to the aster family (Asteracea) within the genus of perennial, long-lived herbs that live in open, usually fire-maintained habitats. This species is endemic to the Lake Wales Ridge in Highlands and Polk Counties. The species range extends from Lake Blue in Polk County (Service 1996), south along the Lake Wales Ridge to ABS at the south end of the ridge in Highlands County (Service 1999). *Liatris ohlingerae* is one of the endemic plants found in rosemary balds. It is also found along the ecotone between these bald and surrounding scrub habitats on white or rarely on yellow sands (Christman and Judd 1990). It can also be found scattered in surrounding scrub. Herndon (1996) found that *Liatris ohlingerae* has important microhabitat requirements, particularly its preference for shade. Unlike most other scrub endemics, it appears to thrive in lightly shaded areas.

Scrub Buckwheat

The threatened scrub buckwheat (*Eriogonum longifolium* var. *gnaphalifolium*) occurs in high pine (dry, longleaf pine savanna) and in turkey oak barrens in Marion, Pasco, Hillsborough, Lake, and Orange Counties in central Florida (Christman 1988). In Polk and Highlands Counties, it is found on the Lake Wales Ridge as far south as ABS, south of Lake Placid (Service 1999). The northern range limits for scrub buckwheat are in Ocala National Forest and in areas of mixed scrub and high pine (dry, longleaf pine savanna) south of Ocala in Marion County. Suitable habitat and possibly the plant extend south into northern Sumter County. Scrub buckwheat historically occurred near Eustis in Lake County (where it was collected around the turn of the century) and it still occurs near Clermont in remnants of high pine (dry, longleaf pine savanna) with *Polygala lewtonii* and several other endangered plant species (Service 1999).

Scrub Plum

The endangered scrub plum (*Prunus geniculata*) is a small shrub endemic to the oak scrub and high pine (dry, longleaf pine savanna) communities of the Lake Wales Ridge. It has declined with the destruction and fragmentation of its scrub habitat for agriculture and residential housing. *Prunus geniculata* is a scrub endemic known to occur on the ridges of central Florida in Lake, Orange, Osceola, Polk, and Highlands Counties. In these areas, *Prunus geniculata* occurs in both high pine (dry, longleaf pine savanna) and in oak scrub communities (Stout 1982). *Prunus geniculata* prefers dry, sunny, nutrient-poor sites (Harper 1911). It has been found on soils of the St. Lucie series and on other fine sands or fine sand Entisols that are excessively drained. These soils are acidic; are subject to rapid drying; and have little silt, clay, or organic matter (Service 1999). *Prunus geniculata* is native to the high pine (dry, longleaf pine savanna) and oak scrub community types.

Scrub Mint

The endangered scrub mint (*Dicerandra frutescens*) is a partially woody, short-lived (less than 10 years) perennial shrub growing to 50 centimeters (cm) in height. The species does not spread clonally. Scrub mint populations are dependent on fire for long-term persistence. White flowers with vivid purple spots are produced August through October. The leaves of this species produce a strong mint odor when crushed (Huck 1987). The species is endemic to the Lake Wales Ridge and occurs only in Highlands County, Florida (Huck 2008). Five of fourteen occurrences of scrub mint are within two protected areas - ABS and Lake Wales Ridge Wildlife and Environmental Area Highland Park Estates tract. Nine of fourteen occurrences are located on unprotected private land and their present status is unknown. Based on analysis of 2008 aerial images, it appears that four are likely destroyed or heavily disturbed and another five may still be extant based on remaining habitat in the area where they were previously recorded.

Short-leaved Rosemary

Very little is known about the biology or ecology of the endangered short-leaved rosemary (*Conradina brevifolia*). Observations of longevity have been made only in cultivation; plants at Bok Tower Gardens (BTG) live 5 - 10 years (Peterson 2008). The FNAI database contains 35 Element Occurrence Records for short-leaved rosemary. The majority of short-leaved rosemary sites have not been surveyed since 1998 or before (FNAI 2008). Only two new occurrences have been discovered since 1999. Of the 35 recorded sites, 17 occur on 5 conservation areas and are presumed or known to be extant. These areas are: Lake Wales Ridge State Forest; Lake Wales Ridge Wildlife and Environmental Area; Hickory Lake Scrub; Polk County Natural Resources Division; and The Nature Conservancy's Saddle Blanket Lakes Preserve and Sunray Preserve. Eighteen recorded

observations occur on privately owned, non-conservation lands. Recent aerial photographs show that 10 of these 18 sites have been destroyed or are likely to be destroyed due to their small size and proximity to development.

Snakeroot

The endangered snakeroot (*Eryngium cuneifolium*), a member of the Apiaceae (carrot family), is a short-lived (less than 10 years) perennial herb with a very long taproot and flowering stems growing to 0.5 m in height. The species does not spread clonally. Greenish flowers occur for about a month during August to October. Seeds germinate in winter and spring. The species is endemic to the Lake Wales Ridge and occurs only in Highlands County, Florida (Turner et al. 2006, FNAI 2009). Habitat for snakeroot is open sand gaps in white sand scrub, primarily Florida rosemary scrub 'balds' characterized by xeric conditions, relatively sparse vegetation, persistent gaps, and longer fire-return intervals than oak (*Quercus* spp.) and sand pine (*Pinus clausa*) dominated scrubs. Eight of nineteen occurrences of snakeroot are within seven protected areas – Archbold Biological Station, Lake Wales Ridge Wildlife and Environmental Area Lands at McJunkin Tract, Gould Road Scrub, Holmes Avenue Scrub, Lake Apthorpe, and Lake Placid Scrub. Eleven of nineteen occurrences are located on unprotected, private land and their present status is unknown. Based on analysis of 2008 aerial images, it appears that two are likely destroyed or heavily disturbed, two have been destroyed by development and another seven may still be extant based on remaining habitat in the area where they were previously recorded.

Wireweed

The endangered wireweed (*Polygonella basiramia*) is an herbaceous perennial endemic to the central ridges of the Florida peninsula and is one of a suite of herbs found primarily in the rosemary phase of sand pine scrub. It is restricted in distribution with a small number of remaining sires and is faced with continued and dramatic habitat loss. The Lake Wales Ridge in central Florida is the center of diversity for the genus *Polygonella*, whose species have remarkably diverse growth habits ranging from tall and leafy, to upright and virtually leafless (wireweeds), to prostrate (Horton 1960). Wireweed is endemic to Lake Wales Ridge and Winter Haven Ridge of central peninsular Florida. It ranges from Lake Pierce in Polk County southward to Venus near the southern tip of the Lake Wales Ridge in Highlands County. *Polygonella basiramia* is most commonly found in rosemary scrub (Abrahamson et al. 1984, Menges and Kohfeldt 1995). *Polygonella basiramia* occupies open spaces or gaps between shrubs and can be found in abundance along sandy fire lanes.

STATE LISTED PLANT SPECIES

There are potentially 135 state listed plant species in the Study Area (86 are classified as endangered, and 49 as threatened) (Appendix H). There are an additional 7 plant species that are considered commercially exploited. Fifty-two of the plant species in the Study Area are considered endemic. The majority of these are high pine (dry, longleaf pine savanna) and scrub inhabitants (e.g. Florida ziziphus, Garrett's mint), but there is a moderate number of wetland-dependent plants (e.g. pine-pink orchid, Chapman's sedge), and a few grassland species (e.g. wild coco, Florida beargrass).

NONNATIVE AND INVASIVE PLANTS

There are more than 4,000 plant species in Florida of which nearly 25 percent are nonnative (University of Florida 2005). Nonnative plants are defined as "those that have become part of the Florida flora following the occupation by European man" (Source: Richard P. Wunderlin © 2006 Institute for Systematic Botany in University of Florida 2005). Many are benign, but numerous

species become invasive in native habitats, outcompeting native plants and degrading the habitat for wildlife. Numerous nonnative and invasive plants are known to occur in the Study Area, including more problematic and frequently occurring species such as Brazilian pepper, Caesar weed, cogon grass, guava species, hydrilla, limpograss, Japanese climbing fern and Old World climbing fern, natal grass, paragrass, Peruvian primrose willow, smutgrass species, torpedo grass, tropical soda apple, water hyacinth and water lettuce, and Wright's nut-rush.

Brazilian Pepper

Brazilian pepper (*Schinus terebinthifolius*) is a woody species that grows quickly and forms a dense canopy, shading out native plant species. It occurs throughout the Study Area primarily in disturbed land covers (i.e., spoil areas left by canal dredging). It also invades upland inclusions and wetlands within the Kissimmee River floodplain.

Caesar Weed

Caesar weed (*Urena lobata*) is an erect shrub that grows up to 10 feet in height. The plant is single stalked, with free-branching stems that comprise a bushy appearance. It grows as an annual species in many areas of Florida but may perennate in south Florida. Caesar weed invades disturbed areas, pastures, eroded areas, and perennial crop plantations. The species does not compete well in tall grass and brush lands and does not grow under forest canopies. Caesar weed tolerates salt spray but does not grow in saturated soils. Caesar weed grows rapidly and can reach 2 to 7 feet by the end of the first year.

Cogon Grass

Cogon grass (*Imperata cylindrica*) was introduced into Florida in the 1930s and 1940s as potential forage and for soil stabilization purposes. It is an aggressive perennial grass now found throughout Florida. It does not survive in cultivated areas but becomes established along roadways, in forests, parks, and mining areas. It also occurs primarily in disturbed uplands in areas of the channelized Kissimmee River floodplain currently not being restored. It is a problematic species in Kissimmee Prairie Preserve State Park

Guava Species

Both guava (*Psidium guajava*) and strawberry guava (*P. cattleianum*) are frequently found growing in the hammocks and disturbed sites of central and southern Florida. These species are native to Asia and Australia but escaped cultivation. They may form thickets and have a serious impact in native forests and open woodlands. Along with the Surinam cherry, they also serve as a major host for the naturalized Caribbean fruit fly, which occasionally spreads to commercial citrus crops.

Hydrilla

Hydrilla (*Hydrilla verticillata*) is a prolific submergent species that forms dense mats at the water surface. It is an ongoing problem in Florida water bodies. In addition to its far-reaching ecological impacts, the species causes problems with water quality, recreation, and navigation. Hydrilla occurs in many lakes within the Study Area and the Kissimmee River, becoming most evident under conditions of stabilized water levels and extended periods of inundation. During long periods of inundation of the floodplain, hydrilla colonized large areas (e.g., the Oak Creek area on the east-central side of the floodplain). In the Upper Kissimmee Basin headwaters lakes, hydrilla populations have developed a resistance to the systemic herbicide fluridone, formerly used extensively for whole-lake treatments.

This development has reduced treatment options. However, treatments were conducted in 2008 with a new systemic herbicide, followed by application of a contact herbicide, with good success.

Limpograss

Limpograss (*Hemarthria altissima*) is a nonnative grass introduced to the Kissimmee River Basin as cattle forage. It forms dense, almost monospecific stands. The herbicides imazapyr and glyphosate are effective control agents.

Japanese Climbing Fern and Old World Climbing Fern

Japanese climbing fern (*Lygodium japonicum*) and Old World climbing fern (*L. microphyllum*) are present in the Study Area. These nonnative wetland ferns climb to the canopies of wetland trees and large shrubs, eventually killing host plants. Approximately 4,000 acres along the Kissimmee River, primarily wetland forest, are impacted by *Lygodium* spp. (SFMWD 2010). While treatment can reduce density and slow rates of infestation, maintenance control of this species with herbicides alone is not likely. New, small populations of *Lygodium* are discovered on the floodplain each year. Larvae of the *Lygodium*-eating moth *Neomusotima conspurcatalis* were released in early 2009 in Pool D in a cooperative program between the SFWMD and the USDA's Agricultural Research Service. A 900-acre area surrounding the release site will not be treated with herbicide this year so the area can be used as a nursery for the moths.

Natal Grass

Natal grass (*Rhynchelytrum repens*) is an annual grass native to South Africa and is found throughout many counties in Florida. It was introduced as a forage species, but lacks the nutritional qualities of other species. Natal grass prefers dry conditions and is found in waste lands and perennial crop fields. Natal grass displaces native vegetation and prevents those species from regenerating. It is a primary invader of abandoned crop fields, unimproved pastures, and disturbed scrub sites and prevents the natural succession of native species such as *Andropogon* sp. and desirable forbs.

Paragrass

Paragrass (*Urochloa mutica*) is sparsely distributed in patches on the restored Kissimmee River floodplain and the backfilled canal, but populations are not believed to be significantly expanding. This species occupies a floodplain niche similar to the native dominant floodplain species, maidencane (*Panicum hemitomon*), and is difficult to distinguish from that species in aerial photography, making broad-scale monitoring difficult.

Peruvian Primrose Willow

Peruvian primrose willow (*Ludwigia peruviana*) is an invasive wetland shrub that tends to be concentrated in the lower portions of Kissimmee River pools above tieback levees, where water levels have remained relatively stable since channelization in 1971. It currently occurs in a large area of otherwise native floodplain marsh in the Phase I restoration area as well as along river channel edges. Primrose willow populations experience temporary frost impacts in very cold weather (e.g., winter 2009) but can quickly reestablish dense cover. Extended periods of deep inundation also cause dieback, but with rapid vegetative regrowth when water levels recede. This species may pose a threat to restoration of moderate-to-long hydroperiod native wetland marsh and shrub communities.

Smutgrass Species

Small smutgrass (*Sporobolus indicus*) and giant smutgrass (*Sporobolus indicus* var. *pyramidalis*) are invasive bunch grasses native to tropical Asia. It is a serious weed of improved pastures, roadsides, natural areas, and waste areas in Florida. Results of a survey conducted by The South Florida Beef Forage Program in 2003 indicated that smutgrass ranks as the second-most-problematic weed species in Florida pastures, behind tropical soda apple, which is the most problematic weed. However, because practices to control tropical soda apple have been widely adopted in Florida since that survey was conducted, it is likely that smutgrass has by now become the most problematic weed species in Florida pastures.

Torpedo Grass

Torpedo grass (*Panicum repens*) is one of the most serious weeds in Florida. It grows in or near shallow waters forming monocultures where it can quickly displace native vegetation. It is also found in disturbed areas (i.e., degraded spoil areas and the backfilled C-38 canal). Native to Africa and/or Asia, it was introduced to the United States before 1876, primarily through seed used for forage crops. In the early 1900s, the USDA imported and distributed torpedo grass seed for planting in pasturelands, providing forage for cattle. By 1992, torpedo grass had taken over 70 percent of Florida's public waters. The largest infestations can be found in Lake Okeechobee where it displaces close to 7,000 acres of native marsh. Torpedo grass management costs approximately $2 million a year in flood control systems. In Florida, torpedo grass is also a major problem for the citrus and golf course industries. The denseness of the mats may impede water flow in ditches and canals and restrict recreational use of shoreline areas of lakes and ponds.

Tropical Soda Apple

Tropical soda apple (TSA) (*Solanum viarum*) is a native to Brazil and Argentina. Since its discovery in the United States, it has been found in many southern states including Florida, North Carolina, and Mississippi. It was first collected in Glades County, Florida, in 1988. It is estimated that approximately one million acres of pasture, sod farms, forests, ditches, natural areas, etc., are covered with TSA in Florida. Tropical soda apple is extremely prolific, producing roughly 40,000 to 50,000 seeds per plant. Seed is spread primarily via livestock and wildlife, such as raccoons, deer, and birds that consume the fruit. If TSA is not controlled in pastures, it can lead to reduced yields in terms of lower stocking rates, lower forage quality, and lower profitability. Dispersal is also accomplished through contaminated equipment, hay, seed, sod, and composted manure. Cattle, sod, as well as other transported goods carry the potential of spreading this invasive weed to other parts of the state and country. This concern and its rapid spread throughout Florida caused TSA to be placed on the Florida Noxious Weed List in 1994 and the Federal Noxious list in 1995. Specifically, it occurs in uplands along the channelized Kissimmee River floodplain. TSA tortoise beetles (*Gratiana boliviana*) were released throughout the Kissimmee River area in 2007 from FDACS stocks. Some areas have exhibited good control.

Water Hyacinth and Water Lettuce

Water hyacinth (*Eichhornia crassipes*) and water lettuce (*Pistia stratiotes*) are floating nonnative species that are widespread throughout aquatic habitats in the Study Area. They occur within the Kissimmee River restoration area in remnant (non-flowing) river channels and channels with reestablished flow, as well as on the floodplain. Areas of open water that lack emergent vegetation are especially vulnerable for establishment and propagation of these species at the water surface, inhibiting development of native emergent communities. Water hyacinth has become a chronic problem on the Kissimmee floodplain in

the restoration area. Large beds can establish on open water portions of the floodplain with sparse or immature emergent vegetation, and can expand with increasing stage and depths before native emergent species can become established. If uncontrolled, water hyacinth and water lettuce would have the potential to severely disrupt reestablishment of native patterns of vegetation, both in the Kissimmee River channel and the floodplain.

Wright's Nut-rush

Wright's nut-rush (*Scleria lacustris*), an introduced sedge, is of increasing ecological concern in Florida. First collected in 1988, its distribution now extends to more than twenty natural areas in four major drainage regions. Freshwater marshes and lake shorelines characterized by seasonal water level fluctuations appear most vulnerable to invasion by *Scleria lacustris*. Seedlings are believed to emerge and establish during spring when marshes are dry. Juvenile plants adapt readily to the influx of water during the rainy summer months. As late summer surface water levels rise, emergent plants flower and grow to heights of 200 cm. In autumn, mature plants sprawl across the water as their nutlets ripen and disperse. *Scleria lacustris* is native to scattered regions of Africa and the Neotropics. Its source of introduction to Florida is unknown. Birds and airboats are suspected to aid in dispersal of the shiny nutlets, although transport by water through drainage systems could be most important, leaving vast conservation marshes of southern Florida at risk.

D. LAND USE

PLANS/POLICIES/CONTROLS

Land use plans and policies are largely under the control of the various federal, state, and local government agencies. The Central Florida Regional Planning Council (CFRPC) is a planning and public policy agency that works with public and private leadership in the Central Florida Region to achieve a healthy and sustainable future. Working with the CFRPC, the Florida Division of Emergency Management, Division of Community Planning, and Department of Transportation developed the Statewide Regional Evacuation Study for the Central Florida Region (2010). This study updated the region's evacuation population estimates, evacuation clearance times, and public shelter demand. The CFRPC also maintains a local emergency planning committee.

Heartland 2060 is a multi-year effort started by the CFRPC in September 2007. The intent is to create a vision for the future that enables growth while simultaneously: (1) Conserving natural areas; (2) protecting wildlife; (3) protecting agricultural production; (4) supporting healthy communities; and (5) ensuring a vibrant economic and social life. It encompasses seven counties in central Florida, including, Polk, Hardee, Highlands, DeSoto, Okeechobee, Glades, and Hendry. The Nature Conservancy convened a Technical Advisory Group and contractors to develop the ecological foundation for this initiative (The Nature Conservancy 2010).

AGRICULTURAL AND NATURAL AREAS

As indicated earlier in this document, the Study Area is largely agricultural in nature. Approximately, 36 percent of the Study Area is pasture (644,858 acres). Adding rangelands (163,638 acres) to that percentage increases it to roughly 46 percent. Citrus groves occupy an additional 88,800 acres (5 percent) and tree crops, 56,961 acres (3.2 percent). Lakes, rivers, canals, and wetlands also occupy a large portion (almost 30 percent) of the Study Area. Conversely, upland forests comprise only about 140,000 acres (or 8 percent) of the Study Area. The combined residential or urban land uses equal 86,697 acres, which is only about 5.5 percent

of the Study Area. Nearly 400,000 acres within the Study Area are publicly owned (Appendix E) and many of those lands and waters are managed for conservation.

TRANSPORTATION FACILITIES

Transportation facilities within the Study Area include numerous roadways and highways, airports, railroad lines, and utility lines.

Roads and Highways

The most noticeable transportation facility within the Study Area is the network of roads and highways. The Florida Turnpike, which extends from Miami to central Florida, crosses through the middle of Osceola County and bisects the Three Lakes Wildlife Management Area. Numerous highways (e.g., SR 60, I-98, and SR 70) cut east-west across the Study Area, and I-27 runs atop the Lake Wales Ridge. All these roads serve to fragment natural and native habitats and the high rates of traffic on these roads cause animal mortality.

Airports

There are 14 airports within the Study Area; however, six of these are small grass airports (less than 14 acres), and two are private airports (less than 50 acres). Of the six remaining airports, Sebring and Okeechobee are the largest two available to the public. The U.S. Air Force operates the Macdill Air Force Base (auxiliary field) at Avon Park Air Force Range. Identifying the locations of airports within the Study Area is important due to Federal Aviation Association guidelines that limit wetland restoration (or other bird attractants) within 2,000 feet of runways.

Railroad Lines

CSX Transportation operates a Class 1 freight railway that runs from West Palm Beach through Okeechobee, to Winter Haven, Orlando, and north. The South Central Florida Express is a Class 3 freight rail that extends from Sebring south along the Lake Wales Ridge to the western side of Lake Okeechobee.

Utility Lines

Florida Gas Transmission Company operates a natural gas pipeline along SR 70 in the lower portion of the Study Area and on the Lake Wales Ridge in Polk and Highlands Counties. The Gulfstream Natural Gas Systems, LLC, also operates a natural gas pipeline that roughly parallels SR 98 through Okeechobee and Highlands Counties. The pipeline rights-of-way are maintained as low-cut herbaceous ground cover and vary from 50 to 200 feet wide.

E. WILDLIFE RESOURCES

LISTED AND CANDIDATE WILDLIFE SPECIES UNDER THE ENDANGERED SPECIES ACT
There are 14 federally listed wildlife species and two candidate species present in the Study Area (Appendix H). A candidate species is one for which we have on file sufficient information on biological vulnerability and threats to support a proposal to list as threatened or endangered, but for which preparation and publication of a proposal is precluded by higher priority listing actions. The following is a short discussion of each species. For more in depth information, we refer the reader to the Service's South Florida Multi-species Recovery Plan (1999), species five-year status reviews, and the Service's website: http://www.fws.gov/verobeach/.

Birds

Federally listed birds known to be present in the Study Area include Audubon's crested caracara, Everglades snail kite, Florida grasshopper sparrow, Florida scrub-jay, red-cockaded woodpecker, whooping crane, and wood stork.

Audubon's Crested Caracara

Historically, the threatened Audubon's crested caracara [*Polyborus plancus audubonii;* now more commonly referred to as crested caracara (*Caracara cheriway*)] was a common resident in Florida from northern Brevard County, south to Fort Pierce, Lake Okeechobee, and Hendry County. Today, the region of greatest abundance for this large raptor is the area north and west of Lake Okeechobee including much of the Study Area. The preferred habitat is dry or wet prairies, and pastures with wetlands and scattered cabbage palms (Service 1999). The species is an opportunistic feeder, eating primarily wetland-dependant organisms, but also insects and road kills. Critical habitat has not been designated for this species.

Everglades Snail Kite

The endangered Everglades snail kite (*Rostrhamus sociabilis plumbeus*), a medium-sized raptor, is a food specialist that feeds almost entirely on apple snails (*Pomacea spp*.). These snails are found in palustrine emergent, long-hydroperiod wetlands, lakes, streams, canals, and ditches. Although the snail kite may forage in a variety of surface water types throughout the Study Area, some lakes are of particular importance to this species' nesting and survival. Lakes Tohopekaliga (Toho), Kissimmee, and East Lake Toho are primary nesting locations within the Study Area. Lakes Istokpoga, Hatchineha, and Jackson have recently become moderately used nesting sites. Over time, these lakes have become critical to continued snail kite nesting due to droughts and water management practices that have limited snail kite nesting in the species historic nesting areas (e.g., Lake Okeechobee and the Water Conservation Areas). Critical habitat for the snail kite (designated in 1977) occurs adjacent to the Study Area within the western Lake Okeechobee littoral zone. The principal threat to this species is the loss or degradation of wetlands in central and south Florida. Degradation of water quality, particularly runoff of phosphorous from agricultural and urban sources, and regulation of water stages in lakes and the water conservation areas are additional threats to this species.

Florida Grasshopper Sparrow

The endangered Florida grasshopper sparrow (*Ammodramus savannarum floridanus*) occurs in the prairie region of south-central Florida. This subspecies was listed as endangered due to habitat loss, limited distribution, and a declining population. Florida grasshopper sparrows are strongly habitat-specific, occupying only native fire-maintained dry prairie, which occur almost exclusively on a few parcels of public land. Five primary Florida grasshopper sparrow populations occur on public lands in Florida: three at Avon Park Air Force Range (APAFR), one at Kissimmee Prairie Preserve State Park (KPPSP), and one at Three Lakes Wildlife Management Area (TLWMA). Besides these public lands, there is little potential habitat remaining for this species in Florida. There is one population known from a privately owned ranch in Okeechobee County, but it has not been thoroughly assessed since 2001. The unexplained decline of the three populations at APAFR is cause for concern (Delany et al. 2005), and more recently, the populations at KPPSP and TLWMA have also exhibited declining trends. Critical habitat has not been designated for this species.

Florida Scrub-jay

The threatened Florida scrub-jay (*Aphelocoma coerulescens*) is similar in size and shape to the blue jay (*Cyanocitta cristata*), but differs significantly in coloration having a pale blue head, nape, wings, and tail and a pale gray back and belly (Woolfenden and Fitzpatrick 1996). Unlike the blue jay, the scrub-jay lacks a crest. The Florida scrub-jay occupies fire-dominated oak (*Quercus* spp.) scrub habitat on well-drained sandy soils in peninsular Florida and has a social structure that involves cooperative breeding requiring a minimum of 5 hectares of habitat per pair (Service 1999). Scrub-jays are extremely habitat-specific, sedentary, and territorial and may be present in any oak scrub habitat within the Study Area. The greatest threats to the continued existence of scrub-jays are habitat destruction, fragmentation, and modification and lack of effective management. Disease or predation would likely have a greater effect on this species in the future. The recovery of the scrub-jay depends mostly on acquiring (or otherwise protecting) and restoring and/or managing scrub habitat in areas that are important for the species, monitoring the effects of the restoration and/or management activity, and implementing adaptive management, where necessary, to achieve population stability. Critical habitat has not been designated for this species.

Red-cockaded Woodpecker

The endangered red-cockaded woodpecker (*Picoides borealis*) is a non-migratory woodpecker of the southeastern United States that is distinguished by its large, conspicuous white cheek patches, black cap and neck, and black-and-white barred back and wings (Jackson 1994). Red-cockaded woodpeckers are territorial and live in cooperative breeding social units called groups. Such groups are typically comprised of a breeding pair and up to three helpers, which are usually males and most often offspring of the mated pair from previous years (Jackson 1994). South Florida contains significant support populations for recovery of the endangered red-cockaded woodpecker. This species occurs within the Study Area at Avon Park Air Force Range and Three Lakes Wildlife Management area. We expect it may also occur in other remnant pine flatwoods in the Study Area, but private properties have been infrequently surveyed for its presence. Pine stands, or pine-dominated pine/hardwood stands, with a low or sparse understory and ample old-growth pines constitute primary nesting and roosting habitat (Service 1999). Threats to this species include: (1) Insufficient numbers of natural cavities and continuing net loss of cavity trees; (2) habitat fragmentation and its effects on genetic variation, dispersal, and demography; (3) lack of foraging habitat and adequate quality; (4) range-wide and within population isolation; and (5) tenuous viability of small populations (Service 2006). Critical habitat has not been designated for this species.

Whooping Crane

The endangered whooping crane (*Grus americana*) is among the most endangered species on the planet, with about 570 birds remaining globally, with approximately 420 in the wild and 150 in a captive breeding population. Whooping cranes currently exist in four wild populations. The only self-sustaining natural wild population nests in the Northwest Territories and adjacent areas of Alberta, Canada, primarily within the boundaries of Wood Buffalo National Park. These birds winter along the central Texas Gulf of Mexico coast at Aransas National Wildlife Refuge and adjacent areas. Two hundred and eighty-one whooping cranes (46 chicks) were reported from the wintering grounds in February 2011. The flock is recovering from a population low of 15 or 16 birds in 1941. The other three populations are designated Nonessential Experimental Populations (NEP) and have been established through reintroductions. The Eastern Migratory Population currently numbers 106. The core breeding area for this population is in central Wisconsin and they winter in the southeast United States from Tennessee to central Florida. A new reintroduction effort is referred to as the Louisiana Nonmigratory Population. This reintroduction project released the first 10 whooping cranes in

southwestern Louisiana in February 2011. The third NEP is the Florida Nonmigratory Population and is located in the Kissimmee Prairie area of central Florida. Between 1993 and 2004, 289 captive-born, isolation-reared whooping cranes were released into Osceola, Lake, and Polk Counties in an effort to establish this nonmigratory flock. As of January 2011, only 21 individuals are being monitored. Since the first nest attempt in 1999, there have been a total of 72 nest attempts, 33 chicks hatched and only 10 chicks successfully fledged. Releases have ceased due to problems with survival and reproduction, both of which have been complicated by drought. The last releases took place in the winter of 2004-2005. The whooping cranes occupy habitats similar to that of sandhill cranes (*Grus canadensis pratensis*; i.e., large freshwater marshes, pastures, and wet and dry prairies). There is some potential for the population to occupy the Study Area in the future assuming the population increases and the habitat is still present. The Florida NEP designation provides protection under the authority of the Endangered Species Act as a threatened species on national wildlife refuges and national parks and protection under the Migratory Bird Treaty Act otherwise. Critical habitat has not been designated in Florida for this species.

Wood Stork

The endangered wood stork (*Mycteria americana*) is one of two species of storks that breed in North America. This large, long-legged inhabitant of marshes, cypress (*Taxodium* spp.) swamps, and mangrove swamps reaches the northern limit of its breeding range in the southeastern United States where it shares breeding colonies with great egrets (*Ardea alba*), snowy egrets (*Egretta thula*), white ibises (*Eudocimus albus*), and many other species. The unique feeding method of the wood stork gives it specialized habitat requirements; these habitats have been disrupted by changes in the distribution, timing, and quantity of water flows in South Florida. From the 1960s to the mid-1980s, the wood stork nesting population declined in south Florida and increased in north Florida (Ogden et al. 1987). Prior to 1970, 70 percent of the population nested south of Lake Okeechobee and declined from 8,500 pairs in 1961 to fewer than 500 pairs in the late 1980s. However, by 2005, the annual nest count had increased in south Florida to 2,684 pairs (Brooks and Dean, in press). Annual nest counts in central and north Florida have not significantly changed over the last 20 years and fluctuate around 3,100 pairs (Brooks and Dean, in press). There are only two active wood stork breeding colonies within the Study Area. There are an additional five locations of abandoned nesting colonies going back the mid 1980s. There are three active wood stork nesting colonies within approximately 20 miles of the Study Area; therefore, the surface water resources within could support these birds and their offspring. Typical foraging sites include freshwater marshes and stock ponds, shallow, seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs (Service 1999). Critical habitat has not been designated for this species.

Mammals

One candidate for federal listing and two federally listed mammals are known to occur in the Study Area: Florida bonneted bat, Florida panther, and West Indian manatee.

Florida Bonneted Bat

The Florida bonneted bat (*Eumops floridanus*) is a candidate species endemic to Florida. It is also the largest bat in Florida (5-6.6” in length). Although relatively little is known of its ecology, in general, Florida bonneted bats will forage over ponds, streams, and wetlands and drink when flying over open water (Marks and Marks 2008). During dry seasons, Florida bonneted bats become more dependent on remaining ponds, streams, and wetland areas for foraging purposes (Marks and Marks 2008). Florida bonneted bats roost primarily in trees and manmade structures

(Marks and Marks 2008). Species occurrence data are scant, but the bat has been documented at 12 locations in Florida and a study in 2008 documented the bat at 2 locations within the Study Area, 1 at an oxbow along the Kissimmee River in the Kicco Wildlife Management Area and another near Platt's Bluff boat ramp on the Kissimmee River.

Florida Panther

The Florida panther (*Puma concolor coryi*) is one of the most endangered large mammals in the world. They use all habitats contained within their home ranges by selecting for forested habitat types and using all others in proportion to availability (Land et al. 2008). The more open habitats are used more at night (Onorato et al. 2010). Reproduction is known only in the Big Cypress Swamp and Everglades physiographic region in Collier, Lee, Hendry, Miami-Dade, and Monroe Counties, south of the Caloosahatchee River (Belden et al. 1991). Transient male panthers are often documented north of the Caloosahatchee River (and within the Study Area); however, no physical evidence of a female or kittens has been documented north of the Caloosahatchee River since 1973 (Nowak and McBride 1974; Belden et al. 1991; Land and Taylor 1998; Land et al. 1999; Shindle et al. 2000; McBride 2002; Onorato et al. 2010). Habitat loss combined with small population size is the primary threat to this species. Critical habitat has not been designated for this species.

West Indian Manatee

The endangered West Indian manatee (*Trichechus manatus*) is one of the largest coastal mammals in North America. It migrates through fresh, brackish, and marine waters, maintaining a seasonal distribution based on water temperatures. It is occasionally found in Lake Okeechobee and more rarely the lower Kissimmee River. Distribution is also controlled by aquatic vegetation availability, proximity to channels of at least 2 m in depth, and location of freshwater sources (Service 1999). Boat-caused mortality is one of the principal threats to the manatee. Critical habitat was originally designated for the Florida manatee in 1976 in areas of Citrus, Hillsborough, Manatee, Sarasota, Charlotte, De Soto, Lee, Collier, Monroe, Dade, Palm Beach, Martin, Volusia, Brevard, Nassau, and Duval Counties. That critical habitat designation was made before critical habitat regulations and guidance were developed. Therefore, it does not identify those essential features needed for the species conservation. Instead, it describes specific waterways that were known to be important concentration areas for manatees at that time. There is no designated critical habitat for manatees in the Study Area.

Reptiles

Federally listed reptiles known to occur in the Study Area include the bluetail mole skink, sand skink, and eastern indigo snake.

Bluetail Mole Skink

The threatened mole skink (*Eumeces egregius*) is a small, fossorial lizard that occupies xeric upland habitats of Florida, Alabama and Georgia (Mount 1963). Five subspecies have been described (Mount 1965), but only the bluetail mole skink (*Eumeces egregius lividus*; more recently *Plestiodon egregius lividus*) is federally listed as threatened. The bluetail mole skink reaches a maximum length of about 5 inches. The legs are somewhat reduced in size and are used only during surface locomotion, not when the animal "swims" through the sand (Christman 1992). This subspecies only occurs at elevations 80 feet above mean sea level or higher on the southern Lake Wales Ridge in Polk and Highlands Counties, and also Osceola County (based on the collection of a single bluetail juvenile just north of the Polk County line). The habitat for this species is comprised of a variety of xeric upland communities, including rosemary and oak-dominated scrub, turkey oak barrens, high

pine (dry, longleaf pine savanna), and xeric hammocks. Habitat loss, fragmentation, and changes in land use continue to be concerns for the subspecies, and active management is necessary to maintain suitable habitat. Fire suppression, improper stand management, competition by invasive plant species, and loss of genetic diversity continue to threaten the existence of the bluetail mole skink. Critical habitat has not been designated for the bluetail mole skink.

Sand Skink

The threatened sand skink (*Neoseps reynoldsi*) is a small, fossorial lizard that reaches a maximum length of about 5 inches. This species occurs on the sandy ridges of interior central Florida from Marion County south to Highlands County. The sand skink is widespread in native xeric uplands with excessively well-drained soils, principally on the ridges at elevations greater than 80 feet above mean sea level. Commonly occupied native habitats include Florida scrub and scrubby flatwoods, as well as high pine (dry, longleaf pine savanna) communities that include sandhill, longleaf pine/turkey oak, turkey oak barrens and xeric hammock. Habitat loss, fragmentation, and changes in land use continue to be concerns for the species, and active management is necessary to maintain suitable habitat. Fire suppression, improper stand management, competition by invasive plant species, and loss of genetic diversity continue to threaten the existence of the sand skink. Critical habitat has not been designated for the sand skink.

Eastern Indigo Snake

The threatened eastern indigo snake (*Drymarchon corais couperi*) is the longest non-venomous snake in North America, obtaining lengths of up to 8.5 feet. Its color is uniformly lustrous-black, dorsally and ventrally, except for a red or cream-colored suffusion of the chin, throat, and sometimes the cheeks (Service 1999). The range of this snake has been reduced to portions of southern Georgia and Florida. It may be present throughout the state, but its abundance is reduced to a point where it is uncommon. Habitat includes pine flatwoods, scrubby flatwoods, high pine (dry, longleaf pine savanna), dry prairie, tropical hardwood hammock, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats. Threats to this species include primarily loss, degradation, and fragmentation of habitat and vehicle mortality. Critical habitat has not been designated for the indigo snake.

Invertebrates

One candidate invertebrate species is known to occur in the Study Area: the Highland's tiger beetle.

Highland's Tiger Beetle

The Highlands tiger beetle (*Cicindela highlandensis*) is a candidate species found only in Polk and Highland Counties, Florida. It is medium-sized (10.5-12 millimeters long), elongate, and mostly black. The Highlands tiger beetle is often associated with evergreen scrub oaks, as well as high pineland with deciduous turkey oak (*Quercus laevis*) and longleaf pines (*Pinus palustris*). Knisley and Hill (1996) view high-quality habitat as primarily scrub or pine woodland, with a high percent of open sand (greater than 50 percent) and with many natural openings which are continuous or connected to adjacent open patches, or connected by lightly disturbed trails or paths. Results from surveys conducted during 2004-2005 (Knisley 2005) supported previous conclusions that the Highlands tiger beetle occurs in a diversity of habitats and that there are no key plant or other specific indicators of habitat, other than open sandy areas within or adjacent to

scrub or sandhill. The amount of open area was usually the primary indicator of suitable habitat (Knisley 2005). The Highlands tiger beetle has been documented at 40 sites, with the largest counts (> 40 individuals) at the listed locations (Knisley 2005).

- Allen David Broussard Catfish Creek State Park Preserve
- Snell Creek Unit (Lake Wales Ridge NWR)
- Flaming Arrow Boy Scout Ranch
- Tiger Creek Preserve (The Nature Conservancy)
- Carter Creek Unit (Lake Wales Ridge NWR)
- Flamingo Villas Unit (Lake Wales Ridge NWR)
- Horse Creek Scrub
- Walk-in-the-Water Tract (Florida Division of Forestry)

STATE LISTED ANIMAL SPECIES

There are 38 state listed animal species that use the resources within the Study Area (Appendix H). Table 9 shows the number of species per guild. Of these, 18 are of particular interest. They are the Florida black bear (*Ursus americanus floridanus*), Sherman's fox squirrel (*Sciurus niger shermani*), gopher tortoise (*Gopherus polyphemus*), bald eagle (*Haliaeetus leucocephalus*), sandhill crane (*Grus canadensis pratensis*), and 134 species of "long-legged" wading birds (two of which are not state-listed species). The following is a brief discussion of several of these species.

Table 9. State listed species found within the Study Area, listed by guild

Guild	Species of Special Concern	Endangered	Threatened	Florida Endemic
Amphibians	1	0	0	0
Birds	17	4	8	3
Fish	4	0	0	1
Mammals	2	2	3	4
Reptiles	3	5	6	5
Invertebrates	0	0	0	36

Florida Black Bear

The Florida black bear is a unique subspecies of the American black bear that historically ranged throughout Florida and the southern portions of adjoining states (Hall 1981). Today, black bears occupy 18 percent of their historic range in Florida and the state has listed the black bear as threatened. Historically, black bears ranged throughout the southeast with the Florida subspecies inhabiting all of Florida (except the lower Keys) and southern portions of Georgia and Alabama (Hall 1981). However, the distribution of the subspecies has been significantly reduced and fragmented in Florida to six large (Eglin, Apalachicola, Osceola, Ocala, St. Johns and Big Cypress) and two small, remnant populations (Chassahowitzka, Glades/Highlands). Black bears are adaptable and inhabit a variety of forested habitats. Habitat selection by bears is a function of nutritional needs and spatially fluctuating food sources. The Florida black bear thrives in habitats that provide an annual supply of

seasonally available foods, secluded areas for denning, and some degree of protection from humans. Harlow (1961) described optimal bear habitat in Florida as “a mixture of flatwoods, swamps, scrub oak ridges, bayhead and hammock habitats, thoroughly interspersed.”

Sherman’s Fox Squirrel

There are three subspecies of fox squirrel (*Sciurus niger*) in Florida - two are state listed as protected species. The Sherman's fox squirrel (species of special concern) is found in the open piney woods of central and northeastern Florida. The Big Cypress fox squirrel (*Sciurus niger avicennia*; threatened) is found from the Everglades region, in Lee County, to the southern part of Dade County. Fox squirrels in the western Florida panhandle belong to a less vulnerable, more widespread subspecies. These large squirrels exhibit color variations which range from a buff color to gray, and in some instances black. The under parts are usually lighter, and typical specimens have white noses and ears with black faces and feet. They are noted for their long, bushy tails and for their strong hind legs, which allows them to leap easily. The diet of the fox squirrel consists primarily of plant material such as nuts, seeds, fungi, fruit, and buds. Longleaf pine cones and seeds are important foods. They have also been known to occasionally eat animal material such as insects and bird eggs. Primary habitats include sandhills (high pine), pine flatwoods, pastures, and other open, ruderal habitats with scattered pines and oaks. Oak trees are important for seasonal food and nest material.

Gopher Tortoise

The state listed threatened gopher tortoise belongs to a group of land tortoises that originated in North America 60 million years ago, thus making it one of the oldest living species. It can be found throughout the State of Florida and southern areas of Georgia, South Carolina, Mississippi, Alabama, and the tip of eastern Louisiana. The gopher tortoise grows on average to 12 inches in length (up to 16 inches) and weighs about 29 pounds. Gopher tortoises are primarily herbivores and feed on many species of low-growing plants. The largest part of their diet consists of grasses and legumes. They also eat gopher apple, pawpaw, blackberries, saw palmetto berries, and other fruits. Gopher tortoises will also scavenge and are opportunistic feeders, occasionally feeding on dead animals or excrement. Gopher tortoises require well-drained, sandy soils for burrowing and nest construction (Landers 1980; Auffenberg and Franz 1982). Longleaf pine and oak uplands, xeric hammock, sand pine and oak ridges (beach scrub), and ruderal (disturbed) habitat most often provide the conditions necessary to support gopher tortoises (Auffenberg and Franz 1982). The gopher tortoise is important because their burrows also provide homes for other animals, such as indigo snakes, gopher frogs, mice, foxes, skunks, opossums, rabbits, quail, armadillos, burrowing owls, snakes, lizards, frogs, toads, and other invertebrates (up to about 250 other species of animals). This species is expected to exist within natural upland habitats throughout the Study Area.

Bald Eagle

Pre-colonial era population estimates of the state threatened bald eagle (*Haliaeetus leucocephalus*) are in the hundreds of thousands. Due to hunting, organopesticide use, and habitat destruction, the numbers of these large raptors fell to threatened levels in the continental United States of less than 10,000 nesting pairs by the 1950s, and to endangered levels of less than 500 pairs by the early 1960s. Bald eagles were protected by the Endangered Species Act of 1973 and designated as a threatened species in the lower 48 states. Due to a successful recovery effort, the species was de-listed in August 2007. The bald eagle continues to be protected by the Bald and Golden Eagle Protection and Migratory Bird Treaty Acts. Bald eagles may nest throughout the Study Area where nest trees and open water are available; however, the Kissimmee Chain of Lakes, central Polk

County, and Lake Istokpoga are particularly important nesting areas. These areas are part of a larger inland “core nesting area” that extends from Lake Okeechobee north to the lower St. John’s River.

Sandhill Crane

The state threatened sandhill crane (*Grus canadensis*) is a long-legged, long-necked, gray, heron-like bird with a patch of bald red skin on top of its head. Two subspecies of sandhill crane occur in Florida. The Florida sandhill crane (*G. c. pratensis*), numbering 4,000 to 5,000, is a non-migratory year-round breeding resident. They are joined every winter by 25,000 migratory greater sandhill cranes (*G. c. tabida*), the larger of the two subspecies. The greater sandhill crane winters in Florida but nests in the Great Lakes region. Cranes are quite omnivorous feeding on seeds, grain, berries, insects, earthworms, mice, small birds, snakes, lizards, frogs, crayfish, but do not "fish" like herons. Sandhill cranes occur in pastures, prairies, and freshwater wetlands in peninsular Florida from the Everglades to the Okefenokee Swamp.

Long-legged Wading Birds

There are 13 species of “long-legged” wading birds that may occupy the Study Area. These include the American bittern (*Botaurus lentiginosus*), least bittern (*Ixobrychus exilis*), glossy ibis (*Plegadis falcinellus*), white ibis (*Eudocimus albus*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), great blue heron (*Ardea herodias*), green heron (*Butorides virescens*), little blue heron (*Egretta caerulea*), tricolor (=Louisiana) heron (*Egretta tricolor*), black-crowned night-heron (*Nycticorax nycticorax*), yellow-crowned night-heron (*Nyctanassa violacea*), and roseate spoonbill (*Ajaia ajaja*). These species are indicators of the overall health of ecosystems, because they require shallow water with abundant prey for foraging and shrubs or trees for nesting. Within the Study Area, the number of active wading bird nesting rookeries has decreased over the last 40 years. In the 1970s and 1980s there were 14 and 17 active wading bird nesting rookeries, respectively. By the 1990s there were only seven nesting rookeries. In 1999, there were two rookeries in Lake Kissimmee, each with over 100 wading birds comprised by 6 different species. West of Lake Rosalie there is a wood stork rookery. West of Lake Arbuckle there is a rookery that is largely cattle egrets (*Bubulcus ibis*) (a nonnative species). In Lake Istokpoga, there is a great egret and anhinga rookery. Along the lower Kissimmee River there is another cattle egret rookery and on the northern shoreline of Lake Okeechobee there is a large (100+ individuals) rookery made up of great egrets, little blue herons, great blue herons, and white ibises.

In 2009, the largest colony on Rabbit Island in Lake Kissimmee was comprised of 740 cattle egret, 150 great egret, 87 tricolored heron, 75 white ibis, 50 great blue heron, 42 little blue heron, 10 snowy egret, 10 glossy ibis, and 3 black-crowned night heron nests. The largest colony along the Kissimmee River included 240 cattle egret, 11 little blue heron, and 3 tricolored heron nests in the southern reach of MacArthur Run near the Pool C boat ramp. Two other colonies formed southwest of the Pool D floodplain on private property (Lykes Brothers, Inc.), comprising 126 great egret and 27 great blue heron nests (SFWMD 2010).

GENERAL WILDLIFE DIVERSITY AND ABUNDANCE

A variety of other wildlife species use the diverse habitats within the Study Area. More than 400 amphibian, reptile, bird, and mammal species have been identified.

The Study Area provides habitat for a variety of resident and migratory birds. More than 300 avian species are known to occur within the Study Area. Over 200 of these birds are considered migrant, either utilizing habitat in the project area as stopover sites as they migrate or residing locally for a portion of the year.

Waterfowl surveys by the SFWMD on the Kissimmee River have indicated that densities fluctuate from year to year from 0.4 to 7.6 birds/km². Blue-winged teal (*Anas discors*) and mottled duck (*A. fulvigula*) are the two most commonly observed species, accounting for over 95 percent of observations. Other regularly observed duck species include green-winged teal (*Anas crecca*), hooded merganser (*Lophodytes cullulatus*), and wood duck (*Aix sponsa*). The American wigeon (*Anas americana*), northern pintail (*A. acuta*), northern shoveler (*A. clypeata*), ring-necked duck (*Aythya collaris*), and black-bellied whistling duck (*Dendrocygna autumnalis*) are present but are not regularly observed (SFWMD 2010).

There are approximately 40 mammal, 50 reptilian, and 26 amphibian species known to occur within the Study Area. Arthropods are also abundant in the Study Area. There are over 60 species of ants, 70 species of bees, 45 species of spiders, and 120 species of beetles occurring on the on the Lake Wales Ridge and adjacent lands. There are a large number of endemic insects including the emerald moth (*Nemouria outina*) which feeds solely on rosemary, the bee fly (*Bombyliidae* sp.) which is the primary pollinator for the scrub balm, and the scrub millipede (*Floridobolus penneri*). The scarab beetle (*Scarabaeidae* sp.) and gopher cricket (*Gryllus* sp.) are both obligate commensals that are only found in gopher tortoise burrows.

Aquatic invertebrates are an integral component of the food web within the Study Area linking different trophic levels. Riverine water bodies support mayflies and caddisflies, while more lacustrine water bodies are dominated by crustaceans, midges, beetles, and dragonflies. Grazing invertebrates such as the grass shrimp (*Palaemonetes paludosus*) comprise a large portion of the aquatic invertebrate biomass. The Florida apple snail (*Pomacea paludosa*) is also important because it is eaten by many animal species including the endangered Everglades snail kite.

GAME SPECIES

The FWC licenses hunters for the following species in Florida: resident game birds (quail and wild turkeys), resident game mammals (white-tailed deer, gray squirrels, and rabbits), furbearers (bobcats, otters, raccoons, opossums, coyotes, beavers, skunks, and nutrias), and migratory game birds (ducks, geese, common moorhens, coots, snipe, rails, woodcocks, crows, mourning doves, and white-winged doves). With landowners' permission, wild hogs may be taken year-round with no bag limits, size limits, or licenses required. Wild hogs can be taken on wildlife management areas only during specified seasons, where bag and size limits may apply.

NONNATIVE AND INVASIVE ANIMALS

The following are some of the more problematic non-indigenous, invasive animals that occur in the Study Area (excluding fish, which are addressed with other fish species), including feral hogs, coyotes, can toads, Cuban treefrogs, island apple snails, and Asian clams. These species can disrupt ecosystems by changing the structure of plant and animal communities or displacing native species.

Feral Hog

Feral hogs impact native habitats through soil and vegetation disturbance by rooting, interspecific competition for resources, and predation of native flora and fauna. This species is present throughout the Study Area, but avoids deepwater conditions on the Kissimmee floodplain. Feral hog populations are managed through hunts and removal programs to help minimize the impacts to native wildlife and habitat.

Coyote

The coyote (*Canis latrans*) is an exotic species becoming more common in Florida. Coyotes can use most upland or wetland habitats, and has a wide-ranging diet (feeding on rodents, rabbits, lizards, snakes, insects, grasses, watermelon, persimmons, wild berries, grains, fish, turtle eggs, and carrion). They can be a major predator on deer fawns and turkey poults. Little is known about coyote ecology in Florida; it is not known if predation on deer could adversely affect the food source for the Florida panther. Coyotes will kill or injure calves, poultry, hogs, goats, and domestic dogs and cats. With the increase of occurrence of this species, loss of livestock could be problematic and ranchers may have to allocate some resources towards coyote control.

Cane Toad (marine toad, giant toad)

Breeding populations of the cane toad (*Rhinella marina*) have been established in the Kissimmee River Basin since the early 1970s; however, the cane toad is mainly associated with disturbed agricultural and residential areas. This species is a threat to native fauna. Its large size and aggressive nature allow the cane toad to out-compete and prey on native species. The toxicity of the cane toad makes it unpalatable to most potential predators; consequently, there is little predator control of the species.

Cuban Treefrog

The Cuban treefrog (*Osteopilus septentrionallis*) is established in all counties in the Kissimmee River Basin. The species has been recorded recently in aural and/or drift fence sampling along the Kissimmee River. It has been observed to prey on native frogs and toads. The species has the potential to disrupt and displace native species in natural habitats, and therefore, is viewed as a potential problem for restoration of native herpetofaunal communities in the Kissimmee River and floodplain.

Island Apple Snail (channeled apple snail)

This nonnative apple snail (*Pomacea insularum*) is present in both the Upper and Lower Kissimmee River Basins and Lake Okeechobee. This species has potential to reduce abundance of the native Florida apple snail (*P. paludosa*), the primary food source of the endangered Everglades snail kite. Snail kite foraging on this larger nonnative snail was thought to be a problem a few years ago, but evidence now seems to indicate that all size classes of this snail are available to the kites.

Asian Clam

The Asian clam (*Corbicula fluminea*) is common in the Kissimmee River with mid-river channel densities averaging 1,585/m2. It has not been determined to what extent, if any this species is depressing native bivalve populations.

F. FISHERY RESOURCES

SPECIES OF SPECIAL CONCERN

American Eel

The American eel (*Anguilla rostrata*) is a candidate species. American eels hatch in the Sargasso Sea, a 2 million-square-mile, warm-water lens in the North Atlantic between the West Indies and the Azores. They take years to reach freshwater streams where they mature, and

then they return to the Sargasso Sea to spawn and die. They are the only species of freshwater eels in the Western Hemisphere. American eels are likely present in the Kissimmee River portion of the Study Area. The threats to this species include dams and other obstructions in rivers, hydropower plants, and overfishing.

Pirate Perch

The pirate perch (*Aphredoderus sayanus*) is a small (few inches) freshwater fish native to the eastern half of North America. It is dark brown, sometimes with a darker band near the base tail. Its preferred habitat is backwaters of warm water and little current. This species commonly inhabits coastal waters along the east coast of the United States, but is also found in the Study Area within the Kissimmee River. It eats mosquito larva, amphipods, glass shrimp, smaller fish, dragon fly larva, and earthworms. While the pirate perch is not an endangered species, it is uncommon due to the habitats it occupies. Urban development does affect this species with dredging and draining of backwater areas for urbanization purposes.

Recreational, Non-Recreational, and Subsistence Fisheries

The fishery resources within the Study Area can be generally divided into recreational (or sport) fisheries, non-recreational fisheries, subsistence fisheries, and nonnative species. Table 10 lists the fish species in the Study Area. The water resources that support these fisheries are primarily the Kissimmee Chain of Lakes, Kissimmee River, Lake Istokpoga Basin (including Lake Arbuckle and Arbuckle Creek), wetlands, and canals. Many of the fisheries in the Study Area have probably changed over the decades due to water management practices. The installation of water control structures on the Kissimmee River, stabilization of lake levels, drainage of wetlands, increased nutrient inputs, and the influx of nonnative species has resulted in a different ecological setting for aquatic communities. Despite these changes, the area still supports significant and valuable fisheries. According to Mann (2011), lakes Tohopekaliga, Cypress, Hatchineha, and Kissimmee all have excellent largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), and bream (*Lepomis* spp.) fisheries. East Lake Toho has a secondary largemouth bass and black crappie fishery. There is commercial fishing for golden shiners and other non-game fish on all lakes in the Kissimmee Chain of Lakes (Mann 2011). Lake Istokpoga supports a strong recreational fishery for largemouth bass and black crappie. The Lower Kissimmee River is known for its springtime black crappie fishery and as spawning grounds for many important fish species in Lake Okeechobee.

Table 10. Fish species list for Lake Okeechobee and the Kissimmee River Basin
Updated May 2010; Nonnative species are noted with an asterisk

CODE	COMMON NAME	SCIENTIFIC NAME
AMEE	American eel	*Anguilla rostrata*
ATNE	Atlantic needlefish	*Strongylura marina*
BETI	Blue tilapia*	*Tilapia aureus*
BLCR	Black crappie	*Pomoxis nigromaculatus*
BLKI	Bluefin killifish	*Lucania goodei*
BLUE	Bluegill	*Lepomis macrochirus*

CODE	COMMON NAME	SCIENTIFIC NAME
BOW	Bowfin	*Amia calva*
BRBU	Brown bullhead	*Ameiurus nebulosus*
BRHO	Brown hoplo*	*Hoplosternum littorale*
BRSI	Brook silverside	*Labidesthes sicculus*
BSSU	Bluespotted sunfish	*Enneacanthus gloriosus*
CPIK	Chain pickerel	*Esox niger*
CHCA	Channel catfish	*Ictalurus punctatus*
DOSU	Dollar sunfish	*Lepomis marginatus*
EPS	Everglades pygmy sunfish	*Elassoma evergladei*
FGAR	Florida gar	*Lepisosteus platyrhincus*
FLAG	Flagfish	*Jordanella floridae*
GISH	Gizzard shad	*Dorosoma cepedianum*
GOSH	Golden shiner	*Notemigonus crysoleucas*
GOTO	Golden topminnow	*Fundulus chrysotus*
GRCA	Grass carp*	*Ctenopharyngodon idella*
INSI	Inland silverside	*Menidia beryllina*
LACH	Lake chubsucker	*Erimyzon sucetta*
LEKI	Least killifish	*Heterandria formosa*
LGAR	Longnose gar	*Lepisosteus osseus*
LITO	Lined topminnow	*Fundulus lineolatus*
LMB	Largemouth bass	*Micropterus salmoides*
MACI	Mayan Cichlid	*Cichlasoma urophthalmus*
MBTI	Mozambique/blue tilapia*	Tilapia hybrid
MOSQ	Eastern mosquitofish	*Gambusia holbrooki*
OPS	Okeefenokee pygmy sunfish	*Elassoma okefenokee*
PIPE	Pirate perch	*Aphredoderus sayanus*
RBD	Redbreast sunfish	*Lepomis auritus*
RED	Redear sunfish	*Lepomis microlophus*

CODE	COMMON NAME	SCIENTIFIC NAME
RPIK	Redfin pickerel	*Esox americanus*
SAMO	Sailfin molly	*Poecilia latipinna*
SEKI	Seminole killifish	*Fundulus seminolis*
SHMI	Sheepshead minnow	*Cyprinodon variegatus*
SPSU	Spotted sunfish	*Lepomis punctatus*
SPTI	Spotted tilapia*	*Tilapia mariae*
SUCA	Suckermouth catfish*	*Hypostomus plecostomus*
SWDA	Swamp darter	*Etheostoma fusiforme*
TAMA	Tadpole madtom	*Noturus gyrinus*
TASH	Taillight shiner	*Notropis maculatus*
THSH	Threadfin shad	*Dorosoma petenense*
VSCA	Vermiculated sailfin catfish*	*Pterygoplichthys disjunctivus*
WACA	Walking catfish*	*Clarias batrachus*
WAR	Warmouth	*Lepomis gulosus*
WHCA	White catfish	*Ameiurus catus*
YEBU	Yellow bullhead	*Ameiurus natalis*

Non-recreational fish species add to the diversity in the Study Area. Some of these smaller species are important as forage for larger fish, wading birds, alligators, otters, and other predators. They are represented by the following families: sunfish (*Centrarchidae*), shad (*Clupeidae*), minnow (*Cyprinidae*), and killifish (*Cyprinodontidae*). Anywhere the public has access, there is also likely to be some subsistence fishing (including for nonnative species such as *Tilapia* spp. and other cichlids).

NONNATIVE AND INVASIVE ANIMALS

Nonnative fishes are not as abundant in the Study Area as they are in areas of south Florida; however, there are still approximately eight species of nonnative fish (included in Table 10) in the Kissimmee Chain of Lakes and the Kissimmee River Basin.

Brown Hoplo and Vermiculated Sailfin Catfish

Both the brown hoplo (*Hoplosternum littorale*) and vermiculated sailfin catfish (*Pterygoplichthys disjunctivus*) have increased in abundance since their introduction in the late 1990s and can be considered naturalized in the Kissimmee River ecosystem. Both species have potential to interfere with centrarchid (sunfish) breeding success through predation of pit nests (based on feeding habits,

Hoover et al. 2004) although this has not been documented in this region. Because vermiculated sailfin catfish construct nesting burrows, spawning colonies can degrade shoreline stability, increase erosion rates, and increase suspended sediment loads (Nico 2000).

G. RELATED RESOURCES

Sections B and C of Chapter II in the Draft LPP provide an overview of related resources in this landscape, including landscape conservation goals and objectives and partner efforts. The proposed Everglads Headwaters NWR and Conservation Area would contribute to many of these, including the Peninsular Florida Landscape Conservation Cooperative, conservation and mitigation banks, national and international conservation plans and initiatives (including Partners-in-Flight Peninsular Florida Bird Conservation Plan, Wetlands Reserve Program of the NRCS of the USDA, and America's Great Outdoors Initiative), and regional conservation plans and initiatives (including federal recovery plans, the State Wildlife Action Plan, Florida's Endangered and Threatened Species Management and Conservation Plan, Florida Forever Program, Critical Lands and Waters Identification Project, Avon Park Air Force Range Joint Land Use Study, Kissimmee River Restoration Project, SFWMD General Management Plan, Northern Everglades and Estuaries Protection Program, State of the Scrub, Highlands County Comprehensive Plan, Polk County Environmental Lands Program, Osceola County Environmental Lands Conservation Program, and Green Horizon Land Trust). Several federal and state agencies serve as key partners in this landscape, including NRCS, USDA) Avon Park Air Force Range, U.S. Air Force; FWC; FDACS; FDOF, FDACS; FDEP; Florida Division of State Lands, FDEP; and South Florida (SFWMD) and Southwest Florida (SWFWMD) water management districts. During this planning process, the Service contacted several Native American tribes with interest in this landscape: Seminole Tribe of Florida; Miccosukee Tribe of Indians of Florida; Seminole Nation of Oklahoma; Muscogee (Creek) Nation; and Poarch Band of Creeks. The Service met with the Seminole Tribe of Florida during this planning process to develop an understanding of its concerns, including those related to cultural resources. The Tribal Historic Preservation Officer for the Muscogee (Creek) Nation has requested copies of the Draft LPP and Draft EA when available for review. And the Miccosukee Tribe has expressed interest in the project, especially in relation to burial sites and tribal cattle grazing lands in Highlands County.

Figure 1 depicts current conservation lands and waters within the Study Area. Many of our partners already own or have future plans to protect lands in the project area through conservation or agricultural easements. Still others have completed on-the-ground habitat restoration projects throughout the area and the Kissimmee River. These partners use their individual mission statements to focus protection and restoration efforts. Taken together, those mission statements cover the protection of state and federal threatened and endangered species, rare habitats, prairie and flatwoods habitats, ranchlands, and recreational areas that have been identified through the scoping process as being important to the long-term ecological health, economy, and way of life of the region. (Please see the Draft LPP for more information about related resources.)

H. CLIMATE CHANGE

"Warming of the earth's climate is unequivocal, as is now evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level," according to the Intergovernmental Panel on Climate Change (IPCC) Report (Intergovernmental Panel on Climate Change 2007). The IPCC Report (2007) describes changes in natural ecosystems with potential wide-spread effects on many organisms, including fish and migratory birds and their habitats. Present day Florida has experienced 8-16 inches of

sea level rise over the last 70 years (Wanless et al. 1994) and climate change will eventually affect all of the species occurring in central Florida. Central Florida will likely become a major migratory corridor for species in south Florida.

Historically, sea levels have risen 27 feet over the last 4,500 years. Wanless et al. (1994) found that, over the past 2,500 years, south Florida has experienced an average rate of sea level rise of 1.5 inches per century. Wanless (2008) also observed that Florida has experienced a 9-inch rise in sea level since 1932. This is eight times the average rate over the past 2,500 years. Much of this accelerated rise is likely the result of warming and expansion of water in the western North Atlantic Ocean. The 2007 IPCC report identified a 90 percent probability of an additional 7 to 23 inches of sea level rise by 2100.

Scientific evidence that has emerged since the publication of the IPCC Report (2007) indicates an acceleration in global climate change. Important aspects of climate change seem to have been underestimated previously and the resulting impacts are being felt sooner. For example, early signs of change suggest that the 1°C of global warming the world has experienced to date may have already triggered the first tipping point of the Earth's climate system – the disappearance of summer Arctic sea ice. This process could lead to rapid and abrupt climate change, rather than the gradual changes that were originally forecasted.

Other processes to be affected by this projected warming include temperatures, rainfall (amount, seasonal timing, and distribution), storms (frequency and intensity), and sea level rise. Temperatures are predicted to rise from 2°C to 5°C for North America by the end of this century (IPCC 2007). The latest data indicate that with current climate change, hurricanes have increased by 1 percent in wind intensity. That equates to a 1-2 mph wind increase in a Katrina class hurricane of 170 mph (Knutson et al 2008). By 2100, there should be a 10-30 percent decrease in hurricane frequency with a 5-10 percent wind increase. This is due to more hurricane energy available for intense hurricanes. However, hurricane frequency is expected to drop due to more wind shear impeding initial hurricane development. Along with climate change, weather variables are extremely influenced by other natural cycles, such as ENSO, with a frequency of every 4-7 years, solar cycle (every 11 years), and the AMO. All of these cycles influence changes in Floridian weather. The exact magnitude, direction, and distribution of all of these changes at the regional level are not easy to predict. Current climate change models offer a wide range of predicted changes and outcomes.

Climatic changes in central Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management (Pearlstine 2008). Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will implement Strategic Habitat Conservation Planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006).

The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of a changing climate. Based on these findings and other similar studies, the Department of the Interior requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2009).

I. SOCIOECONOMIC AND SOCIOCULTURAL CONDITIONS

This section summarizes population, employment, income, tourism, and wildlife-associated recreation data and trends for counties in the Study Area and, where applicable, state and national levels.

REGIONAL ECONOMIC SETTING

The Study Area comprises a landscape that is largely rural, with agriculture, forestry, ranching, and outdoor recreation/tourism being among the more important economic drivers of the area of interest. Of the 18.8 million residents of the State of Florida, approximately 13 million are located in the 24 south Florida counties that either receive their water supply or are located within a 1- to 2-hour drive of the Study Area (U.S. Census Bureau 2011). For the purposes of this Draft EA, selected demographic and economic data for the following counties were summarized: Brevard, Glades, Highlands, Indian River, Okeechobee, Osceola, and Polk.

POPULATION

Recent Population Trends: 2000-2010

Human population characteristics for the Study Area are shown in Table 11. Data from 2000 is compared to 2010, and the general trend is that population has continued to rise in all the counties of the Study Area, as well as the state. The population of Florida grew by over 17 percent during the past 10 years. Although there has been a relative decline in the rate of population growth, the state continues to add people (Dr. S. Smith, University of Florida's Bureau of Economic and Business Research, pers. comm., 14 March 2011). In fact, the rate of population growth has been greater than projected. In 1995, the U.S. Census (1995) estimated that Florida would have approximately 18,497,000 people by 2015; this number has been reached 5 years earlier than anticipated. Furthermore, Florida is likely to overtake New York as the third most populous state in the nation during the next 10 years (America Online News 2011). Each county in the Study Area had positive population growth during the past 10 years (Table 12). Glades County had the lowest population growth rate of counties compared, at +2.4 percent; Osceola County experienced the highest population growth at +59.5 percent.

Population densities (persons per square mile) increased for all counties (and the state), except for Glades County (Table 11), which only added a relatively small number of people during the past 10 years and remained the least densely populated county in the Study Area. The median age ranged between 34.9 (Osceola County) and 49.7 (Highlands County) in 2010 (Table 11). Between 2000 and 2010, the median age increased in most counties, except for Highlands County, where it declined slightly by 0.3-year.

Table 11. Local and regional population estimates, characteristics, and trends (2000 - 2010)

Demographic Unit	Population Characteristics in 2000			Population Characteristics in 2010			Populatio n Change (2000 to 2010)
	Residents	Persons per Square Mile	Median Age	Residents	Persons per Square Mile	Median Age	
Florida	15,982,378	296	38.7	18,801,310	346	40	+17.6%
Glades County	10,576	14	40.2	10,827	14	42.2	+2.4%
Highlands County	87,366	85	50	98,211	97	49.7	+12.4%
Okeechobee County	35,910	46	36.7	40,472	52	37.3	+12.7%
Osceola County	172,493	130	34.6	275,064	204	34.9	+59.5%
Polk County	483,924	258	38.6	585,128	324	38.7	+20.9%

Source: U.S. Census Bureau 2011

Table 12. State and county population trends (2000 - 2060)

Demographic Unit	2000	2020	2040	2060	Percent Population Change (2000 to 2060)
Florida	15,982,378	22,894,140	29,203,842	35,814,574	+124%
Glades County	10,576	12,991	15,371	17,768	+68%
Highlands County	87,366	115,772	142,481	170,038	+95%
Okeechobee County	35,910	44,770	52,831	61,292	+71%
Osceola County	172,493	384,294	577,044	779,319	+352%
Polk County	483,924	675,627	847,712	1,029,606	+113%

Source: Zwick and Carr 2006

Projected Population Trends: 2000-2060

As was discussed above, Florida's population rose during the past 10 years and is expected to do so for the next 50 years. A study conducted by the University of Florida (Zwick and Carr 2006), estimated that Florida's population will more than double by 2060 (Table 12). Included in the study were population projections at the county level. Of the five counties included in the area of interest, Osceola County is expected to experience the fastest growth, with its population expected to more than triple in 50 years to over 750,000 people. According to the study, Glades County's population would grow at the slowest pace, increasing to about 18,000 between 2000 and 2060 or 68 percent (Table 12).

EMPLOYMENT AND INCOME

Employment and income data was summarized for the counties that are part of the Study Area, as well as the State of Florida (Tables 15 and 16). Data from both 2000 and 2009 are shown as a means of comparison, and both were derived from U.S. Census Bureau (USCB) online sources (USCB 2011). For the purposes of this Draft EA, the most recent data available was 2009 (2010 Census data was not available at the time of preparation of this document).

Employment data for all the industry categories are summarized for 2000 and 2009 in Tables 13 and 14. For the purposes of this Draft EA, the discussion of these data will focus largely on the land- and water-based industries (agriculture, forestry, fishing and hunting, and mining), with the assumption that most of the other industry categories are associated with the more urbanized areas of the counties.

Following the statewide trend, the percentage of land-based industries declined in all counties of the Study Area between 2000 and 2010, with the exception of Glades and Osceola Counties. The percentage of people employed in land-based industries almost doubled in Glade County, from 12.5 percent in 2000 to 24.7 percent in 2010. The largest percentage decline was seen in Okeechobee County, where the percentage of people employed in land-based industries declined from 17.5 percent in 2000 to 11.2 percent in 2010. Relatively fewer people were employed in land-based industries for counties that include larger urban centers, such as Osceola. For Osceola County, land-based jobs accounted for less than one percent (0.6) of the total jobs.

National, state, and county income, unemployment and poverty estimates for 2000 and more recent data are shown in Table 15. Median incomes rose in all seven counties included in the area of interest, following patterns seen at state and national levels. The effects of the economic downturn in recent years can be seen in the comparison between 2000 and 2010 unemployment and poverty data. In all seven counties, unemployment levels approximately tripled between 2000 and 2010. Overall, county unemployment levels were higher than the national average of 9.0 percent. County poverty rates also increased by one to three percentage points during the 2000-2010 period, albeit not to the degree seen in unemployment numbers for that timeframe.

TOURISM AND RECREATION

Tourism is an important part of Florida's economy, contributing $65.2 billion in revenue in 2008, which comprised approximately 11 percent of the state's gross domestic product (Visit Florida 2009). It is estimated that over 84.2 million out-of-state and international visitors visited Florida in 2008 (Visit Florida 2009). That year there were an estimated 17.1 million in-state travelers (Visit Florida 2009). In 2009 the Florida Department of Transportation estimated 81 million annual visitors (FDOT 2010).

Table 13. Percent full and part-time employment* in 2000 for counties in the Study Area and the State of Florida

Industry	Glades	Highlands	Okeechobee	Osceola	Polk	Florida
Agriculture, forestry, fishing and hunting, and mining	12.5	10.3	17.5	0.6	3.4	1.3
Construction	10.0	7.1	9.5	8.8	8.4	8.0
Manufacturing	5.4	4.6	4.7	5.4	9.3	7.3
Wholesale trade	2.4	3.3	2.9	3.2	4.6	4.0
Retail trade	9.6	15.0	11.9	13.3	15.2	13.5
Transportation and warehousing, and utilities	6.6	3.6	5.1	5.9	6.1	5.3
Information	1.0	2.5	1.2	1.5	1.5	3.1
Finance and insurance, and real estate and rental and leasing	3.9	5.0	3.2	5.5	6.2	8.1
Professional, scientific, and management, and administrative and waste management services	3.7	6.8	7.1	6.9	7.3	10.6
Educational services, and health care and social assistance	18.5	20.6	17.7	12.3	17.1	18.1
Arts, entertainment, and recreation, and accommodation and food services	9.5	9.0	7.4	29.7	11.3	10.5
Other services, except public administration	5.9	5.5	4.3	3.9	4.8	5.1
Public administration	10.9	6.6	7.4	3.1	4.8	5.2
Totals	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: U.S. Census Bureau 2011

Table 14. Percent full and part-time employment* for 2009 for counties in the Study Area and the State of Florida

Industry	Glades	Highlands	Okeechobee	Osceola	Polk	Florida
Agriculture, forestry, fishing and hunting, and mining	24.7	7.2	11.2	0.9	2.7	1.1
Construction	9.9	11.9	11.7	9.2	10.2	9.3
Manufacturing	3.7	4.0	2.7	4.2	7.2	5.9
Wholesale trade	3.4	1.9	3.2	2.5	3.2	3.3
Retail trade	10.2	15.1	11.7	13.1	14.1	12.9
Transportation and warehousing, and utilities	2.9	3.8	4.8	6.7	5.9	5.1
Information	0.2	1.5	0.3	1.4	1.7	2.4
Finance and insurance, and real estate and rental and leasing	2.0	4.9	3.4	6.4	6.5	8.4
Professional, scientific, and management, and administrative and waste management services	2.5	9.1	8.1	10.4	9.0	11.8
Educational services, and health care and social assistance	14.0	20.9	17.8	13.8	19.2	19.2
Arts, entertainment, and recreation, and accommodation and food services	5.6	9.9	10.0	23.6	11.9	10.7
Other services, except public administration	5.2	4.4	6.4	4.0	4.5	5.2
Public administration	15.7	5.3	8.6	3.7	3.9	4.8
Totals	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: U.S. Census Bureau 2011

Table 15. Income, unemployment, and poverty estimates

Demographic Unit	Median Household Income (US Dollars)		Percent Unemployment		Percent of Persons below Poverty Line	
	2000[a]	2009[a]	2000[a]	2010[b]	2000[a]	2010[a]
United States	$41,994	$51,425	3.7	9.0[c]	12.4	13.5
Florida	$38,819	$47,450	3.2	11.9 [c]	12.5	13.2
Glades County	$30,774	$39,260	4.2	11.5	15.2	17.5
Highlands County	$30,160	$33,902	1.9	12.0	15.2	16.4
Okeechobee County	$30,456	$38,643	2.5	13.4	16.0	18.6
Osceola County	$38,214	$46,315	3.2	12.4	11.5	13.3
Polk County	$36,036	$44,043	3.3	12.5	12.9	14.4

[a]*U.S. Census Bureau 2011*
[b]*U.S. Bureau of Labor Statistics 2010*
[c]*U.S. Bureau of Labor Statistics 2011*

WILDLIFE-DEPENDENT RECREATION

Nationwide, wildlife-dependent recreational opportunities support hundreds of thousands of jobs in industries and businesses. According to the most recent "National Survey of Fishing, Hunting, and Wildlife-Associated Recreation", 87.5 million Americans spent more than $122 billion in 2006 on wildlife-related recreation (USFWS and U.S. Census Bureau 2006).

In Florida, there were over seven million participants engaged in one or more of three wildlife-dependent recreation activities (fishing, hunting, wildlife watching) during 2006, as shown Table 16 (USFWS and U.S. Census Bureau 2006). Most participants, over four million, engaged in wildlife watching, followed by fishing (about 2.8 million), and hunting (approximately 236,000). In the survey results, wildlife-associated expenditures were segregated into trip-related expenses and money spent on equipment and supplies. Total expenditures (trip-related and equipment/supplies) was the highest for fishing, followed by wildlife watching and hunting. The average expenditures per participant for fishing and hunting was almost double (about $1,500) that of wildlife watching ($720).

Table 16. Economics of wildlife-dependent recreation in Florida during 2006

Activity	Number of Participants	Expenditures			
		Trip-related	Equipment & Supplies	Total	Average Per Participant
Fishing	2,767,000	$1,973,985,000	$2,334,598,000	$4,308,583,000	$1,536
Hunting	236,000	$155,116,000	$222,278,000	$377,394,000	$1,442
Wildlife Watching	4,240,000	$887,942,000	$2,193,554,000	$3,081,496,000	$720
Total	**7,243,000**	**$3,017,043,000**	**$4,750,430,000**	**$7,767,473,000**	

Source: USFWS and U.S. Census Bureau 2006

A 2003 assessment by FDEP on the economic impact of Florida's state parks showed that the park system had an overall direct state-wide economic impact of over $573 million on local economies (FDEP 2003). Direct economic impact was defined as the amount of new dollars spent in the local economy by non-local park visitors (e.g., lodging, purchasing fuel and food, and related activities) and by park operations (e.g., construction and maintenance contracts, etc.). It was estimated that for every 1,000 persons attending a state park, the total direct economic effects on the local community was over $27,400 or roughly $274 per person. Locally, Lake Kissimmee State Park recorded 46,342 visitors in FY 2002-2003, which was a 10 percent increase over 1993-1994. It was estimated that these visitors contributed $1,632,814 in direct economic impact and the equivalent of nearly 33 jobs to the area's economy (FDEP 2003).

In 2003, FWC conducted a survey to determine the economic impacts of 17 FWC wildlife management areas (WMAs) across the state (Harding et al. 2003). According to the report, there were over 1.1 million visits to 17 WMAs in 2003. It was estimated that visitors to the 17 WMAs spent over $100 million annually on goods and services while making their trips. Out of the 17 WMAs, five were selected for additional detailed economic analysis, including J.W. Corbett and Babcock/Webb, which are in the vicinity of the Study Area. Average expenditures (per trip) for consumptive uses (e.g., hunting and fishing) were approximately $425/trip and $154/trip for Corbett and Babcock/Webb, respectively. Expenditures per trip were generally lower for non-consumptive uses (e.g., wildlife watching, photography). Visitors to Corbett and Babcock/Webb spent approximately $163/trip and $127/trip, respectively.

Data on recreational opportunities and use on private lands in Florida are relatively scarce. For the purposes of this EA, we used information derived from a study conducted by FWC and The University of Florida Department of Wildlife Ecology and Conservation that aimed to get a better understanding of land use and habitat/wildlife characteristics on private lands (Willcox and Giuliano 2009). The report analyzed and summarized survey responses from over 1,000 private landowners across the state. According to the report, approximately 9 percent of respondents indicated that recreation was the primary land use on their properties, compared to 70 percent indicating that agriculture was the primary land use. Development was the primary land use according to 20 percent of respondents.

Forty-four percent of landowner respondents or their families hunted. Statewide, 6 percent of landowners leased their land to hunters. Only 3 percent of landowners conducted guided hunts and 4 percent conducted ecotourism, bird watching, or wildlife viewing tours.

Recreational Activities and Trends

Still largely rural, the Study Area includes a variety of opportunities for outdoor recreation, including hunting, fishing, wildlife viewing, hiking, biking, camping, boating, airboating, and off-roading. For the purposes of this EA, the focus of our discussion on recreational opportunities will be on those that are wildlife dependent. Wildlife-dependent uses are those uses for which the wildlife experience is a key part of the activity, including priority public uses for refuges (i.e., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation), as well as those uses that support the priority public uses (e.g., camping, hiking,horseback riding, and bicycling).

In the Study Area, various lands and waters are accessible to the public for a variety of recreational activities (e.g., boating, fishing, hunting, camping, biking, hiking, horseback riding, and wildlife watching) include federal-, state-, and county-managed lands. These public lands include, but are not limited to, those listed.

- County-managed lands (recreational and conservation) and facilities, including parks, campgrounds, nature centers, trails, boat access sites, environmental lands, etc.
- FDACS Lands: Lake Wales Ridge State Forest
- FDEP Lands: Kissimmee Prairie State Preserve State Park and Allen David Broussard Catfish Creek Preserve State Park
- FWC Lands: Bull Creek, Three Lakes, and Triple N Ranch Wildlife Management Areas, Lake Wales Ridge Wildlife and Environmental Area
- SFWMD Lands: Kissimmee Chain of Lakes and lands along the Kissimmee River
- U.S. Department of Defense: Select management units on Avon Park Air Force Range
- USFS (in cooperation with Florida Trail Association): Florida National Scenic Trail

Figure 1 outlines the conservation lands within the Study Area. For a more detailed list of managed lands that include areas open to the public see Appendix E.

Scenic Trails

Several hiking trails are found in the Study Area, the most notable of which is the Florida Trail. One of only eight National Scenic Trails, the Florida Trail was designated in 1983. The trail includes over 1,800 miles of hiking trails and runs from Big Cypress National Preserve through the middle of the state into the western portion of the Panhandle (Florida Trail Association and USDA Forest Service 2006). A segment of the trail that originates at Lake Okeechobee runs roughly through the center of the Study Area along much of the Kissimmee River and area lakes (e.g., Lake Kissimmee and Lake Tohopekaliga). At the county level, several parks offer hiking trails, although few of these are contained within the Study Area.

Hunting

The variety of upland and wetland habitat found in the Study Area supports a diversity of game species, including deer, wild hog, turkey, waterfowl, dove, quail, alligator, and a variety of small game. Many of these species attract sport and game enthusiasts to the area. Several of the game species hunted in the Study Area are discussed further below. The FWC's WMA system has been highly

instrumental in providing quality hunting opportunities in Florida, beginning as early as the 1940s with the purchase of Cecil M. Webb (62,500 acres) and the J. W. Corbett (52,000 acres) areas with Pittman-Robertson Wildlife Restoration funds. Later, FWC began entering into agreements with USDA Forest Service and Department of Defense to include national forests and military installations in the WMA system. In 2008, 19 different partners/cooperators had their lands in the WMA system, with over 5.6 million acres open to public hunting (FWC 2008). Within the Study Area, several landowners offer private hunting leases.

Data on game densities, hunter success rates, and other factors related to hunting specific to managed lands in the Study Area were not available during the writing of this EA. In general, hunting success on some of the WMAs in the Study Areas is related to the degree of hunting opportunities available. WMAs that have more hunting restrictions and less access tend to have hunts that are more likely to be successful (P. Glass, FWC, pers. comm. April 2011).

Deer

White-tailed deer are the most popular game animal in Florida, and based on surveys collected in 2006 approximately 168,000 hunters (or 71 percent of all hunters) targeted this species (USFWS and U.S. Census Bureau 2006a). Compared to many other states, Florida's deer densities are generally lower due to its poorer soils, resulting in decreased foraging opportunities (FWC 2008a). Habitats in Florida where relative deer densities tend to be higher include pine flatwoods, scrub, and wet prairie. These habitats make up a large portion of the natural lands within the Study Area.

Wild Hog

Wild hog, a nonnative species, is the second-most popular large animal taken by hunters in the state (FWC 2011). Hog hunting on state-owned public lands is managed by FWC and requires a license. Although wild hog is generally considered a nuisance species, there are bag limits on some public lands to maintain a quality hunt. On private lands, no license is required and typically there are no bag limits, unless otherwise dictated by the landowner. Wild hogs are numerous in many areas, particularly areas that include wetlands and other sources of water and dense cover. Several WMAs in the vicinity of the Study Area rank among the highest in the state in terms of numbers of hogs taken (FWC 2011).

Alligator

Once rare, the American alligator has rebounded across much of its range and is now legally hunted in several states, including Florida. FWC manages alligator populations within the state and allows a statewide alligator hunt. Since 2000, the number of alligators taken in Florida has more than doubled, from 2,552 in 2000 to 7,844 in 2009. The estimated value of wild alligator products (meat, hides, etc.) was $2,962,832 in 2009. Alligators are also commercially farmed in Florida, and a set number of farms is permitted to collect eggs and hatchlings from the wild for their operations. In 2009, the estimated value of farmed alligators was $2,343,281 (FWC 2011). FWC has designated a number of alligator management units across the state, several of which lie in the Study Area. Portions of the Kissimmee River are popular with alligator hunters, with over 480 permits issued in 2008. Based on a 2008 survey, hunters took an average of at least one alligator per person on three Kissimmee River alligator management units that year (FWC 2011).

Wild Turkey

Another much sought-after game species in Florida is the Osceola or Florida turkey, one of five subspecies of wild turkey found in North America. The Osceola turkey is only found on the Florida peninsula, making it extremely popular with out-of-state hunters (FWC 2011). Based on survey data collected in 2006, approximately 82,000 hunters (or 35 percent of all hunters) targeted wild turkey in Florida (U.S. Census Bureau and USFWS 2006). Osceola turkey are habitat generalists and are likely to thrive in areas as long as a variety of vegetation types is present to allow for foraging, resting, nesting, and brood-rearing (FWC 2008b). Tracts of lands with intensive agriculture or that are more urbanized tend to have lower turkey densities, which includes parts of the northern Study Area and locations west of the Kissimmee River. However, several tracts east of the Kissimmee River are believed to support medium to high turkey densities (FWC 2008b).

Waterfowl

Waterfowl comprise an important part of migratory birds hunted in the United States, and according to national survey data, approximately 1.8 million hunters targeted ducks and geese in 2006 (USFWS and U.S. Census Bureau 2006b). In Florida, there were approximately 42,000 migratory bird hunters in 2006 (USFWS and U.S. Census Bureau 2006a). Species taken include: black duck, mottled duck (Florida duck), fulvous whistling-duck, canvasback, pintail, redhead, scaup, wood duck, scoter, mallard, coot, merganser, light geese (snow, including blue, and Ross), and Canada geese. The state's numerous open water and wetland habitats, many of which are open to public hunting, have resulted in hunter success rates that are double the national average for ducks (FWC 2011). The Study Area contains a variety of waterbodies such as the Kissimmee River and numerous lakes that include sovereign state waters (sovereign submerged lands) that are open to FWC-regulated public waterfowl hunting.

Quail

In 2006, approximately 32,000 hunters (14 percent of all hunters that year) sought northern bobwhite quail across Florida (U.S. Census Bureau and USFWS 2006). Of these hunters, less were likely successful in their endeavors compared to hunters decades ago, due to declining populations of this game species. During the last 50 years, the numbers of quail taken in Florida have decreased by over ten-fold (FWC 2011). Quail require a combination of open areas and dense cover in order to thrive. Across their range, quail are declining as a result of habitat loss due to urbanization, increased grassland cultivation, and the transition of native, grassy fields into woods and forests (Riddle et al. 2010). In Florida, flatwoods and dry prairie are believed to be the primary habitats for quail (Martin 2003). These habitats are among the dominant types found in the Study Area.

Dove

The mourning dove (*Zenaida macroura*) is the leading migratory game bird in the United States and more doves are harvested annually than all other migratory game birds combined (Dolton et al. 2007). In 2008, over 17 million doves were harvested in the United States, with approximately 516,500 taken in Florida (Sanders and Parker 2010). FWC manages public dove fields on several WMAs, including sites located in and in the vicinity of the Study Area. According to recent data, the number of doves reported on managed fields was ranked as "fair" (FWC 2011). Data were not obtained on dove fields located on private lands.

Other Small Game

In addition to quail and dove, other small game hunted in Florida includes snipe, woodcock, rabbit, and squirrel. Of these, squirrel are among the most targeted, with over 49,000 hunters seeking this species in 2006 (USFWS and U.S. Census Bureau 2006). The Study Area includes several WMAs (e.g. Three Lakes, Triple N Ranch, and Bull Creek) that typically rank among the best small game areas in FWC's Northeast Region (FWC 2011). These WMAs contain large areas of flatwoods, interspersed with hardwood hammocks, and other habitat types that support a diversity and abundance of small game. Table 17 outlines the general hunting seasons (please contact FWC for more detailed information about State hunting seasons).

Table 17. General hunting seasons for selected game species in the Study Area
(to be used for the purposes of this EA only; for current, detailed seasons and dates, refer to FWC website: http://myfwc.com/hunting/season-dates)

Game Species	General Hunting Season
Deer	Mid-October through mid-February
Hog	Year-round
Alligator	Mid-August through September
Wild Turkey	Fall: Mid-October through January Spring: First week of March through late April
Ducks	Late September through early February
Geese	Early September through late January
Quail	Mid-October through first week of March
Dove	October through early January
Rabbit	Year-round
Raccoon	Year-round
Opossum	Year-round
Snipe	November through mid-February
Woodcock	Mid-December through mid-January

Fishing

Florida's climate and vast water resources provide numerous and varied opportunities for saltwater and freshwater fishing. The state contains over 3 million acres of lakes, ponds, and reservoirs, and 10,550 miles of rivers, streams, and canals. According to a 2006 survey, over 1.4 million resident and visiting freshwater anglers fished inland waters (USFWS and US Census Bureau 2006a). Popular freshwater fish include largemouth bass, crappie, bluegill, various sunfish, warmouth, striped and white bass, several catfish species, as well as a few nonnative species such as peacock bass and Mayan cichlid (FWC 2011). The Study Area contains a large portion of the Kissimmee River as well as numerous lakes and ponds, with shore and boat access available to anglers at a number of sites.

Wildlife Viewing

Wildlife viewing comprises the largest group of people engaged in wildlife-dependent recreational activities. During 2006, approximately 3.4 million participants engaged in wildlife watching in Florida, more than hunters and anglers combined (USFWS and US Census Bureau 2006a). Although hunting and fishing have seen declines in participation rates in recent years (Aiken 2010), wildlife watching continued to grow in popularity nationally and in Florida between 1991 and 2006, based on survey data (Aiken 2009). The Florida Trail, WMAs, and other public lands and waters located in the Study Area provide a host of wildlife observation and photography opportunities. Wildlife viewing is often conducted in association with a variety of outdoor activities, including boating, fishing, hunting, horseback-riding, and other outdoor activities.

RANCHING

As mentioned previsouly under the Habitats section, ranching is an important land use in the Study area. In 2003, cattle ranching contributed $348 million to the state's economy (Main et al. 2003). In the Study Area, ranching is a major economic mainstay. Table 18 shows a summary of 2009 economic activity associated with ranching and farming in selected south-central Florida counties (MIG, Inc. 2009). Total economic output from ranching and farming in Highlands, Okeechobee, Osceola, and Polk Counties was almost $95 million in 2009 (Table 18).

Table 18. Farming and ranching economic output in Highlands, Okeechobee, Osceola, and Polk Counties

County	Output or Revenue (million $)	Export Sales (million $)	Total Value Added (million $)	Total Value Added Impacts (million $)	Employment (Full-time & Part-time Jobs)	Employment Impacts (Fultime & Part-time Jobs)
Cattle ranching and farming	**94.9**	**70.6**	**14.4**	**43.2**	**652.2**	**1,212.3**
Highlands	**24.3**	**18.1**	**3.7**	**10.5**	**179**	**331**
Okeechobee	**26.3**	**17.4**	**4.0**	**9.4**	**207**	**335**
Osceola	**23.9**	**18.7**	**3.6**	**11.9**	**106**	**237**
Polk	**20.4**	**16.3**	**3.1**	**11.4**	**160**	**309**

Source: MIG, Inc. 2009

ECOSYSTEM SERVICES

Ecosystem services are the suite of goods and services that are provided by healthy ecosystems. Humans benefit from resources and processes supplied by natural ecosystems, examples of which include clean drinking water, flood protection, and recreational opportunities. The concept of ecosystem services has been around for some time (Costanza et al. 1997). From 2001 to 2005 the Millennium Ecosystem Assessment involved more than 1,300 scientists worldwide to provide a state-of-the-art scientific appraisal of the condition and trends in the world's

ecosystems and the services they provide, as well as the scientific basis for action to conserve and use them sustainably (Millennium Ecosystem Assessment 2005). The Millennium Ecosystem Assessment organized ecosystem services into four broad categories: provisioning, such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and crop pollination; and cultural, such as spiritual and recreational benefits (Millennium Ecosystem Assessment 2005).

Many of the ecosystem goods and services have traditionally been viewed as free benefits to society, or "public goods." Lacking a formal market, these natural assets are traditionally absent from society's balance sheet; their critical contributions are often overlooked in public, corporate, and individual decision-making (U.S. Department of Agriculture 2007). Costanza and others (1997) were among the first to assign a dollar amount to the world's major ecosystems, in terms of the goods and services that these provide. According to their analysis, wetlands were worth approximately $6,022 per acre annually, primarily as a result flood and water supply regulation, as well as waste treatment. This amount was a global average, an aggregate based on all the world's wetlands. Regionally, an analysis conducted by the Arthur R. Marshall Foundation showed that Everglades restoration would more than pay for itself over time (Giraud et al. 2010; unpublished report).

J. CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act of 1966, as amended, and Section 14 of the Archaeological Resources Protection Act require the Service to evaluate the effects of any of its actions on cultural resources [e.g., historic, architectural, and archaeological that are listed or eligible for listing in the National Register of Historic Places (NRHP)]. In accordance with these regulations, the Service has coordinated the review of this proposal with the Florida State Historic Preservation Office.

The body of federal historic preservation laws has grown dramatically since the enactment of the Antiquities Act of 1906. Several themes recur in these laws, their promulgating regulations, and more recent Executive Orders. They include: (1) Each agency is to systematically inventory the historic properties on their holdings and to scientifically assess each property's eligibility for the National Register of Historic Places; (2) federal agencies are to consider the impacts to cultural resources during the agencies' management activities and seek to avoid or mitigate adverse impacts; (3) the protection of cultural resources from looting and vandalism are to be accomplished through a mix of informed management, law enforcement efforts, and public education; and (4) the increasing role of consultation with groups, such as Native American tribes, in addressing how a project or management activity may impact specific archaeological sites and landscapes deemed important to those groups. The Service, like other federal agencies, is legally mandated to inventory, assess, and protect cultural resources located on those lands that the agency owns, manages, or controls. The Service's cultural resource policy is delineated in 614 FW 1-5 and 126 FW 1-3. In the Service's Southeast Region, the cultural resource review and compliance process is initiated by contacting the Regional Historic Preservation Officer/Regional Archaeologist (RHPO/RA). The RHPO/RA would determine whether the proposed undertaking has the potential to impact cultural resources, identify the "area of potential effect," determine the appropriate level of scientific investigation necessary to ensure legal compliance, and initiate consultation with the pertinent State Historic Preservation Office (SHPO) and federally recognized tribes. The Service believes that the proposed acquisition of lands would have no adverse effect on any known or yet-to-be identified NRHP-eligible cultural resources. However, in the future, if the Service plans or permits any actions that might affect eligible cultural resources, it would carry out appropriate site identifications, evaluations, and protection measures as specified in the regulations and in Service directives and manuals.

The Study Area for the proposed Everglades Headwaters NWR and Conservation Area spans five counties and runs north from Lake Okeechobee to East Lake Tohopekaliga. It encompasses the watershed of the Kissimmee River. Given the history of this area, cultural resource sites are expected to be encountered. Further, the Study Area encompasses numerous sites of interest to the Seminole Tribe of Florida and potentially includes sites of interest to the Miccosukee Tribe. Sites that might be encountered within the proposed 50,000-acre refuge include green corn dance sites, villages, camps, cemeteries, and historic landscapes, such as the Okeechobee Battlefield. Further, the Brighton Reservation of the Seminole Tribe of Florida is located in Glades County, adjacent to the Study Area and the Miccosukee Tribe has cattle grazing lands in Highlands County. Since the Everglades Headwaters NWR and Conservation Area are currently proposed and thus no approved boundary exists, the cultural resources discussion will provide a thumbnail sketch of the cultural history of the watershed. If the Everglades Headwaters NWR and Conservation Area were to be approved, a more detailed cultural resources management plan, which includes sections describing recorded historic properties and past historic and archaeological investigations, may be drafted at a future date if needed and/or cultural resources would be further detailed in a subsequent comprehensive conservation plan.

Although the earliest known human occupation in Florida dates to the Paleoindian Period (ca. 10,000-8,000 BCE), the first widespread human settlement in the Kissimmee watershed and Lake Okeechobee basin occurs during the Belle Glade I Period (800 BCE-200 CE). Earlier sites, such as the Nalcrest Site (8PO15), have been recorded in the Study Area. The Nalcrest Site is a Late Paleoindian/Early Archaic lithic workshop, which included a variety of microlithic tools and cores likely used for leatherworking and/or processing plant fibers for cordage and basketry (Milanich 1994: 58). Geological evidence indicates that the Kissimmee River is a relatively young river that did not consistently flow prior to 3000 BCE, which may account for the sparseness of Paleoindian and Archaic Period sites (Osborn, Wilder, O'Steen, and Carrier Jones 2008: 27).

The Belle Glade Period spans 1000 BCE to 1715 CE and is divided into five discrete subperiods. Sites dating to this time period often have elaborate earthworks that include mounds, burrows, ponds, ditches, canals, and linear and annular embankments. One of the better known and most elaborate Belle Glade sites is Fort Center, which was excavated by Sears (1982). Smaller and less elaborate sites are seen throughout the basin close to rivers and on hammocks along deep water sloughs, marshes, and seasonal ponds (Newman, Memory, and Swann 2000: 6). Belle Glade Plain and Glade Plain wares dominate the early cultural sequence. Decorated wares and St. Johns types appear later. Belle Glade populations exploited a range of plants and animals, though they may have modified wet areas for use as gardens or agricultural fields. Sears (1982) recovered maize pollen from several locations at Fort Center; the earliest date is ca. 450 BCE coming out of the fill of circular ditches. As Milanich (1994: 290) noted, it is undetermined now whether maize constituted a major component of the diet or a highly specialized commodity for specific high status residents (Poplin, McMakin, and Harvey 1996: 28).

European explorers and colonists stayed primarily along Florida's coastal margins, though at least one group of Spanish soldiers based in Tampa Bay traveled inland meeting Urriaparocoxi in 1539 near Lake Apopka. Urriaparocoxi was the paramount chief of the Tampa Bay region. The Study Area was part of Florida referred to by the Spanish as "la rinconada," which loosely translated as corner or nook. Several tribes were mentioned in and around this area, such as the Jororo, the Ais, the Guacata, and the Jaega. The Ais were located in the Indian River area to the east; the Guacata on the St. Lucie Sound and River; and the Jaega around Juniper Inlet (Swanton 1979). Two Jororo sites – the Goodnow Mound near Sebring in Highlands County and the Philip Mound near Lake Marian in Polk County – have yielded 17th century Spanish artifacts, though it is unclear whether this represents direct contact between the Jororo and the Spanish or a movement of goods through an existing trade network. The Jororo were described

by the Spanish as hunter-gatherers heavily reliant on fishing and wild plants. Their language was different from the Timucuans of the coastal and St. Johns basin (Osborn, Wilder, O'Steen, and Carrier Jones 2008: 28). By the late 1700s, most of Florida's indigenous groups had been devastated by European-introduced diseases, conflicts with European settlers, and cultural disruption. The Study Area remained largely unknown and unmapped by European and, later American, settlers until the mid-19th century (Newman, Memory, and Swann 2000: 7).

In the early 18th century, the Spanish encouraged the Lower Creeks to move into northern Florida. The Spanish called these groups "cimarrones" or "wild ones." As the "cimarrones" moved further into the Florida peninsula and away from the Creek sphere of influence, they emerged as the Seminoles (Weisman 1999: 14). The history and archaeology of the Seminole and Miccosukee Tribes have been the subject of numerous investigations (Carr and Steele 1993; Covington 1993; Fairbanks 1978; Kersey 1987; MacCauley 1887; Weisman 1999 & 2000; and Wright 1986). The reader is referred to these well-written and accessible volumes. The Study Area has and continues to play an important role in Seminole history, ethos, and sovereignty. Village and camp sites associated with Chief Jumper, Sam Jones, Chipco, and Tallahassee; "old Indian fields" and pastures for cattle; Green Corn Dance grounds; and sites and battlefields associated with the Seminole Wars are scattered throughout the five-county Study Area. The Brighton Reservation (of the Seminole Tribe of Florida) abuts the Study Area's southwestern corner (Carr and Steele 1993; Masson, Carr, Goldman, and Steele 1987; Weisman 1999).

The Armed Occupation Act of 1842 and the Federal Swamp Act of 1850 opened the Kissimmee watershed to American settlement. Ranchers and cattle herds spread over the vast prairies east of the central Florida ridge. During the American Civil War, ranchers provided beef to both the Confederate and Union forces. After the war, they found new markets first in Cuba and then locally. Other industries, such as commercial citrus groves, phosphate mining, timber and naval stores production, formed the foundation of the area's economy. By the mid-19th century, cattle families, such as the Streaty Parker, Benjamin and Joseph Guy, A. E. Godwin, John M. Pearce, Mitchell Alderman, and Eli Morgan, ran cattle first on open range lands along the Kissimmee River. Open range gave way to fenced pasturage following the early 20th century outbreak of the fever or "Texas" tick. In 1924 Florida enacted a law making cattle dipping compulsory. The state provided funding for dipping vats, as well as financial incentives for each cow dipped. During the tick epidemic, cattlemen needed to treat their cattle every eleven days. Dipping vats became centers of social activities during this period. In addition to dipping vats, other traces of the cattle industry can be found throughout the Study Area. These traces include remains of cow pens, farmsteads, ranch houses, cattle camps, and fence lines (Newman, Memory, and Swann 2000: 14-16; Hughes and Groover 1999). Akermen (2007) provides a detailed account of Florida's cowmen and the cattle business.

Water management has been a critical factor in altering and controlling the Study Area's landscape. The earliest efforts are seen at Belle Glade sites, such as Fort Center, and represent a specialized adaptation to area's wetlands, savannahs, and hammocks (1000 BCE-1715 CE). As noted above, Belle Glade sites are characterized by elaborate earthworks, which include ponds, borrow pits, ditches, canals, and linear and annular embankments. The Federal Swamp Act of 1850 transferred federal wetlands and overflowed lands to the states with caveat that proceeds of any sales go to drainage and land reclamation. Florida created the Trustees of the Internal Improvement Trust Fund in 1855 to handle such sales and to oversee drainage and reclamation projects. Following the American Civil War, the Internal Improvement Trust Fund sought to re-invigorate the land reclamation process and contracted Hamilton Disston in 1881, to drain extensive areas in the Kissimmee and Caloosahatchee basins. Disston would procure rights or titles to alternate sections of land along his canals. His first major drainage and water transportation project was a series of canals connecting Lake Kissimmee, Lake Hatchineha, Cypress Lake, and Lake Tohopekaliga and a

canal from Lake Okeechobee west to Lake Hicpochee and to Lake Flirt. To deal with the increased amount of water flowing into Lake Okeechobee, Disston cut canals into the Calooshatchee, Miami, and St. Lucie Rivers. Levee construction was planned to contain rivers in banks and to prevent water from re-flooding drained marsh areas. The Everglades Drainage District was established in 1913. The District extended just north of Lake Okeechobee south to the end of the peninsula and was charged with permanently lowering the Lake's water levels and preventing overflow into the Everglades. Their primary objective was the expansion of agricultural lands, primarily for sugar cane cultivation. The District was bankrupt and out of business by 1928. Beginning in late 1930s, the Central and South Florida Flood Control Project under the direction of USACE sought further to tame the watershed and its surrounding area for flood control and to ensure a supply of freshwater for human consumption and agriculture. The USACE channelized the sinuous Kissimmee River and constructed a network of canals, levees, and control structures. The USACE's flood control and water storage projects achieved these objectives, but have lead to extensive damage of wetlands heavily used by migratory waterfowl, poorer water quality, and the eutrophication of Lake Okeechobee (Poplin, McMakin, and Harvey 1996: 48-80).

III. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

A. INTRODUCTION

This chapter presents the alternatives including our Proposed Action that we believe best meets the purposes, vision, and goals for the proposed Everglades Headwaters NWR and Conservation Area. The vision is to "conserve, protect, and manage one of the great grassland and savanna landscapes of eastern North America for current and future generations by protecting the important wildlife and habitats of the working rural landscape of central Florida's Kissimmee River Basin that is home to abundant fish and wildlife resources, that is vital to restoration and protection of the water quality and quantity for the Everglades ecosystem, that is resilient to the effects of global climate change, and that offers outdoor recreational opportunities important to the region's economy."

Several purposes were identified to further the vision for the proposed Everglades Headwaters NWR and Conservation Area, as listed.

> *"... 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 of 1973)*
>
> *"…the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C.3901(b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986)*
>
> *"…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds…." 16 U.S.C.715d (Migratory Bird Conservation Act)*
>
> *"…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) "…for the development, advancement, management, conservation, and protection of fish and wildlife resources...." 16 U.S.C.742f(a)(4), (Secretarial powers to implement laws related to fish and wildlife) (Fish and Wildlife Act of 1956)*
>
> *"…suitable for (1) Incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. 460k-1 "... 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 (16 U.S.C.460k-460k-4), as amended]*

Four overarching goals were then developed for the proposed Everglades Headwaters NWR and Conservation Area. The goals are intentionally broad, descriptive statements of the desired future conditions. They embrace the proposed refuge purposes and the proposed vision statement.

Descriptions of the three alternatives address the goals in narrative form, and offer an explanation of how each alternative addresses the proposed refuge's goals. The Proposed Action (Alternative C) is addressed in more detail in the interim compatibility determinations (Appendix B) and in the conceptual management plan (Appendix A), which provide general, interim management direction for the proposed refuge until approval of a considerably more detailed comprehensive conservation plan. If the Everglades Headwaters NWR and Conservation Area were to be approved by the Director of the Fish and Wildlife Service, the Service would develop a comprehensive conservation plan within 15 years of approval. The goals established for the proposed Everglades Headwaters NWR and Conservation Area address a functional conservation landscape; habitat for fish and wildlife; enhanced water quality, quantity, and storage; and wildlife-dependent recreation and education, as listed.

Goal 1. Functional Conservation Landscape. The upper Everglades watershed will become a more connected and functional conservation landscape that will provide effective habitat connections between existing conservation areas and allow habitats and species to shift in response to urban development pressures and global climate change.

Goal 2. Habitat for Fish and Wildlife. The Everglades Headwaters NWR and Conservation Area will provide a wide range of quality Kissimmee River Basin habitats to support migratory birds, federal and state listed species, state designated species of conservation concern, and native wildlife diversity.

Goal 3. Enhanced Water Quality, Quantity, and Storage. Focusing on restoring or mimicking natural hydrologic processes, the Everglades Headwaters NWR and Conservation Area will contribute to water quality, water quantity, and water storage capacity of the upper Everglades watershed to support Everglades restoration goals and objectives and water quality and supply for central and south Florida.

Goal 4. Wildlife-dependent Recreation and Education. Refuge visitors of all abilities will enjoy opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of the important grassland and savanna landscape of the headwaters of the Everglades.

Under the National Environmental Policy Act (NEPA), the Service developed and evaluated a reasonable range of alternatives. The Proposed Action defines what the Service plans to do or recommend, but cannot implement without considering other reasonable, environmentally sensitive alternatives. Other reasonable alternatives to the Proposed Action that could also be viewed as fulfilling the proposed purposes of the refuge are described in this Draft EA, thereby offering the Service and the reviewing public an opportunity to consider a range of reasonable alternatives for the Proposed Action, and thus fulfilling one of the key tenets of NEPA.

B. FORMULATING ALTERNATIVES

The Service developed and evaluated a reasonable range of alternatives based on the issues raised during internal and public scoping by the Service, the public, other federal governmental agencies, Native American tribal governments, state and local governmental agencies, organizations, and local businesses. Alternatives describe complementary management approaches for achieving the missions of the Service and Refuge System, the purposes for which the refuge might be established, and its vision and goals, while responding to issues and opportunities identified during the planning process (see the Public Participation section in Chapter I for more information).

The basic process for formulating alternatives involved wildlife and habitat databases and modeling, including the FWC's 2003 raster graphic land cover layer, the SFWMD's 2004 vector version of the FDOT Future Land Use and Cover Classification System (FLUCCS) code coverage, and a new coverage recently completed by the FNAI Cooperative Land Cover Map. The alternative formulation planning process was based on two objectives: (1) To identify high-priority ecological value lands that are currently unprotected, and (2) to identify potential corridors for animal movement across the landscape and habitat connectivity between existing public lands (e.g., state parks or wildlife management areas) or other similar natural lands (e.g., Avon Park Air Force Range and The Nature Conservancy's landholdings). FWC and Service experts met to identify the habitats considered most rare or most in need of protection within the Study Area, because they support either keystone species or federally listed threatened or endangered species. Generally, the highest priority habitats were dry prairie (with any associated wet prairie habitat that could support Florida grasshopper sparrows), cutthroat grass plant communities, and Florida scrub or sandhill (that supports endemic xeric plants and animals). The second highest ranking habitats were all flatwoods types (scrubby, mesic, and hydric), and other upland and wetland forests. The third highest priority habitats were primarily long-hydroperiod herbaceous marshes. The next step was to analyze connectivity throughout the landscape using the databases listed above using Geographic Information System (GIS) software. Several areas including urban and developed lands were not considered in the development of the alternatives, since they were determined to not meet the Service's criteria for additional conservation or protection. This analysis of ecological value and connectivity resulted in the identification of areas potentially suitable for refuge acquisition. (See Appendix F for a more detailed explanation of this process.)

To help further the development of alternatives, the Study Area was divided into two distinct geographic areas, based upon the distinctly different resource values (e.g., habitat for listed species, endemic habitats, focal species, and landscape connectivity): (1) Ridge (west of the Kissimmee River Basin divide) and (2) Prairie (east of the Kissimmee River Basin divide). Each of these areas was further divided into North, Central and South Units, resulting in six units. These units identified high conservation value areas proposed for acquisition. Unit designation is primarily used to define the specific areas for ease of discussion (See Alternative C description and maps.)

Based on this process to identify and evaluate alternatives, the Service selected three alternatives, including the NEPA required No Action Alternative, to provide a baseline for comparing the other two action alternatives. The three alternatives evaluated in detail are listed.

- Alternative A. No Refuge and No Conservation Area (No Action Alternative)
- Alternative B. Refuge Only Approach
- Alternative C. Conservation Partnership Approach (Proposed Action)

Once priority habitats and connectivity were identified and public input was considered, we developed the description of the alternatives. For Alternative B, the more traditional approach, we selected four planning units containing high-priority conservation lands in which to focus fee title acquisitions: Ridge North, Ridge South, Prairie Central, and Prairie South. These areas were determined to be some of the most important in terms of habitat value and connectivity and identified approximately 50,000 acres for fee title acquisition. For Alternative C, the conservation partnership approach, the lands identified expanded upon the high-priority conservation features identified in Alternative B. Based on our analysis (Appendix F), an area of approximately 130,000 acres was identified (i.e., the Conservation Focal Area for the proposed refuge), within which the Service would have a purchase cap of up to approximately 50,000 acres. This Conservation Focal Area would provide the Service with the opportunity to respond to opportunities for land acquisition, while still limiting Service acquisition to 50,000 acres. Beyond the three outlined alternatives, three other alternatives were

considered, but discarded, since they were determined not to be feasible and did not serve the stated purpose and need, mission of the Service and Refuge System, and proposed vision and goals.

One alternative evaluated, but discarded was an alternative that focused only on proposing a refuge in a single, contiguous block of 50,000 acres. This 50,000-acre proposal would have a fee title acquisition focus, while less than fee title methods of acquisition would also be considered. Although this approach would add to broad conservation goals within this landscape, it was determined to not further the outlined purpose of landscape-scale strategic habitat conservation, and would only provide landscape connectivity in one specified location in the landscape. This approach would not provide greater connectivity between existing conservation lands and resiliency across the landscape to allow wildlife to better respond to the impacts of global climate change. An overriding concern is to enhance the functionality of the conservation landscape in the Kissimmee River Basin, which this alternative would not achieve.

Another alternative evaluated, but discarded, was an alternative that proposed to focus exclusively on utilizing conservation easements (i.e., Service purchase of only certain landowner rights and privileges such as development rights) without any fee title acquisitions (i.e., Service ownership of all landowner rights and privileges). It was determined that this approach would not provide the Service the opportunity to provide wildlife-dependent outdoor recreation and education opportunities. Since the specifics of conservation easements are highly dependent upon the landowners, the Service could not guarantee under this alternative the ability to provide opportunities for wildlife-dependent recreation and education. Although a conservation easements-only approach was determined not to be feasible, conservation easements are useful tools that were incorporated into a more robust approach to landscape-scale conservation that is outlined in the Proposed Action.

The third alternative evaluated, but discarded was a proposal for the Service to acquire interests in lands (e.g., by conservation easements or fee title acquisitions) and then turn over ownership or management of these lands to another conservation agency or organization (e.g., FWC). This approach was also determined not to be feasible since the Service does not have sufficient authority to divest its interest in land ownership in this type of wholesale manner to another management entity. Under this type of alternative, the Service would not be able to assure or guarantee that future funds or support would be available to support the accepting management entity. Additionally, other agencies and organizations do not have the capacity to assume management responsibilities without reimbursement and compensation. Due to the inability of the Service to obligate future management funds and the inability of other management organizations to assume management responsibilities without compensation, this approach was not considered further. Although the approach to turn over wholesale ownership and/or management was determined not to be feasible, working with partners to assist in conservation and management within this landscape, including management of recreational opportunities, was incorporated into a more robust approach to landscape-scale conservation that is outlined in the Proposed Action.

C. ALTERNATIVES

The three alternatives are summarized, followed by a narrative description of each alternative with appropriate figures. The narrative description for each alternative describes the possible management activities that would help meet the overarching goals of the proposed Everglades Headwaters NWR and Conservation Area. Maps are used to illustrate lands that could be included under each alternative.

To help explain the alternatives, definitions are listed for several terms (i.e., Conservation Partnership Area, Conservation Area, Conservation Focal Area, Refuge Acquisition Boundary, Refuge Boundary, and Study Area) and the matrix in Table 19 provides a broad overview of each alternative.

Conservation Partnership Area	A specified area within which the Service would work with partners and willing landowners to achieve conservation goals and within which the Service would have authority to work with willing landowners to acquire less than fee title interest or enter into management agreements. The Service would only be authorized to acquire up to a specified amount or acreage cap. Alternative C identifies an approximately 816,000-acre Conservation Partnership Area. The Service would have an acquisition cap of 100,000 acres for less than fee title acquisitions (with a conservation easement focus). The designation of a Conservation Partnership Area would not convey authority to establish rules and regulations throughout the 816,000-acre Conservation Focal Area.
Conservation Area	The less than fee title interest acquired within the Conservation Partnership Area. As less than fee interests in lands were acquired from willing landowners, they would become the Conservation Area. Under Alternative C, the Conservation Area total would be 100,000 acres.
Conservation Focal Area	A specified area within which the Service would have the authority to purchase property for a proposed refuge, but where the Service would be limited to an acquisition cap smaller than the Conservation Focal Area itself. The Service would be limited to acquiring property within the Conservation Focal Area, but would have the ability to adjust specific parcel acquisition to respond to changing landowner interest, conditions, and opportunities. Under Alternative C, the Conservation Focal Area would be 130,000 acres with an acquisition cap of 50,000 acres.
Refuge Acquisition Boundary	A Refuge Acquisition Boundary defines specific parcels of property which the Service would have the authority to purchase from willing sellers.

	Under Alternative B, the proposed Refuge Acquisition Boundary would be 50,000 acres.
Refuge Boundary	A Refuge Boundary is the management boundary of an approved refuge. A Refuge Boundary is generally comprised of Service-owned property, but can include other properties through some sort of agreement with the landowner (e.g., management agreement, lease, and easement). Under both alternatives B and C, the proposed Refuge Boundary would be 50,000 acres.
Study Area	A generalized area of interest within which the Service would evaluate opportunities for additional conservation measures. The Study Area for this project totals approximately 1.8 million acres of the Kissimmee River Basin. The designation of a Study Area does not convey authority to establish rules and regulations throughout the 1.8 million-acre area.

Table 19. Overview of the alternatives

	Alternative A No Refuge and No Conservation Area (No Action Alternative)	Alternative B Refuge Only Approach	Alternative C Conservation Partnership Approach (Proposed Action)
Total Acres Proposed to be Protected by the Service	0 acres	50,000 acres	150,000 acres
Proposed National Wildlife Refuge	No Refuge	50,000-acre Refuge Acquisition Boundary Up to 50,000 acres authorized for Service acquisition Fee title acquisition focus with potential use of less than fee title methods	130,000-acre ConservationFocal Area Up to 50,000 acres fee title acquisition authorized Fee title acquisition focus with potential use of less than fee title methods
Proposed Conservation Area	No Conservation Area No Conservation Focal Area	No Conservation Area No Conservation Focal Area	100,000-acre Conservation Area Up to 100,000 acres of less than fee title interest authorized within Kissimmee River Basin which supports acquisition focal area Conservation easement focus with potential use of other less than fee title methods

Alternative A. No Refuge and No Conservation Area (No Action Alternative)

The No Action Alternative required by NEPA serves as a baseline to which the other alternatives are compared. In this alternative the Service would not create a new refuge, no designated acquisition boundary would be developed, and no conservation area would be created. Habitat protection and management would continue by existing organizations and government programs. The landscape within the Study Area boundary currently contains approximately 421,000 acres of conservation lands protected by agricultural easements; private conservation organizations; and municipal, state, and federal ownership and management (Figure 1). The Service would pursue no new opportunities for refuge-based wildlife-dependent public uses, partnerships, or scientific research.

Alternative B. Refuge Only Approach

This alternative proposes an acquisition boundary of up to 50,000 acres containing portions of the priority habitats identified in the proposal; focuses the bulk of the proposed refuge within mostly contiguous areas; and compliments existing municipal, state, and federal conservation within this landscape (Figure 7). The Service would use a suite of conservation tools to protect land, including fee title acquisitions and conservation easements. This alternative would protect important wildlife habitat within the landscape, serving both common and rare wildlife species. It would offer opportunities for wildlife management, compatible wildlife-dependent public uses, and new refuge-based partnerships and scientific research. Public use opportunities under this alternative would include hunting and fishing, as well as wildlife observation, photography, environmental education, and interpretation.

Alternative C. Conservation Partnership Approach (Proposed Action)

Alternative C is the Service's Proposed Action; the alternative recommended for implementation. It proposes conservation of up to 150,000 acres containing portions of the priority habitats identified in this proposal (Figure 8). To best compliment existing municipal, state, and federal conservation within this landscape, the Service identified: (1) A proposed Conservation Focal Area of approximately 130,000 acres within which the Service would have the authority to acquire up to 50,000 acres, and (2) a Conservation Partnership Area within which the Service would have the authority to acquire less than fee title interest up to 100,000 acres as a Conservation Area.

Working with willing landowners, protection of lands under Alternative C would focus fee title acquisition of up to 50,000 acres, and less than fee title acquisition on 100,000 acres. Specific ranking criteria would be used to identify and prioritize all lands proposed for acquisition. For the refuge portion of Alternative C, the Service has identified an approximately 130,000-acre Conservation Focal Area within which the Service would be authorized to only acquire up to approximately 50,000 acres. For the Conservation Area under Alternative C, the Service would be authorized to consider less than fee title acquisitions (with a focus on the use of conservation easements) on approximately 100,000 acres. This alternative would protect and meet the needs of both rare and common wildlife, provide wildlife corridors linking existing conservation lands, and restore additional wetlands and wetland function, as well as provide opportunities for wildlife-dependent public use activities and help maintain the cultural ranching heritage of the area. Public use opportunities under Alternative C would include hunting and fishing, as well as wildlife observation, photography, environmental education, and interpretation.

Figures 7 and 8, for Alternatives B and C respectively, also depict areas that were not considered in the development of the alternatives. These areas were determined to not meet the Service's criteria for additional conservation or protection and also included incorporated and developed areas.

Figure 7. Alternative B - refuge only approach

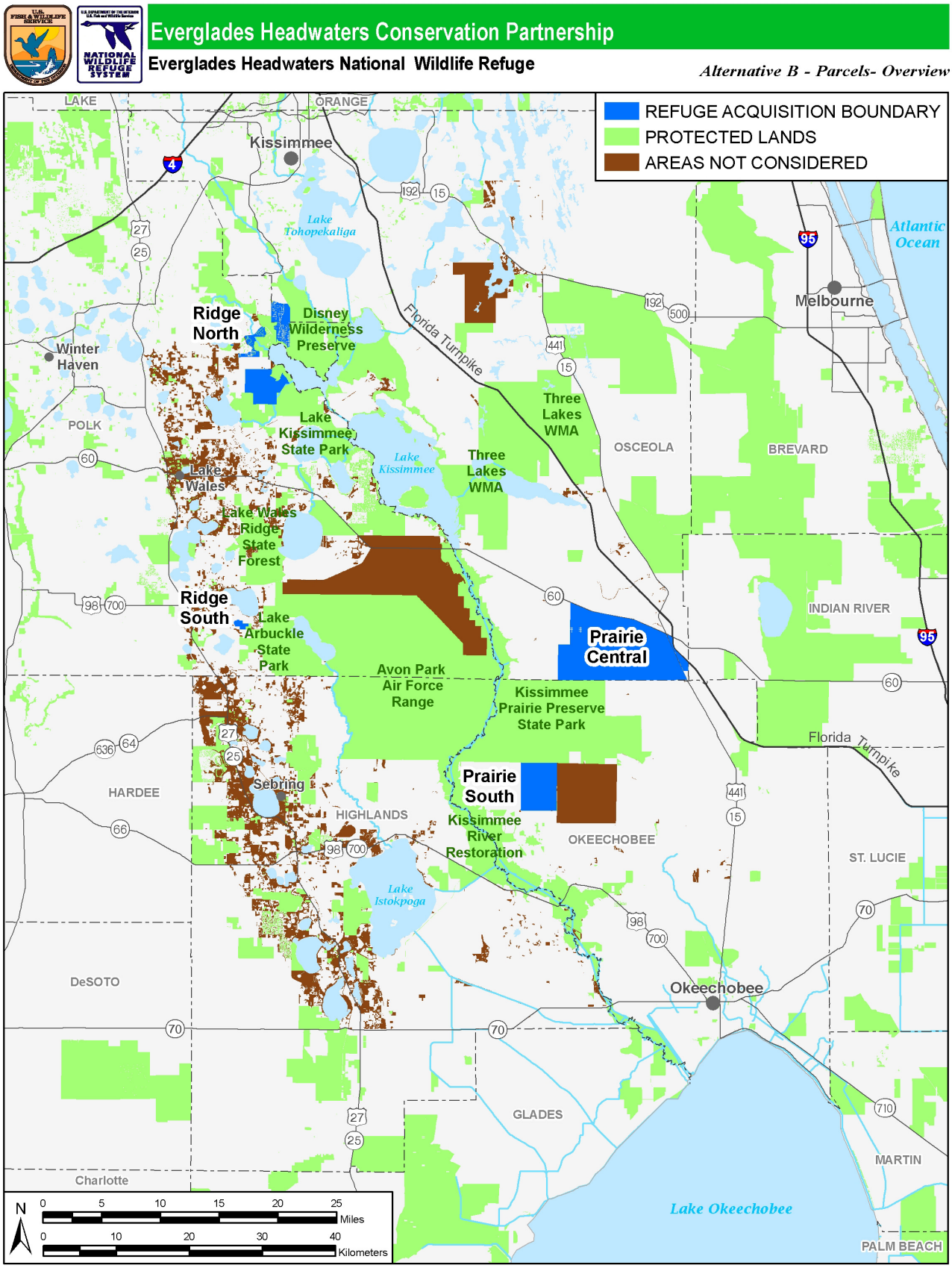
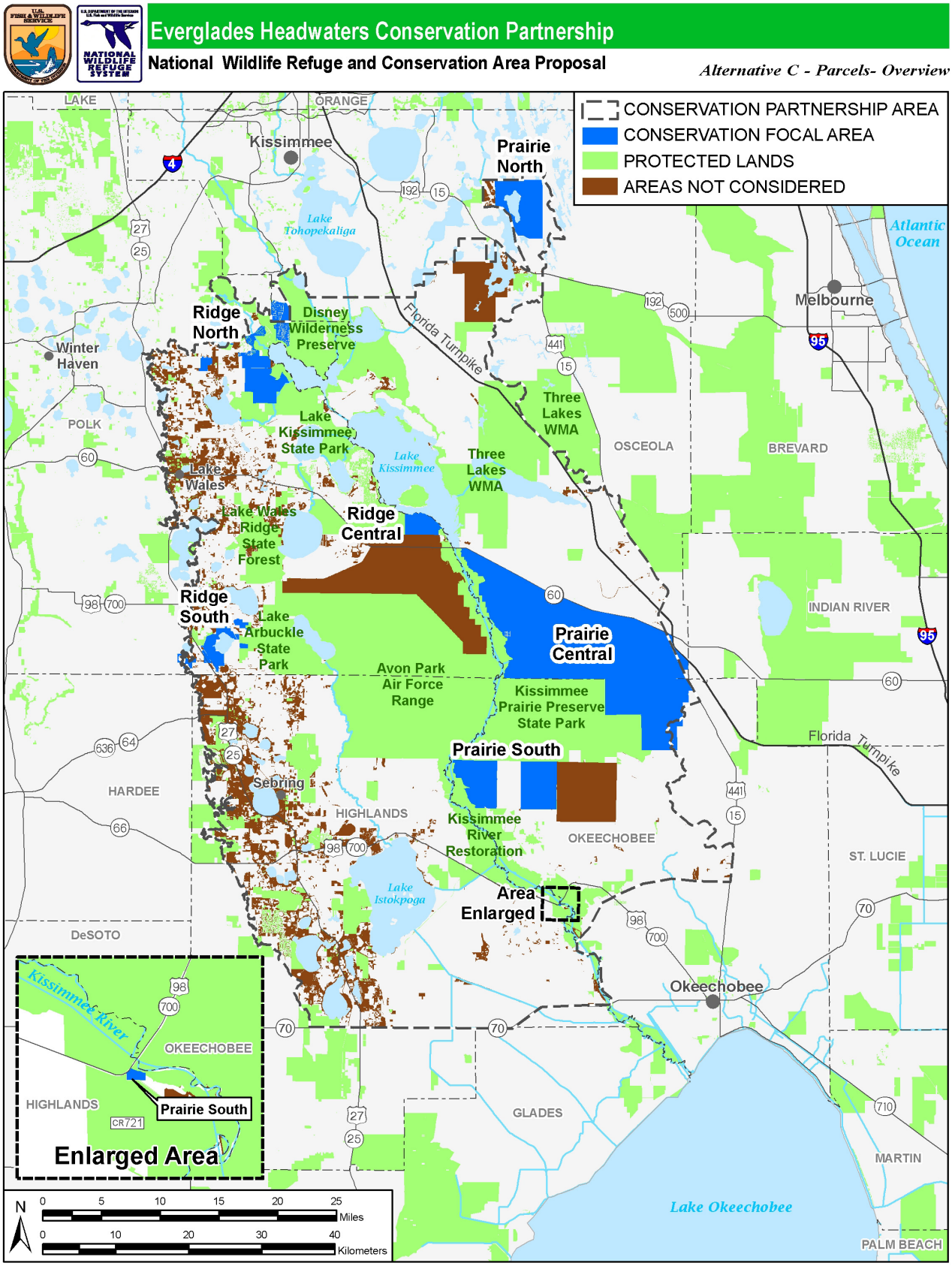


Figure 8. Alternative C - Conservation partnership approach (Proposed Action)



To help provide an overview of the acreage of habitats available for conservation under Alternatives B and C, please see Table 20. Please refer to Chapter II, Affected Environment, for detailed descriptions of the Study Area's resources.

Table 20. Acreage of major habitat types associated with Alternatives B and C

Land Cover	Alternative B		Alternative C	
	Acres	% of Alt. B	Acres	% of Alt. C
Dry Prairie	7199.8	14.29	13414.6	10.31
Freshwater Forested Wetlands	2849.5	5.65	9181.2	7.06
High Pine, Florida Scrub, Sandhill	900.7	1.79	2176.8	1.67
Improved and Unimproved Pasture	19811.2	39.31	63017.5	48.43
Intensive Agriculture	2065.2	4.10	3814.5	2.93
Mesic and Hydric Pine Flatwoods and Scrubby Flatwoods	5959.4	11.83	10123.4	7.78
Mesic Temperate Hammock	1075.8	2.13	1686.5	1.30
Open Water	65.0	0.13	169.6	0.13
Shrub and Brushland	12.6	0.03	662.9	0.51
Urban	81.2	0.16	627.5	0.48
Wet Prairie and Freshwater Marshes	10375.4	20.59	25233.4	19.39
Total	**50395.8**	**100%**	**130,107.9**	**100%**

Notes:

- *Alternatives B and C both propose to conserve up to approximately 50,000 acres in fee title acquisition, although the Conservation Focal Area in Alternative C contains approximately 130,000 acres.*
- *Although cutthroat wetlands are recognized in this proposal as an important plant community, most spatial analysis incorporate them into other habitat types, thus they are not depicted here as a separate land cover type.*

ALTERNATIVE A. NO REFUGE AND NO CONSERVATION AREA (NO ACTION ALTERNATIVE)

This alternative represents the current state of land protection activity within the Everglades headwaters watershed without a refuge or conservation area designation by the Service, thereby offering an important baseline to which the action alternatives can be contrasted (Figure 1). The Service would take no action to establish the proposed Everglades Headwaters NWR and Conservation Area within this alternative, but would continue activities it has pursued over the past several years, which are noted below. This alternative is referred to interchangeably as "Alternative A," "No Action Alternative," or the "No Refuge and No Conservation Area" alternative throughout this document.

Currently, the landscape of the upper Everglades watershed is dominated by a mix of active cattle ranches, scattered homesteads, citrus groves and farms, small communities, lakes, river corridors, isolated wetland basins, grassland savannahs, sandhills, and scrub habitat. A mix of conservation lands ranging from agricultural conservation easements to a military installation to private conservation lands to municipal, state, and federal ownerships is also present.

Approximately 23 percent of this landscape is currently protected and managed. Currently, there are approximately 421,000 acres of lands protected by conservation easements; private conservation; and municipal, state, and federal ownership within the Study Area. Of the lands currently protected, over 250,000 acres are priority habitats as defined in this proposal.

This alternative is described more fully through its ability to serve the outlined overarching goals.

Goal 1. Functional Conservation Landscape

The upper Everglades watershed will become a more connected and functional conservation landscape that will provide effective habitat connections between existing conservation areas and allow habitats and species to shift in response to urban development pressures and global climate change.

The existing conservation lands currently represent 23 percent of the overall land base within the Study Area. As Figure 1 illustrates, these lands are often times disparate and do not allow for the genetic interchange of isolated populations of species, such as the Florida grasshopper sparrow. Some species found within this landscape, such as Florida black bear, require vast areas to forage, find mates, breed, and raise young. Recently one radio telemetry marked bear was captured near Sebring on Lake Wales Ridge NWR, after wandering north just west of Orlando, returning south through the Kissimmee River valley to the shores of Lake Okeechobee, and eventually ending up in the Fisheating Creek watershed west of the Lake Wales Ridge. It spent the majority of time on conservation lands, but crossed minor roads, while avoiding interstates and populated areas and occupied scrub and forested wetlands, while staying close to river and wetland corridors (Archbold Biological Station, unpublished data). Under Alternative A, the fragmented landscape of this area currently limits habitat use, migration, and dispersal of a variety of species.

While debate continues regarding when the cumulative impacts of global climate change will alter human behavior and occupation of coastal environments, some effects are currently known. For instance, present day Florida has experienced 8 to 16 inches of sea level rise over the last 70 years (Wanless et al. 1994). Whether this rise is natural or human-induced is not relevant. What is relevant is that much of south Florida is at or very near sea level elevation. It is anticipated that the human environment and the natural environment will ultimately be impacted by sea level rise and a forced inland and upslope retreat will be forthcoming. The fact that Florida's shoreline has receded historically is not without precedent, since the system of central Florida sand ridges represents the historic shoreline that has pulsed across the peninsula several times during the past 2.5 million years (U.S. Fish and Wildlife Service 2010). Under Alternative A, the fragmentation of this landscape and the anticipated human development patterns would continue to limit the ability of wildlife species and plant communities to respond to the impacts associated with global climate and human demographic changes.

Conservation lands in this landscape would continue to be managed by their respective agencies and organizations under the No Action Alternative, but no further Service efforts to connect them would likely be forthcoming. Additional conservation lands managed by other agencies may be added to the conservation landscape through programs such as Florida Forever. However, current economic conditions have precluded any funding for this state land acquisition program, and other conservation organizations are attempting to divest some of their current landholdings. Taken together, the respective missions of the preceding groups provide an ability to assist in the protection of habitats of the area, but do not provide increased long-term protection from the anticipated effects of climate change and the changes anticipated in the distribution of the human population in this environment. Based on this collective effort, protection of about 421,000 acres of habitats currently protected by agricultural easements, private conservation, municipal, state, and federal ownerships would continue.

Cattle ranches, citrus groves, and row crop agricultural operations dominate the landscape outside of the currently conserved lands. Within the Study Area, agricultural lands occupy approximately 786,686 acres or 43 percent of the area. Cattle ranches provide considerable amounts of wildlife habitat in this area. Improved pasture, riparian corridors, and wetland basins provide habitat for species such as Audubon's crested caracara, southeastern kestrel, and wood stork. Threats to this agricultural community abound. Planned urban growth immediately removes both wildlife habitat and agricultural production from the landscape. Infrastructure required to accommodate this growth follows with the development and associated increases in roadways and utilities. Changing demographics of the ranch community also impact the ability of the ranching traditions to exist. Tax structure and financial opportunities, such as investments in biofuels also threaten the existing agricultural landscape. Additionally, even conservation measures, such as deep water storage, could threaten habitat values, depending upon their placement in the landscape.

Under the No Action Alternative, 786,686 acres of agricultural lands would remain in place on the landscape for some amount of time, but these lands would continue to face the threat of development.

Goal 2. Habitat for Fish and Wildlife

The Everglades Headwaters NWR and Conservation Area will provide a wide range of quality Kissimmee River Basin habitats to support migratory birds, federal and state listed species, state designated species of conservation concern, and native wildlife diversity.

Habitats found within the Study Area include scrub, sandhill, cutthroat seepage wetlands, pine flatwoods, wet and dry prairie, and multiple wetland types. Also found within this landscape are large tracts of improved pastures (areas of pine flatwoods, wet and dry prairie, and wetlands that have been cleared and drained for the planting of tame, horticultural varieties of grasses as improved grass forage). Under the No Action Alternative, protection and management of these habitats would be limited to existing conservation lands and programs, leaving remaining habitats vulnerable to a variety of threats, including development patterns and pressures. Development pressure would continue to threaten this landscape. Developments of Regional Impact (e.g., planned residential and light commercial development), alternative fuels (e.g., biofuel agricultural and processing plants), and expanded urban growth (e.g., housing, roadways, and mass transit) all threaten to reduce the amount of natural habitats found in this landscape.

Conservation lands in this landscape are not directly threatened by this development pressure, but may be affected by adjacent development pressures, decreases in the amount of habitat available, and increased demand for the use of the area by residents and visitors. Current conservation efforts in this landscape include state parks, state wildlife management areas, military reservations, Native American tribal lands, and Lake Wales Ridge NWR. Taken together, the respective missions of the preceding groups provide an ability to assist in the protection of habitats of the area. This collective ability, however, falls short of meeting the needs of wildlife as evidenced by the numbers of state and federal listed species and state designated species of conservation concern found in this landscape. Based on this collective effort, Alternative A would maintain protection of 421,232 acres of habitats currently protected by agricultural easements, private conservation, municipal, state, and federal ownerships.

Goal 3. Enhanced Water Quality, Quantity, and Storage

Focusing on restoring or mimicking natural hydrologic processes, the Everglades Headwaters NWR and Conservation Area will contribute to water quality, water quantity, and water storage capacity of the upper Everglades watershed to support Everglades restoration goals and objectives and water quality and supply for central and south Florida.

The landscape surrounding the headwaters of the Everglades includes the large urban populations of the Tampa/St. Petersburg area and the metro Orlando area. Further south, this watershed provides recreational, agricultural, and drinking water for all of the urban and suburban populations from the Palm Beaches and Ft. Lauderdale area south to the greater Miami area and the Florida Keys, including the seasonal increases of vacationers to the area. Overall, this area boasts approximately 13 million residents.

The agricultural and rural lands in this landscape are ecologically healthy, but are impacted by wetland drainage to accommodate agricultural uses. There are approximately 324,000 acres of drained wetlands within the Study Area. Much of this drainage has been accomplished by shallow surface ditches and the channelization of streams large and small. This drainage has led to unnatural increased water flows to the main Kissimmee River corridor during periods of heavy rainfall, and decreased flows during periods of drought. These pulses affect downstream management of the watershed. Additionally, the quick release of water from the landscape allows for excess nutrients to enter directly into the water flows, instead of slowly remaining in the wetland basins and allowing the natural uptake of nitrogen and phosphorous to occur.

The major water quality problems within the Study Area are elevated nutrients, low dissolved oxygen (DO), with several water bodies being classified as impaired or not meeting water quality standards (FDEP 2008). Much of the elevated nutrients, metal, and pesticide concentrations can be attributed to urban and/or agricultural land uses. Mercury contamination is thought to result from atmospheric deposition and mediated by human caused sulfate conditions (which result from fertilizer use). Groundwater contamination of the Lake Wales Ridge area is well known and coincides with intensive agricultural practices. Nitrates and several pesticides are noted. Copper contamination associated with the citrus industry is also a concern for species such as the Everglades snail kite, which forages on snails that are known to uptake copper (Winger et al. 1984).

Additional development pressure also threatens this landscape. Developments of Regional Impact (e.g., planned residential and light commercial development), alternative fuels (e.g., biofuel agricultural and processing plants), and expanded urban growth (e.g., housing, roadways, and mass transit) all threaten to reduce the amount of wetlands in this landscape, whether they occur today as intact or drained wetlands.

Conservation lands in this landscape are not directly threatened by this development pressure, but may be affected by adjacent development pressures, increasing stormwater flows and nutrient loads. Current efforts in this landscape to increase the water storage capacity through wetland restoration activities include NRCS wetland reserve program, FRESP, and state and federal assistance programs on private lands. These programs, however, are limited in scope and funding, providing limited opportunities for willing landowners to restore degraded wetlands. Additional reductions to the capacity of the landscape to absorb rainfall will only add to the current flow pulses and nutrient loads.

Taken together, the respective missions of the preceding groups provide an ability to assist in the protection of the wetland resources of the area. This collective ability, however, has proven to be too limited to meet the needs of the Everglades ecosystem and the human population that depends on clean and consistent water supplies. Based on this collective effort, Alternative A would maintain protection of 176,858.85 acres of wetlands currently protected by agricultural easements, private conservation, municipal, state, and federal ownerships.

Goal 4. Wildlife-dependent Recreation and Education

Refuge visitors of all abilities will enjoy opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of the important grassland and savanna landscape of the headwaters of the Everglades.

The Service seeks opportunities to promote appropriate and compatible wildlife-dependent recreation on national wildlife refuges. There would be no refuge-based recreational opportunities under the No Action alternative. A number of wildlife-dependent recreational activities exist within the landscape and would continue. Hunting and fishing occur under regulations administered by the FWC. Much hunting occurs on private lands. Public hunting occurs on approximately 227,862 acres of public lands within the Study Area.

Fishing is recreationally and economically important to the local population. Central Florida, specifically the Kissimmee River and Kissimmee Chain of Lakes area, is world renowned as a fishing destination for many types of freshwater fish. These areas, as well as other water bodies found throughout the Study Area, would continue to provide recreational fishing opportunities.

Other outdoor wildlife-dependent recreation and educational opportunities abound. FWC, as well as SFWMD, provide hiking and equestrian trails. Kayaking, canoeing, and boating occur on the water resources found in the area. The FWC sponsors fishing events, “Becoming an Outdoors Woman” workshops, youth camps, and other outdoor wildlife-dependent programs and activities. These wildlife-dependent activities would continue under the No Action Alternative.

ALTERNATIVE B. REFUGE ONLY APPROACH

The Refuge Only Approach alternative is a more traditional Service approach to conservation and would create an acquisition boundary of up to 50,000 acres containing portions of the priority habitats identified in the proposal; would focus the bulk of the refuge within a limited number of contiguous areas; and would complement existing municipal, state, and federal conservation within this landscape (Figure 7). The Service would use a suite of conservation tools to protect land, including fee title acquisitions and conservation easements. This alternative would protect important wildlife habitat within the landscape, serving both common and rare wildlife species. It would offer opportunities for wildlife management, compatible wildlife-dependent public uses, and new refuge-based partnerships. Public use opportunities under this alternative would include hunting and fishing, as well as wildlife observation, photography, environmental education, and interpretation.

Alternative B outlines four proposed areas for fee title acquisition representing six management tracts of land: Ridge North (Figure 9a), Ridge South (Figure 9b), Prairie Central (Figure 9c), and Prairie South (Figure 9d). The three Ridge North tracts were identified and selected based on the prioritization protocol described in Chapter III.B; and best professional judgment, specifically noting the ability of these tracts to mostly complete the conservation landscape in the northwest portion of the Study Area surrounding Hatchineha Lake. Ridge south is represented by one tract that abuts existing conservation lands and is in close proximity to existing units of the Lake Wales Ridge NWR, This tract is being offered to the Service as a donation to the proposed refuge which contains restored high-quality scrub and wetlands. Prairie Central represents one management tract of land and has been identified by the prioritization protocol as some of the highest quality habitat. Prairie Central represents the upper watershed of the water supply for Kissimmee Prairie Park Preserve and would ensure that this watershed would remain intact. Prairie South also contains identified high-quality

Figure 9a. Alternative B - Ridge North Planning Unit

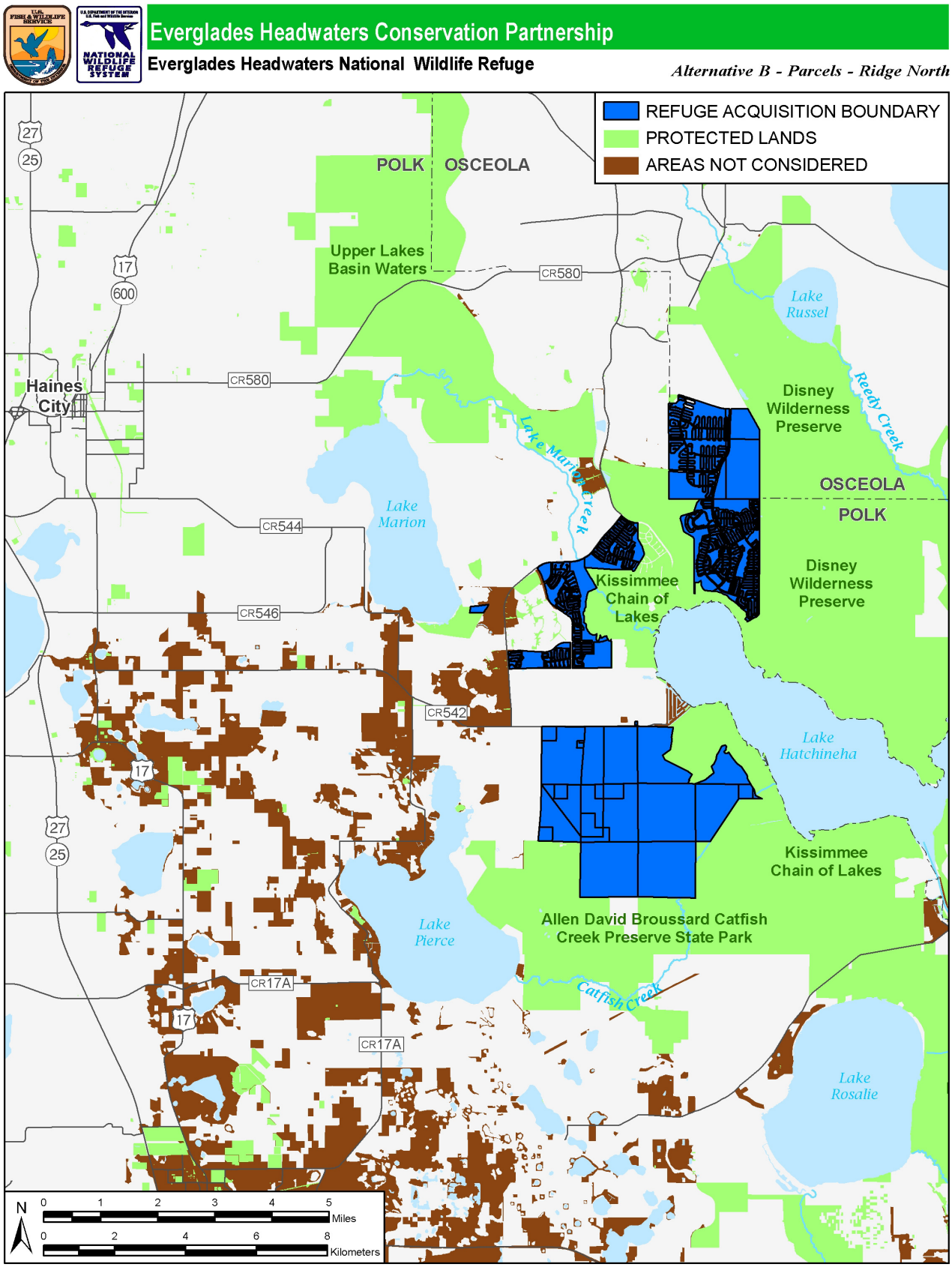


Figure 9b. Alternative B - Ridge South Planning Unit

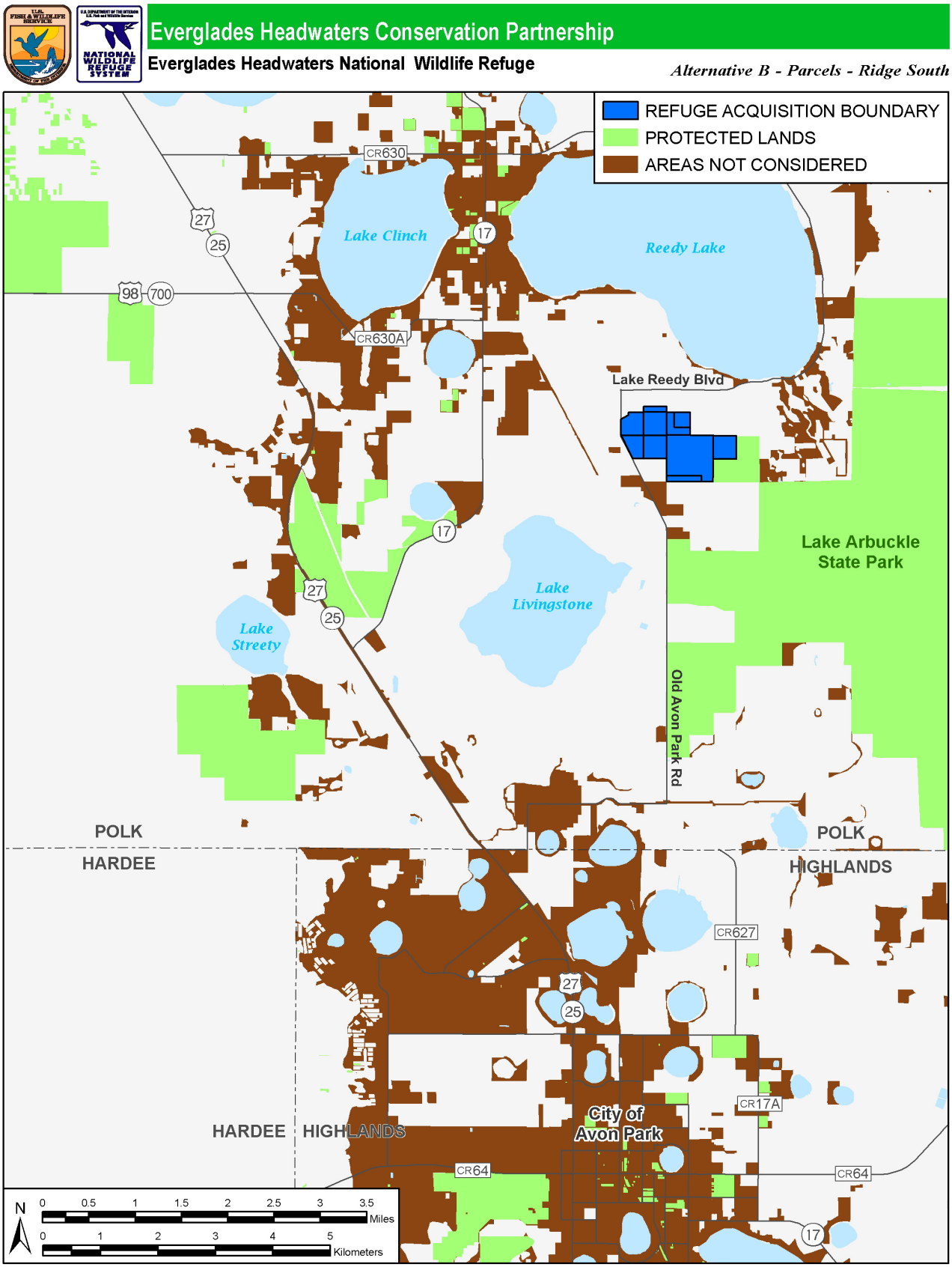


Figure 9c. Alternative B - Prairie Central Planning Unit

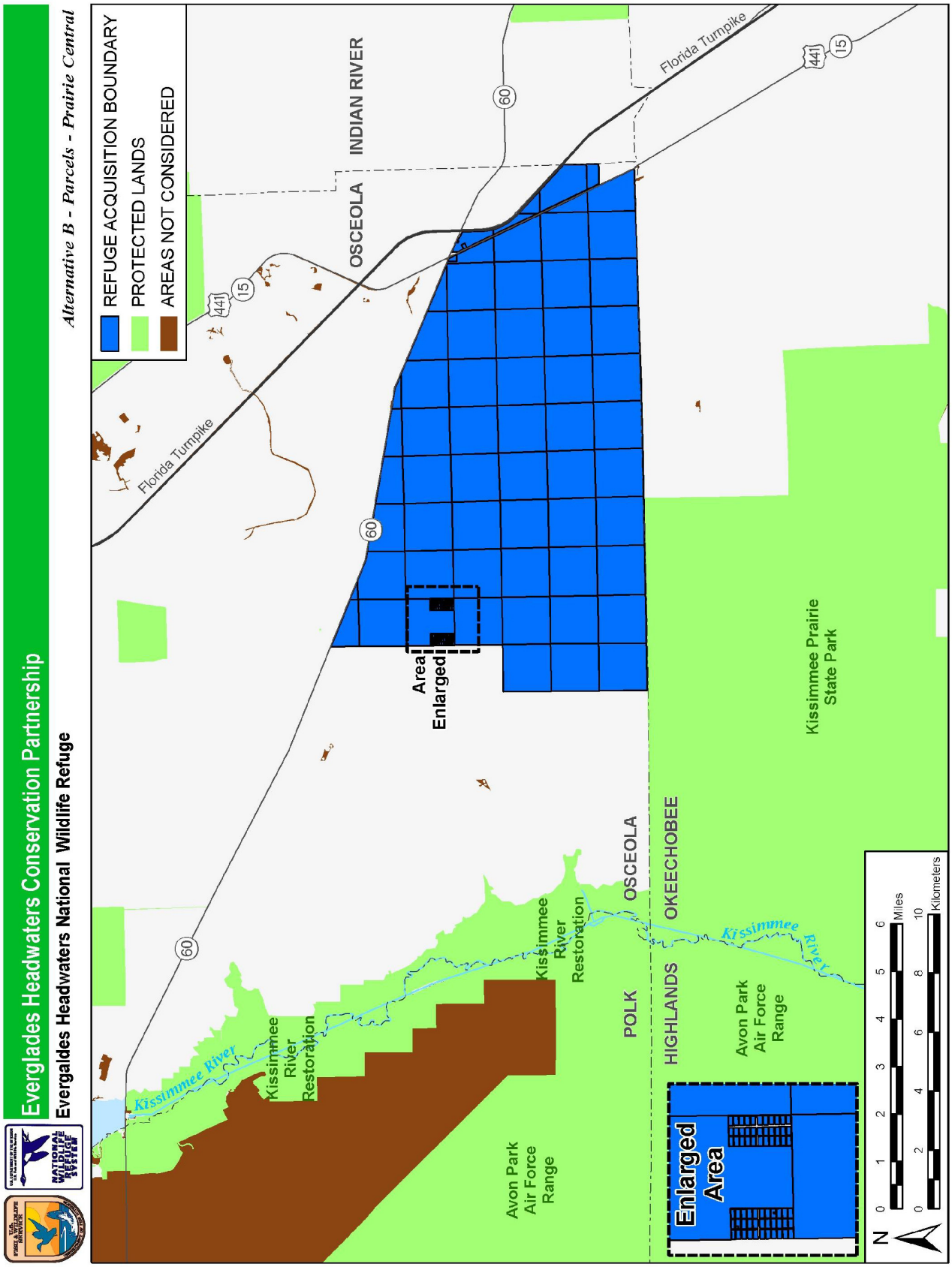
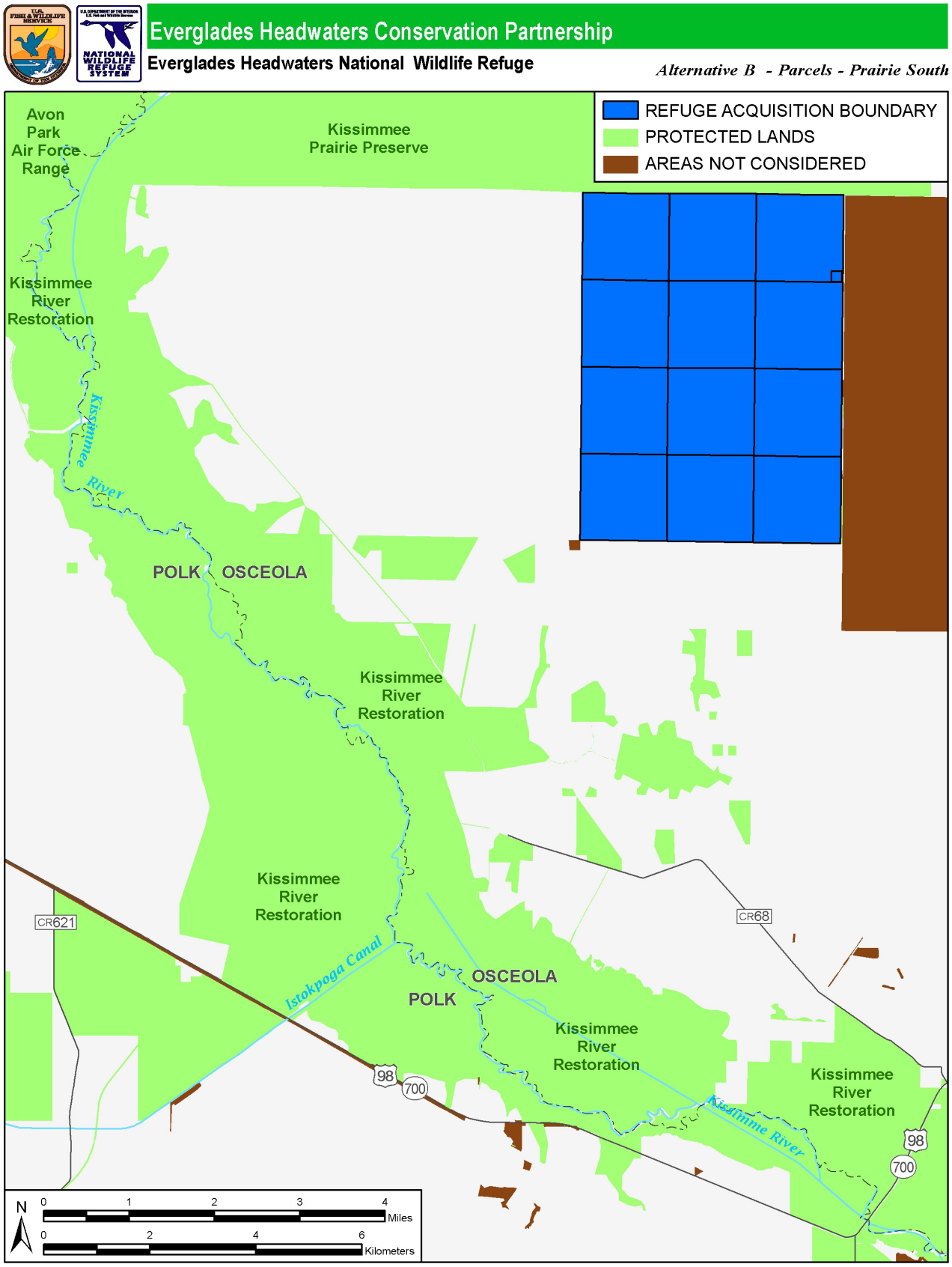


Figure 9d. Alternative B - Prairie South Planning Unit



habitat and represents a key component of the watershed surrounding Kissimmee Prairie Park Preserve. The approach of proposing to protect lands within four geographic areas instead of one large tract was derived at to protect representative high-quality habitats from throughout the landscape, and also to complete critical linkages to the conservation landscape which were geographically separated.

This alternative is described more fully through its ability to serve the outlined overarching goals.

Goal 1. Functional Conservation Landscape

The upper Everglades watershed will become a more connected and functional conservation landscape that will provide effective habitat connections between existing conservation areas and allow habitats and species to shift in response to urban development pressures and global climate change.

The Refuge Only approach would add 50,000 acres of conserved lands and waters to this conservation landscape, while protecting some of the most important linkages, it would only provide limited overall opportunity to link existing conservation lands within the landscape. Under Alternative B, a modest addition to the conservation landscape is proposed, thus building limited linkages to the fragmented landscape of this area, which currently limits habitat use, migration, and dispersal of a variety of species. This alternative would increase the conserved landscape from 23 to 25 percent. Although the Service would continue to provide technical assistance within this landscape, refuge management and expertise would be focused on the lands and waters of the proposed refuge. Landscape-scale considerations would be left to existing programs.

The impacts of global climate and human demographic changes would be similar to those described for Alternative A. Under Alternative B, the fragmentation of this landscape and the anticipated human development patterns would continue to limit the ability of wildlife species and plant communities to respond to the impacts associated with global climate and human demographic change. However, the lands identified as part of Alternative B would provide a moderate increase in the opportunity of species to persist on the landscape. Further, Alternative B may lessen impacts to local and regional climate.

Conservation lands in this landscape would continue to be managed by their respective agencies and organizations under Alternative B, with limited efforts to connect them. Taken together, the respective missions of the preceding groups and the Service provide an ability to assist in the protection of habitats of the area, but do not provide long-term protection from the anticipated effects of climate change and the changes anticipated in the distribution of the human population in this environment. Based on this collective effort, Alternative B would increase protection of approximately 50,000 acres of habitats (e.g., through the acquisition of fee title and conservation easement rights of ownership).

Cattle ranches, citrus groves, and row crop agricultural operations dominate the landscape outside of the currently conserved lands, and would continue to do so under Alternative B. Within the Study Area, agricultural lands occupy approximately 786,686 acres or 43 percent of the area. Cattle ranches provide considerable amounts of wildlife habitat in this area. Improved pasture, riparian corridors, and wetland basins provide habitat for species such as Audubon's crested caracara, southeastern kestrel, and wood stork. Threats to this agricultural community abound. Planned urban growth immediately removes both wildlife habitat and agricultural production from the landscape. Infrastructure required to accommodate this growth follows with the development and associated increases in roadways and utilities. Changing demographics of the ranch community also impact the ability of the ranching traditions to exist. Tax structure and financial opportunities, such as investments in biofuels; also threaten the existing agricultural uses. Additionally, even conservation measures, such as deep water storage, could threaten habitat values, depending upon their

placement in the landscape. The addition of approximately 50,000 acres of lands identified within Alternative B would conserve a relatively few number of sites.

This alternative would provide limited opportunity to work with the local ranching community. Grazing, as a management tool, is used on refuges nationwide and would be available here on a limited basis as well. However, the application of grazing would only be used through a lease agreement with local ranchers and would provide the opportunity to work with the local ranching community only when there was a specific habitat management need on Service owned and managed lands.

Although this alternative does propose to add approximately 50,000 acres to the conservation landscape, it provides limited actions to address the overall picture of habitat connectivity and enhanced conservation throughout the landscape. It does address the threats of urban development, altered ecological processes, and the impacts of global climate change, but confines actions to the proposed approximately 50,000 acres.

Under Alternative B, 786,686 acres of agricultural lands would remain in place on the landscape for some amount of time, but these lands would continue to face the threat of development.

Goal 2. Habitat for Fish and Wildlife

The Everglades Headwaters NWR and Conservation Area will provide a wide range of quality Kissimmee River Basin habitats to support migratory birds, federal and state listed species, state designated species of conservation concern, and native wildlife diversity.

Alternative B would add approximately 50,000 acres of wildlife habitat to this landscape to support protection and management for migratory birds, federal and state listed species, state designated Species of Special Concern, and native wildlife diversity. Compared to the No Action Alternative, restoration, protection, and management of habitats would increase within the landscape with refuge management on Service owned and managed lands. These habitats would be limited geographically to the lands and waters identified in Figure 7 and would not assist, to any great degree, with the restoration, protection, and management of adjacent, privately owned properties. The majority of restoration, protection, and management of habitats, other than wetlands, would occur on Service owned lands and is estimated to total approximately 37,171 acres.

Habitats

Diverse habitats and their respective ecological systems for trust species and species of conservation concern would be protected through this alternative. Of the approximately 50,000 acres to be protected by this alternative, the estimated acreage of key habitats to be protected would be as follows: 7,200 acres of dry prairie; 10,375 acres of wet prairie and freshwater marshes; 5,959 acres of pine flatwoods; 901 acres of sandhill and scrub habitats; and 2,850 acres of freshwater forested wetlands (Table 20). The remainder of the lands identified within this landscape represents opportunities for restoring a variety of habitats. Protecting and restoring these habitats would contribute to the conservation of wetland birds; waterfowl; shorebirds; grassland birds; neotropical migratory birds; native bird species, such as turkey and bobwhite; white-tailed deer; Florida black bear; and the occasional Florida panther. Some of the most important habitat types found within the proposed refuge are discussed below.

Sandhill and Scrub

Approximately 901 acres of sandhill and scrub habitat would be included under Alternative B. Sandhill habitats and scrub occur on well-drained, nutrient-poor sandy soils. Grasses and scrubby oaks dominate this fire-dependent landscape. The sandy soils typical of these habitats allow for rainfall to enter the groundwater system. Discharge from these habitats gives rise to cutthroat seepage wetlands. Several of the species found on these habitats are endemic to central peninsular Florida and many are federally listed species, such as Florida scrub-jay, sand skink, Florida ziziphus, and Garrett's mint.

Pine Flatwoods

Approximately 5,959 acres of pine flatwoods habitat would be included under Alternative B. Pine flatwoods are characterized by level topography and poorly drained soils. These pine forests vary greatly depending on hydrology and can have a dominant understory of wiregrass, saw palmetto, or other low shrubs. The overstory of pine flatwoods can be of longleaf, slash, or pond pine and cabbage palm. They are important for a variety of vertebrate and invertebrate species such as neotropical migratory birds, red-cockaded woodpecker, Florida black bear, Florida panther, fox squirrels, and white-tailed deer.

Dry Prairie

Approximately 7,200 acres of dry prairie habitat would be included under Alternative B. Dry prairie is endemic to central peninsular Florida, occurring on poorly drained soils. It is fire dependent and typically treeless with a low ground cover of wiregrass, stunted saw palmetto, and low-growing runner oak. It harbors numerous endemic vertebrates. The Florida grasshopper sparrow is the flagship species of this habitat.

Wet Prairie and Freshwater Marsh

Approximately 10,375 acres of wet prairie and freshwater marsh habitats would be included under Alternative B. Freshwater marshes and wet prairie are both seasonal wetlands that differ by the duration of inundation and fire regime. Sawgrass, sedges, rushes, and dwarf cypress dominate wet prairie, whereas cattail, sawgrass, pondweeds, water lilies, and numerous sedges and rushes dominate freshwater marshes. The Everglades snail kite, wood stork, whooping crane, and Audubon's crested caracara are noted residents of these habitats.

Forested Wetlands

Approximately 2,850 acres of forested wetland habitat would be included under Alternative B. Forested wetlands range from isolated depression swamps and shoreline to flowing water swamps. Bald cypress, red maple, and bay trees may dominate the overstory, while a mix of shrub species forms the understory. Many smaller isolated swamps have been converted to agricultural uses, and many of the remaining swamps are degraded by drainage and nutrient runoff. The wood stork, eastern indigo snake, and Florida panther can be found in these habitats.

Threatened, Endangered, and Species of Conservation Concern

There are 14 federally listed wildlife species and two candidate species found within the Study Area and 38 state listed animal species either listed as threatened, endangered, or species of special concern within the Study Area (Appendix H). A total of 88 species are listed by the Federal Government and/or State of Florida or designated by the state as a species of conservation concern.

Their habitat needs vary greatly across the landscape, some being exclusively dependent on the habitats that are endemic to central Florida, such as dry prairie and scrub. The Study Area lies within the Atlantic Flyway for migratory birds, with the proposed refuge being located within NABCI's Bird Conservation Region 31(BCR), the Atlantic Coast Joint Venture, and the operational area for the Peninsular Florida Landscape Conservation Cooperative. The following is a brief description of some of the focal species expected to benefit from the proposed refuge.

Audubon's Crested Caracara

The federally threatened Audubon's crested caracara occurs within the wet and dry prairie habitat of central peninsular Florida, but is also found in the improved pastures with scattered cabbage palm. It often feeds on wetland species, but is also noted to feed on road-killed animals as well. Audubon's crested caracara would be expected to use the refuge proposed under Alternative B.

Everglades Snail Kite

The federally endangered Everglades snail kite forages exclusively on apple snails. Apple snails can be found in a variety of wetlands, ranging from permanent wetlands and lakes to seasonal wetlands and ditches. While several larger wetlands throughout the Study Area provide nesting habitat, restoration and management of wetlands in this proposal are focused on providing improved foraging opportunities. The Everglades snail kite would be expected to use the refuge proposed under Alternative B.

Florida Grasshopper Sparrow

The federally endangered Florida grasshopper sparrow occurs throughout the prairie region of peninsular Florida. They are closely associated to the fire-dependent dry prairie and are now found on only a few parcels of public land and nearby ranches. The Florida grasshopper sparrow would be expected to use the refuge proposed under Alternative B.

Wood Stork

The endangered wood stork forages and breeds within the marshes and cypress swamps of southern Florida. It shares these habitats with other more common wading birds, such as the great egret and white ibis. Only two active nest colonies exist within the Study Area, but five abandoned colony locations can be found in the area. Wood storks would be expected to use the refuge proposed under Alternative B.

Florida Black Bear

Listed by the state as a threatened species, the Florida black bear once ranged throughout Florida and the southeast states, but now occupies only 18 percent of its historic range. Using a wide variety of habitats, the Florida black bear is known to wander widely in search of food, cover, mates, and other resources. The Florida black bear would be expected to use the refuge proposed under Alternative B.

Other Migratory Birds

Two subspecies of sandhill crane, a state listed threatened species, can be found within the Study Area. The Florida sandhill crane is a non-migratory, year-round breeding resident, while the greater sandhill crane is migratory and only winters in Florida. Both subspecies use a wide variety of wetlands and pastures throughout the Study Area and would be expected to use the refuge proposed under Alternative B.

Blue-winged teal and mottled duck are the two most commonly observed waterfowl species, with many other species of waterfowl noted throughout the winter period. They would also be expected to use the refuge proposed under Alternative B.

Resident Wildlife

A wide variety of resident wildlife species can be found throughout the Study Area. Bobwhite quail, wild turkey, white-tailed deer, grey squirrels, and rabbits occur in abundance, providing ample hunting and wildlife observation opportunities. Wild hog, although a nonnative and nuisance species, is also considered a game species and can be found in overabundance in many areas throughout Florida. All of these species would be expected to use the refuge proposed under Alternative B.

Listed Plant Species

There are approximately 23 federally listed plant species found throughout the landscape with most occurring in scrub habitat. Nearly all species are fire-dependent and their populations have been impacted by fire suppression, which has allowed brush and overstory species to become established. Some of the federally listed species found within the Study Area include beautiful pawpaw, scrub lupine, Florida ziziphus, and Garrett's mint. Due to the wide distribution and site-specific nature of their occurrences, only a few of these important plant species would be expected to occur on the refuge proposed under Alternative B.

Goal 3. Enhanced Water Quality, Quantity, and Storage

Focusing on restoring or mimicking natural hydrologic processes, the Everglades Headwaters NWR and Conservation Area will contribute to water quality, water quantity, and water storage capacity of the upper Everglades watershed to support Everglades restoration goals and objectives and water quality and supply for central and south Florida.

By adding approximately 50,000 acres of conservation lands to this landscape, the Service would support the enhancement of water quality, quantity, and storage. Compared to the No Action Alternative, Alternative B would provide increased opportunities to restore wetlands within the upper Everglades watershed. Increased storage capacity, groundwater recharge, and water quality benefits would be localized within certain sub-watersheds where the fee title lands would be located. It is estimated that approximately 12,922 acres of wetlands could be restored.

The human dimensions of and impacts to the landscape surrounding the headwaters of the Everglades includes the large urban populations of the Tampa/St. Petersburg area and the metro Orlando area and would not change from that described in Alternative A. The agricultural and rural lands in this landscape are ecologically healthy, but are impacted by wetland drainage to accommodate agricultural uses. The major water quality problems within the Study Area are elevated nutrients, low dissolved oxygen (DO), and mercury in fish (FDEP 2006) and would remain constant under this alternative. With approximately 324,000 acres of drained wetlands within the Study Area and only 12,922 acres contained within Alternative B, opportunity to improve the water quality and quantity would be limited. Some shallow surface ditches and channelized streams located on the lands identified in Alternative B would be restored, leading to improved water quality, including drinking water, and storage capacity. Increased water flows to the main Kissimmee River corridor during periods of heavy rainfall, and decreased flows during periods of drought would be moderated under this alternative. Additionally, excess nutrients would have greater opportunity to be absorbed within the proposed refuge by wetland vegetation, reducing the nitrogen and phosphorus loading of

the watershed. The reduction and change of the grazing regime and any conversion of improved pasture to native pasture would reduce or eliminate runoff of nutrients associated with cattle grazing.

Additional development pressure would continue to threaten this landscape. Developments of Regional Impact (e.g., planned residential and light commercial development), alternative fuels (e.g., biofuel agricultural and processing plants), and expanded urban growth (e.g., housing, roadways, and mass transit) all threaten to reduce the amount of wetlands in this landscape, whether they occur today as intact or drained wetlands.

Conservation lands in this landscape are not directly threatened by this development pressure, but may be affected by adjacent development pressures, increasing stormwater flows, and nutrient loads. Current efforts in this landscape to increase the water storage capacity through wetland restoration activities include NRCS's Wetland Reserve Program, FRESP, and state and federal assistance programs on private lands and would be joined by Service efforts on lands identified within this alternative. These programs, including those of the Service, are limited in scope and funding, which limits opportunities for willing landowners to restore degraded wetlands. Additional reductions to the capacity of the landscape to absorb rainfall would only add to the current flow pulses and nutrient loads.

Taken together, the respective missions of the preceding groups provide an ability to assist in the protection of the wetland resources of the area. This collective ability, however, has proven to be too limited to meet the needs of the Everglades ecosystem and the human population that depends on clean and consistent water supplies. Based on this collective effort, Alternative B would increase protection of 13,225 acres of wetlands.

Goal 4. Wildlife-dependent Recreation and Education

Refuge visitors of all abilities will enjoy opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of the important grassland and savanna landscape of the headwaters of the Everglades.

With the addition of approximately 50,000 acres of Service managed lands to the conservation landscape, wildlife-dependent recreation and education opportunities would increase under Alternative B, compared to the No Action Alternative, and would approach the opportunities described in Alternative C. The Service would work cooperatively with FWC and other partners to provide public hunting and fishing opportunities, and the Service would provide interpretive and educational programs. Because the Service would focus its land acquisition program in four primary locations, all wildlife-dependent recreation and education opportunities would be tied directly to these parcels. The Ridge North Unit parcel would be smaller and located nearby to urban centers. More controlled access would be envisioned, with the focus being primarily on wildlife-dependent interpretation, recreation, photography, and observation. Opportunities may exist for youth or mobility impaired hunting and fishing programs. The Ridge South Unit is located directly adjacent to existing conservation lands and could compliment their existing recreational programs. The Prairie Center and South Units are larger, found in a rural setting, and lie directly adjacent to Kissimmee Prairie Park Preserve. Access for all priority public uses would increase with the Prairie Units, with considerably more opportunities for hunting and fishing programs as compared to the Ridge Units. Refuge Units located in this area would increase hunting opportunities in the local area, since the Kissimmee Prairie Park Preserve does not offer hunting opportunities.

The National Wildlife Refuge System Improvement Act of 1997 established six priority public uses on refuges. Those priority uses depend on the presence, or the expectation of the presence, of wildlife. These uses include hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Although these priority uses must receive consideration in planning for public use, they also must be compatible with the purposes for which a refuge is established and the mission of the Refuge System. Compatibility determinations, which evaluate the effects of a particular use or activity in the context of species or habitats on a refuge, aid in making those decisions. If refuge lands are acquired within the Study Area, compatibility determinations would be used to decide which, where, and how public use opportunities would be permitted.

Public use opportunities contribute to the long-term protection of wildlife resources by promoting understanding, appreciation, and support for wildlife conservation. The six priority public uses would be accommodated to the maximum extent possible where they would not have significant negative effects on wildlife. All of the proposed public use activities are contingent upon availability of staff and funding to develop and implement these programs. The Service would promote opportunities for volunteers and develop community interpretive materials and programs to enhance awareness of and appreciation for the area's resources. Development of school and other group programs would be considered. If a refuge is established within the Study Area, an increase in public use would be expected due to the development of new facilities and programs, such as new hunting opportunities, new and expanded trails, new parking areas, new fishing access, new interpretive overlooks, and new observation platforms. The Service would allow public access for day use on many newly acquired lands, provided there are no expected negative effects on sensitive species (e.g. ESA-listed species) or habitats, and would consider overnight access as a component of other public use activities (e.g., hunting in remote locations).

Hunting and Fishing

The Service would open newly acquired lands for hunting and fishing in accord with the state's regulations after reviewing and evaluating the biological, ecological, and human safety impacts. Newly acquired lands that traditionally have been open for public hunting and fishing would remain open, at the same level of intensity, under interim compatibility determinations until the Service completed the planning process to formally open the refuge to those activities. To this end, the Service would continue discussions with FWC regarding the co-management opportunities for hunting, fishing, and other recreational activities associated with this proposal. Additionally, and if possible, the Service would provide American with Disabilities Act (ADA)-compliant hunts and youth hunt opportunities. Generally, the Service would allow hunting, based on state hunting seasons and consistent with the refuge's comprehensive conservation plan and hunt plan (once developed). The Service would continue discussions to establish portions of the proposed refuge as state managed wildlife management area(s). Fishing would be allowed, where accessible and compatible. Youth fishing opportunities would be encouraged.

Wildlife Observation, Wildlife Photography, and Environmental Education and Interpretation

Beyond hunting and fishing, the refuge would also provide opportunities for wildlife observation, wildlife photography, and environmental education and interpretation. Working with state and local agencies, the Service would study the feasibility of connecting existing hiking, bicycling, and horseback riding trails through refuge lands. The refuge may also provide interpretive and environmental education programs and increase partnership opportunities to interpret the cultural and natural resources within the refuge and the watershed.

Environmental education, one of the six priority wildlife-dependent uses encouraged on refuge lands, incorporates onsite, offsite, and distance learning materials, activities, programs, and products that address the audience's course of study, the mission of the Refuge System, and the management purposes of the refuge. The goal of environmental education is to promote an awareness and understanding of the basic ecological foundations of the interrelationship between human activities and natural systems. Through curriculum-based environmental education, on- and off-refuge, refuge staff, educators, and partners hope to motivate students and other persons interested in learning the role of management in the maintenance of healthy ecosystems, working landscapes, and conservation of our fish and wildlife resources.

On April 16, 2010, President Obama announced the America's Great Outdoors Initiative, calling for a grass roots effort to protect our Nation's lands and waters and to connect all Americans to their natural and cultural heritages (CEQ 2010). Our country has a legacy of conserving its natural resources for the benefit of its citizens. Recent generations find it difficult to connect and enjoy these outdoor resources. Through this initiative, all Americans would have the opportunity to enjoy and appreciate our central Florida outdoor resources.

For years, national wildlife refuges have been connecting children with the land and with the agency's conservation mission. It is now apparent that such connections are of immense importance. New information shows that most children spend their time indoors with televisions, video games, computers, and cell phones, rather than experiencing nature (Louv 2005).

As the Nation's primary conservation agency, the Service has a strong incentive to promote childrens' nature-based activities. We would work with school districts and teachers to develop environmental education curriculum featuring the areas' unique species and communities. The Service would work with the conservation and education partners to promote environmental education, thereby maximizing resources and time commitments for each partner organization. We would utilize the refuge for habitat restoration projects, docent-led trail walks, birding festivals, guest lectures, and youth hunting and fishing efforts.

ALTERNATIVE C. CONSERVATION PARTNERSHIP APPROACH (PROPOSED ACTION)

The Conservation Partnership Approach outlined in Alternative C is the Service's Proposed Action. This alternative offers the most comprehensive and collaborative habitat and wildlife conservation effort. Alternative C would provide the opportunity to work cooperatively with the local ranching community on conservation measures of mutual benefit. Additionally, the Service would work cooperatively with private organizations, municipal, state, and other federal agencies to implement conservation practices across the landscape. The Service proposes approximately 150,000 acres of conservation within the Kissimmee River Basin, containing portions of the priority habitats identified in this proposal (Figure 8). Of these 150,000 acres, the Service would pursue acquisition from willing sellers of up to 50,000 acres in fee title acquisition and up to 100,000 acres in less than fee title acquisition. For the refuge portion of Alternative C, the Service has identified approximately 130,000 acres as the Conservation Focal Area, within which the Service would be authorized to only acquire up to 50,000 acres.

Under Alternative C, the Service would have the opportunity to work cooperatively within the Kissimmee River Basin to pursue the acquisition of a 100,000-acre Conservation Area through less than fee title methods, with a focus on the use of conservation easements. Wetland mitigation banks, conservation banks, and management agreements would also be considered. Acceptance of interest in conservation and mitigation banks or entering into management agreements typically involves the acceptance of less than fee title interest.

The Conservation Focal Area of approximately 130,000 acres identifies the specific parcels of property from which the Service would target the purchase of up to 50,000 acres. Identifying an area larger than that sought for acquisition would provide the opportunity for the Service to adapt and respond to changes, over time, in landowner interest and availability of high-quality habitat. All lands within the Conservation Focal Area, after the acquisition of the 50,000 acres of fee title lands, would still be available for less than fee title acquisition (i.e., the other 80,000 acres).

This flexible yet focused land acquisition strategy for both fee and less than fee acquisition would allow the Service to respond to changing habitat conditions, acquisition opportunities, and changing landowner interests.

Planning Unit Description

In order to organize and describe this conservation partnership approach (Alternative C), it was necessary to develop a hierarchy of levels of conservation, ranging from the overall landscape perspective down to the individual landowner parcels. The following description summarizes how Alternative C is organized.

To best complement existing municipal, state, and federal conservation within this landscape, Alternative C, the Conservation Partnership Approach alternative contains two areas:

- an approximately 130,000-acre Conservation Focal Area where the Service would have opportunity and authority to acquire up to 50,000 acres with a fee title focus and
- an approximately 816,000-acre Conservation Partnership Area with a less than fee title acquisition focus where the Service would have the authority to acquire up to 100,000 acres with a conservation easement focus.

The Conservation Area would provide the Service the opportunity to work together with landowners; private organizations; and municipal, state, and federal governments to conserve wetlands and improve the groundwater recharge, water storage capacity, and water quality of the upper Everglades watershed.

Six planning units have been identified for the Conservation Focal Area: Ridge North (Figure 10a), Ridge Central (Figure 10b), and Ridge South (Figure 10c), and Prairie North (Figure 10d), Prairie Central (Figure 10e), and Prairie South (Figure 10f) (see Appendix F for a detailed description of the methods used to identify and develop the priority areas). Fee title acquisition would be limited to these six units. These six planning units are based upon two primary criteria: (1) The key habitats that support the focal species described in the Affected Environment section of this report (see Chapter II), and (2) connectivity between existing areas of conservation.

This alternative would protect and meet the needs of both rare and common wildlife, provide wildlife corridors linking existing conservation lands, and restore additional wetlands and wetland function, as well as provide opportunities for wildlife-dependent public use activities and help maintain the cultural ranching heritage of the area. Public use opportunities under this alternative would include hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. This alternative is described more fully through its ability to serve the outlined overarching goals.

Figure 10a. Alternative C - Ridge North Planning Unit

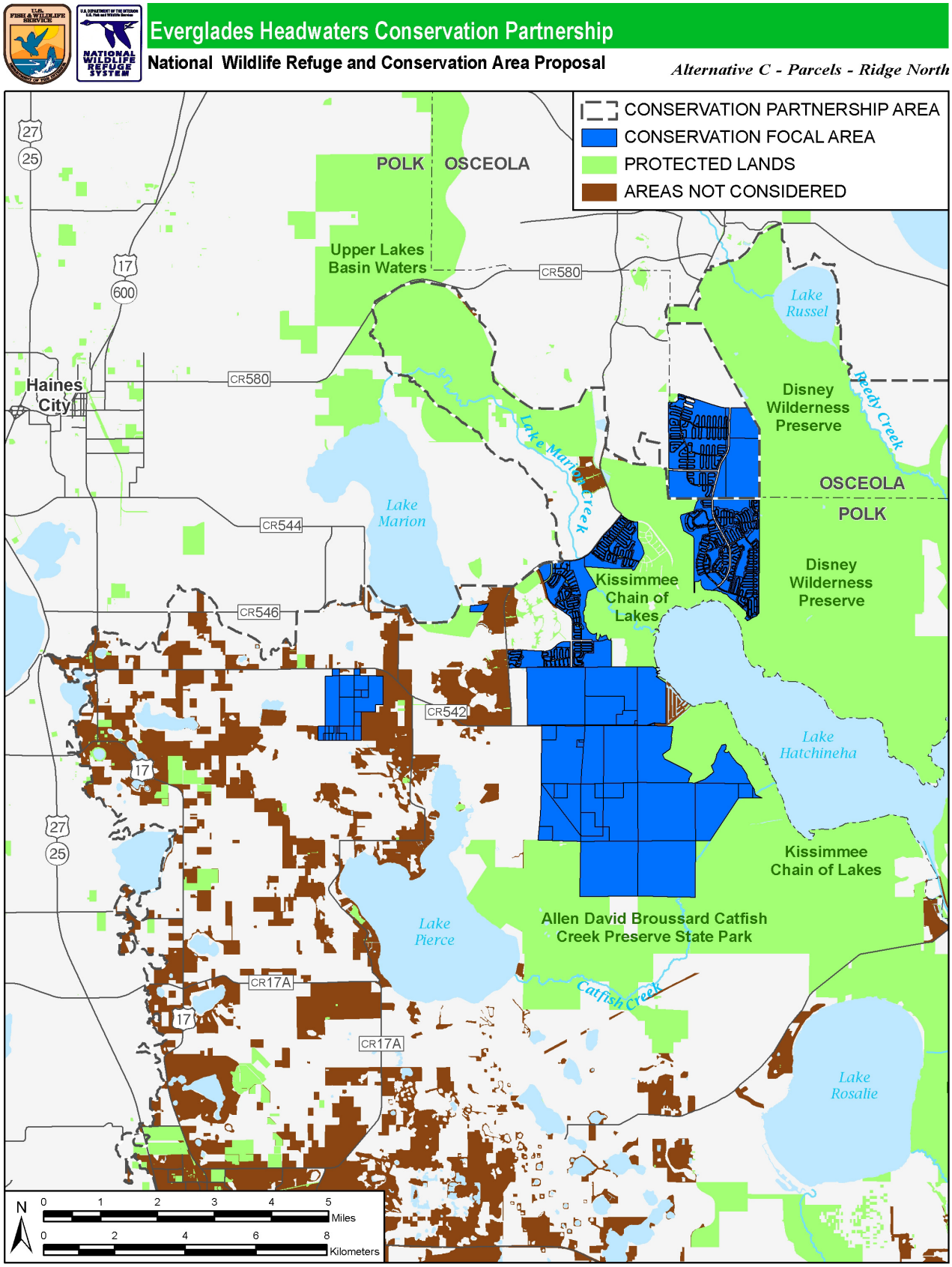


Figure 10b. Alternative C - Ridge Central Planning Unit

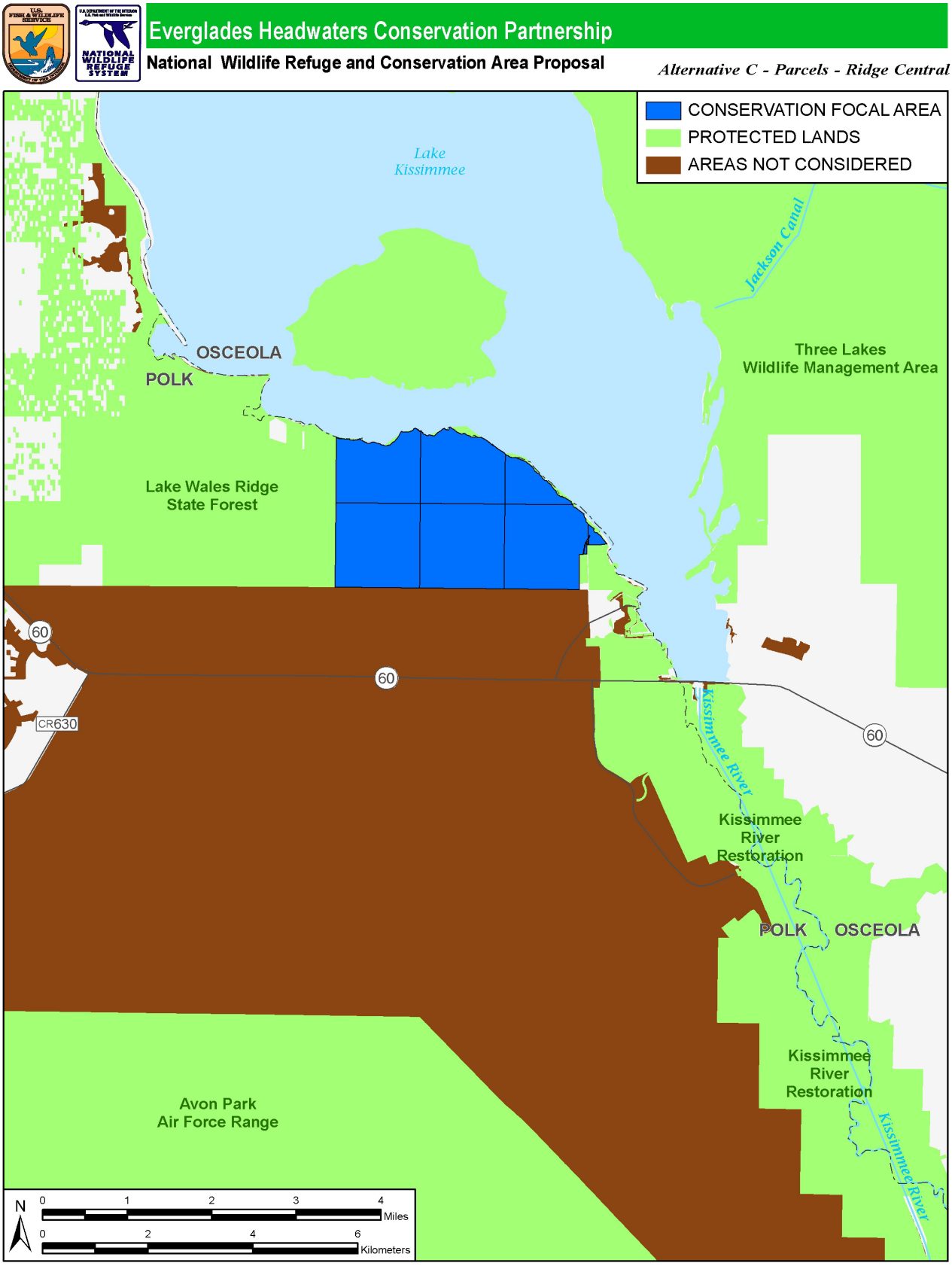


Figure 10c. Alternative C - Ridge South Planning Unit

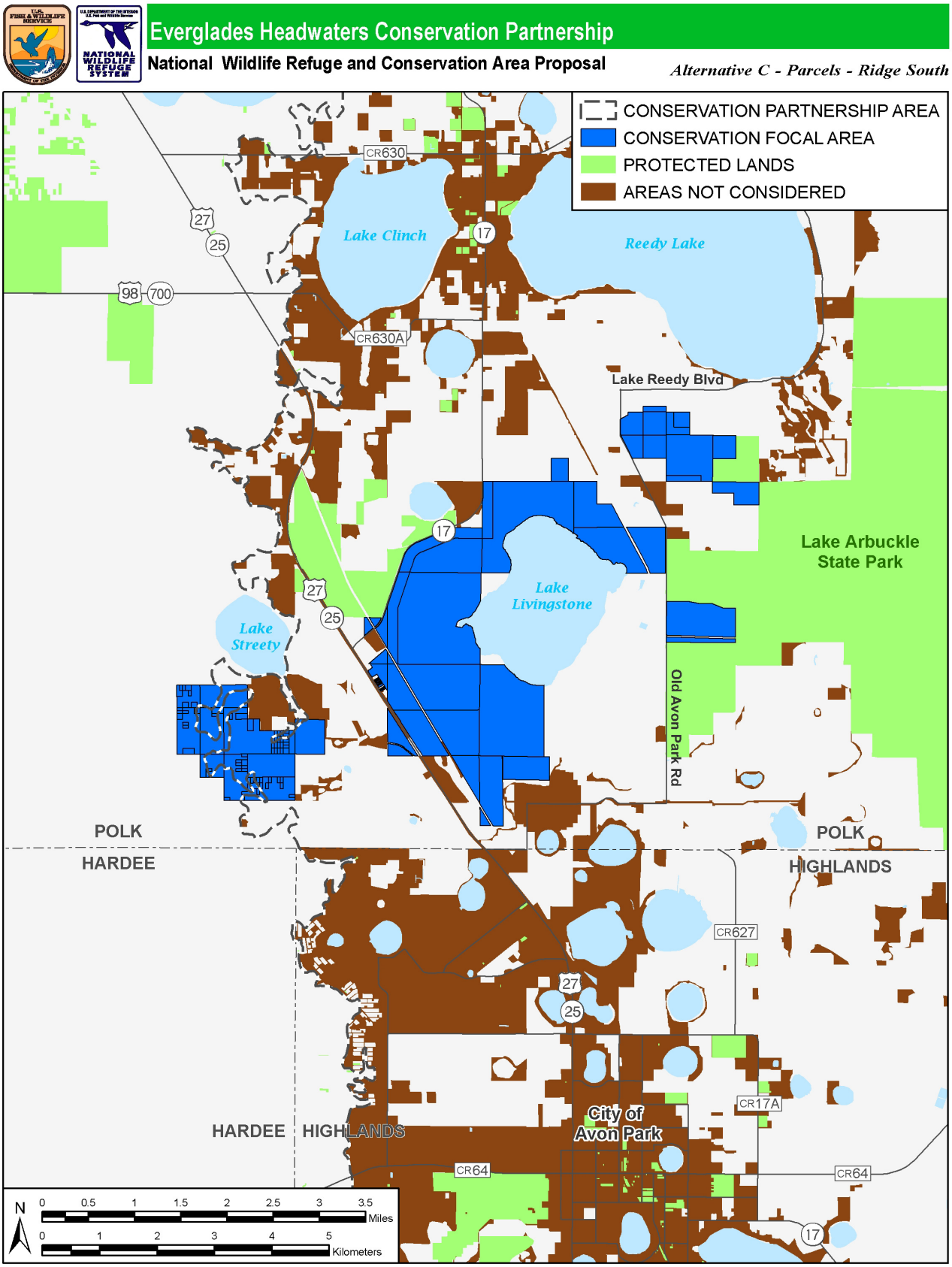


Figure 10d. Alternative C - Prairie North Planning Unit

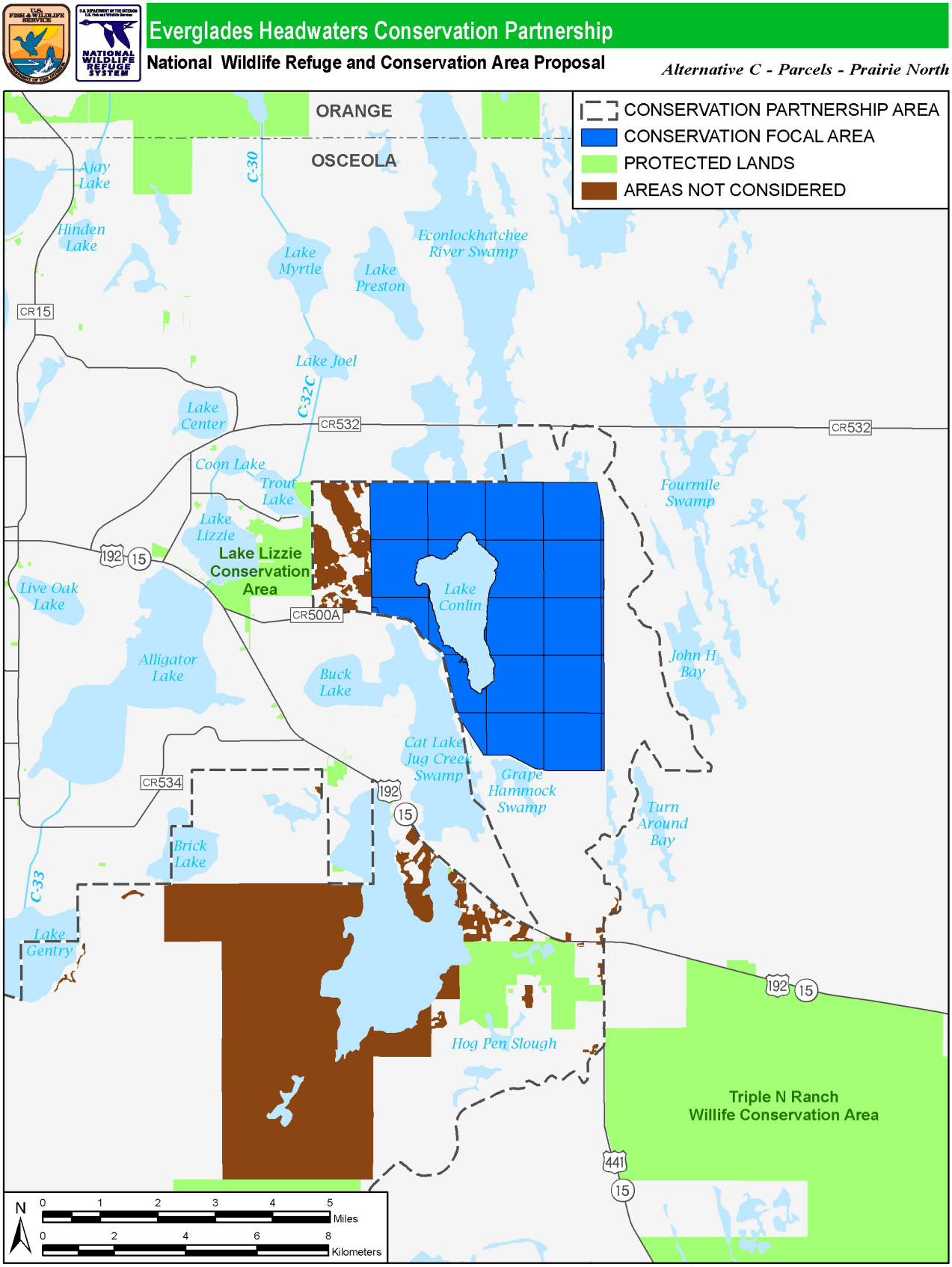


Figure 10e. Alternative C - Prairie Central Planning Unit

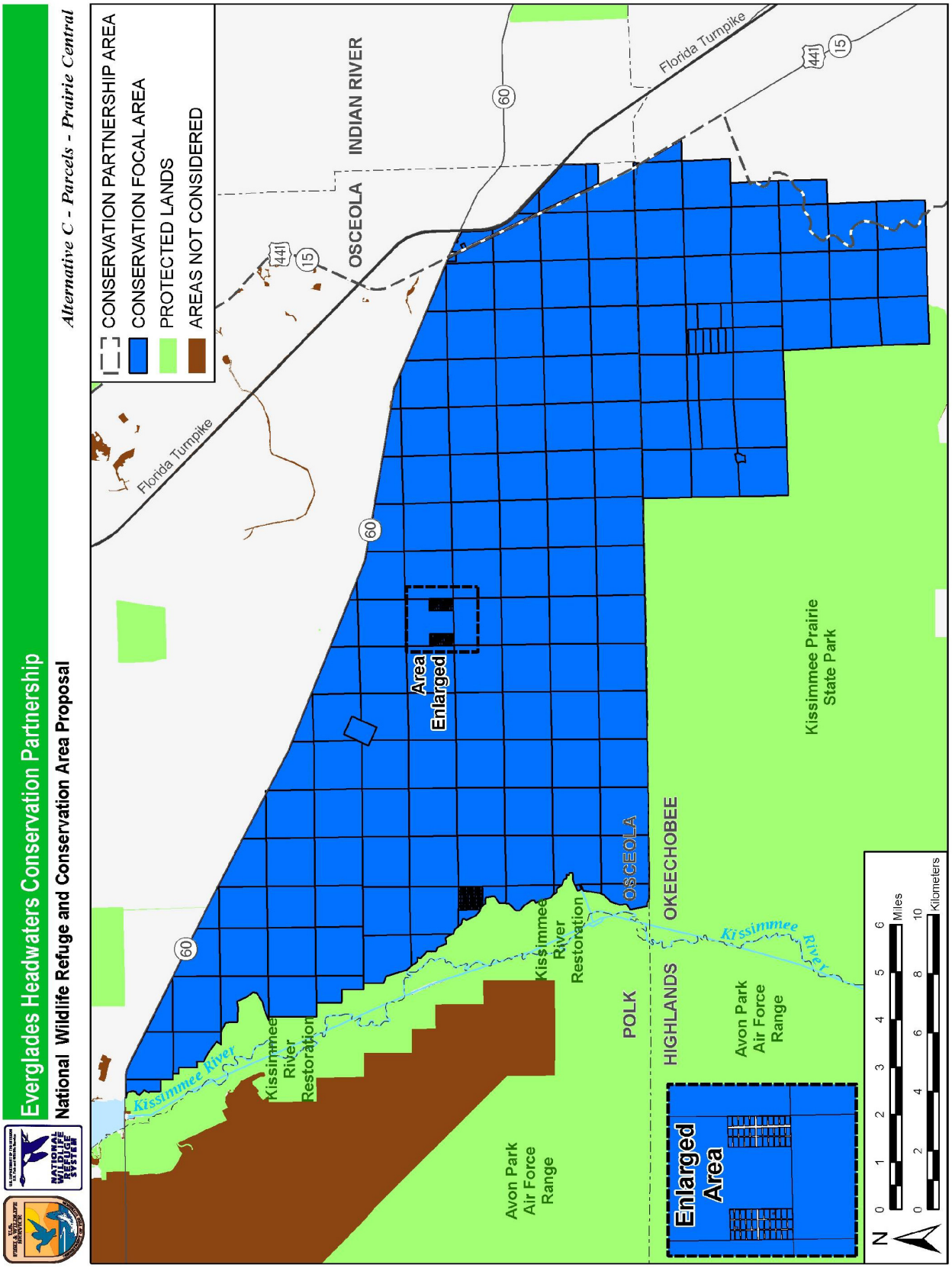
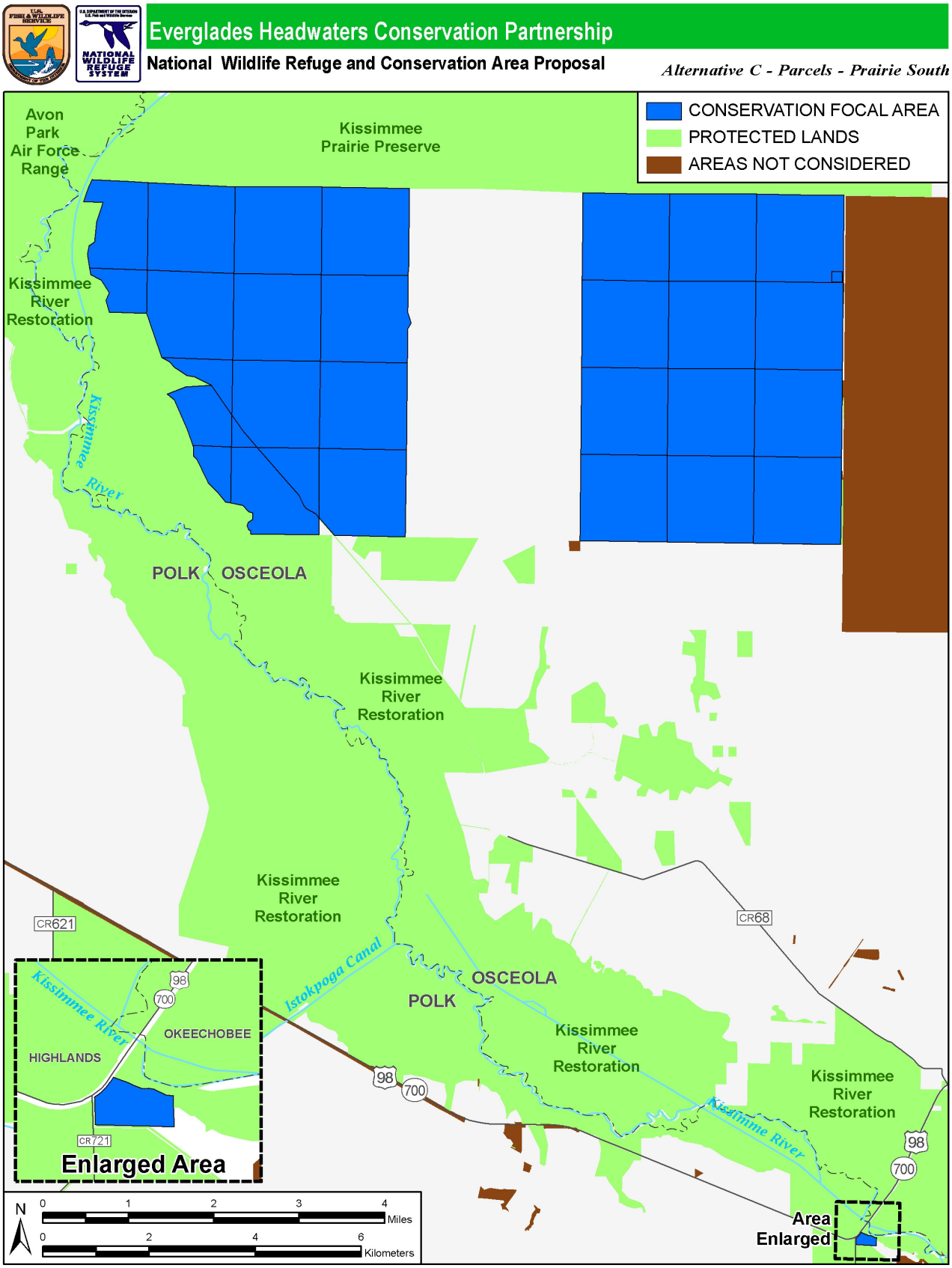


Figure 10f. Alternative C - Prairie South Planning Unit



Goal 1. Functional Conservation Landscape

The upper Everglades watershed will become a more connected and functional conservation landscape that will provide effective habitat connections between existing conservation areas and allow habitats and species to shift in response to urban development pressures and global climate change.

The proposed Everglades Headwaters NWR and Conservation Area lands would provide an important link for migratory birds and important habitat for several species of concern. Proposed management would complement the management of adjacent and nearby conserved lands, both public and private, thus enhancing the Service's wildlife management contribution to the region and helping to make the entire landscape a more functional conservation landscape (Figure 8). Links to existing conserved lands would also provide the opportunity for species to migrate and adapt to changes in habitats anticipated to occur from the impacts of global climate change. The proposed Everglades Headwaters NWR and Conservation Area in central Florida would provide local and regional benefits to wildlife by working in concert with existing conservation areas and partners, including SFWMD's Kissimmee River Restoration efforts, Avon Park Air Force Range, the Nature Conservancy's Disney's Wilderness Preserve, Kissimmee Prairie Preserve State Park, Three Lakes Wildlife Management Area, and various designated trails throughout this area.

Although the proposed acreage for fee title acquisition is the same as for Alternative B, the ability to work within a larger Conservation Focal Area would provide the Service with an enhanced ability to adapt to changing circumstances over time. As landowner interests and opportunities for acquisition change, having the ability to select alternative lands of the same conservation value eliminates the need for the Service to reinitiate land acquisition planning activities. Often times, refuge acquisition boundaries remain uncompleted because the lands initially identified are fixed on the landscape and are sold to other individuals, agencies, or organizations. Thus the opportunity for the Service to participate in conservation efforts is lost. For example, the Lake Wales Ridge NWR initially identified an approximately 20,000-acre refuge acquisition boundary. Today, the Service owns less than 2,000 acres, with other partners conserving approximately 10,000 acres. Much of the remainder has been sold to other private interests leaving the Service with little or no opportunity to reach the objectives established during the planning process for that refuge. In the case of the Everglades Headwaters NWR proposal, identifying an acquisition boundary that is larger than the authorized final acquired acreage would allow the Service a greater opportunity to meet the goals and objectives established in this planning document, while only authorizing the 50,000 acres for acquisition.

The flexibility of being able to select fee title acquisition parcels over time within a larger focal area, along with this same flexibility being built into acquiring conservation easements, would better enable us to provide corridors and linkages and to maintain a working landscape. The additional easement lands associated with the Conservation Area being proposed for acquisition in Alternative C would allow complete connectivity between many existing conservation lands. This would be especially important for species such as Florida grasshopper sparrow whose breeding subpopulations are isolated. Fee title acquisition would not be feasible at the large geographic scale that separates these populations, but easements provide a mechanism that allows landowners to maintain their livelihood, while at the same time securing the conservation landscape.

Less than fee title acquisition provides the Service the opportunity work closely with local landowners and ranchers to provide corridors across working landscapes for wildlife movement between existing conservation lands, while at the same time providing the opportunity for the landowners to continue to engage in ranching pursuits. It may not be necessary to have large tracts of intervening lands under conservation ownership, when the need is simply to protect those corridors from development. Under

this alternative, the Service would continue to work with landowners to protect sensitive corridor areas such as the lands along the base of the east flank of Lake Wales Ridge.

Under this alternative, the Service would work with the public and private partners to promote and protect the active ranching community in this area, as well as its cultural and historical resources. Without the stewardship of the ranching community, the opportunity to conserve the multiple species and habitats found in this landscape would likely not exist today. The partnership approach to conserving these resources, as well as the habitat and wildlife resources described above, is a key to successfully meeting this goal. Fully two-thirds of the acreage being proposed under Alternative C, approximately 100,000 acres, are specifically designated to be protected using less than fee title means (e.g., through conservation easements), thereby providing the opportunity for conservation of wildlife and habitats, while at the same time providing the opportunity to assure a healthy and vibrant ranching community and economy.

Goal 2. Habitat for Fish and Wildlife

The Everglades Headwaters NWR and Conservation Area will provide a wide range of quality Kissimmee River Basin habitats to support migratory birds, federal and state listed species, state designated species of conservation concern, and native wildlife diversity.

Habitats

Diverse habitats and their respective ecological systems for trust species and species of special concern would be protected through this alternative. The Conservation Focal Area provides the opportunity to protect a mix of habitats whose acreage may vary depending upon the specific parcels ultimately selected. The same is true for the Conservation Partnership Area. For the Conservation Focal Area, the total fee title lands to be acquired are the same (50,000 acres) as for Alternative B. The acreages available for conservation under Alternative C vary however. Thus, the acreage of key habitats available to be protected would be as follows: 13,415 acres of dry and wet prairie; 10,123 acres of pine flatwoods; 2,177acres of sandhill and scrub habitats; and 25,233 acres of wet prairie and freshwater marshes. The remaining acreage is primarily improved pasture which provides ample opportunity to restore a variety of important habitats.

The additional acreage to be protected by conservation easement would also vary depending upon the specific parcels that are acquired. Prioritization and selection of lands for conservation easements would be guided by the habitat prioritization model (Appendix F), location within the Conservation Partnership Area, partnership opportunity, and best professional judgment. Protecting these habitats would contribute to the conservation of wetland birds; waterfowl; shorebirds; grassland birds; neotropical migratory birds; native bird species, such as turkey and bobwhite; white-tailed deer; Florida black bear; and the occasional Florida panther. The following is a description of some of the most important habitat types:

Sandhill and Scrub

Approximately 2,177 acres of sandhill and scrub habitat would be available for conservation within the Conservation Focal Area. Additional sandhill and scrub habitat acreage not protected by fee title acquisition could be protected by less than fee acquisitions, especially conservation easements. Sandhill habitats and scrub occur on well-drained, nutrient-poor sandy soils. Grasses and scrubby oaks dominate this fire-dependent landscape. The sandy soils typical of these habitats allow for rainfall to enter the groundwater system. Discharge from these habitats gives rise to cutthroat seepage wetlands, and these would be further protected through less than fee title acquisitions. Several of the

species found on these habitats are endemic to central peninsular Florida and many are federally listed species, such as Florida scrub-jay, sand skink, Florida ziziphus, and Garrett's mint.

Pine Flatwoods

Approximately 10,123 acres of pine flatwoods habitat would be available for conservation within the Conservation Focal Area. Additional pine flatwoods habitat acreage not protected by fee title acquisition could be protected by less than fee acquisitions, especially conservation easements. Pine flatwoods are characterized by level topography and poorly drained soils. These pine forests vary greatly depending on hydrology and can have a dominant understory of wiregrass, saw palmetto, or other low shrubs. The overstory of pine flatwoods can be of longleaf, slash, or pond pine and cabbage palm. They are important for a variety of vertebrate and invertebrate species, such as neotropical migratory birds, red-cockaded woodpecker, Florida black bear, Florida panther, fox squirrels, and white-tailed deer.

Dry Prairie

Approximately 13,415 acres of dry prairie habitat would be available for conservation within the Conservation Focal Area. Additional dry prairie habitat acreage not protected by fee title acquisition could be protected by less than fee acquisitions, especially conservation easements. Dry prairie is endemic to central peninsular Florida, occurring on poorly drained soils. It is fire-dependent and typically treeless with a low ground cover of wiregrass, stunted saw palmetto, and low-growing runner oak. It harbors numerous endemic vertebrates. The Florida grasshopper sparrow is the flagship species of this habitat.

Wet Prairie and Freshwater Marsh

Approximately 25,233 acres of wet prairie and freshwater marsh habitats would be available for conservation within the Conservation Focal Area. Additional wet prairie and freshwater marsh habitat acreage not protected by fee title acquisition could be protected by less than fee acquisitions, especially conservation easements. Freshwater marshes and wet prairie are both seasonal wetlands that differ by the duration of inundation and fire regime. Sawgrass, sedges, rushes, and dwarf cypress dominate wet prairie, whereas cattail, sawgrass, pondweeds, water lilies, and numerous sedges and rushes dominate freshwater marshes. The Everglades snail kite, wood stork, whooping crane, and Audubon's crested caracara are noted residents of these habitats.

Forested Wetlands

Approximately 9,181 acres of forested wetlands habitat would be available for conservation within the Conservation Focal Area. Additional forested wetlands habitat acreage not protected by fee title acquisition could be protected by less than fee acquisitions, especially conservation easements. Forested wetlands range from isolated depression swamps and shoreline to flowing water swamps. Bald cypress, red maple, and bay trees may dominate the overstory, while a mix of shrub species forms the understory. Many smaller isolated swamps have been converted to agricultural uses, and many of the remaining swamps are degraded by drainage and nutrient runoff. The wood stork, eastern indigo snake, and Florida panther can be found in these habitats.

Threatened, Endangered, and Species of Conservation Concern

There are 14 federally listed wildlife species and two candidate species found within the Study Area and 38 state-listed animal species listed as threatened, endangered, or Species of Special Concern within the Study Area (Appendix H). A total of 88 species are listed by the Federal Government and/or State of Florida or designated by the state as a species of conservation concern. Their habitat needs vary greatly across the landscape, some being exclusively dependent on the habitats that are endemic to central Florida, such as dry prairie and scrub. The Study Area lies within the Atlantic Flyway for migratory birds with the proposed refuge being located within NABCI's Bird Conservation Region (BCR) 31, the Atlantic Coast Joint Venture, and the operational area for the Peninsular Florida Landscape Conservation Cooperative. Listed below is a brief description of some of the focal species expected to benefit from the proposed refuge.

Audubon's Crested Caracara

The federally threatened Audubon's crested caracara occurs within the wet and dry prairie habitat of central peninsular Florida, but is also found in the improved pastures with scattered cabbage palm. It often feeds on wetland species, but is also noted to feed on road-killed animals as well. Audubon's crested caracara would be expected to use the proposed Everglades Headwaters NWR and Conservation Area proposed under Alternative C. Less than fee acquisitions would continue to provide caracara with foraging habitats while at the same time providing the ranching community the opportunity maintain its livelihood.

Everglades Snail Kite

The federally endangered Everglades snail kite forages exclusively on apple snails. Apple snails can be found in a variety of wetlands, ranging from permanent wetlands and lakes to seasonal wetlands and ditches. While several larger wetlands throughout the Study Area provide nesting habitat, restoration and management of wetlands in this proposal are focused on providing improved foraging opportunities. The Everglades snail kite would be expected to use the proposed Everglades Headwates NWR and Conservation Area proposed under Alternative C. Wetlands restored on less than fee title acquisitions would provide additional wetland foraging areas for the snail kite as compared to lands protected under Alternative B.

Florida Grasshopper Sparrow

The federally endangered Florida grasshopper sparrow occurs throughout the prairie region of peninsular Florida. They are closely associated to the fire-dependent dry prairie and are now found on only a few parcels of public land and nearby ranches. Opportunities for conservation easements and restoration of pastures may provide the opportunity to link these isolated populations. The Florida grasshopper sparrow would be expected to use the dry prairie habitats on fee and less than fee title acquisitions to a greater extent as compared to lands protected under Alternative B.

Wood Stork

The federally endangered wood stork forages and breeds within the marshes and cypress swamps of southern Florida. It shares these habitats with other more common wading birds, such as the great egret and white ibis. Only two active nest colonies exist within the Study Area, but five abandoned colony locations can be found in the area. Wetlands restored on less than fee title acquisitions would provide additional wetland foraging areas for the wood stork as compared to lands protected under Alternative B.

Florida Black Bear

Listed by the state as a threatened species, the Florida black bear once ranged throughout Florida and the southeast states, but now occupies only 18 percent of its historic range. Using a wide variety of habitats, the Florida black bear is known to wander widely in search of food, cover, mates, and other resources. The population found within the Study Area is isolated and opportunity exists within this proposal to link them with a larger population found within the St. Johns River watershed. The less than fee acquisition lands would provide the Florida black bear greater opportunities for movement across the landscape as compared to Alternative B.

Other Migratory Birds

Two subspecies of sandhill crane, a state listed threatened species, can be found within the Study Area. The Florida sandhill crane is a non-migratory, year-round breeding resident, while the greater sandhill crane is migratory and only winters in Florida. Both subspecies use a wide variety of wetlands and pastures and would be expected to have increased nesting and foraging opportunities as compared to Alternative B.

Blue-winged teal and mottled duck are the two most commonly observed waterfowl species, with many other species of waterfowl noted throughout the winter period. They would be expected to have greater amounts of wintering habitat as compared to Alternative B.

Resident Wildlife

A wide variety of resident wildlife species can be found throughout the Study Area. Bobwhite quail, wild turkey, white-tailed deer, grey squirrels, and rabbits occur in abundance, providing ample hunting and wildlife observation opportunities. Wild hog, although a nonnative and nuisance species, is also considered a game species and can be found in overabundance in many areas throughout Florida. All of these species would be expected to have greater amounts of habitat as compared to Alternative B.

Listed Plant Species

There are approximately 23 federally listed plant species found throughout the landscape with most occurring in scrub habitat. Nearly all species are fire-dependent and their populations have been impacted by fire suppression, which has allowed brush and overstory species to become established. Some of the federally listed species found within the Study Area include beautiful pawpaw, scrub lupine, Florida ziziphus, and Garrett's mint. Many important plant species would be expected to receive greater protection as compared to Alternative B.

Goal 3. Enhanced Water Quality, Quantity, and Storage

Focusing on restoring or mimicking natural hydrologic processes, the Everglades Headwaters NWR and Conservation Area will contribute to water quality, water quantity, and water storage capacity of the upper Everglades watershed to support Everglades restoration goals and objectives and water quality and supply for central and south Florida.

Alternative C would add 150,000 acres of conservation lands to the upper watershed of the Everglades ecosystem, supporting the enhancement of water quality, quantity, and storage of this landscape. An estimated 8,846 acres of degraded wetlands would be restored under this alternative on any fee lands acquired. There are approximately 237,000 acres of degraded wetlands within the Conservation Partnership Area where the Service would have the opportunity to

restore an estimated additional 23,065 acres of wetlands on less than fee title lands. The three primary wetland types that would be restored would be seasonal, semi-permanent, and cutthroat seepage wetlands. Seasonal and semi-permanent wetland basins occur throughout the prairie and savannah landscape, and cutthroat seepage wetlands are associated with the sandhill and scrub habitats of the Lake Wales Ridge. Cutthroat seepage slope wetlands are an endemic wetland type found at the base of the slope of sandhill habitat in south-central Florida. Groundwater entering underground aquifers sometimes express themselves at the ground surface, creating a mosaic of seasonal wetlands ranging from marshes to pine forests dominated by an understory of cutthroat grass. Many of these wetland types have been ditched and drained, while others have been fire suppressed, allowing for hardwoods to encroach.

The primary method of wetland modification has been surface ditching to remove excess standing water from wet and dry prairie systems. These surface ditches are rarely more than 2 to 3 feet deep and are easily restored through the reestablishment of the original surface contours of the landscape. Restoration of these types of wetlands would help serve multiple ecosystem service functions. By blocking surface flow, additional water would be stored in the wetland basin, allowing for slower water discharge, groundwater recharge, and nutrient uptake. Other agencies and organizations, such as NRCS, have wetland restoration programs. Opportunities to complement these restoration activities with Service restoration activities would further serve to benefit the overall watershed, including that of the Kissimmee River, Lake Okeechobee, and the Everglades.

Goal 4. Wildlife-dependent Recreation and Education

Refuge visitors of all abilities will enjoy opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of the important grassland and savanna landscape of the headwaters of the Everglades.

With the addition of 50,000 acres of Service managed lands to the conservation landscape that could support compatible wildlife-dependent public use opportunities, wildlife-dependent recreation and education opportunities would increase under Alternative C, compared with the No Action Alternative, and would be similar in nature to Alternative B. The Service would work cooperatively with FWC and other partners to provide public hunting and fishing opportunities, and the Service would provide interpretive and educational programs.

The National Wildlife Refuge System Improvement Act of 1997 establishes six priority public uses on refuges. Those priority uses depend on the presence, or the expectation of the presence, of wildlife. These uses are: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Although these priority uses must receive consideration in planning for public use, they also must be compatible with the purposes for which a refuge is established and the mission of the Refuge System. Compatibility determinations, which evaluate the effects of a particular use or activity in the context of species or habitats on a refuge, aid in making those decisions. If refuge lands were acquired, compatibility determinations would be used to decide which, where, and how public use opportunities would be permitted.

Public use opportunities contribute to the long-term protection of wildlife resources by promoting understanding, appreciation, and support for wildlife conservation. The six priority public uses would be accommodated to the maximum extent possible, where they would not have significant negative effects on wildlife. All of the proposed public use activities are contingent upon availability of staff and funding to develop and implement these programs. The Service would promote opportunities for volunteers and develop community interpretive materials and programs to enhance awareness of and appreciation for the area's resources. School and other group programs would be considered. If a

refuge is established, an increase in public use would be expected from new facilities and programs such as new hunts, new trails, new parking areas, new fishing access, new interpretive overlooks, and new observation platforms that would potentially be a part of a new refuge. The Service would allow public access for day use on many newly acquired lands, provided there are no expected negative effects on sensitive species (e.g., ESA-listed species) or habitats, and would consider overnight access as a component of other public use activities (e.g., hunting in remote locations). See Appendix B for the interim compatibility determinations for the Proposed Action.

Hunting and Fishing

The Service would open newly acquired lands for hunting and fishing in accordance with the state's regulations after reviewing and evaluating the biological, ecological, and human safety impacts. Newly acquired lands that traditionally have been open to hunting and fishing would remain open, at their current level, under interim compatibility determinations (Appendix B) until the Service completed the planning process to formally open the refuge to those activities. To this end, the Service would continue discussions with FWC regarding the co-management opportunities of the hunting, fishing, and other recreational activities associated with this proposal. If possible, the Service would provide American with Disabilities Act (ADA)-compliant hunts and youth hunt opportunities. Generally, the Service would allow hunting, based on state hunting seasons and consistent with the refuge's comprehensive conservation plan and hunt plan (once developed). The Service would continue discussions to designate the proposed refuge as a state-managed wildlife management area(s). Fishing would be allowed, where accessible and compatible. Youth fishing opportunities would be encouraged.

Wildlife Observation, Wildlife Photography, and Environmental Education and Interpretation

Beyond hunting and fishing, the refuge would also provide opportunities for wildlife observation, wildlife photography, and environmental education and interpretation (see Appendix B for the interim compatibility determinations addressing these uses). Working with state and local agencies, the Service would study the feasibility of connecting existing hiking, bicycling, and horseback riding trails through refuge lands. A refuge may also provide interpretive and environmental education programs and increase partnership opportunities to interpret the cultural and natural resources within the refuge and the watershed.

Environmental education, one of the six priority wildlife-dependent uses encouraged on refuge lands, incorporates onsite, offsite, and distance learning materials, activities, programs, and products that address the audience's course of study, the mission of the Refuge System, and the management purposes of the refuge. The goal of environmental education is to promote an awareness of the basic ecological foundations of the interrelationship between human activities and natural systems. Through curriculum-based environmental education both on- and off-refuge, refuge staff, educators, and partners hope to motivate students and other persons interested in learning the role of management in the maintenance of healthy ecosystems, working landscapes, and conservation of our fish and wildlife resources

On April 16, 2010, President Obama announced the America's Great Outdoors Initiative, calling for a grass roots effort to protect our Nation's lands and waters and connecting all Americans to their natural and cultural heritages (CEQ 2010). Our country has a legacy of conserving its natural resources for the benefit of its citizens. Recent generations find it difficult to connect and enjoy these outdoor resources. Through this initiative, all Americans would have the opportunity to enjoy and appreciate central Florida outdoor resources.

For years, national wildlife refuges have been connecting children with the land and with the Service's conservation mission. It is now apparent that such connections are of immense importance. New information shows that most children spend their time indoors with televisions, video games, computers, and cell phones, rather than experiencing nature (Louv 2005). As the Nation's primary conservation agency, the Service has a strong incentive to promote childrens' nature-based activities. We would work with school districts and teachers to develop environmental education curriculum featuring the areas' unique species and communities, as well as the human dependence and agricultural need for ranching and farming to sustain a healthy working environment and economy. The Service would work with the conservation and education partners to promote environmental education, thereby maximizing resources and time commitments for each partner organization. We would utilize the refuge for habitat restoration projects, docent-led trail walks, birding festivals, guest lectures, and youth hunting and fishing efforts.

D. SUMMARY

Partnerships with surrounding landowners, and municipal, state, and other federal agencies would be the key to successful management of the proposed Everglades Headwaters NWR and Conservation Area. This document was developed cooperatively with state partnering agencies and is supported by the land conservation partners working in the greater Everglades landscape. The Service would continue to cooperate with the conservation partners, all of whom are instrumental in helping accomplish habitat management goals and objectives. The strength of potential partnerships is illustrated by the team that is participating in partnership discussions as part of the Greater Everglades Partnership Initiative.

Taken together, the respective missions of the groups engaged in partnership discussions cover the protection of ranchland, listed species, a wide variety of habitat types, and open space that the local community has identified as important for conservation. Based on this effort, Alternative C (Proposed Action) identifies approximately 150,000 acres that would conserve the area's most important areas for maintaining biological integrity, diversity, and environmental health of the proposed refuge, and would provide habitat connectivity to other areas of protected lands, resulting in a more functional conservation landscape in the headwaters of the Everglades.

As noted in detail above, many of the organizations with whom the Service is collaborating have already protected key habitats in the upper Everglades watershed and will continue to do so within the limits of their available resources. Should the proposed Everglades Headwaters NWR and Conservation Area become a reality, there is a clear need for continued local, state, and federal support. The Service recognizes its inability to solve the problems of habitat fragmentation, urban development, altered ecological processes, impacts from sea level rise and global climate change, and land protection on its own. Thus, it is incumbent upon all agencies and organizations to continue the efforts of communication and cooperation through the Greater Everglades Partnership Initiative. Through this effort, the Service would work to combine its efforts with those of its existing partners, as well as numerous other partners yet to be identified. Newly acquired lands that traditionally have been open for hunting and fishing would remain open, at the same level of intensity, under interim compatibility determinations (Appendix B) until the Service completed the planning process to formally open the refuge. To this end, the Service would continue discussions with FWC regarding the co-management opportunities of the hunting, fishing, and other recreational activities associated with this proposal. If possible, the Service would provide American with Disabilities Act (ADA)-compliant hunts, and youth hunts. Generally, the Service would allow hunting, based on state hunting seasons and consistent with the refuge's comprehensive conservation plan and hunt plan (once developed). The Service would continue discussions to establish portions of the proposed

refuge as state-managed wildlife management area(s). Fishing would be allowed, where accessible, and the refuge may be able to support fishing derbies for children.

Through Alternative C, the Service would have the additional opportunity to establish a Conservation Service Center approach to conservation and environmental education. As envisioned, agencies and organizations could be co-located at various offices and visitor contact stations, both existing and proposed, so that all of the public's conservation and outdoor wildlife-dependent recreation and education needs would be met at this one-stop shop approach to conservation. This approach would also reduce duplication of conservation program efforts amongst agencies and organizations, thereby allowing all agencies and organizations to become more fiscally efficient.

The Service and the Refuge System would work toward the overarching goals outlined in this document, addressing a functional conservation landscape; habitat for fish and wildlife; enhanced water quality, quantity, and storage; and wildlife-dependent recreation and education. It is clear that partnerships with the public; landowners; neighbors; conservation organizations; and municipal, state, and other federal agencies would be the only path to a successful Everglades Headwaters NWR and Conservation Area.

IV. ENVIRONMENTAL CONSEQUENCES

This section analyzes and discusses the potential environmental impacts associated with implementation of the three management alternatives described in Chapter III.

A. ALTERNATIVE A. NO REFUGE AND NO CONSERVATION AREA (NO ACTION ALTERNATIVE)

Under this alternative, the Service would take no action to acquire, protect, and manage any lands to establish the Everglades Headwaters NWR and the Conservation Area.

Future habitat protection under existing laws and regulations may be insufficient to prevent significant degradation of the area's fish and wildlife resource values. Federal executive orders involving the protection of wetlands and floodplains only apply to federal agencies. They do not apply to habitat alterations by non-federal entities which receive no federal funds.

The primary deterrent against the loss of resource values is the USACE Section 404 permit program, which is administered under the authority of the Clean Water Act. This program requires permits for most types of work in wetlands. Most of the wetlands in the project area qualify for protection under this program. In addition, the State of Florida has regulatory authority over the area and would not permit any developments that would violate the state's water quality standards.

However, there is no assurance that the protection offered by these regulations would be consistent with protection of the area's fish and wildlife resources. The regulatory programs are designed to accomplish different objectives. In addition, these programs are subject to changes in the law and to varying definitions and interpretations, often to the detriment of wetlands. The USACE regulatory authority provides for the issuance of Section 10 and/or Section 404 permits when it is not contrary to the public interest to do so and provided other conditions are met. Fish and wildlife conservation is only one of several public interest factors that are considered in these permit issuance decisions. If fish and wildlife conservation is outweighed by other factors, permits that would alter the wetlands in the proposed refuge area could be issued.

The desired fish and wildlife protection objectives, therefore, cannot be achieved to any degree under this alternative. Specifically, implementation of the No Action Alternative would have adverse impacts to the area's valuable fish, waterfowl, and wildlife habitats.

EFFECTS ON THE PHYSICAL ENVIRONMENT

Land Use Patterns

Florida's population is projected to double in 50 years from approximately 18 to 36 million people, based on the report, "Florida 2060: A Population Distribution Scenario for the State of Florida" (Zwick and Carr 2006). The Florida 2060 data were derived from population growth models produced by the University of Florida's Bureau of Economic and Business Research (BEBR). Based on the report, Florida would have approximately 22,894,140 residents by 2020 (Zwick and Carr 2060). As a comparison, a 1997 report by U.S. Census Bureau estimated that Florida's population would reach 19,634,000 by 2020 (U.S. Census Bureau 1997), which is about three million people less than what the Florida 2060 report projects. However, the 1997 U.S. Census Bureau report underestimated Florida's population growth for 2010, which they predicted would be 17,363,000 (U.S. Census Bureau

1997). In 2010, Florida's population was approximately 18,801,310 according to the latest Census data (U.S. Census Bureau 2011). Furthermore, other population projections for Florida have underestimated rates of increase in the number of residents, as detailed in the section on socioeconomics in Chapter II (Affected Environment).

The rise in population will likely dramatically alter Florida's current landscape, as dwellings, strip-malls, industrial parks, parking lots, roads, and other infrastructure are constructed. According to the Florida 2060 report, an additional seven million acres of undeveloped land in the state will be converted to urban areas by 2060 (Zwick and Carr 2006). The change in land use in Florida between 2005 and 2060, as projected by the Florida 2060 report, is illustrated in Figures 11 and 12, reprinted here from the Florida 2060 report with permission. It is predicted that about 2.74 million acres of current native habitat and 2.70 million acres of agricultural lands will be lost to development by 2060 (Zwick and Carr 2006). As can be seen in Figures 11 and 12, a substantial portion of lands contained in the Study Area are likely to be developed during the next 50 years. Previously discussed in the Socioeconomic section of Chapter II, Florida's population growth has not abated substantially, even with the economic downturn of the last few years, and although surplus housing and commercial real estate has reduced the rate of new development, population pressures over the next decades will likely result in continued conversion of land to urban use (Margaret Carr, University of Florida, personal communication, April 20, 2011).

The effect of urbanization is not limited to the conversion of open space to developed lands; it also has indirect effects on how adjacent conservation lands can be maintained. Conservation lands, particularly those in Florida, are often managed using prescribed fire to maintain ecosystem health and to reduce the risk of wildfires. Frequently, as urban areas become established immediately adjacent to conservation lands, the use of prescribed fire as a habitat and wildfire management tool becomes increasingly difficult due to smoke and safety considerations (Davis 1991, Rice et al. 1991). Hence, even land use on established protected areas can be negatively affected as urban areas expand.

Under the No Action Alternative, lands trusts, the State of Florida, and other conservation land managers would continue to protect some of the lands in the Study Area. Florida has a history of funding land protection efforts, and since 2001 the Florida Forever program has acquired more than 668,000 acres of land. Almost 800,000 acres of lands are proposed for acquisition under Florida Forever in 2010, with a substantial portion being in counties in and adjacent to the Study Area (FDEP 2010). However, the State of Florida has recently seen a drastic reduction in land acquisition activities dues to budget reductions. Even if these lands are acquired over the next several decades, many conservation lands in the Study Area would remain unprotected and remain at risk from development, biofuel production, mining, and other land uses incompatible with natural resource protection efforts.

Economic effects associated with land use under the No Action alternative are discussed under the Socioeconomics section below.

Figure 11. 2005 developed and conservation lands in Florida (modified from Zwick and Carr 2006; used with permission from 1000 Friends of Florida)

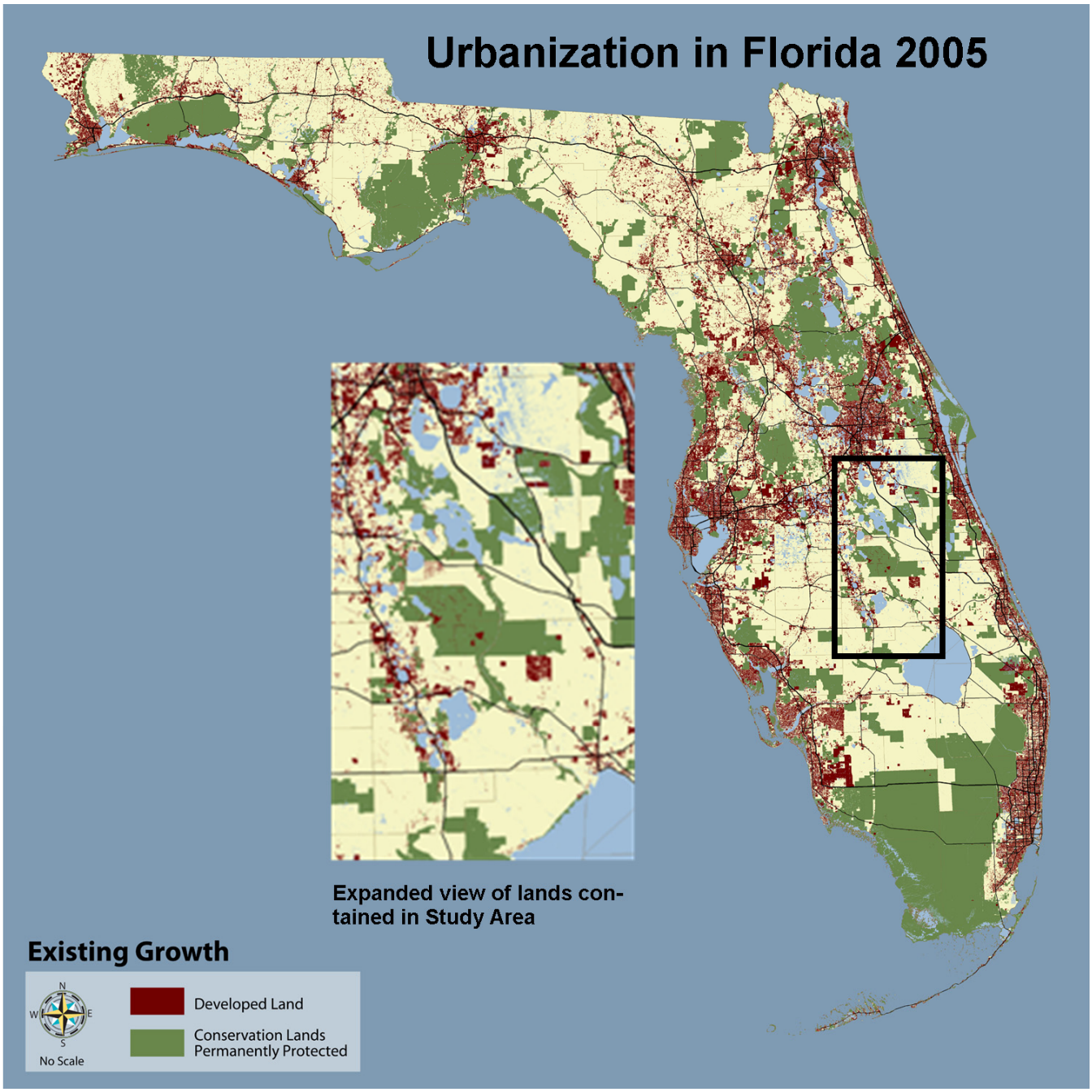
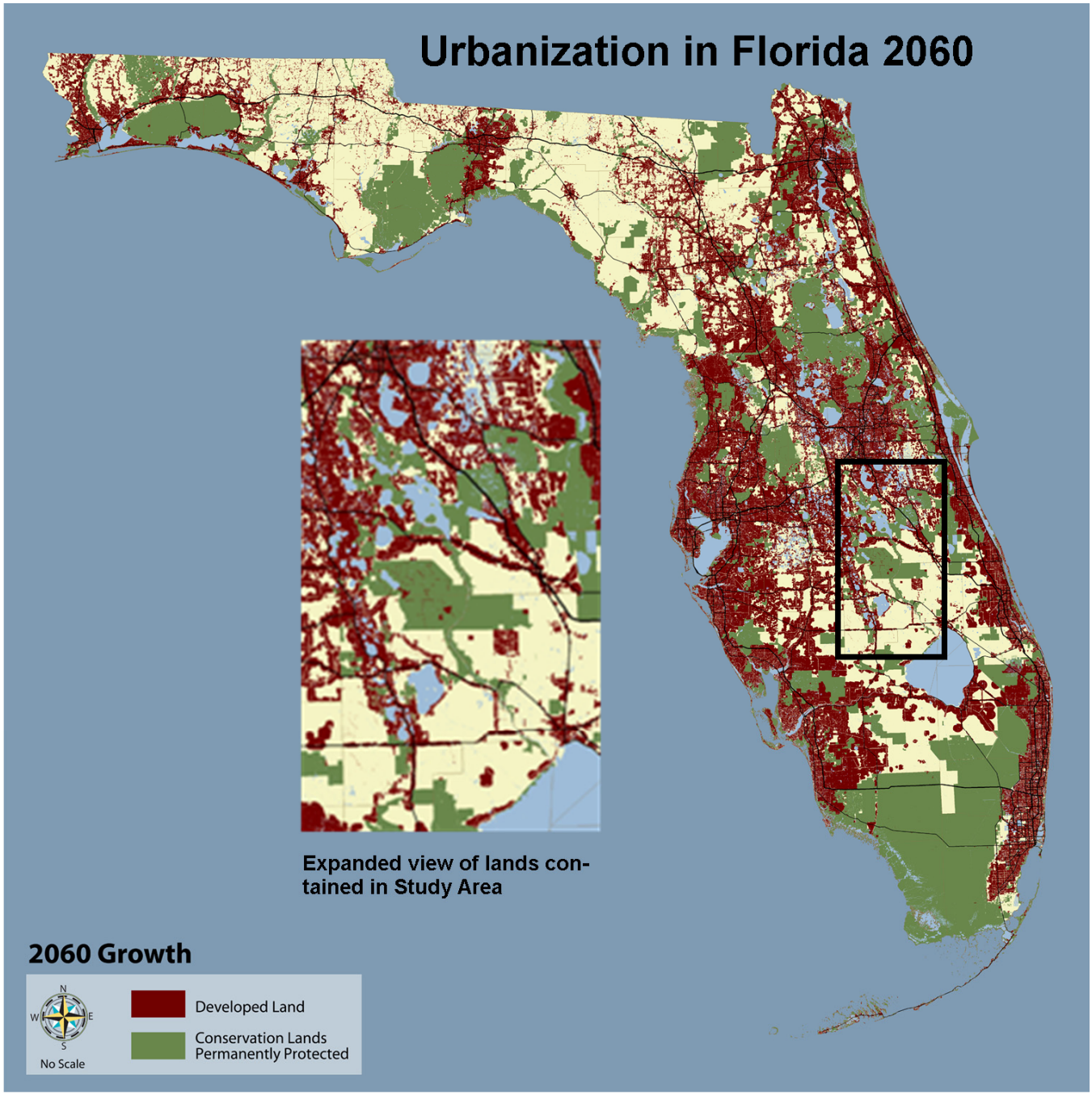


Figure 12. Projected developed and conservation lands in Florida by 2060 (modified from Zwick and Carr 2006; used with permission from 1000 Friends of Florida)



Climate

The climate impacts include those impacts associated with global climate change.

Beneficial

Under this alternative, areas within the Study Area would not be expected to become carbon sinks and positive impacts with regard to global climate change are not anticipated.

Adverse

Vegetation, alive or dead, is an important carbon stock, and ecosystems in the United States contain approximately 66,600 million tons of carbon (Heath and Smith 2004). According to the U.S. Climate Change Science Program, the size of the carbon sink in U.S. forests appears to be declining, based on inventory data from 1952 to 2007 (Birdsey et al. 2007). The carbon density (the amount of carbon stored per unit of land area) is highly variable, as it is directly correlated to the amount of biomass in an ecosystem or plant community. The total carbon in an ecosystem also includes the organic component of soil, which can be substantial, depending on the vegetation cover type and other factors (Bruce et al. 1999). When land is cleared of vegetation, carbon dioxide that was stored in plant material and soil is released into the atmosphere through such processes as decomposition, burning, and soil oxidation. Additionally, without vegetation, the ability of the land to sequester or store carbon is reduced to minimal levels. The exact extent of unprotected natural lands that would eventually be converted to agricultural or urban use is unknown. However, based on population models and current trends, substantial amounts of land would become sources of carbon in the Study Area (Zwick and Carr 2006). Compared to all lands in the United States, the relative contribution of carbon dioxide and other greenhouse gases that would be emitted by land conversion in the Study Area is relatively small. Hence, the impact of the No Action on global climate change is expected to be minimal. However, negative impacts to local and regional climate may be experienced.

Topography

Beneficial

Under this alternative, positive impacts with regard to the topography in the Study Area are not anticipated.

Adverse

Some lands that remain unprotected could be used to mine sand, limestone, and other mineral resources. At least six large sand mines currently operate along the relic dune system that makes up Lake Wales Ridge (FDEP 2011). Sand mining operations along the ridge remove entire dunes, resulting in an altered landscape. Additionally, larger mining pits are typically not filled in Florida (Newman, FDEP, personal communication, April 13, 2011) and become lakes or ponds where the water table is relatively high, which would further alter the local topography to some degree. The change in topography under the No Action Alternative is anticipated to be a minimal impact.

Hydrology and Water Quantity

Beneficial

This alternative is not expected to result in positive impacts to the hydrology and water quantity of the area.

Adverse

Although some hydrological restoration would be conducted under this alternative (e.g., portions of the Kissimmee River), the flow of water on most unprotected lands in the Study Area would continue to be altered as a result of the construction of drainage ditches, roads, and other impervious surfaces. Impervious surfaces associated with urbanized areas reduce the area available for rainwater to percolate into the soil. This generally has two direct consequences when it rains: there is less water available for recharging the local surficial aquifer, while at the same time the amount of runoff that flows into low-lying area increases. Various stormwater management systems required by water management districts would help mitigate some of the impacts associated with impervious surfaces. However, extreme rainfall events (such as those associated with tropical systems) would likely exceed the capacity of most stormwater systems, and some runoff would be transported to area waters. Situated below the greater Orlando metropolitan area, the Kissimmee River Basin is particularly vulnerable to changes in hydrology, such as increased run-off, associated with developed areas. According to a study conducted by USACE, the flow regime in the basin has undergone a major shift and is now predominantly surface runoff with increased volume discharged at a faster rate during flood events (USACE 1991). It is expected that continued development in the Kissimmee River Upper Basin will further compound this situation and place increased demands on the regional water management system (Williams et al. 2006). At a more local level, increased storm water volumes and peak discharge rates associated with urbanization can produce drastic changes in stream channels, resulting in eroded banks and more frequent flooding that can cause damage to adjacent property, homes, and wildlife habitat. Increased surface run-off associated with urban areas would also have regional effects, as the general hydraulic gradient is north-to-south, where excess surface water flows from the Kissimmee River Upper Basin in the north through Lake Okeechobee and the Everglades in the south. Hence, large pulses of water would increasingly tax water management of Lake Okeechobee, whose water has to be maintained at specific levels for the purposes of minimizing levee damage and flood risk (SFWMD 2011). Conversely, developed areas also tend to exacerbate periods of water shortage. Because impervious surfaces limit the amount of water that seeps into the ground, less water is stored in subsurface areas. Subsurface water plays an important part in the hydrology of an area by providing streams and rivers with a steady supply of water during droughts. As more lands are urbanized, the water-storage ability of an area is reduced, limiting water supplies needed for wildlife and human use.

As with hydrology, water quantity in the Study Area is expected to continue to be negatively affected under this alternative. As farmlands expand, the natural flow of water would increasingly be altered to provide for irrigation and drainage to support crop production. Taken together, the amount of water available for wildlife, native habitats, and recreational opportunities would decline, as more water would be diverted to support expanding farm operations and increasing populations.

Overall, the negative consequences on hydrology and water quality in the Study Area as expected constitute a major negaqtive impact under the No Action Alternative.

Geology

Beneficial

No beneficial impacts to the geology of the Study Area are expected under this alternative.

Adverse

As discussed under the Topography section above, mining operations would likely continue in some of the unprotected areas. Sand mines in the area are generally about 65 feet deep (Newman, FDEP, personal communication, April 13, 2011). The effects of mining operations on the underlying geology can be substantial, but they are limited to a particular site. Hence, because the Study Area is large compared to the surface area occupied by mines (even if several are added over the next 15 years), minimal negative impacts to the underlying geology of the area are anticipated.

Soils

Beneficial

No beneficial impacts to soils in the Study Area are expected under the No Action Alternative.

Adverse

In unprotected areas, soils would continue to be disturbed as a result of various land use practices, including agricultural operations, road-building, and the construction of buildings, parking lots, and other infrastructure needed to support expanding human settlements. Natural soil-formation processes would no longer occur in areas covered by impervious surfaces (e.g., roads, parking lots, and buildings). Soil compaction is also expected at sites where construction occurs. Additionally, soils would continue to be degraded by various contaminants resulting from the application of agricultural chemicals and run-off from roads and urban areas. Overall, we expect the effects on soils to constitute a major negative impact.

Air Quality

Beneficial

Positive effects on air quality in the Study Area are not expected under this alternative.

Adverse

Under this alternative, unprotected lands that are currently in a natural state would continue to be converted to agriculture and urban areas. Air quality declines tend to be correlated to increasing urbanization, due to higher levels of traffic, increases in air pollution from point sources, and reductions in vegetated areas (Song et al. 2008). Trees have been shown to reduce the concentration of ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and particulate matter less than 10 and 2.5 microns in diameter (PM10 and PM2.5), primarily through direct uptake and adhesion to stems and leaves (Escobedo et al. 2007). Some tree species naturally produce volatile organic compounds (VOCs) that can convert to ozone under certain atmospheric conditions, such as high temperatures and stagnant air (Chameides et al. 1988). However, because vegetated areas also remove ozone and other air pollutants from the atmosphere, there tends to be net reduction in air quality as areas become increasingly developed and forests are lost (Song et al.

2008). Florida's air quality has remained relatively good in recent years, even as the population has increased. In 2009, the state continued to be within the acceptable standards for air quality as defined by the EPA for all criteria pollutants (FDEP 2009). Hence, we expect the No Action Alternative to have a minimal impact on air quality across the Study Area.

Water Quality

Beneficial

Under the No Action Alternative, benefits to water quality are not anticipated in the Study Area.

Adverse

Under this alternative, water quality is expected to generally be adversely affected in the Study Area. Land use directly affects water quality, and in undeveloped areas, the natural physical, chemical, and biological processes interact to recycle most of the materials found in stormwater runoff. However, as natural vegetated lands are converted to farms or urban use, these natural processes are disrupted. As a result of everyday human activities, materials such as leaves, animal wastes, oil, greases, heavy metals, fertilizers, pesticides and other materials are washed off by rainfall and are carried by stormwater to our wetlands, lakes, rivers, and bays. These materials can create high pollutant loadings of sediment, nutrients, heavy metals, petroleum hydrocarbons, and coliform bacteria and viruses (FDEP 1993). Additionally, the lack of vegetation can cause nutrients (such as nitrogen and phosphorus), which are typically used by plants, to flow directly into surface water bodies, contributing to harmful algal blooms or HABs (Bushaw-Newton and Sellner 1999). The incidence of HABs has sharply increased nationally (HAB Research Development, Demonstration, and Technology Transfer 2008) and in Florida (Abbott et al. 2009), resulting in human health risks, fish and wildlife die-offs, and substantial economic losses (Anderson et. al 2000, Hoagland et al. 2002). HABs are not limited to estuarine or marine waters, and freshwater HABs are increasing (Lopez et al. 2008).

Overall, water quality in the Kissimmee River Basin, and important waterbodies further south (e.g., Lake Okeechobee) is likely to continue to be adversely affected by agricultural operations and expanding urban land use. Although increased management efforts by the SFWMD and its partners will help reduce water quality degradation, it is expected that urban growth will continue to cause declines in water quality across the Study Area, constituting a major impact.

Noise

Beneficial

The soundscape of the Study Area is not expected to benefit under the No Action Alternative.

Adverse

Although noise from various sources currently affects rural lands in the Study Area, substantial tracts of land remain where anthropogenic noise levels are relatively low. Without protection, additional lands in the Study Area would continue to be converted to agricultural and urban use. Noise levels associated with farm equipment, road and air traffic, and industrial operations would increase. Increases in the intensity and frequency of noise associated with a growing population would alter the soundscape of the area. National Park Service research shows that the effects of human-induced sounds on the overall park experience are causes for concern. In a 1998 survey conducted by the National Park Service, 72 percent of visitors stated that one of the most important reasons for having

national parks was to provide opportunities to experience the natural quiet and sounds of nature. According to the National Park Service, uncharacteristic sounds or sound levels affect visitors' perceptions of solitude and tranquility and can generate high levels of annoyance (NPS 2009). Furthermore, there is evidence that human-induced noise can interfere with various aspects of animal behavior including preventing predator warning signals, disrupting breeding behavior, and discouraging birds from singing during the day when noise levels are highest (Brown 2001). There is currently no specific information about the impacts of noise on the soundscape in the Study Area, but human-induced sounds and noise on wildlife and visitors should not be underestimated. Taken together, the impact of increased noise levels across the Study Area within the No Action alternative is expected to constitute a minor impact.

Visual Resources

Beneficial

Under the No Action alternative, visual resources are not expected to benefit.

Adverse

Largely rural, the visual characteristics of the Study Area are expected to be negatively affected under this alternative. With increasing urbanization, various structures such as roads, communication towers, high voltage power lines, and buildings will alter the visual aspects of the landscape. This impact is expected to be a minimal impact.

EFFECTS ON THE BIOLOGICAL ENVIRONMENT

Habitats

Beneficial

Under the No Action Alternative, uncertainty exists as to the potential for beneficial impacts to native habitats and species. Although adverse impacts to native habitats and species are anticipated under the No Action Alternative, it is possible to conceive that continued development and loss of habitat resources in the years leading up to 2060, could sway popular opinion in such a way that additional conservation efforts could be undertaken by public, private, and/or governmental organizations. By 2060, under the No Action Alternative, it is possible that other conservation strategies could be implemented more intensely in the future. We have no way to predict the likelihood of this occurrence, but it would likely require additional funding and changes in social values (i.e., more people might desire habitat conservation than do currently) and it would also depend on similar or lower real estate costs in the Study Area. However, given past actions and trends, it is anticipated that human population growth and development would continue and that further development of the landscape would continue to convert native habitats and natural systems to developed lands, resulting in continued loss of these resources and further fragmenting remaining natural lands and waters.

Adverse

Based on the information presented in the Florida 2060 Report, we anticipate that existing native and natural habitats will be lost to residential and agricultural development. Figure 12 shows that the spatial extent of urbanization will increase along transportation routes and cover the northern half of the Study Area thereby destroying or fragmenting existing native and natural areas in the Kissimmee Chain of Lakes and along the Lake Wales Ridge and SR 60 in Osceola and Polk Counties. The

water resources of the upper basin would be impacted by increased stormwater runoff from the increase in impervious surfaces (e.g., roads, parking lots), leading to a deterioration of water quality of the area lakes and streams (stormwater runoff can contain pollutants such as nutrients, pesticides, endocrine disrupters, garbage, and petrochemicals). Lake levels would likely fluctuate more on a seasonal basis thereby altering their ecosystems. The loss of groundwater recharge (due to increased impervious surfaces) and the increase in residential and agricultural water consumption would increase the frequency of drying events of these water bodies and could reduce or eliminate valuable recreational fishing (either through navigation impacts or loss of fish species or biomass). Wading birds could also be more challenged to find forage if hydroperiods are disrupted. These impacts could also manifest in downstream water bodies such as Lake Okeechobee and therefore, the No Action Alternative could have additional negative effects outside of the Study Area. Ecologically healthy scrub and sandhill habitats along the Lake Wales Ridge that are not protected would become even rarer or possibly eliminated entirely. We also know that landowners within the project area have expressed interest in converting their pasture habitat, which supports federally listed species such as the wood stork and Audubon's crested caracara, to a bio-fuel production facility (e.g., eucalyptus). This would reduce or eliminate the habitat quality for many species including storks and caracaras. The loss of this and similar pasture or rangeland habitats with the No Action Alternative would limit the ability of land mangers to protect, conserve, or restore the dry prairie ecosystem that once existed there. Besides these rare and unique habitats, we would expect overall losses of other ecologically valuable habitats (e.g., pine flatwoods, hardwood hammocks, forested and herbaceous wetlands, and pastures) as they are converted to residential and more intensive agricultural uses. Additional adverse effects from urbanization would be related to increased roads and traffic leading to a higher likelihood of road-killed animals and a higher incidence of feral cats that could prey on native animal species.

Wildlife

Beneficial

Under the No Action Alternative, there would be no benefits to native fish or wildlife populations with the possible exception of those species that can tolerate some urbanization. These could include species such as gray squirrel, opossum, cotton rat, blue jay, mocking bird, black racer, Cooper's hawk, white ibis, Brazilian free-tailed bat, and various insects (butterflies, love bug, mosquito, and cockroach).

Adverse

As native and natural habitats continue to decline in quality and spatial extent, and as habitat patches become more fragmented, the animal species that use these habitats will decline in numbers or fitness. The No Action Alternative would promote this decline in Florida's fauna and because some of these species are endemic or greatly restricted in their distribution, it may contribute to the future listing of species under the ESA [e.g., Florida sandhill crane, Florida black bear, Sherman's fox squirrel, gopher tortoise, Archbold (Scrub) anomala scarab beetle, and Caracara commensal scarab beetle]. Additionally, nonnative animal species (e.g., starling, Cuban tree frog, fire ant, and pollution tolerant fishes like blue tilapia, or Asian swamp eel) may become more prevalent furthering the disruption of the native ecosystems.

FEDERALLY THREATENED, ENDANGERED, AND CANDIDATE SPECIES

Beneficial Effects

Under the No Action Alternative, there would be no benefits to threatened or endangered species.

Adverse Effects

Birds

Audubon's Crested Caracara

With the No Action Alternative, the further loss of this species' preferred habitat (dry or wet prairies and pastures) along with the anticipated reduction in its wetland-dependent prey-base may reduce the distribution of this species in the Study Area. We would expect that entire territories could be lost due to development (habitat fragmentation) and this would therefore, reduce the reproductive potential of the species.

Everglades Snail Kite

The Everglades snail kite population has recently dropped dramatically to a point where additional losses in adults or reproduction could lead to extinction. With the No Action Alternative, the anticipated degradation of water bodies such as Lakes Tohopekaliga (Toho), Kissimmee, and East Lake Toho (in the Kissimmee Chain of Lakes) and the potential for water quality and water level impacts in downstream areas like Lake Okeechobee could curtail this species reproductive capacity. This could be manifested as a reduction in the populations of apple snails in these nesting water bodies (by drought or seasonal lake level fluctuations) and nest failure (from too low lake stages, or increased boat usage associated with an increased human population). Also, the potential for increased residential development on lake shores could increase disturbance of nesting kites (noise, people, boat docks, boat usage, and pesticides) and potentially reduce quality of nesting habitat leading to less reproductive success. The anticipated further degradation of water quality, particularly runoff of phosphorous from agricultural and urban sources would increase the threat to this species under the No Action Alternative.

Florida Grasshopper Sparrow

With the No Action Alternative and the concurrent expectation that properties would be developed for biofuels or residential development, we would lose the opportunity to restore that property back to dry prairie habitat for the grasshopper sparrow. Of the total five populations of Florida grasshopper sparrows, the three at Avon Park Air Force Range have recently exhibited severe declines. The populations at Kissimmee Prairie Preserve State Park and Three Lakes Wildlife Management Area have also exhibited declining trends in recent years. However, with the No Action Alternative we would have lost an opportunity to conserve and restore additional habitat for this species. As a result, there is a real possibility the selection of the No Action Alternative would promote the extinction of the Florida grasshopper sparrow or the extirpation of the species from the wild (with only captive specimens remaining).

Florida Scrub-Jay

With the No Action Alternative, the scrub-jay would likely lose occupied habitat due to the anticipated development on upland oak ecosystems within the Study Area. There could also be a fragmentation of existing habitat and because scrub-jays need a minimum of 5 hectares per pair, some currently occupied scrub may become inhabitable if this threshold is not maintained. Also, as residential development increases there is a lower likelihood that necessary fire management would be allowed to maintain the quality of existing scrub-jay habitat. There is currently a process in place for creating scrub-jay conservation banks as a way to compensate for impacts to scrub-jays. This is a credit-purchasing mechanism that allows the destruction of occupied scrub-jay habitat as long as there is a protection and management of a similar amount within the scrub bank at a 2 to 1 ratio (2 acres protected for each acre destroyed). In the end, more acres of scrub-jay habitat are protected than are currently, but habitat is still lost compared to the existing condition.

Red-Cockaded Woodpecker

Red-cockaded woodpeckers are sparsely present in pine flatwoods or pine-dominated stands on unprotected lands within the Study Area. They are also present on protected lands at Avon Park Air Force Range and Three Lakes Wildlife Management Area. They may also be present on private pine lands for which we do not have access and hence, no survey data. Under the No Action Alternative, there could be additional losses in occupied or potentially occupied habitat, but the scope of impacts would be less severe for this species than for Florida scrub-jays or Florida grasshopper sparrows.

Whooping Crane

Adverse effects to the Nonessential Experimental Population of the Florida Nonmigratory Whooping Crane population (Osceola, Lake, and Polk Counties) could result from the No Action Alternative. Even though this crane population is small (21 individuals are being monitored) and additional releases have ceased due to problems with survival and reproduction, the additional loss or deterioration of large freshwater marshes, pastures, and wet and dry prairies would further hamper this species' recovery efforts in Florida.

Wood Stork

There are only two active wood stork breeding colonies remaining in the Study Area; however, this species is expected to forage in water bodies throughout the entire Study Area. There are three active wood stork nesting colonies within approximately 20 miles of the Study Area. Under the No Action Alternative, we anticipate continued degradation of aquatic resources (freshwater marshes, wet prairies, and cypress swamps) that could reduce or eliminate forage for this species, and as a result, reduce reproductive potential or success. Associated with agricultural or residential development, there may be an increase in stock ponds, seasonally flooded roadside or agricultural ditches, or managed impoundments; however, these features generally do not provide the abundance or diversity of wood stork forage that would be present in more natural water resource features.

Mammals

Florida Bonneted Bat

Under the No Action Alternative, the continued loss in quality of aquatic resources could reduce forage for this species. A loss in the number of trees may also reduce roosting locations; however, an increase in manmade structures may provide some additional roost sites. Not as

much is known about this species (compared with other species of concern in the Study Area), so it is difficult to accurately address the adverse effects of project alternatives with a high degree of certainty on the Florida bonneted bat.

Florida Panther

Although at the present time only dispersing males occur north of the Caloosahatchee River, the Study Area provides habitat for the potential expansion of the breeding portion of the panther population. Under the No Action Alternative, the continued loss of habitat would hamper the potential for population expansion that is necessary for panther recovery.

West Indian Manatee

The manatee is only present in the lower Kissimmee River. The continued degradation of water resources associated with the No Action Alternative would likely worsen the quality of the aquatic habitat for manatees in this area and downstream of the Study Area (Lake Okeechobee, and the rim canal). Increased fluctuations of water levels (more droughts or more high-water events, especially in Lake Okeechobee) could reduce plant forage for manatees. Also, if water turbidity increased (under the No Action Alternative) it could also increase the risk of additional water vessel collisions and manatee injury or mortality if boat operators cannot see manatees near the water's surface.

Reptiles

Sand Skink and Bluetail Mole Skink

Similar to scrub-jays, both the bluetail mole and sand skinks have conservation banks servicing the Study Area as a way to compensate for impacts to these species' habitats from development. While we do not yet have a good understanding of skink population trends, under the No Action Alternative, the continued development along the Lake Wales Ridge on xeric soils is likely to reduce the quality and quantity of native skink habitat. Fragmentation of habitat could also increase. Pike et al. (2008) indicated that this species can occupy degraded or converted habitat including overgrown scrub, pine plantation, citrus grove, old field, or pasture conditions where soil types are suitable regardless of vegetative cover. However, it is unclear if the skink densities and reproductive success on these altered habitats are similar to those of native skink habitats.

Eastern Indigo Snake

The eastern indigo snake is a habitat generalist that requires a large home range. Average male indigo snake home ranges at Archbold Biological Station have been estimated at 185 acres (Layne and Steiner 1996. R. Bolt (Dynamac Corporation, Pers. Comm., 2003) reported a maximum home range in Florida of 805 acres. Habitat loss, degradation, or fragmentation of these large home ranges and vehicle/equipment mortality (in developed areas) would likely increase with the No Action Alternative as more native and natural habitats are developed. We would also anticipate an increase in mortality from an increased human population associated with lawnmowers, ophidiophobia (fear of snakes), or pet (cat and dog) predation. The lack of an effective survey technique, coupled with the secretive nature of this species would make it difficult to verify adverse effects associated with the No Action Alternative.

Invertebrates

Highland's Tiger Beetle

Under the No Action Alternative, we would expect continued residential and agricultural development in this species preferred habitat (i.e., scrub or pine woodland with a high percent of open sand) or other occupied habitats (open sandy areas within or adjacent to scrub or sandhill). As a result, we would expect additional habitat loss, degradation, or fragmentation. The increase in residential development may also increase the risk of insecticide use which may be an additional threat to this species.

Plants

Okeechobee Gourd

Under the No Action Alternative, adverse effects to the Okeechobee gourd are difficult to predict because it is ephemeral in nature and occupies muck soils that become dry during the winter and spring. This species is currently present in the Study Area but only at the extreme southern end around the shores of Lake Okeechobee and the rim canal. It is possible that the hydrologic changes (more extreme high and low water events) or spread of nonnative plants associated with increased urbanization could adversely alter the habitat for the Okeechobee gourd. Increased or inappropriate herbicide use could cause both mortality of gourds and alter gourd habitat.

Beautiful Pawpaw

Recently, the beautiful pawpaw has only been reported near the Study Area in Orange County east of Orlando. Much of the suitable pineland habitat in the historic range has been destroyed or converted to residential housing, commercial activities, and agriculture, and numbers and distribution of plants have decreased as a result. Under the No Action Alternative, we expect continued decline in unprotected pineland habitats that could or would be restored to support this species.

Florida Ziziphus

Under the No Action Alternative, 10 of the 14 extant Florida ziziphus populations are unprotected and would be at risk. They occupy yellow sand pasture habitats that historically supported longleaf pine wiregrass sandhills or oak hickory scrub. If these pastures are converted to residential or more intensive agricultural land uses, these ziziphus populations would likely decrease or be extirpated.

Scrub Plant Species

There are 22 species of federally listed scrub plants that may occupy similar xeric habitats within the Study Area on the Lake Wales Ridge and potentially other nearby ridges. These are: scrub lupine, Avon Park harebells, Britton's beargrass, Carter's mustard, wide-leaf warea, American chaffsead, Highlands scrub hypericum, Florida bonamia, Florida perforate cladonia, Garrett's mint, Lewton's polygala, papery whitlow-wort, pigeon wings, pygmy fringetree, sandlace, scrub blazing star, scrub buckwheat, scrub plum, scrub mint, short-leaved rosemary, snakeroot, and wireweed. As with other species that occupy scrub habitat in Florida, these are some of the most at-risk species today. With increased urbanization on the ridges within the Study Area expected to occur under the No Action Alternative, these plant species that are not already on protected lands are at additional risk of extirpation.

Selected State Threatened and Endangered Species

There are up to 88 state listed species potentially present in the Study Area. We identified a few of the more at-risk species to discuss here. For the other species, suffice it to say, that the No Action Alternative would provide no benefits, but has a good potential to cause similar adverse effects.

Florida Black Bear

Today, black bears occupy 18 percent of their historic range in Florida. Under the No Action Alternative, the continued fragmentation and decline in forested habitats could reduce the population even more. The increase in urbanization would increase the risk of road mortality and the general increase in human presence in potential bear habitat would reduce bear use in those areas even if the habitat is otherwise suitable. As this species declines in abundance and distribution, it may warrant federal protection under the Endangered Species Act.

Sherman's Fox Squirrel

Under the No Action Alternative, we would expect additional losses of the Sherman's fox squirrel habitat [sandhills, high pine (dry, longleaf pine savanna], pine flatwoods, pastures, and other open, ruderal habitats with scattered pines and oaks). If the overall abundance of oak trees decreases with the No Action Alternative, these squirrels would lose some of their important seasonal food and nesting materials.

Gopher Tortoise

Similar to other species that are widespread but still have specific habitat requirements, we expect that the gopher tortoise's habitat (uplands) would also be the areas most at risk for additional development. Therefore, we would expect that as development increases, under the No Action Alternative, there would be a concomitant decrease in the tortoise population (even though some tortoises can survive, but at lower densities, in residential areas). This is a species for which additional adverse effects may result in it becoming federally listed as endangered or threatened. Because gopher tortoise burrows also provide homes for up to about 250 other species of animals, a loss in their abundance would also likely cause a loss in those commensal species as well under the No Action Alternative.

Bald Eagle

The existing nesting and open-water foraging habitat within the Study Area are of regional importance to the bald eagle. Under the No Action Alternative, we'd expect that some of these nesting areas could remain (being conspicuous and protected by law); however, we also expect a deterioration of the quality of the foraging habitat as more pressure is placed on fish populations from with hydrologic or water quality changes and possibly increase human fishing pressure (associated with an increased human population). There is also the possibility that eagles would be more at risk of being shot despite being protected.

Sandhill Crane

Under the No Action Alternative, we would expect additional habitat losses for the sandhill crane (i.e., losses in wetland quality and quantity, and conversion of pasture and prairie habitats to residential or more intensive agricultural land uses). An increase in roads and vehicle traffic associated with increased urbanization may also increase the risk of mortality by vehicle collision as cranes forage in grassed areas along transportation routes.

Long-Legged Wading Birds

There are 13 species of “long-legged” wading birds (Order Ciconiiformes: storks, herons, egrets, ibises, and bitterns) that may occupy the Study Area. Under the No Action Alternative, we expect that these biological indicators of overall ecosystem health would decline in abundance. The anticipated hydrologic and land cover changes due to increased urbanization could reduce prey for foraging and shrubs or trees for nesting. This pattern has already occurred within the Study Area as the number of active wading bird nesting rookeries has decreased from 17 (in the 1970s) to 7 active wading bird nesting rookeries.

Nonnative Species

Beneficial

The increases in water management complexity (e.g., canals, water storage basins) associated with the No Action Alternative could increase the distribution of those nonnative species that are tolerant of urbanization but also may provide some benefits (e.g., tilapia, other cichlids, and other nonnative fishes that are a component of subsistence fishing).

Adverse

The urbanization that is expected to occur under the No Action Alternative could allow for the proliferation of nonnative invasive species such as Brazilian pepper, Lygodium, melaleuca, torpedo grass, Formosa termites, and fire ants. Increases in some types of agriculture could also increase the spatial extent of nonnative pasture grasses (e.g., Bahia) and associated nonnative and invasive plants (e.g., kudzu, and tropical soda apple). As nonnative and invasive species gain a greater foothold in Florida, they reduce habitat for native species and are very costly to control.

EFFECTS ON CULTURAL RESOURCES

Beneficial

No positive impacts to archaeological and historic resources are expected under the No Action Alternative.

Adverse

The No Action Alternative could have a negative effect on the protection of historical and archaeological resources in the Study Area. Without additional protection, cultural resources, whether listed or not, tend to be vulnerable to development, disturbance, take, and vandalism. Without the proposed Everglades Headwaters NWR and Conservation Area, fewer lands would be managed by the Service and its partners, which have a clear responsibility for protection of cultural resources.

Landowners and developers have no similar legal responsibilities, unless one of their activities possesses a federal or state nexus (i.e., FDEP Water Quality Certificate, USACE 404 Permit, or a Service Incidental Take Permit). If a nexus did exist, it would require a landowner or developer to comply with either Section 106 of the National Historic Preservation Act or the Florida Historic Resources Act prior to the issuance of any permit. If a nexus did exist, archaeological and historic investigations, if deemed necessary by the federal agency, the Florida Division of Historic Resources, and the tribes, would be limited to the project area in question. The activity could proceed provided that the landowner or developer has taken steps to avoid, minimize, or mitigate adverse impacts to

historic properties identified within the specific project area. A number of landowners within the Study Area possess a strong conservative ethic. Their efforts to protect and conserve critical habitats on their holdings are often beneficial for cultural resource sites.

However, population growth, increased urbanization, and evolving land use patterns projected for the Study Area guarantees that a number of historic properties would be adversely impacted under the No Action Alternative.

EFFECT ON SOCIOECONOMIC ENVIRONMENT

Beneficial

Under the No Action Alternative, development rates, tax revenues, and business revenues would remain subject to future market conditions. Any changes would be due to existing influences and market forces and would not be associated with Service activities that are part of this proposal.

Adverse

A potential, but unsubstantiated, economic outcome of not having the proposed Everglades Headwaters NWR and Conservation Area within the Study Area would be the loss of refuge visitor expenditures at local businesses. As detailed in Chapter II (Affected Environment), wildlife-dependent recreation can benefit local economies through direct and indirect expenditures associated with activities such as hunting, fishing, and wildlife observation. Under the No Action Alternative, opportunities for wildlife-dependent recreation are likely to become increasingly limited as unprotected lands are converted to urban use, as further detailed in the “Land Use Patterns” section above. Open space can also provide other economic benefits, in terms of cost savings provided by functioning natural systems (e.g., clean drinking water, reductions in stormwater runoff, air-pollution reduction) and reduced costs of government services. A 2010 study found that Long Island’s parks and open space provide quantifiable economic benefits worth over $2.74 billion a year (The Trust for Public Land 2010). It must be noted that the agricultural lands were included in the analysis, and had a combined estimated worth of $288 million annually, slightly more than 10 percent of the total cost benefit. Parks and open space were found to reduce the cost of government services, such as schools, police, roads, and other public services associated with residential development. It was concluded that with property tax revenues and expenditures for services taken into account, residential development was more costly to local governments than parks and open space (The Trust for Public Land 2010). Further, under Alternative A, for landowners in the area the potential continues for trespass from adjacent private lands and from negative impacts of adjacent land use activities (e.g., biofuel operations).

B. ALTERNATIVE B: REFUGE ONLY APPROACH

Under this alternative, the Service would acquire approximately 50,000 acres of habitat as part of the proposed Everglades Headwaters NWR. The Conservation Area would not be a component of this alternative. The land protection priorities and proposed methods of acquisition are summarized in Section VI.

EFFECTS ON THE PHYSICAL ENVIRONMENT

Land Use Patterns

Beneficial

Under Alternative B, the total area of protected lands used for habitat and wildlife conservation and compatible wildlife-dependent recreation would increase in the Study Area. As further detailed in the "Land Use Pattern" section under the No Action Alternative, natural areas would continue to be lost due to increased population growth, demand for biofuels, and mineral extraction. Currently, approximately 1,409,190 acres (77 percent) of the land in the Study Area are unprotected. A substantial portion, approximately 374,383 acres, of these unprotected lands, have already been altered for intensive agriculture (263,475 acres), urban use (96,605 acres), transportation/utility corridors (8,194 acres), and mining/spoil sites (6,109 acres). In addition, the Study Area contains approximately 14,262 acres of open water in the form of lakes, rivers, canals, and stormwater retention ponds. Hence, this leaves about 1,020,546 acres (72 percent) of lands in the Study Area that would potentially be useful as conservation lands deserving protection. It must be noted that lands currently not substantially altered for urban, transportation, or agricultural uses include areas of unknown size that have been degraded by past uses or are fragments isolated from larger contiguous protected lands. Realistically, this means that there is actually less than 1,020,546 acres that would warrant protection. Given the projected land use changes predicted over the next 50 years which are further detailed under the No Action Alternative, many natural lands in the study are at risk of being converted to urban and other uses largely incompatible with wildlife conservation (Zwick and Carr 2006). This alternative would protect, in perpetuity, up to 50,000 acres (less than 5 percent) of currently unprotected natural areas in the Study Area (Figure 7).

Adverse

A potential adverse effect under Alternative B is the loss of land (50,000 acres) available for agriculture, urban development, and other non-conservation uses. This is believed to constitute a minimal impact, as the proposed refuge lands comprise a relatively small percentage of the total area available (50,000 acres out of 917,787 acres or about 5.4 percent).

Climate Change

Beneficial

Under this alternative, approximately 50,000 acres of proposed refuge lands would continue to act as carbon sinks, resulting in a positive impact with regard to climate change. As further detailed in the "Climate Change" section under the No Action Alternative, many natural areas have the ability to store carbon (live and dead vegetation and soil). Habitats differ in their ability to store carbon, depending on the amount of vegetation they support and other factors. Some habitats such as certain wetlands, although they store carbon, also produce methane (Bridgham et al. 2007), which is a powerful greenhouse gas (NOAA 2011). Estimates of various carbon densities for each habitat that would be included in the proposed refuge were not obtained for this EA. However, it is believed that the proposed refuge lands would provide a net reduction in greenhouse gases, even with potential sources (see discussion of Adverse Effects below) of these gases taken into account. Overall, this benefit would be minimal due to the comparatively small size of the proposed refuge relative to all lands in the Study Area and nationally.

Adverse

Under this alternative, refuge operations and facilities, public visitation, and habitat management would contribute greenhouse gases to the atmosphere.

The amount of carbon that would potentially be released through refuge operations (e.g., combustion engines and electrical equipment use) was not estimated for this Draft EA. However, the proposed Everglades Headwaters NWR would aim to minimize its carbon emissions. As the Refuge System works to implement many of the strategies for achieving Service-wide carbon neutrality by 2020 (USFWS 2011: Strategic Plan for Climate Change), refuge energy use is expected to decline. These actions would include use of hybrid vehicles, building energy efficient facilities, video-conferencing, and green purchasing. These strategies, combined with those of other Service offices and the Federal Government in general, would likely result in a beneficial reduction in the rate of greenhouse gas emissions nationally.

Refuge visitation would be associated with a number of vehicles on the refuge. The low rate of speed necessitated would minimize emissions. In addition, the number of vehicles on the refuge at any given time would not be expected to create a significant impact to greenhouse gas emissions.

Prescribed burning would be a valuable habitat management tool within several habitats of the proposed refuge. The primary gases released during prescribed fire include CO_2, CO, and water vapor, with other gases present in trace amounts (EPA 2011). Most of these are greenhouse gases. However, it has been shown that prescribed fires can decrease the risk of wildfires, which typically release greater amounts of greenhouse gases (National Science Foundation 2010). Wildfires tend to burn entire habitats including mature trees, whereas prescribed fires are aimed at reducing groundcover and low-growing shrubs. The amount of greenhouse gases contributed to the atmosphere as a result of prescribed fires on the proposed refuge is expected to be minimal.

Topography

Beneficial

Under this alternative, mining would not be permitted within the 50,000-acre proposed Everglades Headwaters NWR, and the topography would be protected from mining and other activities that could substantially alter the landscape. As discussed under the “Topography” section under the No Action Alternative, current mining operations are changing the topography at selected sites within the Study Area. Given the future demand for sand and other mineral resources, additional areas would likely be targeted for these activities. We expect this to be a minimal benefit, as the 50,000-acre proposed Everglades Headwaters NWR would be relatively small compared to the overall Study Area.

Adverse

If the 50,000-acre Everglades Headwaters NWR were to be established, no construction activities would occur that would affect the topography. Any possible new construction (i.e., visitor center, refuge offices) is not expected to result in adverse impacts to this resource.

Hydrology and Water Quantity

Beneficial

This alternative is expected to result in positive impacts to the hydrology and water quantity of the area. Lands in the 50,000-acre proposed Everglades Headwaters NWR would be protected from the construction of extensive drainage ditches, roads, and large areas of impervious surfaces associated with development that would otherwise alter the hydrology. See the "Hydrology and Water Quantity" section under the No Action Alternative for a discussion on the impacts of various structures on water flow and quantity. The benefit is expected to be minor, as the 50,000 acres constitute a relatively small proportion of the Study Area.

Although Service needs for water are unknown, the state and water management district cannot commit to meeting future water quality, quantity, timing, or distribution needs of the proposed Everglades Headwaters NWR, but would collaborate with the refuge, other agencies, and private landowners to work toward strategies supported by all stakeholders.

Adverse

Under this alternative, there would be some impacts to hydrology and water quantity resulting from construction projects on the proposed Everglades Headwaters NWR. Infrastructure such as visitor and office facilities, paved areas, and landscaped areas would alter, to some degree, the local hydrology and amount of water available to down-stream areas. Specific site plans for public use building(s) and refuge offices have not yet been developed, so the amounts of impervious surfaces are unknown at this time. However, impervious surfaces, such as roads, sidewalks, and buildings, reduce the area available for rainwater to percolate into the soil. This generally has two direct consequences when it rains: there is less water available for recharging the local surficial aquifer, while at the same time the amount of runoff that flows into low-lying area increases. Stormwater management systems would help mitigate many of the impacts associated with impervious surfaces. However, extreme rainfall events (such as those associated with tropical systems) would likely exceed the capacity of most stormwater systems, and some runoff would be transported offsite. Although additional environmental studies would likely be conducted in association with any future construction, it is not believed that there would be significant impacts to the hydrology or water quantity. Overall, the effects on hydrology and water quantity are believed to be minimal under this alternative.

Geology

Beneficial

As discussed under the "Topography" section above, mining operations would likely continue in the Study Area. These activities would not be permitted on the 50,000-acre proposed Everglades Headwaters NWR, offering protection to a relatively small percentage of the total Study Area. Hence, a minimal benefit to geology is expected under this alternative.

Adverse

Any construction projects anticipated would not be expected to result in impacts to the geology of the area. No impacts to this resource are projected under Alternative B.

Soils

Beneficial

Soils within the proposed Everglades Headwaters NWR would benefit under this alternative. This resource would largely be protected from disturbance and degradation associated with agriculture and development (see “Soils” section under the No Action Alternative for a more detailed discussion on how these land use activities could affect soils).

Adverse

Within the proposed Everglades Headwaters NWR, some soils would be disturbed due to the construction of several buildings, parking lots, and other infrastructure needed to support refuge visitors and operations. Natural soil-formation processes would no longer occur in areas covered by impervious surfaces (e.g., roads, parking lots, and buildings). Soil compaction is also expected at sites where construction occurs. Best management practices would be used to minimize these impacts. Additional environmental analyses would be conducted in association with any substantial (e.g., roads, parking lots, and buildings) construction projects, per Service policy. Although the exact acreage needed for any new refuge infrastructure is unknown at this point, it is believed it would be a small percentage of the total refuge area. The impacts to soils resulting from this alternative are expected to be minimal.

Air Quality

Beneficial

A positive effect on air quality is anticipated as a result of this alternative. With the establishment of the proposed Everglades Headwaters NWR, sources of air pollution resulting from agricultural operations and urbanization would be halted within 50,000 acres. This benefit is expected to be minimal, given that the proposed refuge would cover a relatively small percentage (less than 5 percent) of the total Study Area.

Adverse

Under this alternative, refuge operations and facilities, public visitation, and habitat management would contribute some pollutants to the atmosphere, affecting air quality.

Some air pollutants would be released through refuge operations (e.g., combustion engines and electrical equipment use). However, the proposed Everglades Headwaters NWR would aim to minimize its emissions from vehicles as well as the indirect emissions associated with electrical energy use. As the Refuge System works to implement many of the strategies for achieving Service-wide carbon neutrality by 2020 (USFWS 2011: Strategic Plan for Climate Change), refuge energy use is expected to decline. These actions would include use of hybrid vehicles, building energy efficient facilities, video-conferencing, and green purchasing. These strategies, combined with those of other Service offices and the Federal Government in general, would likely result in a beneficial reduction air pollutants.

Refuge visitation would be associated with a number of vehicles on the refuge. The low rate of speed necessitated would minimize emissions of air pollutants. In addition, the number of vehicles on the refuge at any given time would not be expected to create a significant impact to air quality.

Prescribed burning would be a valuable habitat management tool within several habitats. Prescribed fires release several air pollutants, including CO and particulate matter. The proposed Everglades Headwaters NWR would work with its partners to reduce smoke-related issues in adjacent areas that result from prescription fires. The risk of wildfires would be minimized through a fire management program. One positive consequence of prescribed fire is the reduction in the frequency and intensity of wildfires, which tend to release larger amounts of air pollutants (National Science Foundation 2010).

Overall, the negative consequences to air quality associated with this alternative are expected to be minimal.

Water Quality

Beneficial

The water quality found within the Study Area is generally felt to be sufficient to achieve refuge objectives and this alternative is expected to result in benefits to water quality in the Study Area. The establishment of the proposed Everglades Headwaters NWR would protect 50,000 acres from future agricultural operations and urbanization. These land uses are associated with declines in water quality, as further detailed in the "Water Quality" section under the No Action Alternative. Conservation lands, such as the proposed refuge, tend to improve water quality downstream as plants absorb some of the nitrogen and phosphorus. These nutrients, particularly in south Florida, are largely responsible for declines in water quality as a result of eutrophication and associated harmful algal blooms, which are further discussed in the section on "Water Quality" under the No Action Alternative. The impacts to water quality are expected to be minor, given that the proposed Everglades Headwaters NWR would comprise a relatively small portion of the Study Area.

Adverse

Under Alternative B, there may be some impacts to water quality resulting from new construction, refuge operations, and visitor use. If impairments are noted, the Service would participate in reduction strategies identified through the State's Total Maximum Daily Load and Basin Management Action Plan process.

The construction of office and visitor-use buildings, parking areas, trails, and other facilities and infrastructure needed for operations and public use programs would cause some vegetation clearing, soil disturbance, and associated runoff. Best management practices would be used to minimize these effects. Runoff from roads and parking lots would cause some oils, grease, and other materials from vehicles to leach into soils or be carried as runoff into low-lying areas. Stormwater retention/detention ponds would help mitigate most of the water quality impacts associated with runoff.

Prescribed fires and clearing of nonnative plants would cause some vegetation to be removed, leaving soils exposed to runoff and erosion. In general, it is expected that runoff would be buffered by vegetated areas and would likely not contaminate waterbodies. If nonnative plant removal operations were to occur in riparian zones, best management practices would help ensure that impacts to water quality were kept to a minimum. Use of approved herbicides for controlling nonnative plants could cause some of these chemicals to leach into the groundwater or make their way into surface waters. Adherence to product usage guidelines and Service requirements would keep any of these adverse effects to water quality at a minimum.

Public use would include hunting, with some associated trampling of vegetation. This is expected to be a minimal impact, given that hunter densities would likely be sufficiently low to reduce the chances of foot paths from becoming established. Erosion associated with wildlife watching would be minimized by limiting these activities to trails, and possibly, overlooks and observation towers. For anglers, some improved access (e.g., boardwalks and docks) to fishing areas would likely be constructed, minimizing erosion to shorelines.

In general, it is believed that any negative consequences to water quality would be minimal.

Noise

Beneficial

The soundscape of the areas in which the refuge is proposed would benefit under this alternative. Sources of noise from farm machinery, heavy traffic, and industrial operations would not occur within the refuge boundary, providing minimal benefits to this resource.

Adverse

Some noise would be associated with use of vehicles by refuge staff and the visiting public on the refuge. Because high levels of speed would not be permitted, associated noise levels would be kept to a minimum. Hunting would cause some noise disturbance, but the frequency and duration would be at levels that would keep it at minimal levels. Overall, it is expected that the proposed Everglades Headwaters NWR would have a minimal impact on this resource.

Visual Resources

Beneficial

Establishment of the proposed Everglades Headwaters NWR would maintain the visual characteristics (esthetics) of the 50,000 acres largely rural in nature. No communication towers, multi-story buildings, high-power electrical transmission corridors, or other tall structures would be built. Much of the landscape has already been altered in terms of this resource and because the refuge is comparatively small with respect to the Study Area, it is anticipated that there would be a minimal positive effect on esthetics.

Adverse

Buildings and public use infrastructure (e.g., observation towers) would be constructed to minimize their visual impact on the landscape. No adverse impacts are expected to this resource.

EFFECTS ON THE BIOLOGICAL ENVIRONMENT

Habitats

Introduction

With implementation of Alternative B, the upper Everglades watershed would become a more connected and functional conservation landscape that may allow habitats and species to shift in response to climate and human demographic change. A modest addition to the conservation landscape is proposed, thus building limited linkages to the fragmented landscape of this area which

currently limits habitat use, migration, and dispersal of a variety of species. Under Alternative B, the existing and projected loss or fragmentation of habitats would still be problematic at the broader landscape level; however, Alternative B would alleviate some localized habitat loss and therefore, increase the opportunity for many species to persist in the Study Area.

Alternative B would protect or conserve up to approximately 50,000 acres and serve to support the fish and wildlife resources on other protected and non-protected lands. These wildlife resources include migratory birds, federal and state listed species, state designated species of conservation concern, and native wildlife diversity. Appendix H outlines at-risk species, including federal and state listed species.

Focusing on restoring or mimicking natural hydrologic processes, Alternative B would contribute to water quality, water quantity, and water storage capacity of the upper Everglades watershed to support Everglades restoration goals and objectives and water supply needs for south Florida. One way that this would be accomplished would be through wetland restoration. Using GIS, we calculated the acreage of former hydric soils (from the NRCS's Soil Survey Geographic Database) that are currently not functioning as wetlands (based on the FNAI land cover classification). Within Alternative B lands, there are 10,137 acres of non-functioning, potentially restorable wetland soils. See Table 21 for the amount of potentially restorable hydric soils in each Unit. There is an additional acreage of wetlands that are partially functioning on Alternative B lands and we would enhance these to increase their function.

Alternative B would also provide opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of the important grassland and savanna landscape of the headwaters of the Everglades.

Table 21. Acres of degraded, potentially restorable wetland soils in Alternative B

Planning Unit	Acres
Prairie Central	5846.4
Prairie South	1968.2
Ridge North	2170.3
Total	**9,984.9**

Beneficial Effects

Under Alternative B, we expect moderate benefits to native and natural habitats. Up to 50,000 acres would be protected or conserved; Table 22 identifies the percentages of various land covers (or ecosystems) that comprise Alternative B. Under Alternative B, we also anticipate that up to 10,137 acres of former hydric soils that are currently degraded wetlands could also be restored. (Note: Although we refer to Alternative B as encompassing up to approximately 50,000 acres, the analysis conducted using GIS software indicated that the total acreage is approximately 50,396 acres.)

Table 22. Percentage of land cover types in Alternative B

Land Cover Type	Percent of Alternative B
Improved, Unimproved, and Woodland Pasture	39.31
Wet Prairie and Freshwater Marsh	20.59
Dry prairie	14.29
Scrubby, Mesic, and Hydric Pine Flatwoods	11.83
Freshwater Forested Wetlands	5.65
Intensive Agriculture	4.10
Mesic Temperate Hammock	2.13
High Pine, Florida Scrub, and Sandhill	1.79
Urban	0.16
Open Water	0.13
Shrub and Brushland	0.03
Total	100.00

Approximately 39 percent of Alternative B is improved, unimproved, and woodland pastures. At first glance, it may seem curious as to how pasture habitat came to comprise the largest percentage of land covers in Alternative B, especially considering that it was ranked as a lower priority than native habitats. This happened because: (1) Pasture habitat is widespread across the Study Area landscape; (2) we combined three different pasture types, some of which provide a higher level of ecological quality; and (3) pasture was interspersed with the higher quality land covers such as dry prairie, wetlands, and pine flatwoods. Therefore, the GIS neighborhood analysis and the subsequent selection of breakpoints for the different model classes captured some of those pasture acres even though we did not particularly target pasture habitat. However, from a restoration perspective, pasture would be much easier to restore to dry prairie or herbaceous wetlands than other more intensive forms of agriculture (row crops or citrus).

Although these pastures vary in appearances, they generally are low herbaceous systems (e.g., Bahia grass) usually with scattered to moderate numbers of cabbage palms, oaks, and saw palmettos, and in the case of woodland pasture, larger clumps of woody vegetation species interspersed amongst the grassland. The degree of ditching varies and as a result, the amount of functioning wetland acreage per pasture type also varies. However, all of these pasture types have a high degree of potential for being restored to native grassland and herbaceous wetland ecosystems in 2 to 5 years. Therefore, with implementation of Alternative B, we expect that these 15,070 acres of pasture on the Prairie Central and South Units would be largely restored to a dry prairie and herbaceous wetland mosaic (similar to pre-development conditions). Depending on the quality of the habitat, pastures support federally listed species such as crested caracara, Florida grasshopper sparrow, wood stork, eastern indigo snake, and Florida ziziphus (if the proper soil is present). State listed species such as sandhill crane, gopher tortoise, and Sherman's fox squirrel also use pasture. If the pasture connects forested areas, it may also be used as a movement corridor by the state listed Florida black bear. During the rainy season, pastures that become inundated may provide habitat for ducks and wading birds, or allow aquatic and semi-aquatic species to move across the landscape. There are also many migratory birds that are pasture inhabitants (e.g., meadowlark, bobwhite quail, turkey, loggerhead shrike, barn owl, and sparrow and other passerine bird species).

Approximately 21 percent (or 10,375 acres) of Alternative B is herbaceous wetlands. This includes wet prairie, freshwater marsh, slough, and isolated and depression marshes. Many of these wetlands can be categorized based on vegetation type (as is the case with sawgrass or cattail marsh) or hydroperiod (i.e., short versus long). Short hydroperiod wetlands (e.g., wet prairie, and isolated or depression marshes) are important for wading bird foraging because they are shallower (and therefore accessible) at times of the year when the long hydroperiod marshes (freshwater marsh and slough) are too deep. Short-hydroperiod wetlands, especially in the Kissimmee Prairie area (i.e., Prairie Central and South Units) are also critical for amphibian reproduction because there are fewer predators (e.g., fish, alligators). Both short- and long-hydroperiod wetlands in the Study Area provide forage for the federally listed wood stork, crested caracara, Everglades snail kite, and the candidate species, the Florida bonneted bat. State listed plants that may occupy these wetlands include Florida loosestrife, celestial lily, yellow fringeless orchid, cutthroat grass, Arcadian St. Johnswort, giant airplant, and spoonleaf sundew. Under Alternative B, these areas would be protected and up to an additional 10,137 acres of drained wetlands could be restored.

Approximately 14 percent (7,200 acres) of Alternative B is dry prairie. This rare native ecosystem is greatly in decline throughout central Florida and this project represents the best near-term opportunity to protect, conserve, or restore this habitat type for one of the most imperiled species in Florida – the Florida grasshopper sparrow. Dry prairie is an herbaceous community, but has taller vegetative cover than pastures. Dry prairie also has open bare sand patches and much more vegetative species diversity than pasture habitat. The crested caracara, Florida panther, whooping crane, and eastern indigo snake could also occupy dry prairie. State listed inhabitants of dry prairie may include the gopher frog, burrowing owl, southeastern American kestrel, gopher tortoise, Florida black bear, Florida sandhill crane, cutthroat grass, Catesby's lily, Florida beargrass, blueflower butterwort, yellow butterwort, giantspiral lady's tresses, and giant orchid. Under Alternative B, we expect that existing dry prairie would be protected at existing quality or restored (then protected), and we would likely increase the spatial extent on the Prairie Central and South Units from 7,200 acres to approximately 19,200 acres (assumes 80 percent conversion of all pasture to dry prairie).

Alternative B also includes 12 percent (5,959 acres) of pine flatwoods. These include hydric, mesic, and scrubby flatwoods; although the majority (91 percent) is classified as mesic flatwoods in Alternative B. The Prairie Central Unit accounts for 70 percent and the Ridge North Unit accounts for the remainder of the mesic flatwoods in Alternative B. There are 372 acres of scrubby flatwoods and 151 acres of hydric flatwoods in Alternative B. We would expect that some restoration of flatwoods would occur in the future if Alternative B was selected, but it is unclear at this time, where those acres would be restored, or the number of acres that would be restored. It is likely that pine flatwoods were more historically present on the Ridge Units than the Prairie Units; therefore, one would expect that some portion of the existing 4,740 acres of pasture on the Ridge North and South Units of Alternative B could be restored to flatwoods (or other forested communities). Depending on the tree species, this could take several decades for restoration to be completed. Pine flatwoods are important habitats for red cockaded woodpecker, eastern indigo snake, Florida panther, Florida black bear, Sherman’s fox squirrel, gopher tortoise, gopher frog, pine snake, white-tailed deer, beautiful pawpaw, scrub blazing star, Britton's beargrass, Carter's mustard, pigeon wings, among other plants and animals.

Alternative B also includes 6 percent (2,850 acres) of freshwater forested wetlands. These include swamps, mixed forest wetlands, cypress, bayhead, shrub wetlands, and tupelo wetlands. The Ridge North Unit contains 65 percent of the existing forested wetlands in Alternative B. The Prairie Central Unit contains 34 percent of Alternative B’s forested wetlands. Similarly to the previous section regarding flatwoods, we would expect some restoration of forested wetlands under Alternative B, but it is difficult to predict either where, or how many, acres would be restored. We believe that some potential restorable habitat would be available on most parcels acquired, but it would likely be at a

lesser spatial extent than for previously mentioned ecosystems. Forested wetlands are important for the wood stork, Florida panther, Everglades snail kite, swallowtail kite, bald eagle, Sherman's fox squirrel, cutthroat grass, Chapman's sedge, yellow anise, Florida loosestrife, celestial lily, eared spleenwort, plumed rockcap fern, and many other plants and animals.

Alternative B also includes 4 percent (2,065 acres) of intensive agriculture. This is in the form of field crops (1,366 acres) and citrus (698 acres) on the Prairie Central Unit. We would expect that these areas would be restored to native wetland and upland habitats, although this process could take longer due to the higher degree of alteration (when compared to pastures). There may also be copper contamination in the soils of citrus groves or other chemical contamination (pesticides) on field crops; this may hamper restoration of these areas.

Alternative B also includes 2.1 percent (1,076 acres) of mesic temperate hammock, which occurs mostly (91 percent; 980 acres) on the Prairie Central and South Units. Approximately 7 percent (75 acres) was classified as "mixed hardwood-coniferous" on the Ridge North Unit. Under Alternative B, these areas would be protected and restored if needed. Because this ecosystem is present at a lesser spatial extent than other native communities, it is unlikely to provide a large suite of benefits with Alternative B; however, it could still be used by Florida panther, Sherman's fox squirrel, eastern indigo snake, bald eagle, Florida black bear, Florida milkvine, giant airplant, giant orchid, gingerbush, Craighead's noddingcaps, yellow anise, and other species.

Alternative B also includes 1.8 percent (901 acres) of Florida scrub. Some of this (20 acres) is classified as "xeric hammock." It is not surprising that such a small amount of scrub habitat is included in Alternative B, because there is so little scrub left in Florida compared to pre-development conditions, or other available habitats. According to our analysis, approximately half of the 50,000 acres of scrub habitat in the Study Area is protected. The remainder is at risk, but not necessarily available for acquisition. Florida scrub is one of the most important ecosystems to protect due to its high degree of endemic species and its position on the landscape that increases its risk of destruction by development. The sandy soils typical of this habitat also allow rainfall to recharge the groundwater system. Subsequent discharge from these habitats gives rise to cutthroat seepage wetlands. Cutthroat grass communities are even rarer than scrub in Florida, but 99.7 percent of the 11,060 cutthroat acres within the Study Area are already protected. The species found on Florida scrub and sandhill habitats include many of the same species found on mesic temperate hammocks, but also includes Florida scrub-jay, sand skink, blue-tailed mole skink, short-tailed snake, Florida ziziphus, and 20 other species of federally threatened or endangered plants.

Alternative B also includes lesser amounts of urban , open water, and shrub and brushland (159 acres combined). Many of the urban areas were classified as "rural open" and therefore, may be restorable to native habitats. Other urban areas (buildings, commercial) may provide some benefits as maintenance or administrative service structures for the refuge. Open water habitats would likely remain as is if they are natural (32 acres) or may be modified if not (26 acres). The shrub and brushland areas (12 acres) would probably be restored to fit the restoration view for the adjacent areas. This category seems to be a catch-all for more or less indescribable habitats.

Beneficial Connectivity

Alternative B does provide some connectivity and creates larger patches of habitat. For example, the Prairie Central (33,046 acres) and Prairie South (7,995 acres) Units connect to Kissimmee Prairie State Park (53,786 acres) to provide a 94,827-acre block of habitat. This should benefit those species which need more habitats to increase their overall population size (e.g., Florida grasshopper sparrow, caracara, and burrowing owl). In the case of the sparrow, it may be an important piece for the

recovery, or at least delay the extinction, of that species. Similarly, much of the Ridge North Unit (9,509 acres) provides connectivity from the Kissimmee State Park through the Allen David Broussard Catfish Creek Preserve State Park to Disney Wilderness Preserve and the Upper Lakes Basin Waters. These large blocks of contiguous habitat would make it easier for animals to move across the landscape and would alleviate some impacts associated with urbanization and climate change. The shore of Lake Hatchineha would be mostly protected and, as such, those riparian and aquatic resources would be better protected.

Water Quality, Quantity, and Storage Benefits

By adding 50,000 acres of conservation lands to this landscape, the Service would support the Everglades restoration goals and objectives of improved water quality, quantity, and storage capacity of the upper Everglades watershed to assist meeting water supply needs of south Florida. Compared to the No Action Alternative, Alternative B would provide increased opportunities to restore wetlands within the upper Everglades watershed. Increased storage capacity, groundwater recharge, and water quality benefits would be localized within certain sub-watersheds where the lands would be acquired and restored. It is estimated that up to approximately 10,137 acres of wetlands could be restored under Alternative B. Furthermore, an additional acreage of existing wetlands could be enhanced.

The human dimensions of and impacts to the landscape surrounding the headwaters of the Everglades includes the large urban populations of the Tampa/St. Petersburg area and the metro Orlando area and would not change from that described in Alternative A. The agricultural and rural lands in this landscape are ecologically healthy, but are impacted by wetland drainage to accommodate agricultural uses. The major water quality problems within the Study Area are elevated nutrients, low dissolved oxygen (DO), and mercury in fish (FDEP 2006) would remain constant in this alternative. Some shallow surface ditches and channelized streams located on the lands identified in Alternative B would be restored, leading to improved water quality and storage capacity. However, with approximately 371,692 acres of drained wetlands within the Study Area and only 10,137 acres contained within Alternative B, the opportunity to improve the water quality and quantity would be limited. For example, if the maximum average depth across these restored wetlands was 12 inches, then the restored wetlands could store approximately 10,000 acre-feet of water. This amount of water, if it were in Lake Okeechobee, would translate to less than one-quarter of an inch of lake elevation. Increased water flows to the main Kissimmee River corridor during periods of heavy rainfall, and decreased flows during periods of drought would be moderated under this alternative. Additionally, excess nutrients would have greater opportunity to be absorbed by restored wetland and upland vegetation, reducing the nitrogen and phosphorus loading of the watershed to downstream water bodies (although it is difficult at this time to quantify this benefit due to the variability of factors such as site-specific hydrologic characteristics and legacy phosphorus in the soil).

Adverse Effects

Based on the information presented in the Florida 2060 Report, we anticipate that existing native and natural habitats would still be lost to residential and agricultural development under Alternative B. This would fragment remaining natural lands and waters. However, we expect that the distribution of these impacts might change if Alternative B was implemented. For example, Alternative B would protect up to 50,000 acres from further agricultural or residential development, but it may also attract development to its periphery. A frequent real estate selling point is the ability to own land where there are fewer neighbors and some people may desire to live adjacent to a refuge or other protected natural area. This could entice residential development around the Alternative B Units on lands not already protected. In this event, the periphery of these Units could be affected by adjacent landowners (human disturbance) and wildlife connectivity could be reduced. In the interim, the price

for these adjacent lots may also increase due to their anticipated desirability. That increase in cost may make it more difficult for the Service or other conservation agencies or entities to buy additional lands or easements in those areas.

Wildlife

Beneficial Effects

Non-listed Species

There are roughly 370 non-listed fish, amphibian, reptile, bird, and mammal species potentially present in the Study Area. Many of the approximately 30 bird species are winter migrants and, as such, may only be present in the Study Area for a few weeks or months of the year. These species require a good forage base during their migrations, so it is important that the Study Area provide those resources as well as sheltering habitat. The other vertebrate species present in the Study Area are considered resident species (present throughout the year), and add to the functionality of the landscape mosaic. Terrestrial and aquatic arthropods (insects, snails, crustacean, etc.) are also abundant in the Study Area. According to the Draft Comprehensive Conservation Plan and Environmental Assessment for the Lake Wales Ridge National Wildlife Refuge (Service 2010), there are over 60 species of ants, 70 species of bees, 45 species of spiders, and 120 species of beetles occurring on the ridge. We do not have arthropod species counts for non-ridge habitats in the Study Area, but suffice it to say it is likely to be in the hundreds to thousands. Under Alternative B, the largest benefit would be to those species that occupy primarily grasslands, prairie, wetlands, or pine flatwoods.

Game Species

A wide variety of game species can be found throughout the Study Area. Bobwhite quail, wild turkey, white-tailed deer, grey squirrels, and rabbits occur in abundance, providing ample hunting and wildlife observation opportunities. Blue-winged teal and mottled duck are the two most commonly observed waterfowl species, with many other species of waterfowl noted throughout the winter period. Wild hog, although a nonnative and nuisance species, is also considered a game species and can be found in overabundance in many areas throughout Florida. All of these species would be expected to use the refuge proposed under Alternative B.

Federally Threatened, Endangered, and Candidate Species

Beneficial Effects

Birds

Audubon's Crested Caracara

With Alternative B, there would be approximately 37,398 acres of caracara habitat protected. This includes pastures, dry prairie, herbaceous wetlands, and shrub and brushland. Using 3,000 acres as an average territory size, these contiguous habitats on Alternative B could support up to 12 caracara home ranges. (Note: One assumption could be that these home ranges already exist. In that case, Alternative B would protect these existing territories). If the habitat quality is optimal (either now or after restoration of uplands and wetlands), then Alternative B could possibly support more caracara home ranges.

Everglades Snail Kite

Alternative B would protect approximately 10,000 acres of snail kite foraging habitat (long hydroperiod wetlands and open water), and possibly a greater amount created as wetlands are restored under Alternative B. Snail kites nest in the Kissimmee Chain of Lakes, and therefore, if foraging or nesting habitat were available to them on the Ridge North Unit, one could assume that they would use it. Historically, the Prairie Central and Prairie South Units were probably too dry to support any snail kite reproduction; however, with additional wetland restoration on these units, and the push to store more water during the wet season, it is conceivable that kites could forage and possibly nest on these units in the future.

Florida Grasshopper Sparrow

With Alternative B, there would be up to approximately 22,584 acres of habitat protected for the Florida grasshopper sparrow. Some of this would come from the protection of 7,200 acres of dry prairie habitat; the remainder from the protection and restoration of pasture and wet prairie habitat on the Prairie Central and Prairie South Units. We do believe that the proximity of the Prairie Units to the existing grasshopper sparrows on the Kissimmee Prairie Preserve State Park would be a major factor in the success of establishing a breeding population on Alternative B lands. However, because we do not have a good population viability model for this species, or even know what their minimum habitat requirements are, it is difficult to predict how many sparrows could be supported by Alternative B. Alternative B represents roughly a 15 percent increase in potential grasshopper sparrow habitat if you consider that the three main existing populations occupy approximately 155,000 acres (on Three Lakes Wildlife Management Area, Kissimmee Prairie Preserve, and Avon Park AFR). The quality of the management of the potential additional lands would also dictate the abundance of sparrows supported by Alternative B.

Florida Scrub-Jay

In the Study Area, the scrub-jay may occupy Florida scrub and scrubby flatwoods. Under Alternative B, there would be approximately 575 acres of habitat protected for the scrub-jay on the Ridge North Unit. A portion of this (approximately 350 acres) is already designated as the Hatchineha Conservation Bank for scrub-jays and skinks. On the Ridge South Unit there is 300 acres of pasture that is underlain by muck and fine sand soils; therefore, it would probably not be successfully converted to scrub habitat. Using a minimum patch size of 5 hectares (12.3 acres) of habitat per scrub-jay family, Alternative B could support up to 46 existing or future scrub-jay families on the Ridge North Unit (assuming habitat is mostly contiguous and of high quality). Using the average scrub-jay territory size of approximately 25 acres (if habitat is less than optimal), this estimate could be lowered to up to 23 existing or future scrub-jay families.

Red-Cockaded Woodpecker

In the Study Area, the red-cockaded woodpecker may occupy high pine (dry, longleaf pine savanna) and pine flatwoods. Under Alternative B, there would be approximately 5,959 acres of flatwoods habitat protected that could be suitable for the red-cockaded woodpecker. To our knowledge, this species does not occupy any of the lands targeted for acquisition under Alternative B, but comprehensive surveys have not been conducted. However, if pineland habitats can be restored on Alternative B parcels, then red-cockaded woodpeckers could occupy the refuge in the future (after the trees reach the necessary age/size).

Whooping Crane

It is difficult to predict the effects of Alternative B on the whooping crane. Additional releases of individuals into this experimental population have stopped due to problems with survival and reproduction. It is possible with the protection or restoration of wet and dry prairies and freshwater marshes, that Alternative B could support additional whooping cranes releases in the future.

Wood Stork

The wood stork may forage in wetlands throughout the Study Area. Under Alternative B, there would be approximately 13,290 acres of forested or herbaceous wetland habitat protected and available to the wood stork. An additional up to 10,137 acres of wetlands could be restored; therefore, we expect the total wetland acreage available to wood storks to increase over time. We also expect that Alternative B could provide foraging habitat for the existing two stork rookeries and the three adjacent rookeries; however, it is difficult to predict how much forage biomass may be provided under Alternative B. That would depend on the management of the hydroperiod, control of nonnative species, and water quality conditions for forage species.

Mammals

Florida Bonneted Bat

Due to a general lack of ecological data, it is difficult to predict how Alternative B would affect the Florida bonneted bat. However, we know that wetland preservation and restoration would foster support as this species forages on insects over open water. We anticipate that Alternative B would protect 2,849 acres of forested wetlands, 10,375 acres of herbaceous wetlands, and 65 acres of open water (total = 13,289 acres). This species would also benefit from wetland restoration but also requires roosting areas in concert with wetlands.

Florida Panther

The Florida panther needs forested areas to persist. Alternative B would protect up to approximately 10,797 acres of forested habitat and 7,200 acres of dry prairie habitat (total = 17,997 acres) that exists today. These areas combined with the other potential panther habitats outside of Alternative B lands support only a few dispersing males in the Study Area. To help this species under Alternative B, the existing 19,811 acres of pasture habitat would need to be restored to more forested habitat or at least provide more vegetative cover than it does now. And even then, a single panther needs much more than 20,000 additional acres split into three units to maintain a home range. In essence, Alternative B would do very little for the Florida panther.

West Indian Manatee

Alternative B would likely do little to protect or conserve the manatee. This is mainly because the species is present 30 miles downstream of the southernmost Alternative B lands in the extreme lower Kissimmee River and Lake Okeechobee. There may be some small water quality benefits by the protection of 50,000 acres of land, but there are many other opportunities for water quality to be degraded after it leaves Alternative B lands and before it reaches waters occupied by manatees.

Reptiles

Sand Skink and Bluetail Mole Skink

Except for a few locations, we have little information about the overall abundance and population trends of the sand skink or bluetail mole skink. Christman (2005) estimated sand skink density averages (on occupied sites) for Orange and Osceola Counties to be 15.6 per 0.1-acre and for Polk and Highlands Counties to be 6.5 per 0.1-acre. Both skink species may occupy Florida scrub and high pine (dry, longleaf pine savanna) habitats in the Study Area; although occupancy is based on soil type, not vegetative cover. Alternative B would protect approximately 548 acres of scrub on the Ridge North Unit. We do not have skink densities but know that skinks are present throughout the designated 350-acre Hatchineha Conservation Bank for skinks and Florida scrub-jays. The acres of pasture habitat on the Ridge North Unit are underlain by poorly and somewhat poorly drained soils, and therefore, would likely be too wet after restoration to support either of these two skink species. It is also unlikely that any of the 300 acres of pasture on the Ridge South Unit may be restorable to skink habitat because it is underlain by muck or fine sand soils. Furthermore, we do not expect that skinks occupy scrub or sandhill soils on the Prairie South or Central Units because these units are outside their historic range.

Eastern Indigo Snake

Because the eastern indigo snake is a habitat generalist, we expect that much of the 50,000 acres of Alternative B would protect existing habitat (of various qualities) for the indigo snake. The exceptions to this would be the 698 acres of field crops, 65 acres of open water, the 82 acres of urban land cover, and some of the pasture lands with little or no herbaceous cover (hard to quantify this acreage). We expect that indigo snakes would use citrus; therefore, we included those 2,065 acres as suitable for indigo snakes. With an average home range size of about 200 acres, Alternative B protects habitat for roughly 150 (if all pasture is unsuitable) to 250 indigo snakes (assuming habitat, including pasture, is suitable and saturated). Of course, for that acreage that is not now suitable, it may in the future support indigo snakes after restoration.

Invertebrates

Highland's Tiger Beetle

Alternative B protects approximately 548 acres of scrub habitat in the Ridge North Unit. Highland's tiger beetles currently exist on portions of this area, so Alternative B would protect and possibly improve that habitat. The acres of pasture habitat on the Ridge North Unit are underlain by poorly and somewhat poorly drained soils, and therefore, would likely be too wet after restoration to support a xeric species like the tiger beetle. The 300 acres of pasture habitat on the Ridge South Unit does not likely support the tiger beetle currently and would also probably be too wet after restoration.

Plants

Okeechobee Gourd

Alternative B is not likely to have a beneficial effect on the Okeechobee gourd. Similar to the manatee, the gourd is present at the southern end of the Study Area. Therefore, any water quality or habitat benefits from Alternative B, 30 miles away, would be diluted by other factors (hydrologic, land use, etc).

Beautiful Pawpaw

Based on current information, this species is not in the Study Area, but exists immediately adjacent in Orange County. It is possible that some as yet unknown populations of this plant exist in the hydric pine flatwoods in the Study Area. Absent of this, we do not believe that Alternative B would provide any immediate benefits to the beautiful pawpaw. It is possible that it may be transplanted or reseeded in current or restored hydric pine flatwoods on Alternative B lands. The current amount of hydric pine flatwoods in Alternative B is 151 acres on the North Ridge Unit. At this point, it is unclear how many acres of hydric pine flatwoods could be restored with Alternative B.

Florida Ziziphus

Ten of the fourteen extant Florida ziziphus populations are within the Study Area and are on unprotected lands. None of these locations are within Alternative B. The Florida ziziphus occupies sandhill habitat underlain by yellow sand. Alternative B is not likely to benefit the Florida ziziphus.

Scrub Plant Species

Only the Ridge North Unit of Alternative B is known to support any of the 22 federally listed scrub plants. That species is the papery whitlow-wort. It is possible that additional specimens (of these 22 species) exist, but have not yet been found on the 575 acres of scrub and scrubby flatwoods on the Ridge North Unit. It is also possible that some of these species could be transplanted or reintroduced into existing or restored scrub soils under Alternative B. We expect that the maximum scrub acreage after restoration would still be close to the existing amount (as pasture areas are underlain by more mesic or hydric soil types).

Selected State Threatened and Endangered Species

Florida Black Bear

The Florida black bear once ranged throughout Florida and the southeast states, but now occupies only 18 percent of its historic range. Using a wide variety of habitats, the Florida black bear is known to wander widely in search of food, cover, mates, and other resources. Some bears of the Glades/Highlands sub-population live and move along the Lake Wales and other ridge systems into (or out of) the Fisheating Creek watershed. Bears were once abundant on the ridges and in the forested areas of Fisheating Creek, but the populations have declined due to habitat loss and fragmentation as they have become increasingly separated from areas like the Ocala National Forest to the north and Big Cypress National Preserve to the south where stable sub-populations of bears exist. Vehicle mortality is also a reason for bear decline in the Study Area (the most recent available data indicate that seven bears were road-killed in 2008 and 2009 along the ridge and in Fisheating Creek watershed). The Florida black bear would be expected to use the refuge proposed under Alternative B; however, due to the placement of parcels mostly on the prairie (away from areas that bears may frequent) the connectivity benefit to bears is likely to be small.

Sherman's Fox Squirrel

This fox squirrel uses a variety of pinelands and forested swamps. Alternative B would protect up to approximately 8,000 acres of these habitat types in the Prairie Central and Ridge North Units for the Sherman's fox squirrel.

Gopher Tortoise

The gopher tortoise typically uses a variety of scrub, pine flatwoods, and dry prairie communities within the Study Area. It may also be found on canal levees and in low- or medium-density residential areas. Alternative B could protect up to approximately 21,600 acres of existing tortoise habitat. There would be an additional opportunity to provide up to approximately 12,000 more acres of tortoise habitat, assuming that the improved pasture habitat could be restored or made more suitable for gopher tortoises under Alternative B.

Bald Eagle

The bald eagle can forage in most any aquatic, pasture, prairie, or forested habitat. Large trees are needed for nesting, and the Study Area provides habitat for a significant number of nesting bald eagles. Alternative B would protect up to approximately 38,000 acres of potential eagle habitat, and could enhance an additional 12,000 acres of improved pasture habitat so that almost all of Alternative B could provide either potential foraging or nesting habitat for bald eagles.

Sandhill Crane

The Florida sandhill crane is a non-migratory, year-round breeding resident species that uses a wide variety of wetlands, pastures, prairies, and flatwoods throughout the Study Area and would be expected to use those same habitats proposed under Alternative B. This alternative would provide up to approximately 43,300 of existing habitat for sandhill cranes.

Long-Legged Wading Birds

The 13 species of “long-legged” wading birds that may occupy the Study Area would undoubtedly benefit from the protection of the existing 13,225 acres of wetlands and the potential restoration of up to 10,137 acres of wetlands with Alternative B. It is unclear at this time if these wetland benefits would be great enough to restore any of the wading bird nesting rookeries that have been lost over the last 40 years.

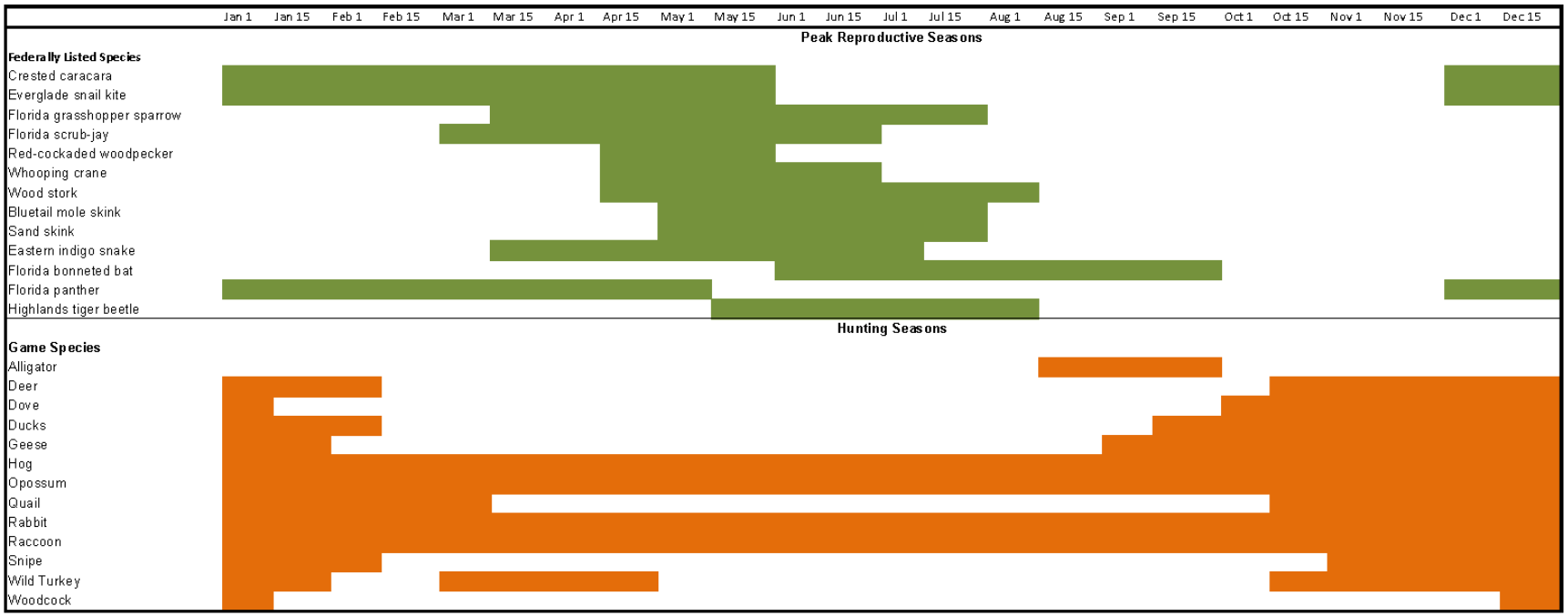
Adverse Effects

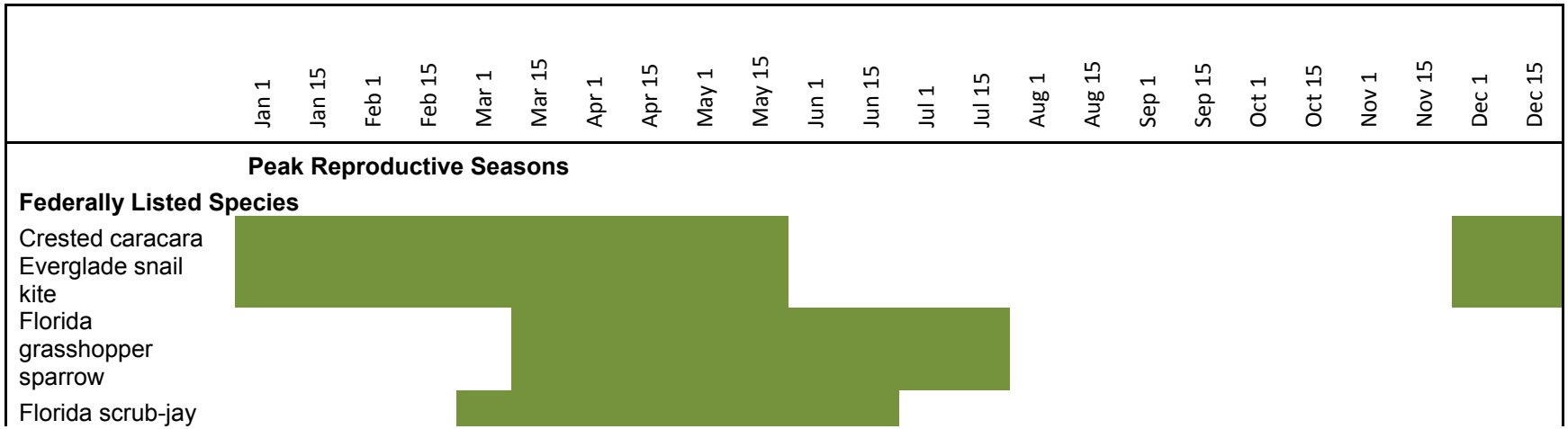
Adverse effects on listed or non-listed plants and animals associated with Alternative B are minimal. We expect that short-term adverse effects may result from habitat restoration or management activities such as prescribed fire or other fire management techniques (fire breaks, vegetation removal) especially for species such as skinks and indigo snakes. These effects could be temporary loss of habitat, or injury or mortality to a small percentage of the population. Residential development patterns could shift slightly towards refuge lands if people view it as a desirable recreational area. This could fragment adjacent unprotected habitats. Also, chemical contaminants in former agricultural soils could pose a risk to fish and wildlife, especially aquatic species during activities such as wetland restoration; however, if the properties are properly assessed and remediated, if necessary, then this risk should be mitigated or minimized. Conflicts between recreational use (hunting, or simply accessing the land) during sensitive breeding times of listed species would be an adverse effect. This could be alleviated by careful planning and timing or location of recreational activities. Table 23 identifies the time of year when federally listed species in the Study Area are in their peak reproductive season and the various game species hunting seasons. In general, the overlaps are small. This is when we would expect potential adverse effects from hunting activities disrupting reproduction. For example, the Florida grasshopper sparrow breeds from late March through July. Of the 13 game species, only the hunting seasons for feral hog, opossum, rabbit, raccoon, and wild turkey (spring season) overlap. Therefore, it would be prudent to only allow

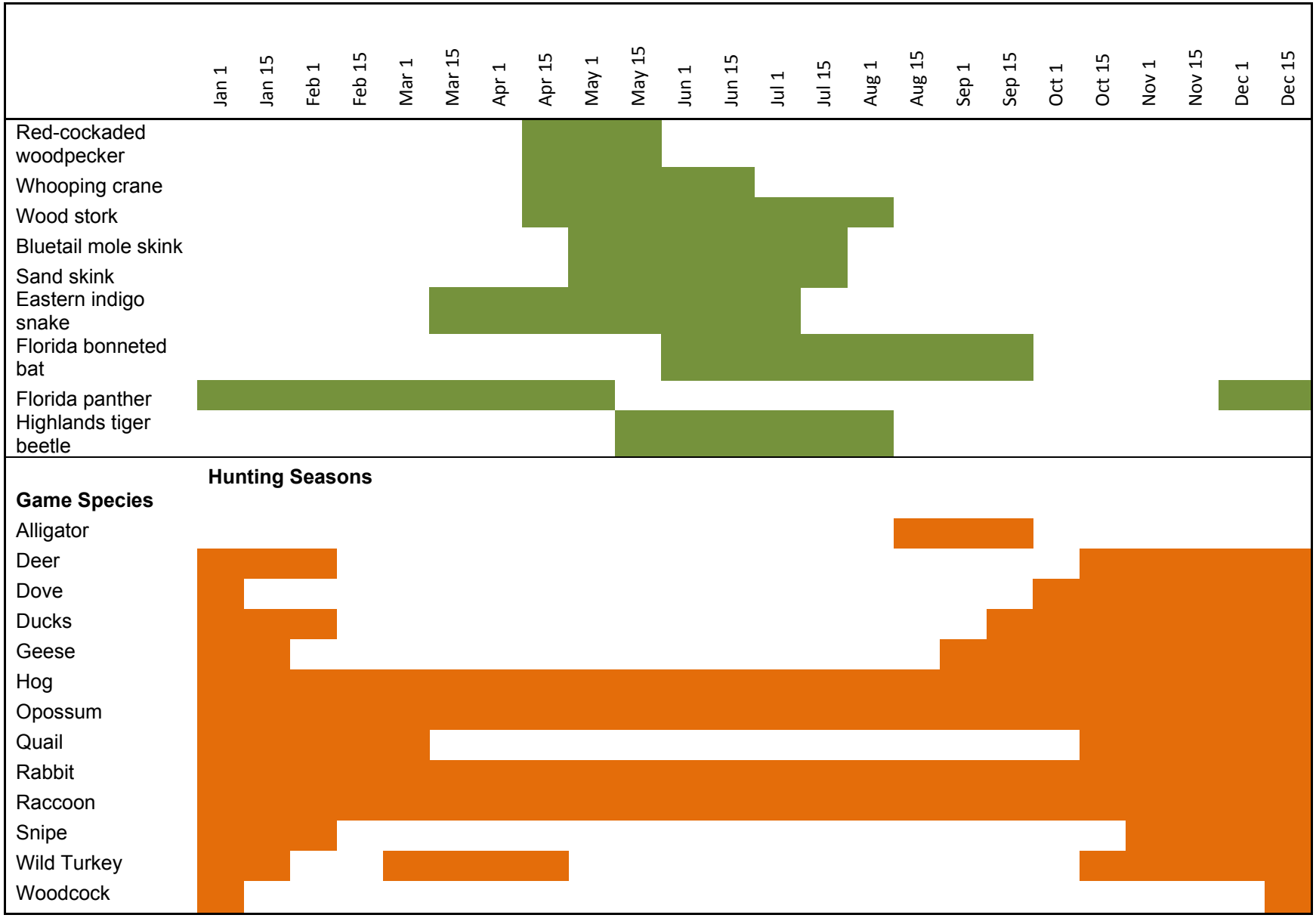
hunting for these species where and when grasshopper sparrows are not nesting. The hunting of deer, alligator, dove, quail, ducks, geese, snipe, woodcock, or turkey (fall season) should not conflict with Florida grasshopper sparrow nesting. In contrast, caracara nesting is in its peak from January to March, and overlaps hunting seasons for almost all of the game species. In this case, land managers would need to be specific about where hunting can occur so that it does not disrupt caracara reproduction. Similar concerns could occur between snail kite nesting and waterfowl hunting if snail kites occupy Alternative B lands. Scrub jays would likely be managed (with regards to hunting), similar to grasshopper sparrows.

Table 23. Peak reproductive seasons for federally listed species in the project area and hunting seasons

Key: Peak Reproduction Seasons Hunting Seasons






Jan 1
Jan 15
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May 15
Jun 1
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Aug 1
Aug 15
Sep 1
Sep 15
Oct 1
Oct 15
Nov 1
Nov 15
Dec 1
Dec 15
Red-cockaded woodpecker
Whooping crane
Wood stork
Bluetail mole skink
Sand skink
Eastern indigo snake
Florida bonneted bat
Florida panther
Highlands tiger beetle
Hunting Seasons
Game Species
Alligator
Deer
Dove
Ducks
Geese
Hog
Opossum
Quail
Rabbit
Raccoon
Snipe
Wild Turkey
Woodcock

Nonnative Species

Beneficial

We anticipate that nonnative invasive species (primarily plants but also feral hogs and nonnative fish) would be controlled on Alternative B lands. This would serve to improve the overall ecology of the Study Area by limiting further spread of these species.

Adverse

Some of these nonnative species (feral hogs, tilapia and other cichlid fishes) are sport and subsistence species. The reduction of these species' abundance may represent a minor adverse effect to some people; however, it is unlikely that we would ever completely eradicate these species under either Alternative B or C, and the expectation is that we would provide improved habitat condition for native species (deer, turkey, bass, crappie, or other sunfish) that would replace these nonnative species.

EFFECTS ON CULTURAL RESOURCES

Beneficial

Beneficial impacts would be anticipated from the implementation of Alternative B. The Service's acquisition of up to 50,000 acres of habitat in the greater Everglades landscape, as well as any historic properties contained therein, would place these properties under the federal historic preservation protective umbrella. The Service, like other federal agencies, has several legally mandated responsibilities that include development of a cultural resource management plan, compliance with the Section 106 of the National Historic Preservation Act prior to any undertaking that possesses the potential to impact historic properties, archaeological inventory of its lands and subsequent National Register eligibility testing, research-directed testing or excavation, site protection, and interpretation. Critical to these efforts are the Florida Division of Historical Resources, the Seminole Tribe of Florida, the Miccosukee Tribe, the Seminole Nation of Oklahoma, the Poarch Band of Creeks, and the Muscogee (Creek) Nation, and a number of interested parties, such as nearby universities, adjacent landowners, and state resource agencies. The Service would, when possible, partner with the Seminole Tribe and/or other interested Native American tribes to facilitate archaeological and ecological investigations, protection, and interpretation of sites deemed to have culturally and religiously significance for the tribe(s). Protection of historic properties would be enhanced by incorporating concepts of site stewardship and ownership, where appropriate, into public use materials and interpretive panels. This effort would be further enhanced by providing advanced archaeological resource protection training to refuge law enforcement personnel.

Adverse

Negligible impacts to cultural resources could be anticipated under Alternative B. There could be some risk that refuge visitors may inadvertently or intentionally damage or disturb cultural resource sites; however, we would employ all means available to protect archaeological sites, historic structures, cemeteries, and historic landscapes through scientific investigations, public education, partnerships with tribal, state, and local governments, and law enforcement efforts.

EFFECTS ON SOCIOECONOMIC ENVIRONMENT

Beneficial

Several positive effects to the area's socioeconomics are expected under this alternative. As discussed in the "Socioeconomic Resources" section under the No Action Alternative, wildlife-dependent activities would contribute to the region's economy. A segment of the visiting public would spend its money at area hotels and restaurants. Furthermore, visitors would locally buy some equipment and supplies associated with public uses such as hunting, fishing, and wildlife-watching/photography. Conservation lands have also been shown to produce economic benefits to local communities by reducing costs associated with providing clean water, stormwater management, and improving air quality (The Trust for Public Land 2010). A study of a 73-square-mile watershed conducted by the University of Illinois showed that there were substantial economic benefits associated with conservation lands. Areas down-stream of conservation lands had higher property values due to reduced flood risks. In addition, municipalities located downstream of conservation lands were able to save money on replacing or repairing culverts due to a reduced frequency and intensity of high volume events (Johnston et al. 2006). Neighboring landowners of a proposed refuge in Alternative B would benefit from improved water quality from restoration of refuge lands and waters to native habitats and from the assurance that those refuge properties would not be developed or operated in ways that might have a negative impact to the neighboring properties. Further, as development patterns change, the potential exists for increased land values for those neighboring properties.

Adverse

There would likely be some adverse impacts, namely a potential decline of tax revenue to local counties (as lands come under Service ownership). The Refuge Revenue Sharing Act of June 15, 1935 (16 U.S.C. 715s) offsets the loss of local tax revenues from federal land ownership through payments to local taxing authorities. The refuge provides annual payments to taxing authorities, based on the acreage and value of refuge lands located within their jurisdiction. Money for these payments comes from the sale of oil and gas leases, timber sales, grazing fees, the sale of other Refuge System resources, and from Congressional appropriations, which are intended to make up the difference between the net receipts from the Refuge Revenue Sharing Fund and the total amount due to local taxing authorities. The actual Refuge Revenue Sharing payment does vary from year to year, because Congress may or may not appropriate sufficient funds to make full payment. The exact amount of the annual payment depends on the congressional appropriation, which in recent years has tended to be less than the amount to fully fund the authorized level of payments.

The refuge Revenue Sharing payments are based on one of three different formulas, whichever results in the highest payment to the local taxing authority. The payments are based on three-quarters of 1 percent of the appraised fair market value (or the purchase price of a property until the property is reappraised). The Service reappraises the value of refuge lands every 5 years, and the appraisals are based on the land's highest and best use. On wetlands and formerly farmland-assessed properties, the full entitlements refuge Revenue Sharing payments sometimes exceed the real estate tax; in other cases, refuge Revenue Sharing payments may be less than the local real estate tax. For the nearby Lake Wales Ridge NWR, 2009 Refuge Revenue Sharing payments were: $23,252 for 1,685 acres in Highlands County and $2,278 for 172 acres in Polk County.

The fact that, in general, refuges put little demand on the infrastructure of a municipality and this must be considered in assessing the financial impact on the municipality. For example, there is little to no demand placed on the school system, roads, utilities, police and fire protection, and other systems and services. There is a substantial body of literature that shows that development, especially

residential development, actually costs a community more in schools, roads, sewers, and other services than the tax revenue generated by the development (Land Trust Alliance 1994).

The potential does exist under Alternative B for neighboring landowners to experience trespass by the public using refuge properties. The Service would design public use opportunities and programs and would work with neighboring landowners to minimize or eliminate any negative impacts.

Taking all the socioeconomic factors into account, we believe there to be a net positive effect to the region under Alternative B.

C. ALTERNATIVE C. CONSERVATION PARTNERSHIP APPROACH (PROPOSED ACTION)

Under this alternative, the Service would acquire interest in approximately 150,000 acres of land, of which up to approximately 50,000 acres would be fee title lands included as part of the proposed Everglades Headwaters NWR and approximately 100,000 acres of less than fee acquisition as part of the Conservation Area. Alternative C contains two areas:

- an approximately 130,000-acre Conservation Focal Area where the Service would have opportunity and authority to acquire approximately 50,000 acres of fee title land; and
- a Conservation Partnership Area surrounding the fee title acquisition focal area and focusing opportunity for approximately 100,000 acres of less than fee title acquisition.

The Conservation Partnership Area would provide the Service the opportunity to work together with landowners; private organizations; and municipal, state, and federal governments to conserve wetlands and improve the groundwater recharge, water storage capacity, and water quality of the upper Everglades watershed. The Conservation Partnership Area would guide the Service to areas of most interest for less than fee title acquisition. The Conservation Focal Area would guide and also restrict fee title acquisition to specified areas within the landscape.

Six planning units have been identified for the Conservation Focal Area: Ridge North (Figure 10a), Ridge Central (Figure 10b), and Ridge South (Figure 10c), and Prairie North (Figure 10d), Prairie Central (Figure 10e), and Prairie South (Figure 10f) (see Appendix F for a detailed description of the identification and development of priority areas). Within the six units, the Service would have the opportunity to participate in fee and less than fee acquistions. These six planning units are based upon two primary criteria: (1) The key habitats that support the focal species described in the Affected Environment section of this report (Chapter II), and (2) connectivity between existing areas of conservation.

EFFECTS ON PHYSICAL ENVIRONMENT

Land Use Patterns

Beneficial

Under Alternative C, the total area of protected lands used for habitat and wildlife conservation and compatible wildlife-dependent recreation would increase over the No Action Alternative and Alternative B. In addition, this alternative would potentially protect an additional 100,000 acres as conservation easements.

Adverse

A potential adverse effect under Alternative C is the loss of land (150,000 acres) available for agriculture, urban development, and other non-conservation uses. This is believed to constitute a minimal impact, as the proposed refuge lands comprise a relatively small percentage of the total area available (150,000 acres out of 1,401,894 acres or about 10 percent). Furthermore, some former uses would continue on the proposed conservation easements.

Climate Change

Beneficial

Under this alternative, approximately 150,000 acres of proposed refuge lands and conservation easements would continue to act as carbon sinks, resulting in a positive impact with regard to climate change. These benefits are further detailed under Alternative B. Overall, this benefit would be minimal due to the comparatively small size of the proposed Everglades Headwaters NWR and Conservation Area relative to all lands in the Study Area and nationally.

Adverse

Under this alternative, refuge operations and facilities, public visitation, and habitat management would contribute greenhouse gases to the atmosphere. These adverse impacts are further described under Alternative B. For Alternative C, it is believed that the total net contribution of greenhouse gases resulting from the establishment of the proposed Everglades Headwaters NWR and Conservation Area would constitute a minimal impact.

Topography

Beneficial

Under this alternative, the topography would be protected within 150,000 acres of proposed Everglades Headwaters NWR and Conservation Area. This is expected to be a minimal benefit, as the 150,000-acre proposed Everglades Headwaters NWR and Conservation Area are relatively small compared to the overall Study Area.

Adverse

Impacts would be similar to those described under Alternative B.

Hydrology and Water Quantity

Beneficial

This alternative is expected to result in positive impacts to the hydrology and water quantity of the area. These benefits would include those detailed under Alternative B, except that in this case there would additional positive effect given that more lands (100,000 acres of proposed conservation easements) would be protected from development and mining under Alternative C. Conservation easements would not preclude the ability of the landowner from implementing pollutant reduction strategies identified through the state's Total Maximum Daily Load and Basin Management Action Plan process. The benefit is expected to be minor, as the 150,000 acres constitute a relatively small proportion of the Study Area.

Adverse

Under Alternative C, there would be some impacts to hydrology and water quantity resulting from construction projects on proposed refuge lands only (i.e., the Service-construction would not occur on conservation easements). The negative effects on hydrology and water quantity would be similar to those described under Alternative B and are believed to be minimal.

Geology

Beneficial

Under Alternative C, more land (e.g., an additional 100,000 acres of proposed conservation easements) would be protected from large construction projects and mining operations, resulting in additional benefits to those described under Alternative B. Overall, these benefits would be minimal, as 150,000 acres of potentially protected lands is a relatively small percentage of the total Study Area.

Adverse

Adverse effects would similar to those discussed under Alternative B.

Soils

Beneficial

This alternative would provide benefits to soils similar to those described under Alternative B, except that a larger area (an additional 100,000 acres of proposed conservation easements) would be protected. This positive effect would be minimal.

Adverse

As described under Alternative B, there would be some adverse effects on soils under this alternative resulting from the construction of a refuge office and public use buildings. Some limited construction (e.g., expanding an existing dwelling) may be allowed on the conservation easements, depending on the type of agreements that are made with landowners. Those details are not available at this time. However, it is anticipated that any impacts to soils resulting from those activities would be minimal.

Air Quality

Beneficial

Under Alternative C, there would be additional benefits to air quality compared to Alternative B as a result of the added 100,000 acres of conservation easements being protected.

Adverse

Impacts to air quality would be similar to those described under Alternative B for refuge lands. Under Alternative C, there would be some sources of air pollution resulting from such activities as prescribed burning on the proposed conservation easements. Overall, the negative consequences to air quality associated with this alternative are expected to be minimal.

Water Quality

Beneficial

Compared to Alternative B, this alternative would result in added benefits to water quality. In addition to the 50,000-acre proposed Everglades Headwaters NWR, another 100,000 acres of potential conservation easements would become established, further protecting the watershed from development and associated declines in water quality.

Adverse

Under this alternative, there would be impacts to water quality on the proposed 50,000 acres of refuge lands similar to what is described under Alternative B. In general, it is believed that any negative consequences to water quality resulting from the proposed refuge would be minimal and would be limited to increased sediment loads during wetland restoration activity. This impact could be minimized or eliminated by conducting construction during the dry season (November through May)

Noise

Beneficial

There would be additional benefits to the soundscape under this action as compared to Alternative B. More lands would be protected from development and other land uses that are associated with higher levels of noise. These benefits would be minimal.

Adverse

Effects on noise would be similar to what was discussed under Alternative B for the proposed refuge lands. Under this alternative, there would some landowner and public use (e.g., hunting) activities in the Conservation Focal Area that would generate noise. It is not expected that these would have any significant effects on the area's soundscape as they are similar to what currently occurs on many of the proposed lands.

Visual Resources

Beneficial

Under this alternative, visual resources would be maintained on a larger area, compared to Alternative B. Tall structures would likely not be built in the Conservation Partnership Area, further protecting the esthetics of the local landscape. These benefits are considered minimal.

Adverse

Impacts would be the same as those under Alternative B.

EFFECTS ON THE BIOLOGICAL ENVIRONMENT

Habitats

Introduction

Alternative C, the Service's Proposed Action, consists of up to 150,000 acres containing a 50,000-acre refuge (with a fee title acquisition focus) and a 100,000-acre Conservation Area (with an easement focus). For the refuge portion of Alternative C, the Service has identified approximately 130,000 acres within which the Service would be authorized to only acquire up to 50,000 acres based on specific ranking criteria to meet the proposed refuge's goals and objectives, and landowner willingness. For the Conservation Area portion of Alternative C, conservation easements would also be based on suitability criteria; however, we expect that ranching on other types of low-intensity agriculture would continue on approximately 80 percent of the 100,000 acres. This format for both the proposed Everglades Headwaters NWR and Conservation Area would allow the Service the flexibility to respond to changing economic conditions and landowner interest.

With implementation of Alternative C, the upper Everglades watershed would become a more connected and functional conservation landscape that may allow habitats and species to shift in response to climate and human demographic change. It offers the most comprehensive habitat and wildlife conservation effort of all alternatives. A larger addition to the conservation landscape would build larger linkages to the fragmented landscape of this area which currently limits habitat use, migration, and dispersal of a variety of species. Under Alternative C, the existing and projected loss or fragmentation of habitats could still be problematic at the broader landscape level; however, Alternative C would alleviate more localized habitat loss and therefore, increase the opportunity for many species to persist in the Study Area.

Both the proposed Everglades Headwaters NWR and Conservation Area would provide an important link for migratory birds and important habitat for both rare and common wildlife. Proposed management would complement the management of adjacent and nearby conserved lands, both public and private, thus enhancing the Service's wildlife management contribution to the regional landscape and helping to make the entire landscape a more functional conservation landscape (Figure 8). The proposed Everglades Headwaters NWR and Conservation Area in central Florida would provide local and regional benefits to wildlife by working in concert with existing conservation areas and partners, including SFWMD's Kissimmee River Restoration efforts, Avon Park Air Force Range, Disney's Wilderness Preserve, Kissimmee Prairie Preserve, Three Lakes WMA, and various designated trails throughout this area. Alternative C would also restore wetlands and wetland function and would contribute to water quality, water quantity, and water storage capacity of the upper Everglades watershed to support Everglades' restoration goals and objectives and water supply needs for south Florida. Alternative C would provide opportunities for wildlife-dependent public use activities and help maintain the cultural ranching heritage of the area. Public use opportunities under this alternative would include hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

For the 50,000-acre refuge component of Alternative C, we would expect very similar benefits to those predicted from the 50,000 acres of Alternative B. However, because we have identified a larger Conservation Focal Area (130,000 acres) we would have the opportunity to select different lands that would support the refuge goals and objectives even better than Alternative B lands. This could occur where additional field investigations change our original assumptions about the quality of the habitat, or where continued residential or agricultural development or climate change alter the landscape in the intervening years so that a parcel which was once desirable becomes undesirable,

or vice-a-versa. Additionally, because Alternative C includes all lands in Alternative B, we would not expect the environmental benefits of Alternative C to be worse than Alternative B.

Beneficial Effects

Under Alternative C, we expect up to 50,000 acres would be protected or conserved. Table 24 identifies the percentages of various land covers (or ecosystems) that comprise Alternative C. While the percentages of each land cover may be different between Alternatives B and C, the rank of the percentages remains similar. Because Alternative C protects or conserves similar amounts and types of habitat to that in Alternative B, we have not repeated duplicate benefits here and encourage the reader to consider the Alternative B benefits to listed species, and other plants and animals while reading this section. Where Alternative C provides additional benefits, we discuss them in this section.

Table 24. Percentage of land cover types in Alternative C

Land Cover Type	Percent of Alternative C
Improved, Unimproved, and Woodland Pasture	48.43
Wet Prairie and Freshwater Marsh	19.39
Dry Prairie	10.31
Scrubby, Mesic, and Hydric Pine Flatwoods	7.78
Freshwater Forested Wetlands	7.06
Intensive Agriculture	2.93
Mesic Temperate Hammock	1.30
High Pine, Florida Scrub, and Sandhill	1.67
Urban	0.48
Open Water	0.13
Shrub and Brushland	0.51
Total	**100.00**

Approximately 48 percent of lands available to Alternative C are improved, unimproved, and woodland pastures (see Alternative B for a discussion of why pasture habitats had the highest percentage). All of these pasture types have a high degree of potential for being restored to native grassland and herbaceous wetland ecosystems in 2 to 5 years. Therefore, with implementation of Alternative C, there would be up to 63,018 acres of pasture habitat available for restoration. If we wanted to select the planning unit with the greatest amount of pastures, we would select the Prairie Central Unit (47,958 acres). We would expect that the acres of pasture in the Prairie Central and South Units would be largely restored to a dry prairie and herbaceous wetland mosaic (similar to pre-development conditions) to support primarily Florida grasshopper sparrow, crested caracara, Florida black bear, waterfowl and wading birds. Pasture habitats on the Ridge Units would likely be restored to a wetland and upland forest mosaic (to mimic predevelopment conditions).

Approximately 19 percent (or 25,233 acres) of lands available to Alternative C are herbaceous wetlands. These include wet prairie, depression marsh, freshwater marsh, slough, and isolated and emergent vegetation marshes. The planning unit with the largest amount of herbaceous wetlands is the Prairie Central Unit, which has 5,914 acres of short-hydroperiod and 13,047 acres of long-hydroperiod wetlands. Wet prairies and other short-hydroperiod wetlands on the Prairie Central and

South Units are critical for amphibian reproduction and as part of the dry prairie - wet prairie mosaic, much of which has been converted to other uses.

Approximately 10 percent (13,415 acres) of lands available to Alternative C are dry prairie. This project represents the best near-term opportunity to protect, conserve, or restore this habitat type for one of the most imperiled species in Florida – the Florida grasshopper sparrow. The planning units that provide the greatest amount of dry prairie are the Prairie Central and South Units (7,573 and 5,840 acres, respectively). Under C, we expect that existing dry prairie would be protected at existing quality or restored (then protected), and we would likely increase the spatial extent on those planning units by restoring pasture habitat to dry prairie.

Lands available to Alternative C also include 8 percent (10,123 acres) hydric, mesic, and scrubby pine flatwoods. The majority (82 percent or 8,338 acres) is classified as mesic flatwoods. All Alternative C planning units possess mesic flatwoods, with Prairie Central (4,283 acres) and Prairie North (2,036 acres) having the most acres. Scrubby flatwoods, an ecotone between scrub and pine flatwoods occupy 1,179 acres, most of which are on the Ridge South (434 acres) and Prairie Central (36 acres) Units. Hydric flatwoods are rarer (only 228 acres total), but an assumption is that some hydrologic restoration could increase this acreage on proposed refuge lands.

Lands available to Alternative C include 7 percent (9,172 acres) freshwater forested wetlands. These include primarily cypress, mixed wetland hardwoods, isolated freshwater swamp, and shrub bog. Most of the cypress (85 percent or 3,093 acres) is in the Prairie North Unit. Planning units with other substantial amount of forest wetlands include Ridge North, Prairie Central, and Ridge South Units. We would expect some restoration of forested wetlands under Alternative C, but it is difficult to predict either where, or how many, acres would be restored.

Lands available to Alternative C also include 3 percent (3,814 acres) intensive agriculture. This is in the form of citrus (1,922 acres) and field crops (1,366 acres), primarily in the Prairie Central Unit. We would expect that these areas would be restored to native wetland and upland habitats, although this process could take longer due to the higher degree of alteration (when compared to pastures). There may also be copper contamination in the soils of citrus groves or other chemical contamination (pesticides) on field crops; this may delay restoration of these areas.

Lands available to Alternative C also include 1.3 percent (1,686 acres) mesic temperate hammock, which occurs mostly in the Prairie Central Unit (976 acres). Approximately 354 acres (21 percent) were classified as “mixed hardwood-coniferous,” which occurs on 4 of the 6 planning units. Under Alternative C, these areas would be protected and restored if needed. Because this ecosystem is present at a lesser spatial extent than other native communities in Alternative C, it is unlikely to provide as large of a suite of benefits.

Lands available to Alternative C also include 1.6 percent (2,177 acres) Florida scrub and sandhill. The specific amounts are 1,747 acres of scrub, 370 acres of sandhill, and 60 acres of xeric hammock. Alternative B only contained 901 acres of these xeric habitats, so by selecting slightly different lands under Alternative C we could potentially double the amount of scrub conservation or restoration by acquiring additional properties in the Ridge North Unit. This would also likely increase the suite of benefits for the many federal or state listed scrub plants and animals.

Lands available to Alternative C also include lesser amounts of urban, open water, and shrub and brushland (1,461 acres combined). Many of the urban areas (628 acres) were classified as “rural open” and therefore, may be restorable to native habitats. Other urban areas (buildings, commercial) may provide some benefits as maintenance or administrative services structures for the refuge.

Open water habitats would likely remain as is if they are natural (96 acres) or may be modified if not (74 acres). The shrub and brushland areas (663 acres) would probably be restored to fit the restoration of adjacent areas. This category seems to be a catch-all for more or less indescribable habitats. The majority of shrub and brushland (494 acres) occurs on the Prairie Central Unit.

Conservation Easement Benefits

We expect that pasture habitats would comprise a large part of the 100,000-acre conservation easement component of Alternative C. These areas are largely pasture now, with some native or natural communities interspersed. We anticipate that up to 80 percent of the pasture habitat would remain; but that wetlands would be restored within these pastures and that at least 20 percent of the site would be protected or restored to an appropriate native land cover. However, because the current area for these lands is so vast, it is difficult to make any accurate predictions about the amount or quality of native and natural habitats on these lands under Alternative C other than to expect that we would add an additional 20,000 acres of native habitats (with easements) to the 50,000 acres (with fee simple acquisition). The stipulations of the easement agreement would dictate the resulting quality of the ecosystem (e.g., cattle density, fencing requirements, allowable land uses, management, and nonnative species control).

Beneficial Connectivity

Alternative C provides a similar level of connectivity and creates larger habitat patches as does Alternative B when considering just the 50,000-acre refuge component. However, Alternative C provides much more connectivity than Alternative B and creates larger patches of habitat when the 100,000 acres of conservation easements is included. Besides the additional approximately 20,000 acres of lands to be protected or restored and the approximately 80,000 acres of pasture lands that would be protected from development, the easement agreements should serve to foster a common management strategy across all lands in Alternative C and would give landowners the opportunity to share resources and to learn new management techniques. Having a group of landowners managing different parcels of lands under a set of common objectives, could be the difference between having a patchwork of varying, but overall diminishing, quality habitats and a continuum of a highly connected, functioning landscape.

Water Quality, Quantity, and Storage Benefits

By protecting or conserving an additional 150,000 acres of conservation lands on this landscape, the Service would support the Everglades restoration goals and objectives of improved water quality, quantity, and storage capacity of the upper Everglades watershed to assist meeting water supply needs for south Florida. Compared to the No Action Alternative and Alternative B, Alternative C would provide increased opportunities to restore wetlands within the upper Everglades watershed. Increased storage capacity, groundwater recharge, and water quality benefits would be localized within certain sub-watersheds where the lands would be acquired and restored.

Using GIS, we calculated the acreage of former hydric soils (from the NRCS's Soil Survey Geographic Database) that are currently not functioning as wetlands (based on the FNAI land cover classification). Within the 130,000 acres of lands that form the Conservation Focal Area, there are 23,065 acres of non-functioning, potentially restorable wetland soils. Table 25 shows the amount of potentially restorable hydric soils in each Planning Unit. Assuming that Alternative C would contain at least an equal amount of restorable soils as in Alternative B, then 10,137 acres of former wetlands could be restored (in addition to an unquantified acres of existing wetlands enhanced). Beyond this it

is difficult to predict how many acres of wetlands could be restored with Alternative C because it would depend on the parcels acquired and the amount of potentially restorable hydric soils therein.

Table 25. Acres of non-functioning, potentially restorable wetland soils under Alternative C

Planning Unit	Acres
Prairie North Unit	755.3
Prairie Central Unit	15,235.6
Prairie South Unit	3,159.9
Ridge North Unit	2,519.6
Ridge Central Unit	695.5
Ridge South Unit	699.5
Total	**23,065.4**

When compared to Alternative B, we expect Alternative C to provide additional hydrologic benefits simply based on the increased acreage. Those additional acres that would be protected from further development would remove those impervious surfaces from the future without the project condition, and therefore, would help to maintain the current hydrologic conditions in those areas. The restoration of refuge lands would have similar benefits under both Alternatives B and C. We expect augmented groundwater infiltration that would both decrease stormwater flows to the main Kissimmee River corridor and increase flows during periods of drought. Additionally, excess nutrients would have greater opportunity to be absorbed by restored wetland and upland vegetation, reducing the nitrogen and phosphorus loading of the watershed to downstream water bodies (although it is difficult at this time to quantify this benefit due to the variability of factors such as site-specific hydrologic characteristics and legacy phosphorus in the soil).

Adverse Effects

Based on the information presented in the Florida 2060 Report, we anticipate that existing native and natural habitats would still be lost to residential and agricultural development under Alternative C. This may fragment remaining natural lands and waters. However, we expect that the distribution of these impacts might change if Alternative C was implemented. For example, Alternative C would protect up to 50,000 acres from further agricultural or residential development, but it may also attract development to its periphery. On adjacent lands not already protected, the periphery of these units could be affected by adjacent landowners (human disturbance) and wildlife connectivity could be reduced. In the interim, the price for these adjacent lots may also increase due to their anticipated desirability. That increase in cost, may make it more difficult for the Service or other conservation agencies or entities to buy additional lands or easements in those areas.

Similarly, the acquisition of conservation easements on 100,000 acres may decrease the amount of land available for development and increase the cost of adjacent properties. This may increase the price of land to the point where it is economically infeasible for additional conservation efforts in the immediate area.

Wildlife

Beneficial Effects

Non-listed Species

There are approximately 370 non-listed fish, amphibian, reptile, bird, and mammal species potentially present in the Study Area that would benefit under Alternative C just as they would under Alternative B. Alternative C protects or restores an additional up to 20,000 acres of native or natural habitat on conservation easement lands and up to 80,000 acres of pasture lands. These additional lands would provide additional habitat for these non-listed species. Under Alternative C, the largest benefit would be to those species that occupy primarily pastures, grasslands, prairies, wetlands, or pine flatwoods.

Game Species

All of the game species that would be expected to use the refuge proposed under Alternative B would also use lands under Alternative C. The additional easement lands would also provide habitat for game species; therefore Alternative C would provide a greater benefit to game species.

Federally Threatened, Endangered, and Candidate Species

Beneficial Effects

Because the overall acreages of habitats either protected or restored remained similar on proposed refuge lands under both Alternatives B and C, the effects to federally listed species would be similar. Where differences are likely to occur, they are discussed below. On the conservation easement lands of Alternative C, we would expect benefits to some species from the additional up to 20,000 acres of conserved native or natural habitat and the up to 80,000 acres of pasture habitat.

Birds

Audubon's Crested Caracara

With Alternative C, there would be up to approximately 102,329 acres of caracara habitat available to be protected within the 50,000-acre refuge and additional 100,000 acres of habitat placed into conservation easements. These habitats include pastures, dry prairie, herbaceous wetlands, and shrub and brushland. Using 3,000 acres as an average territory size, these contiguous habitats of Alternative C could support up to 50 caracara home ranges. (Note: One assumption could be that these home ranges already exist. In that case, Alternative C would protect these existing territories). If the habitat quality is optimal (either now or after restoration of uplands and wetlands), then Alternative C could possibly support more caracara home ranges.

Everglades Snail Kite

With Alternative C there would be up to approximately 18,127 acres of snail kite foraging habitat (long hydroperiod wetlands and open water) available to be protected. There would be an additional amount as wetlands are restored under Alternative C. We also assume that some of the conservation easement areas would protect or restore wetlands that snail kites may use. Snail kites nest in the Kissimmee Chain of Lakes, and therefore, if foraging or nesting habitat were available to them on the Ridge North Unit or Ridge Central Unit, we assume that they would use it.

Florida Grasshopper Sparrow

With Alternative C, there would be up to approximately 83,709 acres of habitat available to be protected for the Florida grasshopper sparrow from which to choose refuge lands. Some of this would come from the protection of up to 13,415 acres of dry prairie habitat; the remainder from the protection and restoration of pasture (up to 63,018 acres) and wet prairie habitat (up to 7,276 acres) on the Prairie Central and Prairie South Units. Easement lands could provide up to an additional 20,000 acres of native lands and up to an additional 80,000 acres of pasture lands (although it is unlikely that all of these lands would be suitable for the grasshopper sparrow). We do believe that the proximity of the South and Central Prairie Units to the existing grasshopper sparrows on the Kissimmee Prairie Preserve State Park would be a major factor in the success of establishing a breeding population on Alternative C lands. However, because we do not have a good population viability model for this species, or even know what their minimum habitat requirements are, it is difficult to predict how many sparrows could be supported by Alternative C.

Florida Scrub-jay

In the Study Area, the scrub-jay may occupy Florida scrub and scrubby flatwoods. Under Alternative C, there would be up to approximately 2,177 acres of scrub habitat available to be protected for the scrub-jay. The majority of this is on the Ridge North (930 acres) and Ridge South (780 acres) Units. The 350 acres of scrub in the Hatchineha Conservation Bank (Ridge North Unit) supports scrub-jays and skinks. There is a proposed scrub-jay conservation bank for a 60-acre property also in the Ridge North Unit. Using a minimum patch size of 5 hectares (12.3 acres) and an average size (25 acres) of habitat per scrub-jay family, and assuming that we could not acquire all 2,132 acres of scrub, but could acquire the three largest blocks (which equals 2,106 acres), we could protect land for up to between 84 and 170 scrub-jay families. Furthermore, the up to 20,000 acres of conservation easement lands could add to this, but it is difficult to accurately predict how much until we know where these lands would be located.

Red-cockaded Woodpecker

In the Study Area, the red-cockaded woodpecker may occupy high pine (dry, longleaf pine savanna) and pine flatwoods. Under Alternative C, there would be approximately 10,123 acres of flatwoods habitat available to be protected that could be suitable for the red-cockaded woodpecker. To our knowledge, this species does not occupy any of the lands targeted for acquisition under Alternative C. However, we do know that they exist on pinelands on some of the ranches on the east side of the Study Area between SR 60 and Three Lakes Wildlife Management Area. If we can acquire conservation easements on these areas, then we can protect additional lands for the red-cockaded woodpecker.

Whooping Crane

It is difficult to predict the effects of Alternative C on the whooping crane. Additional releases of individuals into this experimental population have stopped due to problems with survival and reproduction. It is possible with the protection or restoration of wet and dry prairies and freshwater marshes, that Alternative C could support additional whooping cranes releases in the future.

Wood Stork

The wood stork may forage in wetlands throughout the Study Area. Under Alternative C, there would be up to approximately 34,414 acres of forested or herbaceous wetland habitat available to be protected for the wood stork on refuge lands and an additional acreage of wetlands on

easement lands plus those wetlands that could be restored; therefore, we expect the total wetland acreage available to wood storks to increase over time. We also expect that Alternative C could provide foraging habitat for the existing two stork rookeries and the three adjacent rookeries; however, it is difficult to predict how much forage biomass may be provided under Alternative C. That would depend on the management of the hydroperiod, control of nonnative species, and water quality conditions for forage species.

Mammals

Florida Bonneted Bat

Due to a general lack of ecological data, it is difficult to predict how Alternative C would affect the Florida bonneted bat. However, we know that wetland preservation and restoration would foster support as this species forages on insects over open water. We anticipate that Alternative C would have up to 9,181 acres of forested wetlands, 25,233 acres of herbaceous wetlands, and 170 acres of open water (total = 34,584 acres) on the 130,000 acres of lands, the majority of which are on the Prairie South and Central Units. This species would also benefit from wetland restoration but also requires roosting areas in concert with wetlands. We expect that the conservation easement lands would also support this species provided wetlands can be protected or restored.

Florida Panther

The Florida panther needs forested areas to persist. Alternative C could have up to approximately 23,830 acres of existing forested habitat and 13,415 acres of dry prairie habitat that would be available for acquisition (total = 37,245 acres). These habitats combined with the other potential panther habitats outside of Alternative C lands support only a few dispersing males in the Study Area. To help this species under Alternative C, the entire 50,000-acre refuge would need to be restored to panther habitat and the conservation easement areas would also need to have as much panther habitat as possible. And even then, if 150,000 acres of new panther habitat were created, it would only provide enough habitats for one or two panthers. In essence, unless Alternative C can provide corridors to other existing or future conservation lands, it would do very little for the Florida panther.

West Indian Manatee

Alternative C would likely do little to protect or conserve manatees. This is mainly because the species is present 30 miles downstream of the southernmost Alternative C lands in the extreme lower Kissimmee River and Lake Okeechobee. There may be some small water quality benefits by the protection of 50,000 acres of land, and the 100,000-acre conservation easements, but there would be other opportunities for water quality to be degraded after it leaves Alternative C lands an before it reaches waters occupied by manatees.

Reptiles

Sand Skink and Bluetail Mole Skink

Except for a few locations, we have little information about the overall abundance and population trends of the sand skink or bluetail mole skink. Both skink species may occupy Florida scrub and high pine (dry, longleaf pine savanna) habitats in the Study Area. Alternative C could acquire up to approximately 930 acres of scrub on the Ridge North Unit and 780 acres of scrub on the Ridge South Unit. It is unlikely that the conservation easements would benefit skinks since these easements are anticipated to be off the ridge in pasture habitat. Approximately 350 acres of Ridge North Unit is the

Hatchineha Conservation Bank for skinks and scrub-jays. Another conservation bank for skinks and jays is proposed in the Ridge North Unit (60 acres).

Eastern Indigo Snake

Because the eastern indigo snake is a habitat generalist, we expect that much of the 50,000 acres of Alternative C would protect existing habitat (of various qualities) for the indigo snake. The exceptions to this would be open water, urban land cover, field crops, and some of the pasture lands with little or no herbaceous cover (hard to accurately quantify this acreage). We anticipate that the 100,000 acres of conservation easements could also largely support indigo snakes as long as there is some herbaceous cover. After restoration, more or improved indigo snake habitat would exist.

Invertebrates

Highland's Tiger Beetle

There is approximately 930 acres of scrub habitat on the Ridge North Unit available to Alternative C for this species. Highland tiger beetles currently occupy parts of this unit, so Alternative C could protect and possibly expand that habitat. The acres of pasture habitat on the Ridge North Unit are underlain by poorly and somewhat poorly drained soils, and therefore, would likely be too wet after restoration to support a xeric species like the tiger beetle. The 780 acres of scrub habitat on the Ridge South Unit may also support this tiger beetle or could after restoration.

Plants

Okeechobee Gourd

Alternative C is not likely to have a beneficial effect on the Okeechobee gourd. Similar to the manatee, the gourd is present at the southern end of the Study Area. Therefore, any water quality or habitat benefits from Alternative C, 30 miles away, would probably be diluted by other factors (hydrologic, land use, non-point source pollution, etc.).

Beautiful Pawpaw

Based on current information, this species is not in the Study Area, but exists immediately adjacent in Orange County. It is possible that some as yet unknown populations of this plant exist in the hydric pine flatwoods in the Study Area. Absent of this, we do not believe that Alternative C would provide any immediate benefits to the beautiful pawpaw. It is possible that it may be transplanted or reseeded in current or restored hydric pine flatwoods on Alternative C lands. The current amount of hydric pine flatwoods in Alternative B is 228 acres mostly on the North Ridge Unit, but there are also 56 acres on the Prairie North Unit and this is the closest proposed land for acquisition to a current pawpaw population. As such this would likely be the best candidate for reintroduction assuming it is not present on these lands. At this point, it is unclear how many acres of hydric pine flatwoods could be restored with Alternative C, either on the refuge or the conservation easement lands.

Florida Ziziphus

Ten of the fourteen extant Florida ziziphus populations are within the Study Area and are on unprotected lands. None of these locations are within the refuge component of Alternative C. The Conservation Focal Area includes the area around Lake Pierce, which has the greatest opportunity to

protect existing ziziphus populations that are at risk on private lands. If these lands could be acquired then Alternative C would likely benefit Florida ziziphus.

Scrub Plant Species

It is possible that any of the 22 federally listed scrub plants may occur on scrub and scrubby flatwoods habitats along the Lake Wales Ridge or smaller ridges. Lands in the Ridge North Unit support the papery whitlow-wort. Other Ridge North or Ridge South Unit lands are the most likely candidates for supporting some of these listed species currently. If not present on these lands currently, it may also be possible to transplant or reintroduce some of these species into existing or restored scrub soils under Alternative C. About half of the 935 acres of pasture on the Ridge South Unit are underlain by non-hydric soils and therefore, may be restored to scrub or scrubby flatwoods. Other pastures areas close to the ridges may be restored to support scrub plants under conservation easements, but it is unclear to what extent that could occur until those lands are identified.

Selected State Threatened and Endangered Species

Florida Black Bear

The Florida black bear would be expected to use the refuge proposed under Alternative C, especially forested areas in those planning units closer to the ridge (where bears may be found now). The 100,000-acre easement component of Alternative C could also increase habitat for bears and could provide a connectivity benefit that would not otherwise exist.

Sherman's Fox Squirrel

This fox squirrel uses a variety of pinelands and forested swamps. Alternative C would have available up to approximately 19,304 acres of these habitat types across all Planning Units for the Sherman's fox squirrel. The native and natural component of the conservation easements could provide up to an additional 20,000 acres of potential habitat for this species.

Gopher Tortoise

The gopher tortoise typically uses a variety of scrub, pine flatwoods, and dry prairie communities within the Study Area. It may also be found on canal levees and in low or medium-density residential areas. Potential lands identified under Alternative C contain up to approximately 25,000 acres of existing tortoise habitat. There are an additional 63,018 acres of pasture habitat available under Alternative C that may be restored, in part, for gopher tortoises. Similarly, the 100,000 acres of conservation easements also provides a significant opportunity to protect or restore land for this ecologically important species.

Bald Eagle

The bald eagle can forage in most any aquatic, pasture, prairie, or forested habitat. Large trees are needed for nesting, and the Study Area provides habitat for a significant number of nesting bald eagles. Alternative C has available approximately 61,000 acres of native potential eagle habitat, and could enhance an additional up to 63,000 acres of pasture habitat so, in essence there is more protectable and restorable eagle habitat in the Alternative C parcels than can be acquired under fee simple acquisition. The conservation easement component of Alternative C could also protect or restore either potential foraging or nesting habitat for bald eagles.

Sandhill Crane

The Florida sandhill crane is a non-migratory, year-round breeding resident species that uses a wide variety of wetlands, pastures, prairies, and flatwoods throughout the Study Area and would be expected to use those same habitats proposed under Alternative C. The parcels in this alternative have over 124,000 acres of existing habitat for sandhill cranes. The conservation easement component of Alternative C would provide or protect even more habitat for cranes.

Long-legged Wading Birds

The 13 species of "long-legged" wading birds that may occupy the Study Area would benefit from the protection of the existing 25,233 acres of wetlands and the potential restoration of additional wetlands with Alternative C. The 100,000-acre conservation easement component of Alternative C would provide additional habitat to wading birds. It is unclear at this time if these wetland benefits would be great enough to restore any of the wading bird nesting rookeries that have been lost over the last 40 years.

Adverse

Adverse effects on federal and state listed species associated with Alternative C are minimal. As with Alternative B, short-term habitat losses could occur with fire management or other land management activities. Some fossorial listed species (skinks, indigo snakes) may be injured or killed during these activities as well. Residential development patterns could shift slightly towards refuge lands if people view it as a desirable recreational area. This could fragment adjacent unprotected habitats. Conflicts between recreational use (hunting, or simply accessing the land) during sensitive breeding times of listed species would be an adverse effect. This could be alleviated by careful planning and timing or location of recreational activities. Also, chemical contaminants in former agricultural soils could pose a risk to fish and wildlife, especially aquatic species during activities such as wetland restoration; however, if the properties are properly assessed and remediated, if necessary, then this risk should be mitigated or minimized.

Nonnative Species

Beneficial

We anticipate that nonnative invasive species (primarily plants but also feral hogs and nonnative fish) would be controlled on Alternative C lands. This would serve to improve the overall ecology of the Study Area by limiting further spread of these species.

Adverse

Some of these nonnative species (feral hogs, tilapia and other cichlid fishes) are sport and subsistence species. The reduction of these species' abundance may represent a minor adverse effect to some people; however, it is unlikely that we would ever completely eradicate these species under either Alternative B or C, and the expectation is that we would provide improved habitat condition for native species (deer, turkey, bass, crappie, or other sunfish) that could replace these nonnative species.

EFFECTS ON CULTURAL RESOURCES

Beneficial

Under this alternative, cultural resources would benefit. As described in Alternative B's effects on cultural resources, the proposed Everglades Headwaters NWR would bring these resources under the federal historic preservation protective umbrella as the Service acquires up to 50,000 acres of habitat within the greater Everglades area. The benefits for cultural resources located in the 100,000-acre Conservation Area would be more limited. The Service would acquire protective or restrictive easements from willing landowners that would prevent urban and commercial developments that damage or destroy both critical habitats and cultural resources. However, any historic property located in the Conservation Area would remain in private ownership. We, like other federal agencies, have several legally mandated responsibilities that include development of a cultural resource management plan, compliance with the Section 106 of the National Historic Preservation Act prior to any undertaking that possesses the potential to impact historic properties, archaeological inventory of its lands and subsequent National Register eligibility testing, research-directed testing or excavation, site protection, and interpretation. Critical to these efforts are the Florida Division of Historical Resources, the Seminole Tribe, the Miccosukee Tribe, the Seminole Nation, the Poarch Band of Creeks, and the Muscogee (Creek) Nation, and a number of interested parties, such as nearby universities, adjacent landowners, and state resource agencies. The Service would, when possible, partner with the Seminole Tribe and/or other interested Native American tribes to facilitate archaeological and ecological investigations, protection, and interpretation of sites deemed to have cultural and religious significance for the tribe(s). Protection of historic properties would be enhanced by incorporating concepts of site stewardship and ownership, where appropriate, into public use materials and interpretive panels. This effort would be further enhanced by providing advanced archaeological resource protection training to law enforcement personnel.

Adverse

As with Alternative B, negligible impacts to cultural resources could be anticipated under Alternative C. There could be some risk that refuge visitors may inadvertently or intentionally damage or disturb historic properties; however, we would employ all means available to protect archaeological sites, historic structures, cemeteries, and historic landscapes. This would be accomplished through scientific investigations; public education; partnerships with tribal, state, and local governments; and law enforcement efforts. However, the Service's management and legal authorities would not be extended to the proposed Conservation Area, as it is not part of the proposed refuge. Section 106 of the National Historic Preservation Act would be complied with during our acquisition of an easement and then only when the Service funds, permits, or conducts future management actions on the easements. Protections delineated under Archaeological Resources Protection Act and Native American Grave Protection and Repatriation Act would not extend to the proposed Conservation Area, though the comparable state historic preservation laws would.

EFFECTS ON THE SOCIOECONOMIC ENVIRONMENT

Beneficial

Benefits to the local economy would be expected under Alternative C. The positive effects would be like those described under Alternative B, but greater in scope due to the additional lands (an added 100,000 acres) set aside for conservation under this alternative. Neighboring landowners of the proposed Everglades Headwaters NWR would benefit from improved water quality from restoration of refuge lands and waters to native habitats and from the assurance that those refuge properties would

not be developed or operated in ways that might have a negative impact to the neighboring properties. Further, as development patterns change, the potential exists for increased land values for those neighboring properties. The potential also exists for maintained or increased wildlife movement through the area, which could be seen by many as a positive impact on the quality of life, including wildlife observation and hunting. Further, as development patterns change, the potential exists for increased land values for those neighboring properties.

With conservation easements under Alternative C, we would expect that pastures or more native rangelands would be managed appropriately to provide both an economic benefit to the rancher (livestock production and game hunting) and ecologic benefits in the form of soil and water conservation and habitat management (control of nonnative species and fire management). We anticipate that we would negotiate easement agreements with landowners in addition to the NRCS. The NRCS could also provide funds (for easement acquisitions) and technical assistance under its Wetlands Reserve Program, Environmental Quality Incentives Program, or other similar programs.

Adverse

There would likely be some adverse impacts, namely a potential decline of tax revenue to local counties (as lands come under Service ownership). The Refuge Revenue Sharing Act of June 15, 1935 (16 U.S.C. 715s) offsets the loss of local tax revenues from federal land ownership through payments to local taxing authorities. Refuges provide annual payments to taxing authorities, based on the acreage and value of refuge lands located within their jurisdiction. Money for these payments comes from the sale of oil and gas leases, timber sales, grazing fees, the sale of other Refuge System resources, and from congressional appropriations, which are intended to make up the difference between the net receipts from the Refuge Revenue Sharing Fund and the total amount due to local taxing authorities. The actual Refuge Revenue Sharing payment does vary from year-to-year, because Congress may or may not appropriate sufficient funds to make full payment. The exact amount of the annual payment depends on the congressional appropriation, which in recent years have tended to be less than the amount to fully fund the authorized level of payments.

The Refuge Revenue Sharing payments are based on one of three different formulas, whichever results in the highest payment to the local taxing authority. The payments are based on three-quarters of 1 percent of the appraised fair market value (or the purchase price of a property until the property is reappraised). The Service reappraises the value of refuge lands every 5 years, and the appraisals are based on the land's highest and best use. On wetlands and formerly farmland-assessed properties, the full entitlements of Refuge Revenue Sharing payments sometimes exceed the real estate tax; in other cases, Refuge Revenue Sharing payments may be less than the local real estate tax. For the nearby Lake Wales Ridge NWR, 2009 Refuge Revenue Sharing payments were: $23,252 for 1,685 acres in Highlands County and $2,278 for 172 acres in Polk County.

The fact that, in general, refuges put little demand on the infrastructure of a municipality must be considered in assessing the financial impact on the municipality. For example, there is little to no demand placed on the school system, roads, utilities, police and fire protection, and other systems and services. There is a substantial body of literature that shows that development, especially residential development, actually costs a community more in schools, roads, sewers and other services than the tax revenue generated by the development (Land Trust Alliance 1994).

The potential does exist under Alternative B for neighboring landowners to experience trespass by the public using refuge properties. The Service would design public use opportunities and programs and would work with neighboring landowners to minimize or eliminate any negative impacts.

Overall, impacts would be the same as described under Alternative B. Further, the potential would also exist for maintained or increased movement of wildlife within the landscape that could result in negative human-wildlife or livestock-wildlife interactions. The Service would work with the partners and neighboring landowners to minimize these impacts. Taking all the socioeconomic factors into account, we believe there to be a net positive effect to the region under Alternative C.

D. CUMULATIVE EFFECTS

According to the Council on Environmental Quality NEPA implementing regulations in 40 CFR 1508.7, "cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

PHYSICAL RESOURCES

Some minimal and minor impacts on physical resources are expected, under each of the alternatives, but none of these are anticipated to be cumulatively significant. Cumulative effects on individual physical resource categories are further discussed below.

Land Use

The No Action Alternative would be expected to have a minor cumulative effect on land use in the Study Area due to continued urbanization over the next decades. Currently, these lands are largely rural, but projected population growth would likely result in the spread of developed areas. State and other land protection efforts would have a difficult time keeping pace with the loss of natural and other open areas. Alternatives B and C would have positive cumulative effects on land use of the area by helping protect portions of the landscape from urbanization.

Climate Change

Under Alternative A (No Action), a minimal cumulative impact on climate change is expected as land currently functioning as carbon sinks would likely become net sources of greenhouse gases. Conversely, lands protected under Alternative B and C would not have a significant cumulative negative effect on climate change. Under these alternatives, additional lands that are believed to function as net carbon sinks would be protected. Growing vegetation and natural soil formation processes would continue to sequester carbon.

Topography

The No Action alternative would have a minimal negative cumulative effect on the topography of the Study Area. Without protection, mining and other activities that can alter the topography would continue. Under Alternatives B and C, no adverse cumulative effects are predicted to this resource.

Hydrology and Water Quantity

Hydrology and water quantity would suffer some minimal cumulative effects under the No Action alternative. Insufficient lands would likely be protected from development and associated adverse impacts to these resources without the Service acquiring lands as proposed under Alternatives B and C. Increased urbanization and associated changes in drainage patterns and declines in water availability would exacerbate current issues affecting these resources. As previously discussed,

Alternatives B and C would result in net benefits to the hydrology and water quantity in the Study Area by protecting vegetated areas.

Both Alternatives B and C propose wetland restoration activities within the proposed 50,000-acre refuge. Since both action alternatives target generally intact habitats, including intact wetlands, for acquisition and conservation, they limit the extent of wetland restoration activities that might be needed. Wetland restoration activities would likely be limited approximately 8,000 acres or less within the Conservation Focal Area. Alternative C also proposes to protect through less than fee title means (targeting conservation easements as the primary tool) another 100,000 acres within the the proposed Conservation Partnership Area, which would further limit development activities and the associated human demand for water use. An additional approximately 16,000 acres of wetlands could be restored. Neither of the action alternatives would be anticipated to have significant cumulative impacts on the availability of water for human use from Lake Okeechobee.

Geology

Under Alternative A, there would be minimal negative cumulative effects on the geology of the Study Area resulting from mining operations. No adverse impacts on geology are expected under Alternatives B and C.

Soils

Alternative A would likely result in minimal cumulative impacts to soils in the Study Area. Without protection, lands in the Study Area would continue to be converted to urban use. Soil disturbance would result from the construction of buildings, roads, parking lots, and other infrastructure associated with development. Furthermore, an increase in impervious surfaces would alter natural soil formation processes. Alternatives B and C are expected to have net beneficial effects on soils in the Study Area as more lands would be protected from development.

Air Quality

Alternative A (No Action) would likely contribute to an acceleration of poor air quality over the long term simply due to the expected continued increases in development and its concomitant contributions to pollutant emissions. Neither Alternative B or C are expected to have significant cumulative adverse impacts on air quality, locally or regionally, since they would help retain vegetated areas within the proposed acquisition boundaries. Some short-term, local deterioration in air quality would be expected from air emissions of motor vehicles used by refuge visitors and staff, as well as habitat management (e.g., prescribed burning).

Water Quality

The No Action alternative is expected to result in minimal adverse cumulative effects on water quality. Land conversion to high intensity agriculture and development is likely to continue in unprotected areas, resulting in a deterioration of water quality. Overall, Alternatives B and C are predicted to have net positive benefits to water quality in the Study Area as they would protect vegetated areas within the proposed acquisition boundaries and help slow the flow of water, helping to improve water quality.

Noise

Cumulative effects on noise are anticipated to be minimal under the No Action. Increase urbanization and associated sources of noise would continue to negatively impact the soundscape of the Study Area. Conversely, Alternatives B and C would have a net beneficial effect on the area's soundscape by helping to maintain a more rural landscape.

Visual Resources

Alternative A would have minimal negative cumulative effects on the area's visual resources. Without protection, the landscape would increasingly be altered by tall structures, roads, and other infrastructure associated with urbanization. Alternatives B and C would result in a positive benefit to the area's aesthetics by protecting proposed lands from development.

BIOLOGICAL RESOURCES

Effects of Habitat Loss (and other factors associated with development)

Hunting Impacts

Deer

Deer hunting does not have regional population impacts due to restricted home ranges. The average deer home range in Florida is 500 to 600 acres for an adult female and 750 to 1,600 acres for adult males (FWC 2008). Therefore, only local impacts are expected to occur.

State-wide, approximately 100,000 deer are harvested annually (FWC 2008), which represents approximately 15 percent of the state's total population, estimated at 600,000 (Labisky 2000). Like many prey species, deer populations adjust to various harvest levels through a compensatory response. As deer densities are reduced through hunting (or predation), more forage is available for surviving deer, increasing their reproductive capacity. A study conducted in Florida showed that mean number of fetuses per pregnant doe was greater on hunted land than on non-hunted sites. Furthermore, incidence of twinning (doe producing twins) was 38 percent on hunted sites and 14 percent on non-hunted sites. No twinning was observed among pregnant fawns or yearlings from non-hunted areas, whereas 6 of 33 (18 percent) of the pregnant yearlings and 1 of 3 (33 percent) pregnant fawns from hunted areas carried twins (Richter and Labinsky 1985). Additionally, white-tailed deer are adapted to and thrive in highly fragmented habitats (Nixon et al 2001) and their numbers are likely to remain at huntable levels even as the landscape becomes more urban. The proposed action would likely result in an increase in deer taken, as more lands that are currently closed to the public would opened. Under alternative B, deer hunting opportunities would increase compared to the No Action alternative. It is not expected that local deer populations would be significantly affected under either of the action alternatives. Overall, regulated hunting is not expected to have any significant cumulative effects on deer populations in the Study Area.

Feral Hog

Feral hog is an invasive, nonnative species. However, because they are popular with hunters, they are considered a game species in Florida. Bag limits are established for feral hogs on some WMAs.

Hunting of feral hogs on proposed lands would be considered a management tool in reducing this detrimental species, while providing recreational opportunities to hunters. Cumulative effects to a nonnative, invasive species should not be of concern because the Service would likely work to extirpate this species on refuge lands. Hunting of hogs is not considered detrimental to the biological integrity of the refuge, is not likely to create conflict with other public uses and is within the wildlife dependant public uses to be given priority consideration. Since hogs are nonnative, they are a priority species for refuge management only in terms of their negative impacts on refuge biota and need for eradication. They are a popular game species though, and the public interest would best be served by allowing this activity on the refuge. However, even with hunting, feral hogs are likely to always be present because they are prolific breeders. Hence, Alternatives B and C are expected to have a net positive effect through the reduction of feral hog. This would benefit any agricultural lands adjacent to the proposed lands, as feral hog can cause crop loss and other damage. Under the No Action alternative, feral hog numbers are unlikely to be controlled at levels where their damage to native vegetation and croplands in the vicinity is minimal.

Alligator

Alligator hunting is likely to occur primarily on state sovereign waters that may be within Service-acquired lands and would be regulated solely by FWC in those areas. FWC regulates the hunting of alligators to allow for this hunting opportunity, while also ensuring the viability of the species. No cumulative effects are expected under any of the alternatives.

Wild Turkey

Turkey is a non-migratory species and therefore hunting only impacts the local population. Turkey populations in Florida have increased substantially since 1970, as evidenced by a state-wide distribution assessment conducted in 2001 (Nicholson et al. 2005). Habitat loss, not hunting, appears to be the primary factor limiting their populations. Research has shown that in many cases hunters can remove a large portion of the gobblers from a population (up to 30 percent) and still have a healthy turkey population (Vangiler 1992). The proposed action would increase wild turkey hunting opportunities by opening up more land to the public. Alternative B would also increase wild turkey hunting opportunities, albeit less than under Alternative C. Turkey hunting would be in accordance with applicable regulations, which help ensure the provision of the hunting opportunity and the viability of the species. Neither of these alternatives is expected to have significant cumulative effects on local wild turkey populations.

Migratory Birds

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

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

The process for adopting migratory game bird hunting regulations, located in 50 CFR 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rule making process would last. Most importantly, however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation. The process of adopting migratory game bird hunting regulations includes two separate regulations-development schedules, based on "early" and "late" hunting season regulations. Early hunting seasons pertain to all migratory game bird species in Alaska, Hawaii, Puerto Rico, and the Virgin Islands; migratory game birds other than waterfowl (e.g., dove, woodcock, etc.); and special early waterfowl seasons, such as teal or resident Canada geese. Early hunting seasons generally begin prior to October 1. Late hunting seasons generally start on or after October 1 and include most waterfowl seasons not already established. There are basically no differences in the processes for establishing either early or late hunting seasons. For each cycle, Service biologists and others gather, analyze, and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to Flyway Councils and other interested parties. Under the proposed action, waterfowl hunting is expected to occur primarily in sovereign state waters, which would not be subject to regulation by a future refuge. Some waterfowl hunting could occur in areas subject to management by the proposed refuge, but those opportunities are expected to be relatively limited and numbers of waterfowl taken from those areas would be low. As such, it is not anticipated that any of the alternatives would have a significant cumulative effect on waterfowl resulting from hunting.

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

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

Waterfowl

Waterfowl hunting within the proposed acquisition boundaries would likely be taken on sovereign state waters, and would be regulated by FWC, not the Service. Hence, none of the alternatives are expected to have an effect on this resource with regards to hunting and there would be no cumulative impacts.

Dove

Although migratory, doves in Florida are typically resident. Hence, hunting in the proposed areas would only affect local populations. This species is a prolific breeder, capable of producing several broods per year. A habitat generalist, it thrives in secondary growth, pastures, cultivated fields, and suburban areas. Under the proposed action more lands would be opened to dove hunting by the public. The same is true for Alternative B, although not to the extent as Alternative C. Neither of these alternatives is expected to have any significant cumulative effects on dove numbers in the Study Area as a result of increased hunting.

Quail

Quail are non-migratory, so hunting in the proposed areas would only have effects on local populations. As further described in the section on game species in Chapter II (Affected Environment), quail numbers have been declining during the last decades in Florida, primarily as a result of habitat loss and degradation.

Other Small Game

Squirrels, rabbit, raccoon, and opossum cannot be affected regionally by hunting on any proposed lands because of their limited home ranges. Therefore, only local effects will be discussed. Land use alterations and reductions in predators have contributed to increases in several small game species, particularly raccoon and opossum. Consequently, populations of these species sometimes become higher than optimal, with detrimental effects on other native wildlife (e.g., higher levels of predation on songbird eggs and nestlings), increased crop damage, and spread of diseases (e.g., rabies). Hunting can help regulate opossum and raccoon populations; however, unless the popularity of this type of hunting increases, the numbers of these species would likely be higher than desired. When these species become overabundant, diseases such as distemper and rabies reduce the populations. However, waiting for disease outbreak to regulate their numbers can be a human health hazard. Cumulative adverse impacts to raccoon and opossum are unlikely under Alternatives B and C,

considering their high reproductive ability, their being difficult to hunt due to their nocturnal habits, and the fact that they are not as popular for hunting as other game species.

CULTURAL RESOURCES

There could be some minimal cumulative adverse impacts to cultural resources under the No Action alternative. Less land would be protected from development, increasing the risk of disturbance or destruction of cultural resources. Under Alternatives B and C, beneficial effects would occur because of increased land protection. In addition, increased field surveys would likely be conducted on Service-owned lands to identify and protect any sites discovered.

SOCIOECONOMIC ENVIRONMENT

There would be no expected long-term, significant cumulative change in the local economy under Alternative A. Current development rates, tax revenues, and business revenues would remain subject to market influences. There could be some loss of economic opportunities associated with wildlife-dependent recreation (e.g., hunting, fishing, wildlife watching, etc.). In addition, there could be increased costs to local communities associated with the loss of vegetated areas as urban sprawl continued on unprotected lands. Vegetated areas have been shown to reduce costs of providing clean water and air. Furthermore, vegetated lands help reduce stormwater runoff, providing additional cost savings (e.g., less frequent repairs to water control structures) to nearby communities. Alternatives B and C would have some positive effects on socioeconomic resources. Wildlife-dependent recreation would provide additional direct and indirect economic benefits to the region by drawing visitors. Increased opportunities for wildlife-dependent recreational opportunities would further help improve the quality of life in the Study Area, particularly as open space available to the public becomes increasingly scarce over the next decades. Further, no significant negative impacts would be anticipated to neighboring landowners from the implementation of either Alternative B or Alternative C, including from management and public use activities.

UNAVOIDABLE ADVERSE EFFECTS

Unavoidable adverse effects are the effects of those actions that could cause significant harm to the human environment and that cannot be avoided, even with mitigation measures. There would be some minor, localized unavoidable adverse effects under all the alternatives. The No Action Alternative would maintain the status quo for development and growth in the valley, thus contributing to the unavoidable effects of such development (e.g., increased air emissions, increased impervious surface and stormwater runoff, increased noise). Under Alternatives B and C, there could be, for example, localized adverse effects of building a new refuge headquarters and upgrading access roads. There would be property tax losses to towns and increased visitation that could be unavoidable effects in those years that revenue sharing payments are less than local property taxes. However, none of these effects rises to the level of significance. All would be mitigated, so there would in fact be no significant unavoidable adverse impacts under any of the alternatives.

RELATIONSHIP BETWEEN SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The No Action Alternative would be expected to diminish the long-term productivity and sustainability of natural resources in the Study Area. In contrast, Alternatives B and C would strive to maintain or enhance the long-term productivity and sustainability of natural resources on proposed refuge lands and/or Conservation Area. These alternatives would strive to conserve federal trust species and state listed species and the habitats they depend on, as evidenced by management activities described in the

Conceptual Management Plan. These alternatives also outline outreach and environmental education activities that would encourage visitors to be better stewards of the environment.

POTENTIAL IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Alternative A would have no long-term effect on potential irreversible and irretrievable commitments of federal financial resources. Establishing a refuge, as described under Alternatives B and C, may contribute to irreversible and irretrievable commitments of federal financial resources. For example, one would be the possible construction or modification of a refuge office and associated visitor facility and access road(s). These typically require long-term commitments of resources. Another irreversible commitment of resources impacting local communities is Service land acquisition. Once these lands become part of the refuge, it is unlikely they would revert back to private ownership

ENVIRONMENTAL JUSTICE

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” (February 11, 1994), requires that federal agencies consider as part of their action, any disproportionately high and adverse human health or environmental effects to minority and low income populations. Agencies are required to ensure that these potential effects are identified and addressed. The communities surrounding the refuge are relatively homogenous; minority groups do not represent a substantial portion of the affected community. No differential impacts based on minority status would therefore be anticipated under any of the alternatives.

SUMMARY OF EFFECTS

Table 26 summarizes the impacts.

Table 26. Comparison of potential environmental effects for Alternatives A, B, and C, evaluated for the Proposed Everglades Headwaters NWR and Conservation Area, Florida

Resource	Alternative A: No Refuge and No Conservation Area	Alternative B: Refuge Only Approach (50,000-acre Refuge)	Alternative C: Conservation Partnership Approach (50,000-acre Refuge and 100,000-acre Conservation Area)
PHYSICAL RESOURCES			
Land Use	Beneficial: lands available for agriculture and development Adverse: continued loss of natural areas through conversion to agriculture and developed areas; loss of lands open for public wildlife-appropriate and -compatible public use	Beneficial: some restoration of agricultural areas; additional lands open for public wildlife-appropriate and -compatible public use Adverse: loss of agricultural lands	Beneficial: Similar benefits as B, but over a larger area Adverse: similar to B
Climate Change	Beneficial: none Adverse: vegetative cover lost	Beneficial: net increase in vegetative cover (carbon sequestration) Adverse: negligible emissions from refuge operations and visitor use	Beneficial: Similar benefits as B, but over a larger area Adverse: similar to B
Topography and Geology	Beneficial: none Adverse: lands otherwise protected could be impacted by mining	Beneficial: proposed lands protected from mining. Adverse: none	Beneficial: Similar benefits as B, but over a larger area Adverse: similar to B

Resource	Alternative A: No Refuge and No Conservation Area	Alternative B: Refuge Only Approach (50,000-acre Refuge)	Alternative C: Conservation Partnership Approach (50,000-acre Refuge and 100,000-acre Conservation Area)
Hydrology and water Quantity	Beneficial: none Adverse: continued ditching, new roads and development on unprotected lands would alter hydrology and affect water quantity	Beneficial: some restoration of hydrology; vegetated areas would benefit hydrology and water quality Adverse: none	Beneficial: Similar benefits as B, but over a larger area Adverse: similar to B
Soils	Beneficial: none Adverse: mining, development, agriculture, transportation and utility corridors	Beneficial: vegetative cover would continue to stabilize and form soils Adverse: some minimal impacts from infrastructure projects needed to support refuge operations and public uses	Beneficial: Similar benefits as B, but over a larger area Adverse: similar to B
Air Quality	Beneficial: none Adverse: vegetative cover lost; wildfires; industry & traffic	Beneficial: net increase in vegetative cover Adverse: prescribed fire, traffic associated with public use & refuge operations	Beneficial: Similar benefits as B, but over a larger area Adverse: similar to B
Water Quality	Beneficial: none Adverse: development of unprotected lands would cause further declines in water quality	Beneficial: proposed lands remain vegetated, benefitting water quality Adverse: negligible effects on water quality from refuge operations and visitor uses	Beneficial: Similar benefits as B, but over a larger area Adverse: similar to B

Resource	Alternative A: No Refuge and No Conservation Area	Alternative B: Refuge Only Approach (50,000-acre Refuge)	Alternative C: Conservation Partnership Approach (50,000-acre Refuge and 100,000-acre Conservation Area)
Noise	Beneficial: none Adverse: additional lands developed with higher associated noise levels	Beneficial: lands protected from urbanization and associated noise Adverse: some noise associated with refuge operations and visitor traffic	Beneficial: Similar benefits as B, but over a larger area Adverse: similar to B
Aesthetics	Beneficial: none Adverse: additional lands developed, including tall structures, further altering visual resources	Beneficial: lands protected from development and construction of tall structures Adverse: none	Beneficial: Similar benefits as B, but over a larger area Adverse: similar to B
BIOLOGICAL RESOURCES			
Habitats	Beneficial: none Adverse: many habitats, especially upland types, would continue to be lost or degraded due to agriculture, development, construction of transportation/utility corridors, unfavorable fire regimes, and nonnative species.	Beneficial: uplands would benefit from habitat restoration/management (primarily through prescribed fire) and control of nonnative species. Wetlands would benefit from improved restoration/management and hydrological connectivity. Adverse: some minor impacts from construction of refuge and public use infrastructure. Minor impacts from public use (vegetation trampling). Minimal impacts to native habitats resulting from herbicides/mechanical removal of nonnative species.	Beneficial: similar to B, but to a greater extent as more lands would be protected Adverse: similar to B

Resource	Alternative A: No Refuge and No Conservation Area	Alternative B: Refuge Only Approach (50,000-acre Refuge)	Alternative C: Conservation Partnership Approach (50,000-acre Refuge and 100,000-acre Conservation Area)
Imperiled and Threatened and Endangered Species	Beneficial: none Adverse: imperiled and T&E species would continue to suffer from habitat loss and degradation.	Beneficial: imperiled and T&E species would benefit from habitat restoration/management. Adverse: minimal impacts from public use.	Beneficial: similar to B, but to a greater extent as more lands would be protected Adverse: similar to B
Nonnative Species	Beneficial: none Adverse: continued degradation of natural habitats resulting from spread of nonnative species.	Beneficial: control of nonnative species would increase. Adverse: none	Same as B
Wildlife	Beneficial: none Adverse: land alterations and use would continue to favor generalist species at the expense of listed wildlife and rare habitats.	Beneficial: common species would be managed at more optimal levels, biodiversity would be maintained or increased. Adverse: minimal impacts resulting from hunting program.	Beneficial: similar to B, but to a greater extent as more lands would be protected Adverse: similar to B
CULTURAL RESOURCES			
Archaeological and Historic Resources	Beneficial: none Adverse: cultural resources on unprotected lands would continue to be at risk from development projects	Beneficial: cultural resources would be offered increased protection on refuge lands Adverse: risk from disturbance and damage caused refuge operations or public use would be minimal	Beneficial: similar to B, but to a greater extent as more lands would be protected Adverse: similar to B

Resource	Alternative A: No Refuge and No Conservation Area	Alternative B: Refuge Only Approach (50,000-acre Refuge)	Alternative C: Conservation Partnership Approach (50,000-acre Refuge and 100,000-acre Conservation Area)
SOCIOECONOMICS			
Economics and Wildlife-dependent Public Use	Beneficial: none Adverse: opportunities for appropriate and compatible wildlife-dependent uses would decline as more lands become developed	Beneficial: some local economic benefits associated with wildlife-dependent uses; increased cost-savings to local communities with regards to maintaining clean water and reduced need for stormwater management infrastructure; potential for increased property values for properties near the refuge Adverse: potential for increased development pressure due to the desire to buy land adjacent to the refuge, leading to increased fragmentation of remaining lands	Beneficial: similar to B, but to a greater extent as more lands would be protected Adverse: similar to B

Resource	Alternative A: No Refuge and No Conservation Area	Alternative B: Refuge Only Approach (50,000-acre Refuge)	Alternative C: Conservation Partnership Approach (50,000-acre Refuge and 100,000-acre Conservation Area)
Neighboring Landowners – adjacent to proposed Refuge and Conservation Area	Beneficial: likely no change from current conditions Adverse: potential for trespass from adjacent private lands lands, potential for negative impacts from adjacent land use activities (e.g., biofuel operations)	Beneficial: adjacent land uses in the refuge to maintain and restore native habitats; potential for increased land values as development patterns change Adverse: potential for trespass by public users from refuge lands	Beneficial: adjacent land uses in the Conservation Area to remain similar to past and existing uses and activities; adjacent land uses in the refuge to be maintained and restored to native habitats; potential for increased land values as development patterns change, potential for maintained or increased movement of wildlife through the area Adverse: potential for trespass by public users from refuge lands; potential for maintained or increased movement of wildlife through the area

E. SUMMARY

Based on the nature of the proposal, the location of the site and the current land use, the Proposed Action would not have any significant effects on the quality of the human environment including public health and safety. Further, because the purpose of the proposal is to protect, maintain, and where possible, enhance the natural habitat of the lands within the proposed acquisition area, the proposal is not expected to have any significant adverse effects on the area's wetlands and floodplains, pursuant to Executive Orders 11990 and 11988.

Implementation of the Proposed Action would not involve any highly uncertain, unique, unknown, or controversial effects on the human environment. The proposed action would not establish a precedent for future actions with significant effects, nor would it represent a decision in principle about a future consideration. No cumulatively significant impacts on the environment would be anticipated.

In addition, the proposal would not significantly affect any unique characteristic of the geographic area, such as historical or cultural resources, wild and scenic rivers, or ecologically critical areas. The proposal would not significantly affect any site listed in or eligible for listing in the National Register of Historic Places, nor would it cause loss or destruction of significant scientific, cultural, or historic resources. The area's cultural resources would be protected under the regulations of the National Historic Preservation Act of 1966, as amended, the Archaeological Resources Protection Act, and the Advisory Council on Historic Preservation (36 CFR 800). The Florida State Historic Preservation Office would be contacted whenever any future management activities have the potential to affect cultural resource sites.

All tracts acquired by the Service in fee title would be removed from local real estate tax rolls because federal government agencies are not required to pay state or local taxes. However, the Service makes annual payments to local governments in lieu of real estate taxes, as required by the Refuge Revenue Sharing Act (Public Law 95-469). Payment for acquired land is computed on whichever of the following formulas is greatest: (1) Three-fourths of 1 percent of the fair market value of the lands acquired in fee title; (2) 25 percent of the net refuge receipts collected; or (3) 75 cents per acre of the lands acquired in fee title. The estimated annual revenue-sharing payment that would be made to the individual county would depend on the amount of acreage acquired in fee title. No actions would be taken that would lead to a violation of federal, state, or local laws imposed for the protection of the environment.

F. RECOMMENDATION

The Service recommends Alternative C as the Proposed Action, because it better serves the outlined purpose and need, stated goals and objectives, and vision and purposes of the proposed refuge. Through the establishment of the Everglades Headwaters NWR and Conservation Area, as described in Alternative C, the Service would be able to fully participate with other conservation partners in the management and protection of the wildlife and habitats within the project area. Connectivity between existing conservation lands would be enhanced, movement corridors would be protected, and threatened and endangered species would receive additional management attention. Opportunities for wildlife-dependent recreational activities would be increased, and the existing rural working landscape would receive further protection from development pressure. Further, any cultural resources found within the proposed refuge would be afforded protection by the Service.

Appendix A. Conceptual Management Plan

INTRODUCTION

The proposed Everglades Headwaters NWR and Conservation Area would be located in south-central Florida within the counties of Osceola, Polk, Highlands, and Okeechobee and would be geographically bounded by the Orlando metropolitan area to the north, Lake Wales Ridge to the west, Lake Okeechobee to the south, and the St. Johns River watershed to the east. If established, the Everglades Headwaters NWR and Conservation Area would protect a combination of wetland and upland habitat supporting multiple species of management concern and imperiled habitats. The area is home to several federal listed species such as the Florida grasshopper sparrow and eastern indigo snake and would provide corridor linkages for wide-ranging species such as the Florida black bear. Important habitats of the upper Everglades watershed include sandhill and scrub, cutthroat seepage wetlands, dry and wet prairie, and pine flatwood forests. Should the proposed action to establish the Everglades Headwaters NWR and Conservation Area be adopted, they would be comprised of approximately 150,000 acres of wildlife habitat that are protected, in perpetuity, through fee acquisition, conservation easements, or other ecosystem services instruments.

This document, the draft Conceptual Management Plan (CMP), provides further details on the Service's proposed action and, if adopted, how the lands identified therein would be administered.

PURPOSE OF CONCEPTUAL MANAGEMENT PLAN

The Draft LPP and Draft EA examine the feasibility of establishing the Everglades Headwaters NWR and Conservation Area in the upper Everglades watershed. In Chapter III of this Draft EA, three alternatives for the potential refuge are described, with Alternative C (Conservation Partnership Approach) presented as the Service's proposed action. This alternative would not be implemented until it has been officially reviewed and authorized.

If approved, Alternative C, the "Conservation Partnership Approach" alternative, would conserve approximately 150,000 acres, with up to approximately 50,000 acres being purchased in fee title within a Conservation Focal Area of 130,000 acres. The remaining 100,000 acres of less-than-fee conservation land would come from within a Conservation Partnership Area. The protocol described in Appendix F outlines the methodology used to identify priorities within both areas and ultimately provide priority acquisition ranking for individual parcels (Figure 8). For more specific information on the resources to be protected, please see Chapter II of this Draft EA. The Service concludes that acquiring these lands over time would provide the needed protection of rare and unique habitats in south-central Florida, and build on the existing coalition of organizations and individuals that advocate conservation within the upper Everglades watershed. It would also provide ample opportunities for wildlife-dependent recreation, new and dynamic partnerships, and the preservation of the ranching traditions and culture in central Florida.

The Service developed this CMP to describe the management direction for the proposed Everglades Headwaters NWR and Conservation Area, as defined in Alternative C, and outlines possible interim habitat management priorities and compatible public uses on newly acquired lands, should the refuge be approved. The activities described in this CMP would direct the way we pursue and manage acquisitions, conservation easements, and other land interests until a comprehensive conservation plan (CCP) is developed. By Service policy, a CCP must be developed within 15 years of the actual establishment of the refuge (i.e., acquisition of first land

parcel). Any major changes in the activities described in this CMP, any new activities, and our development of the CCP would be subject to public review and comment in accordance with the provisions of Service refuge planning policy (602 FW 1, 2, and 3) and Service and Departmental policy implementing the National Environmental Policy Act (NEPA) of 1969 (Department of the Interior Manual 516, Appendix 1).

MISSION OF THE SERVICE AND THE NATIONAL WILDLIFE REFUGE SYSTEM

FISH AND WILDLIFE SERVICE

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, fisheries, aquatic resources, and wildlife management activities.

As part of its mission, the Service manages 553 national wildlife refuges and other units of the Refuge System covering 150 million acres (60.7 million ha). These areas comprise the Refuge System, the world's largest collection of lands and waters set aside specifically for fish and wildlife. The majority of these lands, 77 million acres (31 million ha), is in Alaska, while 54 million acres (21.8 million ha) are part of three marine national monuments in the Pacific Ocean. The remaining acres/hectares are spread across the other 49 states and several United States' territories. In addition to refuges, the Service manages thousands of small wetlands, 37 wetland management districts, 70 national fish hatcheries, 65 fishery resource 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, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

NATIONAL WILDLIFE REFUGE SYSTEM

The mission of the Refuge System, as defined by the Improvement Act 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 wildlife and habitat vision for national wildlife refuges stresses that wildlife come 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.

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

- Fulfill the mission of the Refuge System;
- Fulfill the individual purposes of each refuge;

- Consider the needs of wildlife first;
- Fulfill requirements of CCPs 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 authority to determine compatible public uses.

National wildlife refuges connect visitors to their natural resource heritage and provide them with an understanding and appreciation of fish and wildlife ecology to help them understand their role in the environment. Wildlife-dependent recreation on refuges also generates economic benefits to local communities. According to the report, *Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation*, approximately 35 million people visited national wildlife refuges in 2006, generating almost $1.7 billion in total economic activity and creating almost 27,000 private sector jobs producing about $543 million in employment income (Carver and Caudill 2007). Additionally, recreational spending on refuges generated nearly $185.3 million in tax revenue at the local, county, state, and federal levels (Carver and Caudill 2007). As the number of visitors grows, significant economic benefits are realized by local communities. In 2006, 87 million people, 16 years and older, fished (30 million), hunted (12.5 million), or observed wildlife (71 million), generating $120 billion (U.S. Department of the Interior, Fish and Wildlife Service; and U.S. Department of Commerce, U.S. Census Bureau 2007). In a study completed in 2002 on 15 refuges, visitation had grown 36 percent in 7 years. At the same time, the number of jobs generated in surrounding communities grew to 120 per refuge, up from 87 jobs in 1995, pouring more than $2.2 million into local economies. The 15 refuges in the study were Chincoteague (Virginia); National Elk (Wyoming); Crab Orchard (Illinois); Eufaula (Alabama); Charles M. Russell (Montana); Umatilla (Oregon); Quivira (Kansas); Mattamuskeet (North Carolina); Upper Souris (North Dakota); San Francisco Bay (California); Laguna Atacosa (Texas); Horicon (Wisconsin); Las Vegas (Nevada); Tule Lake (California); and Tensas River (Louisiana) the same refuges identified for the 1995 study. Other findings also validate the belief that communities near refuges benefit economically. Expenditures on food, lodging, and transportation grew to $6.8 million per refuge, up 31 percent from $5.2 million in 1995. For each 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, unpublished data). Visitation is growing with 41 million visitors to national wildlife refuges in 2008.

Volunteers continue to be a major contributor to the success of the Refuge System. As of 2010, more than 39,000 volunteers and friends groups annually contributed nearly 1.4 million hours of support on national wildlife refuges nationwide. The value of their labor was about $26 million; their in-kind services total the equivalent of 665 full-time employees.

The Improvement Act 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. Each 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).

BACKGROUND AND RATIONALE FOR THE ESTABLISHMENT OF AN EVERGLADES HEADWATERS NWR

The land, water, and wildlife resources of the Everglades Headwaters landscape represent one of the great grassland and savanna landscapes in the eastern United States. These habitats are home to many rare and endemic plants and plant communities found nowhere else in the world. Wildlife is also varied and diverse and represents one of the highest densities of imperiled species with over 23 federal and 135 state listed plants, with 14 federal and 38 state listed animal species. Threats to these plants and animals range from habitat fragmentation and isolation of small breeding populations, to the drainage of wetlands and conversion of habitat to other uses such as housing development. Some of these plants such as cutthroat grass and wildlife such as the Florida grasshopper sparrow are in need of increased protection and management because of their limited and declining home ranges.

Wetland and water resources of the upper Everglades watershed are important for many reasons. Being the very first waters to enter the watershed, the quality and quantity of this water affects all downstream users, from the wildlife present in the Kissimmee River Basin, to the fishery of Lake Okeechobee, to the restoration efforts of the Everglades proper, and also to the human needs of millions of residents of central and south Florida. Many of the wetlands that are found in this landscape have been drained by shallow surface ditches. These drainage ditches aid in the quick removal of water from these wetlands, increasing the speed at which water enters the system, increasing the impacts and onset of drought conditions, reducing the ability of the land to absorb water and also to replenish groundwater aquifers. Species such as the Everglades snail kite which requires ample wetlands in order to find apple snails, its primary food source, are also negatively impacted by drainage. Restoration, however, is easily accomplished by filling or plugging ditches or placing stop log riser water control structures to allow the natural hydrology to return to the landscape.

Throughout this landscape there exists a multitude of existing conservation lands ranging from private preserves to military bases to state and federal parks and refuges. The historic use of this area by the ranching community also adds to this conservation landscape. Many of these conservation lands, however, are isolated from each other and the interconnecting ranching landscape is under continued and varied threats ranging from development pressure and unfavorable tax structures (e.g., inheritance tax issues). Impending climate change also creates land management challenges for ranchers and conservation land stewards as hydrology and climate patterns change. Consequently, partnerships between conservation agencies and landowners will be integral for the continued protection of wildlife corridors for species such as Florida black bear.

If the proposed Everglades Headwaters NWR and Conservation Area were to be established, the Service would be able to provide additional opportunities for wildlife-dependent recreation and environmental education. Special emphasis would be placed on engaging local youth and their families in nature-based activities that would encourage a life-long attachment to America's outdoors.

It is envisioned that the proposed Everglades Headwaters NWR and Conservation Area would accomplish many things, including the listed items.

- Conduct landscape-scale strategic habitat conservation for the important resources found within the Kissimmee River Basin region through partnerships between the Service, partner agencies and organizations, and with the support of the ranching and agricultural interests of this working rural landscape, to protect and enhance habitat corridors, link existing conservation lands, and implement other wildlife adaptation strategies to help buffer the impacts of climate change.

- Protect and enhance habitats for federal trust species and species of management concern, with special emphasis on federal and state listed species.
- Protect and restore the headwater wetlands, groundwater recharge, and watershed of the upper Everglades watershed.
- Provide opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, while promoting activities that complement the purposes of the refuge and other protected lands in the region.
- Protect historic properties; facilitate archaeological and historic investigations regarding human occupation, land use, and paleoecology; and interpret the region's history and culture.

LAWS GUIDING THE NATIONAL WILDLIFE REFUGE SYSTEM

A number of laws, policies and regulations, including the following, govern the acquisition and management of land in the Kissimmee River Valley landscape, including the National Wildlife Refuge System Improvement Act of 1997, the National Wildlife Refuge System Administration Act of 1966, the Endangered Species Act, and the Migratory Bird Treaty Act.

NATIONAL WILDLIFE REFUGE SYSTEM IMPROVEMENT ACT OF 1997

The Improvement Act guides the development and operation of the Refuge System. It clearly identifies the mission of the Refuge System; requires the Secretary of the Interior to maintain the biological integrity, diversity, and environmental health of refuge lands; mandates a "wildlife first" policy on refuges; and requires comprehensive conservation planning. It also designates six wildlife-dependent recreational uses as priority public uses of the Refuge System: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The Improvement Act amended the National Wildlife Refuge System Administration Act of 1966, which continues to serve as the parent legislation for the Refuge System.

NATIONAL WILDLIFE REFUGE SYSTEM ADMINISTRATION ACT OF 1966

This Act defines the Refuge System, including refuges, areas for the protection and conservation of fish and wildlife threatened with extinction, wildlife ranges, wildlife management areas, and waterfowl production areas. It also authorizes the Secretary of the Interior to permit any use of an area, provided the use is compatible with the major purposes for establishing the area.

ENDANGERED SPECIES ACT OF 1973 (AS AMENDED)

The Endangered Species Act (ESA) directs all federal agencies to participate in endangered species conservation by protecting endangered and threatened species and restoring them to a secure status in the wild. Section 7 of the ESA charges federal agencies to aid in the conservation of species listed as threatened or endangered under the ESA, and requires federal agencies to ensure that their activities will not jeopardize the continued existence of ESA listed species or adversely modify designated, critical habitats.

MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act protects all migratory birds and their parts (including eggs, nests, and feathers) from illegal trade. The Migratory Bird Treaty Act is a domestic law that acknowledges the United States' involvement in four international conventions (with Canada, Japan, Mexico, and

Russia) for the protection of a shared migratory bird resource. The bird resource is considered shared because these birds migrate between countries at some point during their annual life cycle.

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

The National Environmental Policy Act (NEPA) requires that all federal agencies consult fully with the public in planning any action that may significantly affect the quality of the human or natural environment. The Final EA that this document accompanies is formatted to assist the Service in complying with NEPA if the proposed refuge moves forward.

LAND AND WATER CONSERVATION ACT

The Land and Water Conservation Fund uses monies from certain user fees, the proceeds from the disposal of surplus federal property, the federal tax on motor boat fuels, and oil and gas lease revenues (primarily Outer Continental Shelf oil monies) to fund matching grants to states for outdoor recreation projects and to fund land acquisition for various federal agencies.

MIGRATORY BIRD CONSERVATION ACT

The Migratory Bird Conservation Act provides for the acquisition of suitable habitats for use as migratory bird refuges, and the administration, maintenance, and development of these areas, under the administration of the Secretary of the Interior.

ARCHAEOLOGICAL RESOURCES PROTECTION ACT OF 1979

The Archaeological Resources Protection Act of 1979 provides protection for archaeological resources on public lands by prohibiting the “excavation, removal, damage or defacing of any archaeological resource located on public or Indian lands,” and sets up criminal penalties for those acts. It also encourages the increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals having archaeological resources or data obtained before 1979.

NATIONAL HISTORIC PRESERVATION ACT OF 1966

The National Historic Preservation Act requires all federal agencies to consider the effects of their undertaking on properties meeting criteria for the National Register of Historic Places, and ensures that historic preservation fully integrates into the ongoing programs and missions of federal agencies.

PURPOSE OF ESTABLISHMENT AND LAND ACQUISITION AUTHORITY

Refuge lands can be acquired under various legislative and administrative authorities for specified purposes. Establishment of and land acquisition for the proposed Everglades Headwaters NWR and Conservation Area would be authorized by the National Wildlife Refuge System Administration Act, Endangered Species Act, Emergency Wetlands Resources Act, Migratory Bird Conservation Act, Fish and Wildlife Act, and Refuge Recreation Act. The purposes of a refuge are derived from legislative authorities that established the refuge. The purposes guide the long-term management of the refuge, prioritize future land acquisition, and play a key role in determining the compatibility of proposed public uses. The purposes for the proposed Everglades Headwaters NWR and Conservation Area are listed.

"... 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 of 1973)

"…the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. 3901(b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986)

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

"…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) "…for the development, advancement, management, conservation, and protection of fish and wildlife resources...." 16 U.S.C. 742f(a)(4), (Secretarial powers to implement laws related to fish and wildlife) (Fish and Wildlife Act of 1956)

"…suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. 460k-1 "... 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 (16 U.S.C. 460k-460k-4), as amended]

VISION FOR THE PROPOSED EVERGLADES HEADWATERS NATIONAL WILDLIFE REFUGE AND CONSERVATION AREA

The vision for the proposed Everglades Headwaters NWR and Conservation Area is to conserve, protect, and manage one of the great grassland and savanna landscapes of eastern North America for current and future generations, protecting the important wildlife and habitats of the working rural landscape of central Florida's Kissimmee River Basin that is home to abundant fish and wildlife resources; that is vital to restoration and protection of the water quality and quantity for the Everglades ecosystem; that is resilient to the effects of global climate change; and that offers outdoor recreational opportunities important to the region's economy.

GOALS OF THE PROPOSED EVERGLADES HEADWATERS NATIONAL WILDLIFE REFUGE AND CONSERVATION AREA

Four overarching goals were developed for the proposed Everglades Headwaters NWR and Conservation Area, as listed.

Goal 1. Functional Conservation Landscape. The upper Everglades watershed will become a more connected and functional conservation landscape that will provide effective habitat connections between existing conservation areas and allow habitats and species to shift in response to urban development pressures and global climate change.

Goal 2. Habitat for Fish and Wildlife. The Everglades Headwaters NWR and Conservation Area will provide a wide range of quality Kissimmee River Basin habitats to support migratory birds, federal and state listed species, state designated species of conservation concern, and native wildlife diversity.

Goal 3. Enhanced Water Quality, Quantity, and Storage. Focusing on restoring or mimicking natural hydrologic processes, the Everglades Headwaters NWR and Conservation Area will contribute to water quality, water quantity, and water storage capacity of the upper Everglades watershed to support Everglades restoration goals and objectives and water quality and supply for central and south Florida.

Goal 4. Wildlife-dependent Recreation and Education. Refuge visitors of all abilities will enjoy opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of the important grassland and savanna landscape of the headwaters of the Everglades.

How each goal would be achieved through the proposed Everglades Headwaters NWR and Conservation Area is summarized and described below.

GOAL 1. FUNCTIONAL CONSERVATION LANDSCAPE

The upper Everglades watershed will become a more connected and functional conservation landscape that will provide effective habitat connections between existing conservation areas and allow habitats and species to shift in response to urban development pressures and global climate change.

Proposed management would complement the management of adjacent and nearby conserved lands, both public and private, thus enhancing the Service's wildlife management contribution to the regional landscape and helping to make the entire landscape a more functional conservation landscape (Figure 8). Links to existing conserved lands would also provide the opportunity for species to migrate and adapt to changes in habitats anticipated to occur from the impacts of global climate change. The proposed Everglades Headwaters NWR and Conservation Area in central Florida would provide local and regional benefits to wildlife by working in concert with existing conservation areas and partners, including SFWMD's Kissimmee River Restoration efforts, Avon Park Air Force Range, Disney's Wilderness Preserve, Kissimmee Prairie Preserve, Three Lakes WMA, and various designated trails throughout this area.

The Service would work with the public and private partners to restore and maintain key habitat connections throughout the landscape; restore and maintain native habitat for resident and migratory species; and promote and protect the historical, cultural, and active ranching community in this area. Without the stewardship of the ranching community, the opportunity to conserve the multiple species and habitats found in this landscape would likely not exist today. This partnership approach to conserving these resources, as well as the habitat and wildlife resources described above, are keys to successfully meeting this goal and are fundamental to the philosophy of how the Service envisions the management of the proposed Everglades Headwaters NWR and Conservation Area. Fully two-thirds of the acreage being proposed, approximately 100,000 acres, are specifically designated to be protected using less than fee title means (e.g., through conservation easements), thereby providing the opportunity for conservation of wildlife and habitats, while at the same time providing the opportunity to assure a healthy and vibrant ranching community and economy.

GOAL 2. HABITAT FOR FISH AND WILDLIFE

The Everglades Headwaters NWR and Conservation Area will provide a wide range of quality Kissimmee River Basin habitats to support migratory birds, federal and state listed species, state designated species of conservation concern, and native wildlife diversity.

Habitats

Diverse habitats and their respective ecological systems for trust species and species of conservation concern would be protected. Of the 150,000 acres to be protected, the estimated acreage of key habitats to be protected would be as follows: 13,415 acres of dry prairie; 10,123 acres of pine flatwoods; 2,177 acres of sandhill and scrub habitats; and 34,414 acres of various wetland types. Protecting these habitats would contribute to the conservation of wetland birds; waterfowl; shorebirds; grassland birds; neotropical migratory birds; native bird species such as turkey and bobwhite; white-tailed deer; Florida black bear; and the occasional Florida panther. The following is a description of some of the most important habitat types found within the proposed Everglades Headwaters NWR and Conservation Area.

Sandhill and Scrub

Approximately 2,177 acres of sandhill and scrub habitat would be restored, managed, and conserved. Sandhill habitats and scrub occur on well-drained, nutrient-poor sandy soils. Grasses and scrubby oaks dominate this fire-dependent landscape. The sandy soils typical of these habitats allow for rainfall to enter the groundwater system. Discharge from these habitats gives rise to cutthroat seepage wetlands. Several of the species found on these habitats are endemic to central Peninsular Florida and many are federally listed species, such as Florida scrub-jay, sand skink, Florida ziziphus, and Garrett's mint.

Pine Flatwoods

Approximately 1,123 acres of pine flatwoods habitat would be restored, managed, and conserved. Pine flatwoods are characterized by level topography and poorly drained soils. These pine forests vary greatly depending on hydrology and can have a dominant understory of wiregrass, saw palmetto, or other low shrubs. The overstory of pine flatwoods can be of longleaf, slash, or pond pine and cabbage palm. They are important for a variety of vertebrate and invertebrate species, such as neotropical migratory birds, red-cockaded woodpecker, Florida black bear, Florida panther, fox squirrels, and white-tailed deer.

Dry Prairie

Approximately 13,415 acres of dry prairie habitat would be restored, managed, and conserved. Dry prairie is endemic to central Peninsular Florida, occurring on poorly drained soils. It is fire-dependent and typically treeless with a low ground cover of wiregrass, stunted saw palmetto, and low-growing runner oak. It harbors numerous endemic vertebrates. The Florida grasshopper sparrow is the flagship species of this habitat.

Wet Prairie and Freshwater Marsh

Approximately 25,233 acres of wet prairie and freshwater marsh habitats would be restored, managed, and conserved. Freshwater marshes and wet prairie are both seasonal wetlands that differ by the duration of inundation and fire regime. Sawgrass, sedges, rushes, and dwarf cypress

dominate wet prairie, whereas cattail, sawgrass, pondweeds, water lilies, and numerous sedges and rushes dominate freshwater marshes. The Everglades snail kite, wood stork, whooping crane, and Audubon's crested caracara are noted residents of these habitats.

Forested Wetlands

Approximately 9,181 acres of forested wetlands habitat would be restored, managed, and conserved. Forested wetlands range from isolated depression swamps and shoreline to flowing water swamps. Bald cypress, red maple, and bay trees may dominate the overstory, while a mix of shrub species forms the understory. Many smaller isolated swamps have been converted to agricultural uses, and many of the remaining swamps are degraded by drainage and nutrient runoff. The wood stork, eastern indigo snake, and Florida panther can be found in these habitats.

Threatened, Endangered, and Species of Conservation Concern

There are 14 federally listed wildlife species and two candidate species found within the Study Area and 38 state listed threatened, endangered, and species of special concern within the Study Area. Their habitat needs vary greatly across the landscape, some being exclusively dependent on the habitats that are endemic to central Florida, such as dry prairie and scrub. The Study Area lies within the Atlantic Flyway for migratory birds with the proposed refuge being located within NABCI's Bird Conservation Region (BCR) 31, the Atlantic Coast Joint Venture, and the operational area for the Peninsular Florida Landscape Conservation Cooperative.

The following is a brief description of some of the focal species expected to benefit from the proposed Everglades Headwaters NWR and Conservation Area.

Audubon's Crested Caracara

The federally threatened Audubon's crested caracara occurs within the wet and dry prairie habitat of central Peninsular Florida, but is also found in the improved pastures with scattered cabbage palm. It often feeds on wetland species, but is also noted to feed on road-killed animals as well.

Everglades Snail Kite

The federally endangered Everglades snail kite forages almost exclusively on apple snails. Apple snails can be found in a variety of wetlands ranging from permanent wetlands and lakes to seasonal wetlands and ditches. While several larger wetlands throughout the Study Area provide nesting habitat, restoration and management of wetlands in this proposal are focused on providing improved foraging opportunities.

Florida Grasshopper Sparrow

The federally endangered Florida grasshopper sparrow occurs throughout the prairie region of peninsular Florida. They are closely associated to the fire-dependent dry prairie and are now found on only a few parcels of public land and nearby ranches. Opportunities for conservation easements and restoration of improved pasture may provide the opportunity to link these isolated populations.

Wood Stork

The federally endangered wood stork forages and breeds within the marshes and cypress swamps of southern Florida. It shares these habitats with other more common wading birds, such as the great egret and white ibis. Only two active nest colonies exist within the Study Area, but five abandoned colony locations can be found in the area.

Florida Black Bear

Listed by the state as a threatened species, the Florida black bear once ranged throughout Florida and the southeast states, but now occupies only 18 percent of its historic range. Using a wide variety of habitats, the Florida black bear is known to wander widely in search of food, cover, mates, and other resources. The population found within the Study Area is isolated and opportunity exists within this proposal to link them with a larger population found within the St. Johns River watershed.

Other Migratory Birds

Two subspecies of sandhill crane, a state listed threatened species, can be found within the Study Area. The Florida sandhill crane is a non-migratory, year-round breeding resident, while the greater sandhill crane is migratory and only winters in Florida. Both subspecies use a wide variety of wetlands and pastures throughout the Study Area.

Blue-winged teal and mottled duck are the two most commonly observed waterfowl species, with many other species of waterfowl noted throughout the winter period.

Resident Wildlife

A wide variety of resident wildlife species can be found throughout the Study Area. Bobwhite quail, wild turkey, white-tailed deer, grey squirrels, and rabbits occur in abundance, providing ample hunting and wildlife observation opportunities. Wild hog, although a nonnative and nuisance species, is also considered a game species and can be found in overabundance in many areas throughout Florida.

Listed Plant Species

There are approximately 23 federally listed plant species found throughout the landscape with most occurring in scrub habitat. Nearly all species are fire-dependent and their populations have been impacted by fire suppression, which has allowed brush and overstory species to become established. Some of the federally listed species found within the Study Area include beautiful pawpaw, scrub lupine, Florida ziziphus, and Garrett's mint.

GOAL 3. ENHANCED WATER QUALITY, QUANTITY, AND STORAGE.

Focusing on restoring or mimicking natural hydrologic processes, the Everglades Headwaters NWR and Conservation Area will contribute to water quality, water quantity, and water storage capacity of the upper Everglades watershed to support Everglades restoration goals and objectives and water quality and supply for central and south Florida.

The Service would add 150,000 acres of conservation lands to this landscape, supporting the enhancement of water quality, quantity, and storage within this landscape. An estimated 26,538 acres of degraded wetlands could be restored within the Conservation Area. The three primary wetland types that would be restored would be seasonal, semi-permanent, and cutthroat seepage

wetlands. Seasonal and semi-permanent wetland basins occur throughout the prairie and savannah landscape, and cutthroat seepage wetlands are associated with the sandhill and scrub habitats of the Lake Wales Ridge.

The primary method of wetland modification has been surface ditching to quickly remove standing water from wet and dry prairie systems. These surface ditches are rarely more than 2 to 3 feet deep and are easily restored through the reestablishment of the original surface contours of the landscape by either filling the ditch or placing a stop log riser water control structure in the ditch. Restoration of these types of wetlands would help serve multiple ecosystem service functions. By blocking surface flow, additional water would be stored in the wetland basin, allowing for slower water discharge, groundwater recharge, and nutrient uptake. Other agencies and organizations, such as NRCS also have wetland restoration programs. Opportunities to complement these restoration activities with Service restoration activities would further serve to benefit the overall watershed, including that of the Kissimmee River, Lake Okeechobee, and the Everglades.

Cutthroat seepage wetlands are an endemic wetland type found at the base of the slope of sandhill habitat in south-central Florida. Groundwater entering underground aquifers sometimes express themselves at the ground surface, creating a mosaic of seasonal wetlands ranging from marshes to pine forests dominated by an understory of cutthroat grass. Many of these wetland types have been ditched and drained, while others have been fire suppressed, allowing for hardwoods to encroach. Estimates of acreage figures of degraded cutthroat wetlands have not been estimated because of their distribution within multiple habitat types. Regardless, restoration of habitats such as pine flatwoods would benefit this plant community.

GOAL 4. WILDLIFE-DEPENDENT RECREATION AND EDUCATION

Refuge visitors of all abilities will enjoy opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of the important grassland and savanna landscape of the headwaters of the Everglades.

With the addition of approximately 50,000 acres of Service-managed lands within the Kissimmee River Basin, wildlife-dependent recreation and education opportunities would increase. The Service would work cooperatively with FWC and other partners to provide a variety of wildlife-dependent activities for the public.

The Improvement Act established six priority public uses on refuges: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Although these priority uses must receive consideration in planning for public use, they also must be compatible with the purposes for which a refuge is established and the mission of the Refuge System. Compatibility determinations, which evaluate the effects of a particular use or activity in the context of species or habitats on a refuge, aid in making those decisions. If refuge lands were acquired, compatibility determinations would be used to decide which, where, and how public use opportunities would be permitted.

Public use opportunities contribute to the long-term protection of wildlife resources by promoting understanding, appreciation, and support for wildlife conservation. The six priority public uses would be accommodated to the maximum extent possible, without significant negative effects on wildlife or habitat. All of the proposed public use activities are contingent upon availability of staff and funding to develop and implement these programs. The Service would promote opportunities for volunteers and develop community interpretive materials and programs to enhance awareness of and appreciation for the area's resources. School and other group programs would be encouraged. If a refuge were to be established, an increase in public use on the acquired lands

would be expected due to the development of new public facilities and programs including hunting, hiking trails, fishing access, observation platforms and overlooks, and other support facilities (e.g., parking lots, trailheads, and visitor contact stations). Most public access would be limited to daylight-use only, but the Service would consider overnight access as a component of other public use activities (e.g., hunting in remote locations). See Appendix B for the interim compatibility determinations for the Proposed Action.

Hunting and Fishing

The Service would open newly acquired lands for hunting and fishing in accord with the state's regulations after reviewing and evaluating the biological, ecological, and human safety impacts. Newly acquired lands that traditionally have provided hunting and fishing opportunities would remain open, at their current level, under interim compatibility determinations until the Service completed the planning process to formally open the refuge, no later than 3 years from acquiring lands suitable to sustain these opportunities. To this end, the Service would continue discussions with FWC regarding the co-management opportunities of the hunting, fishing, and other recreational activities associated with this proposal. If possible, the Service would provide American with Disabilities Act (ADA)-compliant hunts and youth hunt opportunities. Generally, the Service would allow hunting, based on state hunting seasons and consistent with the refuge's CCP and Hunt Plan (once developed). The Service would continue discussions to designate proposed refuge lands as a state-managed wildlife management area(s). Fishing would be allowed, where accessible and compatible. Youth fishing opportunities would be encouraged.

Wildlife Observation, Photography, Environmental Education, and Interpretation

The refuge would provide opportunities for wildlife observation, wildlife photography, and environmental education and interpretation (Appendix B). Working with state and local agencies (e.g., FWC), the Service would study the feasibility of connecting existing hiking, bicycling, and horseback riding trails through refuge lands. A refuge could also provide interpretive and environmental education programs and increase partnership opportunities to interpret the cultural and natural resources, including the role Native Americans and European settlers contributed to the environment of central Florida.

Environmental education, one of the six priority wildlife-dependent uses encouraged on refuge lands, incorporates onsite, offsite, and distance-learning materials, activities, programs, and products that address the audience's course of study, the mission of the Refuge System, and the management purposes of the refuge. The goal of environmental education is to promote an awareness of the basic ecological foundations of the interrelationship between human activities and natural systems. Specific programs of study could include water quality and habitat restoration and the land stewardship of the ranching community. Through curriculum-based environmental education, on- and off-refuge, refuge staff, educators, and partners hope to motivate students and other persons interested in learning the role of management in the maintenance of healthy ecosystems, working landscapes, and conservation of our fish and wildlife resources

President Obama launched the America's Great Outdoors (AGO) Initiative to develop a 21st Century conservation and recreation agenda for our Nation. Lasting conservation solutions should rise from the American people; protection of our natural heritage is a non-partisan objective shared by all Americans. The vision of the AGO Initiative involves connecting Americans to the great outdoors, conserving and restoring America's great outdoors, and working together for America's great outdoors. AGO seeks to empower all Americans—citizens, young people, and representatives of community groups; the private sector; nonprofit organizations; and local, state, and tribal

governments—to share in the responsibility to conserve, restore, and provide better access to our lands and waters in order to leave a healthy, vibrant outdoor legacy for generations yet to come. The proposed Everglades Headwaters NWR and Conservation Area serve the conservation initiative outlined by the AGO Initiative (http://americasgreatoutdoors.gov/.)

For years, national wildlife refuges have been connecting children with the land, teaching a conservation ethic. It is now apparent that such connections are of immense importance. The Service is committed to engaging children with nature for numerous reasons, including mental and physical health and awareness and understanding of the natural world.

The Service would attempt to work with local school districts to develop environmental education programs featuring the unique species and communities of the Kissimmee River Basin, including contributions of the ranching and farming culture in sustaining a healthy environment and economy. The Service would work with the partners to promote environmental education, thereby maximizing the use of resources and time commitments for each partner organization. The Service would also consider the role of a refuge in other potential opportunities such as small habitat restoration projects through the use of our Partners for Fish and Wildlife program in and around local schools, docent-led trail walks, birding festivals, guest lectures, youth hunting and fishing efforts, and even simple monitoring of various forms of wildlife on and off the refuge.

ADMINISTRATION

The proposed refuge may be managed as a stand-alone refuge or as part of a refuge complex. Generally, a stand alone refuge has a dedicated staff and equipment and is based in local facilities. The Conservation Area component of this proposal would require additional staff to administer conservation easements programs. As part of a refuge complex, the proposed Everglades Headwaters NWR would likely have less on-site staff initially and would share staff and equipment with one or more other refuges. Sometimes, refuges initially are part of a refuge complex, but as they grow in size and complexity, they become stand-alone refuges. Under the refuge complex scenario, the refuge staff of the Pelican Island NWR sub-complex would have the responsibility for managing the newly established refuge (note, the Pelican Island NWR sub-complex is part of the Merritt Island NWR Complex, which currently oversees six national wildlife refuges). During the interim period, the Service would seek funding for refuge staff within the project boundary.

The proposed Everglades Headwaters NWR and Conservation Area would be easily accessible via state and local roads. The east and west flank of the Conservation Area is bordered by U.S. 441 and U.S. 27, respectively. Beginning in the south, the east-to-west corridors include State Roads 70, 98, 60, and 500. All of these roads are either directly connected or easily reached by Florida's Turnpike or Interstate 95 along the east flank of the Study Area. Existing access roads on acquired properties would be evaluated for use depending on access needs, presence of sensitive species and/or habitats, public use, and other potential future needs. Some roads may be retained and improved, while others may be abandoned and removed. Legal access to inholdings and homes would be maintained.

The refuge manager would not initiate or permit a new use of a national wildlife refuge or expand, renew, or extend an existing use of a national wildlife refuge unless it has been determined that the use is consistent with the mission of the Refuge System and the purposes of each specific refuge. Further, the same use may be deemed compatible on some refuges, but not others due to refuge-specific differences. [See Appendix B for the interim compatibility determinations that outline the uses authorized to continue to occur during the interim period between acquisition of a property and the development of appropriate management plan(s) for a particular property.]

FACILITIES

Because no actual lands have been acquired as of yet, it is difficult to discuss specifics of facilities and improvements that may be needed to manage the refuge. The strength of the proposed Everglades Headwaters NWR and Conservation Area is the potential private-public partnerships and innovative cost-sharing opportunities that could result in multipurpose and multiagency facilities.

Conversion of existing trails and ranch roads to public use and/or refuge management access corridors would occur as lands were acquired. Use of such roads for public-only or government-only access would be evaluated based on the conditions of roads/trails, protection of sensitive or protected habitat, and/or need of access to areas to facilitate permitted public uses. Roads and trails may only be open seasonally, or may have other restrictions to protect wildlife resources or to provide access for visitor programs, such as hunting activities. Vehicle access to refuge resources would only be allowed on designated roads and trails. Improvements, such as small parking areas, boat ramps, boardwalks and observationi platforms, information kiosks could be constructed in some areas.

Because of the potential wide geographic distribution of refuge lands across this landscape, one or more refuge headquarters and visitor contact stations may be established through the adaptive reuse of buildings acquired through land acquisition (e.g., a ranch house or hunt lodge may be used as a refuge office or education facility; a pole building or barn may be used for equipment storage). Other potential future on-site improvements, including additional trails, improved access roads, observation platforms, photography blinds, and parking areas may be discussed in a future CCP. The construction of new facilities or conversion of existing structures is contingent upon availability of funds and acquisition of appropriate land.

Restoration of wetland habitats may provide the opportunity for the construction of low-level berms and water control structures to further refuge management goals and objectives. Such structures would be managed and maintained to minimize adverse impacts to threatened, endangered, and species of conservation concern.

Where facility construction, operation, or maintenance may conflict with the conservation of federally listed species, appropriate measures (e.g., buffers and seasonal restrictions) would be identified and implemented to avoid adverse effects. This would be done in consultation with the Service's endangered species program

Generally, public use areas would be open from dawn to dusk. Some areas of the refuge could be closed to the public to protect important habitat areas or for safety reasons. Special use permits would be issued to researchers, educational groups, and others on an as needed basis, providing that the activities are compatible with refuge purposes, goals, and objectives and contribute to the ecological understanding, biological survey, or baseline data needs. Refuge areas could be opened to the public year-round, seasonally, or for special events, or closed due to hazards or for biological and ecological reasons.

FUNDING

We would maintain a current inventory of management needs in appropriate Service database(s) and update the associated costs and priorities annually. Those databases provide a mechanism for each unit of the Refuge System to identify its essential staffing, mission-critical projects, and major needs and form a realistic assessment of the funding needed to meet each station's goals, objectives, and strategies.

Since this refuge is only proposed and not yet approved, no funding has been identified, developed, or approved to support management. Any funding would be dependent upon a variety of factors, including national and regional budget priorities and allocations.

STAFFING

Staffing on national wildlife refuges is based on a number of factors including refuge size and complexity, proximity to other refuges, and funding. Based on these and other factors, the proposed refuge may be managed as a stand-alone refuge or as a unit of a refuge complex. At this time it is difficult to delineate staffing specifics, because of the uncertainties associated with the refuge's size, complexity, resource issues, funding, and other factors. Because of this uncertainty, two staffing models that depict both staffing scenarios have been evaluated to better illustrate how these variables interact to determine levels of staffing. These models may serve to guide how this proposed refuge may grow in staff over time. Initially however, the proposed Everglades Headwaters NWR and Conservation Area would be managed as a complexed unit under the supervision and management of the Pelican Island NWR sub-complex staff, a unit of the larger Merritt Island NWR Complex.

Refuge Complex Staffing Strategy

The initial staffing strategy for the proposed Everglades Headwaters NWR and Conservation Area under the refuge complex scenario identifies few new positions. A refuge manager would provide direction, supervision, and coordination for all management activities and ensure the effective oversight and community outreach for the successful management of acquisitions and easements. A maintenance worker would assure that management projects are completed such as invasive species control, mowing, maintaining fence, and other general maintenance activities. A biologist would assist in delivering the full range of wildlife conservation and restoration projects on public land, provide technical assistance, assist in the restoration and management of new acquisitions, and monitor and inventory wildlife and habitat use and conditions. All other refuge functions such as law enforcement, outreach, or prescribed fire would be provided by the overlying refuge complex staff.

Refuge Stand-Alone Staffing Strategy

As refuge lands would be acquired, an independent, stand alone refuge staff would build upon the refuge complex staffing strategy. Refuge law enforcement would be one of the first additional staffing requirements to ensure the safety of the visiting public and assure that wildlife laws are enforced to protect an ever-increasing federal interest. An administrative office assistant would also be required to handle an increasing administrative workload (e.g., purchasing, budget, and personnel support). A visitor services staff member (park ranger) would provide the needed link with local community educational institutions for wildlife-dependent education and oversee plans for any public use activities, such as the coordination of a hunting program. An assistant refuge manager, private lands program biologist, and multi-agency fire management team consisting of a supervisory forestry technician, prescribed fire technician, equipment operator, and multiple seasonal firefighters would assure the safe conduct of prescribed and wildfire managememt programs in this fire-dependent ecosystem. Additionally, collaborative staffing approaches, such as a co-located multi-agency/organization visitor service facility and program, would also be under the direction of the refuge manager. In the long-term, the Service's Southeast Regional Office would evaluate the need for additional full-time staff based on management needs, project loads, public use activities, and other factors, and could move forward with providing additional staff, if justified.

PARTNERSHIPS

The proposed establishment of the Everglades Headwaters NWR and Conservation Area is one component of a larger landscape-scale, partnership-driven initiative, the Greater Everglades Partnership Initiative (Initiative). The Service currently is facilitating Initiative discussions with multiple agencies and organizations. This Initiative is built upon the premise that many conservation partners in this landscape have programs that are complimentary to one another, and that it is not only important, but critical for any individual agency or organization to work collaboratively toward conservation in the greater Everglades landscape. These partner discussions have led to the overall development of this proposal, and also would play an integral part in any future activities if the proposal were to be approved. Examples of these partnerships activities include those listed below.

FIRE MANAGEMENT

Currently The Nature Conservancy (TNC), with assistance and support from multiple State and federal agencies, manages the Lake Wales Ridge Fire Strike Team. This group of firefighters is available to all participating agencies to conduct prescribed burning activities on lands they manage in the Lake Wales Ridge area. This team also has the capability to assist with prescribed fire activities on private lands with appropriate management agreements. Additionally, TNC is hosting a Service firefighter position assigned to Lake Wales Ridge NWR, to be co-located at TNC's Tiger Creek Preserve office. It is anticipated that if a Service-sponsored fire team is established to support the proposed refuge, that the co-location and co-staffing of that team would complement the existing Fire Strike Team. Additionally, the Service traditionally enters into mutual-aid agreements with local and municipal fire departments that provide for fire support from the local departments on-refuge and assistance from Service fire staff on off-site wildland fires.

LAW ENFORCEMENT

Federal refuge officers would be the primary law enforcement officer on refuge lands. The Service would establish formal, cooperative agreements with local law enforcement departments, the county sheriff's departments, and FWC to assist with protection, enforcement, and appropriate law enforcement response for the proposed refuge.

CONSERVATION SERVICE CENTER

Part of the Greater Everglades Partnership Initiative includes development of a Conservation Service Center, or one-stop-shop approach to conservation within the landscape. Because many partners currently have existing facilities and share similar conservation objectives, co-location of these partners, either physically or virtually via electronic media, would facilitate the public being able to interact and seek the most appropriate agency, organization, or conservation program for any conservation and/or wildlife-dependent recreation, regulatory, and/or education need. This approach would also reduce duplication of conservation program efforts among agencies and organizations, thereby allowing all agencies and organizations to become more fiscally efficient.

WILDLIFE-DEPENDENT RECREATIONAL OPPORTUNITIES

The Service recognizes the need to provide increased opportunities for wildlife-dependent recreation and education and has included this as one of the primary goals for the proposed refuge. Hunting and fishing are two wildlife-dependent recreational activities that both the Service and FWC fully support. The hunting and fishing resources found within the Study Area are well-known. In an effort to continue and expand these opportunities for the public, the

Service is discussing with FWC the opportunity to identify and manage lands that the Service might acquire as wildlife management areas (WMAs). As the lead state agency for administering hunting programs, FWC has the expertise, experience, and established protocol for managing WMAs and the Service would look into the opportunity of entering into a cooperative agreement with FWC for the management of Service-owned lands as WMAs.

SUMMARY

In summary, working partnerships with surrounding landowners; conservation organizations; and municipal, state, and federal agencies would be critical to successful refuge management and the conservation of the greater Everglades landscape. We would continue to cooperate with our conservation partners, all of whom are instrumental in helping us accomplish habitat management goals and objectives. It is clear that partnerships with the public; landowners; neighbors; conservation organizations; and tribal, state, municipal, and other federal agencies would be the only path to a successful Everglades Headwaters NWR and Conservation Area.

MANAGEMENT OF PROPOSED EVERLADES HEADWATERS NWR AND CONSERVATION AREA

Goal 1. Functional Conservation Landscape.
The upper Everglades watershed will become a more connected and functional conservation landscape that will provide effective habitat connections between existing conservation areas and allow habitats and species to shift in response to urban development pressures and global climate change.
Objectives:
• Link four current conservation lands using easement and fee title purchases within 2 years of refuge establishment. Conserve one corridor for wildlife movement across Lake Wales Ridge using easement and fee title purchases within 5 years of refuge establishment. • Conserve one additional corridor for wildlife movement between Kissimmee River and St. Johns River watersheds within 5 years of refuge establishment, with particular emphasis on Florida black bear. • Conserve lands between two known populations of Florida grasshopper sparrow within 5 years of refuge establishment. • Evaluate and conserve 25 percent of wildlife corridor along east slope of Lake Wales Ridge using easement, other less than fee, and fee title purchases within 10 years of refuge establishment.
Rationale
The landscape of the upper Everglades watershed exhibits multiple conservation lands, managed by a network of conservation agencies and organizations. However, many gaps currently exist between these conservation lands. These gaps present the threat of development, negating any habitat corridor and wildlife movement across the landscape. There are a few corridors of wildlife movement that traverse the landscape. The east side of Lake Wales Ridge and the Kissimmee River both allow movement of animals in a north-south direction. Several areas which traverse Lake Wales Ridge have conservation lands in place and would benefit from additional conservation lands in order to complete the conservation landscape.

Additionally, there are a few key parcels surrounding Lake Hatchineha which would complete the conservation picture in the northwest corner of the Conservation Focal Area, and a large contiguous block, centrally located along the east side of Kissimmee River, could effectively link the habitats of Kissimmee Prairie Park Preserve and Three Lakes Wildlife Management Area, bringing together isolated populations of Florida grasshopper sparrow. This area would also serve to bridge species like Florida black bear from southwestern Florida with the populations of bears found in the St. Johns River watershed.

Some of the management activities which would occur might include:

- Evaluate and rank all interested landowner parcels to assure the highest conservation value lands and connectivity with existing conservation lands are protected.
- Work with partner agencies to identify key habitat corridors for focused conservation efforts.
- Integrate climate change predictions, as they become available, into land conservation priorities.
- Document the movement patterns of various species of wildlife, including Florida black bear, Florida panther, and whooping crane to better identify landscape connectivity and corridors.

Goal 2. Habitat for Fish and Wildlife.

The Everglades Headwaters NWR and Conservation Area will provide a wide range of quality Kissimmee River Basin habitats to support migratory birds, federal and state listed species, state designated species of conservation concern, and native wildlife diversity.

Objectives:

- Complete baseline inventory and document degraded and high-quality habitat necessary for trust species on all refuge and easement lands within 1 year of acquisition.
- Restore 10 percent annually of dry prairie and cutthroat wetland habitat within 3 years of acquisition of refuge lands.
- Reestablish historic fire regime on 10 percent annually of pine flatwoods, dry prairie, and scrub habitats.
- Within 5 years, begin restoration on all other habitats on refuge lands.
- Initiate restoration activities (e.g., modified grazing rotation, native planting) on all dry prairie and cutthroat wetland habitat within 2 years of acquisition on less than fee title lands.
- Initiate restoration activities (e.g., native planting, timber harvest) within 3 years on all other habitats on less than fee lands.
- Reduce nutrient loading (phosphorus and nitrogen) on any improved pasture conserved by fee acquisition by 50 percent within 2 years of refuge establishment.
- Restore improved pasture to semi-native pasture on all refuge fee lands.

Rationale

The habitats associated with the existing conservation lands are well-known and well-surveyed. However, little of the private landholdings have been surveyed for wildlife or habitat. An initial baseline monitoring and ground truthing of lands within the Conservation Focal Area needs to be completed in order to assess the validity of the computer models used to identify high, medium, and low priority habitats. Additionally, wetland, grassland, forest, and scrub restoration potential needs to be assessed in order to prioritize restoration activities.

Most habitats in this landscape require frequent low intensity fires. Reduced fire frequency or complete fire suppression is one of the primary negative impacts in this landscape; wetland drainage being the other. Grassland habitats such as dry prairie and cutthroat wetland can have more of an immediate positive response to restoration activities, whereas forest and scrub restoration may take several years and repeated fire treatments to realize a positive response. The initiation of restoration activities takes these timeframes into account when prioritizing areas to restore.

Conservation banks provide a unique opportunity for the Service to manage lands as part of the Refuge System that provide dedicated and completely restored endangered species habitat, while at the same time being provided dedicated resources (funds) to carry out the restoration, management, and monitoring activities associated with managing the landbase. Trust funds management would reside elsewhere (e.g., land trusts, non-governmental organizations) and the Service would provide their management expertise in getting things done on the ground.

To ensure proper habitat conditions and persistence of certain species, management actions for some species would need to occur in a very timely manner once a particular property were to be acquired (e.g., management actions for Florida grasshopper sparrow should occur within six months of acquisition of a site supporting this species, nonnative plant control activities should occur soon after an acquisition, and skink and Florida scrub-jay surveys should be conducted within 2 to 3 years of an acquisition).

Some of the management activities which would occur might include:

- Work cooperatively with partners and partner programs to secure grassland and forest conservation easements.
- Manage lands, in consultation with the Service's Ecological Services Vero Beach Office, of all new conservation banks for endangered species critical habitat, upon completion of conservation bank requirements.
- Seek opportunities with partner agencies and organizations to co-locate and cooperate on habitat restoration and management activities.

Goal 3. Enhanced Water Quality, Quantity, and Storage.

Focusing on restoring or mimicking natural hydrologic processes, the Everglades Headwaters NWR and Conservation Area will contribute to water quality, water quantity, and water storage capacity of the upper Everglades watershed to support Everglades restoration goals and objectives and water quality and supply for central and south Florida.

Objectives:

- Complete baseline inventory and document drained wetlands on all proposed Everglades Headwaters NWR and Conservation Area properties within 1 year of acquisition.
- Restore 70 percent of all drained wetlands within 3 years of acquisition of refuge properties.
- Restore 50 percent of all drained wetlands within 2 years of acquisition of Conservation Area properties.
- Reduce nutrient runoff from wetland basins by 50 percent within 2 years of refuge establishment

Rationale
Much of what is known of wetland restoration potential on private land is derived from aerial photography. As properties come into ownership, initial evaluations are required to document restoration opportunities and design restoration activities. Much of what is known does indicate, however, that most restoration would consist of simple ditch plugs and construction of stop log riser structures, possibly some low-level earthen berms. Opportunities for these activities, although not quantified, are known to abound. Larger drained wetlands and stream channelization would require Service staff to work with other partners (e.g., NRCS) to design and construct more sophisticated projects. The needs for water quantity, quality, timing, and distribution for refuge managaement activities are unknown at this time. However, the primary source of freshwater would be derived from rainfall or runoff from the surrounding fields. The Service would collaborate with state agencies and water management districts to work toward strategies that are supported by all stakeholders. The Service is also committed to improve water quality, quantity, timing, and distribution to downstream users and would participate in reduction strategies identified through the state's Total Maximum Daily Load and Basin Management Action Plan process. Additionally, the Service would assure that all conservation easements would provide specific language that would allow the placement of structures and practices which are part of the state's Total Maximum Daily Load and Basin Management Action Plan process. Conservation banks provide a unique opportunity for the Service to manage lands as part of the Refuge System that provide dedicated and completely restored endangered species habitat, while at the same time being provided dedicated resources (funds) to carry out the restoration, management, and monitoring activities associated with managing the landbase. Trust funds management would reside elsewhere (e.g., land trusts, non-governmental organizations) and the Service would provide management expertise in getting things done on the ground. Some of the management activities which would occur might include: • Work cooperatively with partners and partner programs to secure wetland conservation easements. • Manage wetlands, in consultation with the Service's Ecological Services Vero Beach Office, of all new wetland mitigation banks, upon completion of bank requirements. • Seek opportunities with partner agencies and organizations to co-locate and cooperate on wetland restoration and management activities.

Goal 4. Wildlife-dependent Recreation and Education.
Refuge visitors of all abilities will enjoy opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of the important grassland and savanna landscape of the headwaters of the Everglades.
Objectives:
• Immediately upon fee acquisition work cooperatively with FWC to evaluate the designation of Service lands as WMAs. • Develop a Hunt Plan within 1 year of acquisition of acreage suitable to support hunt programs.

- Within 2 years of suitable land acquisition, identify up to three sites suitable for development or restoration of facilities to engage public in outdoor recreation and educational programs.
- Within 3 years, develop step-down management plans to address all aspects of outdoor wildlife-dependent recreation identified in the interim compatibility determinations.

Rationale

The Service has a long history of supporting wildlife-dependent recreation, ranging from hunting and fishing to environmental education and interpretation. The hunting and fishing traditions of local residents and visitors to this landscape area are well-known, and the Service anticipates hosting a full complement of recreational activities. To this end, the Service has been communicating with FWC about the potential to manage any suitable fee title lands within Florida's WMA program.

Access to public lands is of concern to the public, and the Service would seek to accommodate opportunities for mobility impaired and youths to visit the refuge. Being in close proximity to urban areas, the Service also hopes to engage local residents and schools in multiple educational opportunities, ranging from self-guided interpretive trails to formal curriculum for local schools.

Facilities are keys in the Service being able to engage and interact with the public. Because the landscape of interest is widespread, several facilities may be necessary to reach all of those in the vicinity. Since many conservation partners have similar missions and interests, it is important to seek out mutually beneficial opportunities to co-locate facilities and staff to be more cost efficient and effective.

Some of the management activities which would occur might include:

- Incorporate opportunities, in cooperation with FWC, for youth and mobility impaired hunting and fishing programs.
- Actively participate and host FWC sponsored wildlife-dependent recreational workshops.
- Evaluate opportunities, in cooperation with FWC and other partner groups, to connect and expand trail networks.
- Seek cooperative opportunities with partner agencies and organizations to co-locate and cooperate on educational and interpretive programs and facilities.

ACQUISITION MANAGEMENT

Protection of lands would be accomplished by targeting up to approximately 50,000 acres of fee title acquisition within the approximately 130,000-acre Conservation Focal Area; and target approximately 100,000 acres of less than fee acquisition within the Conservation Partnership Area. The reader is referred to the Draft LPP for more specific details regarding the Service's land acquisition program.

PUBLIC USE MANAGEMENT

The initial decision-making process a refuge manager follows when first considering whether or not to allow a proposed use on a refuge involves an evaluation of the appropriateness of a given activity on a national wildlife refuge. The refuge manager must find a use to be appropriate before undertaking a compatibility review of the use. If a proposed use is not found to be appropriate, the refuge would not allow the use and would not prepare a compatibility determination. By screening out proposed uses that

are not appropriate to the refuge, the refuge manager avoids unnecessary compatibility reviews. By following the process for finding the appropriateness of a use, we strengthen and fulfill the Refuge System mission. The collection of interim appropriateness reviews for this project can be found in Appendix B.

The Improvement Act establishes six priority public uses on refuges. Those priority uses depend on the presence, or the expectation of the presence of wildlife. These uses are: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Although these priority uses must receive our consideration in planning for public use, they also must be compatible with the purposes for which the refuge was established and the mission of the Refuge System. Compatibility determinations, which evaluate the impacts of a use that has been determined to be appropriate in the context of species or habitats, aid in making those decisions. As lands are acquired in the upper watershed of the Everglades ecosystem, compatibility determinations would be used to decide what public use opportunities are compatible and can be permitted. The interim compatibility determinations for these priority public uses, which would allow existing uses to continue until such time that a more comprehensive management plan is developed, can be found in Appendix B.

Appendix A, Table 1, summarizes the public uses that would likely be evaluated during the interim phase and their potential limitations under current conditions. More specific discussion of these public use activities follows.

Appendix A. Table 1. Interim public uses

Public Use Activity	Would this use be provided during the interim phase?
Public Hunting	Yes, limited by available hunting areas and potentially by wildlife management area restrictions.
Public Fishing	Yes, limited by available access and potentially by wildlife management area restrictions.
Environmental Education	Yes, limited due to staffing, partnership development, and facilities.
Interpretation	Yes, limited due to staffing, partnership development, and facilities.
Wildlife Observation	Yes, limited due to staffing, partnership development, and facilities.
Wildlife Photography	Yes, limited due to staffing, partnership development, and facilities.
Camping	Yes, limited to existing campsites and as component of other approved uses.
Horseback Riding (trails)	Yes, limited to existing trails.
Bicycling (trails)	Yes, limited to existing trails.
Hiking (trails)	Yes, limited to existing trails.
Off-road Vehicle	No, all off-road travel by any vehicle would not be allowed.
Boating	Service has no jurisdiction over navigable waters.

Hunting

Hunting is a popular and traditional activity of many residents and non-residents of the State of Florida. Private lands within the Conservation Partnership Area are typically subject to hunting leases or reserved by family members for their own hunting activities, thus largely limiting general public hunting access today. In general, select and appropriate lands that would become part of the proposed Everglades Headwaters NWR would likely be open for public hunting as part of the WMA program administered by FWC, increasing the amount of lands open to public hunting in this area. The Improvement Act provides the opportunity for compatible public uses on newly acquired lands to continue on an interim basis (until a more detailed hunt plan or comprehensive conservation plan is developed) at the same level of activity that existed prior to Service acquisition of the land (Appendix B). Several options exist under the WMA program that could be selected to match the individual circumstance of a given land acquisition parcel without exceeding the current level of activity. Once an adequate, manageable land base is acquired, the Service would then conduct a more detailed hunt plan as soon as possible and not more than 3 years after acquisition of a property on which hunting would be allowed. The Service would work closely with FWC to establish a hunt program beyond the initial interim basis. Beyond the interim compatibility determinations, the Service would work with the partners and the public to develop long-term plans to provide opportunities for hunting on the proposed Everglades Headwaters NWR.

Fishing

The Kissimmee River and the Kissimmee Chain of Lakes is a world-renowned freshwater fishery. Access to the navigable waters in this region is governed primarily by public and private boat ramps, which are numerous and scattered throughout the region. However, many of the smaller lakes and ponds do not have public access. The Service, likely working through the WMA program administered by FWC, would provide opportunities for fishing access that are compatible with the reasons for which the refuge was established. A cursory review of the lands within the planning units that are important for the Service to conserve reveals that the majority of shoreline and boat access to the major waterways is currently protected and managed by the SFWMD, thus providing the Service limited opportunities to increase fishing and boating access to these areas. Beyond the interim compatibility determinations, the Service would work with the partners and the public to develop long-term plans to evaluate and provide opportunities for fishing on the proposed Everglades Headwaters NWR.

Wildlife Observation

The upper Everglades watershed provides a wealth of opportunities for wildlife observation; however, safe viewing opportunities are limited by state and county roads that do not provide adequate pull-offs. Until such time as better wildlife observation opportunities can be provided and a detailed visitor services plan is written and based on the interim compatibility determinations, wildlife observation would be allowed to continue on an interim basis on parcels acquired by the Service at the same level of activity that existed prior to Service acquisition of the land. Beyond the interim compatibility determinations, the Service would work with partners and the public to develop long-term plans to provide opportunities for wildlife observation on the proposed Everglades Headwaters NWR.

Photography

Until such time as better wildlife photography opportunities can be provided and a detailed public use plan is written and based on the interim compatibility determination, photography would be allowed to continue on an interim basis on parcels acquired by the Service at the same level of activity that

existed prior to Service acquisition of the land. Beyond the interim compatibility determinations, the Service would work with the partners and the public to develop long-term plans to provide opportunities for photography on the proposed Everglades Headwaters NWR.

Environmental Education

Environmental education is limited by the lack of support facilities in the upper Everglades watershed. Shortfalls in environmental education opportunities may be overcome with partnerships with local schools and conservation groups. Until such time as better environmental education opportunities can be provided and a detailed visitor services plan is written and based on the interim compatibility determination, environmental education would be allowed to continue on an interim basis on parcels acquired by the Service at the same level of activity that existed prior to Service acquisition of the land. Beyond the interim compatibility determinations, the Service would work with the partners and the public to develop long-term plans to provide opportunities for environmental education on the proposed Everglades Headwaters NWR.

Interpretation

Interpretation is limited by the lack of support facilities in the upper Everglades watershed. Shortfalls in interpretation opportunities may be overcome with partnerships with local schools and conservation groups. Until such time as better interpretation opportunities can be provided and a detailed visitor services plan is written and based on the interim compatibility determination, environmental education would be allowed to continue on an interim basis on parcels acquired by the Service at the same level of activity that existed prior to Service acquisition of the land. Beyond the interim compatibility determinations, the Service would work with the partners and the public to develop long-term plans to provide opportunities for interpretation on the proposed Everglades Headwaters NWR.

Other Uses

Where any of the priority public uses may conflict with the conservation of federally listed, endangered or threatened species, appropriate measures (e.g., buffers and seasonal restrictions) would be identified and implemented to avoid adverse effects. This would be done in consultation with the Service's Endangered Species Program. Additionally, public uses other than the six priority public uses, such as horseback, biking, and hiking trails, must pass the same standards of appropriateness, compatibility, and planning. While activities such as camping and ATV use (designated trails and roads only) may not pass standards of appropriateness and compatibility in and of themselves, these uses may be allowed as components in support of other compatible uses (e.g., camping in remote locations during hunting seasons, ATV access on designated trails and roads during hunting seasons). Until such time as these opportunities can be assessed for compatibility and a detailed visitor services plan is written and based on the interim compatibility determinations, these other public uses would be allowed to continue on an interim basis on parcels acquired by the Service at the same level of activity that existed prior to Service acquisition of the land.

OPERATIONS AND PLANNING

Refuges are managed according to an annual work plan that summarizes goals and objectives for the upcoming year. Specific actions for on the ground work, such as operation procedures, wildlife inventory plans, habitat management actions, public use, and other management activities are covered in detail in refuge specific management plans. An annual work plan may generally state, for example, that 1,000 acres of invasive plant species would be controlled on the refuge, thus setting a

target and goal for invasive species, control methods, timing of control, monitoring of effectiveness of the application, retreating areas, monitoring, and other actions for the year.

Long-term planning, outlined earlier, includes the preparation of a comprehensive conservation plan (CCP). A CCP describes the desired future conditions of a refuge and provides long-range guidance and management direction to achieve the purposes of the refuge.

CONCLUSION

Should the proposal for the Everglades Headwaters NWR and Conservation Area go forward, the Service would work towards achieving the overarching goals outlined in this Draft EA. Partnerships with landowners; neighbors; conservation organizations; and local, state, tribal, and other federal government agencies would be a crucial component of a successful Everglades Headwaters NWR and Conservation Area.

Appendix B. Interim Appropriateness Findings and Interim Compatibility Determinations

APPROPRIATE USE FINDINGS

An appropriate use finding is the initial decision process a refuge manager follows when first considering whether or not to allow a proposed use on a refuge. An interim appropriate use is used as the initial step during the time period when land is first acquired and continuing until such time, no later than 15 years, when either a comprehensive conservation plan or step-down management plan is developed, so that ongoing public use activities can continue during this interim period. The refuge manager must find that a use is appropriate before undertaking a compatibility review of the use. This process clarifies and expands on the compatibility determination process by describing when refuge managers should deny a proposed use without determining compatibility. If a proposed use is not appropriate, it would not be allowed and a compatibility determination would not be undertaken.

Except for the uses noted below, the refuge manager must decide if a new or existing use is an appropriate refuge use. If an existing use is not appropriate, the refuge manager would eliminate or modify the use as expeditiously as practicable. If a new use is not appropriate, the refuge manager would deny the use without determining compatibility. Uses that have been considered and administratively determined to be appropriate or not appropriate are listed.

- Six wildlife-dependent recreational uses - As defined by the National Wildlife Refuge System Improvement Act of 1997, the six wildlife-dependent recreational uses (i.e., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) are determined to be generally appropriate for refuges. However, a particular refuge may have none, some, or all of these uses and the refuge manager must still determine if these uses are compatible.

- Take of fish and wildlife under state regulations - States have regulations concerning the take of wildlife that includes hunting, fishing, and trapping. The Service considers take of wildlife under such regulations appropriate. However, the refuge manager must determine if the activity is compatible before allowing it on a refuge.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Proposed Everglades Headwaters NWR

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?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ 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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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Proposed Everglades Headwaters NWR

Use: Grazing

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ 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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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Proposed Everglades Headwaters NWR

Use: Camping

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ 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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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Proposed Everglades Headwaters NWR

Use: Horseback Riding (trails)

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ 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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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Proposed Everglades Headwaters NWR

Use: Bicycling (trails)

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ 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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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Proposed Everglades Headwaters NWR

Use: Hiking (trails)

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager:_____ 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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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Proposed Everglades Headwaters NWR

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?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		✓
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?		✓
(h) Will this be manageable in the future within existing resources?		✓
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		✓

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ✓ **Appropriate** ___

Refuge Manager:_____ 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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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Proposed Everglades Headwaters NWR

Use: Off-road vehicles (off-trail use)

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		✓
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?		✓
(h) Will this be manageable in the future within existing resources?		✓
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		✓

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ✓ **Appropriate** ___

Refuge Manager:_____ 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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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Proposed Everglades Headwaters NWR

Use: Boating (airboat, motorboat, self-propelled)

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?		
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		
(d) Is the use consistent with public safety?		
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		
(g) Is the use manageable within available budget and staff?		
(h) Will this be manageable in the future within existing resources?		
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ___ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate**_____

Refuge Manager:_____ 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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COMPATIBILITY DETERMINATIONS

Introduction: The Service reviewed several uses for compatibility during the development of the proposal to establish the Everglades Headwaters NWR and Conservation Area. The descriptions, anticipated impacts, and approval of each use are addressed separately. These interim compatibility determinations are used during the time period when land is first acquired and continuing until such time, no later than 15 years, when a comprehensive conservation plan and/or earlier when an appropriate step-down management plan is developed, so that ongoing public use activities can continue during this interim period at levels similar to those that existed prior to acquisition by the Service. If the proposal were to be approved and during the acquisition of a particular property, the Service would develop an understanding of the types, conditions, and levels of use(s) that previously occurred on that property to determine which use(s) would continue to occur under these interim compatibility determinations.

Uses: The following uses were evaluated to determine their compatibility with the mission of the National Wildlife Refuge System and the purposes of the refuge: hunting, fishing, environmental education and interpretation, wildlife observation and photography, research, camping, hiking, horseback riding, bicycling, and grazing.

Proposed Refuge Name: Everglades Headwaters National Wildlife Refuge

Date Established: Currently Proposed

Establishing and Acquisition Authorities:
Endangered Species Act of 1973 (16 U.S.C. 1531)
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd)

Proposed Refuge Purposes:

> *"... 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. 1531 (Endangered Species Act of 1973)*
>
> *"…the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. 3901(b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986)*
>
> *"…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds…." 16 U.S.C. 715d (Migratory Bird Conservation Act)*
>
> *"…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) "…for the development, advancement, management, conservation, and protection of fish and wildlife resources...." 16 U.S.C. 742f(a)(4), (Secretarial powers to implement laws related to fish and wildlife) (Fish and Wildlife Act of 1956)*

"…suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. 460k-1 "... 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 (16 U.S.C. 460k-460k-4), as amended]

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)
- 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 of 1964 (16 U.S.C. 1131-1136; 78 Stat. 890)
- Land and Water Conservation Fund Act of 1964
- 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)
- 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, U.S.C. 668dd)
- Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System, March 25, 1996

Definitions:

<u>Appropriate Use</u>

A proposed or existing use on a refuge that meets at least one of the listed 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 603 FW 1 1.11.

Native American

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

Priority General Public Use

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

Quality

The criteria used to determine a quality recreational experience include:

- Promotes safety of participants, other visitors, and facilities.
- Promotes compliance with applicable laws and regulations and responsible behavior.
- Minimizes or eliminates conflicts with fish and wildlife population or habitat goals or objectives in a plan approved after 1997.
- Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation.
- Minimizes conflicts with neighboring landowners.
- Promotes accessibility and availability to a broad spectrum of the American people.
- Promotes resource stewardship and conservation.
- Promotes public understanding and increases public appreciation of America's natural resources and the Service's role in managing and protecting these resources.
- Provides reliable/reasonable opportunities to experience wildlife.
- Uses facilities that are accessible and blend into the natural setting.
- Uses visitor satisfaction to help define and evaluate programs.

Wildlife-Dependent Recreational Use

As defined by the Improvement Act, a use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Compatibility Determinations for the Proposed Refuge: Compatibility determinations for each use listed were considered separately and descriptions appear between the two drawn lines. Although the preceding sections from "Uses" through "Definitons" and the ending sections from "Public Review and Comment" section through the final signatures are only written once within the plan, they are part of each descriptive use and become part of each compatibility determination.

Description of Use: *Hunting (big game, upland game, and waterfowl)*

This pre-acquisition compatibility determination serves as our commitment to allow hunting activities to continue, where they are pre-existing and owner-authorized, on lands that would be acquired by the Service, should the refuge proposal go forward.

Hunting is a traditional use in this landscape. Hunting has been identified as a priority wildlife-dependent activity under the National Wildlife Refuge System Improvement Act of 1997. With the implementation of the Land Protection Plan, the Service, in cooperation with the state, would take the steps necessary (e.g., develop needed regulations and publish the appropriate *Federal Register* notice) to open the refuge to upland hunting for deer, feral hog, turkey, waterfowl, and other small game in accordance with state regulations. However, the Improvement Act also provides for the opportunity for existing public uses to continue, at the same level of activity as occurred when acquired, during an interim period until such time that a detailed plan is developed [e.g., Hunt Plan and/or Comprehensive Conservation Plan (CCP)]. This would provide additional opportunities for a priority recreational activity. Big game hunting potential may consist of refuge-sponsored or state-managed wildlife management area (WMA) hunts for deer, wild turkey, and feral hogs. Upland game (e.g., gray squirrels, rabbits, and raccoons) and waterfowl (e.g., ducks, coots, and geese) hunting may consist of refuge-sponsored or state-managed WMA hunts. Any or all hunt programs may be administered as part of the WMA program and would be in accordance with state regulations.

Availability of Resources: The cost of administering a hunt program is unknown at this time, but revenue may be generated from fees collected from hunters. Refuge law enforcement, public use, administrative, managerial, and biological staff may allocate a portion of their time to support this program (e.g., with existing staff from existing refuges). Maintenance of roads and potential building of hunt check stations also are costs that could be absorbed within the refuge operating budget. There is the potential for the Service to partner with the Florida Fish and Wildlife Conservation Commission (FWC) to share responsibilities of administering the hunt program as part of the state's WMA program or through some similar management agreement.

Anticipated Impacts of the Use: By policy, all activity addressed by this interim compatibility determination would not exceed the current use occurring on the land. Therefore there would be no additional anticipated impacts. Existing impacts would be 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 waterfowl 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 structure and length of hunt seasons can minimize or eliminate these anticipated impacts.

The harvest of feral hogs on the refuge may have a beneficial impact to native wildlife and habitat, since hogs compete for mast; destroy native plants; and prey upon bird nests, small vertebrates, and invertebrates. Deer hunting can maintain herd size and sex ratios at a healthy population level commensurate with available habitat. Spring turkey hunting can disrupt nesting. Impacts of recreational small game hunting include harvest of target species--gray squirrels, rabbits, and raccoons. In addition to the harvest of legal game, killing of non-target species, such as snakes, is known to occur. Other impacts of hunting may include littering, disturbing wildlife, trampling vegetation, and removing dead/down wood. (For more information regarding potential impacts associated with public use activities, please refer to the Environmental Assessment.)

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Hunting would be in accordance with applicable state regulations and would not exceed the scope of current hunting activity until such time as a refuge hunt plan or CCP is developed. A hunt plan would likely be developed within 3 years of acquisition of property sufficient to support hunting activities. Hunting programs may be administered as a state-managed WMA unit or a refuge-sponsored management program. For all hunts, weapon restrictions would be in accordance with State of Florida regulations. Vehicles would be restricted to existing designated roads and trails. ATV use may be allowed for access along designated roads and trails. Camping may be allowed to access remote areas during the hunting season. All hunts would be designed in cooperation with state biologists and managers to provide quality user opportunities based upon estimated wildlife population levels and biological parameters. Hunt season dates and bag limits would be adjusted to meet current hunter densities and activities and may be adjusted as needed to achieve balanced population levels within carrying capacities, regardless of impacts to user opportunities. As additional data are collected and a hunt plan or CCP is developed, additional refuge-specific regulations or changes to the WMA could be implemented. These refuge-specific regulations could include, but may not be limited to the following: season dates that differ from those in surrounding state zones; refuge permit requirements; and closed areas on a permanent or seasonal basis to reduce disturbance to specific wildlife species or habitats, such as bird rookeries, wintering waterfowl, or threatened or endangered species, as well as to provide for public safety. If evidence of unacceptable impacts begins to appear, it may be necessary to change the activity, move the activity, or eliminate the activity.

Justification: Under the Improvement Act, hunting is a priority public use. Hunting is an acceptable form of wildlife-dependent recreation compatible with the purposes for which the refuge would be established. The harvest of surplus animals is one tool used to maintain wildlife populations at a level compatible with habitat. Overabundance of animals, such as hogs and deer, can have detrimental impacts to native habitats. In addition to recreational opportunities, hunting to control populations of feral hogs and deer would be beneficial to native species and habitats, and would therefore be considered compatible with proposed refuge purposes.

Mandatory 15-year Re-evaluation Date:

Description of Use: *Fishing*

This pre-acquisition compatibility determination serves as our commitment to allow fishing activities to continue, where they are pre-existing and owner-authorized, on lands that would be acquired by the Service, should the refuge proposal go forward.

Fishing is a traditional use in this landscape. Fishing has been identified as a priority wildlife-dependent activity under the National Wildlife Refuge System Improvement Act and is a traditional use on refuges. Recreational freshwater fishing may be allowed on refuge lakes, rivers, and/or ponds. The refuge would not have jurisdiction over state navigable waters, thus boating and access to navigable waters would continue according to state regulations. There may be the potential for

visitors to fish from the banks of the refuge or by boat. This wildlife-dependent recreational use is supported by boating; therefore, boating impacts which are associated with fishing are also considered in this review. Motorized and non-motorized boating activities support fishing. The Service would work with the FWC and others to develop an understanding of fishing activities for a particular site during the acquisition process.

Availability of Resources: The cost of administering a fishing program is unknown, but revenue may be generated from potential access fees. Refuge law enforcement, public use, administrative, managerial, and biological staff may allocate a portion of their time to this program (e.g., with existing staff from existing refuges).

Anticipated Impacts of the Use: The primary impacts of this use are disturbance to and the taking of non-target wildlife species, vandalism (e.g., removal of stoplogs from water control structures), littering, habitat disturbance (e.g., trampling of bank vegetation), and water pollution from boat motors. Some wildlife may be injured or killed by discarded fishing line and hooks. (For more information regarding potential impacts associated with public use activities, please refer to the Environmental Assessment.)

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Fishing within state navigable waters would continue. Fishing would adhere to state fishing laws and regulations should help maintain fish populations at a healthy, sustainable level. Fishing programs may be administered as a component of a state-managed WMA unit or a refuge-sponsored management program. Disturbance to non-target species and water pollution problems could be minimized by an electric trolling boat motor or no motor restriction for refuge lakes and ponds that are not considered state navigable waters. Fishing on non-navigable waters would be restricted to daylight hours. Closure of sensitive areas within or adjacent to refuge waters may be necessary at certain times of the year to protect the wildlife resources. If evidence of unacceptable impacts begins to appear, it may be necessary to change the activity, move the activity, or eliminate the activity.

Justification: Fishing is a priority public use under the Improvement Act and a wildlife-dependent activity that would be compatible with proposed refuge purposes.

Mandatory 15-year Re-evaluation Date:

Description of Uses: *Environmental Education and Interpretation*

This pre-acquisition compatibility determination serves as our commitment to allow environmental education and interpretation activities to continue, where they are pre-existing and owner-authorized, on lands that would be acquired by the Service, should the refuge proposal go forward.

Formal and informal environmental education and interpretation continue to occur in this landscape. Environmental education and interpretation comprise a variety of activities and facilities that seek to increase the public's knowledge and understanding of wildlife and to promote wildlife conservation. These are tools used to inform the public of resource values and issues. Examples of environmental education activities include staff or teacher-led events, student and teacher workshops, and nature studies. Interpretive programs and facilities could include special events, visitor center displays, interpretive trails, visitor contact stations, auto tour routes, and signs.

Environmental education and interpretation consist primarily of youth and adult education and interpretation of the natural resources of the refuge. Activities may include on-site refuge-led or refuge-approved environmental education programs; teacher workshops; and interpretation of wildlife, habitat, other natural features, and/or management activities occurring in 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 were identified in the National Refuge System Improvement Act as priority public activities, provided they are appropriate and compatible with the purposes for which the refuge was established.

Environmental education and interpretation programs may be conducted by the Service or by a Service-approved member. Any non-Service environmental education and interpretation activities must be reviewed and approved by the Service through a special use permit issued by the refuge. These permits would contain conditions to minimize impacts and ensure compatibility. The Service would work with the local schools and others to develop an understanding of existing environmental education and interpretation activities for particular sites during the acquisition process.

Availability of Resources: Annual refuge operation and maintenance funds provided for the Pelican Island NWR Sub-complex of the Merritt Island NWR Complex would be used to support the visitor services programs, including environmental education and interpretation opportunities, during planned programs and events.

Facilities, such as visitor centers, trails, and environmental education shelters would require funding to build and staff to maintain them, but they are a necessary expense to carry-out the refuge's mission. The management of a volunteer program would be essential to implement environmental education and interpretive programs.

Anticipated Impacts of the Use: Disturbance promulgated by refuge specific, limited programs, managed through and with direct oversight by refuge or refuge-approved members would be considered short-term and discrete disturbances due to the low anticipated frequency of use; the utility of existing infrastructure, such as fire lines and unimproved access roads; and the ability to move sites to new areas if the habitat shows signs of impact. It is anticipated that by utilizing existing resources and guiding all aspects of use, vegetation trampling, alteration of structure and species composition, and temporal wildlife impacts to species would be minimal. The minimal impact associated with conducting limited environmental educational and interpretation programs is generally determined to be acceptable. Specific sites would be evaluated on a case by case basis following acquisition.

The use of the refuge for on-site, hands-on, action-oriented activities by large groups to accomplish environmental education objectives may impose low-level impacts on the sites used for the activities. Impacts may include trampling of vegetation and temporary disturbance to wildlife species in the immediate use area. Such impacts would not be permanent or long-lasting. Most of the interpretive activities would be self-guiding and would pose minimal threat to wildlife and habitat. (For more information regarding potential impacts associated with public use activities, please refer to the Environmental Assessment.)

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: While the anticipated impacts are expected to be minimal, stipulations are required to ensure that wildlife resources are adequately protected. The environmental education program and interpretation activities would avoid sensitive sites and vulnerable wildlife and plant populations. Environmental education and interpretive programs and activities would be held and conducted at or near disturbed areas, including, but not limited to fire lines and unimproved access roads where impacts can be minimized.

Activities would be held on sites where minimal impact would occur. Periodic evaluation of the sites and program would be done to assess whether the program objectives are being met and whether resources are being degraded. If adverse impacts become evident, environmental education and interpretive activities may need to be rotated or moved. Certain areas of the refuge may be restricted seasonally for breeding or nesting purposes or to protect habitat. If evidence of unacceptable impacts begins to appear, it may be necessary to change the activity or program, move the activity or program, or eliminate the activity or program.

As long as stipulations to ensure compatibility are followed, the programs should remain compatible with the purposes of the refuge. The refuge would modify or eliminate any use that results in unacceptable impacts.

Justification: Environmental education and interpretation represent two priority wildlife-dependent recreational activities under the Improvement Act. Environmental education and interpretation are key components of the Service's initiative to connect children with nature and are used to encourage all citizens to act responsibly in protecting natural resources. Both would be compatible with proposed refuge purposes.

Mandatory 15-year Re-evaluation Date:

Description of Uses: *Wildlife Observation and Photography*

This pre-acquisition compatibility determination serves as our commitment to allow wildlife observation and photography activities to continue, where they are pre-existing and owner-authorized, on lands that would be acquired by the Service, should the refuge proposal go forward.

Wildlife observation and photography are traditional uses in this landscape. For the purposes of this compatibility determination, non-consumptive wildlife observation uses include wildlife watching and nature photography by walking or using motorized or non-motorized vehicles and boats, bicycles, or horses. Foot travel would generally be allowed on refuge roads, levees, and trails.

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 as priority wildlife-dependent recreational uses provided they are compatible with the purposes of the refuge. This compatibility determination applies only to personal photography and not to other forms of photography (e.g., commercial photography and filming). Commercial photography or videography, if allowed, would be covered under a separate Commercial Services compatibility determination (not being considered at this time) and would require a special use permit issued by the refuge with specific restrictions. The Service would develop an understanding of wildlife observation and photography activities for a particular site during the acquisition process.

Availability of Resources: Annual refuge operation and maintenance funds provided for the Pelican Island NWR Sub-complex of the Merritt Island NWR Complex would be used to support the visitor services program, including wildlife observation and photography opportunities.

Anticipated Impacts of the Use: The purpose of this section is to critically and objectively evaluate the potential effect that wildlife observation and photography could have on wildlife and habitat based on available information and best professional judgment. Each activity has the potential to have impacts, but the focus is to minimize impacts to levels within acceptable limits. This is based on the impacts at the existing and projected level of use.

Even the most controlled wildlife observation and photography programs designed in-part to limit wildlife disturbance have the potential for disturbing wildlife species. In general, activities that occur outside of vehicles tend to increase the disturbance potential for most wildlife species (Klein 1993; Gabrielson and Smith 1995; Burger 1981; Pease et al. 2005) as compared to similar activities conducted within vehicles. Refuge-led or refuge-approved and led visitors would typically access refuge habitats on-foot via fire lines and/or unimproved roads and foot trails. Although this type of access could potentially disturb wildlife, it is expected to be minimal as a result of the limited and controlled character of such events and opportunities. Among wetland habitats, out-of-vehicle approaches can reduce wildlife foraging times and can cause water birds to avoid foraging habitats adjacent to the out-of-vehicle disturbance (Klein 1993). One possible reason for this result is that vehicle activity is usually brief, while walking requires a longer period of time to cover the same distance. Similarly, 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). Wildlife photographers tend to have the largest disturbance impacts (Klein 1993; Morton 1995; Dobb 1998). While wildlife observers frequently stop their vehicles to view wildlife, wildlife photographers are much more likely to leave their vehicles and approach wildlife on foot (Klein 1993). Even a slow approach by wildlife photographers tends to have behavioral consequences to wildlife (Klein 1993). Other impacts include the potential for 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 subject than other activities would require (Morton 1995). (For more information regarding potential impacts associated with public use activities, please refer to the Environmental Assessment.)

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: By design, wildlife observation and photography should have minimal species and habitat impacts. Nonetheless, as use increase, species impacts are more likely to occur. Evaluation of the sites and programs would be conducted annually to determine if objectives are being met, if habitat impacts are minimized, and if wildlife populations are being adversely affected. If evidence of unacceptable impacts begins to appear, it may be necessary to change the activity or the program, relocate the activity or program, or eliminate the program.

Stipulations that may be employed include those listed.

- Providing limited refuge-led and/or refuge approved wildlife observation and photography opportunities during refuge events and/or through special use permit would lessen species impacts.
- Providing access only on designated roads and trails would lessen species impacts.
- Vegetation that effectively conceals visitors and provides cover for birds can help minimize impacts of people in busy areas.
- Establishing buffer zones that minimize disturbance around sensitive areas and establishing no-entry zones during refuge approved events and opportunities would help minimize impacts.
- Rerouting, modifying, or eliminating activities which have demonstrated direct species impacts should be employed.
- Education is critical for making visitors aware that their actions can have negative impacts on plants and wildlife.

Justification: Wildlife observation and photography are priority public uses of the Refuge System. Providing quality, appropriate, and compatible opportunities for these activities help fulfill the provisions of the Improvement Act. Wildlife observation and photography would provide excellent forums for promoting increased awareness, understanding, and support of refuge resources relative to wildlife/human interactions. The stipulations outlined above should minimize potential impacts relative to wildlife/human interactions. Under a controlled level of limited visitation, these wildlife-dependent uses would not conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge and would be determined to be compatible with proposed refuge purposes.

Mandatory 15-year Re-evaluation Date:

Description of Use: *Research*

This pre-acquisition compatibility determination serves as our commitment to allow research activities to continue, where they are pre-existing and owner-authorized, on lands that would be acquired by the Service, should the refuge proposal go forward.

Research is a regular activity in this area, with various ongoing research projects, topics, habitat types, and species. 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, partners, and other research entities furthers refuge management and serves the purposes, vision, and goals of the refuge. The refuge would likley host research from a variety of research institutions, including various universities, Native American tribe(s), and private research groups. All research activities, whether conducted by governmental agencies, public research entities, universities, private research groups, or any other entity, would be required to obtain special use permits from the refuge. Approved refuge special use permits would contain conditions under which researchers must operate to help minimize negative impacts to refuge resources. All research activities would be overseen by the wildlife biologist/botanist, refuge manger, or staff member as assigned by the refuge manager or designee. Projects that are fish and wildlife management-oriented, which would provide needed information to refuge operation and management, would receive priority consideration and may even be solicited. A research policy would be established to provide guidance for the refuge's research program. The types of research activities conducted on the refuge might cover wildlife, habitat, climate change, water resources, cultural resources, and/or public use activities. The Service would work with area researchers and others to develop an understanding of the research activities associated with a particular site during the acquisition process.

Availability of Resources: The Merritt Island NWR Complex maintains geographic information system databases and a library of pertinent biological texts, published scientific and biological papers, reports, and reprints. Other than the administration of associated special use permits, no refuge resources are generally required for this use. The refuge may provide some type of housing for researchers if resources were available.

Anticipated Impacts of the Use: Generally, adverse impacts from research are minimal. An anticipated method of accessing research sites throughout the refuge may include ATVs or similar vehicles. A critical and objective evaluation of the potential effects that ATVs could have on wildlife and habitat would be based on the most current information available and best professional judgment. Although ATVs have the potential to impact refuge resources, the focus is to minimize their negative effects. This would be based on the impacts at the existing and projected level of use. 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 considerable, nor are they permanent. Also, a small number of individual plants or animals might be collected for further scientific study, but these collections would be anticipated to have minimal impact on the populations from which they came. All collections would adhere to the Service's specimen collection policy (Director's Order 109, dated March 28, 2005). (For more information regarding potential impacts associated with public use activities, please refer to the Environmental Assessment.)

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: All research conducted on the refuge must further the purposes of the refuge and the mission of the Refuge System. All research would 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 would require that a special use permit be obtained before any research activity may occur. Research proposals and/or research special use permit applications would be required to 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 would be conducted. Each special use permit holder would submit annual reports or updates to the refuge on research activities, progress, funding, and other information. Further, each special use permit holder would provide copies of findings, final reports, publications, and/or other documentation at the end of each project. Limiting use of ATVs primarily to designated trails and roads would minimize anticipated impacts. The refuge would deny permits for research proposals that are determined to not serve the purposes of the refuge and mission of the Refuge System. The refuge would 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 would be subject to the conditions of their respective permits. If evidence of unacceptable impacts begins to appear, it may be necessary to change the activity, move the activity, or eliminate the activity.

Justification: Research activities provide benefits to the refuge and to the natural resources supported by the refuge. 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 proposed purposes and goals of the refuge and the mission of the Refuge System.

Mandatory 10-year Re-evaluation Date:

Description of Use: *Camping*

This pre-acquisition compatibility determination serves as our commitment to allow camping activities to continue, where they are pre-existing and owner-authorized, on lands that would be acquired by the Service, should the refuge proposal go forward.

Camping is a traditional use in this area. Camping, as considered under this compatibility determination, is the primitive overnight cooking and sleeping accommodations erected at designated sites that facilitates access to remote areas of the refuge that would otherwise be unavailable during priority public use activities such as hunting and fishing. Camping would only be authorized in support of other approved refuge uses and to facilitate access to remote areas. Campsites would typically be located at the terminus of a designated trail and accessible by foot, bike, or horse. Campsite use by recreational vehicle or camper trailer, or camping at trailheads is not being considered. The Service would develop an understanding of camping activities for a particular site during the acquisition process.

If the refuge were to be approved, camping would be incorporated into any appropriate step-down management plans developed (e.g., hunt plan or visitor services plan) and in the CCP for the refuge. Such plan or plans would address a variety of elements associated with camping, including use(s) supported, number and location(s) of sites, capacity targets, periods of use, and impacts.

Availability of Resources: Annual refuge operation and maintenance funds provided for the Pelican Island NWR Sub-complex of the Merritt Island NWR Complex would be used to support camping as an activity which supports the refuge priority public use program. A refuge staff position may be allocated to maintenance of the potential campsite and may be assisted by refuge volunteers or other trail user groups. Further, refuge staff would be required to annually assess camping activities, including any public safety issues.

Anticipated Impacts of the Use: Some impacts, such as littering, vegetation trampling, and wildlife disturbance, can be expected, but these are anticipated to be localized and minor. The potential for accidental wildfires exists. (For more information regarding potential impacts associated with public use activities, please refer to the Environmental Assessment.)

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Camping would only be authorized to occur in association with an approved use of the refuge. Camping as a temporary or permanent residence would not be allowed. No open fires would be permitted. All litter/garbage would be required to be carried-off by campers. Camping would only be permitted in designated sites. Certain areas of the refuge may be restricted seasonally to protect breeding or nesting areas or to protect habitat. Camping would occur as a component of other priority public use programs to allow access to remote areas. To help ensure public safety, the refuge would likely require some kind of registration for campers (e.g., self registration at a trailhead or camping registration included in a hunt permit) with a limited length of stay (e.g., no more than 5 days within a 14-day period). Further, the Service may also consider camping fees to support this activity. If unacceptable impacts were to result from this activity the refuge would modify, move, or eliminate the use.

Justification: Primitive camping in designated camp sites would be a low-impact and low-cost activity and would occur as a component of refuge priority public use programs (e.g., hunting), which would be determined to be compatible with proposed refuge purposes.

Mandatory 10-year Re-evaluation Date:

Description of Use: *Hiking (including backpacking, jogging, and walking)*

This pre-acquisition compatibility determination serves as our commitment to allow hiking activities to continue, where they are pre-existing and owner-authorized, on lands that would be acquired by the Service, should the refuge proposal go forward.

Hiking is a traditional use in this area. Day-use by hikers, backpackers, joggers, and hikers are considered under this compatibility determination. Hiking would only be authorized in support of other approved refuge uses. Foot traffic trails would provide the opportunity for participants to become surrounded by the natural environment, instilling an appreciation for plants, animals, and their habitats. Portions of the Florida National Scenic Trail are found within the project area. The Service would develop an understanding of hiking activities for a particular site during the acquisition process.

Availability of Resources: Many existing roads and trails would be maintained for refuge purposes and therefore would not constitute additional maintenance costs to support hiking. The development of associated maps, signs, and brochures would be minor costs associated with hiking that would be supported by the Pelican Island NWR Sub-complex of the Merritt Island NWR Complex. Designated trails may be maintained by a combination of volunteers and refuge staff.

Anticipated Impacts of the Use: Impacts from these activities could include littering, vegetation trampling, and wildlife disturbance. (For more information regarding potential impacts associated with public use activities, please refer to the Environmental Assessment.)

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Hiking, Jogging, and walking would only be authorized in support of other approved refuge uses. Hiking, jogging, and walking would be restricted to daylight hours. Certain areas of the refuge may be restricted seasonally for breeding or nesting seasons or to protect habitat. Hiking, jogging, and walking would be limited to existing, designated roads and trails. If evidence of unacceptable impacts begins to appear, it may be necessary to change the activity, move the activity, or eliminate the activity.

Justification: These activities are low impact and considered to be wildlife-dependent. Hiking, jogging, and walking activities would be in support of priority public use activities and programs (e.g., wildlife observation), which would be determined to be compatible with proposed refuge purposes.

Mandatory 10-year Re-evaluation Date:

Description of Use: *Horseback Riding*

This pre-acquisition compatibility determination serves as our commitment to allow horseback riding activities to continue, where they are pre-existing and owner-authorized, on lands that would be acquired by the Service, should the refuge proposal go forward.

Horseback riding is a traditional use in this landscape. Horseback riding would only be authorized in support of other approved refuge uses, including camping. As proposed, horseback riding would occur only on designated refuge roads and trails. Use would be expected to be light and sporadic, occurring mostly during cooler weather (November through April), particularly on weekends. Horseback riding is currently allowed on public properties near the proposed refuge. The Service would develop an understanding of horseback riding activities for a particular site during the acquisition process.

Availability of Resources: Many existing roads and trails would be maintained for refuge purposes and therefore would not constitute additional maintenance costs to support horseback riding. The development of associated maps, signs, and brochures would be minor costs associated with horseback riding that would be supported by the Pelican Island NWR Sub-complex of the Merritt Island NWR Complex. Designated trails may be maintained by a combination of volunteers and refuge staff.

Anticipated Impacts of Use: The Service evaluated the potential effects of horseback riding on wildlife, habitat, human health, cultural resources, and other proposed refuge resources and uses. Although wildlife disturbance from horseback riding is not well-documented, some studies suggest that many wildlife species are habituated to livestock and that horseback wildlife observers can approach wildlife at closer distances than by other forms of travel. Any form of approach is expected to cause some disturbance, which would vary according to the species affected and the type, level, frequency, and duration of disturbance, as well as the time of day or year that it occurs. Horseback riding has both direct and indirect effects on habitat. Trampling causes mortality of plant (and animal) species by crushing them. Indirect effects result when soil is compacted and plants cannot re-establish. Grazing by horses can reduce vegetation. Debate exists within the literature over whether horse hair or feces can spread nonnative weed seed. Any trail or road can be a conduit for the introduction of nonnative plants, since exposed soil and abundant sunlight provide favorable conditions for establishment of these species.

Compacting and loosening of soils occur from stock riding, more so in moist or wet soils. Therefore, trails should be established in well-drained, upland sites. Roads and trails for public access affect hydrologic drainage patterns. Horseback riding is proposed to continue on designated roads and trails. While it is possible for horses to transmit parasitic diseases, particularly *Cryptosporidium parvum* and *Giardia duodenalis*, to humans via the water supply, these diseases are usually spread by pregnant mares and foals under six months old. Horse manure is not harmful to human health, although it can cause conflicts with other trail users, since it can be odorous, unaesthetic, and a nuisance. While there can be user group conflicts or safety issues resulting from hikers, cyclists, and horseback riders using the same roads and levees, these are not anticipated effects due to the current levels of use. Horseback travel on the designated roads and trails is considered safe under current conditions and leveld of use. Horseback riding would be permitted only on designated roads and trails and prohibited on established, interpretive hiking trails. (For more information regarding potential impacts associated with public use activities, please refer to the Environmental Assessment.)

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Horseback riding would only be authorized in support of other approved refuge uses. Horseback travel to facilitate priority public use would only be compatible on designated roads and trails. Horses would not be allowed on interpretive foot trails. Horseback riding would only be allowed between sunrise and sunset (which would be normal refuge hours). Group size would be limited to a maximum of eight riders who travel no more than two abreast. Horseback riding would be prohibited during deer gun hunting season in all refuge hunt areas. All roads and trails would be monitored annually to determine if they meet the compatibility criteria. Monitoring would be designed to assess the long-term effects of horse riding on refuge resources, visitor use, and route maintenance needs. Law enforcement patrols would be conducted throughout the year. The patrols would promote compliance with refuge regulations, monitor public use patterns and public safety, and document visitor interactions. Patrols would include recording visitor numbers, vehicle numbers, visitor activities, and activity locations to document the current and future level of refuge use. No corralling, tethering, or hitching of horses along trails would be allowed. Other areas of the refuge may be closed to the public seasonally to protect certain species or habitat. Riders would be able to gain entrance to the refuge road system only at designated access points. If evidence of unacceptable impacts begins to appear, it may be necessary to change the activity, move the activity, or eliminate the activity.

Justification: While not listed as a primary, wildlife-dependent recreational use under the Improvement Act, as amended, horseback riding is believed to be a compatible public use under the stipulations outlined in this compatibility determination for the proposed refuge. Primary reasons for this determination include the following: wildlife observation can be an element of horseback riding; horseback riding would allow the refuge to reach a target audience that it would not otherwise reach; horseback riders would be potential partners and a potential source of support for the refuge; and impacts associated with horseback riding are not believed to exceed impacts already caused by other public use activities. Horseback riding activities would be in support of priority public use activities and programs, which would be determined to be compatible with proposed refuge purposes.

Mandatory 10-year Re-evaluation Date:

Description of Use: *Bicycling*

This pre-acquisition compatibility determination serves as our commitment to allow bicycling activities to continue, where they are pre-existing and owner-authorized, on lands that would be acquired by the Service, should the refuge proposal go forward.

While not one of the six priority wildlife-dependent recreational uses listed in the National Wildlife Refuge System Improvement Act, bicycling is a mode of transportation currently used to facilitate wildlife observation. As proposed, bike riding would occur only on designated roads and trails. This use occurs all year. Bicycling would only be authorized in support of other approved refuge uses. Mountain biking (e.g., off-trail with an aggressive riding style) would not be allowed. The Service would develop an understanding of bicycling activities for a particular site during the acquisition process.

Availability of Resources: Many existing roads and trails would be maintained for refuge purposes and therefore would not constitute additional maintenance costs to support bicycling. The development of associated maps, signs, and brochures would be minor costs associated with bicycling that would be supported by the Pelican Island NWR Sub-complex of the Merritt Island NWR Complex. Designated trails may be maintained by a combination of volunteers and refuge staff.

Anticipated Impacts of the Use: Minor impacts may occur in association with bicycling, such as littering and vegetation and wildlife disturbance. Refuge law enforcement officers would patrol regularly and refuge staff and/or volunteers would regularly pick up litter. This is a critical and objective evaluation of the potential effects that bicycles could have on the wildlife, habitat, and other public use activities and is based on available information and best professional judgment. Although bicycling has the potential to have impacts, the focus is to minimize those impacts to below a certain threshold. This is based on the impacts at the existing and projected level of use.

Bicycling, as a mode of transportation to facilitate participation in other priority public uses such as wildlife observation, is an appropriate form of transportation to view wildlife. Other forms of bicycle riding such as mountain biking are not wildlife-dependent and are not considered appropriate under this compatibility determination. All bicycling would be allowed only on designated roads and trails.

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). In general, activities that occur outside of vehicles (including bicycling) tend to increase the disturbance potential for most wildlife species (Klein 1993, Gabrielson and

Smith 1995; Burger 1981; Pease et al. 2005). Out of vehicle activities along wildlife observation trails and pullouts along the trails have the greatest potential for disturbing wildlife species.

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, is disruptive (Laskowski 1999). As a result, marsh birds 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 1993). A 2005 study at Back Bay 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. Based on the current and anticipated level of use, bicycling is not considered to have negative long-term impacts to wildlife or refuge habitats. (For more information regarding potential impacts associated with public use activities, please refer to the Environmental Assessment.)

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Bicycling would only be authorized in support of other approved refuge uses. All forms of wildlife observation should have minimal wildlife and habitat impacts. However, bicycling can cause wildlife impacts in open wetland areas, can increase wildlife impacts, and can disrupt other individuals viewing wildlife. Bicycles would not be permitted on established interpretative trails. Evaluation of bike riding on designated roads and trails would 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, move the activity, or eliminate the activity.

Justification: Bicycling to observe wildlife facilitates priority public uses of the Refuge System. Providing opportunities for these activities contributes toward fulfilling provisions of the 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. At the anticipated and current level of visitation, bicycling does not seem to conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the proposed refuge. Bicycling activities would be in support of priority public use activities and programs (e.g., wildlife observation), which would be determined to be compatible with proposed refuge purposes.

Mandatory 10-year Re-evaluation Date:

Description of Use: *Grazing*

This pre-acquisition compatibility determination serves as our commitment to consider using grazing activities as a management tool, where they are pre-existing and owner-authorized, on lands that would be acquired by the Service, should the refuge proposal go forward.

Grazing is a traditional use in this area. Grazing under the terms of this compatibility determination is to allow the limited and controlled grazing by domestic livestock, chiefly cattle, but potentially including other domestic livestock, on refuge managed lands to improve the vigor and health of forestlands, grasslands, and other appropriate habitats. Further, grazing can be used as a management tool to further refuge management goals and objectives, such as habitat restoration and maintenance provided through prescribed fire, mechanical control, and nonnative plant control activities. Controlled grazing is recognized as a valuable tool to remove standing vegetation, reduce vegetation litter, and suppress undesired woody vegetation.

Frequency, duration, and timing of livestock on any particular unit would be evaluated and agreed upon by the Service and the grazing operation on a case-by-case basis. Most commonly, we would use high intensity, short duration grazing pulses (lasting perhaps four to eight weeks) and then require livestock removal. We would target two typical seasons of use: (1) wet season (May through October), which would be designed to reduce the vigor of nonnative species and increase the vigor of native species, while (2) dry season (November through April) may be used to stimulate native vegetation response after nesting season and would be designed to further reduce nonnative species. Fencing may be and control of livestock would be the responsibility of the cooperating private party under a refuge special use permit. Frequency of cattle on any unit would be based on site-specific evaluation of the unit being managed. A typical scenario may include a unit being grazed for two consecutive years with grazing eliminated from the unit for several years before resuming grazing operations.

Market rate grazing fees would be required of permittees. Market grazing fees would include typical market deductions for unusual fencing requirements, required cattle movement, or other factors limiting economic return for the permittees. Market rates [per animal unit month (AUM)] would be determined on a case-by-case basis and would be determined annually in consultation with the U.S. Department of Agriculture on prevailing local grazing rates. One AUM is the amount of forage consumed by a cow/calf pair in a 30-day grazing period. Thus the grazing fee for each cow/calf pair would be determined for each 30 days of grazing.

Grazing is not considered a priority public use as identified in the Improvement Act. As an economic use of Refuge System lands, a compatibility determination for grazing would be mandatory.

Availability of Resources: Developing grazing agreements and monitoring compliance and biological effects requires some Service resources. Most grazing costs (e.g., fencing and monitoring herd health) would be assumed by the permittee. Some alternative resource management would be required if we were not to use grazing as a management tool. Typically, these other tools would be prescribed burning and mechanical control with light to heavy equipment, including using mowers and Gyrotrac. These costs would be assumed by the agency. Prescribed burning is an effective management tool, but staff limitations and unit logistics may prevent us from burning as many acres as desirable each year. Plus, there is likely an ecological benefit to rotating management techniques and seasons over time so that a given unit may be grazed one year and burned another. Annual refuge operation and maintenance funds provided for the Pelican Island NWR Sub-complex of the Merritt Island NWR Complex would be used to support grazing as an activity which supports refuge management goals and objectives.

Anticipated Impacts of the Use: Grazing by domestic livestock has severe short-term effects on plant communities and ecosystems. Many of these effects are desirable and are designed to maintain and improve healthy natural area communities. Some impacts, such as vegetation trampling and wildlife disturbance, can be expected, but these are anticipated to be localized and minor. Some of these effects include removing standing vegetation, trampling of other vegetation, and reducing populations of pioneering, undesirable woody plants. Other effects of grazing are more harmful but generally short-lived. Grazing can cause direct loss of habitat and species in cases where extended frequencies, increased density of livestock on the unit, and long rotations occur. However, controlled grazing is typically of short duration where frequency would be set by natural resource conditions and management goals, thus long-term, chronic impacts expressed from livestock overgrazing are not anticipated.

Grazing livestock can create minor direct disturbance to wildlife, but any harm should be negligible. Grazing at any time of the year could create an aesthetic issue of concern for some people who enjoy using the refuge in a natural state; seeing public lands being grazed by domestic livestock may reduce the appeal of the visit. There is a slight potential for conflict between members of the public and livestock or the permittee, particularly during the dry or winter season when most units would be expected to receive their heaviest use. All permittees would be advised that the unit may be open to the public for appropriate and compatible visitor uses that may include hunting and other forms of wildlife-dependent recreation. The public would be informed that appropriate and compatible visitor uses may be precluded during periods when cattle were being grazed in a visitor use area. There would be a very slight risk of injury to the public caused by livestock. Most visitors who are uncomfortable using property containing livestock would likely to select another unit or another time of year for their visit.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Grazing would be allowed only as a tool to further refuge management goals and objectives. Stipulations in the required refuge special use permit would likely include the listed items and could include additional conditions under which any allowed grazing would be required to operate.

- Grazing frequency, duration, and timing would be evaluated on a case-by-case basis and subject to the goals, objectives, and strategies of the refuge and the particular refuge unit. Unit specific compatibility determinations may be necessary to fulfill the vision, purposes, goals, objectives, and strategies of the refuge and unit.
- All fencing costs would be borne by the permittee.
- No insecticides, including insecticidal dusting bags, would be used.
- No supplemental feeding would be allowed without specific authorization of the refuge manager.
- Control and confinement of the livestock would be the responsibility of the permittee.

If unacceptable impacts were to result from this activity the refuge would modify, move, or eliminate the use.

Justification: Grazing is another tool that the refuge could employ to meet refuge management goals and objectives and thus would be compatible with proposed refuge purposes. Controlled grazing by domestic livestock would not materially interfere with or detract from the purposes for which the refuge would be established. Limited livestock grazing creates temporary disturbances to vegetation and many of these disturbances are desirable for management. Grazing produces an undesirable but short-term impact to site aesthetics for some and wildlife displacement. Controlled grazing would be an alternative management tool that could be used to replace or complement prescribed burning, mechanical control, and application of herbicides to control nuisance plant species. Without occasional disturbance caused by burning, mechanical control, herbicide control, or grazing, natural area health would decline, as would an area's potential and suitability for wildlife production.

Mandatory 10-year Re-evaluation Date:

Public Review Comment: A 45-day public review and comment period will enable interested parties to comment on the proposed interim compatibility determinations.

NEPA Compliance for Refuge Uses Descriptions:

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

References:

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Appendix C. Interim Recreation Act Funding Analysis

Proposed Refuge Name: Everglades Headwaters National Wildlife Refuge and Conservation Area

Date Established: Currently Proposed

Purposes for Which the Refuge is Proposed to be Established:

> *"... 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 of 1973)*
>
> *"…the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions ..." 16 U.S.C. 3901(b), 100 Stat. 3583 (Emergency Wetlands Resources Act of 1986)*
>
> *"…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds…." 16 U.S.C. 715d (Migratory Bird Conservation Act)*
>
> *"…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) "…for the development, advancement, management, conservation, and protection of fish and wildlife resources...." 16 U.S.C. 742f(a)(4), (Secretarial powers to implement laws related to fish and wildlife) (Fish and Wildlife Act of 1956)*
>
> *"…suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. 460k-1 "... 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 (16 U.S.C. 460k-460k-4), as amended]*

Recreational Use(s) Evaluated: (1) Recreational hunting of resident game (e.g., deer, turkey, and small game) and migratory birds (i.e., waterfowl) in accordance with federal and State of Florida regulations, (2) recreational fishing of freshwater fish species (e.g., largemouth bass, bream, catfish, and crappie) in accordance with State of Florida regulations, (3) environmental education and interpretation, (4) wildlife observation and photography, (5) research, (6)camping (as component of priority public uses), (7) hiking (as component of priority public uses), (8) horseback riding (as component of priority public uses), and (9) bicycling (as component of priority public uses).

Funding Required to Administer and Manage the Proposed Recreational Use(s): The Service would use existing staff from nearby refuges such as the Merritt Island and Pelican Island NWR Complexes. Funding to support the proposed Everglades Headwaters NWR and Conservation Area would be made available to implement initial protection activities, hunt implementation, data

collection, and non-consumptive uses. The Service would also cooperate with FWC to support initial public use activities on the proposed refuge, including the provision of law enforcement support. The Service would continue discussions with FWC regarding opportunities for state wildlife management area designation(s) and management, co-management, and joint activities.

Based on a review of the refuge budget allocated for recreational use management, I certify that funding is adequate to ensure compatibility and to administer and manage the recreational use(s).

Project Leader: _____
Signature/Date

Refuge Supervisor: _____
Signature/Date

Regional Chief, National Wildlife Refuge System: _____
Signature/Date

Appendix D. Information on Preparers

Contributors to the documents:

- Keenan Adams; Wildlife Refuge Specialist; Pelican Island, Archie Carr, and Lake Wales Ridge NWRs; Merritt Island NWR Complex; USFWS
- James Caudill, Senior Economist, Division of Economics, Washington Office, USFWS
- Cheri M. Ehrhardt, AICP, Natural Resource Planner, Area 2, Southeast Region, USFWS
- John Galvez, Project Leader, Peninsular Florida Fish and Wildlife Conservation Office, USFWS
- Steve Glass, South Florida Ecological Services Field Office, USFWS
- Betty Gouge, Realty Specialist, Realty, Southeast Region, USFWS
- Layne Hamilton, Project Leader, Merritt Island NWR Complex, USFWS
- Laura Housh, Land Protection Planner, Southeast Region, USFWS
- Richard Kanaski, Regional Archaeologist, Southeast Region, USFWS
- Kristen Kneifl; Refuge Biologist; Pelican Island, Archie Carr, and Lake Wales Ridge NWRs; Merritt Island NWR Complex; USFWS
- Lori Miller, Hydrologist, South Florida Ecological Services Field Office, USFWS
- Evelyn Nelson, Writer/Editor, Southeast Region, USFWS
- Charlie Pelizza; Refuge Manager; Pelican Island, Archie Carr, and Lake Wales Ridge NWRs; Merritt Island NWR Complex; USFWS
- Steve Schubert, Fish and Wildlife Biologist, South Florida Ecological Services Field Office, USFWS
- Marilyn Stoll, Senior Fish and Wildlife Biologist, South Florida Ecological Services Field Office, USFWS
- Oliver van den Ende, Natural Resource Planner, Southeast Region, USFWS
- Allen Webb, Senior Fish and Wildlife Biologist, South Florida Ecological Services Field Office, USFWS
- Barry Wood, GIS Specialist, South Florida Ecological Services Field Office, USFWS

Reviewers of the documents, in whole or in part:

- Chris Belden, Senior Fish and Wildlife Biologist, South Florida Ecological Services Field Office, USFWS
- Dave Bender, Botanist, South Florida Ecological Services Field Office, USFWS
- Robert Frakes, Supervisory Ecologist, South Florida Ecological Services Field Office, USFWS
- Tamar Hogan, Realty Chief, Southeast Region, USFWS
- Rose Hopp, Planning Chief, Southeast Region, USFWS
- Pam Horton, Compatibility Determination Coordinator, Southeast Region, USFWS
- Chuck Hunter, Resource Management Chief, Southeast Region, USFWS
- Marilyn Knight, Fish and Wildlife Biologist, South Florida Ecological Services Field Office, USFWS
- Brian Powell, Fish and Wildlife Biologist, South Florida Ecological Services Field Office, USFWS
- Sandra Sneckenberger, Fish and Wildlife Biologist, South Florida Ecological Services Field Office, USFWS

- Elizabeth Souheaver, Refuge Supervisor, Area 2, Southeast Region, USFWS
- Susan Trokey, Realty Specialist, Southeast Region, USFWS
- Richard Warner, NEPA Coordinator, Southeast Region, USFWS

Appendix E. Public Lands Located in Study Area by County

The following table shows acreages public lands located in the Study Area by county.

Appendix E. Table 1. Public lands located in the Study Area by county

NAME	COUNTY	ACRES
Archbold Biological Station	Highlands	2,634
Avon Park Air Force Range - Highlands	Highlands	54,635
Carter Creek	Highlands	245
Highlands Hammock State Park	Highlands	2,721
Holmes Avenue	Highlands	10
Jack Creek	Highlands	1,285
Kissimmee Prairie Preserve State Park - Highlands	Highlands	4
Kissimmee River - Highlands	Highlands	12,080
Lake June-in-Winter Scrub State Park	Highlands	864
Lake Wales Ridge National Wildlife Refuge	Highlands	1,658
Lake Wales Ridge State Forest - Highlands	Highlands	0
Lake Wales Ridge Wildlife and Environmental Area - Highlands	Highlands	13,564
Paradise Run - Highlands	Highlands	248
	Subtotal	***89,948***

NAME	COUNTY	ACRES
Avon Park Air Force Range - Okeechobee	Okeechobee	118
Kissimmee Prairie Preserve State Park - Okeechobee	Okeechobee	53,261
Kissimmee River - Okeechobee	Okeechobee	18,426
Lake Okeechobee Sanctuaries	Okeechobee	14
Lake Okeechobee Water Retention Phosphorus Removal Project	Okeechobee	194
Lemkin Creek Urban Treatment Area	Okeechobee	154
North of Lake Okeechobee Storage Reservoir	Okeechobee	13
Paradise Run - Okeechobee	Okeechobee	1,431
Taylor Creek/Nubbins Slough STA	Okeechobee	4,783
	Subtotal	***78,394***
North of Lake Okeechobee Storage	Glades	4,701
Paradise Run	Glades	3,328
	Subtotal	***8,029***
Disney Wilderness Preserve - Osceola	Osceola	5,285
Escape Ranch Conservation Easement	Osceola	312
Kissimmee Chain of Lakes - Osceola	Osceola	18,140
Kissimmee Prairie Preserve State Park - Osceola	Osceola	520
Kissimmee River - Osceola	Osceola	4,972

NAME	COUNTY	ACRES
Lake Kissimmee State Park - Osceola	Osceola	85
Lake Lizzie Conservation Area	Osceola	1,073
Lonesome Camp Ranch Conservation Area	Osceola	2,513
Split Oak Forest Mitigation Park Wildlife and Environmental Area - Osceola	Osceola	628
Three Lakes Wildlife Management Area	Osceola	41,762
Upper Lakes Basin Watershed - Osceola	Osceola	490
	Subtotal	***75,780***
Allen David Broussard Catfish Creek Preserve State Park	Polk	8,328
Avon Park Air Force Range - Polk	Polk	53,671
Bok Tower Gardens	Polk	210
Crooked Lake Prairie	Polk	201
Crooked Lake Sandhill	Polk	25
Crooked Lake West	Polk	18
Disney Wilderness Preserve - Polk	Polk	6,698
Hancock Commons Tract	Polk	41
Hatchineha Ranch	Polk	5,126
Hickory Lake Scrub County Park	Polk	56
Kissimmee Chain of Lakes - Polk	Polk	11,126

NAME	COUNTY	ACRES
Kissimmee Prairie Preserve State Park - Polk	Polk	0
Kissimmee River - Polk	Polk	7,903
Lake Kissimmee State Park - Polk	Polk	5,809
Lake Wales Ridge State Forest - Polk	Polk	26,824
Lake Wales Ridge Wildlife and Environmental Area - Polk	Polk	642
Lake Wales Trailways	Polk	3
Mary Male Sanctuary	Polk	20
North/Walk-in-Water Creek	Polk	1,105
SUMICA	Polk	4,038
Saddle Blanket Scrub Preserve	Polk	509
Sherwood L. Stokes Preserve/Lake Marion	Polk	121
Sun Ray Scrub	Polk	9
TNC/Dellock	Polk	11
Tiger Creek Preserve	Polk	4,863
Upper Lakes Basin Watershed - Polk	Polk	2,297
	Subtotal	***139,654***
	Total	**391,805**

Appendix F. Habitat Ranking, Alternative Development, and Land Acquisition Prioritization Methodology

INTRODUCTION

The proposal to establish an Everglades Headwaters NWR and Conservation Area led to the identification of an approximately 1.8 million-acre Study Area, a general area of conservation interest in south-central peninsular Florida. Within this area lies a diversity of habitat types and other resource values that are fully described in this Draft EA (Chapter II). In addition, landowner interest in the project far exceeds the proposed acquisition boundary acreage. In order to prioritize, evaluate, and identify the specific parcels of land to be included in the proposed approximately 150,000-acre Everglades Headwaters NWR and Conservation Area, a methodology was needed to scientifically and objectively identify focal areas for conservation, and the highest priority lands for acquisition within those focal areas. Prioritization occurred at three levels of resolution. At the landscape level, we needed to first rank habitats based on the goals established for the proposed refuge. Once all habitats were ranked, a set of alternatives was developed and evaluated as part of the NEPA compliance (Chapter III), thereby establishing local priorities. The Proposed Action - Alternative C - includes two areas: Conservation Partnership Area and Conservation Focal Area.

> Conservation Partnership Area – The area within which the Service would have the ability to work with partners and landowners on an array of less than fee title conservation activities, including management agreements and conservation easements, and within which the Service would have authority to acquire up to 100,000 acres in less than fee title for a proposed Conservation Area.
>
> Conservation Focal Area – The Service identified a 130,000-acre area within which the Service would have authority to acquire up to 50,000 acres with a fee title acquisition focus.

Lastly, once a proposed action was selected, it was necessary at the site-specific scale to further define focal areas for conservation as well as identifying specific parcels for fee and less than fee title acquisition. The methodology used to define these parameters is described below.

<u>Objective</u>

The objectives of this prioritization methodology are to:

- At a landscape scale, identify the highest quality habitats within the Study Area, as defined by the stated goals and vision for the proposed Everglades Headwaters NWR and Conservation Area
- At a local scale, identify lands to be contained within the Conservation Focal Area
- At a site specific scale, rank and select specific parcels for acquisition that best meet refuge goals and objectives

<u>Methodology – Landscape-Scale Habitat Ranking</u>

Initial classification for identifying the highest quality habitats within the Study Area was based on two criteria: (1) To identify high-priority ecological value lands that are currently unprotected, and (2) quantify connectivity between currently conserved lands, thus identifying potential corridors for animal movement across the landscape.

This portion of the planning process began with the selection of a land cover layer, Cooperative Land Cover Map (FNAI 2010). The 112 FNAI land cover types found within the Study Area were then combined into the 12 land cover types used in the analysis for this document (Appendix F, Figure 1), upon which to conduct a Geographic Information Systems (GIS) analysis. FWC's 2003 raster graphic land cover layer, and SFWMD's 2004 vector version of the FDOT Future Land Use and Cover Classification System (FLUCCS) code coverage were assessed and integrated into the base layer along with the FNAI Cooperative Land Cover Map. In an effort to build an analytical model for subsequent alternatives analysis development for the project we crosswalked each land cover code into a more generalized ecological community based on the Service's South Florida Multi-Species Recovery Plan (Service 1999).

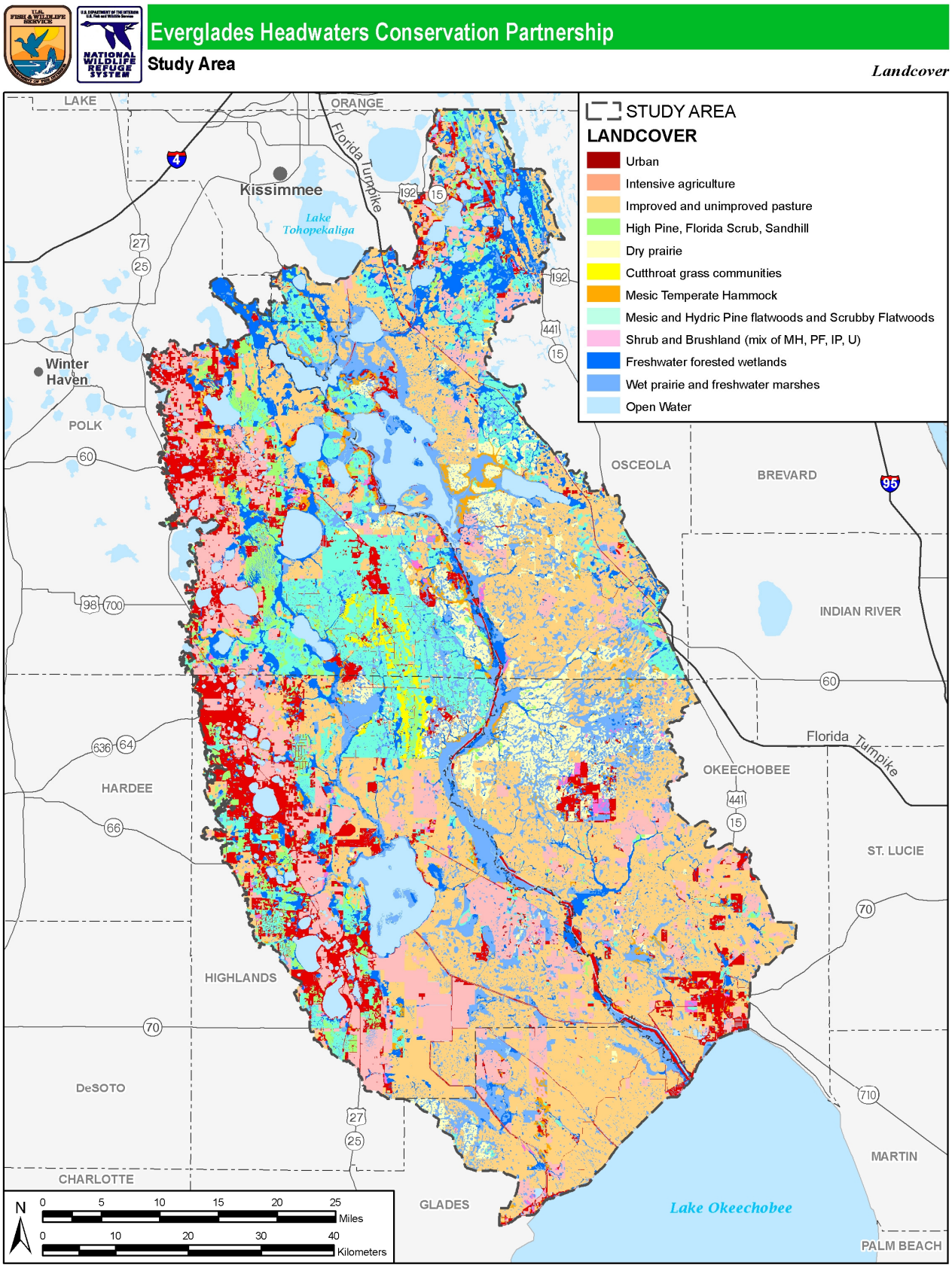
The land cover base map used in this planning process is derived from existing sources and expert review of aerial photography for focal communities, and is improved upon by integrating local ecologically based land cover and data for focal natural communities that were revised through review of aerial photography. The map provides significantly improved data for scrub and sandhill land cover types. All data were crosswalked into the Florida Land Use and Cover Classification System. The Service examined the new FNAI coverage data within the Study Area boundary for potential outliers, finding two miscoded land covers. One was "1670 sand beach – coastal uplands," which upon examination was a sandy shoreline along Lake Livingston (freshwater). The other was "5220 tidal flat," which appeared to be a cattle pond dug into a former freshwater marsh surrounded by a ring of deciduous trees within a pasture. These data were recoded to their proper codes.

The area used for the GIS analysis included all areas within 20 kilometers of the Study Area boundary. Analysis was conducted on this larger area so that the Study Area boundary would not inadvertently constrain the analysis and reduce the possibility of inappropriately excluding connectivity options that were available immediately outside of the Study Area boundary.

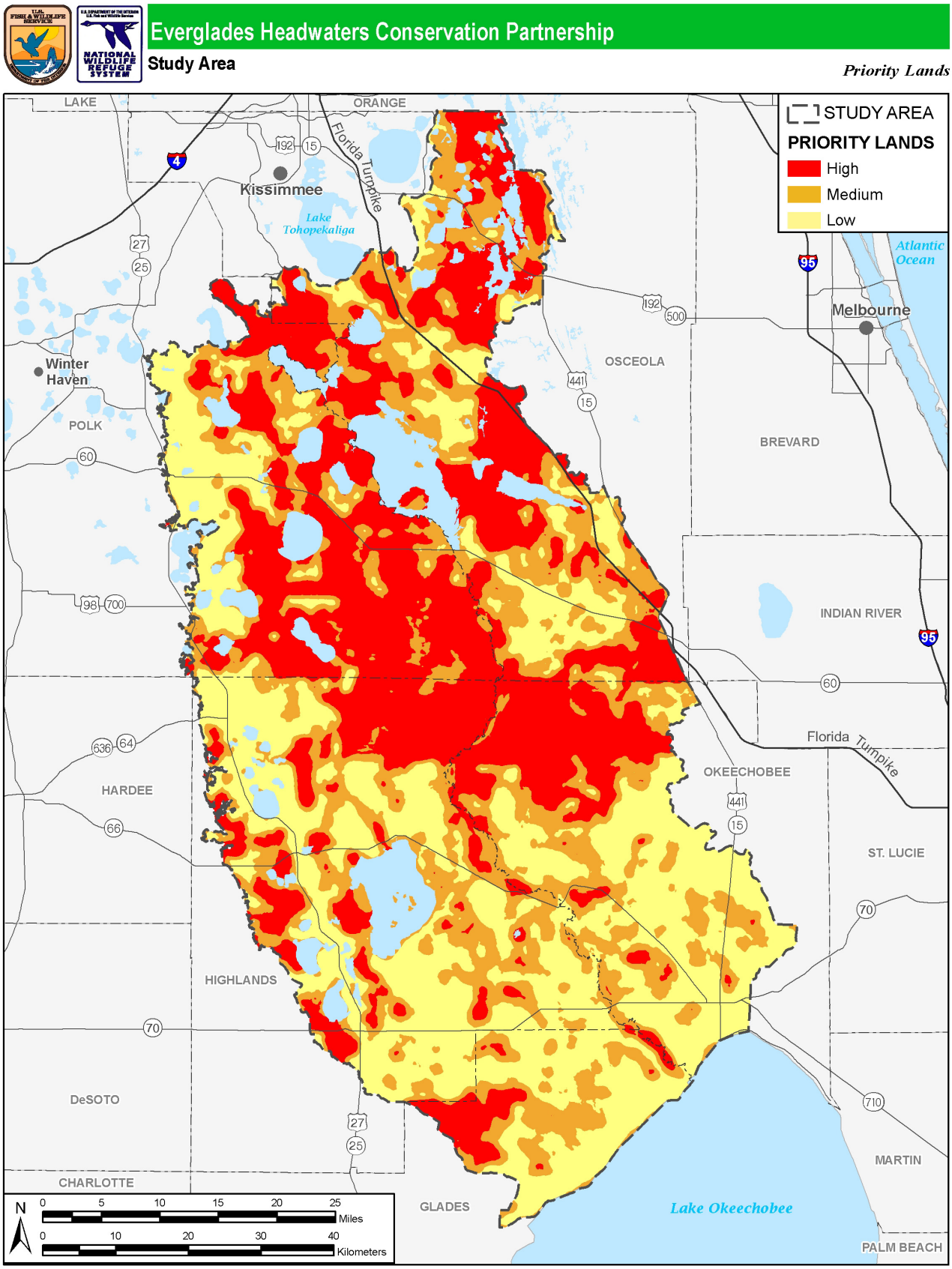
A group of biologists and GIS technicians from the FWC and FWS was convened, and using best professional judgment, framed a strategy for the selection of the habitats considered most rare or most in need of protection within the Study Area, because they support both keystone species and habitats, or federally listed threatened or endangered species. The FNAI Cooperative Land Cover Map was reclassified into a six-class scheme to prioritize the land cover types into five priority classes (the sixth class being of no conservation value), based upon the needs of the proposal and identifying land cover classes considered to be barriers. Generally, the highest priority habitats were dry prairie (with any associated wet prairie habitat that could support Florida grasshopper sparrows), cutthroat grass and seeps, and Florida scrub or sandhill (that could support xeric plants and animals). The second highest ranking habitats were all flatwoods types (scrubby, mesic, and hydric), and other upland and wetland forests. The third highest priority habitats were primarily long-hydroperiod herbaceous marshes. Fourth and fifth ranked habitats were also developed, but in many cases these were potentially undesirable land covers (e.g., row crops received a rank of 5 due to low wildlife habitat, high level of repeated human disturbance, and potential for chemical contaminants in the soils) (Appendix F, Table 1 and Appendix F, Figure 2).

In order to quantify and demonstrate connectivity between existing landscapes and potential corridors, two neighborhood statistic analyses were run using the Spatial Analyst Extension of ArcGIS (ESRI 2011). The neighborhood statistic creates output values for each cell (pixel) location based on the value for that location and the values identified in a neighborhood specified by the user. The neighborhood statistic analyses were run using a weighted prioritization of the FNAI cooperative land cover. The weighted land cover prioritization gives preference to the higher priority classes

Appendix F. Figure 1. Study Area land cover



Appendix F. Figure 2. Priority land cover



(Appendix F, Table 1). The analysis used sum as the statistic type, circle as the neighborhood, and the distances selected for the neighborhood were 250 meters and one kilometer. For the neighborhood statistic output, as a pixel value increases it identifies areas with greater amounts of higher priority habitats within the neighborhood distance. The one kilometer neighborhood analysis identifies areas with large amounts of priority habitats on a large scale, whereas the 250-meter neighborhood analysis identifies these areas on a finer scale. The 250-meter neighborhood identifies narrower potential corridors and smaller patches of priority habitats than the one kilometer analysis due to the smaller window (neighborhood) in the analysis.

To generate the model conclusions both neighborhood statistic output maps were reclassified using a two-class equal interval classification scheme where the lower half of the pixel values were given a value of No Data and the upper half of pixel values were given a value of one. We retained these reclassified layers in our final model: all areas in the reclassified one kilometer neighborhood analysis, and only patches in the reclassified 250-meter neighborhood analysis that intersect the one kilometer reclassification. The final model uses the reclassified one kilometer neighborhood analysis patches as its foundation for priority areas and incorporates potential finer scale connectivity from these areas by retaining the intersecting reclassified 250-meter neighborhood analysis patches.

Both the Priority Class rank, and the Neighborhood Statistic Value were combined to develop the priority land cover which is used in all subsequent analysis. Appendix F, Figure 2, represents the highest conservation value lands on a landscape scale based upon the criteria set forth in this proposal and satisfies the first objective set forth in Appendix F and also provides the framework for assessing alternative development and land acquisition prioritization strategies. Appendix F, Table 1, shows the priority land cover types, assigned ecological priority classes, and neighborhood statistic value. Appendix F, Figure 2, shows the three priority land covers derived from the above described GIS analysis.

Appendix F. Table 1. Assigned values for prioritization of FNAI cooperative land cover map

Land Cover Type	USFWS Priority Class	Neighborhood Statistic Value
1150 - Xeric Hammock	Priority 1	10
1210 – Scrub	Priority 1	10
1211 - Oak Scrub	Priority 1	10
1213 - Sand Pine Scrub	Priority 1	10
1230 - Upland Coniferous	Priority 1	10
1240 – Sandhill	Priority 1	10
1330 - Dry Prairie	Priority 1	10
2111 - Wet Prairie	Priority 1	10
21112 - Cutthroat Seep	Priority 1	10
222111 - Cutthroat Grass Flatwoods	Priority 1	10
3117 - Sandhill Lake	Priority 1	10

Land Cover Type	USFWS Priority Class	Neighborhood Statistic Value
1110 - Upland Hardwood Forest	Priority 2	8
1120 - Mesic Hammock	Priority 2	8
1123 - Live Oak	Priority 2	8
1125 - Cabbage Palm	Priority 2	8
1311 - Mesic Flatwoods	Priority 2	8
1312 - Scrubby Flatwoods	Priority 2	8
1400 - Mixed Hardwood-Coniferous	Priority 2	8
1410 - Successional Hardwood Forest	Priority 2	8
2123 - Floodplain Marsh	Priority 2	8
2200 - Freshwater Forested Wetlands	Priority 2	8
2210 - Cypress/Tupelo(incl Cy/Tu mixed)	Priority 2	8
2211 – Cypress	Priority 2	8
2213 - Isolated Freshwater Swamp	Priority 2	8
22131 - Dome Swamp	Priority 2	8
221312 - Gum Pond	Priority 2	8
22132 - Basin Swamp	Priority 2	8
2215 - Floodplain Swamp	Priority 2	8
2220 - Other Coniferous Wetlands	Priority 2	8
2221 - Wet Flatwoods	Priority 2	8
22211 - Hydric Pine Flatwoods	Priority 2	8
2230 - Other Hardwood Wetlands	Priority 2	8
2232 - Hydric Hammock	Priority 2	8
2233 - Mixed Wetland Hardwoods	Priority 2	8
2240 - Other Wetland Forested Mixed	Priority 2	8
2242 - Cypress/Pine/Cabbage Palm	Priority 2	8
1500 - Shrub and Brushland	Priority 3	5
1670 - Sand Beach (Dry)	Priority 3	5

Land Cover Type	USFWS Priority Class	Neighborhood Statistic Value
183214 - Unimproved/Woodland Pasture	Priority 3	5
2100 - Freshwater Non-Forested Wetlands	Priority 3	5
2112 - Mixed Scrub-Shrub Wetland	Priority 3	5
21121 - Shrub Bog	Priority 3	5
2120 - Freshwater Marshes	Priority 3	5
2121 - Isolated Freshwater Marsh	Priority 3	5
21211 - Depression Marsh	Priority 3	5
21212 - Basin Marsh	Priority 3	5
2124 - Slough Marsh	Priority 3	5
2131 – Sawgrass	Priority 3	5
2140 - Floating/Emergent Aquatic Vegetation	Priority 3	5
2141 – Slough	Priority 3	5
2231 – Baygall	Priority 3	5
22311 - Bay Swamp	Priority 3	5
22312 - South Florida Bayhead	Priority 3	5
2300 - Non-vegetated Wetland	Priority 3	5
3100 - Natural Lakes & Ponds	Priority 3	5
3113 - Flatwoods/Prairie/Marsh Lake	Priority 3	5
4100 - Natural Rivers & Streams	Priority 3	5
4120 - Blackwater Stream	Priority 3	5
8000 - Open Water	Priority 3	5
18211 - Urban Open Land	Priority 4	2
182111 - Urban Open Forested	Priority 4	2
182112 - Urban Open Pine	Priority 4	2
18212 - Low Structure Density	Priority 4	2
182131 – Parks	Priority 4	2
1831 - Rural Open	Priority 4	2

Land Cover Type	USFWS Priority Class	Neighborhood Statistic Value
18311 - Rural Open Forested	Priority 4	2
183111 - Oak - Cabbage Palm Forests	Priority 4	2
18312 - Rural Open Pine	Priority 4	2
1832121 – Sugarcane	Priority 4	2
183213 - Improved Pasture	Priority 4	2
18322 - Orchards/Groves	Priority 4	2
183221 – Citrus	Priority 4	2
183222 - Fruit Orchards	Priority 4	2
18323 - Tree Plantations	Priority 4	2
183232 - Coniferous Plantations	Priority 4	2
3200 - Artificial Lakes & Ponds	Priority 4	2
3211 - Aquacultural Ponds	Priority 4	2
3220 - Artificial Impoundment/Reservoir	Priority 4	2
3230 - Quarry Pond	Priority 4	2
4200 - Canal/Ditch	Priority 4	2
4210 – Canal	Priority 4	2
1832 – Agriculture	Priority 5	1
18321 - Cropland/Pasture	Priority 5	1
183211 - Row Crops	Priority 5	1
183212 - Field Crops	Priority 5	1
18324 - Vineyard & Nurseries	Priority 5	1
183241 - Tree Nurseries	Priority 5	1
183242 - Sod Farms	Priority 5	1
183243 – Ornamentals	Priority 5	1
183251 - Feeding Operations	Priority 5	1
183252 - Specialty Farms	Priority 5	1
1880 - Bare Soil/Clear Cut	Priority 5	1

Land Cover Type	USFWS Priority Class	Neighborhood Statistic Value
7200 – Melaleuca	Priority 5	1
7300 - Brazilian Pepper	Priority 5	1
9100 - Unconsolidated Substrate	Priority 5	1
1821 - Low Intensity Urban	Barrier	No Value
182132 - Golf courses	Barrier	No Value
182135 – Cemeteries	Barrier	No Value
1822 - High Intensity Urban	Barrier	No Value
18221 - Residential, Med. Density	Barrier	No Value
18222 - Residential, High Density	Barrier	No Value
18223 - Commercial & Services	Barrier	No Value
18224 – Industrial	Barrier	No Value
18225 – Institutional	Barrier	No Value
1840 – Transportation	Barrier	No Value
1841 – Roads	Barrier	No Value
1850 – Communication	Barrier	No Value
1860 – Utilities	Barrier	No Value
1870 – Extractive	Barrier	No Value
1873 - Rock Quarries	Barrier	No Value
1877 - Spoil Area	Barrier	No Value
3240 - Sewage Treatment Pond	Barrier	No Value
3260 - Industrial Cooling Pond	Barrier	No Value

Methodology – Alternative Development

Based on landscape scale habitat ranking, location of existing conservation lands (Appendix F, Figure 3), and best professional judgment, we found that the Study Area was easily divided into two main planning areas based upon the distinctly different resource values found in each: (1) Scrub, sandhill and related habitats and species associated with Lake Wales Ridge; and (2) grasslands, pine forests, extensive wetlands and the species associated with the prairie landscape. Thus, the approximately 1.8 million-acre Study Area was divided ecologically along the Kissimmee River corridor and the center line of the Kissimmee Chain of Lakes. The landscape lying west of this divide is labeled the Ridge Area and those lands lying east of this divide are labeled the Prairie Planning Area.

Real estate parcel data were then overlaid onto the model data to see where existing conservation lands were located, and to identify geographic areas of high-priority habitat for potential acquisition. Species occurrence data for federally listed scrub plants such as Florida ziziphus were also added as an internal check to confirm that the habitats were proper surrogates for, in this case, xeric plants.

For ease of prioritization, each planning area was divided into three units: Ridge North, Ridge Central, Ridge South, Prairie North, Prairie Central, and Prairie South. This division is based on a combination of: (1) The abundance of high-quality conservation lands occurring within a generalized area of the landscape; (2) connectivity to other identified high-quality habitats; and (3) observable linkages between existing conservation lands.

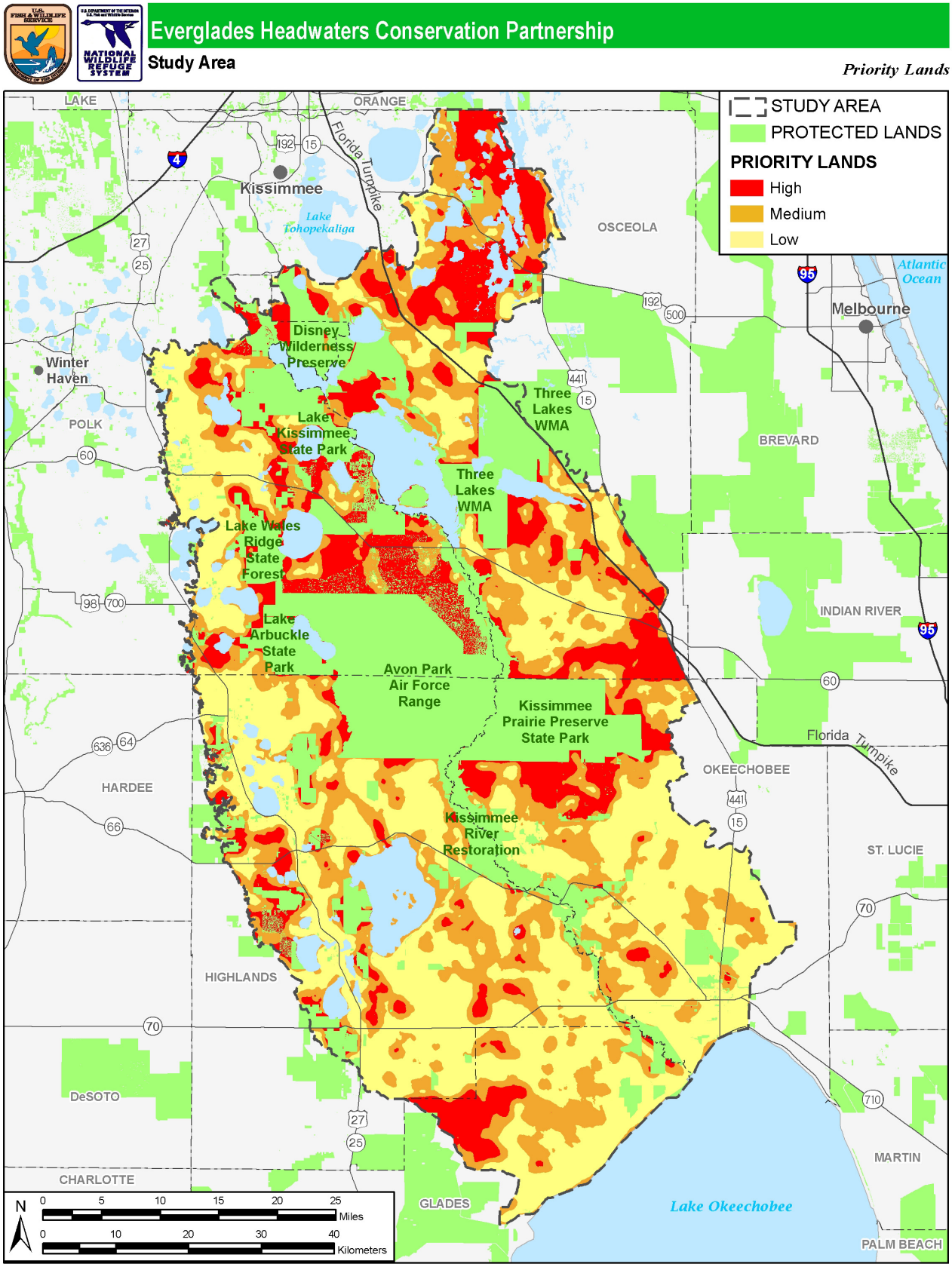
These units became the geographic structure for the development and identification of lands contained in both Alternatives B and C (Appendix F, Figures 4 and 5). The parcels which compose Alternative B's Refuge Acquisition Boundary and Alternative C's Conservation Focal Area were located in highest priority landscapes for ridge and prairie planning areas. For Alternative C, the Conservation Partnership Area and Conservation Focal Area reflect the increase in acreage identified in Alternative C. Landowner interest was used as a final filter in the identification and selection process of which land parcels would be proposed for inclusion in the Refuge Acquisition Boundary for Alternative B, and the Conservation Partnership Area and the Conservation Focal Area for Alternative C. This satisfies the second objective set forth in Appendix F.

Methodology – Land Acquisition Prioritization

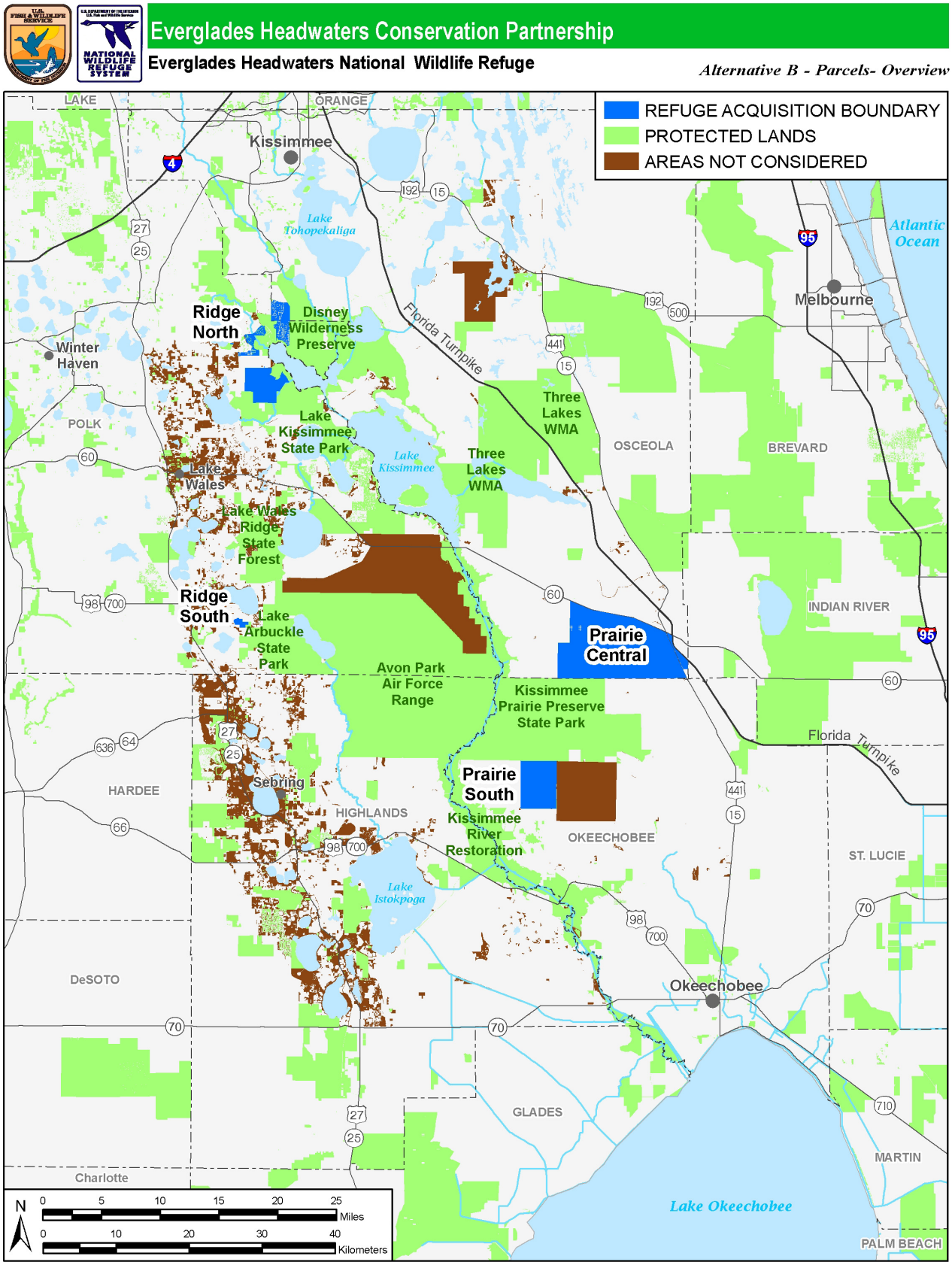
Data represented by Appendix F, Table 1, and Appendix F, Figure 2, were applied to individual parcels identified during the development of Alternatives B and C (Appendix F, Figures 4 and 5). Using the habitat conservation priority model at this finer resolution, we were able to evaluate individual landowner parcels to determine the quantity and quality of habitat that each possesses and to provide a priority rank score for the individual parcel.

The respective acreage of tiers I, II, and III lands per individual parcel was calculated as a percentage, providing a quantitative rank score which represents the suitability of each parcel for acquisition. The specific steps and numerical assessment in this process are as follows: high-priority conservation lands were assigned a score of three points; medium-priority conservation lands were assigned a score of two points; and low-priority conservation lands were assigned a score of point. These point values were multiplied by the respective acreage of each, and then an average for the entire parcel calculated.

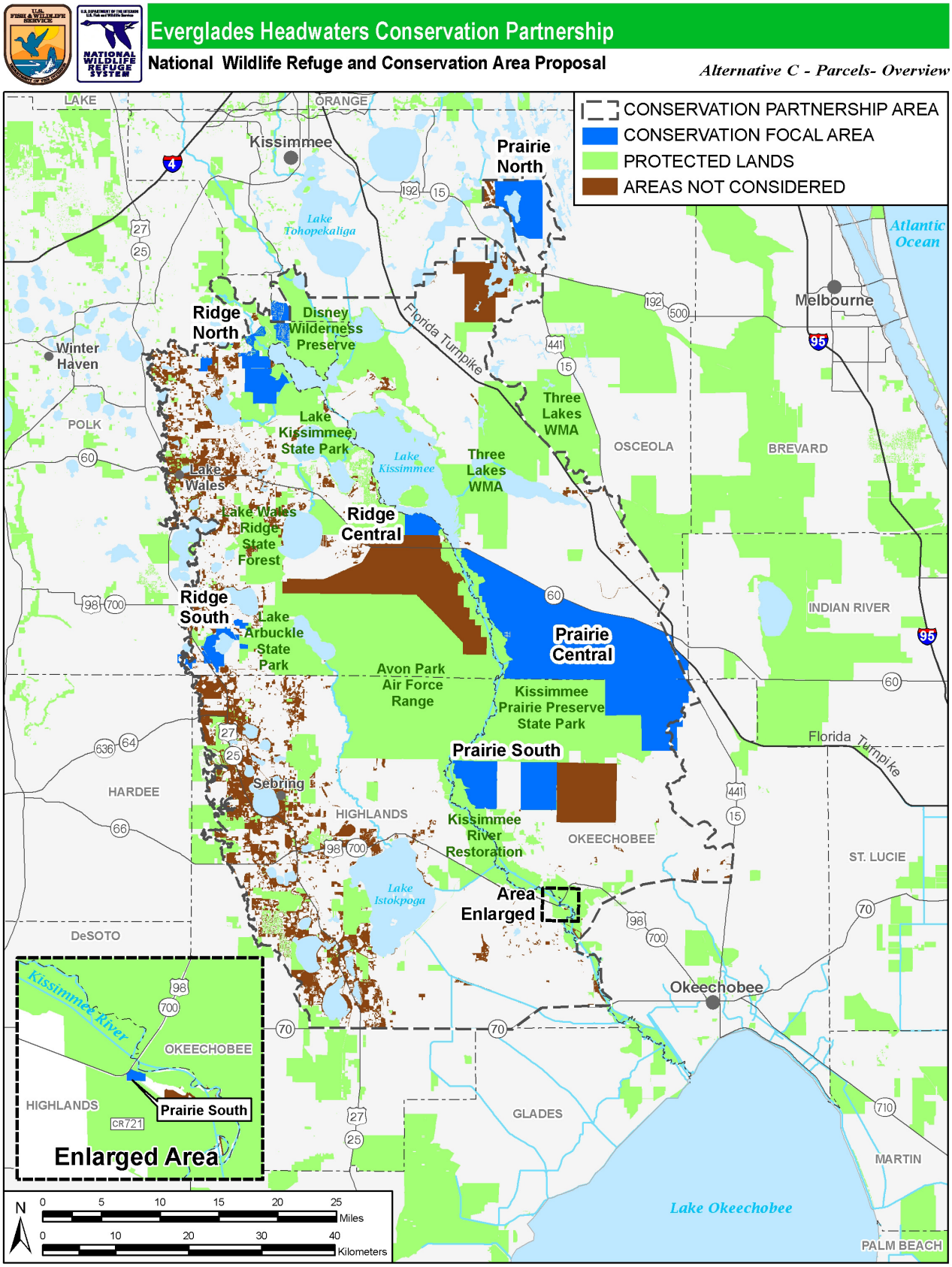
Appendix F. Figure 3. Priority lands with protected lands



Appendix F. Figure 4. Alternative B - planning units



Appendix F. Figure 5. Alternative C - planning units



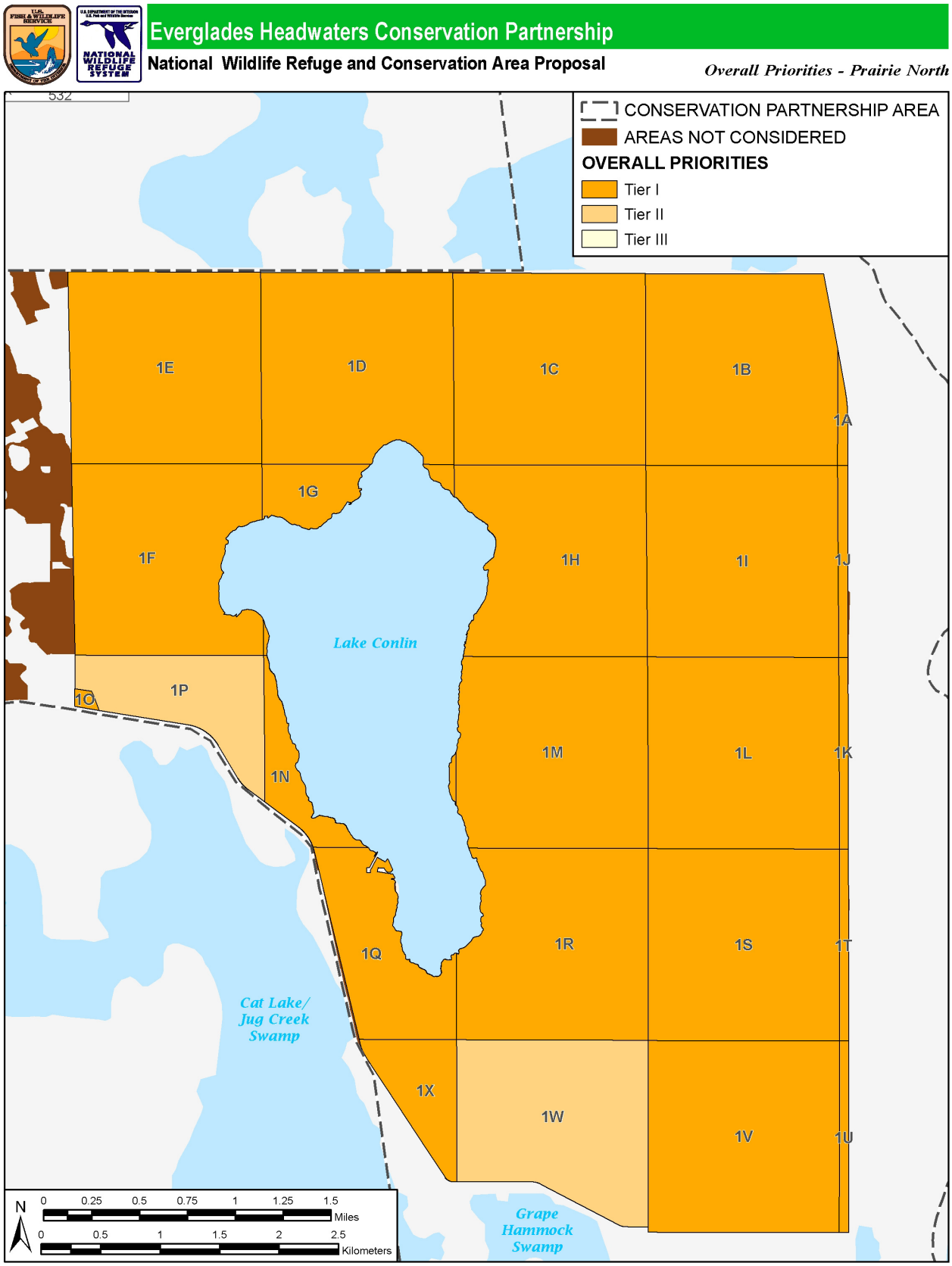
Once all parcels were individually evaluated, an overall priority rank for each landowner was determined (Appendix F, Figures 6 through 11a). Please see Table 4 in the Draft LPP for parcel-specific information. This overall priority ranking was then used to categorize the highest priority lands for acquisition. It should be noted that while this land acquisition prioritization methodology can provide a rank list of priority parcels, other considerations such as availability of funds, landowner interest, changing opportunities over time and restoration opportunity may alter the ranking of an individual parcel. This calculation satisfies the third objective outlined in Appendix F.

Summary

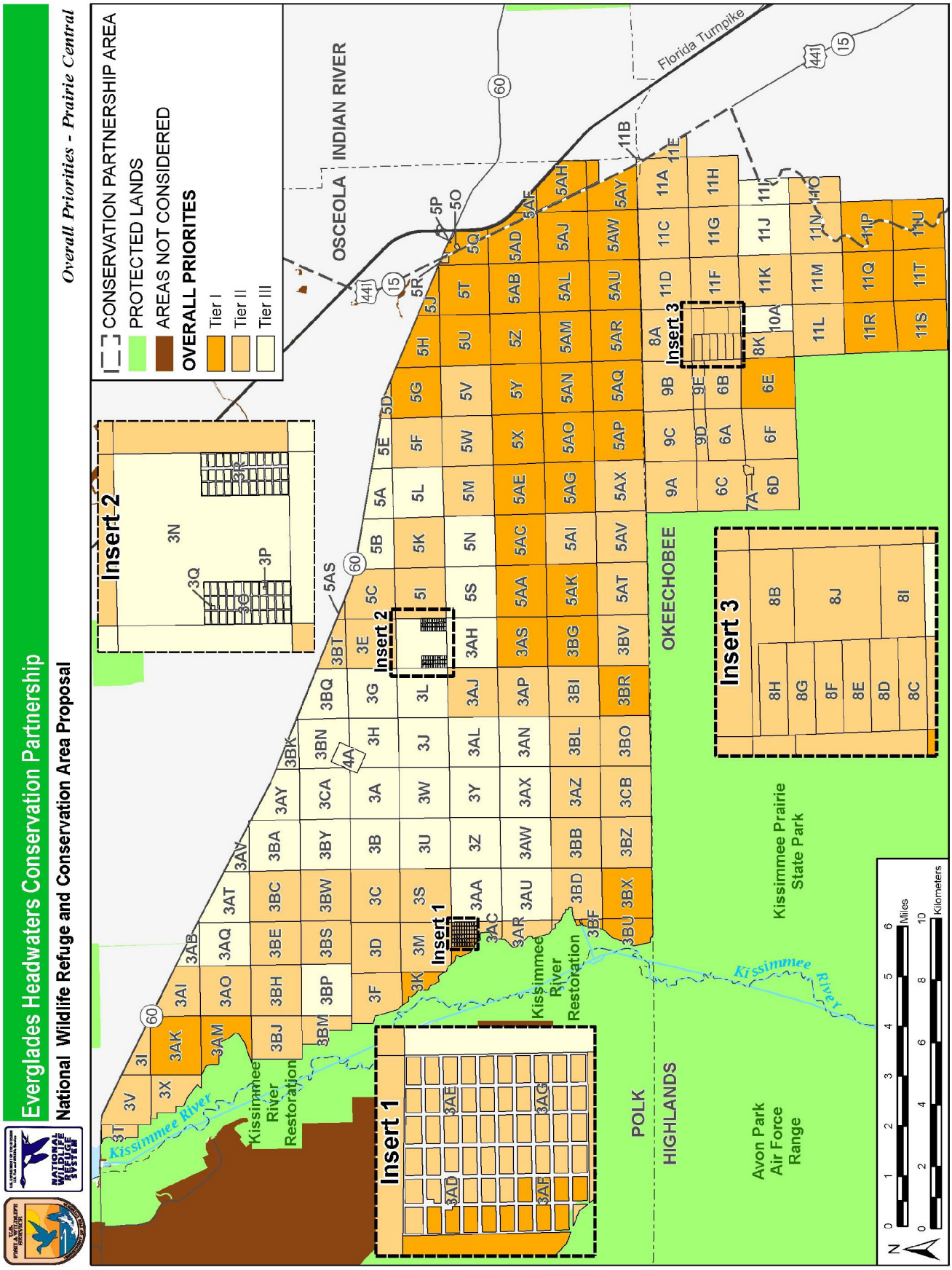
In an effort to prioritize and demonstrate the Service's best interest, a strategic approach was needed to prioritize the highest quality landscape features, as well as provide the Service with the ability to respond to opportunities presented by changing demographics and landowner interest over time. This land acquisition prioritization protocol is used to: prioritize the overall landscape; demonstrate the highest concentration of priority habitats and the greatest habitat connectivity; identify focal areas for conservation during the EA process; and rank individual parcels for acquisition priority. This methodology could be applied over time to identify the most important habitats for conservation that meet changing needs and opportunities for conservation in the project area. While this methodology provides a finite numeric statistic, on-site evaluations, best professional judgment, landowner opportunity and interest, and available funds may alter the priority rank that one parcel may receive over another.

*note: The Conservation Focal Area under Alternative C depicts an area of approximately 130,000 acres within which the Service seeks authority to acquire up to approximately 50,000 acres. The justification for the identification of a larger boundary than the acquisition acreage cap is based on the desire to be flexible to changes in landowner interest and availability of parcels of equal, high-quality habitat, over time. The less than fee title Conservation Partnership Area is a general area where the Service would focus interest and effort on acquiring up to 100,000 acres of less than fee interest. Please see the description of Alternative C in Chapter III and/or Draft LPP, Chapters I and III, and Draft LPP, Attachment 1, for a more complete explanation.

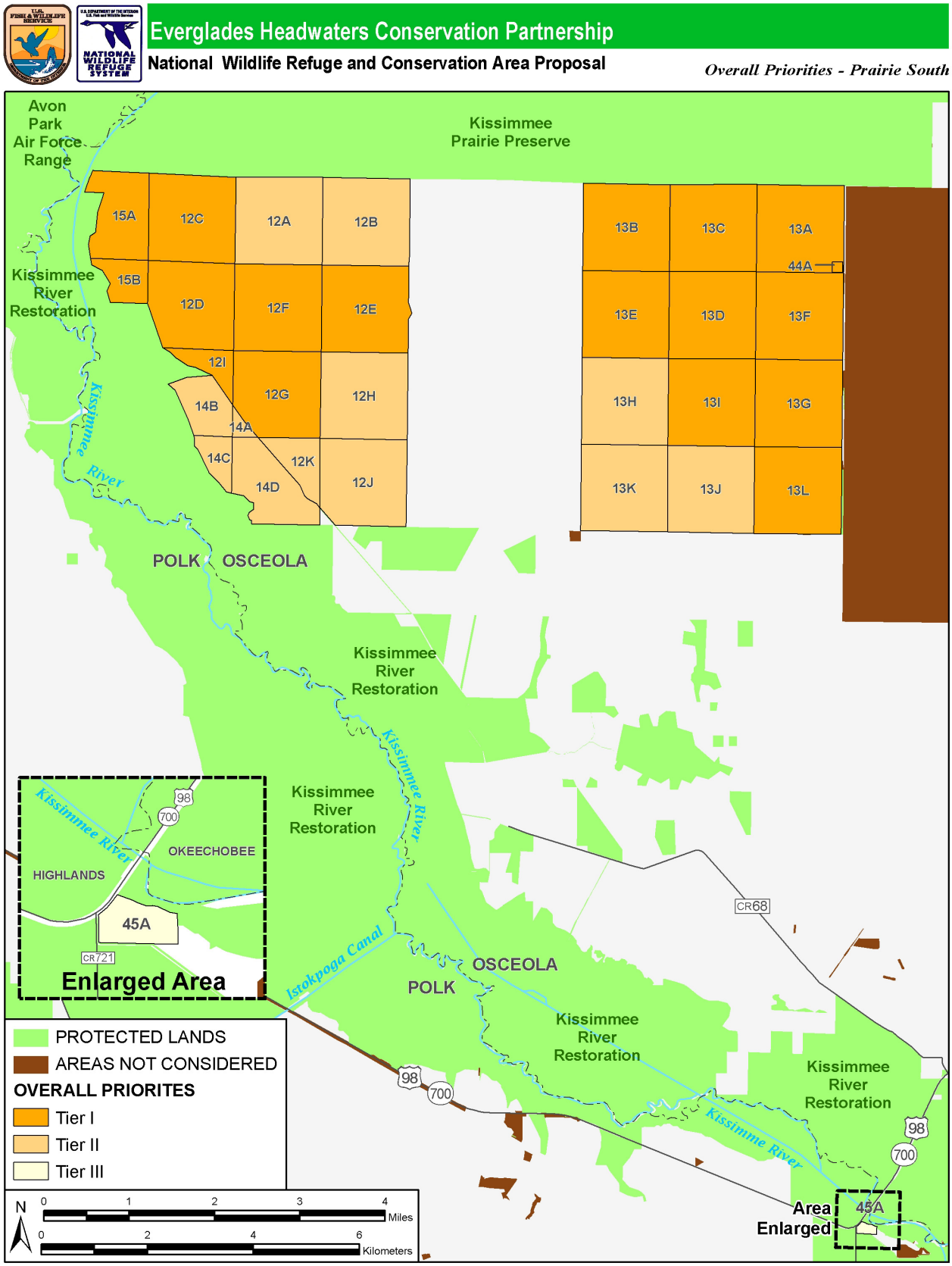
Appendix F. Figure 6. Prairie North overall priorities



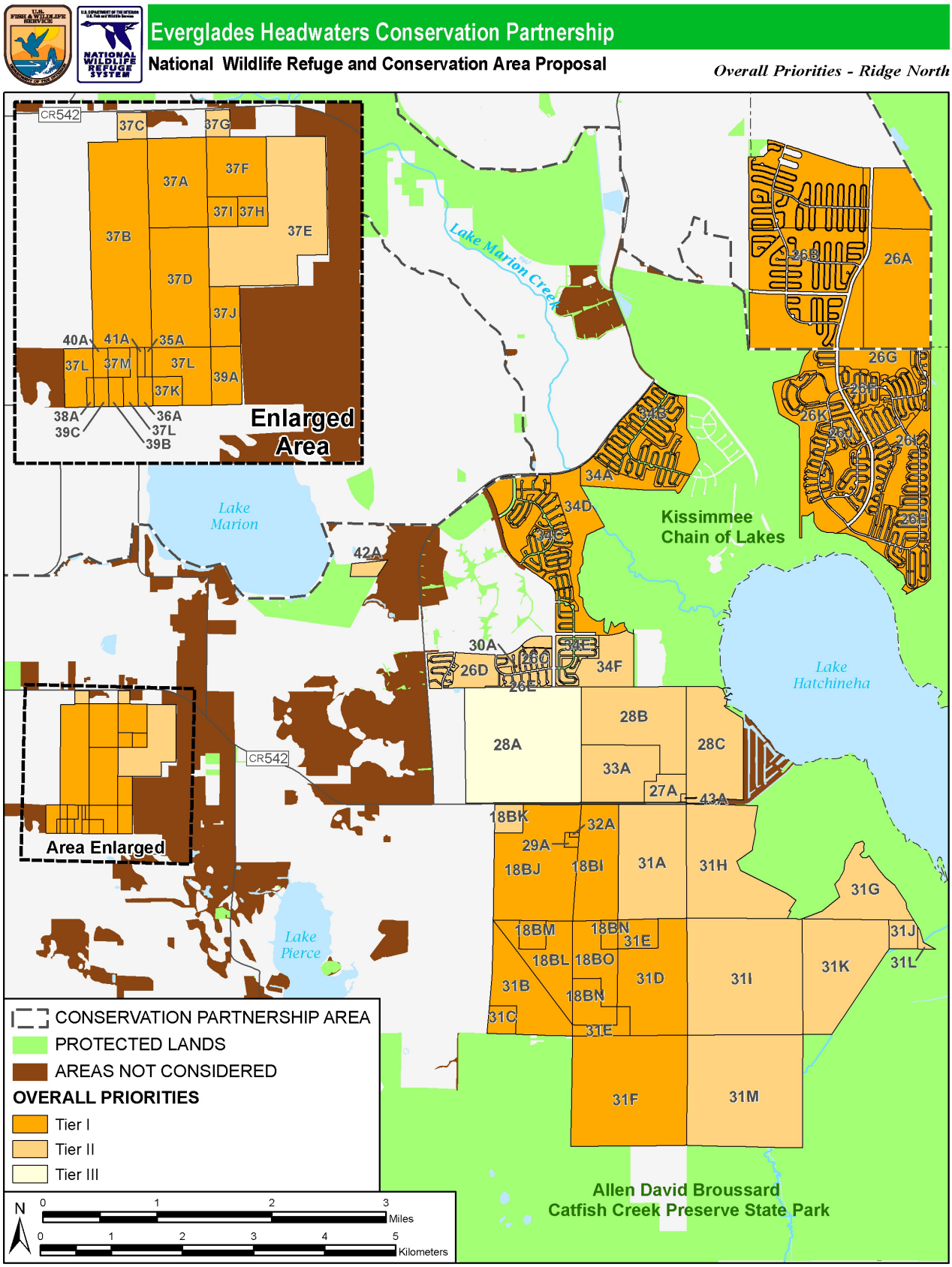
Appendix F. Figure 7. Prairie Central overall priorities



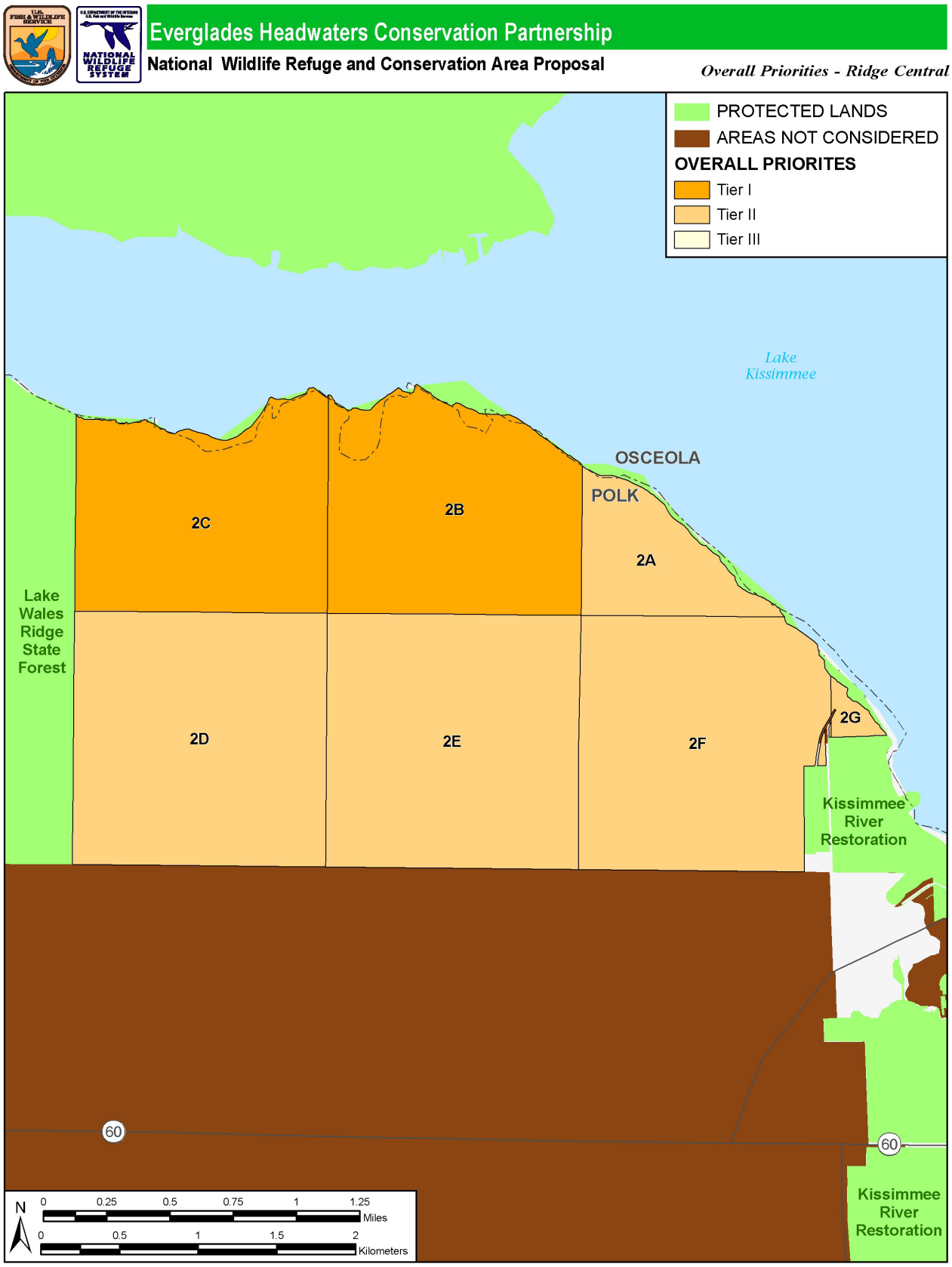
Appendix F. Figure 8. Prairie South overall priorities



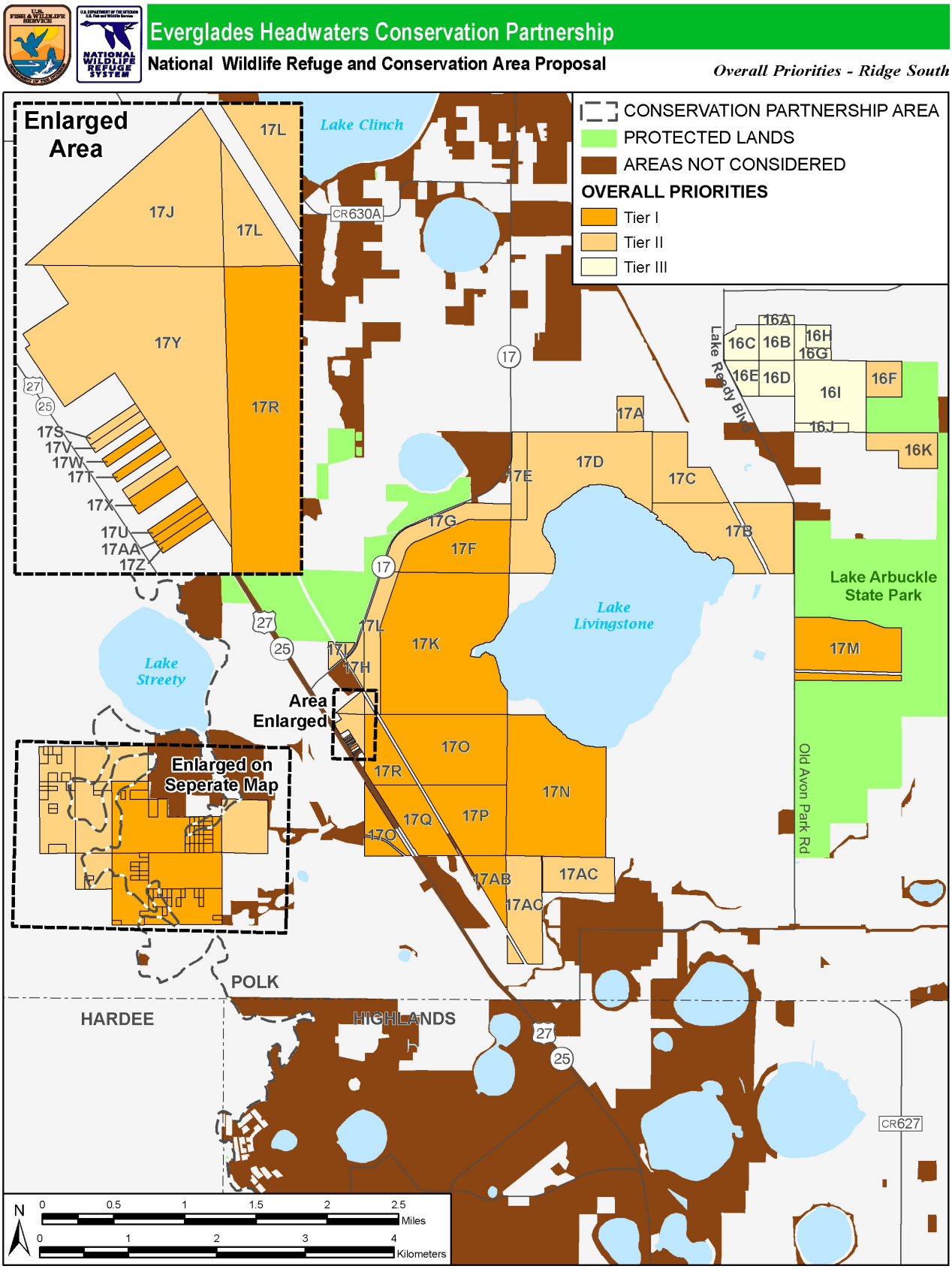
Appendix F. Figure 9. Ridge North overall priorities



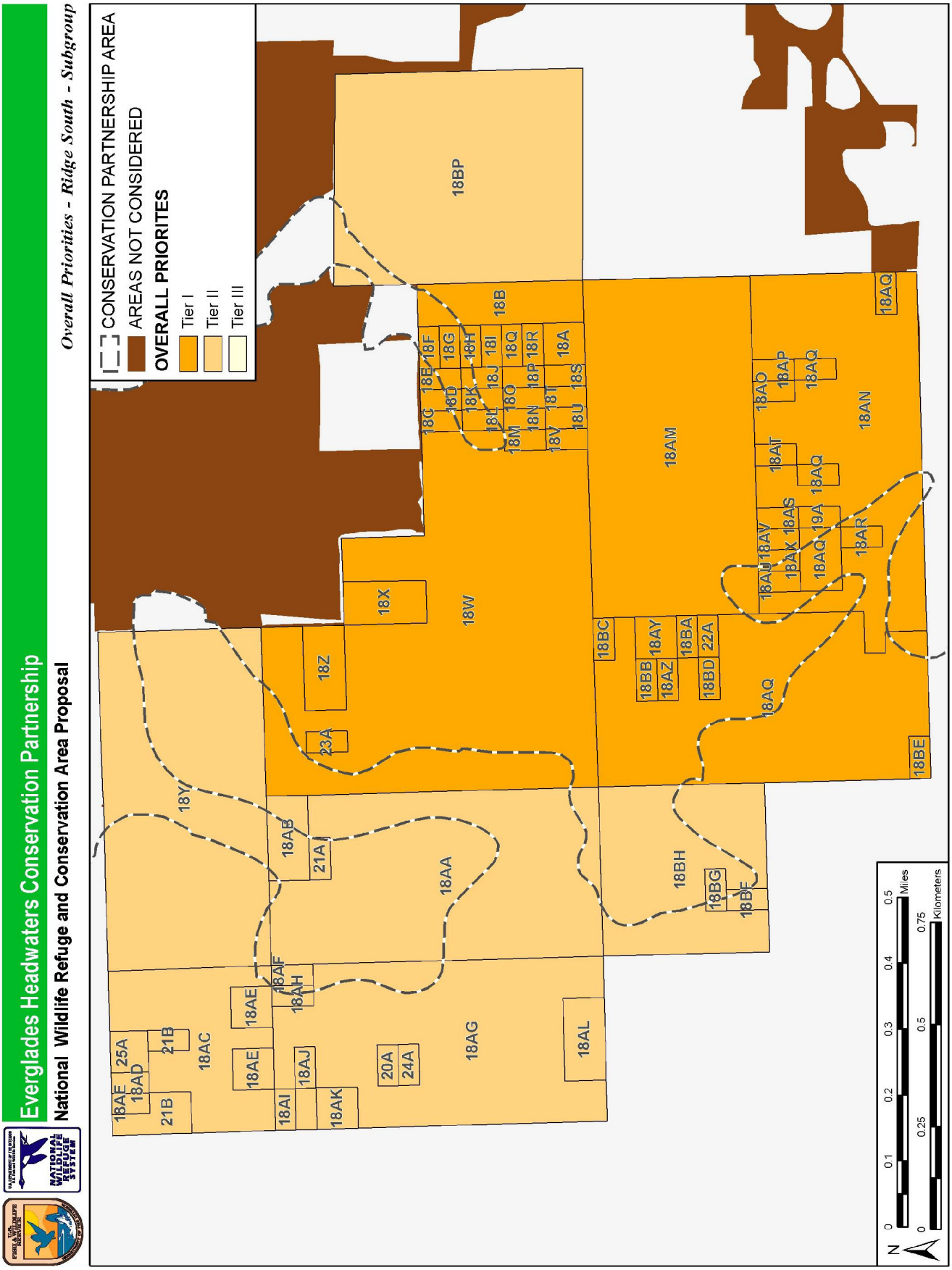
Appendix F. Figure 10. Ridge Central overall priorities



Appendix F. Figure 11a. Ridge South overall priorities



Appendix F. Figure 11b. Ridge South overall priorities



Appendix G. Intra-Service Section 7 Biological Evaluation

SOUTHEAST REGION
INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Charles Pelizza, Refuge Manager, Pelican Island National Wildlife, Archie Carr National Wildlife Refuge, and Lake Wales Ridge National Wildlife Refuge

Telephone Number: 772-562-3909 X 244 **E-Mail:** charlie_pelizza@fws.gov

Date: May 18, 2011

PROJECT NAME: Proposed Everglades Headwaters National Wildlife Refuge and Conservation Area

I. Service Program:
___ Ecological Services
___ Federal Aid
___ Clean Vessel Act
___ Coastal Wetlands
___ Endangered Species Section 6
___ Partners for Fish and Wildlife
___ Sport Fish Restoration
___ Wildlife Restoration
___ Fisheries
_X_ Refuges/Wildlife

II. State/Agency:
n/a

III. Station Name:
Everglades Headwater National Wildlife Refuge, FL

IV. Description of Proposed Action: The Service is proposing to establish the Everglades Headwaters National Wildlife Refuge and Conservation Area in order to protect important scrub, sandhill, dry prairie, pine flatwoods, and associated wetlands, and habitat corridors for wide-ranging species such as Florida black bear. The Service is evaluating a proposal to acquire fee title purchases of up to approximately 50,000 acres within a 130,000-acre Conservation Focal Area and perpetual conservation easements of 100,000 within the Conservation Partnership Area, all from willing sellers. The scope of the Draft Environmental Assessment and Draft Land Protection Plan is limited to the proposed acquisition, in fee title and in less than fee title, of lands for the establishment of the Everglades Headwaters National Wildlife Refuge and Conservation Area. The Draft Environmental Assessment is not intended to cover the development and/or implementation of detailed, specific programs for the administration and management of those lands. If the refuge is established and the needed lands or interests in lands are acquired, the Service would develop a comprehensive conservation plan, a 15-year management plan and needed step-down management plans (e.g., a step-down plan addressing hunting). These plans would be developed and reviewed in accordance with the Departmental requirements of the National

Environmental Policy Act. Intra-Service biological evaluations or assessments (under Section 7 of the Endangered Species Act) for individual management activities, or groups of activities, would be conducted at the time those activities would be proposed.

IV. Pertinent Habitat and Species:

The historic landscape of the Kissimmee Valley was comprised of a freshwater marsh which encompassed the Kissimmee River with more expansive wet and dry prairies that occupied slightly higher elevations east and west of the Kissimmee marsh. Pine flatwoods exist interspersed and upslope from the prairies, and cypress strands or domes also dotted the valley landscape of the Study Area. The ridges were dominated by pinelands and scrub with lesser amounts of hardwoods and open water. Today, the native communities of greatest areal extent within the Study Area are lakes and ponds (7.0 percent), mesic flatwoods (6.0 percent), freshwater marsh (6.0 percent), dry prairie (4.5 percent) and wet prairie (4.4 percent). Table 1 outlines the land cover types within the Study Area.

Appendix G. Table 1. Major habitat types and acreages within the Conservation Focal Area

Land Cover	Acres
Dry Prairie	13,414.6
Freshwater Forested Wetlands	9,181.2
High Pine, Florida Scrub, Sandhill	2,176.8
Improved and Unimproved Pasture	63,017.5
Intensive Agriculture	3,814.5
Mesic and Hydric Pine Flatwoods and Scrubby Flatwoods	10,123.4
Mesic Temperate Hammock	1,686.5
Open Water	169.6
Shrub and Brushland (mix of MH, PF, IP, U)	662.9
Urban	627.5
Wet Prairie and Freshwater Marshes	25,233.4
Total	**130,107.9**

There are approximately 18 federal or state listed (threatened or endangered) wildlife species, 34 federal or state listed (threatened or endangered) plant species, and two candidate species present in the Study Area (Table 2). The federally listed plant species occur mostly in scrub, though some also occur in high pine (dry, longleaf pine savanna) and flatwoods, or areas that formerly supported these vegetation types but have been converted to pasture. Most of the scrub plants are gap specialists whose populations expand after fire and then decline as clonal oaks and palmettos reclaim dominance. Nearly all of the plant species are adapted to the fires that were once frequent in these habitats. The Okeechobee gourd (*Cucurbita okeechobeensis* ssp. *okeechobeensis*) is the only listed plant species associated with water bodies.

Appendix G. Table 2. Federal and state listed threatened and endangered species and candidate species likely to occur in the project area

Scientific Name	Common Name	Legal Status	
		Federal	State
Invertebrates			
Highlands Tiger Beetle	*Cicindela highlandensis*	C	N
Amphibians and Reptiles			
Bluetail mole skink	*Eumeces egregious lividus*	T	T
Eastern indigo snake	*Drymarchon corais couperi*	T	T
Gopher tortoise	*Gopherus polyphemus*	N	T
Sand skink	*Neoseps reynoldsi*	T	T
Short-tailed snake	*Stilosoma extenuatum*	N	T
Birds			
Audubon's crested caracara	*Polyborus plancus audubonii*	T	T
Bald eagle	*Haliaeetus leucocephalus*	N	T
Everglade snail kite	*Rostrhamus sociabilis*	E	E
Florida grasshopper sparrow	*Ammodramus savannarum floridanus*	E	E
Florida sandhill crane	*Grus canadensis pratensis*	N	T
Florida scrub-jay	*Aphelocoma coerulescens*	T	T
Red-cockaded woodpecker	*Picoides borealis*	E	T
Southeastern American kestrel	*Falco spaverius paulus*	N	T
Wood stork	*Mycteria americana*	E	E

Scientific Name	Common Name	Legal Status	
		Federal	State
Mammals			
Florida black bear	*Ursus americanus floridanus*	N	T
Florida bonneted bat	*Eumops floridanus*	C	E
Florida panther	*Puma concolor coryi*	E	E
West Indian manatee	*Trichechus manatus*	E	E
Plants			
American Chaffseed*	*Schwalbea americana*	E	E
Ashe's savory	*Calamintha ashei*	N	T
Avon Park harebells	*Crotalaria avonensis*	E	E
Britton's beargrass	*Nolina brittoniana*	E	E
Carter's warea	*Warea carteri*	E	E
Curtiss' milkweed	*Asclepias curtissii*	N	E
Cutthroat grass	*Panicum abscissum*	N	E
Edison's St. John's-wort	*Hypericum edsonianum*	N	E
Florida bonamia	*Bonamia grandiflora*	T	E
Florida perforate cladonia	*Cladonia perforata*	E	E
Florida ziziphus	*Ziziphus celata*	E	E
Garrett's mint	*Dicerandra christmanii*	E	E
Highlands scrub hypericum	*Hypericum cumulicola*	E	E
Lewton's polygala	*Polygala lewtonii*	E	E
Nodding pinweed	*Lechea cernua*	N	T
Okeechobee gourd	*Cucurbita okeechobeensis* ssp *okeechobeensis*	E	E
Papery whitlow-wort	*Paronychia chartacea ssp. chartacea*	T	E
Pine pinweed	*Lechea divaricata*	N	E
Pygmy fringe-tree	*Chionanthus pygmaeus*	E	E

Scientific Name	Common Name	Legal Status	
		Federal	State
Sandlace	*Polygonella myriophylla*	E	E
Scrub blazing star	*Liatris ohlingerae*	E	E
Scrub bluestem	*Schizachyrium niveum*	N	E
Scrub buckwheat	*Eriogonum longifolium var. gnaphalifolium*	T	E
Scrub lupine	*Lupinus aridorum*	E	E
Scrub mint	*Dicerandra frutescens*	E	E
Scrub pigeon-wing	*Clitoria fragrans*	T	E
Scrub plum	*Prunus geniculata*	E	E
Scrub stylisma	*Stylisma abdita*	N	E
Scrub willow	*Salix floridana*	N	E
Short-leaved rosemary	*Conrandina brevifolia*	E	E
Wedge-leaved button snakeroot	*Eryngium cuneifolium*	E	E
Wide leaf warea	*Warea amplexifolia*	E	E
Wireweed	*Polygonella basiramia*	E	E
Yellow star anise	*Illicium parviflorum*	N	E

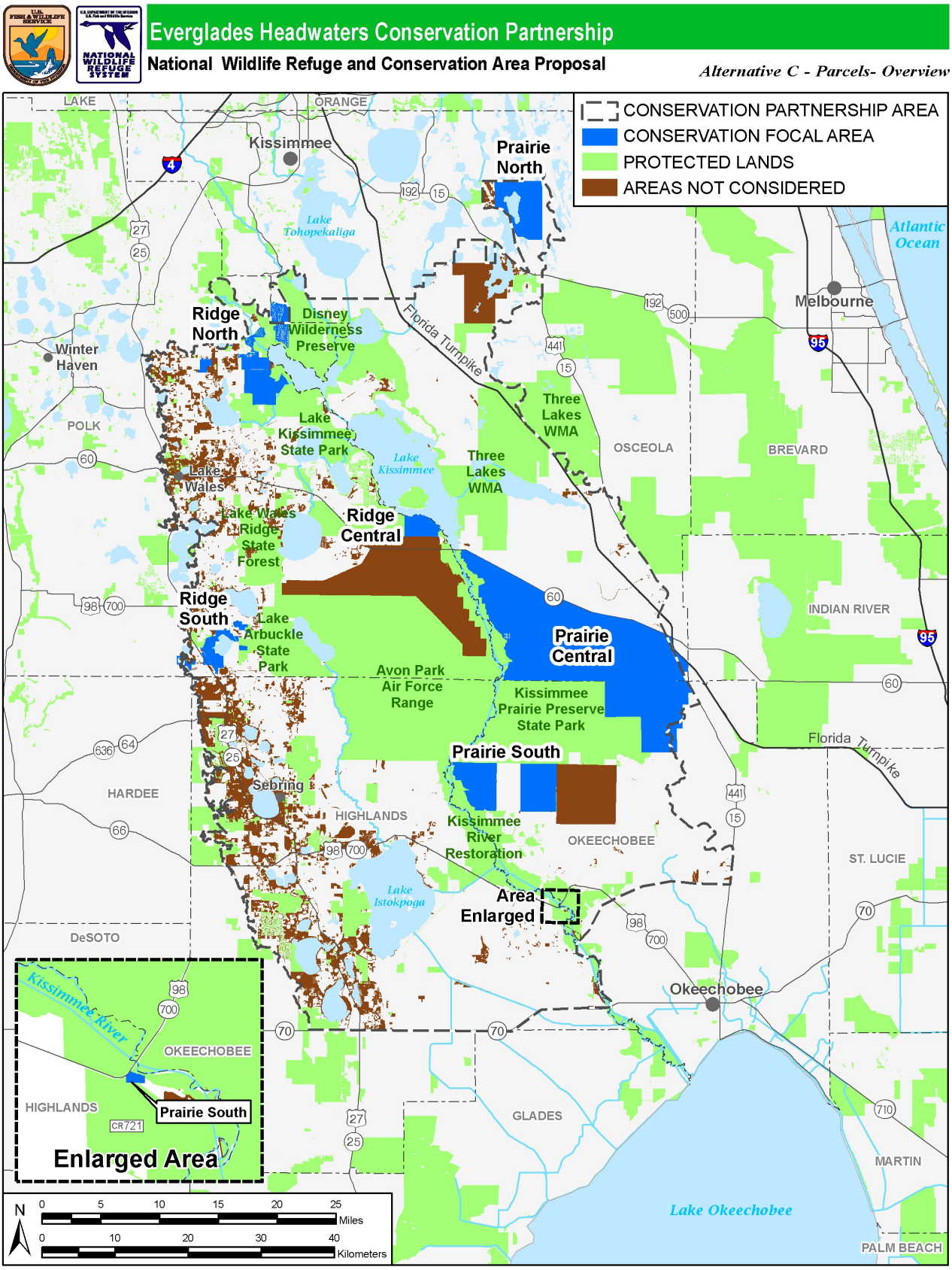
Key: Federal and State Listings:
E = Endangered, T = Threatened, N = Not Listed, C = Candidate

*note: extirpated from the Study Area

VI. Location:

The proposed Everglades Headwaters National Wildlife Refuge and Conservation Area are located within Polk, Osceola, Okeechobee, and Highlands Counties, Florida, in the Upper Kissimmee River Basin. It is bounded by the city of Orlando to the north, Lake Okeechobee to the south, on the east by the St John's River watershed, and on the west by the Lake Wales Ridge (Appendix G, Figure 11b).

Appendix G. Figure 1. Study area, location of protected lands, and proposed lands for acquisition



VII. Determination of Effects:

The Service expects that the issuance of the Draft Environmental Assessment and Draft Land Protection Plan for the proposed Everglades Headwaters National Wildlife Refuge and Conservation Area is not likely to adversely affect any federally listed species or candidate species. There is no critical habitat within the Study Area for any federally listed species, although critical habitat for the Everglades snail kite occurs immediately adjacent to the Study Area in Lake Okeechobee. We anticipate that a Final Environmental Assessment would be issued in September 2011. Any construction, survey, acquisition, or management activities associated with the proposed refuge will undergo Endangered Species Act consultation when those activities become more clearly defined and the locations are known. In the future, we anticipate that surveys for listed species and chemical contaminants may need to occur on project lands in association with acquisition. We also anticipate that habitat management activities such as brush removal, fire management, nonnative plant removal, etc., could occur and may require Intra-Service consultation. Future construction, outreach, or public use activities may also require Intra-Service consultation.

Signature (originating station) **Date**

Title

IX. Reviewing Ecological Services Office Evaluation:

A. Concurrence _____ Nonconcurrence _____

B. Formal consultation required _____

C. Conference required _____

D. Informal conference required _____

E. Remarks (attach additional pages as needed):

Signature **Date**

Title **Office**

Appendix H. At-Risk Species

The status and occurrence information for at-risk species in this Appendix provides a snapshot in time. Animals and plants move across landscapes, apprearing in areas where conditions are favorable for life history needs to reproduce, grow, and shelter; and disappearinig from areas where threats appear. Though we have outlined at-risk species knowledge to date, knowledge of, as well as actual species status and occurrence constantly changes and evolves over time and space.

Preliminary status summary (Appendix H, Table 1) and status and occurrence details (Appendix H, Table 2) are included for nearly 300 at-risk species documented or with potential to occur within the 5-county, 1.8 million-acre Everglades Headwaters NWR and Conservation Area Study Area (Study Area). The 288 at-risk species assessed include 94 veterbrates (2 amphibians, 72 birds, 8 mammals, and 12 reptiles), 50 invertebrates, and 144 plants identified by the Service, FWC, FDACS, FCREPA, and FNAI. There are no agency or organization at-risk designations for any fish species in the Study Area.

At-risk species are vunerable to, or at-risk from, threats. Threats include natural disturbances such as storm events or climate change, or human-caused disturbances such as habitat changes resulting from development or pollutants. Population status and trends indicate a species' vulnerability. Federal and state agencies consider listing at-risk species as endangered, threatened, or as a candidate for listing when scientists document declining population trends. Population trends can be difficult to determine in some cases, including, but not limited to newly described species, species with small population numbers, species occurring sparsely over a wide landscape, species that occur in areas inaccessible to researchers, or species difficult to detect or to track over time. In these situations, scientists may also consider species at-risk when the ecological communities in which they occur are declining.

Scientists may use additional status designations for species with limited evidence of declining status such as Species of Concern (SC) or Species of Special Concern (SSC), Rare (R), Status Undertermined (SU), or Rare and Status Undetermined (RSU). FNAI designations track both global and state status in five ranks from 1-Critically Imperiled to 5-Demonstrably Secure. This Appendix includes species tracked by FNAI as state-ranked 1-Critically Imperiled; 2-Imperiled; and 3-Rare, Restricted, or Otherwise Vulnerable to Extinction.

Federal designation includes protection for species listed and critical habitat designated under federal statutes such as the Endangered Species Act of 1973, as amended; the Migratory Bird Protection Act; and the Bald and Golden Eagle Protection Act, as amended. State protections apply to species listed under Florida statutes. Statuatory protection may not apply to agency SC and SSC designations or to FCREPA and FNAI designations, though they provide important information sources for federal, state, and local agencies considering species and habitat conservation actions.

The Study Area includes 38 federal and 142 state listed species, 2 candidate species for federal listing, 75 federal species of concern, and 23 state species of special concern. FCREPA status designations are identified for 110 species: 12 Endangered, 30 Threatened, 29 Species of Concern, 22 Rare, 6 Status Undetermined, and 11 Rare Status Undetermined species. FCREPA used Rare Status Undeteremined designations for new, previously undescribed beetle species collected from only a few locations. In these cases, the few available records provide very limited information on population status and trends or habitat associations. These species are included in this appendix though additional information would improve knowledge of species status, life history characterists, occurrences, habitat associations, and vulnerability to threats. Eighty-five (85) of the 288 at-risk species (30 percent) in the Study Area are endemic to Florida.

Habitat in the five counties in the Study Area support a number of at-risk species: 168 in Glades, 221 in Highlands, 161 in Okeechobee, 177 in Osceola, and 217 in Polk. The 15 natural ecological communities (Service 1999) in the Study Area also support important communities of at-risk species.

Life history and habitat associations for some of these at-risk species are discussed in more detail in the text of this Draft EA. Though those details might not be known for many of the species included in this appendix, this assessment provides a larger sample of at-risk species and habitat that would benefit by designation of the proposed Everglades Headwaters NWR and Conservation Area.

Appendix H. Table 1. Summary of status designations by Taxon Group for 288 at-risk species in the proposed Everglades Headwaters NWR and Conservation Area Study Area

Federal designations by Fish and Wildlife Service, Florida designations by Florida Fish and Wildlife Conservation Commission and Florida Department of Agriculture and Consumer Services, FCREPA designations (animals only) by Florida Committee on Rare and Edangered Plants and Animals. Number of Florida endemic species summarized in the Florida row.

		Birds							Mammals				Amphibians and Reptiles				Invertebrates						Plants				
	Total Designations	Endangered	Threatened	Candidate	Rare	Species of Concern	Status Undetermined	Endemic to Florida	Endangered	Threatened	Species of Concern	Endemic to Florida	Endangered	Threatened	Species of Concern	Endemic to Florida	Endangered	Threatened	Candidate	Species of Concern	Rare/Status Undetermined	Endemic to Florida	Endangered	Threatened	Species of Concern	Commercially Exploited	Endemic to Florida
Federal	115	5	3	1	-	28	-		2	0	4		0	3	2		0	0	1	17	-		21	4	23	-	
Florida	165	4	8	-	-	17	-	3	2	1	2	2	0	5	3	4	0	0	-	0	-	29	76	47	0	7	47
FCREPA	110	7	11	-	6	20	4		2	3	1		1	5	1		2	11	-	7	25						

Appendix H. Table 2. Preliminary details of status and county and ecological community occurrence data for 288 at-risk species in the proposed Everglades Headwaters NWR and Conservation Area Study Area

*Status				Species **Occurrence by:	County						Multispecies Recovery Plan Community											
Federal	Florida	FCREPA	Endemic to Florida	***Scientific Name*** **Common Name**	Glades	Highlands	Okeechobee	Osceola	Polk	High pine	Scrub	Scrubby high pine	Beach/Dune	Mesic temperate hammock	Scrubby flatwoods	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp
				Amphibians - alphabetical by scientific name																				
SC	SSC	T		*Rana capito* Gopher frog	x	x	x	x	x	x	x				x	x	x	x			x			
				Desmognathus auriculatus Southern dusky salamander		x															x	x	x	x
				Birds - alphabetical by scientific name																				
		SSC		*Accipiter cooperi* Cooper's hawk	x	x	x	x	x															
SC				*Aimophila aestivalis* Bachman's sparrow	x	x	x	x	x	x	x					x	x	x						
	SSC	R		*Ajaia ajaja* Roseate spoonbill	x	x	x	x	x								x				x		x	
SC				*Ammodramus henslowii* Henslow's sparrow				x	x									x	x	x				
E	E	E	F	*Ammodramus savannarum floridanus* Florida grasshopper sparrow	x	x	x	x	x									x		x				
T	T	T	F	*Aphelocoma coerulescens* Florida scrub-jay	x	x	x	x	x		x				x									
	SSC	SSC		*Aramus guarauna* Limpkin	x	x	x	x	x								x						x	
		SSC		*Ardea herodias occidentalis* Great white heron	x	x	x	x	x								x			x	x	x	x	x
	SSC	SSC		*Athene cunicularia floridana, Speotyto cunicularia* Florida burrowing owl	x	x	x	x	x	x								x						

*Status				Species **Occurrence by:	County						Multispecies Recovery Plan Community												
Federal	Florida	FCREPA	Endemic to Florida	***Scientific Name*** **Common Name**	Glades	Highlands	Okeechobee	Osceola	Polk	High pine	Scrub	Scrubby high pine	Beach/Dune	Mesic temperate hammock	Scrubby flatwoods	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp
SC				*Bartramia longicauda* Upland sandpiper														x		x				
SC				*Botaurus lentiginosus* American bittern	x	x	x	x	x											x	x	x	x	x
SC		R		*Buteo brachyurus* Short-tailed hawk	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x
C				*Calidris canutus* red knot																				
E	E	E		*Campephilus principalis* Ivory-billed woodpecker	h	h	h	h	h					x							x	x	x	
SC				*Catharus fuscescens* Veery										x			x							
T CH	T	E		*Charadrius melodus* Piping plover									x											
SC		SSC		*Charadrinus wilsonia* Wilson's plover									x											
SC				*Chondestes grammacus* Lark sparrow														x						
SC				*Circus cyancus* Northern harrier	x	x	x	x	x									x	x	x	x	x		
SC				*Cistothorus platensis* Sedge wren	x	x	x	x	x										x	x	x			
SC				*Coccyzus americanus* Yellow-billed cuckoo	x	x	x	x	x					x										
SC				*Colaptes auratus* Northern flicker	x	x	x	x	x					x	x	x	x							
SC				*Coturnicops noveboracensis* Yellow rail	x	x	x	x	x									x	x	x	x	x		x

*Status				Species **Occurrence by:	County						Multispecies Recovery Plan Community												
Federal	Florida	FCREPA	Endemic to Florida	***Scientific Name*** **Common Name**	Glades	Highlands	Okeechobee	Osceola	Polk	High pine	Scrub	Scrubby high pine	Beach/Dune	Mesic temperate hammock	Scrubby flatwoods	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp
SC				*Dendroica caerulescens* Black-throated blue warbler										x										x
		SU	F	*Dendroica discolor paludicola* Florida prairie warbler	x	x	x	x	x									x						
SC				*Dolichonyx oryzivorus* Bobolink														x			x			
	SSC	SSC		*Egretta caerulea* Little blue heron	x	x	x	x	x								x	x		x	x	x	x	x
SC		R		*Egretta rufescens* Reddish egret																				
	SSC	SSC		*Egretta thula* Snowy egret	x	x	x	x	x								x	x		x	x	x	x	x
	SSC	SSC		*Egretta tricolor* Tricolor (=Louisiana) heron	x	x	x	x	x								x	x		x	x	x	x	x
		T		*Elanoides forficatus* American swallow-tailed kite	x	x	x	x	x					x		x	x	x		x	x	x	x	x
		R		*Elanus leucurus* White-tailed kite														x		x	x		x	
	SSC	SSC		*Eudocimus albus* White ibis	x	x	x	x	x							x		x		x	x	x	x	x
		SU		*Falco columbarius* Merlin	x	x	x	x	x		x		x	x	x	x	x	x		x	x	x	x	x
		T		*Falco peregrines* Peregrine falcon	x	x	x	x	x	x	x		x		x	x	x	x		x	x	x	x	x
	T	T		*Falco sparverius paulus* Southeastern American kestrel	x	x	x	x	x	x	x					x	x	x						
		T		*Fregata magnificens* Magnificent frigatebird																				

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SC				*Gavia immer* Common loon	x	x	x	x	x															x
E/XN	SSC	RX		*Grus Americana* Whooping crane				x										x		x	x			
	T	T		*Grus canadensis pratensis* Florida sandhill crane	x	x	x	x	x							x	x	x		x	x			
	SSC	SSC		*Haematopus palliates* American oystercatcher									x											
	T	T		*Haliaeetus leucocephalus* Bald eagle	x	x	x	x	x	x		x		x	x	x	x	x		x	x	x	x	x
SC				*Hylocichla mustelina* Wood thrush										x										x
SC	SSC	SSC		*Ixobrychus exilis* Least bittern	x	x	x	x	x												x	x	x	x
SC				*Lanius ludovicianus* Loggerhead shrike	x	x	x	x	x						x	x	x	x	x	x				
SC		R		*Laterallus jamaicensis* Black rail														x			x		x	
SC				*Limnothlypis swainsonii* Swainson's warbler										x			x							x
E	E	E		*Mycteria Americana* Wood stork	x	x	x	x	x								x			x	x	x	x	x
SC				*Numenisus americanus* Long-billed curlew									x											
	SSC	SSC		*Nyctanassa violacea* Yellow-crowned night-heron	x	x	x	x	x															
	SSC	SSC		*Nycticorax nycticorax* Black-crowned night-heron	x	x	x	x	x															

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	SSC	T		*Pandion haliaetus* Osprey	x	x	x	x	x								x			x	x	x	x	x
		SU		*Passerina ciris* *Painted bunting*		x																		
	SSC	T		*Pelecanus occidentalis* Brown pelican	x				x															
	SSC	SSC		*Plegadis falcinellus* Glossy ibis	x	x			x															
E	T	E		*Picoides borealis* Red-cockaded woodpecker	x	x	x	x	x	x						x	x							
		SSC		*Picoides villosus* Hairy woodpecker	x	x	x	x	x	x	x	x	x	x	x	x	x					x	x	x
T	T	T		*Polyborus plancus audubonii, Caracara cheriway* Audubon's crested caracara	x	x	x	x	x					x		x	x	x		x				
		SSC		*Recurvivrostra Americana* American avocet	x		x		x												x			
E CH	E	E	F	*Rostrhamus sociabilis plumbeus* Everglade snail kite	x		x	x	x								x				x			x
	SSC	SSC		*Rynchops niger* Black skimmer	x			x	x				x								x			
		R		*Setophaga ruticilla* American redstart	x	x	x	x	x					x									x	
SC				*Spizella pusilla* Field sparrow	x	x	x	x	x									x		x				
	T			*Sterna antillarum* Least tern		x	x		x				x								x			
		SSC		*Sterna caspia* Caspian tern	x	x	x	x	x				x											

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		SSC		*Sterna maxima* Royal tern	x	x	x	x	x				x											
		SU		*Sterna nilotica* Gull-billed tern					x				x											
		SSC		*Sterna sandvicensis* Sandwich tern					x				x											
SC				*Sturnella magna* Eastern meadowlark	x	x	x	x	x							x	x	x		x				
SC				*Tyto alba* Barn owl	x	x	x	x	x					x				x		x				
SC				*Vermivora pinus* Blue-winged warbler										x										
				Mammals - alphabetical by scientific name																				
SC				*Corynorhinus (=Plecotus) rafinesquii* *Rafinesque's big-eared bat*	x	x	x	x	x					x			x					x	x	x
		R		*Mustela frenata peninsulae* Florida mouse		x		x	x	x	x	x			x									
SC				*Neofiber alleni* Round-tailed muskrat	x	x	x	x	x											x	x		x	
	SSC		F	*Podomys floridanus* Florida mouse		x		x	x	x	x	x			x									
E	E		F	*Puma (=Felis) concolor coryi* Florida panther	x	x				x	x			x	x	x	x	x		x	x	x	x	x
SC	SSC			*Sciurus niger shermani* Sherman's fox squirrel	x	x	x	x	x	x		x			x	x	x							x
E	E			*Trichechus manatus* West Indian manatee	x		x																	

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	T			*Ursus americanus floridanus* Florida black bear	x	x			x	x	x			x	x	x	x	x			x	x	x	x
				Reptiles - alphabetical by scientific name																				
T S/A	SSC			*Alligator mississippiensis* American alligator	x	x	x	x	x								x			x	x	x	x	x
		R		*Clemmys guttata* Spotted turtle					x							x	x					x	x	
				Crotolus adamanteus Eastern diamonback rattlesnake	x	x	x	x	x															
T	T	SSC		*Drymarchon corais couperi* Eastern indigo snake	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x
T	T	E	F	*Eumeces egregius lividus* Bluetail mole skink		x		x	x	x	x													
	SSC	T		*Gopherus polyphemus* Gopher tortoise	x	x	x	x	x	x	x				x	x	x	x						
				Heterodon simus Southern hognose snake				x	x															
		R		*Lampropeltis calligaster rhombamaculata* Mole snake						x					x									
T	T	T	F	*Neoseps reynoldsi* Sand skink		x		x	x	x	x													
SC	SSC	SU		*Pituophis melanoleucus mugitus* Florida pine snake	x	x	x	x	x	x	x				x									
SC		T	F	*Sceloporus woodi* Florida scrub lizard		x			x	x	x													
	T	T	F	*Stilosoma extenuatum* Short-tailed snake		x			x	x	x													
				Invertebrates - alphabetic by group, scientific name																				

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				Sponges																				
SC			F	*Ephydatia subtilis* Kissimmee sponge																				
				Gastropods (Snails and Allies)																				
		T	F	*Praticolella bakeri* Ridge shrubsnail		x			x	x	x													
				Bivalves (Clams and Mussels)																				
			F	*Villosa amygdale* Florida rainbow					x												x			
				Beetles																				
		RSU		*Acanthocerus aeneus* *Scarab beetle*		x																		
SC			F	*Anomala exigua* Exiguous anomalan scarab beetle					x	x														
SC			F	*Anomala eximia* Archbold anomalan scarab beetle		x			x		x													
		E		*Aphodius aegrotus* Scarab beetle		x			x															
		T		*Aphodius troglodytes* Scarab beetle		x																		
		RSU	F	*Ataenius saramari* Scarab beetle				x																
		RSU	F	*Bolbocerosoma hamatum* Scarab beetle	x			x	x															
C			F	*Cicindela highlandensis* Highlands tiger beetle		x			x		x													
		R		*Cicindela scabrosa* Scarab beetle		x			x		x													

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SC			F	*Copris gopher* Copris tortoise commensal scarab beetle		x				x	x												
		T		*Copris howdeni* Scarab beetle		x		x	x														
		RSU	F	*Diplotaxis spissipes* Scarab beetle		x			x														
SC			F	*Mycotrupes pedester* Scrub Island burrowing scarab beetle							x												
		RSU	F	*Onthophagus aciculatulus* Scarab beetle		x																	
SC				*Onthophagus polyphemi polyphemi* Onthophagus tortoise commensal scarab beetle						x	x												
		RSU		*Peltotrupes profundus* Scarab beetle		x		x	x														
		RSU	F	*Phyllophaga elizoria* Scarab beetle		x	x		x														
		RSU	F	*Phyllophaga elongata* Scarab beetle		x			x														
		RSU	F	*Phyllophaga okeechobea* Scarab beetle		x	x																
		RSU	F	*Phyllophaga panorpa* Scarab beetle		x			x														
		RSU	F	*Serica delicata* Scarab beetle		x			x														
SC		R	F	*Serica frosti* Frost's Spring serican scarab beetle		x					x												
SC		R	F	*Trigonopeltastes floridana* Scrub palmetto flower scarab beetle		x			x		x												

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SC		T		*Trox howelli* Caracara commensal scarab beetle				x										x						
				Butterflies and Moths																				
SC		R		*Atrytone arogos arogos* Arogos skipper butterfly	x	x	x	x	x	x						x								
		R	F	*Atrytonopsis loammi* Loammi skipper butterfly		x	x									x								
SC		SSC		*Eumaeus atala* Atala hairstreak butterfly			x																	
				Euphyes pilatka Palatka skipper butterfly	x	x	x	x	x									x			x			
SC				*Idia gopher* Tortoise commensal noctuid moth	x	x	x	x	x	x	x													
				Caddisflies																				
SC		SU	F	*Ceraclea floridana* Florida ceraclean longhorn caddisfly				x													x			
		R		*Hydroptila lloganae* Llogan's vari-colored microcaddisfly		x														x			x	
		R		*Hydroptila molsonae* Molson's microcaddisfly		x																x	x	
SC				*Oecetis parva* Little longhorn caddisfly				x																
		T	F	*Oecetis pratelia* Little meadow long-horn sedge caddisfly	x																			
		R		*Orthotrichia curta* Short orthotrician microcaddisfly		x																		
SC		T	F	*Oxyethira florida* Florida cream and brown mottled microcaddisfly																				

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				Dragonflies and Damselflies																				
		SSC		*Argiallagma pallidulum* Everglades sprite	x				x															
		SSC	F	*Didymops floridensis* Maidencane cruiser dragonfly		x			x															
		R		*Gomphaeschna antilope* Sooty darner dragonfly	x	x																		
		SSC		*Gomphus alachuensis* Sandhill clubtail dragonfly		x			x															
		SSC		*Nehalennia pallidula* Everglades sprite dragonfly	x	x														x	x		x	
		SSC	F	*Progomphus alachuensis* Tawny sanddragonfly	x	x			x															
				Flies																				
SC		R	F	*Asaphomyia floridensis* Florida asaphomyian tabanid fly		x					x													
				Spiders																				
SC		E	F	*Sosippus placidus* Lake Placid funnel wolf spider		x			x	x	x													
		T	F	*Geolycosa xera* McCrone's burrowing wolf spider		x		x	x															
		SSC	F	*Latrodectus bishopi* Red widow spider		x																		
				Millipedes																				
		R		*Floridobolus penneri* Florida scrub millipede		x			x		x													
				Plants - alphabetical by scientific name																				

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	T			*Acanthocereus tetragonus, Cereus pentagonus* Barbed-wire cactus	p	p	p	p	p															
SC	E			*Agrimonia incise* Incised groovebur	p	p	p	p	v p	x				x										
	T			*Andropogon arctatus* Pinewood bluestem	p	v p	p	v p	v p		x					x	x			x		x		
	T			*Arnoglossum diversifolium, Cacalia diversifolia* Variable-leaved Indian-plantain, Indian-plantain	p	p	p	p	p														x	
	E		F	*Asclepias curtissii* Curtis' milkweed	p	v p	p	v p	v p		x				x									
	E			*Asplenium auritum* Auricled spleen-wort	p	p	p	p	p					x								x	x	
	E			*Asplenium verecundum* Delicate spleenwort	p	p	p	p	p															
	T			*Baptisia simplicifolia* Scare-weed				p																
	T			*Bletia purpurea* Pine-pink orchid					v p							x					x		x	x
T	E		F	*Bonamia grandiflora* Florida bonamia	p	v p	p	p	v p	x	x	x												
SC	E			*Brickellia mosieri* Mosier's false boneset	p	p	p	p	p															
SC	T			*Calamintha ashei* Ashe's savory	v p	v p	p	p	v p		x													
	E			*Calopogon multi-florus* Many-flowered grass pink orchid	p	v p	v p	v p	v p							x	x		x					
	E			*Campyloneurum latum* Wide strap fern	p	p	p	p	p															

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	E			*Carex chapmanii* Chapman's sedge	p	p	p	v p	v p														x	
	E			*Celosia nitida* West Indian cock's comb	p	p	p	p	p															
	E		F	*Centrosema arenicola* Sand butterfly pea	p	v p	p	v p	v p	x					x									
SC	E		F	*Chamaesyce cumulicola* Sand-dune spurge	p	v p	p	p	p		x													
	E			*Cheilanthes microphylla* Southern lip fern	p	p	p	p	p					x										
E	E		F	*Chionanthus pygmaeus* Pygmy fringe-tree	p	v p	p	v p	v p		x	x												
			F	*Chrysopsis highlandsensis* Highlands goldenaster	p	p			p															
E	E		F	*Cladonia perforate* Florida perforate cladonia		p			p		x													
T	E		F	*Clitoria fragrans* Pigeon-wings		v p			v p	x	x	x			x									
SC	T			*Coelorachis tuberculosa* Piedmont jointgrass	p	v p	p	v p	v p								x			x	x			
E	E			*Conradina brevifolia* Short-leaved rosemary		p			p	x	x													
	T		F	*Conradina grandiflora* Large-flowered rosemary				v			x				x									
E	E		F	*Crotalaria avonensis* Avon Park harebells		v p			v p		x													
	E			*Ctenitis sloanei* Florida tree fern					v p								x						x	

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	E			*Ctenitis submarginis* Brown-hair comb fern	p	p	p	p	p								x						x	
E	E			*Cucurbita okeechobeensis* ssp *okeechobeensis* Okeechobee gourd	v p		p														x			x
	E			*Cyperus pedunculatus, Remirea maritime* Beach star		p																		
E	E		F	*Deeringothamnus pulchellus* Beautiful pawpaw				p								x	x							
E	E		F	*Dicerandra christmanii* Garrett's mint		v p				x	x	x												
E			F	*Dicerandra frutescens* Scrub mint		v p				x	x	x												
	E		F	*Dicerandra modesta* Blushing scrub plum					v p	x	x	x												
SC			F	*Digitaria gracillima* Longleaf finger grass	p	p	p	p	p	x	x													
	T			*Drosera intermedia* Water sundew	p	v p	p	v p	v p								x				x	x		
	E			*Eltroplectris calcarata* Spurred neottia		v p																		
	CE			*Encyclia tampensis* Butterfly orchid	p	p	p	p	p															
	CE			*Epidendrum conopseum* Green-fly orchid	p	p	p	p	p															
	E			*Epidendrum difforme* Umbelled epidendrum					v p														x	
T	E		F	*Eriogonum longifolium* var. *gnaphalifolium* Scrub buckwheat	p	v p	p	v p	v p	x	x	x												

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E	E		F	*Eryngium cuneifolium* Snakeroot		v p					x												
			F	*Euphorbia rosescens* No common name		p																	
SC				*Forestiera segregata var. pinetorum* Florida pinewood privet	p	p	p	p	p								x						
SC				*Galactia pinetorum* Pineland milk-pea	p	p	p	p	p														
	T		F	*Garberia heterophylla* Garberia	p	v p	p	v p	v p		x	x											
	E		F	*Glandularia maritime* Coastal vervain	p	p	p	p	p							x							
	E		F	*Glandularia tampensis* Tampa vervain	p	p	p	p	p							x						x	
	T			*Gonolobus suberosus* Angularfruit milkvine, Angle pod	v				v														
	E			*Gossypium hirsutum* Wild cotton	p	p	p	p	p														
				Gymnopogon chapmanianus Chapman's skeletongrass	p	p	p	p	p	x	x					x		x					
	E			*Habenaria distans* Distans habenaria		v p																x	
	T			*Habenaria nivea, Platanthera nivea* Snowy orchid	p	p	p	v p	v p								x						
	T			*Harrisella filiformis* Threadroot orchid	v p	v p	p	v p	v p								x					x	
SC	T			*Hartwrightia floridana* Hartwrightia	p	v p	p	p	v p							x	x		x			x		

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				Helianthus debilis ssp. tardiflorus Late flowering beach sunflower	p	p	p	p	p															
	E			*Hexalectris spicata* Crested coralroot	p	p	p	p	p															
E	E		F	*Hypericum cumulicola* Highlands scrub hypericum		v p			v p		x													
	E		F	*Hypericum edisonianum* Edison ascyrum	p	v p			v p								x		x	x	x	x		
SC	E			*Illicium parviflorum* Yellow star anise				v p	v p					x								x	x	
	E			*Lantana canescens* Hammock shrub verbena		p		p	p																
SC	T		F	*Lechea cernua* Nodding pineweed	p	v p	p	v p	v p		x				x									
SC	E		F	*Lechea divaricata* Pine pinweed	p	v p	p	p	v p	x	x				x									
E	E		F	*Liatris ohlingerae* Scrub blazing star		v p			v p		x	x			x									
	T			*Lilium catesbaei* Southern red lily	p	v p	v p	v p	v p							x	x	x	x	x		x		
	T			*Listera australis* Southern twayblade	p	p	p	p	v p															
	T			*Lobelia cardinalis* Cardinalflower					v															
E	E		F	*Lupinus aridorum* Scrub lupine		p			p		x													
	T		F	*Lupinus westianus* Gulf Coast lupine				v p	v p															

*Status				Species **Occurrence by:	County						Multispecies Recovery Plan Community												
Federal	Florida	FCREPA	Endemic to Florida	***Scientific Name*** **Common Name**	Glades	Highlands	Okeechobee	Osceola	Polk	High pine	Scrub	Scrubby high pine	Beach/Dune	Mesic temperate hammock	Scrubby flatwoods	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp
	CE			*Lycopodiella cernua* Nodding club moss	p	p	p	p	p															
SC	E		F	*Lythrum flagellare* Lowland loosestrife	v p	p	v p	p	p								x				x	x	x	x
	E			*Matelea floridana* Florida spiny-pod	p	p	p	p	v p					x										
	T			*Matelea gonocarpos* Angle-pod	p	p	p	p	p															
	E			*Matelea pubiflora* Sandhill spiny pod	p	v p	p	p	v p															
SC	T			*Melanthera parvifolia* Small-leaved melanthera	p	p	p	p	p															
SC	T			*Myrcianthes fragrans* var. *simpsonii* Twinberry	p	p	v p	p	p															
SC				*Myriophyllum laxum* Piedmont water-milfoil	p	p	p	p	p														x	x
	T			*Najas filifolia* Slender naiad	p	v p	p	v p	p															
SC	E		F	*Nemastylis floridana* Fall-flowering ixia	p	p	p	v p	v p							x	x			x		x		x
	T			*Nephrolepis biserrata* Giant sword fern	p	v p	p	p	p								x						x	
	T		F	*Nolina atopocarpa* Florida beargrass	p	p	p	p	p							x		x						
E	E		F	*Nolina brittoniana* Britton's beargrass	p	v p	p	v p	v p	x	x	x			x									
				Nyssa ursine Bog tupelo	p	p	p	p	p															

*Status				Species **Occurrence by:	County						Multispecies Recovery Plan Community											
Federal	Florida	FCREPA	Endemic to Florida	***Scientific Name*** **Common Name**	Glades	Highlands	Okeechobee	Osceola	Polk	High pine	Scrub	Scrubby high pine	Beach/Dune	Mesic temperate hammock	Scrubby flatwoods	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp
	E			*Ophioglossum palmatum* Hand fern	p	p	p	p	v p								x							
	T			*Opuntia stricta* Shell mound prickly-pear	p	p	v p	p	p		x													
	CE			*Osmunda cinnamomea* Cinnamon fern	p	p	p	p	p															
	CE			*Osmunda regalis* Royal fern	p	p	p	p	p															
SC	E		F	*Panicum abscissum* Cutthroat grass	p	v p	p	v p	v p								x	x	x		x	x		
T	E		F	*Paronychia chartacea* Papery whitlow-wort	p	v p	p	v p	v p	x	x													
	E			*Pavonia paludicola* Swampbush	p	p	p	p	p															
	E			*Pavonia spinifex* Yellow hibiscus	p	p	p	p	p					x								x		
	E			*Pecluma dispersa* Widespread polypody	p	p	p	p	v p															
	E			*Pecluma plumula* Plume polypody	p	v p	p	v p	v p														x	
	E			*Peperomia humilis* Peperomia	p	p	p	p	p					x								x	x	
	E			*Peperomia obtusifolia* Florida peperomia	p	p	p	p	p														x	
				Pharus parvifolius Creeping-leaf stalkgrass					v p															
	T			*Pinguicula caerulea* Blue butterwort	v p	v p	p	v p	v p							x	x	x	x					

*Status				Species **Occurrence by:	County						Multispecies Recovery Plan Community											
Federal	Florida	FCREPA	Endemic to Florida	***Scientific Name*** **Common Name**	Glades	Highlands	Okeechobee	Osceola	Polk	High pine	Scrub	Scrubby high pine	Beach/Dune	Mesic temperate hammock	Scrubby flatwoods	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp
	T			*Pinguicula lutea* Yellow butterwort	v p	v p	v p	v p	v p							x	x	x	x					
	T			*Platanthera blephariglottis* White-fringed orchid	p	v p	p	p	v p										x					
SC	T			*Platanthera ciliaris* Yellow-fringed orchid	p	v p	p	v p	v p										x					
	T			*Platanthera cristata* Crested fringed orchid	p	p	p	p	v p										x					
SC	E			*Platanthera integra* Yellow fringeless orchid	p	p	p	p	p							x			x	x				
	T			*Pogonia ophioglossoides* Rose pogonia	p	v p	p	v p	v p										x					
E	E		F	*Polygala lewtonii* Lewton's polygala		v p		v p	v p	x	x	x												
E	E		F	*Polygonella basiramia* Wireweed		v p			v p		x													
E	E		F	*Polygonella myriophylla* Sandlace		v p		v p	v p		x	x												
	E			*Polystachya concreta* Pale-flowered polystachya	p	v p	p	p	p														x	
E	E		F	*Prunus geniculata* Scrub plum		v p			v p	x	x	x												
	T		F	*Pteroglossaspis ecristata* Wild coco	p	v p	p	v p	v p		x			x		x		x						
	T			*Pycnanthemum floridanum* Florida mountain-mint	p	p	p	p	p															
	CE			*Rhapidophyllum hystrix* Needle palm		p																		

*Status				Species **Occurrence by:	County						Multispecies Recovery Plan Community												
Federal	Florida	FCREPA	Endemic to Florida	***Scientific Name*** **Common Name**	Glades	Highlands	Okeechobee	Osceola	Polk	High pine	Scrub	Scrubby high pine	Beach/Dune	Mesic temperate hammock	Scrubby flatwoods	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp
				Rhynchospora floridensis Florida white-top sedge		p																		
			F	*Rhynchospora megaplumosa* Large-plumed beaksedge		p																		
	E			*Rudbeckia nitida* St. John's black-eyed-susan	p	p	p	p	p															
	T			*Sacoila lanceolata* Leafless beaked ladiestresses, Leafless beaked orchid	v	v	v	v	v															
	E			*Rudbeckia nitida* St. John's black-eyed-susan	p	p	p	p	p															
	T			*Sacoila lanceolata* Leafless beaked ladiestresses, Leafless beaked orchid	v	v	v	v	v															
	T			*Sarracenia minor* Hooded pitcherplant		v	v		v															
	T			*Scaevola plumier* Inkberry	p	p	p	p	p															
SC	E		F	*Schizachyrium niveum* Riparian autumngrass		v p		v p	v p	x	x													
E	E			*Schwalbea Americana* Chaffseed	p	v p			v															
	E			*Spiranthes brevilabris* Small ladies'-tresses	p	p	p	p	v p								x							
	T			*Spiranthes laciniata* Lace-lip ladies' tresses	p	v p	v p	v p	p								x				x			
	T			*Spiranthes longilabris* Long-lip ladies' tresses	p	v p	p	v p	v p							x	x	x						
	T			*Spiranthes tuberose* Little pearl-twist	p	v p	p	p	v p															

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Federal	Florida	FCREPA	Endemic to Florida	***Scientific Name*** **Common Name**	Glades	Highlands	Okeechobee	Osceola	Polk	High pine	Scrub	Scrubby high pine	Beach/Dune	Mesic temperate hammock	Scrubby flatwoods	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp
	E			*Stachys crenata* Mouse's-ear, Shade betony					v															
	E			*Stenanthium densum* Coastal death camas	p	p	p	p	p															
	E		F	*Stylisma abdita* Scrub stylisma	p	v p	p	p	v p															
	E		F	*Tephrosia angustissima* var. *Angustissima* Hoary pea	p	p	p	p	p							x								
	T			*Tephrosia mohrii* Pineland hoary-pea	p	p	p	p	p															
	E			*Thelypteris serrata* Toothed maiden fern	p	v p	p	v p	v p															
	T			*Tillandsia balbisiana* Inflated wild-pine	v p	v p	v p	v p	v p		x			x			x						x	
	E			*Tillandsia fasciculate* Common wild-pine	v p	p	v p	v p	v p		x	x		x			x				x		x	
	T			*Tillandsia flexuosa* Twisted air plant	p	v p	p	p	p		x			x			x						x	
	E			*Tillandsia utriculata* Giant wild-pine	v p	v p	v p	v p	v p		x	x					x						x	
	T			*Tillandsia valenzuelana, Tillandsia variabilis* Soft-leaved wild-pine		v	v p							x			x						x	
SC	E		F	*Triphora craigheadii* Craighead's nodding-caps		v p								x										
	T			*Triphora trianthophoros* Three-birds orchid	p	v p	p	p	p															
E	E		F	*Warea amplexifolia* Wide-leaf warea				v p	v p	x														

*Status				Species **Occurrence by:	County						Multispecies Recovery Plan Community												
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E	E		F	*Warea carteri* Carter's mustard	v p	v p	 p	 p	v p	x	x	x			x	x								
	CE			*Zamia pumila* Coontie	 p	 p	 p	 p	 p															
	T			*Zephyranthes treatiae* Treat's zephyr-lily	 p	v p	 p	v p	v p															
	T			*Zephyranthes simpsonii* Rain lily	v p	v p	v p	v p	v p															
E	E			*Ziziphus celata* Florida ziziphus		v p			v p	x	x													

** Status Designations:*
- *E = Endangered*
- *CH = Critical Habitat designated*
- *T = Threatened*
- *C = Candidate for Federal listing*
- *SC/SSC = Species of Concern (Fed) or Species of Special Concern (State)*
- *EXN/RXN = Endangered - non-essential experimental pop (Fed) or Recently Extirpated (FCREPA)*
- *Rare = Rare (FCREPA)*
- *RSU = Rare and Status Undetermined (FCREPA for beetles)*
- *SU - Status Undetermined (FCREPA)*
- *CE = Commecially Exploited (State plant designation)*

***Occurrence Designations:*
- *x = animal documented in county*
- *h = animal historically documented in county*
- *v = vouchered plant specimen exists for county*
- *p = potential plant habitat occurs in county*

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