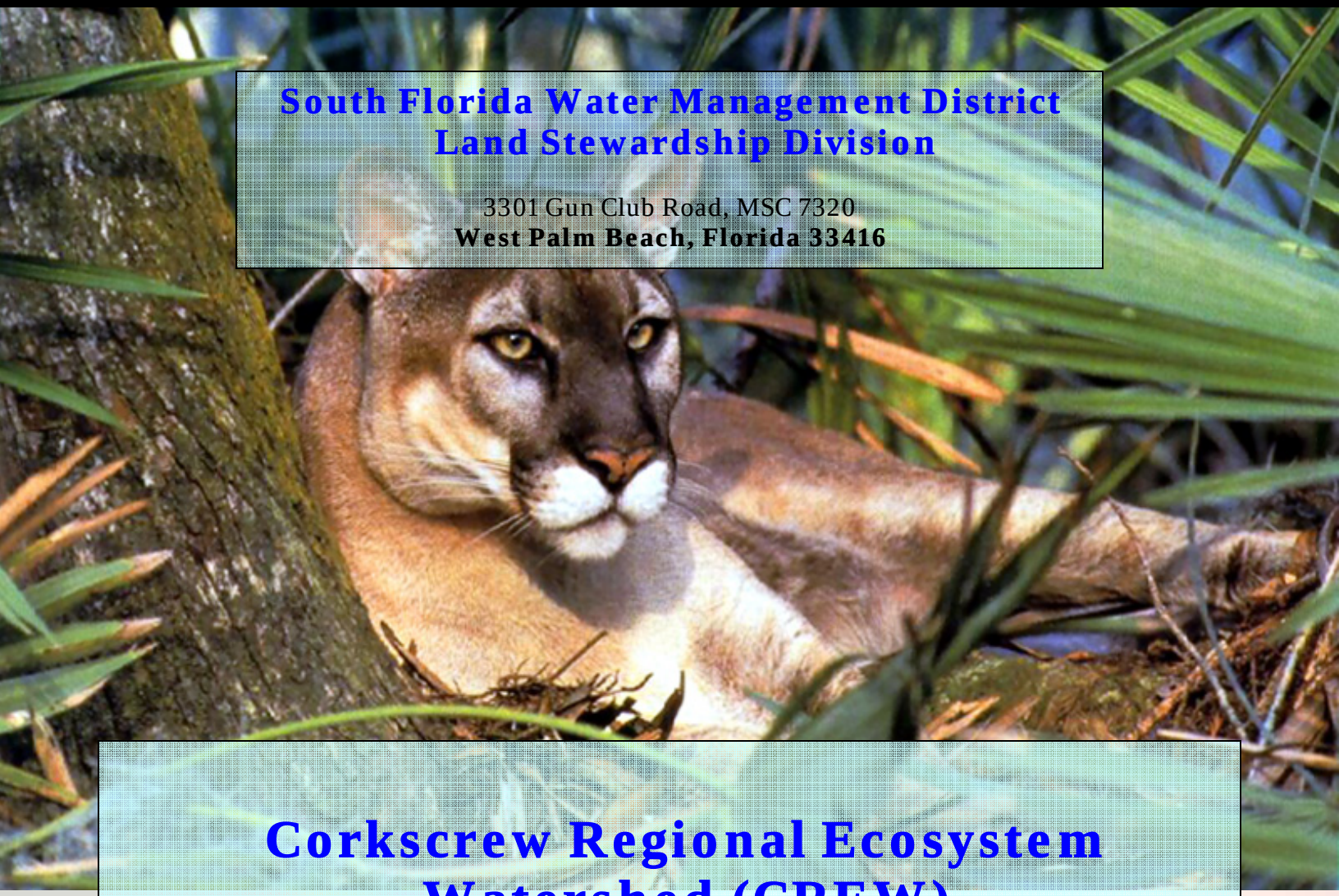
SOUTH FLORIDA WATER MANAGEMENT DISTRICT



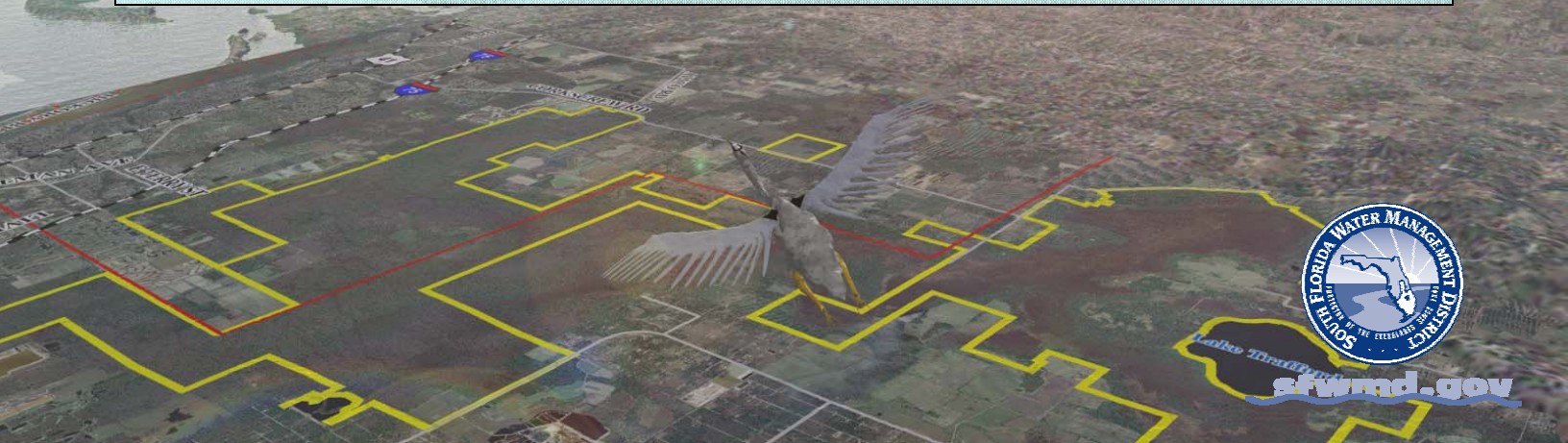
South Florida Water Management District
Land Stewardship Division

3301 Gun Club Road, MSC 7320
West Palm Beach, Florida 33416

Corkscrew Regional Ecosystem Watershed (CREW) Management Area

Five-Year General Management Plan (2006-2011)

May, 2006



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CREW Management Area Five-Year General Management Plan (2006 – 2011)

May 2006

Land Stewardship Division
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33416-4680

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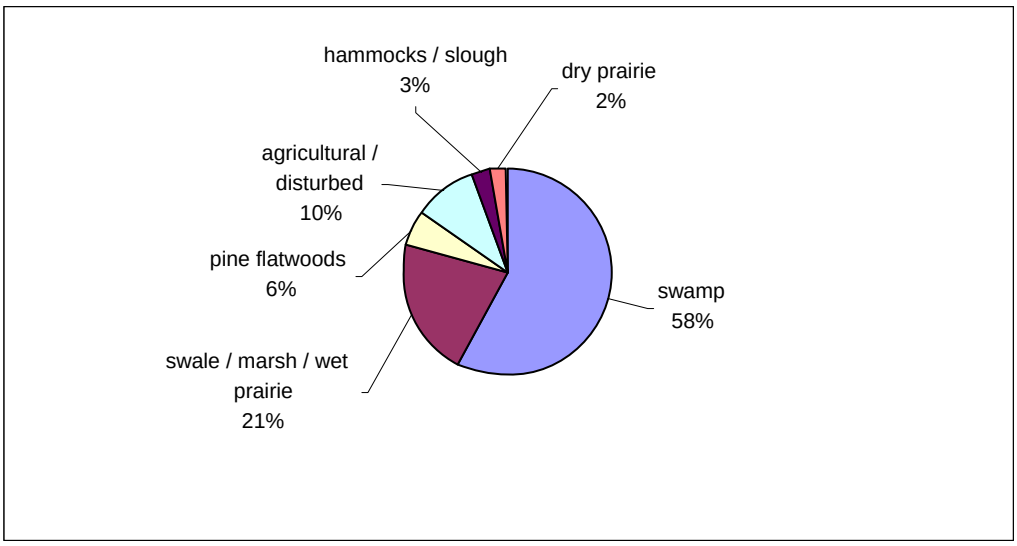
1. Executive Summary

The South Florida Water Management District (District) is mandated to acquire and manage lands which are vital to the restoration of the Everglades, the Kissimmee River, the Kissimmee Chain of Lakes and its headwaters. In the 1980's the District targeted for acquisition 64,103 acres of predominantly swale and strand swamp communities and adjacent uplands within the Estero Bay watershed as a Save Our Rivers (SOR) project. This plan addresses management for the 28,540 acres that have been acquired by the District within the project area known as the CREW Management Area (MA).

This General Land Management Plan describes the historical, ecological, and managerial aspects of the area as a means to coordinate effective management programs. The plan guides the District land management personnel toward logical and consistent land management practices. It also informs the public of operational procedures and organizational structures within the District and of management activities and objectives for the MA.

NATURAL SETTING

The natural character of CREW is defined by 5 distinct soil categories within the MA as defined by the Natural Soil Landscape Positions soil classification system: flatwood soils, flats soils, sand depression soils, muck depression soils, and urban or made lands. Living on these soils are ten distinct natural communities within the management area with the following coverage:



RESOURCE MANAGEMENT

Resource Management programs at CREW consist of:

- Prescribed fire to mimmick the natural fire frequency in CREW's fire-dependant natural communities (primarily in Flint Pen and the Corkscrew Marsh)
- Forestry and vegetation management such as shredding or mowing overgrown understories, or thinning pine communities where they are too dense.

- Wildlife management, including survey, trapping, and hunting programs.
- Exotic vegetation control and eradication.
- Monitoring the health of the natural communities and the impact of managent practices on them.
- Restoring sites that had previously been converted to other uses.

RESTORATION PROJECTS

The District is using mitigation funds to finance four restoration projects (448 acres) on former agricultural lands. The groundcover restoration component of the restoration has proven difficult with only a few of the harvested native plants successfully establishing on the restoration sites. In 2006 the District will commission a study to determine which method of restoration will be the most effective to use in the groundcover restoration.

MONITORING

The Florida Fish and Wildlife Conservation Commission (FFWCC) and the District perform vegetative community monitoring. The District has installed 360 degree photomonitoring points and FWC has established 18 photomonitoring points in the Corkscrew Marsh Unit and 11 photomonitoring points in the Flint Pen Strand Unit to monitor ecological change over time. 15 fixed-radius bird points have been established and bird counts are conducted quarterly in all units. Scent stations are set up annually to monitor furbearer populations. Remote sensing camera surveys for wild turkeys are done annually in January. Other wildlife are photographed as well during this annual survey. Track and spotlight counts for deer are conducted in Flint Pen Strand and Corkscrew Marsh twice a year.

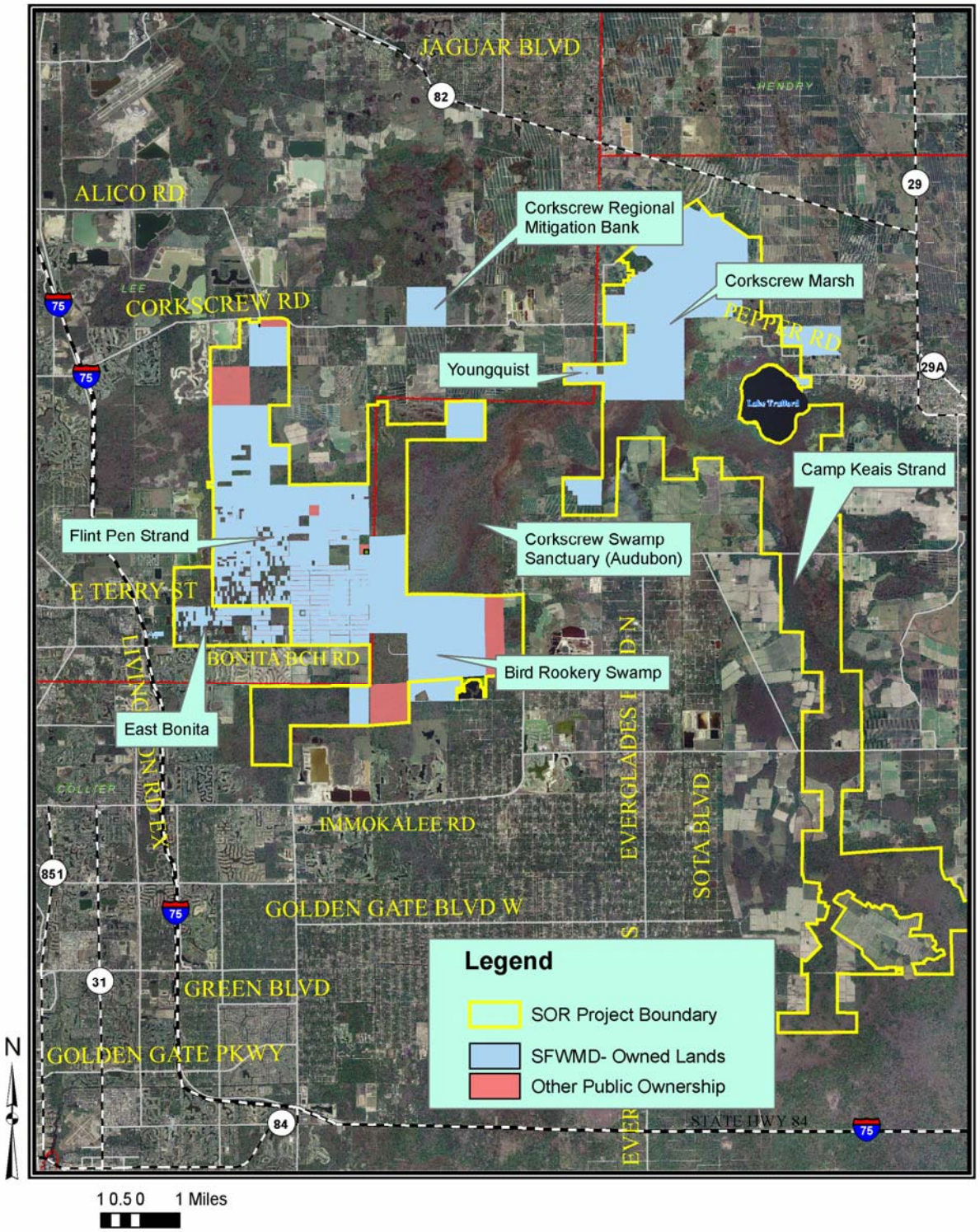
WILDLIFE MANAGEMENT

Wildlife Management and a hunting program are conducted by the Florida Fish and Wildlife Conservation Commission through a cooperative agreement with the District.

PUBLIC USE

The District maintains a contract with the CREW Land and Water Trust to coordinate volunteers and implement an environmental education and public outreach program. The CREW Trust intends to expand their role in providing public use opportunities over the next five years. In addition, there are opportunities for hiking and nature appreciation as well as primitive camping and hunting by permit. There are two primary public use areas with developed facilities: the Corkscrew Marsh unit with boardwalks, marked trails, a raised observation deck, and an observation tower; and the Bird Rookery Swamp trail system and boardwalk being developed in 2006. Four small lakes (12 acres each) are being constructed in the southern Flint Pen for floodplain compensation and will provide fishing and enhanced birdwatching opportunities.

Map 1. CREW Management Area



2. Management Plan Purpose

This General Management Plan (GMP) consolidates relevant information about the CREW Management Area (MA) including goals and objectives, past and present land uses, resource data, restoration and management needs, public use programs, and administrative duties to guide management actions for the period 2006 to 2011. Management activities described in this plan are based on requirements and directives of Legislative statutes and established District policies. District policy 140-21 requires that general management plans be developed for each designated Save Our Rivers project.

District policy further states that the Land Stewardship Program's (LSP) mission for Conservation Lands is to provide natural resource protection and management while allowing compatible multiple uses on designated public lands. This mission statement and requirements set forth in Florida Statutes provide three primary goals for the LSP:

- Conserve and protect water resources
- Protect and/or restore land to its natural state and condition
- Provide public use

To accomplish these goals, the LSP performs six major functions:

- Strategic, project, and management planning
- Operation and maintenance of land resources
- Development of public use programs
- Development of restoration projects
- Evaluation of management activities
- Administration of land management service contracts & lease agreements

The plan consolidates current site information and general guidelines for management of the area. It also updates and replaces the 2001-2006 General Management Plan. As such, it serves as a collective information source for management staff, partners, and the general public.

2.1 CREW Management Area Goals and Objectives

LSP functions are incorporated in specific MA goals and objectives for the period of this management plan 2006 – 2011.

Goal 1: Manage natural communities and modified habitats to protect and enhance water, floral, and faunal resources

Objectives:

- Continue the regular application of fire through a well-planned and documented prescribed burning program with a target of 1000 acres of flatwoods and marsh burned annually
- Continue an aggressive, integrated exotic plant management program to control infestations of all invasive exotic plant species. Treatments will be documented and coordinated with other management activities
- Continue to restore high value to degraded wildlife habitats based on historic information
- Continue to administer resource protection program with FFWCC

Goal 2: Provide resource-based public use opportunities

Objectives:

- Maintain present public-use improvements (roads, signs, entrances, structures) using a combination of District maintenance, construction contracts, and user group involvement
- Improve public access through construction, acquisition, easements and/or cooperative agreements
- Open a new public use area at Bird Rookery Swamp with parking and a new boardwalk to open access to the old tram road trail network.
- Continue to support efforts of the CREW Land and Water Trust's environmental education and public use programs
- Develop and install interpretive signage at key points within the MA to enhance visitor experience and to educate visitors about the MA

3. Introduction and Site History

In 1981, the Florida Legislature established the Save Our Rivers (SOR) program for the five water management districts to acquire environmentally sensitive land. The legislation (373.59 F.S.) produced the Water Management Lands Trust Fund and empowered the water management districts to acquire lands needed to manage, protect, and conserve the state's water resources. Once acquired, the lands should be managed in an environmentally acceptable manner and restored to their natural state. Districts may make certain capital improvements, i.e. fencing, access roads/trails, and provide basic public facilities. In addition, habitat management such as control of exotic species and prescribed burning may be conducted. The legislation also requires the districts to develop appropriate public use.

Efforts to protect wildlife resources and manage recreation on CREW began in 1951. The Collier Wildlife Management Area (WMA) was established by the FFWCC under agreement with private landowners. This area included most of Collier County from SR 29 west to US 41, covering 350,000 acres. Lee Cypress, the Collier Company, and Bill Piper provided most of the land. This area encompassed a 50,000 acre refuge, closed to hunting, on lands now part of Flint Pen and Bird Rookery. Due to land sales and changing land uses, Collier WMA was closed in 1961. The Lee WMA was established in 1953. This acquisition involved many landowners, including Alico, Henderson Ranch, and doctors William E. Berkey and Ben L. Fabric. Lee WMA extended south of Corkscrew Road, to contain portions of Flint Pen Strand. Land owned by Alico remained a WMA until 1966. In 1954, the National Audubon Society Corkscrew Swamp Sanctuary was established to protect the rookery and a small stand of old growth cypress. Since its creation, the sanctuary has provided bird watchers and amateur enthusiasts with world-class wildlife viewing opportunities. Over 90,000 visitors enjoy the unique natural features of this sanctuary annually.

Four sections, located south of the original Flint Pen boundary, were added to the CREW project in 1995, and became known as the Flint Pen Addition. Four sections were added in 1998, under the Imperial Flow Way Project. This land was purchased in response to the 1995 Imperial River floods in the Bonita Springs area, located west of Flint Pen. These eight sections were subdivided into 2.5 and 5 acre lots under the now defunct Sun Coast Acres development in the early 1960's. Unlike the rest of Flint Pen, there is active agriculture, business operations, and 40 to 50 residences in the area.

The National Audubon Society and The Conservancy of Southwest Florida nominated Bird Rookery Swamp for acquisition under the SOR Program in 1986. Lee County proposed SOR acquisition of Flint Pen the following year. In 1989 Bird Rookery Swamp and the Flint Pen Strand were combined and additional land was added to the proposed acquisition project. The larger project was given

the name Corkscrew Regional Ecosystem Watershed, or CREW, by Joel Kuperberg, a contract acquisition agent working for the District. CREW was added to the Florida Department of Environmental Protection (FDEP's) Conservation and Recreation Lands (CARL) list in 1990.

The project area currently encompasses approximately 64,000 acres in Lee and Collier Counties (**Map 1.**), and is divided into four large units. These units, named after major natural flow ways, strand swamps and marshes in southwest Florida, consist of Bird Rookery Swamp, Corkscrew Marsh, Flint Pen Strand and Camp Keais Strand. The National Audubon Society's Corkscrew Swamp Sanctuary is located in the center of the CREW project area and considered a part of CREW, but is owned and managed by the Audubon Society as a separate management area. Under the existing program, Camp Keais Strand is not included in the acquisition program. This unit is proposed for protection under private ownership either through conservation easements or similar programs through Collier County's Rural Land Stewardship Program, a stewardship credit trading system that may result in certain land uses being stripped from those properties. Under this program owners may transfer ownership of these areas to a public conservation land manager. Should the District receive ownership of any of these properties, the District will evaluate those properties for their long-term management and restoration potentials. Restoration of disturbed sites would be dependant on funds being available.

Land acquisition began with the purchase of 7,348 acres of Alico land within the Corkscrew Marsh Unit. In 1995, public lands within Flint Pen Strand, Corkscrew Marsh and Bird Rookery Swamp were established as The CREW Wildlife and Environmental Area with 17,913 acres acquired. Since that time the District and Lee County have acquired another 10,627 acres in the south part of Flint Pen and Bird Rookery Swamp for a total of 28,540 acres acquired.

4. Resource Inventory

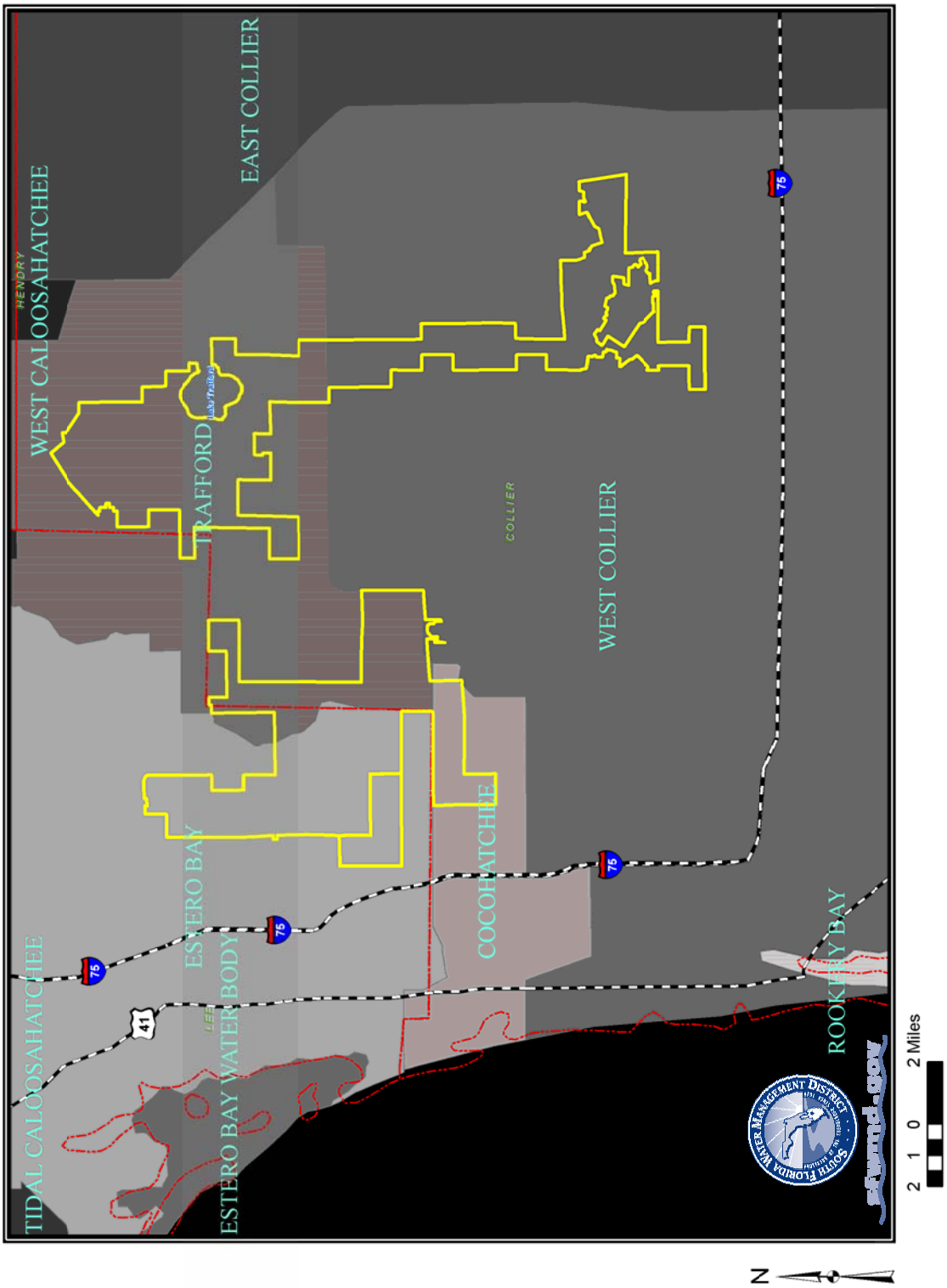
Policy 140-25(3)(e) Inventories of natural and historic resources shall be performed to provide information for effective land management planning, natural community maintenance and ecological restoration.

Floral and faunal species are inventoried, and natural communities are mapped by LSP personnel, volunteers, or private contractors. The data helps District land managers with resource management planning.

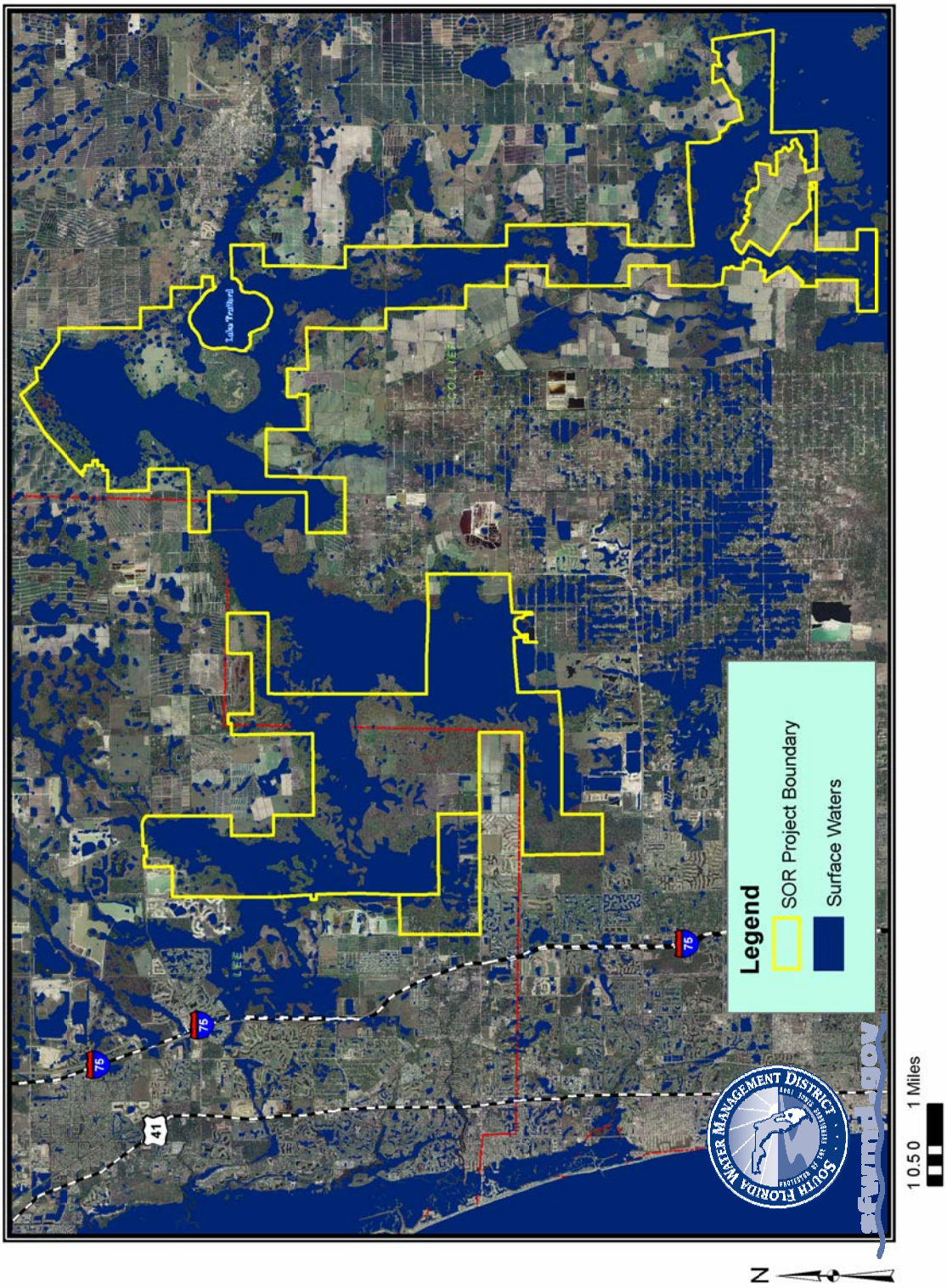
Inventory data is on file within the Planning Section of the LSP. LSP shares natural areas and species data with the Florida Natural Areas Inventory (FNAI) through a Memorandum of Understanding (MOU).

Floral and faunal inventories of the MA were included in the environmental assessment initiated shortly after acquisition to determine the presence of listed species and to serve as baselines. Additional surveys have been completed with species' lists being updated regularly by volunteers, contractors, and District staff. Archeological inventories were conducted in coordination with the Department of State, Division of Historical Resources and are described in the State's Master Site File.

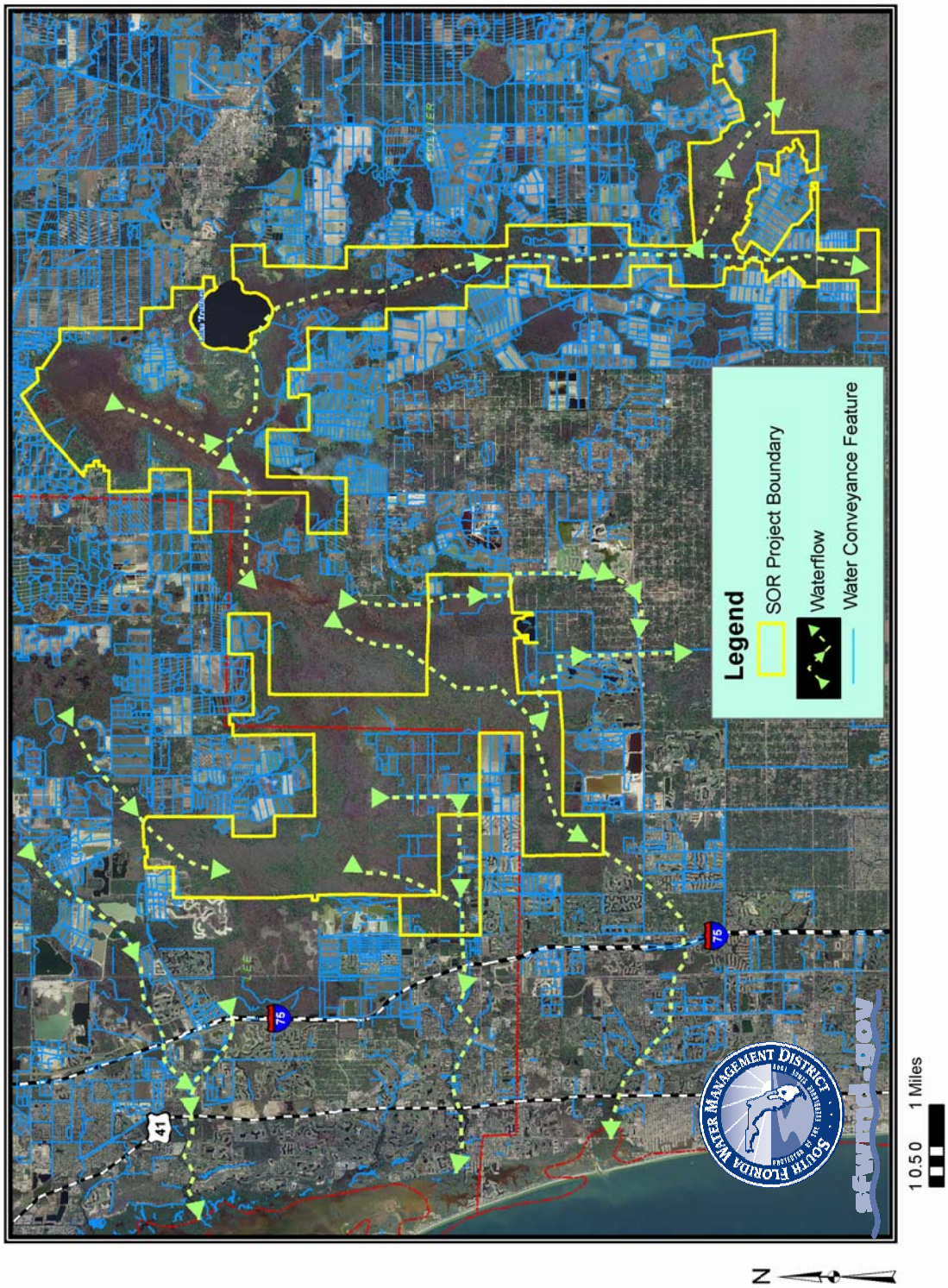
Map 2. Hydrologic Basins



Map 3. Surface Waters



Map 4. Waterflow



4.1 Hydrology

Policy 140-25(1) The basis for the Land Stewardship Program is the protection and management of natural hydrologic resources.

Water flowing from the eastern portion of the MA is part of the larger Big Cypress watershed, and delivers water to Florida Panther National Wildlife Refuge, Fakahatchee Strand Preserve State Park, Picayune Strand State Forest, Big Cypress National Preserve, and Everglades National Park. Water flowing from the western portion of the MA enters the Imperial River and flows into Estero Bay and the Gulf of Mexico.

Maximum elevation in the CREW system is approximately 26 feet (7.9 m) in the flatwoods north of the Corkscrew Marsh. CREW drains south to an elevation of 15 feet (4.6 m) (+-) NVGD in the Bonita Springs vicinity and the southern end of Bird Rookery Swamp, a distance of about 14 miles (22.4 km). From the highest flatwoods and hammocks to the wetland flow ways is an elevation change of approximately ten feet (3 m).

Previous land development in the MA included efforts to drain wetter areas and provide water management for agricultural areas. Numerous ditches drain surrounding agricultural areas into the central sawgrass swale of Corkscrew Marsh. Adjacent landowners retain use rights for these ditches to drain into Corkscrew Marsh. Ditches and canals were also dug in southern Flint Pen Strand, the most notable of these being the Kehl canal. In 1960, Suncoast Acres residential development was established in the southern portion of Flint Pen. A combination of roads and canals were constructed to provide access and drainage for each 2.5 or 5 acre (1 or 2 ha) parcel. 40 to 50 houses are in the area. The inadequacy of the drainage system has been witnessed frequently, with the last flooding episode occurring in 1995.

All alterations within the CREW system have combined to make a very dynamic hydrologic system. While it is uncertain how the collective hydrological changes have affected the natural communities, it is clear that the hydrology of the MA is different than it was historically.

One of the District's primary goals is to restore sheetflow and equalize water levels. The LSP staff plan to monitor and restore other areas that have been altered as addressed above, where necessary. To moderate the dynamic hydrology and create a more natural hydrologic pattern, the District plans to implement several hydrologic restoration projects including those based on the South Lee County Watershed Plan, 1999, prepared by Johnson Engineering, Inc. and associates under District contract (C-8812).

The Watershed Plan was prompted by flood events in June and October 1995 that indicated existing conveyance capacities of the Imperial River/Kehl Canal, Estero

River and Halfway Creek in South Lee County, and Camp Keais Strand in Collier County, were inadequate to manage floodwater from the Corkscrew watershed. The plan was commissioned to determine what management measures could reduce or alleviate flooding of residential areas adjoining the Imperial watershed in Lee County, and the Cocohatchee watershed in Collier County. The Watershed Plan presents conclusions based on the regional analysis, including:

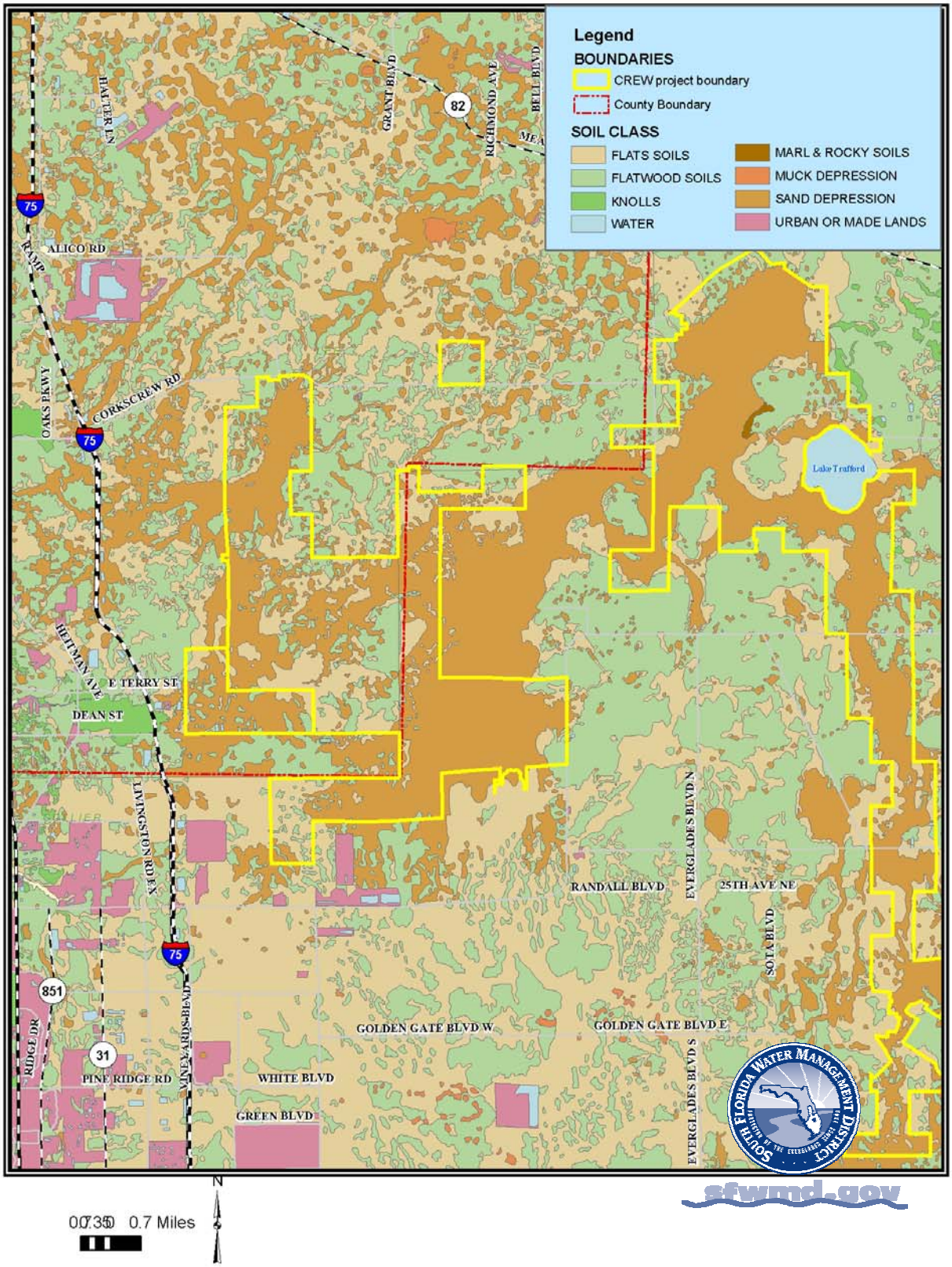
- proper maintenance of downstream outfalls
- restoration of historical surface water flows
- improved control of inflow into primary outfalls, which utilize a storage component on public land
- protection of existing flow-way corridors.

4.2 Soils

There are five distinct soil categories within the MA (**Map 5.** and further described in **Appendix B**.) as defined by the Natural Soil Landscape Positions (NSLP) soil classification system: flatwood soils, flats soils, sand depression soils, muck depression soils, and urban or made lands. The NSLP groups South Florida soils into 12 categories based on hydrology and soil morphology that reflect the local relative topography, hydrology, and vegetation of the area. Soil classification descriptions, vegetation associations, soils classification map and data files of NSLP can be accessed from the following link—(http://glacier.sfwmd.gov:80/org/pld/proj/wetcons/nslp/nslp_data.htm).

CREW soils are mostly in the fine sand and depressional groups (Gee and Jenson 1992). Soils are primarily mineral and poorly drained being near water level or inundated most of the year. Organic soils contribute to the soil profiles in deeper depressional areas of CREW, such as cypress sloughs, flag ponds and sawgrass marshes.

Map. 5. Soils


Legend
BOUNDARIES
CREW project boundary
County Boundary
SOIL CLASS
FLATS SOILS
FLATWOOD SOILS
KNOLLS
WATER
MARL & ROCKY SOILS
MUCK DEPRESSION
SAND DEPRESSION
URBAN OR MADE LANDS
HALTER LN
GRANT BLVD
RICHMOND AVE
BELL BLVD
82
75
ALICO RD
RAMP
OAKS PKWY
CORKSCREW RD
Lake Trafford
HETTMAN AVE
E TERRY ST
DEAN ST
LIVINGSTON RD N
RANDALL BLVD
EVERGLADES BLVD N
25TH AVE NE
SOTA BLVD
851
RIDGE DR
31
PINE RIDGE RD
VINEYARDS BLVD
GOLDEN GATE BLVD W
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Soil Contamination and Excavation Sites

There is one point-source of soil contaminants within the CREW project area, a cattle dipping vat at tract number 004-038, Collier County (S4, T47n, R27e).

The SFWMD contracted the services of Dames and Moore to chemically and physically analyze the area's soil and water properties. This site characterization was the first phase of a two-part remedial strategy that developed site-specific, risk-based action levels. The second phase of this process determined the appropriate degree of corrective actions. The FDEP Waste Cleanup Section Staff assisted in decision-making with regard to the appropriate land use classification and required corrective actions. The recommended exposure scenario was Residential, with corrective actions that include the following:

- excavation and offsite disposal of approximately 500 tons of impacted soil to meet the Residential criteria
- removal, decontamination and off-site disposal of the concrete vat
- backfill excavated area with clean soil
- conducting a short duration groundwater removal event from the excavation prior to the backfill activities to reduce arsenic concentration
- sample groundwater upon completion of remedial actions.

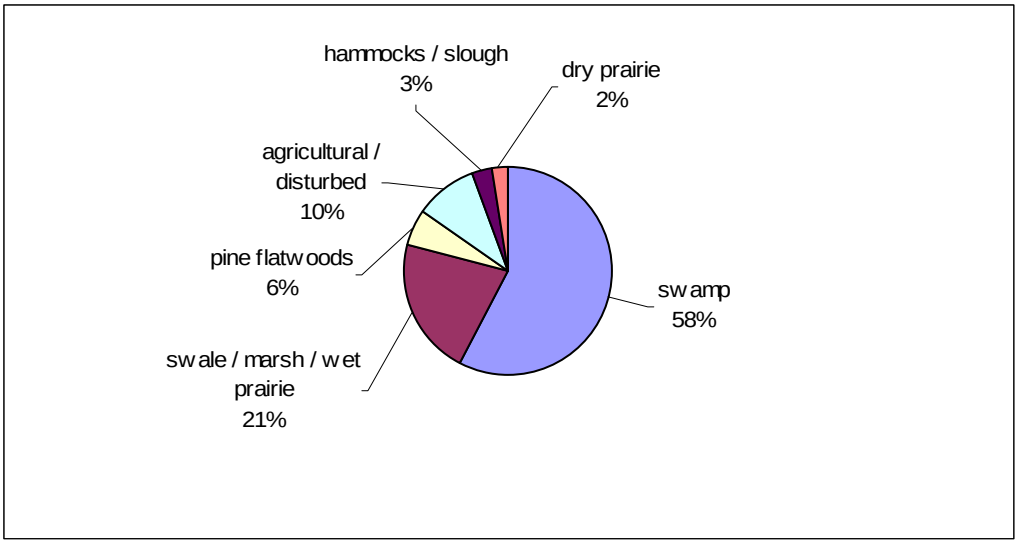
The SFWMD has implemented appropriate corrective actions leading to closure or "no further action" status on the CREW cattle dipping vat site. At this particular site, acceptable cleanup for a Restricted I scenario required off-site removal of elevated arsenic concentrations above five mg/kg. However, based on the localized horizontal extent of the contamination, corrective action was conducted to meet Direct Exposure-Residential criteria (0.8mg/kg) by removing an additional 150 tons of contaminated soil with minimal additional cost.

The SFWMD will maintain land use at these properties consistent with a Residential Exposure Scenario. For any change in land use and resultant exposure scenario from that currently observed, the SFWMD will evaluate soil contaminant concentrations in terms of the exposure scenario that most closely resembles that proposed land use and human activity pattern. The District will notify the FDEP of any changes in use the site that would result in it being managed or otherwise used in any manner inconsistent with the current management status. In addition, the District will notify FDEP prior to taking any agency action to sell, lease, or otherwise transfer any of its interest in the site.

4.3 Natural Communities

There are ten distinct natural communities within the management area (**Map 6.** and further described in **Appendix C**.). The LSP classifies natural community types by the Florida Natural Areas Inventory (FNAI) Classification system.

Community condition varies widely, depending on previous and current land use, hydrologic alteration, and exotic infestation.

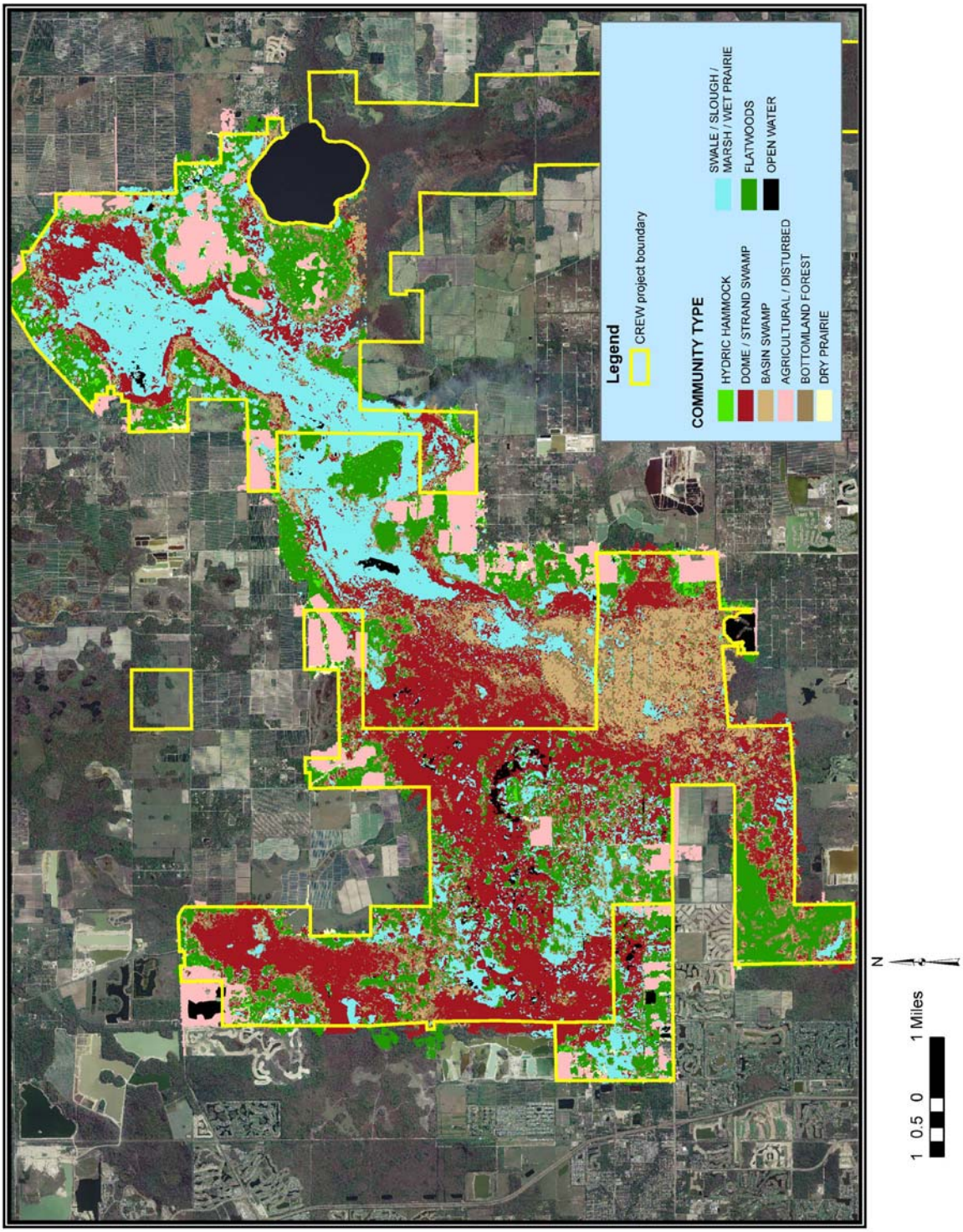


The Bird Rookery Swamp Management Unit (7,017 acres) (**Map 6c**) is located to the north, west and south of Corkscrew Swamp Sanctuary, and one half mile west of CR 846 (Immokalee Road). The unit is mostly strand swamp dominated by cypress and maple. There is a mix of wet flatwoods and dome swamps along the western portion of the property. An area of open marsh, dominated by sawgrass and willow, is found in the center of the tract. A system of logging tram roads and adjacent borrow ditches remain from previous cypress logging operations.

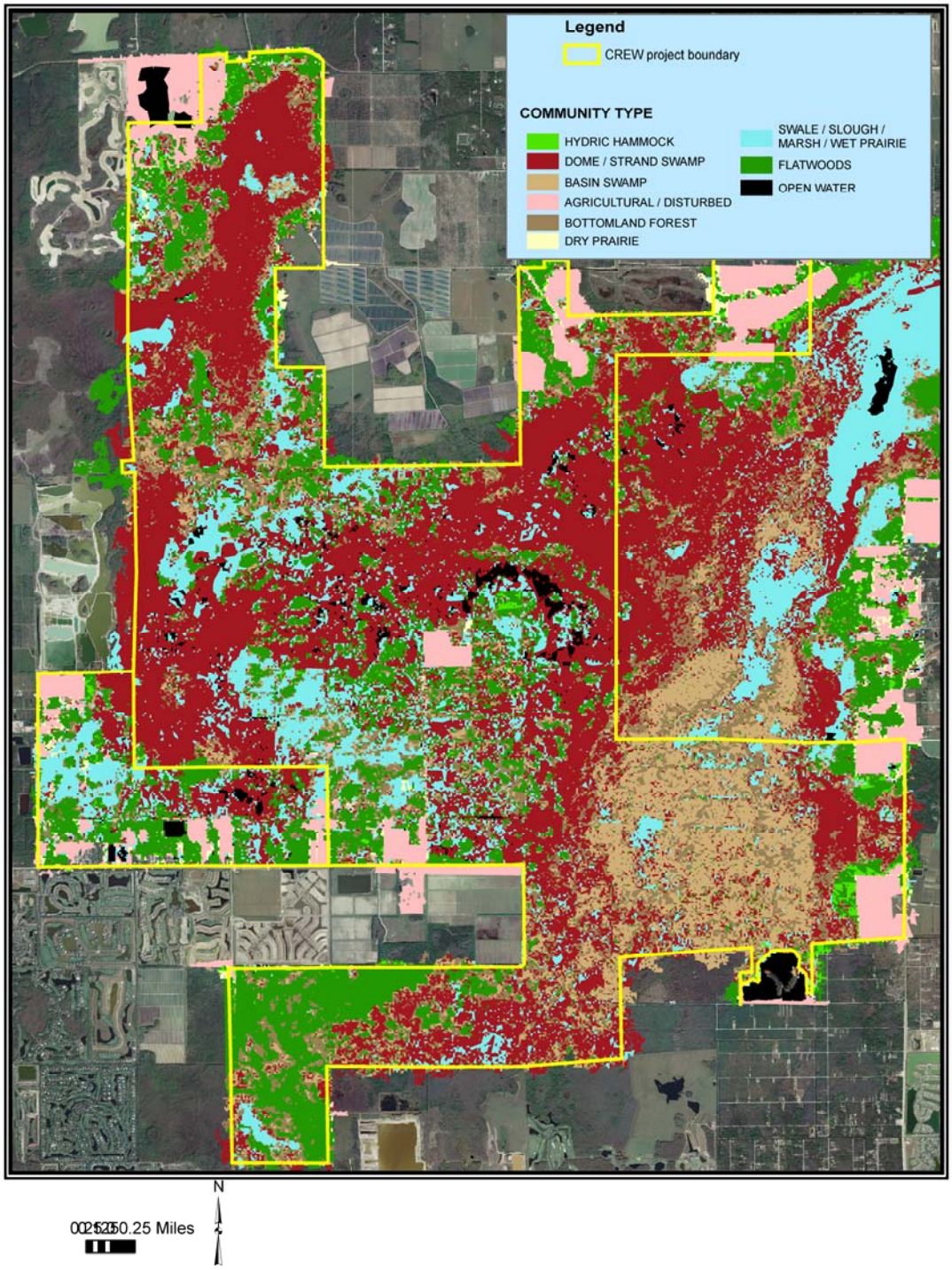
Corkscrew Marsh Management Unit (7,348 acres) (**Map 6b**) forms the eastern headwaters of CREW, and flows south to the larger Big Cypress system. It is located to the southwest of State Road (SR 82) and southeast of County Road 850 (CR 850). The unit is dominated by a 5,000-acre sawgrass swale. Hammocks and flatwoods surround the swale on the eastern, northern and western boundaries.

Flint Pen Strand Management Unit (14,173 acres) (**Map 6a**) boundaries extend to the south from Lee County Utilities' Corkscrew well field at Corkscrew and Alico Roads, south to Bonita Springs, and east to the Collier County line. The western boundary extends to within two miles of Interstate 75. Flint Pen strand swamp consists of cypress-dominated communities and pine flatwoods.

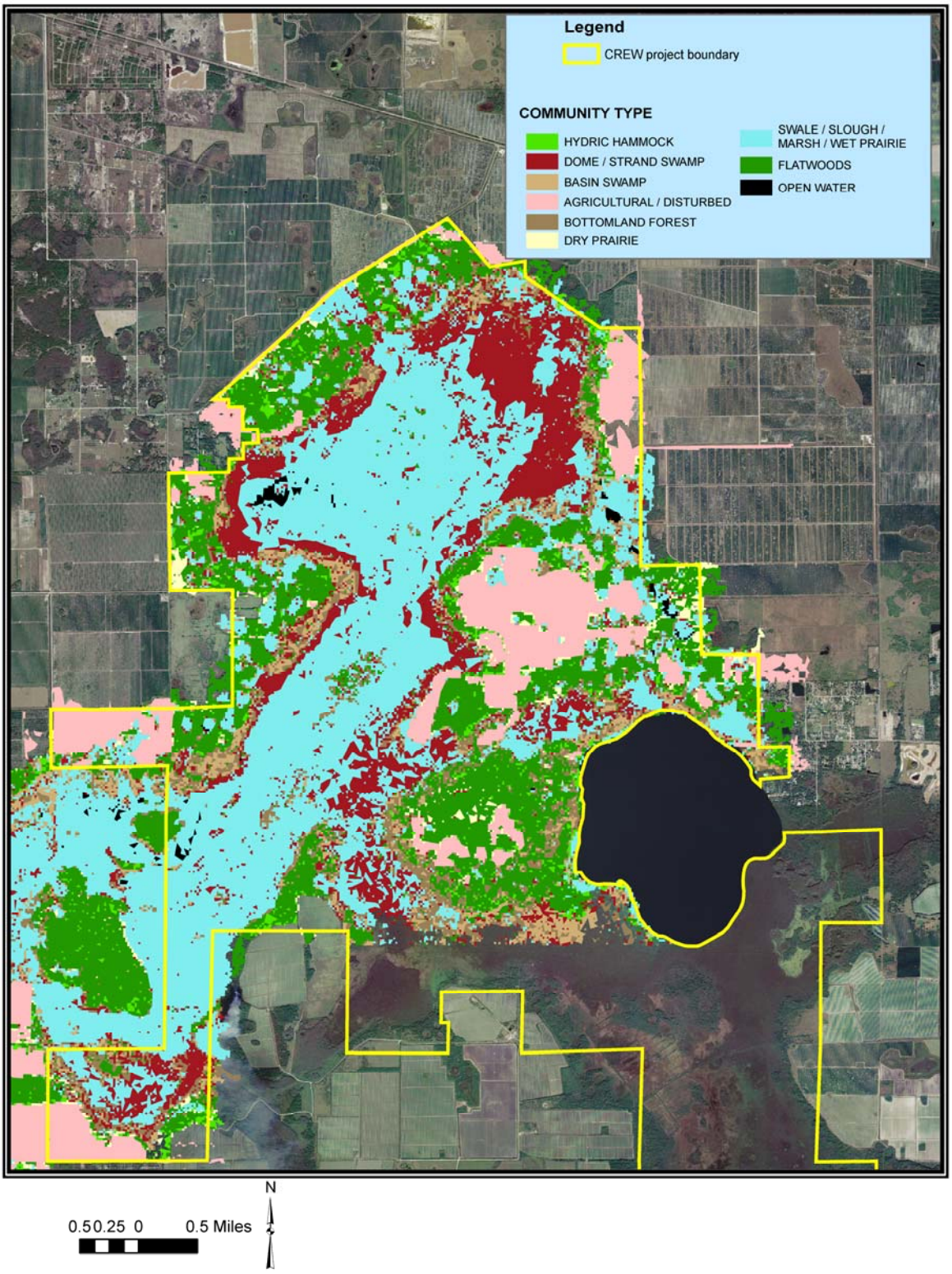
Map 6a Natural Communities: CREW



Map 6b Natural Communities: Flint Pen Strand



Map 6c Natural Communities: Corkscrew Marsh



4.4 Wildlife

The Fish and Wildlife Conservation Commission (FFWCC) has identified the area in and around the MA as a "Biodiversity Hotspot" and a "Priority Wetland for Listed Species" (Cox et al, 1994; Kautz et al, 1994). The natural communities within the project provide habitat for numerous bird, reptile, and mammal species, several of which are listed federally or by the state. "Biodiversity Hotspots" are areas with a high degree of overlap for 5-7+ declining species of wildlife, plus known occurrences of flora, fauna, & natural communities (Cox et al, 1994). "Priority Wetland for Listed Species" represents wetland habitats critical for one to three wetland-dependent species of vertebrates listed as endangered, threatened, or species of special concern (Kautz et al, 1994).

Since the District's initial involvement with the MA, it has conducted inventories to determine the natural and cultural resources present. Regular surveys are ongoing by District and FFWCC staff, volunteers, or contractors, and species lists are updated accordingly. To date the District has recorded 122 bird, 22 mammal, 38 reptile, 17 amphibian, 24 fish, and 24 butterfly species within the MA (**Appendices E-G**). At least 19 species considered rare, endangered, threatened, or of special concern have been noted.

4.5 Cultural Resources

Policy 140-25(3)(j) Archaeological and historic resources are protected by site identification and inter-agency coordination with the Florida Division of Historical Resources. Land stewardship planning shall include an analysis of archeological data accompanied by appropriate public education opportunities.

The CREW Management Area has experienced a variety of land use patterns similar to other inland areas of southwest Florida. Native Americans lived in southwest Florida approximately 2,000 years before European discovery. The Calusa Tribe occupied the region surrounding CREW with main settlements at Mound Key in Estero Bay, and Pineland on Pine Island. By the mid 1800s, south Florida native tribes were decimated and replaced by Seminole Indians, an association of several tribes displaced from Georgia and north Florida.

Early inhabitants used CREW's endemic plants and animals for substance living, but with European arrival, commercial utilization of wildlife flourished. Through 1940, pelts, plumes, and hides were items of commerce. Hides of alligator, deer, raccoon, and otter were harvested. Breeding plumes from egrets and herons were also harvested, and rookeries throughout south Florida were decimated to supply the fashion trade. Recreational hunting also occurred during early times but its impacts were likely minimal.

Euro-Americans settled in the area at the end of the 19th century. CREW is at the northwest boundary of the Big Cypress region, and its swamps hindered development. CREW properties remain as some of the least disturbed land by the Gulf.

In the latter half of the 20th century additional commercial activities occurred. Cattle, timber, oil exploration, and recreational hunting became important activities within CREW. A number of cattle operations were in operation, including the Flint family cattle ranch in Flint Pen Strand. Other landowners, such as Alico and Collier, leased land for grazing and hunting. Logging for pine and cypress removed most of the commercial grade timber. Lee-Tidewater Cypress, a forestry operation based in Copeland, Florida, logged cypress from Bird Rookery Swamp. Alico harvested pine from the flatwoods of the Corkscrew Marsh Unit in the 1940's, 1970's and again in 1989. Florida's first commercial oil was produced from the Sunniland Oil Field in 1943, the first of 11 commercial oil fields. The West Felda oil field (1966) and Lake Trafford oil field (1969) are near CREW. The Lake Trafford field includes wells and production pads east and west of Corkscrew Marsh.

In 1988, the Florida Department of State, Division of Historic Resources (FDHR) reviewed existing information on archaeological or historic sites in or near Flint Pen Strand and Bird Rookery Swamp. Their report identified five archaeological sites within the boundary of Corkscrew Swamp Sanctuary. One prehistoric burial site was identified within Corkscrew Marsh in 2000. Geological features indicate the potential for additional sites. FDHR completed a preliminary on-site survey of potential archaeological sites in 2002.

The District plans to promote research on the site within the MA and safeguard its integrity, primarily through prohibiting ground disturbing activities. Management activities planned for this area are exotic plant control, vegetation management, and prescribed burning. Staff from FDHR may revisit these sites to conduct additional investigations.

5. Natural Resource Management

Policy 140-23 The Land Stewardship Program mission is to provide natural resource protection and management while allowing compatible multiple uses on designated public lands.

Resource management includes all applied programs wherein activities manipulate, modify, and control natural features within CREW. All SOR lands shall be managed and maintained in an environmentally acceptable manner and, to the extent practicable, restored and protected in their natural state and condition. Management responsibilities are defined by statutory law, and directed by best management practices. Goals and objectives for CREW clarify

resource management guidelines necessary to fulfill the District's land stewardship responsibilities. Programs in CREW consist of :

- Prescribed fire to mimmick the natural fire frequency in CREW's fire-dependant natural communities (primarily in Flint Pen Strand and the Corkscrew Marsh)
- Forestry and vegetation management such as shredding or mowing overgrown understories, or thinning pine communities where they are too dense.
- Wildlife management, including survey, trapping, and hunting programs.
- Exotic vegetation control and eradication.
- Monitoring the health of the natural communities and the impact of managent practices on them.
- Restoring sites that had previously been converted to other uses.

5.1 Restoration Projects

Policy 140-25(1) The *basis for the Land Stewardship Program is the protection and management of natural hydrologic resources.*

Policy 140-25(1)(c) *Where feasible, an attempt shall be made to restore a more natural hydroperiod on tracts where the drainage patterns have been altered.*

Youngquist 288 acres (**Map 7.**)

This 288-acre site situated between orange groves, the Corkscrew Swamp Sanctuary and the CREW Corkscrew Marsh unit in southeastern Lee County was purchased in March of 2000 as mitigation for wetland impacts authorized by DEP, the Corps, or SFWMD. The parcel had been utilized for row crops and pasture; a surface water management system was built and permitted to support future farming. The goal was to restore the hydrology by filling in/plugging drainage ditches, followed by limited groundcover restoration and phased re-vegetation.

The restoration of the property was delineated into three basic and separate scopes of work, which included earthwork, groundcover restoration and re-vegetation. The earthwork or hydrologic restoration component included filing the drainage ditches and degrading nearly two miles of the remnant surface water management system berms to natural grade elevations. The volume of material to be degraded from the berm and placed in the adjacent ditches was 48,325 cubic yards, or 5.7 acres of filled in ditches. The degradation and filling will restore some connectivity of sheet flow to the Sanctuary along the southern property line. The second contract included groundcover restoration of 10 acres in the northeast corner using the harvested seed technique with native vegetation to recreate the historic flatwoods. Prior to implementing the seeding technique the site was mowed, herbicided and plowed to prepare it for planting. The final

revegetation effort is ongoing and has consisted of planting the pasture areas with pine seedlings and containers of native species within the groundcover restoration site.

The hydrologic component of restoration was completed in 2001 and the groundcover restoration in 2002. Presently efforts are ongoing to revegetate with container material using volunteers. The project is moving towards success for the hydrologic and vegetative restoration.

Tree Wizard 10 acres (**Map 7.**)

The Tree Wizard property covers 10 acres; it is located at the northeast corner of Vincent and Harrell Roads, off Bonita Beach Road, in the southeast portion of the Flint Pen Strand of the Corkscrew Regional Ecosystem Watershed in Lee County. The property was originally a queen palm nursery that was acquired with mitigation funding and was restored with same. The goal was to restore the hydrology by removing tree stock, excavating a slough to the dry season water table, followed by revegetation with vegetative material. The District purchased the land in 1999.

The restoration of the property was delineated into two basic and separate scopes of work, which included clearing/earthwork and re-vegetation. The clearing/earthwork or hydrologic restoration component included clearing the site of all existing nursery and exotic vegetation and excavation of the artificial sloughs to the dry season water table with a connection to the adjacent Kehl Canal. This connection provides a water source for rehydration of the site. Borrow from the excavation of the slough and degradation of the levee adjacent to the Kehl canal was utilized to construct two tree islands as part of an upland portion of the property, and provide fill for the existing ditches. The second contract included re-vegetation with native vegetation to recreate a mosaic of pine flatwoods, hardwood swamp forest and marsh communities. Exotic plant maintenance was part of both contracts. The major components of restoration were completed in 2001.

Bird Rookery Swamp 70 acres (**Map 7.**)

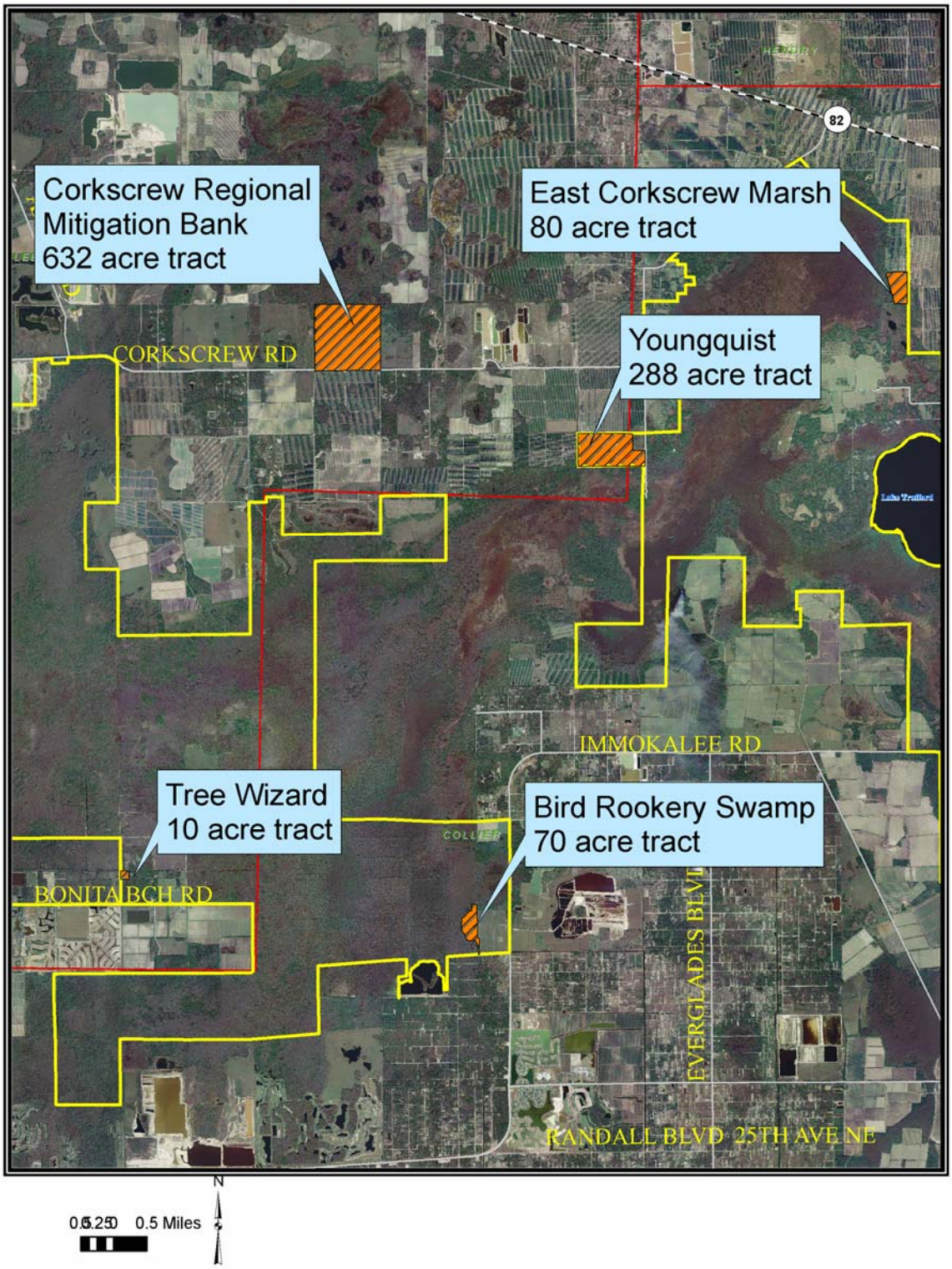
The Bird Rookery Swamp restoration site is geared toward converting an agricultural row crop area to a wet flatwood community. The linear ditches have been filled and exotic trees removed in preparation of the restoration efforts. In 2006 the District will commission a study to determine which method of restoration will be the most effective to use in the groundcover restoration.

East Corkscrew Marsh 80 acres (**Map 7.**)

East Corkscrew Marsh restoration is divided into two 40 acre cells. Prior to restoration the site was dominated by Brazilian pepper. The goal of the

restoration is a wet flatwood community. The peppers were cleared in the first cell, and then the bare soil was prepped to receive native seed from a donor site. Native seeds were collected at the Avon Park Bombing Range and the Triple Diamond Ranch near the Kissimmee River. The native seed was worked into the soil in the first cell. At the time of this management plan only a few species that were known to have been harvested from the donor sites have successfully established themselves in these 40 acres. There is encouraging evidence that the native grasses including lopsided Indian grass and wire grass are becoming well established. The remaining plants are ruderal species that commonly establish themselves in disturbed soils. In 2006 the District will commission a study to determine which method of restoration will be the most effective to use in the groundcover restoration of the other 40 acre cell.

Map 7. Restoration Projects and Mitigation Areas.



5.1.1 Mitigation

Mitigation plays an important role in resource management and restoration activities within CREW. CREW was designated a Regional Mitigation Area that received mitigation funds starting in 1995 to be used for land acquisition and restoration purposes. While CREW no longer receives these mitigation funds, a balance of $803,000 remained at the beginning of FY 2006 for land acquisition and $754,000 remained for restoration and monitoring. The restoration funds have been used to fund the restoration projects covered in section 5.1. As of the end of FY2005 1,054 acres had been acquired with $2,730,574 of the mitigation funds. Exotic control efforts in FY 2006 will be using mitigation funds.

Just north of CREW is the Corkscrew Regional Mitigation Bank which is actively selling mitigation credits for the restoration of 632 acres of agricultural lands just North of the CREW Management Area and South of the 5230 acre Airport Mitigation Project (Imperial Marsh). Mariner Properties Development Inc., is the private banker implementing the Corkscrew Regional Mitigation Bank project under a contract with the South Florida Water Management District.

5.2 Vegetation Management

Policy 140-25(2)(d) Where practicable, an attempt shall be made to restore and maintain desirable vegetation to promote habitat diversity in areas where invasive exotic vegetation, grazing practices, or improved land uses have substantially altered the historic landscape.

Policy 140-25(3)(l) Mechanical equipment may be used in conjunction with prescribed burning and other management tools to control vegetation and restore habitat structure.

5.2.1 Mowing for Wildlife Benefits

In CREW, openings may be mowed every two to three years to maintain their structural integrity. Mowing is considered an alternative to prescribed burns when weather conditions or other constraints prohibit fire application. It will be avoided during the spring to protect ground-nesting birds.

Mowing can provide similar benefits as grazing and fire by suppressing woody plant growth, and by encouraging grasses and low-growing herbs to produce new growth (Williams 1991, Landers and Mueller 1992). Mowing improves brood habitat conditions for wild turkeys by reducing dense understory vegetation in hardwood hammocks, and invasion of woody plants in grassy fields (Williams 1991). Mowing benefits rabbits by providing a supply of growing forage (Sharpe 1990).

Map 8. Corkscrew Regional Mitigation Bank Restoration Plan

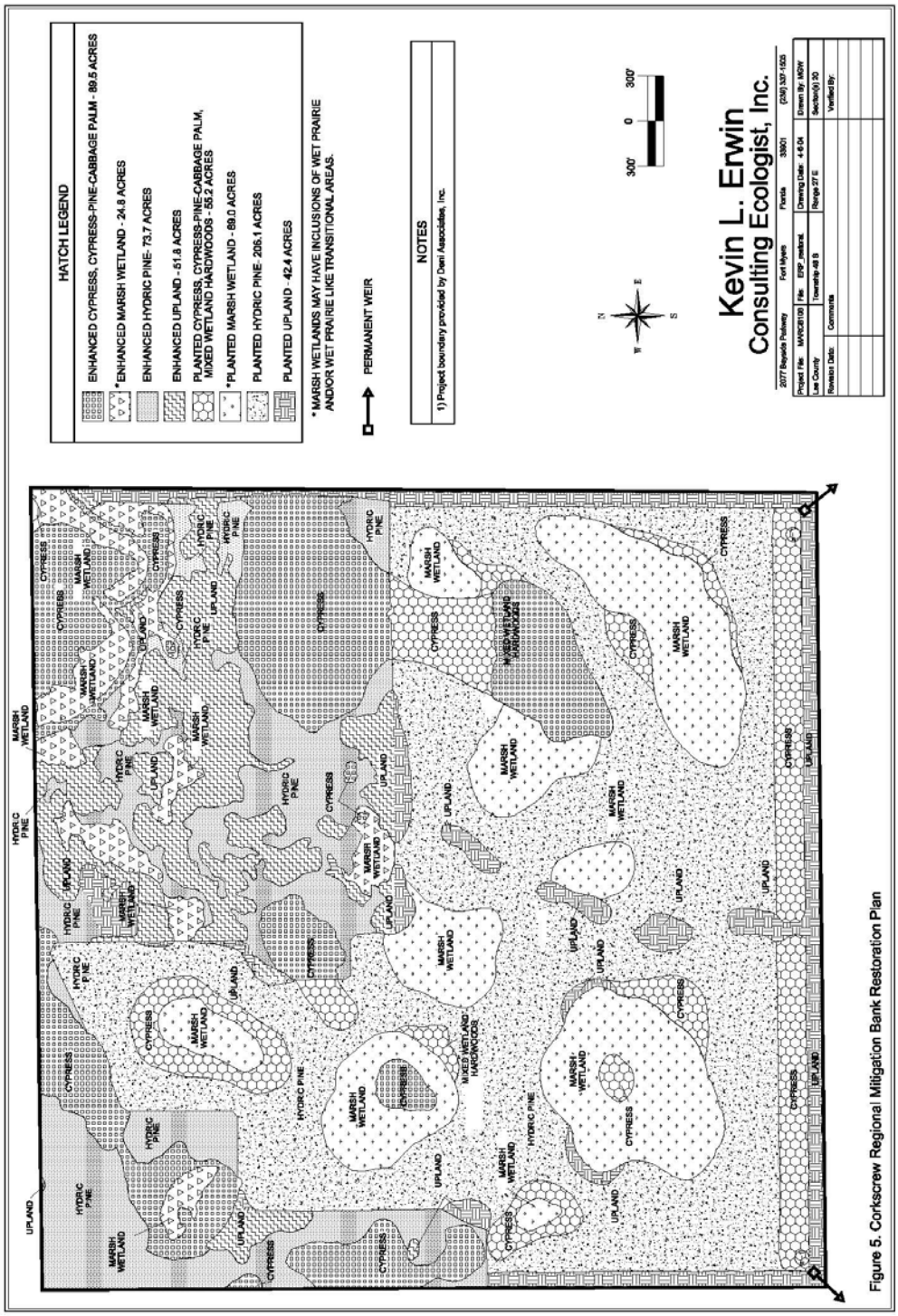


Figure 5. Corkscrew Regional Mitigation Bank Restoration Plan

Smooth cuts are not required when mowing to improve wildlife habitat conditions. Mowing height is also generally not important, although a higher cut in early spring may leave important nesting cover for bobwhite quail.

5.2.2 Exotic/Invasive Plants

Policy 140-25(2)(c) Management practices will strive to identify existing infestations and implement appropriate control or eradication measures.

Policy 140-25(3)(b) Exotic plant control in all management areas shall strive to attain a level of success where periodic maintenance eliminates the infestation or reduces the coverage of exotic plants.

South Florida's subtropical climate provides an excellent growth environment for the rapid spread of exotic plants that can cause extensive alterations to natural ecosystems. Environmental changes caused by extensive hydroperiod alterations have been an important factor in exotic plant invasion. Exotic plant invasion can result in partial or total displacement of native plants, loss of wildlife habitat, and the degradation of public use areas.

The LSP targets Category I and II non-native plant species as identified on the Exotic Pest Plant Council's biennially updated list of *Florida's Most Invasive Species* (http://www.fleppc.org/). Category I species include non-native plants that invade and disrupt Florida native plant communities. Category II plants have the potential to invade and disrupt natural successional processes. Both Category I and II exotics are considered invasive and a threat to the function and ecological stability of Florida's natural communities.

Control efforts were initiated by SFWMD staff, volunteers from Corkscrew Swamp Sanctuary, and the CREW Land and Water Trust from 1990 through 1992. Work was concentrated in the flatwoods of Corkscrew Marsh where access was available via public roads. Control work in Flint Pen Strand began in 1994 using contractors. Since 1994, contract work teams spent an average of six months per year in Bird Rookery Swamp, Corkscrew Marsh and Flint Pen Strand. The prominent problem species are melaleuca, Brazilian pepper, downy rose myrtle, cogon grass, and Old World climbing fern (*Lygodium microphyllum*). Of significant concern is Old World climbing fern, which persists in spite of consistent treatment since 1994. The District treats and surveys Lygodium-infested areas several times a year to control established infestations and locate new ones in the MA.

Table 1. Primary Exotics in the MA

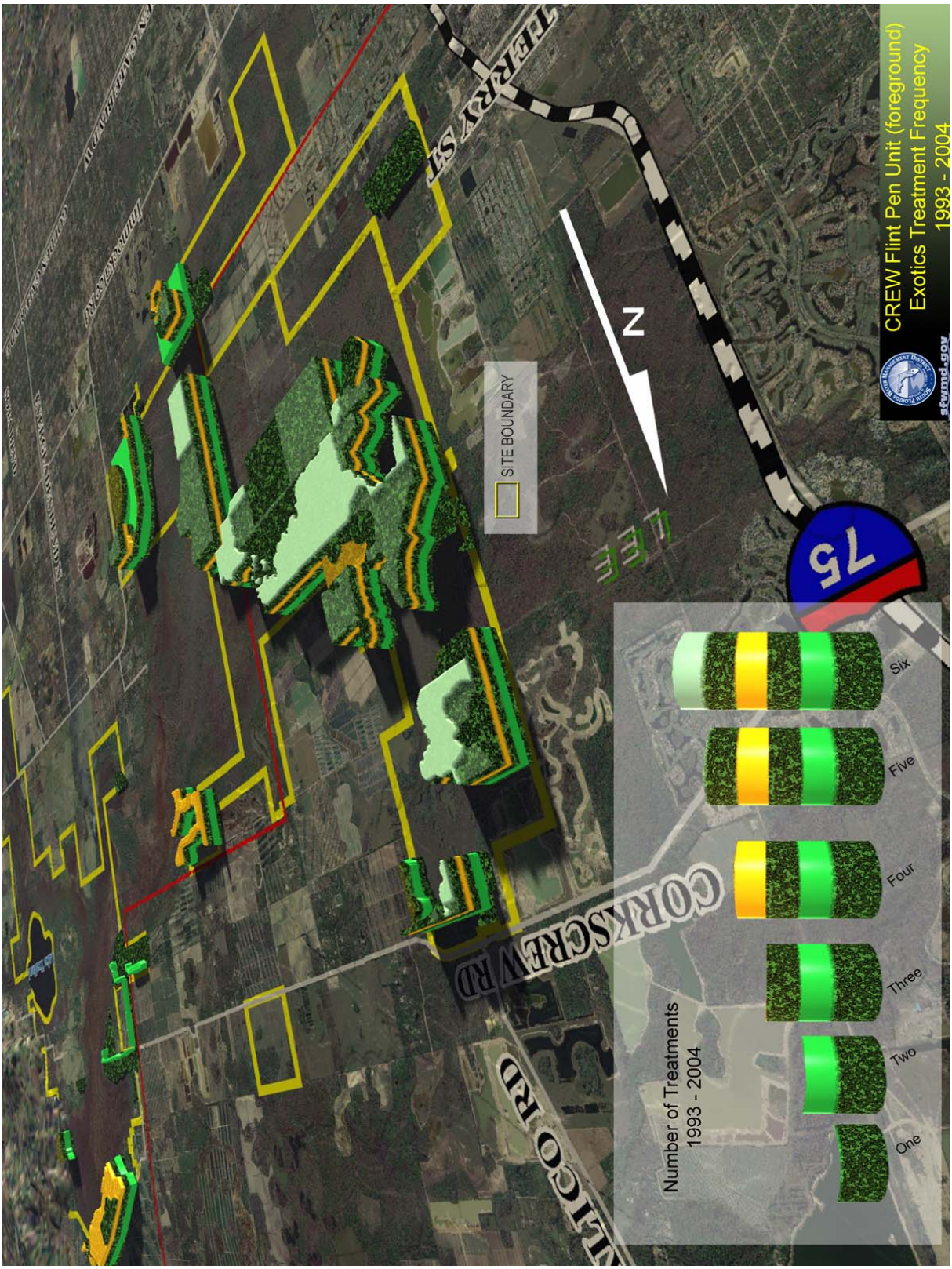
Common Name	Scientific Name	EPPC Category
Melaleuca	*Melaleuca quinquenervia*	I

Brazilian pepper	*Schinus terebinthifolius*	I
Downy Rose Myrtle	*Rhodomyrtus tomentosa*	I
Creeping Signal Grass	*Urochloa plantaginea*	N/A
Cogon grass	*Imperata cylindrica*	I
Common guava	*Psidium guajava*	I
West Indian Marsh Grass	*Hymenachne amplexicaulis*	I
Old World climbing fern	*Lygodium microphyllum*	I
Napier Grass	*Pennisetum purpureum*	I
Java Plum	*Syzygium cumini*	I

Invasive exotic plant control measures include a combination of herbicide application, prescribed fire, and physical removal. Selection of control measures is dependent upon species type, environmental factors, and natural communities impacted. Private contractors conduct exotic plant control activities in cooperation with the District's Vegetation Management Division.

District field technicians also provide supplemental support on small or sporadically distributed infestations. Generally, treatments in the MA are scheduled so that each unit is covered annually; however, schedules are adjusted based on current conditions. Areas of treatment are scheduled based on groundwater conditions, time since last treatment, severity of infestation, public use, and consistency with other management operations. All treatments follow herbicide BMP's and use the best available science.

Map 9. CumulativeExotic Treatments at CREW 1993 - 2004



5.2.3 Rare, Threatened and Endangered Species

Policy 140-25(2)(b) Particular emphasis shall be placed on the identification, protection and management of rare, threatened and endangered species.

Listed species are those plants and animals considered rare within a specific geographic area by the U.S. Fish and Wildlife Service (FWS), the Florida Fish and Wildlife Conservation Commission (FFWCC), Florida Natural Areas Inventory (FNAI), and the Florida Department of Agriculture and Consumer Services (FDACS). A list of these species is annually updated and published by the FFWCC. The plant list of the MA (**Appendix D**) contains several listed species (Table 4).

Table 2. Plants Occuring on the CREW Management Area that are Listed by the Florida Department of Agriculture and Consumer Services as Threatened (T), Endangered (E), or Commercially Exploited (C) as of 2005

Common Name	Scientific Name	Status
Giant Leather Fern	*Acrostichum danaeifolium*	C
Pine Pink Orchid	*Bletia purpurea*	T
Many-flowered Grass Pink	*Calopogon multiflorus*	E
Hand Fern	*Cheiroglassa palmata*	E
Satinleaf	*Chrysophyllum oliviforme*	T
Blodgett's Swallowwort	*Cynachum blogetii*	T
Clam-shell Orchid	*Encyclia cochleata v. triandra*	E
Brown Epidendrum Orchid	*Epidendrum anceps*	E
Night-blooming Orchid	*Epidendrum nocturum*	E
Matted Epidendrum Orchid	*Epidendrum rigidum*	E
Catesby's Lily	*Lilium catesbaei*	T
Climbing Milkweed	*Matelea gonocarpa*	T
Simpson's Stopper	*Myrcianthes fragrans*	T
Giant Sword Fern	*Nephrolepsis biserrata*	T
Royal Fern	*Osmunda regalis*	C
Blue Butterwort	*Pinguicula caerulea*	T
Yellow Butterwort	*Pinguicula lutea*	T
Widespread Polypody	*Polypodium dispersum*	E
Plume Fern	*Polypodium plumula*	E
Swamp Plume Polypody	*Polypodium ptilodon*	E
Pale-Flowered Polystachya	*Polystachya concreta*	E
Clam-Shell Orchid	*Prosthechea cochleata*	E
Southern Shield Fern	*Thelypteris kunthii*	T
Bulbous Wild-pine	*Tillandsia balbisiana*	T
Cardinal Wild-pine	*Tillandsia fasciculata*	E
Stiff Wild-pine	*Tillandsia flexulosa*	T
Giant Wild-pine	*Tillandsia utriculata*	E
Soft Wild-pine	*Tillandsia valenzuelana*	T
Atamasco Rainlily	*Zephyranthes atamasco*	T
Simpson's Rainlily	*Zephyranthes simpsonii*	T

The LSP establishes appropriate fire and hydrologic regimes, and controls invasive exotics in natural communities with the intent of perpetuating listed plant species. District Public Use Rules aid in the protection of native habitat and specifically prohibit destroying, defacing, or removing any natural feature or native plant on District lands. In this manner, listed plants are given lawful protection and environmental conditions suitable for their growth and reproduction.

Several listed bromeliad species ocurring on the MA may be threatened by the exotic Mexican weevil (*Metamasius callizona*) that has caused destruction of native bromeliads in other south Florida locations. Five species of once abundant bromeliads, *Tillandsia sp.*, have been placed on the state's list of endangered and threatened plant species as a direct result of this weevil. District LSD staff will conduct periodic surveillance of areas of potential infestations to assess management needs.

5.2.4 Forest Resources

Policy 140-25(3)(h) *Sustainable use of forest resources shall be conducted where these activities adhere to a series of environmental criteria (see 1999 Forest Management Plan) that meet Land Stewardship Program goals. Timber contractors will be required to meet silvicultural Best Management Practices (BMP) developed for Florida forests.*

Policy 140-25(5)(b)(3) *Timber sales will be conducted to improve forest health or to support specific forest management goals.*

District LSP policy designates its properties as multiple-use resources, which include timber harvesting. However, such activity must be compatible with LSP goals and objectives and meet strict environmental criteria:

- The area planned for silvicultural rotation is currently in an improved or disturbed state (i.e. bahia pasture, existing pine plantation)
- The site to be planted is not scheduled for future hydrologic restoration, or the site to be harvested is scheduled for hydrologic restoration and existing timber will be lost as a result of flooding
- The area does not contain any valuable resources (e.g. endangered species) that may be harmed by changes in land use
- Forest operations would not require major road construction or improvement for accessing and processing timber, particularly within or across wetlands or other sensitive plant communities
- The area to be managed currently requires maintenance (i.e., burning, mowing)

- District costs would be reduced as a result of inclusion in the forest management plan
- The area contains timber that requires salvage following fire and/or insect or disease damage, and could be subject to a sanitation harvest with minimal environmental impact
- The area provides special needs for endangered species (e.g., red-cockaded woodpecker) management that requires timber stand improvement
- Harvest or planting will not create an aesthetically unpleasant scene or an impediment to public use
- Timber harvests will return forests to a more natural structure and improve forest health.

Raising slash pine for revenue is expected to be a small but integral part of the overall management of CREW. Slash pines will be established in areas previously used for agricultural activities of row crop farming and pastureland. Following tree plantings, standard forestry practices for pine tree management will be employed, including application of fire. The Youngquist Restoration Project will employ forestry practices to restore slash pine to a former agricultural site.

5.2.5 Range Resources

Policy 140-25(3)i Range management and grazing will be considered on improved or native ranges when the introduction of cattle will not conflict with other natural resource management and public use goals.

A one square mile (640 acre) area is under lease agreement (Contract LS040821) for the period of 2004 through 2009. Contract renewal will be considered at the time of termination. This single cattle lease operation, near the north end of Bird Rookery Swamp Unit, has approximately 400 acres (162 ha) of pastureland. Prescribed fire is used to maintain these pastures and adjacent flatwoods for cattle grazing.

Livestock grazing has occurred over the last century within south Florida and continues to be an important land use today. Cattle grazing is employed by the District and other land management agencies on areas that have historically been grazed as a management tool, particularly for the reduction of fire fuel loads and maintenance of open range for the benefit of native wildlife.

The decision to open an area to grazing that has not been grazed before is evaluated in light of the negative environmental impacts often accompanying cattle introduction. Cattle are vectors for non-native invasive and pest plants, particularly bladder-pod (*Sesbania sp.*) and tropical soda apple (*Solanum viarum*). Trampling and grazing of sensitive native ground covers select for rhizome-prolific grasses and often result in dominance of non-native, early successional species. By reducing understory plant densities, grazing eliminates natural fire patterns that would otherwise define plant community types. In

addition, costs are incurred for exclusion fencing of sensitive environmental areas.

Grazing Lease Agreement Parameters

The District exercises the option to lease grazing rights to the public, or the original owner when a property is acquired. Lease terms are based on carrying capacity and agreement to certain management responsibilities that may include non-native and nuisance plant control, hog removal and/or fence construction. Livestock operations follow guidelines defined in the publication Guidelines and Criteria for Interim Use of District-owned Land (Dames & Moore 1998). The District limits certain activities deemed detrimental to the environmental integrity of each parcel leased, with each lease customized to ensure best management practices. Leased SOR lands are returned to the county property tax rolls, and these tax payments become the responsibility of the lessee. Leases are re-evaluated at the time of termination with consideration to LSP management goals and objectives.

5.3 Fire

Policy 140-25(5)(c)(3) Prescribed fire will be a primary management tool on District lands and will be applied within fire-maintained communities at appropriate intervals.

The majority of natural communities on District lands rely on frequent fire to maintain their vegetative characteristics and biodiversity. Wildfires no longer occur with historical frequency or extent, and this has altered natural community structure and function. Prescribed fire attempts to mimic the benefits of natural wildfires that historically reduced fuel loads, recycled soil nutrients, and maintained natural communities by inhibiting hardwood encroachment and stimulating fire-adapted plant growth. The LSP recognizes the benefits of fire and has integrated prescribed fire planning and application into its land management strategy.

5.3.1 Fire History

The incidence of past fire use in CREW has varied. Numerous landowners utilized different land use practices before District acquisition. Past land uses range in intensity from agricultural practices such as row crop farming, logging and ranching, to idle land like that found today in the centers of wetland systems. Most of the wet and mesic flatwoods, as well as the open marsh, were probably burned for improvement of cattle grazing. There are signs of past fires in hammock areas, and evidence of destructive fires in Bird Rookery Swamp and Flint Pen Strand from times of prolonged drought.

The District, FFWCC and the DOF initiated the present prescribed burning program in late 1993 within the Corkscrew Marsh flatwoods. The program has

grown to include burning participants from the CREW Land and Water Trust, Corkscrew Swamp Sanctuary, Lee County and volunteers. **Map 10** shows the cumulative prescribed fires for the years 1993 through 2004.

5.3.2 Prescribed Fire Planning

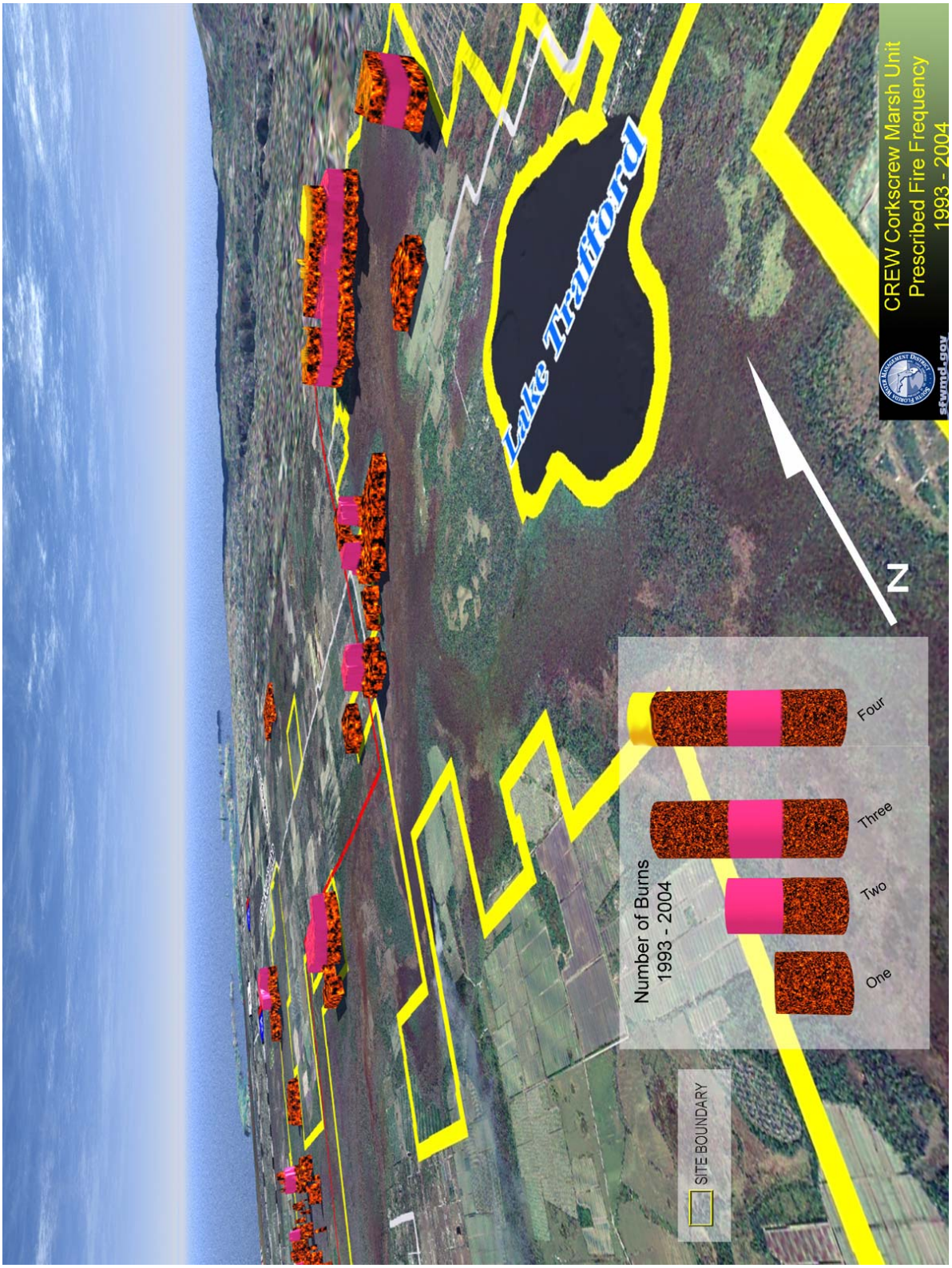
A fire management plan is developed for each LSP management area. Each plan includes a description of location and natural community types, fire history, fire management objectives and constraints, and a burn prescription. The LSP bases all fire management plans on ecological research and professional experience. Fire frequency schedules for each natural community consider recommendations provided in *The Natural Communities of Florida* (FNAI, 1990). To mimic historic fire conditions, LSP emphasizes growing or lightning season burns (April-August) where possible, though weather conditions and smoke sensitive areas make the timing difficult. Natural firebreaks are utilized where possible to promote historic fire patterns, avoid soil disturbance, and reduce hydrologic flow disruption created by fire lines. Listed species life requirements and welfare are elements of prescribed fire planning. Application of fire, with appropriately timed herbicide treatments, is used as a tool for control of invasive plants. To mimic historical fire patterns, the District endeavors to burn during the growing season.

Burns are executed using proven safety measures as defined by the Prescribed Burning Act of 1990, 590.026 F.S. This legislation and associated administrative rules outlines accepted forestry burn practices and is administered through DOF. CREW has a three-person prescribed fire crew and has utilized other cooperating agency staff—DOF, Lee County, the CREW Land and Water Trust, and FFWCC to conduct burns at the MA. All LSP staff have completed the state certified burn course to ensure fire safety and burning efficiency.

Prescribed fire is applied within the MA at appropriate fire intervals for each natural community:

<u>Scrubby, Mesic and Wet Flatwoods</u>
These natural communities will be burned to maintain an open pineland structure with less than 50% canopy cover. Shrub hardwood densities, especially palmetto and gallberry, will be targeted at less than 20% coverage to encourage species diversity in herbs and grasses. Desired fire frequency is three to five year intervals for mesic flatwoods, and three to eight years for wet flatwoods to maintain targeted vegetative cover composition and avoid hazardous fuel accumulation.

Map 10. Fire History maps: Corkscrew Marsh



Map 10. Fire History maps: Flint Pen

Hydric and Prairie Hammock
Fire maintenance of hammocks will be applied in conjunction with adjacent flatwoods and marsh prescribed burns. Fire frequency will be dictated by prescribed burns in adjacent natural communities. Maintenance of natural species composition and protection from excess fuel build-up will be accomplished by flank or backfire. Headfires will be avoided. Fire will be introduced into the edges of hammocks under moisture conditions that deter destructive fire.

Swale
This Everglades-type community dominates the central portion of Corkscrew Marsh and large portions of the watershed south of Lake Trafford. Currently sawgrass areas are being displaced by coastal willow, due in part, to the absence of severe fires in recent history. Prescription burns, on a fire frequency of one to five years, will be used to control woody species encroachment and maintain this sawgrass-dominated system. Fire will be excluded during extremely dry periods to avoid igniting organic soils.

Depression Marsh
Small isolated marshes are dispersed throughout the flatwoods of CREW. Marshes will be burned with flatwoods to maintain open herbaceous ponds and control woody plants found on the edge of these depressions. The center of depression marshes may require drier conditions to carry fire, and a separate burn.

Dome Swamp
Fire controls hardwoods and reduces ground fuels on the edge of cypress domes, however, application of fire during dry conditions in the dome's center may damage trees. The burning of cypress domes will occur when moisture conditions are sufficient for surface burns in the dome's periphery. Fire will be excluded under drier conditions.

Strand Swamp
Although strand swamps have historically burned on a frequency of 30 to 200 years, conditions dry enough to burn strand swamps occur only during periods of drought. For this reason, fire management for this natural community will be limited to the prescribed burning of adjacent communities.

5.3.3 Wildfire Suppression

Policy 140-25(3)(d) The DOF will be notified of all wildfires on District lands. LSP will provide initial suppression when commensurate personnel and equipment are available.

Wildfires ignited by lightning are a common occurrence throughout Florida, and the MA receives numerous lightning strikes as indicated by past wildfires. It is District policy, and state law, that DOF is notified when a wildfire occurs on LSP-managed properties. The Land Stewardship Field Crew will respond to and, if appropriate, begin suppression of area wildfires when detected. DOF will be called immediately while a fire assessment is made.

5.4 Wildlife Management

A primary objective in the management of MA is to maintain healthy fish and wildlife populations. The LSP accomplishes this in several ways:

- Performing land management activities that maintain and/or improve native wildlife habitat
- Conducting specific management beneficial to protected species
- Conducting wildlife inventories where management operations may negatively impact listed species
- Following management guidelines for listed species protection as determined by the *Multi-species Recovery Plan for the Threatened and Endangered Species of South Florida, Volume 1,* (U.S. Fish and Wildlife Service. 1998)
- Reducing non-native pest species populations where appropriate
- Maintaining a master file of confirmed and potential wildlife species
- Cooperating with the FFWCC on wildlife management issues
- Using best snag management practices: removing snags only when they pose a safety hazard

MA wildlife management is directed toward production of natural species diversity consistent with the biological community types present. Management on MA occurs through the actions mentioned above, primarily through regular prescribed fire and the control of exotic species. Additionally, the District conducts various plant and animal inventories through volunteers, staff, and private contractors to evaluate the health and dynamics of MA's natural communities.

5.4.1 Game Management

Policy 140-25(4)(b)(4) Florida Fish and Wildlife Conservation Commission regulations shall govern hunting in areas opened for such use.

Game diversity is high due to the wide array of natural communities within CREW. Turkey, white-tail deer and the non-native feral hog are the three most popular big game species. Small game includes gray squirrel, quail, marsh and cotton-tail rabbits, opossum, skunk, coyote, armadillo.

Rules for harvest are defined in the Florida Wildlife Code, Title 39, and distributed to the public in the FFWCC publication CREW Wildlife and

Environmental Area Regulations Summary and Area Map, and on their web site at www.*myFWC.com*. For more details on hunting, see the Public Use section.

Game management – in effect, all wildlife management - in CREW means managing habitat to provide sufficient food, water, shelter and space for each species of desired animal. Managing for umbrella species such as Florida panthers, which prey on white-tailed deer and wild hogs, and Florida black bears, which require a variety of habitats and food sources throughout the year, provides good habitat for game species as well.

Management for deer, and wild turkeys includes the use of prescribed fire. Flatwoods areas will be burned every three to five years to increase quantity of forbs and legumes, increase nutritional quality of browse plants, and to increase food accessibility (Harlow and Jones 1965, Marion and Werner 1986). Freshwater marshes will also be burned periodically to maintain habitat conditions preferred by deer. Burns will be timed to alter vegetation structure. Growing season burns will be performed at several year intervals or alternated with dormant season burns to enhance deer habitat by increasing the density of grasses and forbs *(Robbins and Myers 1992)*.

For turkeys, prescribed burning is an important tool for managing habitat and will be utilized in CREW for habitat enhancement. The best season for burning to provide maximum benefits to turkeys has yet to be determined (Robbins and Myers 1992). Williams (1991) suggested that both grassy areas and pinelands be burned every two to three years. It is important to keep burns patchy and to protect hardwood hammocks and mast producing trees. Williams (1991) felt the best time for a growing season burn was late August to early September. Prescribed burning and mowing may impact turkey nests from March through June. CREW fire planning will consider impacts to turkey nesting.

Grazing and discing of CREW pastureland may be implemented to improve turkey habitat. Moderate grazing is beneficial to turkeys, especially if pastures are rotated to allow portions to rest for short periods.

Waterfowl

Florida hosts three breeding species of waterfowl, two of which have been observed in the CREW area: the wood duck and the Florida mottled duck. Wood ducks and mottled ducks have been observed in all units of CREW. Blue-winged and green-winged teal have also been observed in Corkscrew Marsh. Wood ducks prefer wooded wetlands including strand swamps and wooded or shrubby areas of lakes or ponds with water less than eight inches (20 cm) deep. Broods require herbaceous or shrubby vegetation for cover and food production. Fluctuating water levels are key to producing large quantities of seeds, invertebrates, and cover. Water level stabilization is detrimental.

Mottled ducks nest in upland sites with dense grass communities within one mile (1.6 km) of brood-rearing habitat. They nest during the spring dry season prior to the time of naturally occurring fires. Hens with broods prefer mudflats with nearby escape cover. Mottled ducks prefer shallow wetlands less than four inches (10 cm) deep, but will use deeper water during summer molting. Mottled ducks will also use flooded pastureland. Ideal habitat for mottled ducks consists of a wetland with 50% vegetative cover and 50% open areas with fluctuating water levels to maintain productivity. The FFWCC Waterfowl Management Section suggests the following to benefit mottled ducks:

- allow water to fluctuate in marshes to maintain productivity.
- keep wetlands from succeeding to shrubs and other rank vegetation by fire, grazing or mechanical means
- avoid mowing/burning in dense nesting cover or in known nesting areas during the nesting season (March-June).

Wood duck nest boxes were erected in the Corkscrew Marsh and Bird Rookery Swamp units. To date, no nesting activity has been observed and no young fledged. Boxes will continue to be monitored, repaired and cleaned annually.

5.4.2 Exotic/Invasive Animal Species

Wildlife pest species are those non-native species that are harmful to native wildlife, that negatively impact native vegetation or seriously interfere with management objectives. The LSP's goal for wildlife pest management is to reduce populations to attain an acceptable level of impact to natural plant and animal communities. The MA land manager uses personal knowledge of the problem and consultation with the FFWCC to define the acceptable level of impact. When population control measures are warranted, land managers consult with the FFWCC to determine an appropriate control technique that is cognizant of public safety and humane to the species. The effects of pest population control efforts are monitored by periodic site evaluations.

The feral hog has been a pest species within the MA. Disturbance caused by this species negatively impacts natural communities and interferes with land management operations. Their high fecundity, adaptability, and rooting behavior make them a potent destructive force and environmental concern. Their disruption of soil and vegetation alter natural communities and can be especially damaging in sensitive habitats that are slow to recover. Hog disturbance has occurred within some of the MA including wetland communities. Land management objectives are affected when rooting disturbance disrupts prescribed burns by preventing the spread of fire. Areas of disturbed soil can also be more susceptible to exotic plant invasion. Rooting disruption can make perilous conditions on hiking trails, and hog foraging can have a detrimental impact on reptile populations.

5.4.3 Rare, Threatened and Endangered Species

Policy 140-25(2)(b) Particular emphasis shall be placed on the identification, protection and management of rare, threatened and endangered species.

19 species listed as E, T or SSC occur within the WEA. They include: the Florida panther, Florida black bear, Crested caracara, snail kite, bald eagle, Big Cypress fox squirrel, gopher tortoise, and sandhill crane. Additionally, FFWCC has classified most of the MA as a Regional Biodiversity Hotspot. Hotspots represent areas which have high overlap for 54 declining species of wildlife plus known occurrences of rare flora, fauna, and natural communities (Cox et al., 1994).

Impacts to these species from planned land management and recreational activities are of special concern. Activities that might jeopardize the well being of these species may be altered or cancelled. District land management activities including prescribed burning, hydrologic restoration, exotic vegetation eradication, understory control, and selective forest thinning improve natural environmental characteristics that benefit listed species as well as a variety of other indigenous wildlife.

Table 3. Listed Animal Species

Count	Scientific Name	Common Name	Status	
			Fed	State
1	*Ajaia ajaja*	Roseate Spoonbill		SSC
2	*Alligator mississippiensis*	American Alligator	T	SSC
3	*Ammodramus savannarum floridanus*	Florida Grasshopper Sparrow	E	E
4	*Aramus guarauna*	Limpkin		SSC
5	*Caracara cheriway*	Crested Caracara	T	T
6	*Drymarchon couperi*	Eastern Indigo Snake	T	T
7	*Egretta caerulea*	Little Blue Heron		SSC
8	*Egretta thula*	Snowy Egret		SSC
9	*Egretta tricolor*	Tri-colored Heron		SSC
10	*Eudocimus albus*	White Ibis		SSC
11	*Falco sparverius paulus*	Southeastern American Kestrel		T
12	*Gopherus polyphemus*	Gopher Tortoise		T
13	*Grus canadensis pratensis*	Florida Sandhill Crane		T
14	*Haliaeetus leucocephalus*	Bald Eagle	T	T
15	*Mycteria americana*	Wood Stork	E	E
16	*Puma concolor coryi*	Florida Panther	E	E
17	*Rostrhamus sociabilis plumbeus*	Snail Kite	E	E
18	*Sciurus niger avicennia*	Big Cypress Fox Squirrel		T
19	*Ursus americanus floridanus*	Florida Black Bear		T

5.5 Monitoring

Policy 140-25(3)(f)(2) Monitoring shall be conducted to identify landscape changes resulting from management activities.

Tracking environmental response to restoration projects provides valuable information on progress toward restoration objectives. Information obtained by monitoring specific sites assists land managers in making sound ecological choices for each unique parcel in the LSP.

The District, through private contractors, has initiated vegetative monitoring throughout the MA. This will provide baseline information for future studies and help determine the effects of future restoration projects in the MA. As part of this effort initial 360 degree photomonitoring points have been installed in the restoration areas with additional points being added as needed. 360 degree panorama photos are taken from these points at least 2 times per year.

In 2005, the FWC biologist and the CREW Land & Water Trust staff established 18 photomonitoring points in the Corkscrew Marsh Unit and 11 photomonitoring points in the Flint Pen Strand Unit to monitor ecological change over time. Four-direction photos are taken quarterly and water levels and canopy density are recorded.

In addition the FWC monitors a variety of wildlife throughout each year. 15 fixed-radius bird points have been established and bird counts are conducted quarterly in all units. Scent stations are set up annual to monitor furbearer populations. Remote sensing camera surveys for wild turkeys are done annually in January. Other wildlife are photographed as well during this annual survey. Track and spotlight counts for deer are conducted in Flint Pen Strand and Corkscrew Marsh every two years.

In 2006 the District will commission a study at CREW to determine which method of restoration will be the most effective given to use in groundcover restoration projects. This information will be used for restoration projects in CREW, with applications expected to extend to other conservation lands.

During the next five years, wildlife monitoring by the FWC will continue. It will be useful to conduct additional surveys for threatened and endangered species such as snail kites, wading birds, and gopher tortoises as well as the summer-nesting swallow-tailed kites to determine population trends and assist in decision-making regarding habitat management for these species. No herpetological surveys have been conducted since the baseline data was collected in 1998, so additional herp arrays may also be useful.

District staff monitor and document hydrologic and vegetative changes within the MA. Hydrologic monitoring continues at all recorders, and data is kept on the

District's DBHydro internal website (www.sfwmd.gov/site/index.php?id=38). Using GIS and GPS technology, the District tracks the locations of exotic plants throughout the MA. This helps the LSP monitor the effectiveness of the exotics control program and track the extent and severity of infestations.

Table 4. Biological Assessments & Inventories

Survey Type	Performed by	Date
Vegetation Photomonitoring	FFWCC/CREW Trust	2005 (start)
Butterfly Counts	N. American Butterfly Assosciation	1996 & 97
Plant Inventory	Original by Chuck Hilsenbeck, updated annually by Barbara Conolly (volunteer)	1997-2005
Fixed Radius Bird Counts	FFWCC	1998-2005
General site inspection	District	1991
Biological/hydrologic	District/FFWCC	1994
Vegetative Photomonitoring	District/contractor/FFWCC	2005 (start)
Cultural Resources Survey	DHR, Bureau of Archaeological Research	2002
Frog Surveys	FFWCC for the SouthwestFlorida Frog Monitoring Network	2004 (Start)
Restoration Monitoring	KCI, Inc.	2004 - 2006

6. Public Use

Policy 140-23 The Land Stewardship Program mission is to provide natural resource protection and management while allowing compatible multiple uses on designated public lands.

Section 373.1391 (1)(a) Florida statute states that wherever practical, lands acquired by the LSP shall be open to the general public for recreational uses. The District encourages Public use of management areas for appropriate resource-based activities. All SOR lands are available for public use, except in rare instances where there is no legal public access or where lease restrictions prohibit public entry.

The determination of compatible public use will be based on the following criteria:

- consistency with the reason the lands were acquired;
- restrictions and/or prohibitions imposed by easements, leases, reservations, adjacent land ownership, and other conditions of the purchase agreement;

- infrastructure and support facility requirements, such as fences, gates, signage, entry design, stabilized off-road parking, trails, campsites, maintenance, and other operational and budgetary impacts;
- opportunities for persons with disabilities;
- limitations resulting from endangered species, other sensitive natural resources, archeological resources, or land management practices;
- public health, safety and welfare;
- environmental education program opportunities.

Several recreational activities are appropriate and encouraged on the MA:

Nature Appreciation

Nature appreciation was identified as the primary activity accommodated on CREW during the interim conceptual management plan. Nature appreciation includes wildlife viewing, nature photography, natural history study, and plant and wildflower identification. The flatwoods area adjacent to Corkscrew Marsh was identified as a suitable location for these activities, as well as hiking and environmental education.

In 2006, the CREW Marsh Hiking Trails were designated by the FFWCC as a stop along the Great Florida Birding Trail. The South Section of the trail was officially opened on January 14, 2006. The Great Florida Birding Trail (GFBT) is a collection of sites throughout Florida selected for their excellent birdwatching or bird education opportunities. This 2000-mile trail is designed to conserve and enhance Florida's bird habitat by promoting birdwatching activities, environmental education and economic opportunity. (floridabirdingtrail.com)

Environmental Education

Environmental education is similar to nature appreciation, but involves a structured learning process with facilitators and students. The CREW Land and Water Trust has developed an extensive program in cooperation with the Lee and Collier County School Boards (7.4.1). Students in the Lee and Collier County School Systems and other groups participate in these programs. Guided hikes are also provided to the general public on a regular basis.

Hiking

Hiking trails were established at the inception of the CREW's public use program. These trails are an integral feature of the interim public use program, and provide access to a variety of habitats including hammocks, marshes, and flatwoods. Trails in the Corkscrew Marsh Unit and the logging trams in Bird Rookery Swamp are ideal for hiking, nature appreciation, and environmental education and will be the primary activities at these locations. A new public access area is being developed to provide access to the tram roads by a boardwalk constructed in FY 2006. The Corkscrew Marsh Unit trails include a raised observation deck, an observation tower, and a boardwalk.

The CREW area is remote, and provides abundant backcountry opportunities. Visitors must be self-reliant. Supervision and visitor services are not provided, and users will be advised of these facts at access points. Users are required to pack out their trash.

Primitive Camping

Historically, most camping has been conducted in association with hunting, and several permanent camps were established throughout the area. Traditionally in south Florida, these camps serve as a family oriented retreat, and other resource-based activities occurred in association with camping. Permanent camps were dismantled following District acquisition.

Primitive camping is currently allowed in CREW by special use permit, at designated sites. Recreational camping was initially established for activities associated with nature appreciation and environmental education on the Corkscrew Marsh Unit, but was also available for past hog hunts.

Hunting

Recreational hunting has been a primary use of CREW lands. The southern portion of Flint Pen Strand has been hunted as “open land” (6.4.2.1), while other areas were hunted under lease agreements. Deer and hog hunting accounted for the majority of use. Turkey hunting, and waterfowl hunting on Lake Trafford and surrounding wetlands were popular activities. Waterfowl hunting has declined in recent years. Small game, including gray squirrel, snipe and quail, have been important game species in CREW.

Historically, ownership patterns and CREW’s remote location maintained hunting at acceptable levels. Public ownership and the proximity to a large population are major changes that now dictate additional restrictions. The 1998 CREW hog hunts were conducted under the statewide Special Quota Hunt Program. A carefully regulated hog hunt was conducted in 1998 and 1999 to reduce hog impacts on CREW. The primary objective of the two hunts was to minimize rooting problems within the vicinity of hiking trails while maintaining moderate hog densities, since hogs are an important panther prey. Two nine-day hunts were held in September and October. Each hunt was limited to 25 hunters, subject to a mandatory check system.

As recommended in the 2001 management plan, four Special Quota Hunts were established on CREW. These included an archery and a muzzleloading gun hunt that coincided with the hog management hunts. In addition, a nine-day general gun hunt was added in November 2004 for both the Corkscrew Marsh Unit and the Flint Pen/West Bird Rookery Swamp units, coinciding with the Big Cypress Wildlife Management Area general gun season opening quota period. A nine-day spring turkey hunt was also established to coincide with the opening weekend of Big Cypress WMA's spring turkey hunt.

Hog harvests have declined in the Corkscrew Marsh unit from 2000 – 2005. The decline may be due in part to trapping efforts by adjacent private landowners, but the overall population of hogs appears stable.

Since the acquisition of Sections 25, 26, 35 and 36 has been completed and homesites removed in lower Flint Pen Strand, wildlife is returning to the area, and hunts in Flint Pen Strand have been successful with hog and deer harvest rates doubling in the first two years. Remote camera turkey surveys indicate a stable, moderate population of turkeys in the CREW Marsh Unit and turkey sign and sightings have been increasing in Flint Pen Strand.

Recommendations for the next five years include:

- Continue the current hunting program as established by FFWCC rules and regulations.

- Management hunts may be employed as necessary to address specific needs. Management hunts will be scheduled during non-peak use periods when conducted in areas where other types of recreation are the primary activity.

- Hunts conducted on CREW will use guidelines and regulations established for the 1998, 1999 and 2000 hog hunts, and be of short duration with quotas established based on available acreage. Past special hog hunts indicate that quotas approximating 25-50 hunters per 3,000 acres (4,047 ha) are suitable for this area. There will be no exemptions to the permit requirement.

Fishing and Frogging

Only limited opportunities for fishing and frogging exist on CREW lands. Man-made ditches, canals and ponds provide most of the habitat for these activities, and are available to the public for this use.

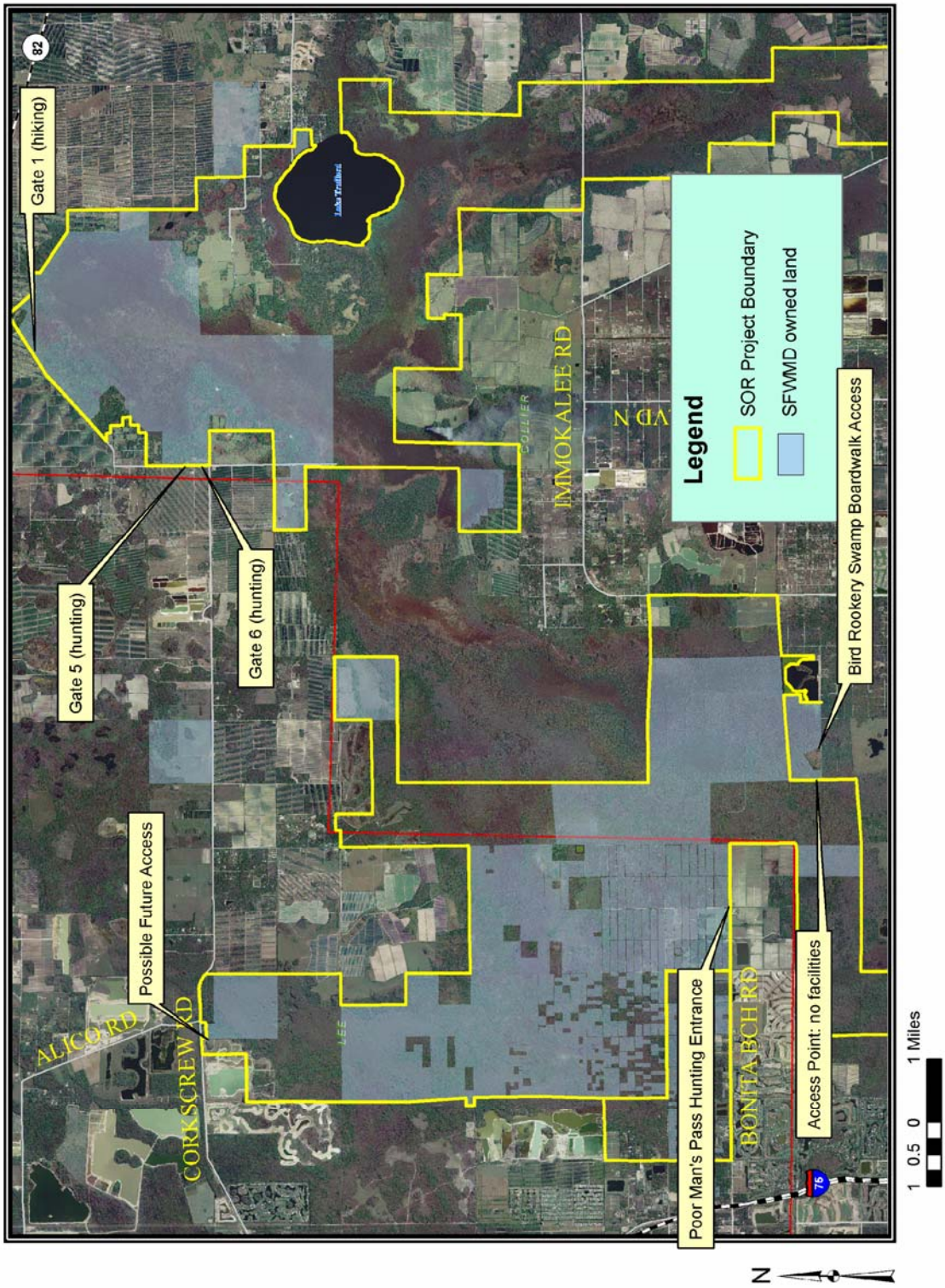
Equestrian Use

The use of horses was evaluated during the interim management period. Due to the extensive wetland coverage of CREW and substantial acreage required for equestrian activities, no single upland area was identified as sufficiently large to support permanent equestrian trails. There will be opportunity for special equestrian events during dry periods. Staging these events will be evaluated individually, as conditions permit.

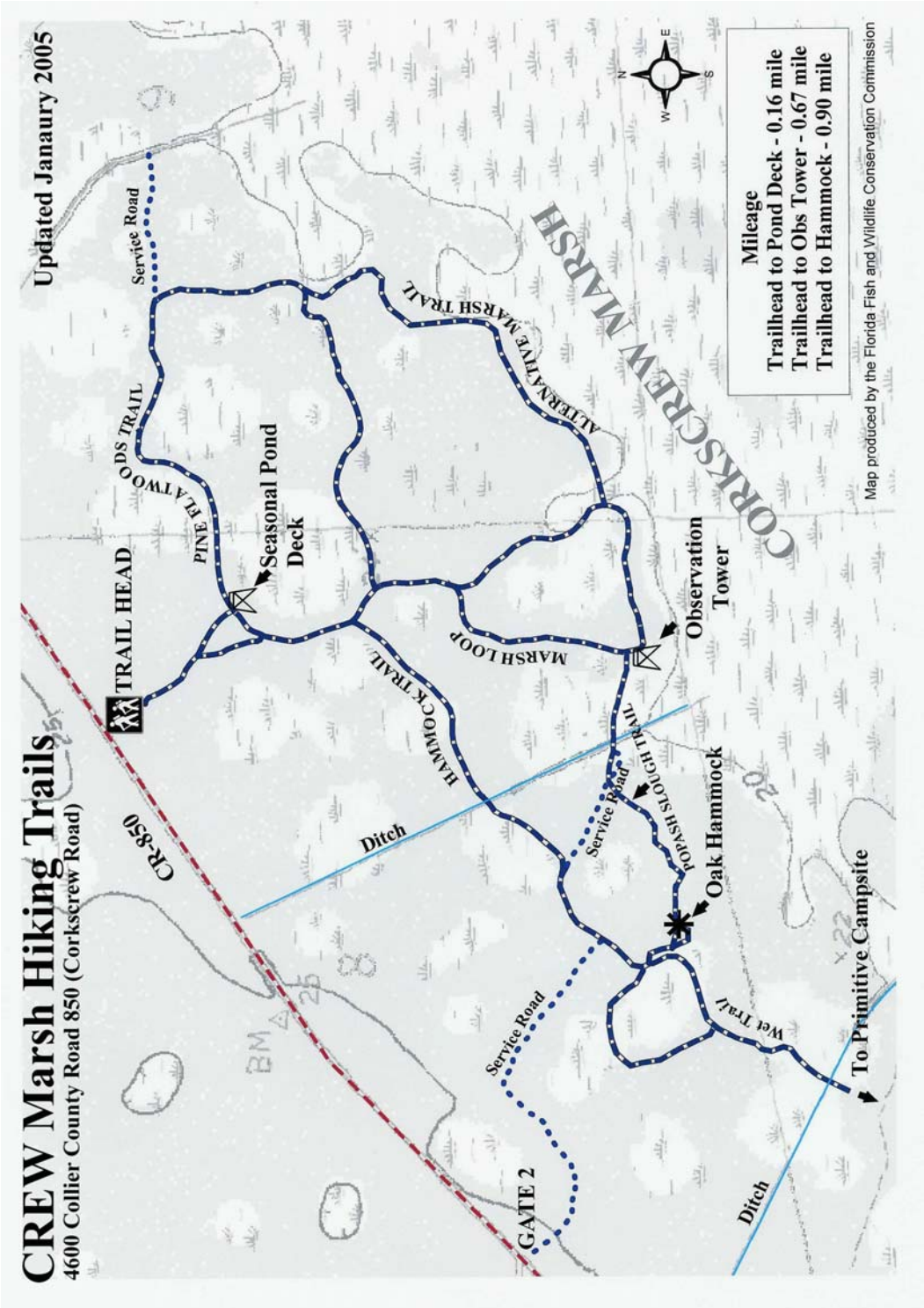
Vehicular Use

In the Flint Pen, Swamp Buggies are permitted on designated roads during hunting season with a permit. Highway vehicles are allowed on designated roads during hunting season with a permit.

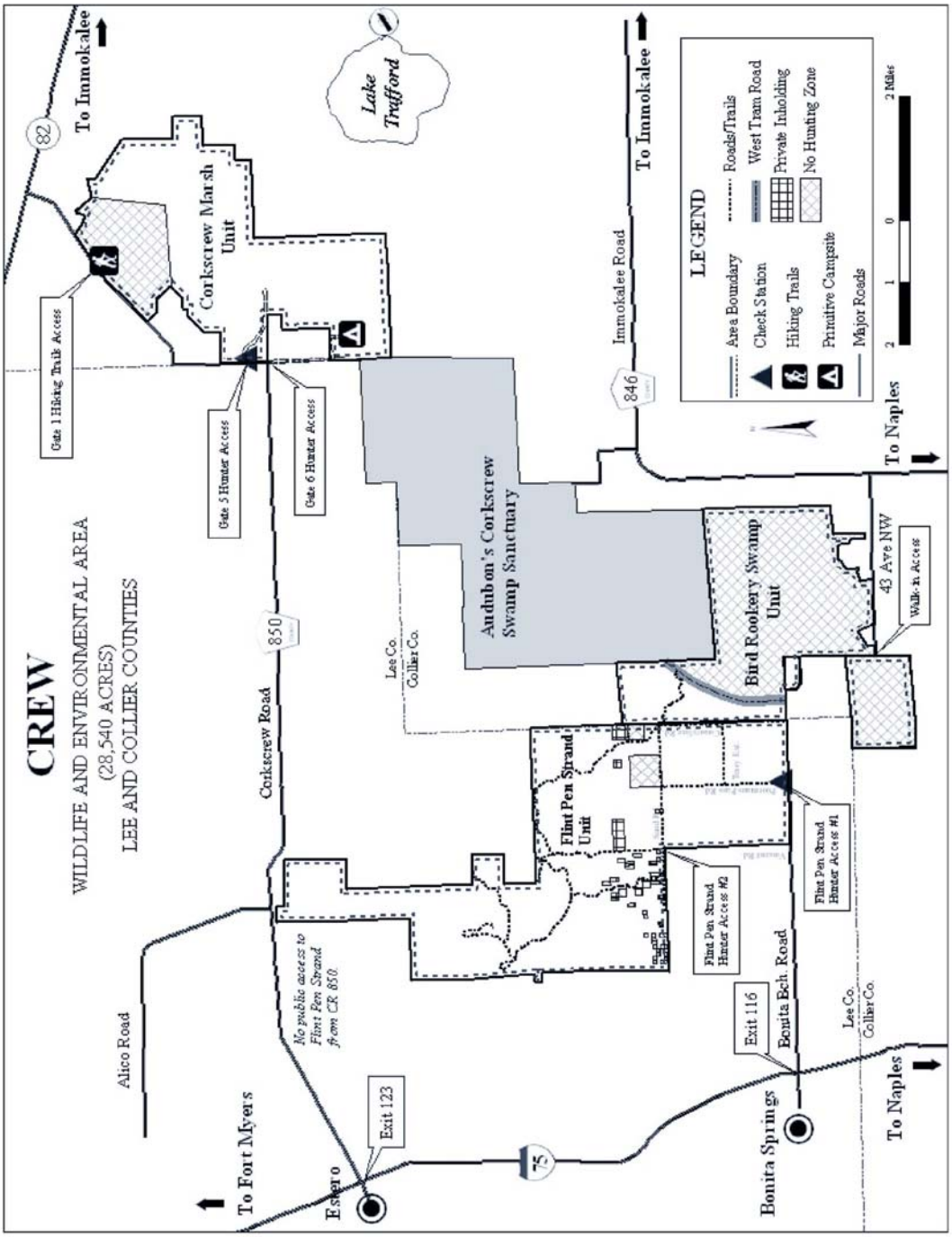
Map 11.
Access Points



Map 12.
Trail System



Map 13. FFWCC Wildlife and Environmental Area Map



6.1 Resource Protection

Policy 140-25(1)(d) Public use shall not result in detrimental impacts to water resources. When a public use activity produces detrimental effects on water resources, it shall be discontinued until an evaluation determines that such use is compatible.

Policy 140-25(3)(g) Resource protection shall be provided by professional law enforcement services through funded and unfunded contractual agreements to safeguard the public and protect natural and cultural resources on District-managed natural areas.

Policy 140-25(4)(b)(1) Public use regulations are set forth in 40E-7.511, Florida Administrative Code, to implement Section 373.1391(1)(b), Florida Statutes...

Activities within the MA are in the District's *Recrational Guide,* which is available at the SFWMD Ft. Myers Service Center or online at http://www.sfwmd.gov/org/clm/lsd/3_rec.html office and at agency headquarters in West Palm Beach. Allowed activities include hiking, fishing, birding, biking, and nature study. Prohibited activities are listed in the regulations summary at http://myfwc.com/recreation/cooperative/crew.asp FFWCC is responsible for enforcing laws, rules, and regulations applicable to MA, along with the Lee and Collier County Sheriff's Department.

Management of public activities on District lands requires a strong commitment to resource protection while simultaneously promoting all appropriate public uses. The LSP emphasizes the enforcement of pertinent rules and regulations to protect natural resources and also provide a safe recreational opportunity. The resource protection program integrates contractual law enforcement to protect the natural resources and District assets. As part of the District's enhanced patrol contract with FFWCC, FFWCC law enforcement officers conduct regular patrols throughout the year, increasing their presence during hunting seasons and at other times when public use is high. Law enforcement surveillance protects natural and cultural resources, deters illegal activity, and safeguards the public. Patrols are conducted with 4-wheel drive vehicles and on foot. The District's resource protection coordinator and the MA manager review biweekly reports and meet with officers to structure patrols based on resource needs. In addition to the FFWCC, Lee and Collier County Sheriff's deputies occasionally patrol the area, particularly in areas surrounding the MA.

Resource protection is also greatly enhanced by the presence and maintenance of continual, posted boundary signs that delineate SOR property boundaries. The MA perimeter is posted where entry is likely. Fencing will be addressed as necessary.

6.2 Environmental Education

Educational programs are developed and implemented on select management areas by cooperators interested in promoting increased visitor awareness and appreciation of natural areas and cultural resources. A central theme to these programs is the vital role of water management in maintaining resource viability and productivity. The LSP encourages educational partnerships through memorandums of understanding, lease, and contract agreements.

Historically, the CREW Trust has provided the community with environmental education and public information about the spectrum of natural systems comprising the Corkscrew Watershed and surrounding region. Activities have included guided hikes and field trips on the CREW Marsh trails, community events focused on natural systems (e.g. Wildflower Weekend), outreach activities and presentations for the private and public sector (e.g. teacher workshops, executive seminars, service organization functions), CREW publications, and volunteer work within CREW oriented toward understanding, preserving, and protecting the watershed and other natural systems.

<u>CREW Trust, program development plan</u>

Over the next 5 years, the CREW Trust plans to broaden and extend the scope of its environmental education and outreach activities. This process is contingent upon their ability to secure additional resources through external funding sources. Resources include new personnel, equipment, and related operating funds. Activities currently in planning include:

1. Designing and constructing an environmental education center which will function as a regional focal point for field-based environmental education and ecosystem research on CREW Project lands and across Southwest Florida. It is anticipated that the center will be completed in several phases. Extensions of this concept may include an NSF Long Term Ecological Research (LTER) component, a residential facility, and a facility for hosting global/national/regional/community conferences, workshops and seminars that span and integrate the disciplines, journaling, ecosystem monitoring, ecological restoration, and sustainable living projects.
2. Initiating field programs, bike tours, environmental education activities, and cooperative research along the CREW Bird Rookery Swamp tram road/boardwalk system currently under construction.
3. Developing and extending cooperative environmental education and science-based partnerships with universities and colleges, including Florida Gulf Coast University, International College, Ave Maria University, Edison College, the University of Florida, and other institutions of higher learning.

4. Expanding science-based teacher education programs on natural systems, including field and classroom components. Current programs will be extended to incorporate both top-down and bottom-up constructivist educational processes. The development of a sense of place, ecological literacy, concepts of sustainability, an appreciation for complex system dynamics, deep scientific understanding, mentoring skills, and intercultural skills are among the goals of the teacher education programs.
5. Expanding K-12 field science programs to include hands-on field experience, exploration, observation and listening skills, general ecosystem understanding, nature interpretation, and participation in creative communication. This will be accomplished in partnership with county parks and recreation departments, school systems, and higher education institutions.
6. Developing innovative, field-oriented programs for integrating the arts and the sciences in a natural systems setting (CREW), thus creating a new form of common ground for the regional community and beyond. The intent is to expand our circle of understanding and action regarding ecological, economic, and human systems by connecting and combining science, natural history, music, song, dance, painting, pottery, hiking, sports, storytelling, writing, photography, history, politics, economics, health, human welfare, the contemplative disciplines, and other pursuits in innovative, beneficial ways.

7. Administration

Administration of LSP lands is directed through the Land Stewardship Division. Policy decisions, planning and budgeting, procurement of personnel and equipment, contract administration, and issues of program development are administrative tasks coordinated through the Division. Input is provided from regional land managers located at District service centers over the 16-county area. Regional land managers handle regular administrative duties from their field locations to assure quick response to local concerns and management issues. MA administrative activities are handled through the District's and FFWCC's Field Office at CREW.

7.1 Planning and Budgeting

Planning is a major function of the LSP mission and is critical to maintain proper program focus, direction, and coordination with other agencies. LSP planning is accomplished by division planning staff and in coordination with individual land managers. Division level planning develops land acquisition strategy and project evaluation, produces the SOR Land Acquisition and Management Plan, and coordinates acquisition planning with other District and outside agency personnel.

Policy 140-25(6)(b) General Management Plan (GMP): Provides a description of recommended management and is required for each Land Stewardship Management Area. The GMP follows a designated format and is updated every five years.

GMP's are developed that detail strategies to guide management activities on individual project areas. The GMP defines goals and objectives, identifies major management issues, and describes management activities. Each plan is subject to a draft revision period where public comment and professional review is requested prior to plan approval. Each plan is revised on a five-year cycle by planning team staff.

Policy 140-25(6)(d) Annual Work Plan (AWP): Summarizes activities corresponding with annual budget development and is prepared by the Operations Section of the Land Stewardship Program.

Annual work plans (AWP) are developed each fiscal year for budget preparation and to address activities and projects targeted for completion within the upcoming fiscal year on individual properties. The AWP includes performance objectives for exotic plant control, vegetation management, prescribed burning, fencing, infrastructure maintenance, forest management, resource protection, public use development, environmental monitoring, and contract administration.

CREW MA AWP's and budgets are developed in concert with program-wide operational priorities and budgetary cycle. Current year MA annual plans are available at the District headquarters in West Palm Beach.

Policy 140-25(6)(e) Summaries of management activities for each management area will be reported quarterly within the District and annually as part of the Florida Forever Work Plan.

Each month land managers submit regional management reports to document progress toward achieving annual work plan objectives. The MA monthly reports are kept on file at District headquarters. LSP semiannual meetings address management problems and plan for future management operations.

Policy 140-25(5) The District will secure dedicated funding sources, personnel and other resources to support program goals and objectives. Project funding needs and sources for cooperative management agreements with government and non-government entities will be identified during acquisition. A cooperative management agreement will designate a lead Manager and identify whether District funding is required.

The principle source of funding for the Land Stewardship Program is the Water Management Lands Trust Fund, administered by the Florida Department of Environmental Protection. Money for this dedicated fund is generated from the sale of state documentary tax stamps and is used for property acquisition and management. Additional funding and support may be obtained from the harvest of renewable resources, land use leases, in-kind management services from cooperating management partners, no-cost services from user groups and volunteers.

Additional funding for CREW comes from mitigation. While CREW no longer receives these mitigation funds, a balance of $800,000 remained at the beginning of FY 2006 for land acquisition and $754,000 remained for restoration and monitoring.

Budget planning begins in March during the work planning process for the following fiscal year (October-September). Overall budget availability generally determines management activities. Budget distribution among the District's five land management regions is based on a programmatic prioritization of management activities. Operational funds are distributed to most effectively accomplish the management objectives of each management area.

7.2 Infrastructure

Policy 140-25(3)(k) Infrastructure support shall be developed and maintained to provide safe access for responsible management and public use on District

lands. Such infrastructure may include access points, roads, trails, signs, utilities, and minimal public facilities.

The development of adequate infrastructure for MA public use and management activities has received support from FFWCC and the CREW Trust. Current MA infrastructure includes 6 entrances (**Map 12**), perimeter posting, firelines, five miles of marked hiking trails, and a port-a-pot which require regular maintenance.

7.3 Personnel and Equipment

The LSP is separated into five geographic regions, each staffed with professional land managers directed by the supervising land manager. Highly trained land management technicians are based at the DuPuis Management Area (DMA), the West Coast and Miami Field Offices, and at the Orlando and Okeechobee Service Centers. The Land Stewardship Division director and additional planning staff are headquartered at the main West Palm Beach office.

Management of the MA is the primary responsibility of the CREW land manager. Additional management input and support comes from District planning and field station personnel. Staff has access to tools, supplies, four-wheel drive vehicles, fire suppression trucks, all terrain vehicles, swamp buggies, and other heavy equipment. Management support also comes from the DMA and its staff.

7.4 Volunteers and Alternative Work Force

Policy 140-25(5)(d)(1) Volunteers, interns and alternative work forces will be used when possible to supplement existing staff and services.

Section 373.1391(3) F.S. encourages the District to use volunteers for land management and other services. The District recognizes the merits of volunteerism and welcomes participation in activities appropriate for public involvement. Selection of appropriate management activities is at the discretion of the land manager and may fall under the general guidance of the supervising land manager. Volunteers have contributed many hours to MA maintenance and wildlife surveys. All volunteer activities help accomplish management objectives, promote citizen involvement, and allow area staff to focus on other needs.

Volunteer coordination is provided by the CREW Trust. Volunteer events and projects at CREW have included:

- Teacher Workshops
- Monitoring CREW lands
- Wonders of the Nighttime sky
- Off site exhibits
- Annual Wildflower Festival (their largest event)
- Guides for day and full moon hikes

- Trail maintenance
- Assist with field trips
- Adopt-a-Road
- Assist with grants and office work
- Assist with prescribed burning
- Provide exotic plant mapping and treatment

7.5 Contractual Management

Policy 140-25(5)(a). The private sector may be solicited to furnish certain management-related facilities and services through the execution of leases and agreements. These leases/agreements will assure mutual benefits to both the District and private parties and be consistent with the program management objectives.

Effective operation and management of LSP properties requires the services and cooperation of private organizations, other governmental agencies, and volunteers. Contractual management is legalized through a management agreement signed by both the District and contracting entity with the document defining responsibilities of each party.

The District has established and maintains several contractual management agreements to assist with MA management:

AGREEMENT #1
The District has a 50 year lease (C-12548) beginning 11/29/2000 on those properties within the CREW MA that were purchased by the State Trustees of the Internal Improvement Trust Fund. This lease requires that the Division of State Lands has the opportunity to perform a management review every five years. The Division of State Lands also is to be copied on all public notices relating to the development of the site.

Agreement #2
The District has a Memorandum of Agreement with FFWCC (C-5213) for the establishment of the Wildlife Management Area. The agreement was originally executed on 9/6/1994 and has been amended several times. The current agreement runs until 9/30/2004 and allows for the reimbursement of Commission operational expenses not to exceed $100,000 per year.

Agreement #3
The District has a three-year contract with the CREW Land and Water Trust OT040586 for the coordination of volunteers, and assistance with public use and land management.

7.6 Management Review

Policy 140-22(j) Section 373.591, Florida Statutes, mandates the District to solicit input on current management programs through professional peer reviews.

Each District project area has a land management review team comprised of state, county, and private entities that periodically reviews management activities to assure they are consistent with acquisition intent and SOR objectives. Management assessments are conducted in light of the goals and objectives defined in the area's general management plan. If the review team determines that management is not in accordance with the management plan, the lead management agency provides a written explanation to the review team.

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Appendix A

Land Stewardship Program Goals and Policies

ARTICLE II. LAND STEWARDSHIP

Sec. 140-21. Scope.
This policy shall apply to all lands managed by the Land Stewardship Program, including property acquired with Save Our Rivers, Preservation 2000 or mitigation funding. Nothing in this policy shall negate any statute, administrative rule, or other policy requirement. This policy may be reviewed and approved by the District Governing Board at five-year intervals or earlier and updated as required. Public comment may be solicited as part of the review process.
(R.M. No. 139)

Sec. 140-22. Purpose.
(a) This policy establishes a commitment to the responsible management of District lands in a manner consistent with legislative directives and the District's mission.
(b) In 1981, the Florida Legislature established the "Save Our Rivers" program (SOR) for the five water management Districts to acquire water resource lands. This legislation (Section 373.59, Florida Statutes) produced the Water Management Lands Trust Fund, empowering the water management Districts to acquire lands needed to protect, manage, and conserve the state's water resources. Preservation 2000 (P2000), enacted by the Legislature in 1990, also added land acquisition funds to the Save Our Rivers program. The 1999 Florida Forever Act consolidated the legislative directives of SOR/P2000 and expanded the funding to take over when P2000 terminates. The 1999 legislation authorized funds to be appropriated for acquisition, management, maintenance and capital improvements, including perimeter fencing, signs, control of invasive exotic species, controlled burning, habitat inventory and restoration, law enforcement, access roads and trails, and minimum public accommodations.
(c) Land acquired by the District's Save Our Rivers program and managed by the Land Stewardship program must satisfy several requirements set forth in Sections 373.139 and 373.1391, Florida Statutes. Section 373.139, Florida Statutes, declares it necessary for the public health and welfare that water and water-related resources be conserved and protected. The acquisition of real property for this objective shall constitute a public purpose for which public funds may be budgeted.
(d) Section 373.1391(1)(a), Florida Statutes, states that lands titled to the water management districts shall be managed and maintained to the extent practicable to ensure a balance between public access, general public recreational purposes, and restoration and protection of their natural state and condition.
(e) Section 373.1391(1)(b), Florida Statutes, states, in part, that "Whenever practicable, such lands shall be open to the general public for recreational uses. General public recreational uses shall include, but not be limited to, fishing,

hunting, horseback riding, swimming, camping, hiking, canoeing, boating, diving, birding, sailing, jogging, and other related outdoor activities to the maximum extent possible considering the environmental sensitivity and suitability of those lands."

(f) Section 373.1391(1)(d), Florida Statutes, states that the District shall first consider using soil and water conservation Districts to administer agricultural leases.

(g) Section 373.1391(3), Florida Statutes, encourages each District to use volunteers to provide land management and other services.

(h) Section 373.1391(4), Florida Statutes, encourages each District to enter into cooperative land management agreements with state agencies or local governments to provide the coordinated and cost-effective management of lands.

(i) Section 373.1391(5), Florida Statutes, authorizes water resource and supply projects, stormwater management projects, linear facilities, and sustainable agriculture and forestry where it is compatible with the natural resource values and the public interest and is consistent with the project management plan, the proposed use is appropriately located on the property and other lands have been considered, and the titleholder of the property has been properly compensated.

(j) Section 373.591, Florida Statutes, mandates the District to solicit input on current management programs through professional peer reviews.

(R.M. No. 139)

Sec. 140-23. Statements of Policy.

The Land Stewardship Program mission is to provide natural resource protection and management while allowing compatible multiple uses on designated public lands. The mission statement, together with requirements set forth in the Florida Statutes, provide three primary goals for the District Land Stewardship Program, each of which is linked to sections in this Land Stewardship Policy document:

(1) Conservation and protection of water resources (section 140-25(1)).

(2) Protection and/or restoration of land to its natural state and condition:

a. Restoration and Protection of Natural Communities (section 140-25(2)); and

b. Resource Operations and Maintenance (section 140-25(3)).

(3) Provide public use (section 140-25(4)).

(R.M. No. 139)

Sec. 140-24. Definitions.

For the purpose of this article, the following words and terms shall have the meanings respectively ascribed:

Archaeological/Historic Resources means any prehistoric or historic district site, building, object, or property of historic, architectural, or archaeological value relating to the history, government, and culture of a historic or pre-historic people.

Best Management Practice (BMP) means the best available technology or process that is practical and achieves the desired goal or objective.

Capital Improvement means activities relating to the restoration, public access, recreational uses and necessary services for land and water areas, including the

initial removal of invasive plants, and the construction, improvement, enlargement or extension of facilities' signs, fire lines, access roads, and trails. Such activities shall be identified prior to the acquisition of a parcel or the approval of a project.

Cooperating Agencies means two or more agencies working together to operate a specific management area.

Cooperative Management Agreement means an agreement between two or more agencies outlining the respective duties and responsibilities of each agency in the management of a specific tract of land.

Critical Habitat means areas designated for the survival and recovery of state/federally listed rare, threatened, endangered or other sensitive species.

Desirable Vegetation means native plant species that are appropriate for a specific community type and provide benefits to wildlife in the form of food, cover and nesting.

Habitat Diversity means richness and variety of native plant communities within a particular area of the landscape.

Hydroperiod means flooding duration, depth, and timing that influences species composition, ecosystem structure and function.

Interim Land Management means management of non-natural areas that provides revenue without impacting long-term water-development projects.

Invasive/Exotic Vegetation means certain plants that displace native species and adversely affect wildlife habitat, water quality, recreation, and biological diversity.

Lead Manager means the prime managing entity designated for a given tract of land; generally provides the on-site staff.

Management Area means a single tract or combination of tracts under one management program.

Mitigation means, for purposes of this policy, the actual acquisition, restoration, creation, or enhancement of wetlands to compensate for permitted wetland impacts.

Mitigation Banking means wetland acquisition, restoration, creation or enhancement undertaken expressly to provide compensation in advance of wetland losses from development activities.

Multiple-Use means the management of renewable resources for a variety of purposes such as recreation, range, timber, wildlife habitat, and water resource development.

Prescribed Fire means burning of vegetative fuels using controlled application of fire within specified environmental conditions.

Primary Resource Lands means lands having high water resource, fish, wildlife, and recreational values requiring acquisition or protection.

Regional Mitigation Area means, for purposes of this policy, permitted wetland impacts offset through payment for the acquisition, restoration and perpetual management of a Save Our Rivers identified and duly noticed project.

Responsible Management means level of management described in the General Management Plan.

Sustainable Use means to provide continued use of a natural resource without degradation or loss of that resource.
Water Resource Buffer means that portion of a Preservation 2000 or Save Our Rivers project necessary to protect the aquatic environment.
Wildlife Corridor means a connection between natural areas that allows the safe movement of wildlife.
(R.M. No. 139)
Cross references: Definitions and rules of construction, § 100-2.

Sec. 140-25. Responsibilities.
The Land Stewardship Program is responsible for:
(1) Water Resource Protection. The basis for the Land Stewardship Program is the protection and management of natural hydrologic resources. The following policies guide implementation of this objective:

a. Acquired lands shall be managed to provide water resource-related benefits.

b. Land uses or activities that significantly or permanently alter or degrade the quality, quantity and/or natural movement of ground or surface water are not allowed unless they are a part of a regional water management system.

c. Where feasible, an attempt shall be made to restore a more natural hydroperiod on tracts where the drainage patterns have been altered.

d. Public use shall not result in detrimental impacts to water resources. When a public use activity produces detrimental effects on water resources, it shall be discontinued until an evaluation determines that such use is compatible.

e. Water resource lands designated as necessary to implement the Central and Southern Florida "Restudy" Project shall, upon acquisition, become the responsibility of the (Interim) Land Management Program, and follow the guidelines set forth under Section 373.1391(5), Florida Statutes.

(2) Restoration and Protection of Natural Communities:

a. The Land Stewardship Program will encourage the acquisition of large or regionally significant areas that protect important natural resources and provide wildlife corridors.

b. Particular emphasis shall be placed on the identification, protection and management of rare, threatened and endangered species.

c. The planting of invasive exotic plant species shall be prohibited in all management areas. Management practices will strive to identify existing infestations and implement appropriate control or eradication measures.

d. Where practicable, an attempt shall be made to restore and maintain desirable vegetation to promote habitat diversity in areas where invasive exotic vegetation, grazing practices, or improved land uses have substantially altered the historic landscape.

(3) Resource Operations and Maintenance:

a. Lands acquired for natural and/or hydrologic resource benefits shall be managed to conserve and protect those resources.

b. Exotic plant control in all management areas shall strive to attain a level of success where periodic maintenance eliminates the infestation or reduces the coverage of exotic plants.

c. Prescribed fire will be a primary management tool on District lands and will be applied within fire-maintained communities at appropriate intervals.

d. The Division of Forestry will be notified of all wildfires on District lands. Land Stewardship will provide initial suppression when commensurate personnel and equipment are available.

e. Inventories of natural and historic resources shall be performed to provide information for effective land management planning, natural community maintenance and ecological restoration.

f. Evaluation and monitoring of management activities shall be conducted to improve program effectiveness and efficiency.

1. Research shall evaluate the environmental response of certain management activities to assist staff in making appropriate management decisions.

2. Monitoring shall be conducted to identify landscape changes resulting from management activities.

3. Legislative-mandated management reviews will provide input from professional peers.

g. Resource protection shall be provided by professional law enforcement services through funded and unfunded contractual agreements to safeguard the public and protect natural and cultural resources on District-managed natural areas.

h. Sustainable use of forest resources shall be conducted where these activities adhere to a series of environmental criteria (see 1999 Forest Management Plan) that meet Land Stewardship Program goals. Timber contractors will be required to meet silvicultural Best Management Practices (BMP) developed for Florida forests.

i. Range management (grazing) will be considered on improved or native ranges when the introduction of cattle will not conflict with other natural resource management and public use goals.

j. Archaeological and historic resources are protected by site identification and inter-agency coordination with the Florida Division of Historical Resources. Land stewardship planning shall include an analysis of archeological data accompanied by appropriate public education opportunities.

k. Infrastructure support shall be developed and maintained to provide safe access for responsible management and public use on District lands. Such infrastructure may include access points, roads, trails, signs, utilities, and minimal public facilities.

l. Mechanical equipment may be used in conjunction with prescribed burning and other management tools to control vegetation and restore habitat structure.

m. Agricultural developments previously existing on acquired natural areas may be maintained if management of these developments is consistent with other land stewardship goals.

(4) Public Use and Environmental Education:

a. Public use of management areas that is consistent with other management goals shall be encouraged. Public use that may have detrimental impacts on sensitive environmental resources shall be restricted until an evaluation determines such use is compatible. A public use compatibility assessment will be included in the General Management Plan completed for each management area and will be based on the following criteria:

1. Consistency with the reason the lands were acquired.
2. Restrictions and/or prohibitions imposed by easements, leases, reservations, adjacent land ownership, conditions of the purchase agreement, and any other agreements concerning the property.
3. Infrastructure and support facility requirements, such as fences, gates, signage, entry design, stabilized off-road parking, trails, campsites, maintenance, and other operational and budgetary impacts.
4. Opportunities for persons with disabilities.
5. Limitations resulting from endangered species, other sensitive natural resources, archaeological resources, or land management practices.
6. Public health, safety and welfare.
7. Environmental education program opportunities.

b. Public Use Regulation:

1. Public use regulations are set forth in 40E-7.511, Florida Administrative Code, to implement Section 373.1391(1)(b), Florida Statutes. Accordingly, the District shall publish and make available to the public a "Public Use Guide" for designated land management areas. The Public Use Guide will be adopted by the Governing Board at a public meeting advertised in accordance with Chapter 120, Florida Statutes.
2. Rules and regulations governing the public use of each management area shall be enforced by agencies with appropriate law enforcement jurisdiction.
3. Pursuant to Section 373.609, Florida Statutes, the District shall seek the cooperation of every state and county attorney, sheriff, police officer, and appropriate city and county official in the enforcement of the provisions set forth according to 40E-7.511, Florida Administrative Code.
4. Florida Fish and Wildlife Conservation Commission regulations shall govern hunting in areas opened for such use.

(5) Implementation Strategies. The District will secure dedicated funding sources, personnel and other resources to support program goals and objectives. Project funding needs and sources for cooperative management agreements with government and non-government entities will be identified during acquisition. A cooperative management agreement will designate a lead Manager and identify whether District funding is required.

a. The private sector may be solicited to furnish certain management-related facilities and services through the execution of leases and agreements. These leases/agreements will assure mutual benefits to both the District and private parties and be consistent with the program management objectives.

b. Mitigation:

1. Mitigation Banking: Mitigation banking provides an opportunity to accomplish large-scale restoration that may otherwise go unfunded. Pursuant to Section 373.4135, Florida Statutes, the District is encouraged to develop mitigation banks. Land managers will evaluate opportunities in their regions to implement mitigation banks that are consistent with the guidelines established in the Joint State and Federal Mitigation Bank Review Team Process for Florida.

2. Regional Mitigation Areas: The acquisition, restoration and management of District lands as mitigation shall be consistent with Chapter 2000-133, amending Sections 373.414 and 373.4135, Florida Statutes. This includes the establishment of Memorandums of Agreement (MOA) that include restoration plans, success criteria, and monitoring requirements. The MOAs will be used to implement mitigation using full-cost accounting, public noticing, and approval by the Governing Board for use as a mitigation area. The mitigation shall meet restoration objectives as provided in the General Management Plan.

c. Revenue Generation:

1. Private concessions and/or agreements with non-profit organizations will be considered to implement needed services through concession contracts.

2. Entrance and user fees, permits, licenses and/or advance reservations may be required where considered necessary by the managing agency.

3. Timber sales will be conducted to improve forest health or to support specific forest management goals.

4. Grazing leases will be encouraged on selected rangeland to generate revenue or to provide services that offset program management costs.

d. Volunteers and Interns:

1. Volunteers, interns and alternative work forces will be used when possible to supplement existing staff and services.

2. Any volunteer services must meet the standards and procedures prescribed by the District (Risk Management Manual, Volume 1).

(6) Program Components:

a. Management Assessment: A brief summary of the management issues completed when the site is identified for acquisition.

b. General Management Plan (GMP): Provides a description of recommended management and is required for each Land Stewardship Management Area. The GMP follows a designated format and is updated every five years.

c. Activity Plan (AP): Provides a detailed implementation strategy for specific activities such as prescribed burning, exotic removal and restoration. The plan shall be developed by the lead Manager in consultation with the cooperating agencies for each major tract of land (or group of tracts) to be operated as a single

management unit. The AP may be included in the GMP and is updated when necessary.

d. Annual Work Plan (AWP): Summarizes activities corresponding with annual budget development and is prepared by the Operations Section of the Land Stewardship Program.

e. Reporting: Summaries of management activities for each management area will be reported quarterly within the District and annually as part of the Florida Forever Work Plan.

(R.M. No. 139)

Secs. 140-26--140-40. Reserved.

Appendix B. CREW SOILS

Marl and Rock

The marl and rocky soil landscape denotes that area near the southern tip of the Florida peninsula typically adjacent to the tidal area of Florida Bay. These soils usually occur within Dade, Monroe and Collier counties along the southern extent of the Everglades. Marl soils are hydric and originate from the precipitation of calcite in the water by calcareous algae mats. Rocky soils have exposed limestone at or near the surface. The seasonal high water table ranges from one foot below to one foot above the soil surface for four to six months annually. Some areas are noted as drained phases, which means that there has been artificial drainage implemented, however the degree or effectiveness of the drainage is not expressed.

Scrub cypress is found only in south Florida on marl and rock that is frequently flooded. Eastern Collier County and northern Monroe County have the largest areas. This region is called "Big Cypress". It appears as a broad area of marshes with dwarf cypress, less than 20 feet in height, scattered throughout. Cypress are stressed by extreme seasonal change in water levels, and low levels of plant nutrients. These factors cause poor growing conditions with a lack of plant diversity, and small wildlife populations in comparison to other cypress communities. Marl/rock soils are found in only one area within the CREW Project; located west of Lake Trafford.

Soils associated in scrub cypress are nearly level, poorly to very poorly drained, with coarse to medium textured surfaces underlain by finer textured material or fractured limestone. A representative soil is Margate.

Vegetation is much like that of freshwater marshes. Occasional air plants and orchids can be found in the scattered cypress trees. Plants which characterize this community are: Bald cypress (*Taxodium distichum*), pond cypress (*Taxodium distichum var. nutans*), wax myrtle, stiff-leafed wild pine (*Tillandsia fasiculata*), yellow-eyed grass (*Xyris Myricacerifera*), blue maidencane (*Amphicarpum muhlenbergianum*), bluejoint panicum (*Panicum tenerum*), chalky bluestem (*Andropogon capillipes*), cutgrass (*Leersia hexandra*), gulfdune paspalum (*Palspalum monostachyum*), and maidencane (*Panicum hemitomon*). The following protected plant species may be found in or around scrub cypress: Acuna's epidendrum (*Epidendrum acunae*), auricled spleenwort (*Asplenium auritum*), bird's nest spleenwort (Asplenium serratum), cow-horn orchid (*Cyrtopodium punctatum*), dwarf epidendrum (*Encyclia pygmaea*), hidden orchid (*Maxillaria crassifolia*), leafless orchid (*Campylocentrum pachyrrhizum*), night-scented orchid (*Epidendrum nocturnum*), and nodding catopsis (*Catopsis nutans*).

Flats Soils

Flats, (previously referred to as slough) soils are poorly drained hydric soils with sandy marine sediments throughout the profile, or more rarely with loamy sand or sandy loam. Some areas within this unit are frequently flooded alluvial areas that have a sandy surface for the majority of the area. Flats are located between the flatwood and depressional landscapes, and are generally regarded as transition areas. The seasonal high water table can range from the soil surface to one foot below the surface for four to 10 months annually. In most years, the seasonal high water table begins in June and ends from September to March (typically by February). Some areas may be inundated for less than a few weeks by large storm events. Examples of these soils include Boca, Felda and Riviera.

One of the ecological communities most typical of the flats landscape is the slough. Slough soils are nearly level and very poorly drained with organic surfaces underlain by sand. Representative soils include Hontoon, Sanibel and Okeelanta. Most sloughs serve as drainage ways for water during periods of heavy and prolonged rainfall. Surface water may move over this area for up to a few weeks during the rainy season. Most sloughs are relatively long and narrow and slightly lower in elevation than the surrounding flatwoods and hammocks. Vegetation within the slough may be open expanse of grasses, sedges and rushes with scattered pines and cypress in an area where the surface soil is saturated during the wet season. Grasses are the most common plants found in sloughs. Plants characterize this community are St Peter's wort (*Ascyrum stans*), pickerelweed, sundew, marsh pink, meadowbeauty, milkwort (*Polygala sp.*), beak rushes, blue maidendane (*Amphicarpum muhlenbergianum*) and sloughgrass (*Scleria sp.*). Statewide, other natural communities less frequently found on flat are pine rockland, prairie hammock, rockland hammock, shell mound or seepage slope.

Sand Depression Soils

Sand depression soils are very poorly drained hydric soils that typically have sandy marine sediments throughout the profile. A few areas may have mucky sand, loamy sand, or sandy loam surfaces with sandy or loamy subsurfaces. Often, these areas are depressions adjacent to flats and flatwood landscapes. The seasonal high water table can range from one foot below to two feet above the soil surface for seven to ten months annually. In most years, the seasonal high water table begins in June and ends from October to March (typically in March). Some areas within this unit are frequently flooded alluvial areas that have a sandy surface for the majority of the area. These frequently flooded map units are known to have surface flooding at least one out of every two years. Examples of Sand Depression soils include Basinger, Boca, Chobee, Felda and Riviera.

Wetland communities dominate this landscape position. Natural communities often found in this landscape are the freshwater marsh and ponds. Soils commonly associated with this community are nearly level and very poorly drained with organic surfaces underlain by sand. Representative soils include

Hontoon, Sanibel and Okeelanta. Vegetation varies widely within marshes, and may be composed of combinations of different major types. Marsh types are; flag, sawgrass, arrowhead, and other non-grass herb marsh, cattail, spike-rush, bulrush, and maidencane marsh. Plants that characterize this community may include; beakrushes, bulrushes (*Scirpus sp.*), maidencane, sawgrass, and spike rushes (*Eleocharis sp.*), arrowhead, cattail (*Typha sp.*), pickerelweed, and primrose willow (*Ludwigia sp.*).

Statewide, other natural communities that may occur less frequently on sand depression soils include hydric hammock, floodplain swamp, strand swamp, basin swamp, floodplain swamp and baygalls.

Flatwood Soils

Flatwood soils are poorly drained non-hydric, upland soils with sandy marine sediments throughout the profile. Most of the soils series have a subsurface spodic horizon, some of which may have loamy sand substrates. The seasonal high water table can range from six to 18 inches below the soil surface for three to six months annually. Some areas may become inundated for less than a couple of weeks during large storm events. Examples of these soils include Immokallee, Malabar, and Wabasso. Natural communities typical of flatwood soils are dry prairie, mesic flatwoods, scrubby flatwoods. The landscape position of these communities affects plant-water relationships and causes slight differences in plant composition from wet to dry areas. Typical natural vegetation flatwood soils are scattered pine trees with an understory of saw palmetto and grasses. Common plants are south Florida slash pine, live oak, ground blueberry (*Vaccinium myrsinites*), gallberry, tarflower (*Befaria racemosa*), shining sumac (*Rhus copallina*), wax myrtle, chalky bluestem (*Andropogon capillipes*), south Florida bluestem (Schiachryium rhizomatum), and pineland threeawn (*Aristida stricta*).

Statewide, other communities found on flatwood soils are slope forest, upland hardwood forest, upland mixed forest, sinkhole, pine rockland, hydric hammock, baygall, prairie hammock, xeric hammock, and sink hole.

Appendix C. CREW Natural Communities

Prairie Hammock (1.3% coverage of CREW project)
Prairie hammock is characterized as a clump of tall cabbage palms and live oaks in the midst of prairie or marsh communities (FNAI, 1990). Prairie hammocks establish on elevated soils surrounded by lower topography. These islands flood only for a short duration during the highest water levels. Naturally occurring fires are rare in these hammocks, due mainly to a lack of under-story fuel.

Canopy species in CREW's prairie hammocks are live oak and cabbage palm, with occasional laurel oak (*Quercus laurifolia*) in lower elevations. An abundance of epiphytes, including listed species, are found in mature canopy trees. As in most prairie hammocks, those of CREW have a sparse under-story due to over-story shading. Typical under-story plants of pristine prairie hammocks include wax myrtle (*Myrica cerifera*), stoppers (*Eugenia sp.*), marlberry (*Ardisia escallonioides*), beautyberry (*Callicarpa americana*), and saw palmetto (*Serenoa repens*).

CREW hammocks are associated with prairie or marsh communities, and provide valuable habitat for nesting birds and mast feeders, Acorns are important forage for a variety of wildlife, including black bears, white-tailed deer and feral hogs.

FNAI ranks prairie hammocks as 'G4' and 'S4' both statewide and globally secure, although it may be quite rare in parts of its range, especially at the periphery. LSP management strives to minimize soil disturbance, restrict fire where appropriate and eradicate non-native invasive species within hammock areas.

Scrubby Flatwoods (0.6%)
Scrubby flatwoods are characterized as an open canopy forest of widely scattered pine trees with a sparse shrubby under-story and numerous areas of barren white sand. (FNAI, 1990). This community occurs on sites slightly higher in elevation than mesic flatwoods, but lower than scrub. Soils are well drained and dry, even during maximum rainfall events. Unlike scrub, the water table is relatively close to the soil surface. As with typical scrubby flatwoods, those of CREW harbors species common to both scrub and mesic flatwoods. Typical species include slash pine (Pinus elliotii), sand live oak (*Quercus geminata*), dwarf live oak (*Quercus minima*), live oak (*Quercus virginiana*) saw palmetto, rusty staggerbush (*Lyonia ferruginea*), fetterbush (*Lyonia lucida*), tarflower (*Befaria racemosa*), goldenrod (*Solidago sp.*), runner oak (*Quercus pumila*), and wiregrass (*Aristida sp.*).

Due to floristic and geographic similarities, some ecologists speculate that this community is merely a form of mesic flatwoods where fire has been excluded. This theory is based on the natural occurrence of hardwood (oak) invasion without sufficient fire frequency patterns. Natural fire frequency for this community is at eight to 25 year intervals. Sparse ground layer vegetation and relatively incombustible oak litter contributes to slow fuel build-up and extended

periods without fire. In CREW, scrubby flatwoods often grade into mesic flatwoods.

Although scrubby flatwoods are fairly widespread geographically, the total area of this association is quite limited (Myers and Ewel, 1990). Global and state rankings list this community as 'G3' and 'S3', either very rare and local throughout its range or found locally even abundantly at some of its locations, 21 to 100 occurrences statewide in a restricted range, or because of other factors making it vulnerable to extinction throughout its range. In addition, scrubby flatwoods provide habitat for the gopher tortoise (species of special concern), Florida scrub jay (threatened), eastern indigo snake (threatened), and Florida mouse (species of special concern) (FFWCC, 1999). Management planning for scrubby flatwoods in CREW includes prescribed fire at natural intervals, with consideration to listed species habitat requirements.

Mesic Flatwoods (2.8%) Mesic flatwoods are characterized as an open canopy forest of sparse pine trees with little or no under-story but a dense ground cover of herbs and shrubs. Global and state rankings list this community as 'G4' and 'S4'. Two common vegetation associations are longleaf pine/wiregrass/runner oak and slash pine/gallberry/saw palmetto. In CREW, slash pine dominates the over-story and gallberry (*Ilex glabra*), saw palmetto and fetterbush occur in the understory. Other typical plants include St. Johns-wort (*Hypericum sp.*), dwarf huckleberry (*Gaylussacia dumosa*), staggerbush, blueberry (*Vaccinium sp.*), gopher apple (*Lycania michauxi*), tar flower, bog buttons (*Lachnocaulon sp.*), blackroot (*Pterocaulon pycnostachyum*), and yellow-eyed grass (*Xyris sp*).

This community occurs on similar soils as dry prairies and wet flatwoods, with minor changes in topography determining community type. Acidic sands overlay hardpan that reduces water exchange between the soil surface and subsurface. Thus rainy seasons produces surface flooding, and dry seasons extreme drought, influencing vegetation species composition. Plants of this community have adapted to long intervals of inundation and desiccation, and acclimated to periodic fire.

Natural fires occur every one to eight years. Frequency of fire determines community type between dry prairie and mesic flatwoods, with longer fire intervals favoring mesic flatwoods. Mesic flatwoods is the dominant community type in Corkscrew Marsh, west of the sawgrass swale. Much of this community had been logged prior to purchase in 1989. Shrub densities have increased following logging; however, with application of an aggressive burn program, a more natural mesic flatwoods community will return. A few isolated pockets of mesic flatwoods are also found in the eastern and western portions of Bird Rookery Swamp and portions of Flint Pen Strand.

Hydric Hammock (0.02%)

Hydric hammock is characterized as a well-developed hardwood and cabbage palm forest with a variable understory often dominated by palms and ferns. Typical plants include cabbage palm, red maple (*Acer rubrum*), swamp bay (*Persea palustris*), sweetbay (*Magnolia virginiana),* wax myrtle, saw palmetto, poison ivy (*Toxicodendron radicans*) , dahoon holly (*Ilex cassine*), myrsine (*Rapanea punctata*), royal fern (*Osmunda regalis*), pepper vine (*Ampelopsis arborea*), virginia creeper (*Parthenocissus quinquefolia*) and marsh fern (*Thelyptris sp*.).

Hydric hammock occurs on low, flat, wet sites. Soils are sands with considerable organic material that, although generally saturated, are inundated only for short periods following heavy rains. The normal hydroperiod is seldom over 60 days per year. Because the scarcity of herbaceous ground cover, hydric hammocks rarely burn. Prescribed burn planning for adjacent natural communities will consider hydrologic conditions of hydric hammocks prior to application of fire.

The normal hydrological regime must be maintained in hydric hammocks. If the water table is lowered, hydric hammocks will gradually change to mesic conditions. If the hammock is flooded, many trees will die and eventually be replaced by more hydrophytic species.

This community occurs as patches in a variety of lowland situations, generally grading into strand swamp, basin swamp, or wet flatwoods. In CREW, they occur west of the Corkscrew Marsh sawgrass swale.

Hydric hammock is ranked as apparently secure in the state “S4?”, although it may be rare in some parts of its state range. Further research is required for a definitive global classification.

Wet Flatwoods (8.5%)

Wet flatwoods are characterized as relatively open-canopy forests of scattered pine trees or cabbage palms with either a thick shrubby under-story and very sparse ground cover, or a sparse under-story and a dense ground cover of hydrophytic herbs and shrubs, with variations between these extremes (FNAI, 1990). Other plants associated with this habitat type in CREW include wax myrtle, saw palmetto, beakrush (*Rhynchospora sp*.), St. John’s-wort (*Hypericum sp*.), and blue maidencane (*Amphicarpum muhlenburgianum*). This community is found in small areas of less than 100 acres on either side of the cypress strand in Bird Rookery Swamp and west of the central swale in Corkscrew Marsh. Flint Pen has wet flatwoods east and west of the central cypress strand, and as islands within the strand.

Wet flatwoods develop on poorly drained acidic, low nutrient sands underlain by hardpan. Surface water appears a minimum of one month per year. Natural fire frequency is considered to be three to 10 years. Frequent fire postpones

hardwood succession and thins canopy trees, while promoting under-story growth and fire-adapted species.

State ranking is "S4", apparently secure in the state, although it may be rare in some parts of its state range. Global ranking requires further research. Most wet flatwoods are extremely vulnerable to hydrologic manipulation and exotic invasion.

Swale (19.8%)
Swales are marshes situated in broad shallow channels with flowing water, and characterized by emergent grasses, sedges and herbs up to 10 feet in height. The dominant species is sawgrass (*Cladium jamaicense*). Within CREW, arrowhead (Sagittaria sp.), pickerelweed (*Pontedaria cordata*), buttonbush, American white waterlily (*Nymphaea odorata*), coastal plain willow (*Salix caroliniana*), water primrose (*Ludwigia sp.*), and bladderwort (*Utricularia sp.*) are also common species.

Swale soils are peat or sands, and are generally located over linear depressions in the underlying limestone. Sheet flow is maintained for 250 days a year. Swales are valuable ecologically because they serve as water storage and recharge areas, water transportation corridors, nutrient filters and salt water intrusion barriers.

Light ground fires occur every one to five years in swales, and may occur any time of the year, as sawgrass can carry fire over the water's surface. Fire during dry seasons may result in peat fire that lowers the ground surface, converting the swale into a slough. Lack of fire results in dominance of coastal plain willow and buttonbush thickets.

The most prominent feature of the Corkscrew Marsh unit is an open sawgrass swale that covers 70% of the total area. A swale is also located in the central portion of Bird Rookery Swamp. In both swales, coastal willow is becoming the dominant plant species due to absence of fires in recent years.

Swales are state listed as "G3", either rare, and local throughout its range or found locally in a restricted range. Global ranking, "G4", indicates it is secure, although further research is required for a definitive classification. Threats to this natural community are disruption of natural hydrologic flow and fire cycles, conversion to agriculture and invasion of exotics in disturbed areas.

Strand Swamp (38.4%)
Strand swamps are shallow, forested, usually elongated depressions or channels dominated by bald cypress. They are generally situated in troughs in a flat limestone plain. Typical plants include red maple, laurel oak, cabbage palm, strangler fig, red bay, sweet bay, coastal plain willow, wax myrtle, myrsine, buttonbush, poison ivy, swamplily (*Crinum americanum*), leather fern (*Acrostichum danaeifolium*), royal fern, sawgrass, swamp primrose (*Ludwigia*

palustris), smartweed (*Polygonum sp*.) and green arum (*Peltandra virginica*). Canopy plants are mainly temperate, while understory plants are sub-tropical.

A cypress/maple strand swamp is the dominant natural community in Bird Rookery Swamp, and also forms the wetland core of Flint Pen Strand. Bobcat, panther and black bear are known to frequent these locations.

Strand swamp soils are peat and sand over limestone with normal hydroperiods of 200 to 300 days per year. Water movement is an integral component of strand swamps, which typically have periodic flow. Gross and net primary productivity is high in swamps with flowing water (Myers and Ewel 1990).

Natural fire is infrequent in strand swamps, occurring on a cycle of 30 to 200 years. Fire, however, is essential for reduction of hardwood encroachment and reduction of peat accumulation that would convert this community to a bottomland forest. Strand swamps are classified as both regionally and globally secure (G4 And S4), however, more research is required for a definitive classification. Strand swamps are extremely vulnerable to local and regional hydrologic modifications.

Slough (0.5%)
Sloughs are broad shallow channels associated with strand and swale systems. They are the deepest drainages in the system and usually hold water for at least 250 days a year. Typical plants include pond apple (*Annona glabra*), fire flag (*Thalia genticulata*), golden canna (*Canna flaccida*), giant cutgrass (*Zizaniopsis miliancea*), duckweed (Lemna sp.), buttonbush, pickerelweed, arrowhead and lizard's tail (*Saururus cernuus*). This community harbors rare tropical epiphytes. Sloughs can have a varied vegetative structure. Canopied sloughs, which occur in Bird Rookery Swamp, consist of pond apple, coastal plain willow and pop ash (*Fraxinus caroliniana*) associated with large emergent herbs and floating aquatic plants. Sloughs may also be devoid of a canopy and consist mainly of large emergent herbs, floating aquatics and open water. Emergent herbaceous sloughs occur in the center of the Flint Pen cypress strand.

Sloughs are often aligned with the lowest linear depressions in the underlying limestone bedrock. Soils are peat, unless removed by catastrophic fire. Natural fire is infrequent in sloughs, and generally results in a temporary reduction of hardwoods.

Sloughs are abundant throughout Florida. FNAI ranks sloughs as "G4" and "S4", both statewide and globally secure, although it may be quire rare in parts of its range, especially at the periphery. More research is required for a definitive state ranking.

Dome Swamp (0.4%)

Dome swamps are characterized as shallow, forested, usually circular depressions that generally present a domed profile because smaller trees grow in the shallower waters at the outer edge, while larger trees grow in the deeper water of the interior. This community usually forms around sinkholes or depressions in flatwoods caused by solution activity. Cypress trees grow in the sand that fills these depressions**.** From above, dome swamps may resemble a "doughnut", with open ponds or depression marshes in the center of the dome.

Pond cypress, red maple, dahoon holly, pop ash and pond apple are typical trees of the CREW dome swamp, with sawgrass, fire flag, maidencane, arrowhead and pickerelweed in the central depression. Other common plants include swamp bay, sweetbay, Virginia willow (*Itea virginica*), fetterbush, chain fern (*Woodwardia sp*.), poison ivy, laurel greenbrier (*Smilax laurifolia*), Spanish moss (*Tillandsia usneoides*), wild pine (*Tillandsia sp*.), royal fern (*Osmunda regalis*), coastal plain willow, wax myrtle, orchids *(Encyclia sp*. and *Epidendrum sp*.), St. John's-wort, lizard's tail, swamp primrose, redroot, floating heart (*Nymphoides aquatica*), buttonbush, and green arum (*Peltandra virginica*). Dome swamps are associated with flatwoods within Bird Rookery, Flint Pen, and Corkscrew Marsh.

Dome soils are composed of peat, which become thickest toward the center of the dome, and are generally underlain with acidic sands and then limestone, although other subsoils may also occur. Some domes have a clay lens that helps retain water levels. Dome swamps often derive much of their water through runoff from surrounding uplands, but they may also be connected with underground channels in which case subterranean flows would dominate the hydrological regime. They generally function as reservoirs that recharge the aquifer when adjacent water tables drop during drought periods. The normal hydroperiod is 200 to 300 days per year with water being deepest and remaining longest near the center of the dome.

Fire is essential for the maintenance of a cypress dome community. Without periodic fires, hardwood invasion and peat accumulation would convert the dome to a bog. Dome swamps dominated by bays are close to this transition. Fire frequency is greatest at the periphery of the dome and least in the interior where long hydroperiods and deep peat maintain high moisture levels for most of the year. The normal fire cycle might be as short as three to five years along the outer edge, and as long as 100 to 150 years towards the center. The dome's profile is largely attributable to this fire regime. Cypress is very tolerant of light surface fires, but muck fires burning into the peat can kill them, lower the ground surface, and transform a dome into a pond. In order to prevent peat fires in CREW, prescribed fire is applied to surrounding natural communities when soils within the domes are saturated.

Natural hydroperiods must be maintained for dome preservation. Somewhat deeper than normal water levels are not likely to do much harm, but extended

hydroperiods will limit tree growth and prevent reproduction. Shortened hydroperiods permit the invasion of mesophytic species, which will change the character of the understory and eventually allow hardwoods to replace cypress. Dome swamps may also be degraded by pollution, and the invasion of exotic plants, especially melaleuca.

Dome swamps are considered rare or uncommon in the state, "S3", but secure globally "G4". More research is needed for definitive ranking of both categories.

Depression Marsh (1.5%)
Depression marsh, also known as a flatwoods pond, is characterized as a shallow, usually rounded depression in sand substrate with herbaceous vegetation often occurring in concentric bands (FNAI 1990). Typical plants include St. John's-wort, spikerush (*Eleocharis sp*.), yellow-eyed grass, chain fern, primrose willow (*Ludwigia peruviana*), maidencane (*Panicum hemitomon*), wax myrtle, buttonbush, pickerelweed, arrowhead, and bladderwort.

Depression marshes occur throughout the sloping flatwoods west of the Corkscrew Mash swale, from the highest elevations to low areas of sawgrass in the management unit's center. Where marshes occur, one of three geological conditions is present: surficial deposits are impermeable, the water table emerges through the permeable substrate, or the marsh is hydrologically connected to a river (Kushlan, 1991). Depression marshes are typically small in size and hydrologically isolated from other surface water bodies. Water is received by runoff, seepage or direct rainfall. Hydroperiods range widely from as few as 50 days or less to more than 200 days per year (FNAI, 1990). Bottom soils are generally acidic peat, resulting from accumulation of decayed plant material. This community frequently grades into wet or mesic flatwoods.

Natural fire occurs in depression marshes every one to five years, depending on a combination of weather conditions and fuel build-up. Fire preserves the open canopy by limiting invasion of woody vegetation, promoting herbaceous growth, and slowing succession by deepening the marsh with an occasional peat fire. The LSP coordinates fire schedules to insure depression marshes burn at natural frequencies and during periods of adequate ground moisture.

Depression marshes provide critical breeding and foraging habitat for a wide assemblage of amphibians and reptiles not found in larger, more permanent systems. Cyclic surface water availability promotes foraging by numerous listed wading bird species such as the wood stork, white ibis, snowy egret, and sandhill crane.

Depression marsh is ranked statewide as either very rare throughout its range; or found locally, even abundantly at some of its locations in a restricted range; or because of other factors making it vulnerable to extinction throughout its range. Global ranking indicates it is apparently secure, though it may be quite rare in

parts of its range, especially at the periphery. Further research is required for a definitive global classification.

Appendix D. Plant Species List

N = Non-native
E = Endangered
T = Threatened

Scientific Binomial	Common Name	Status
Acalypha gracilens	Three-seeded Mercury	
Acer rubrum	Southern red maple	
Achrostichum danaefolium	Giant leather fern	
Aeschynomene americana	Shy-leaf	
Agalinis fasciculata	False foxglove	
Agalinis purpurea	False foxglove	
Aletris lutea	Yellow colic root	
Amaranthus cannabinus	Giant water hemp	
Amaranthus hybridus	Common pigweed	
Ambrosia artemisifolia	Ragweed	
Amorpha fruticosa	Bastard indigo	
Ampelopsis arborea	Pepper vine	
Amphicarpum muhlenbergianum	Blue maidencane	
Andropogon brachystachyus	Shortspike bluestem	
Andropogon cabansii	Cabanis bluestem	
Andropogon elliotii	Elliot's bluestem	
Andropogon glomeratus	Bushy beardgrass	
Andropogon ternarius	Splitbeard bluestem	
Andropogon virginicus	Beardgrass	
Andropogon virginicus v. glaucopsis	Chalky bluestem	
Andropogon virginicus v. virginicus	Beardgrass	
Anemia adiantifolia	Pineland fern	
Angadenia berteri (rare)	Pineland golden trumpet	
Annona glabra	Pond apple	
Apios americana	Ground nut	
Ardisia escallonioides	Marlberry	
Aristida patula	Spreading three-awn	
Aristida purpurascens	Arrowfeather	
Aristida spiciformis	Florida barley	
Aristida stricta	Wiregrass	
Arnoglossum floridanum	Indian plantain	
Arnoglossum ovatum	Indian plantain	
Asclepias curassavica	Scarlet milkweed	
Asclepias incarnata	Pink swamp milkweed	
Asclepias lanceolata	Swamp milkweed	
Asclepias longifolia	Purple butterfly weed	
Asclepias pedicellata	Yellow milkweed	
Asclepias tuberosa	Orange milkweed	
Asclepias viridis	Green antelopehorn	
Asimina reticulata	Pawpaw	
Aster adnatus	Clasping aster	
Aster carolinianus	Climbing aster	
Aster concolor	Silvery aster	
Aster dumosus	Bushy aster	

Aster elliottii	Purple bushy aster	
Aster reticulatus	Yellow-headed white aster	
Aster subulatus	Small-headed aster	
Aster tortifolius	White-topped aster	
Axonopus furcatus	Carpet grass	
Azolla caroliniana	Mosquito fern	
Baccharis glomeruliflora	Groundsel bush	
Baccharis halimifolia	Saltbush	
Bacopa carolinana	Aromatic figwort	
Bacopa monnieri	Matted figwort	
Befaria racemosa	Tarflower	
Berchemia scandens	Rattan vine	
Bidens mitis	Marsh beggar ticks	
Bidens pilosa	Spanish needles	
Bigelowia nudata	Rayless goldenrod	
Blechnum serrulatum	Cypress fern	
Blechum brownei	Blechum	
Bletia purpurea	Pine pink orchid	T
Boehmeria cylindrica	False nettle	
Boltonia diffusa	Doll's daisy	
Borerria laevis	Buttonweed	
Buchnera americana	Bluehearts	
Bulbostylis ciliatifolia	Hair sedge	
Bumelia reclinata	Buckthorn	
Bumelia reclinata	Buckthorn	
Bursera simaruba	Gumbo limbo	
Callicarpa americana	Beautyberry	
Calopogon multiflorus	Many-flowered grass pink	E
Calopogon pallidus	Common grass pink	
Calopogon tuberosus	Marsh pink	
Campanula floridana	Florida bluebell	
Campyloneuron phyllitidis	Strap fern	
Canna flaccida	Golden canna	
Caperonia castaneifolia (rare)	Water mercury	
Carex sp.	Carex sedge	
Carex lupulina	Carex sedge	
Carex sp.	Carex sedge	
Carphephorus corymbosus	Deer tongue	
Carphephorus odoratissima	Vanilla plant	
Carphephorus paniculatus	Deer tongue	
Cassia chamaecrista	Partridge pea	
Cassia nictitans v. aspera	Flatwoods partridge pea	
Cassia obtusifolia	Wild senna	
Cassytha filiformis	Love vine	
Celtis laevigata	Hackberry	
Cenchrus incertus	Sandspur	
Centella asiatica	Coinwort	
Centrosema virginianum	Butterfly pea	
Cephalanthus occidentalis	Buttonbush	
Chamaecrista fasciculata	Partridge pea	
Chamaesyce cordifolia	Round-leaved spurge	
Chamaesyce hirta	Button spruge	
Chamaesyce hyssopifolia	Small-leaved spurge	

Chamaesyce maculata	Spotted spurge	
Chaptalia tomentosa	Pineland daisy	
Cheiroglossa palmata (*)	Hand fern	E
Chicocca alba	Snowberry	
Chloris petra	Goosefoot grass	
Chrysobalanus icaco	Cocoplum	
Chrysophyllum oliviforme	Satinleaf	T
Chrysopsis subulata	Goldenaster	
Cicuta mexicana	Water hemlock	
Cirsium horridulum	Thistle	
Cirsium nuttalli	Thistle	
Cissus sicyoides	Possum grape	
Citrus aurantium	Sour orange	
Cladium jamaicense	Sawgrass	
Clematis baldwinii	Pine hyacinth	
Cnidoscolus stimulosus	Tread-softly	
Coelorachis rugosa	Wrinkled joint grass	
Commelina diffusa	Creeping dayflower	
Commelina erecta	Dayflower	
Conchorus aestuans	Jutes	
Conoclinum coelestinum	Mistflower	
Conyza canadensis	Sneezeweed	
Coreopsis gladiata	Tickseed	
Coreopsis leavenworthii	Tickseed	
Cornus foemina	Swamp dogwood	
Crinum americanum	Swamp lily	
Crotalaria rotundifolia	Rabbit bells	
Crotalaria spectabilis	Rattle box	N
Croton glandulosus v. simpsonii	Simpson's croton	
Cuphea carthagenesis	Cuphea	
Cynanchum blodgetii	Blodgett’s Swallowwort	T
Cynanchum scoparium	Vine milkweed	
Cynanchum sp.	Vine milkweed	
Cynodon dactylon	Bermuda grass	
Cyperus ferax		
Cyperus filiculmis	Thread-stem rush	
Cyperus haspan	Three-sided rush	
Cyperus ligularis	Snail rush	
Cyperus ochraceus	Tan rush	
Cyperus odoratus	Fragrant rush	
Cyperus polystachyos var. texensis	Sweet rush	
Cyperus pumilius	Dwarf sedge	
Cyperus retrorsus		
Cyperus surinamensis		
Dactyloctenium aegyptium	Crowfoot grass	
Dalea carnea	Prairie clover	
Desmodium triflorum	Trefoil	
Dichanthelium commutatum	Woods panic grass	
Dichanthelium erectifolium	Erect panic grass	
Dichanthelium laxiflorum	Drooping panic grass	
Dichromena colorata	White-top sedge	
Dichromena latifolia	Big white-top sedge	
Digitaria ciliaris	Southern crabgrass	

Diodia teres	Poor joe	
Diodia virginiana	Buttonweed	
Diospyros virginana	Persimmon	
Drosera capillaris	Dwarf sundew	
Drymaria cordata	West Indian chickweed	
Dyschoriste angusta	Pineland twinflower	
Dyschoriste oblongifolia	Twinflower	
Echinochloa crusgalli	Barnyard grass	
Echinochloa colonum	Jungle rice	
Echinochloa crusgalli	Barnyard grass	
Echinochloa walteri	Coast cockspur	
Eclipta alba	Yerba-de-tago	
Eichhornia crassipes	Water hyacinth	
Eleocharis baldwinii	Spikerush	
Eleocharis cellulosa	Spikerush	
Eleocharis geniculata	Segmented spikerush	
Eleocharis interstincta	Annulated spikerush	
Eleocharis vivipara	Annual spike rush	
Elephantopus elatus	Florida elephant's foot	
Eleusine indica	Yard grass	
Elytraria c. var. angustifolia	Narrow-leaved scale stem	
Elytraria caroliniensis	Scale-stem	
Elytraria caroliniensis v. angustifolia	Narrow-leaved scale-stem	
Emilia fosbergii	Red tassle-flower	
Encyclia cochleata v. triandra	Clam-shell orchid	E
Encyclia tampensis	Butterfly orchid	
Epidendrum anceps	Brown epidendrum orchid	E
Epidendrum nocturum	Night-blooming orchid	E
Epidendrum rigidum	Matted epidendrum orchid	E
Eragrostis elliottii	Elliott lovegrass	
Eragrostis ciliaris	Annual lovegrass	
Eragrostis elliottii	Elliott lovegrass	
Eragrostis spectabilis	Purple lovegrass	
Erechites hieracifolia	Hawkweed	
Erechites hieracifolia	Fireweed	
Erechites hieracifolia	Hawkweed	
Erianthus giganteus	Plume grass	
Erigeron annuus	Daisy fleabane	
Erigeron quercifolius	Southern fleabane	
Erigeron strigosus	Fleabane	
Erigeron vernnus	Fleabane	
Eriocaulon compressum	Hat pins	
Eriocaulon decangulare	Pipewort	
Eriocaulon decangulare	Pipewort	
Eryngium baldwinii	Creeping snakeroot	
Eryngium yuccifolium	Button snakeroot	
Erythrina herbacea	Coral bean	
Eugenia axillaris	White stopper	
Eupatorium capillifolium	Dog fennel	
Eupatorium compositifolium	Dog fennel	
Eupatorium leptophyllum	Marsh dog fennel	
Eupatorium mikanioides	Semaphore eupatorium	
Eupatorium mohrii	Mohr's eupatorium	

Eupatorium rotundifolium	False hoarhound	
Euphorbia polyphylla	Pineland spurge	
Euthamia tenuifolia	Flat-topped goldenrod	
Evolvulus sericeus	Dwarf morningglory	
Ficus aurea	Strangler fig	
Fimbristylis autumnalis	Annual fringe-rush	
Fimbristylis miliacea	Fringe-rush	
Flaveria linearis	Yellowtop	
Fraxinus caroliniana	Pop ash	
Fuirena breviseta	Umbrella-grass	
Fuirena scirpoidea	Smooth umbrella-grass	
Galactia elliottii	Milkpea	
Galactia regularis	Trailing milkpea	
Galactia volubilis	Twining milkpea	
Galium tinctorium	Dye bedstraw	
Gaura angustifolia	Southern gaura	
Gaylussacia dumosa	Dwarf huckleberry	
Gnaphalium obtusifolium	Rabbit tobbaco	
Gnaphalium purpureum	Purple cudweed	
Gratiola hispida	Gratiola	
Gratiola ramosa	Creeping hedge-hyssop	
H. angustifolius x floridanus	Sunflower (hybrid forms)	
Habernaria odontopetala	Spider ground orchid	
Hamelia patens	Firebush	
Haplopappus divaricatus	Scratch daisy	
Hedoytis procumbens	Creeping innocence	
Hedyotis uniflora	Clustered diamond-flower	
Helenium pinnatifidum	Sneezeweed	
Helianthus agrestis	Peninsular sunflower	
Helianthus angustifolius	Narrow-leaved sunflower	
Helianthus angustifolius	Narrow-leaved sunflower	
Helianthus floridanus	Florida sunflower	
Heliotropium polyphyllum	Pineland heliotrope	
Heterotheca subaxillaris	Camphorweed	
Hibiscus coccineus	Red swamp hibiscus	
Hibiscus grandiflorus	Swamp hibiscus	
Hieracium gronovii	Gronov's hawkweed	
Hieracium megalocephalon	Hawkweed	
Hoya carnosa	Hoya	N
Hydrocotyle umbellata	Water pennywort	
Hydrolea corymbosa	Skyflower	
Hymenachne amplexicaulis	Trompetilla grass	N
Hypericum cistifolium	Cluster-leaf St. Johns wort	
Hypericum fasciculatum	Sandweed	
Hypericum hypericoides	St. Andrew's cross	
Hypericum mutilium	Dwarf St. John's wort	
Hypericum myrtifolium	Myrtle-leaf St. Johns wort	
Hypericum tetrapetalum	Heart-leaved St.John's wort	
Hypoxis juncea	Common star grass	
Hyptis alata	Musky mint	
Hyptis canadensis	Musky mint	
Hyptis verticillata	Bittermint	
Ilex cassine	Dahoon	

Ilex glabra	Gallberry	
Imperata cylindrica	Cogon grass	
Indigofera hirsuta	Hairy indigo	N
Ipomoea alba	Moonflower	
Ipomoea indica	Common morning glory	
Ipomoea sagittata	Glades morning glory	
Ipomoea tuba	Moonflower	
Iresine diffusa	Bloodleaf	
Iris hexagona v. savannarum	Prairie iris	
Itea virginica	Virginia willow	
Iva microcephala	Pineland elder	
Juncus ,megacephalus	Large-headed rush	
Juncus effusus	Soft rush	
Juncus polycephalus	Many-headed rush	
Justicia angusta	Narrow-leaved water willow	
Justicia ovata var. lanceolata	Water willow	
Kosteletzkya virginica	Saltmarsh mallow	
Lachnanthes caroliniana	Bloodroot	
Lachnocaulon anceps	Bog-buttons	
Lactuca graminifolia	Wild lettuce	
Lantana camara	Shrub lantana	
Lasiascius divaricata	Wild bamboo	
Lechea torreyi	Pinweed	
Lemna aequinoctialis	Duckweed	
Lepidium virginicum	Pepper weed	
Leptochloa dubia	Green sprangletop	
Leptochloa fascicularis	Sprangletop grass	
Liatris chapmannii	Chapman's blazing star	
Liatris gracilis	Blazing star	
Liatris spicata v. resinosa	Blazing star	
Liatris tenuifolia	Blazing star	
Licania michauxii	Gopher apple	
Lilium catesbaei	Catesby's lily	T
Limnophila sessiliflora	Water hyssop	
Linaria canadensis	Blue toadflax	
Lindernia crustacea	Purple false pimpernel	
Linum floridanum	Florida flax	
Lippia nodiflora	Frog's bit	
Lobelia feayana	Bay lobelia	
Lobelia glandulosa	Glades lobelia	
Lobelia paludosa	Marsh lobelia	
Ludwigia curtissii	Curtis' tiny seedbox	
Ludwigia decurrens	Marsh primrose willow	
Ludwigia maritima	Coastal plain seedbox	
Ludwigia microcarpa	Tiny seedbox	
Ludwigia octovalvis	Long-throated primrose willow	
Ludwigia peruviana	Primrose willow	
Ludwigia repens	Floating water primrose	
Ludwigia virgata	Long-petaled seedbox	
Lycopodium carolinianum	Slender clubmoss	
Lygodesmia aphylla	Roserush	
Lygodium japonicum	Japanese climbing fern	N
Lygodium microphyllum	Small-leaved climbing fern	N

Lyonia ferruginea	Rusty lyonia, fetterbush	
Lyonia fruticosa	Staggerbush	
Lyonia lucida	Fetterbush	
Lythrum alatum	Loosestrife	
Magnolia virginica	Sweet bay	
Mastichodendron foetidissimum	Mastic	
Matalea gonocarpa	Climbing milkweed	T
Mecardonia acuminata	Mecardonia	
Melaleuca quinquenervia	Punk tree	N
Melanthera nivea	Cat's tongue	
Melochia corchorifolia	Chocolate weed	
Melochia petiolata	Hairy melochia	
Melothria pendula	Melonette	
Mikania batatifolia	Climbing hemp vine	
Mikania cordifolia	Climbing hemp weed	
Mitreola petiolata	Miterwort	
Mitreola sessilifolia	Miterwort	
Momordica charantia	Balsam apple	
Morus rubra	Red mulberry	
Muhlenbergia capillaris	Muhly grass	
Myrcianthes fragrans var. simpsonii	Simpson's stopper	T
Myrica cerifera	Bayberry	
Myrsine floridana	Myrsine	
Nectrandra coriacea	Lancewood	
Nephrolepsis biserrata	Giant Swordfern	T
Nephrolepsis exaltata	Boston fern	
Nymphea odorata	White water-lily	
Nymphoides aquatica	Floating hearts	
Oplismenus hirtellus	Woodsgrass	
Opuntia humisfusa	Prickly-pear cactus	
Orontium aquaticum	Golden club	
Osmunda regalis	Royal fern	
Oxalis corniculata	Creeping wood sorrel	
Oxyopolis filiformis	Water dropseed	
Oxyopolis filiformis	Water dropseed	
Palafoxia feayi	Palafoxia	
Panicum fusiforme	Needle-leaved panicum	
Panicum hemitomum	Maidencane	
Panicum repens	Torpedo grass	
Panicum rigidulum	Redtop panicum	
Panicum tenerum	Blue-joint panicum	
Panicum verrucosum	Warty panicum	
Panicum virgatum	Switch grass	
Parieteria floridana	Clearweed	
Parthenocissus quinquefolia	Virginia creeper	
Paspalidium paludivagum	Alligator grass	
Paspalum caespitosum	Blue paspalum	
Paspalum conjugatum	Sour grass	
Paspalum fluitans	Water paspalum	
Paspalum laxum	Spreading paspalum	
Paspalum notatum	Bahia grass	
Paspalum setaceum	Pineland paspalum	
Paspalum urvillei	Vasey grass	

Passiflora suberosa	Corky passionflower	
Pectis linearifolia	Lemon weed	
Peltandra virginca	Green arum	
Penstemon multiflorus	Beardtongue	
Persea borbonia	Red bay	
Persea palustris	Swamp bay	
Petalostemon carneum	Prairie clover	
Phaseolus lathyroides	Phasey bean	
Phlebodium aureum	Serpent fern	
Phoebanthus grandiflora	Phoebanthus	
Phoradendron seritonum	Mistletoe	
Phragmites communis	Common reed	
Phyllanthus caroliniensis s. saxicola	Florida leaf-flower	
Phyodina cordifolia	Creeping spiderwort	
Physalis angulata	Ground cherry	
Physalis viscosa	Sticky ground cherry	
Phytolacca americana	Pokeberry	
Piloblephis rigida	Pennyroyal	
Pinguicula caerulea	Blue butterwort	T
Pinguicula lutea	Yellow butterwort	T
Pinguicula pumila	Dwarf butterwort	
Pinus elliotii var. densa	South Florida slash pine	
Piriqueta caroliniana	Piriqueta	
Pistia stratiotes	Water lettuce	
Pityopsis graminifolia	Golden aster	
Pityopsis microcephala	Golder aster	
Pluchea camphorata	Marsh fleabane	
Pluchea rosea	Swamp fleabane	
Poinsettia heterophylla	Painted leaf	
Pol;ypodium polypoioides	Resurrection fern	
Polygala baulduinii	White bachelor buttons	
Polygala boykinii	Slender leaf milkwort	
Polygala cruciata	Drumheads	
Polygala grandiflora	Large-flowered polygala	
Polygala incarnata	Procession flower	
Polygala lutea	Bog bachelor buttons	
Polygala nana	Wild bachelor buttons	
Polygala ramosa	Short milkwort	
Polygala rugelli	Yellow bachelor buttons	
Polygala verticillata		
Polygonum densiflora	Smartweed	
Polygonum densiflorum	Smartweed	
Polygonum hydropiperoides	Water pepper	
Polygonum punctatum	Spotted smartweed	
Polypodium dispersum	Widespread polypody	E
Polypodium plumula	Plume fern	E
Polypodium polypoioides	Resurrection fern	
Polypodium ptilodon	Swamp plume polypody	E
Polystachya extinctoria	Pale-flowered poylstachya	E
Pontederia lanceolata	Pickerelweed	
Ponterderia cordata	Pickerelweed	
Proserpinaca palustris	Mermaid-weed	
Proserpinaca pectinata	Pectinate mermaid-weed	

Psidium guajava (exotic)	Guava	
Psilotum nudum	Whisk fern	
Psychotria sulzneri	Wild coffee	
Psychotria undata	Wild coffee	
Pteridium aquilinum	Bracken fern	
Pteris vitatta	Ladder brake	
Pterocaulon virgatum	Blackroot	
Ptilimnium capillaceum	Mock bishop weed	
Quercus geminata	Sand live oak	
Quercus laurifolia	Water oak	
Quercus minima	Dwarf oak	
Quercus virginiana	Live oak	
Rhexia mariana	Pale meadow beauty	
Rhexia nutallii	Meadow beauty	
Rhodomyrtus tomentosa	Downy rosemyrtle	N
Rhus copallina	Winged sumac	
Rhynchelytrium repens	Natal grass	
Rhynchospora baldwinii	Small beakrush	
Rhynchospora corniculata	Horned beakrush	
Rhynchospora divergens	Spreading beakrush	
Rhynchospora fascicularis	Fleshy beakrush	
Rhynchospora inundata	Inundated beakrush	
Rhynchospora microcarpa	Small-seeded beakrush	
Rhynchospora miliacea	Millet beakrush	
Rhynchospora traceyi	Star-headed beakrush	
Rorippa teres	Terete yellow-cress	
Rotalia ramosior	Toothcups	
Rubus trivialis	Southern dewberry	
Rudbeckia hirta	Blackeyed susan	
Ruellia caroliniensis ssp. ciliosa	Wild petunia	
Rumex verticillatus	Swamp dock	
Sabal palmetto	Cabbage palm	
Sabatia bartramii	Marsh pink	
Sabatia grandiflora	Large marsh pink	
Sabatia stellaris	Star sabatia	
Sacciolepis indica	Dwarf cupscale grass	N
Sacciolepis striata	Cupscale grass	
Sagittaria lancifolia	Wapato	
Sagittaria latifolia	Common arrowhead	
Sagittaria subulata	Narrow-leaved arrowhead	
Salix caroliniana	Coastal plains willow	
Salvia lyrata	Wild sage	
Salvinia minima	Miniature water fern	
Sambucus canadensis	Elderberry	
Samolus ebracteatus	Water pimpernel	
Saururus cernuus	Lizard tail	
Schinus terebinthifolius	Brazilian peppertree	N
Schizachyrium semiberbe	Little bluestem	
Schizachyrium stoloniferum	Creeping bluestem	
Schoenolirion albiflorum	Sunnybells	
Schoenus nigricans	Black-top rush	
Scirpus californicus	Giant bulrush	
Scirpus validus	Soft-stem bulrush	

Scleria baldwinii	Baldwin's nutgrass	
Scleria triglomerata	Nutrush	
Scleria verticillata	Pineland nutgrass	
Scoparia dulcis	Sweet broom	
Senecio glabellus	Butterweed	
Serenoa repens	Saw palmetto	
Sesbania emerus	Bladderpod	
Setaria geniculata	Jointed foxtail grass	
Setaria magna	Giant foxtail grass	
Sida acuta	Southern sida	
Sida rhombifolia	Arrowleaf sida	
Sisyrinchium atlanticum	Blue-eyed grass	
Sisyrinchium atlanticum	Blue-eyed grass	
Sisyrinchium miamiense	Blue-eyed grass	
Smilax auriculata	Bamboo vine	
Smilax bona-nox	Greenbrier	
Smilax havenensis	Cat brier	
Smilax laurifolia	Smooth brier	
Smilax tamnoides	Bristly catbrier	
Solanum americanum	Nightshade	
Solanum capsicoides	Soda apple	
Solanum viarum	Tropical soda apple	
Solidago chapmanii	Chapman's goldenrod	
Solidago fistulosa	Goldenrod	
Solidago sempervirens	Giant goldenrod	
Solidago stricta	Marsh goldenrod	
Sonchus asper	Spiny-leaved sow thistle	
Sonchus oleraceus	Common sow thistle	
Sorghastrum secundum	Indian grass	
Spartina bakeri	Sand cordgrass	
Spermacoce assurgens	Creeping madder	
Spermacoce prostrata	Pine madder	
Spermolepsis divaricata	Spreading scale-seed	
Spilanthes americana	Marsh daisy	
Spiranthes lanceolata lanceolata	Red ladies' tresses	
Spiranthes lanceolata paludicola (*)	Fahkahatchee ladies'-tresses	
Spiranthes praecox	Giant ladies'-tresses	
Spiranthes vernalis	Spring ladies' tresses	
Sporobolus domingensis	Coral dropseed	
Sporobolus indicus (exotic)	Dropseed grass	
Sporobolus junceus	Florida dropseed	
Stendandrium dulce	Stenandrium	
Stillingia aquatica	Corkwood	
Stillingia sylvatica ssp. tenuis (*)	Queen's delight	
Stipa avenacioides	Florida needlegrass	
Syngonanthus flavidulus	Bantam buttons	
Syngonium podophyllum	Arrowhead vine	N
Syzygium jambos	Rose apple	N
Taxodium distichum	Bald cypress	
Tephrosia cf. chysophylla	Hoary pea	
Tephrosia florida	Florida hoary pea	
Tephrosia hispidula	Hispid hoary pea	
Teucrium canadense	Wood sage	

Thalia geniculata	Alligator flag	
Thelypteris augescens	Shield fern	
Thelypteris kunthii	Southern shield fern	T
Thelypteris ovata	Shield fern	
Thelypteris palustris	Woods fern	
Tillandsia balbisiana	Bulbous wild pine	T
Tillandsia circinata	Twisted wild pine	
Tillandsia fasciculata	Stiff wild pine	E
Tillandsia flexulosa	Banded wild pine	T
Tillandsia recurvata	Ball moss	
Tillandsia setacea	Needle-leaved wild pine	
Tillandsia usneoides	Spanish moss	
Tillandsia utriculata	Giant wild pine	E
Tillandsia valenzuelana	Soft wild pine	T
Toxicodendron radicans	Poison ivy	
Trema micrantha	Florida trema	
Tripsicum dactyloides	Gama grass	
Typha domingensis	Southern cattail	
Typha latifolia	Common cattail	
Ulmus americana	American elm	
Urechites lutea	Wild allamanda	
Urechites lutea	Wild allamanda	
Urena lobata	Caesar weed	N
Urochloa plantaginea	Creeping signalgrass	N
Uticularia inflata	Floating bladderwort	
Uticularia simulans	Leafless bladderwort	
Utricularia cornuta	Horned bladderwort	
Utricularia foliosa	Bladderwort	
Utricularia gibba	Cone-sour bladderwort	
Utricularia inflata	Floating bladderwort	
Utricularia purpurea	Purple bladderwort	
Utricularia radiata	Spreading bladderwort	
Utricularia resupinata	Little purple bladderwort	
Utricularia simulans	Leafless bladderwort	
Utricularia subulata	Bladderwort	
Utriculatia foliosa	Bladderwort	
Vaccinium darrowii	Darrow's blueberry	
Vaccinium myrsinites	Shiny blueberry	
Verbena officinalis	Verbena	
Verbesina laciniata	Frostweed	
Vernonia angustifolia	Ironweed	
Vernonia blodgettii (*)	Blodgett's ironweed	
Vicia acutifolia	Vetch	
Vigna luteola	Yellow vigna	
Viola lanceolata	Long-leaved violet	
Viola affinis	Florida violet	
Viola septemloba	LeConte's violet	
Vitis munsoniana	Southern fox grape	
Vitis rotundifolia	Fox grape	
Vitis shuttleworthii	Calusa grape	
Vittaria lineata	Shoestring fern	
Waltheria indica	Waltheria	
Ximenia americana	Hog plum	

Ximenia americana	Hog plum	
Xyris brevifolia	Yellow-eyed grass	
Xyris difformis	Yellow-eyed grass	
Xyris elliottii	Yellow-eyed grass	
Xyris jupicai	Yellow-eyed grass	
Xyris smalliana	Yellow-eyed grass	
Zanthoxylum fagara	Wild lime	
Zephyranthes atamasco	Atamasco rainlily	T
Zephyranthes simpsonii	Simpon's rainlily	T
Zeuxine strateumatica	Lawn orchid	
Zizaniopsis miliacea	Giant cut-grass	

Appendix E. Bird Species List

		PRESENCE	STATUS	
Data Source: FFWCC, SFWMD and IFAS	E=Endangered T=Threatened S=Species of Special Concern N=Non-native ♋ = Potential ◆ = Confirmed		**Federal**	**State**
Common Name	**Scientific Name**	♋=P ◆=C		
Acadian Flycatcher	Empidonax virescens	♋		
American Avocet	Recurvirostra americana	♋		
American Bittern	Botaurus lentiginosus	◆		
American Coot	Fulica americana	◆		
American Crow	Corvus brachyrhynchos	◆		
American Goldfinch	Carduelis tristis	◆		
American Kestrel	Falco sparverius	◆		
American Redstart	Setophaga ruticilla	◆		
American Robin	Turdis migratorius	◆		
American Wigeon	Anas americana	♋		
American Woodcock	Scolopax minor	♋		
Anhinga	Anhinga anhinga	◆		
Bachman's Sparrow	Aimophila aestivalis	◆		
Bald Eagle	Haliaeetus leucocephalus	◆	T	T
Barn Owl	Tyto alba	♋		
Barn Swallow	Hirundo rustica	◆		
Barred Owl	Strix varia	◆		
Bay-Breasted Warbler	Dendroica castenea	♋		
Belted Kingfisher	Ceryle alcyon	◆		
Black-and-white Warbler	Mniotilta varia	◆		
Black Rail	Laterallus jamaicensis	♋		
Black Vulture	Coragyps atratus	◆		
Blackpoll Warbler	Dendroica striata	♋		
Black-Bellied Plover	Pluvialis squatarola	♋		
Blackburnian Warbler	Dendroica fusca	♋		
Blk-crowned Night-heron	Nycticorax nycticorax	◆		
Black-necked stilt	Himantopus mexicanus	◆		
Blk-throated Blue Warbler	Dendroica caerulescens	♋		
Blk-throated Green Warbler	Dendroica virens	◆		
Blue Jay	Cyanocitta cristata	◆		
Blue-gray Gnatcatcher	Polioptila caerulea	◆		

Blue-winged Teal	Anas discors	◆		
Blue-winged Warbler	Vermivora pinus	♋		
Blue Grosbeak	Guiraca caerulea	♋		
Boat-tailed Grackle	Quiscalus major	◆		
Bobolink	Dolichronyx oryzivorus	♋		
Brewer's Blackbird	Euphagus cyanocephalus	◆		
Broad-Winged Hawk	Buteo platypterus	♋		
Brown Creeper	Certhia americana	♋		
Brown-headed Cowbird	Molothrus ater	♋	N	N
Brown-headed Nuthatch	Sitta pusilla	♋		
Brown Thrasher	Toxostoma rufum	◆		
Burrowing Owl	Athene cunicularia	♋		S
Canvasback	Aythya valisineria	♋		
Cape May Warbler	Dendroica tigrina	♋		
Carolina Chickadee	Parus carolinensis	♋		
Carolina Wren	Troglodytes ludovicianus	◆		
Cattle Egret	Bubulcus ibis	◆	N	N
Canada Warbler	Wilsonia canadensis	♋		
Cedar Waxwing	Bombycilla cedrorum	◆		
Chuck-Will's Widow	Caprimulgus carolinensis	◆		
Clapper Rail	Rallus longirostris	◆		
Common Flicker	Colaptes auratus	◆		
Common Grackle	Quiscalus quiscula	◆		
Common Ground Dove	Columbina passerina	◆		
Common Moorhen	Gallinula chloropus	◆		
Common Nighthawk	Chordeiles minor	◆		
Common Snipe	Gallinago gallinago	◆		
Common Yellowthroat	Geothlypis trichas	◆		
Connecticut Warbler	Oporonis agilis	♋		
Cooper's Hawk	Accipiter cooperii	◆		
Crested Caracara	Caracara cheriway	◆	T	T
Dark-Eyed Junco	Junco hyemalis	♋		
Dickcissel	Spiza americana	♋		
Double-crested Cormorant	Phalacrocorax auritus	◆		
Downy Woodpecker	Picoides pubescens	◆		
Eastern Bluebird	Sialia sialis	◆		
Eastern Kingbird	Tyrannus tyrannus	◆		
Eastern Meadowlark	Sturnella magna	◆		
Eastern Phoebe	Sayornis phoebe	◆		
Eastern Screech-owl	Otus asio	◆		
Eastern Wood-pewee	Contopus virens	♋		
Eurasian Collared Dove	Streptopelia decaocto	◆	N	N
European Starling	Sturnus vulgaris	◆	N	N

Field Sparrow	Spizella pusilla	♋		
Fish Crow	Corvus ossifragus	◆		
Fulvous Whistling-duck	Dendrocygna bicolor	♋		
Gadwall	Anas strepera	♋		
Glossy Ibis	Plegadis falcinellus	◆		
Golden-Winged Warbler	Vermivora chrysoptera	♋		
Grasshopper Sparrow	Ammodramus savannarum	◆	E	E
Gray Catbird	Dumetella carolinensis	◆		
Gray-cheeked Thrush	Catharus minimus	♋		
Gray Kingbird	Tyrannus dominicensis	♋		
Great Blue Heron	Ardea herodias	◆		
Great-crested flycatcher	Myiarchus crinitus	◆		
Great Egret	Ardea alba	◆		
Great Horned Owl	Bubo virginianus	◆		
Greater Yellowlegs	Tringa melamoleuca	◆		
Green-winged Teal	Anas crecca	♋		
Green Backed Heron	Butorides virescens	◆		
Hairy Woodpecker	Picoides villosus	◆		
Henslow's Sparrow	Ammodramus henslowii	♋		
Hermit Thrush	Catharus guttatus	♋		
Horned Grebe	Podiceps auritus	♋		
Hooded Merganser	Lophodytes cucullatus	♋		
Hooded Warbler	Wilsonia citrina	♋		
House Sparrow	Passer domesticus	♋	N	N
House Wren	Troglodytes aedon	◆		
Indigo Bunting	Passerina cyanea	◆		
Kentucky Warbler	Oporonis formosus	♋		
Killdeer	Charadrius vociferus	◆		
Least Bittern	Ixobrychus exilis	◆		
Least Sandpiper	Calidris minutilla	◆		
Lesser Scaup	Aythya affinis	♋		
Lesser Yellowlegs	Tringa flavipes	♋		
Limpkin	Aramus guarauna	◆		S
Little Blue Heron	Egretta caerulea	◆		S
Lincoln's Sparrow	Melospiza lincolnii	♋		
Loggerhead Shrike	Lanius ludovicianus	◆		
Long-Billed Dowitcher	Limnodromus scolopaceus	♋		
Louisiana Waterthrush	Seiurus motacilla	◆		
Magnolia Warbler	Dendroica magnolia	♋		
Marsh Wren	Cistothorus palustris	♋		
Merlin	Falco columbarius	◆		
Mottled Duck	Anas fulvigula	◆		
Mourning Dove	Zenaida macroura	◆		

Nashville Warbler	Vermivora ruficapilla	♋		
N. Rough-winged Swallow	Stelgidopteryx serpennis	♋		
Northern Bobwhite Quail	Colinus virginianus	◆		
Northern Cardinal	Cardinalis cardinalis	◆		
Northern Harrier	Circus cyaneus	◆		
Northern Mockingbird	Mimus polyglottos	◆		
Northern Oriole	Icterus galbula	♋		
Northern Parula Warbler	Parula americana	◆		
Northern Pintail	Anas acuta	♋		
Northern Shoveler	Anas clypeata	♋		
Northern Waterthrush	Seiurus noveboracensis	◆		
Orchard Oriole	Icterus spurius	♋		
Osprey	Pandion haliaetus	◆		
Ovenbird	Seiurus aurocapillus	◆		
Painted Bunting	Passerina ciris	◆		
Palm Warbler	Dendroica plamarum	◆		
Common Peafowl	Pavo cristatus	◆	N	N
Peregrine Falcon	Falco peregrinus	♋	T	
Philadelphia Vireo	Vireo philadelphicus	♋		
Pied-billed Grebe	Podilymbus podiceps	◆		
Pileated Woodpecker	Dryocopus pileatus	◆		
Pine Siskin	Carduelis pinus	♋		
Pine Warbler	Dendroica pinus	◆		
Prairie Warbler	Dendroica discolor	◆		
Prothonotary Warbler	Protonotaria citrea	♋		
Purple Finch	Carpodacus purpureus	♋		
Purple Gallinule	Porphyrula martinica	◆		
Purple Martin	Progne subis	◆		
Red-bellied Woodpecker	Melanerpes carolinus	◆		
Red-cockaded Woodpecker	Picoides borealis	◆		
Red-Eyed Vireo	Vireo olivaceus	♋	E	T
Redhead	Aythya americana	♋		
Red-Headed Woodpecker	Melanerpes erythrocephalus	♋		
Red-shouldered Hawk	Buteo lineatus	◆		
Red-tailed Hawk	Buteo jamaicensis	◆		
Redwing Blackbird	Agelaius phoeniceus	◆		
Ring-necked Duck	Aythya collaris	◆		
Roseate Spoonbill	Ajaia ajaja	◆		S
Rose-Breasted Grosbeak	Pheucticus ludovicianus	♋		
Ruby-Crowned Kinglet	Regulus calendula	♋		
Ruby-throated Hummingbird	Archilochus colubris	♋		
Ruddy Duck	Oxyura jamaicensis	♋		
Rufous-sided Towhee	Pipilo erythrophthalmus	◆		

Sandhill Crane	Grus canadensis	◆		T
Savannah Sparrow	Passerculus sandwichensis	♋		
Scarlet Tanager	Piranga Olivacea	♋		
Scissor-tailed Flycatcher	Tyrannus forficatus	♋		
Scrub Jay	Aphelocoma coerulescens	♋	T	T
S.E American Kestrel	Falco sparverius paulus	◆	T	T
Sedge Wren	Cistothorus platensis	◆		
Semipalmated Plover	Charadrius semipalmatus	♋		
Semipalmated Sandpiper	Calidris pusilla	♋		
Sharp-shinned Hawk	Accipiter straiatus	◆		
Short-Billed Dowitcher	Limnodromus griseus	♋		
Short-eared Owl	Asio flammeus	♋		
Short-Tailed Hawk	Buteo brachyurus	◆		
Smooth-billed Ani	Crotophaga ani	♋		
Swainson's Warbler	Limnothylpis swainsonii	♋		
Swallow-tailed Kite	Elanoides forficatus	◆		
Swamp Sparrow	Melospiza georgiana	◆		
Snail Kite	Rostrhamus sociabilis	◆	E	E
Snowy Egret	Egretta thula	◆		S
Solitary Sandpiper	Tringa solitaria	◆		
Solitary Vireo	Vireo solitarius	◆		
Song Sparrow	Melospiza melodia	♋		
Sora	Porzana carolina	♋		
Spotted Sandpiper	Actitis macularia	◆		
Summer Tanager	Piranga rubra	♋		
Swainson's Thrush	Catharus ustulatus	♋		
Tennessee Warbler	Vermivora peregrina	♋		
Tree Swallow	Tachycineta bicolor	◆		
Tricolored Heron	Egretta tricolor	◆		S
Tufted Titmouse	Parus bicolor	◆		
Turkey Vulture	Accipiter cooperii	◆		
Veery	Catharus fuscescens	♋		
Vesper Sparrow	Pooecetes gramineus	♋		
Virginia Rail	Rallus limicola	♋		
Warbling Vireo	Vireo gilvus	♋		
Water Pipit	Anthus spinoletta	♋		
Western Kingbird	Tyrannus verticalis	♋		
White-Crowned Sparrow	Zonotrichia leucophrys	♋		
White-eyed Vireo	Vireo griseus	◆		
White-throated Sparrow	Zonotrichia albicollis	♋		
White-winged Dove	Zenaida asiatica	◆		
White Ibis	Eodocimus albus	◆		S

Whip-poor-will	Caprimulgus vociferus	♋		
Wild Turkey	Meleagris gallopavo	◆		
Wilson's Warbler	Wilsonia pusilla	♋		
Wood Duck	Aix sponsa	◆		
Woodstork	Mycteria americana	◆	E	E
Wood Thrush	Hylocichla mustelina	♋		
Worm-Eating Warbler	Helmitheros vermivora	♋		
Yellow-crowned Night-heron	Nycticorax violacea	◆		
Yellow-bellied Sapsucker	Sphyrapicus varius	◆		
Yellow-billed Cuckoo	Coccyzus americanus	◆		
Yellow-Breasted Chat	Ictera virens	♋		
Yellow-rumped Warbler	Dendroica coronata	◆		
Yellow-throated Vireo	Vireo flavifrons	♋		
Yellow-throated Warbler	Dendroica dominica	◆		
Yellow Warbler	Dendroica petechia	♋		

Appendix F. Mammal Species List

Data source: FFWCC, SFWMD and IFAS.

		PRESENCE	STATUS	
	E=Endangered T=Threatened S=Species of Special Concern N=Non-native ♋ = Potential ◆ = Confirmed		**Federal**	**State**
Common Name	Scientific Name	♋=P ◆=C		
Big Brown Bat	Eptesicus fuscus	◆		
Big Cypress Fox Squirrel	Sciurus niger avicennia	◆		T
Black Rat	Rattus rattus	♋	N	N
Bobcat	Felix rufous	◆		
Brazilian Free-Tailed Bat	Tadarida brasliensis	♋		
Common Long-nosed Armadillo	Dasypus novemcinctus	◆	N	N
Cotton Mouse	Peromyscus gossypinus	◆		
Coyote	Canis latrans	◆		
Eastern Cottontail	Sylvilagus floridanus	◆		
Eastern Gray Squirrel	Sciurus carolinensis	◆		
Eastern Mole	Scalopus aquaticus	♋		
Eastern Spotted Skunk	Spilogale putorius	◆		
Evening Bat	Nycticeius humeralis	◆		
Everglades Mink	Mustela vison evergladensis	♋		T
Feral Hog	Sus scrofa	◆	N	N
Florida Black Bear	Ursus americanus	◆		T
Florida Panther	Felix concolor cori	◆	E	E
Gray Fox	Urocyon cineroargenteus	◆		
Hispid Cotton Rat	Sigmodon hispidus	◆		
House Mouse	Mus musculus	♋	N	N
Least Shrew	Crytotis parva	◆		
Long-Tailed Weasel	Mustela frenata peninsulae	♋		
Marsh Rabbit	Sylvilagus palustris	♋		
Marsh Rice Rat	Oryzomys palustris	♋		
Northern Yellow Bat	Lasiurus intermedius	◆		
Norway Rat	Rattus norvegicus	♋	N	N
Raccoon	Procyon lotor	◆		
Rafineque's Big-Eared Bat	Plecotus rafinesquei	♋		
River Otter	Lutra canadensis	◆		
Round-tailed Muskrat	Neofiber alleni	◆		
Short-Tailed Shrew	Blarina carolinensis	♋		
Southeastern Harvest Mouse	Reithrodontomys humulis	♋		
Southern Flying Squirrel	Glaucomys volans	♋		
Striped Skunk	Mephitis mephitis	♋		
Virginia Opossum	Didelphis marsupialis	◆		
White-tailed Deer	Odocoileus virginianus	◆		

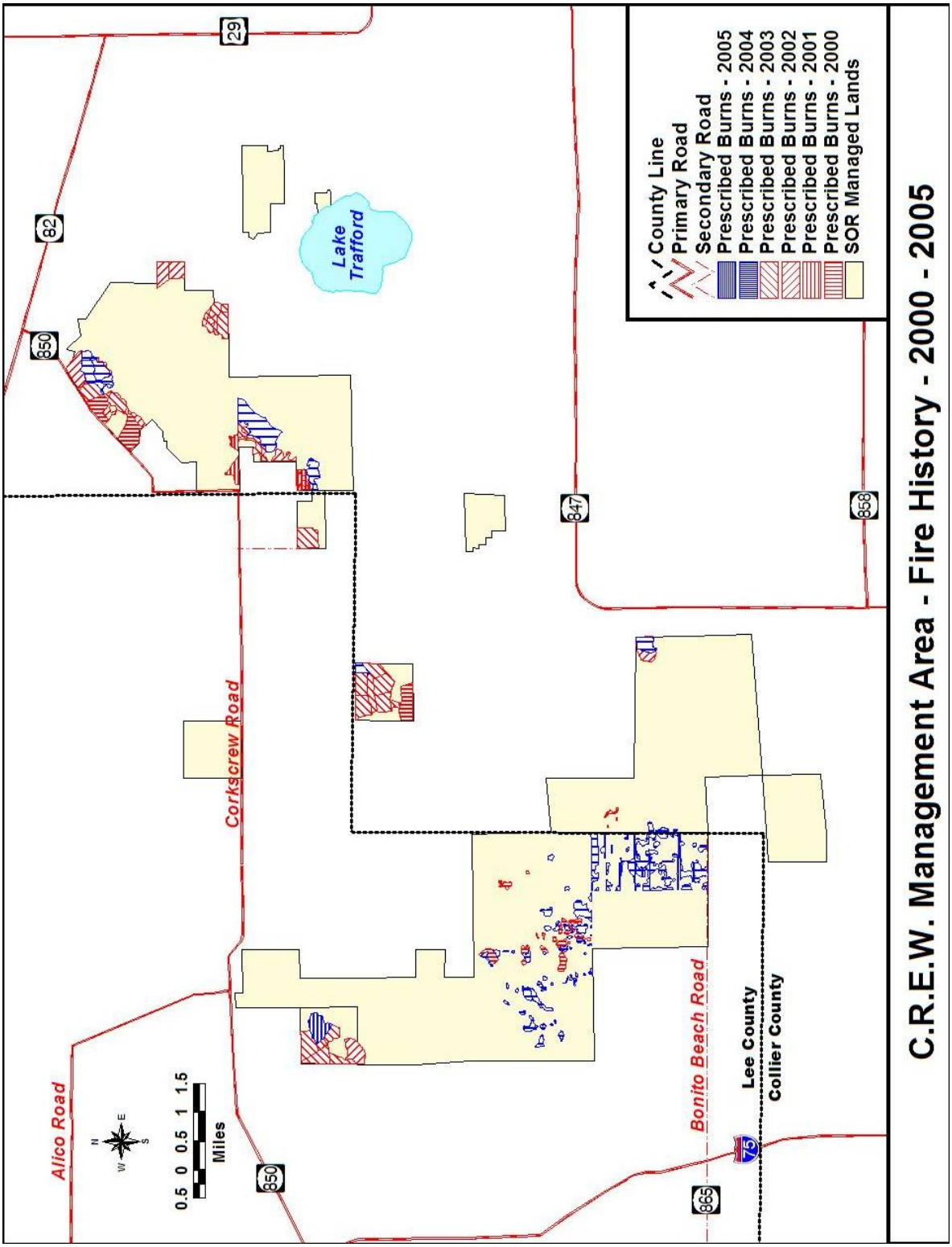
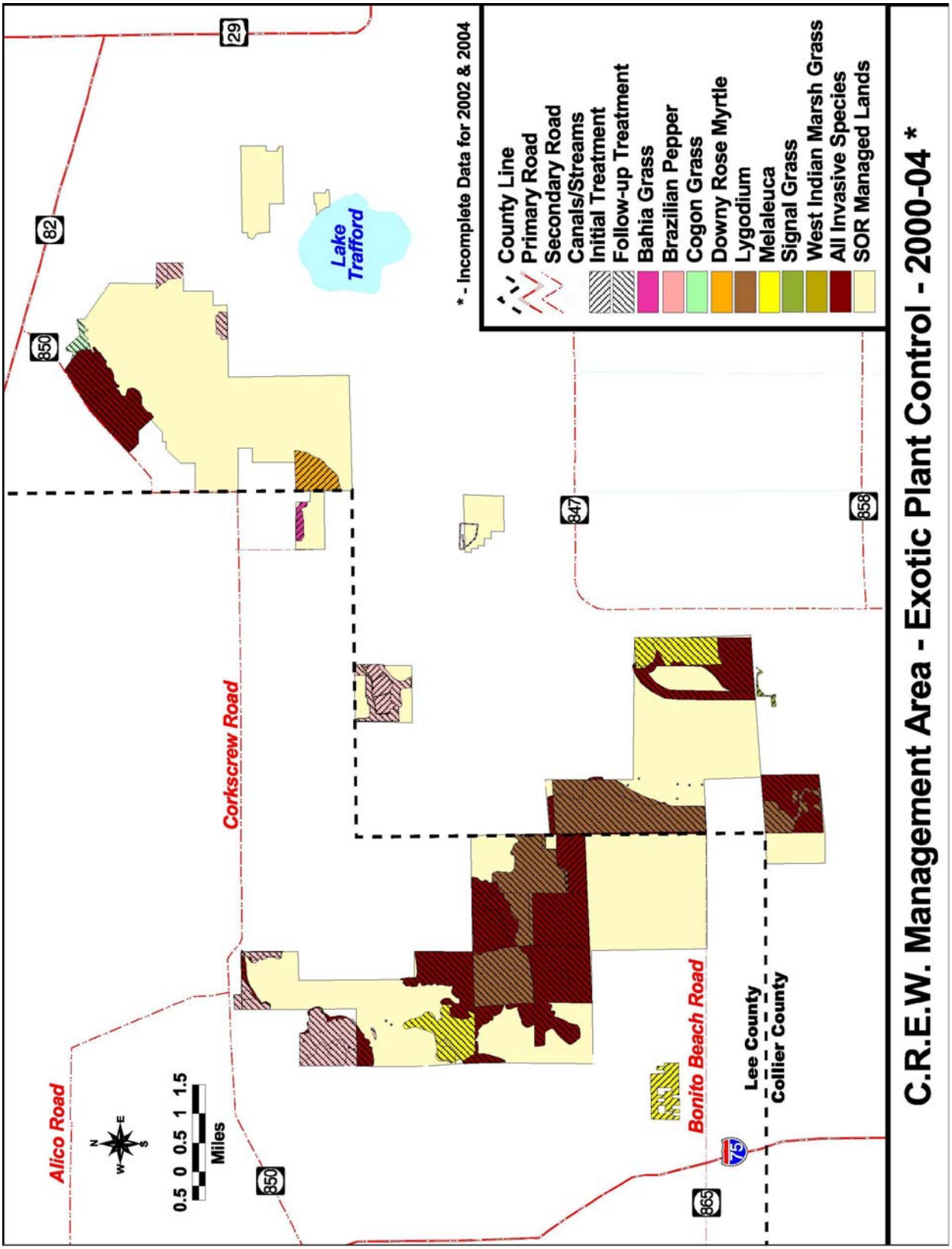
Appendix G. Reptile and Amphibian Species List

Data Source: FFWCC, SFWMD, and IFAS.

		PRESENCE	STATUS	
	E=Endangered T=Threatened S=Species of Special Concern N=Non-native ♋ = Potential ◆ = Confirmed		**Federal**	**State**
Common Name	Scientific Name	♋=P ◆=C		
American Alligator	Alligator mississippiensis	◆	T	S
Barking Treefrog	Hyla gratiosa	◆		
Brown Anole	Anolis sagrei	◆	N	N
Brown Water Snake	Nerodia taxispilota	♋		
Chicken Turtle	Deirochelys reticularia	♋		
Congo Eel	Amphiuma means	◆		
Cuban Treefrog	Osteopilus septentrionalis	◆	N	N
Dusky Pigmy Rattlesnake	Sistrurus miliarius	◆		
Dwarf Salamander	Eurycea quadridigitata	♋		
East. Slender Glass Lizard	Ophisaurus attenuatus	♋		
Eastern Coral Snake	Micrurus fulvius	♋		
Eastern Couchwhip	Masticophis flagellum	◆		
Eastern Diamondback Rattlesnake	Crotalus adamanteus	◆		
Eastern Garter Snake	Thamnophis sirtalis	◆		
Eastern Glass Lizard	Ophisaurus ventralis	◆		
Eastern Hognose Snake	Heterodon platirhinos	◆		
Eastern Indigo Snake	Drymarchon corais	◆	T	T
Eastern Lesser Siren	Siren intermedia	◆		
Eastern Mud Snake	Francia abacura	◆		
Eastern Narrow-Mouthed Toad	Gastrophryne caroliensis	◆		
Everglades Dwarf Siren	Pseudobranchus striatus	♋		
Florida Banded Water Snake	Nerodia fasciata	◆		
Florida Box Turtle	Terrapene carolina bauri	◆		
Florida Brown Snake	Storeria dekayi	◆		
Florida Chorus Frog	Pseudacris nigrita	◆		
Florida Cottonmouth	Agkistrodon piscivorus	◆		
Florida Cricket Frog	Acris gryllus dorsalis	◆		
Florida Crowned Snake	Tantilla relicta	♋		
Florida Gopher Frog	Rana capito	♋		S
Florida Green Water Snake	Nerodia cyclopion floridana	◆		
Florida Kingsnake	Lampropeltis getula	♋		
Florida Mud Turtle	Kinosternon subrubrum	♋		
Florida Pine Snake	Pituophis melanoleucus	♋		S
Florida Red-Bellied Turtle	Chrysemys nelsoni	◆		
Florida Snapping Turtle	Chelydra serpentina	◆		
Florida Softshell Turtle	Trionyx ferox	◆		

Gopher Tortoise	Gopherus polyphemus	◆		S
Greater Siren	Siren lacertina	◆		
Green Anole	Anolis carolinensis	◆		
Green Treefrog	Hyla cinerea	◆		
Greenhouse Frog	Eleutherodactylus planirostris	◆	N	N
Ground Skink	Scincella laterale	◆		
Indo-Pacific Gecko	Hemidactylus garnoti	♋	N	N
Island Glass Lizard	Ophisaurus compressus	◆		
Little Grass Frog	Limnaoedus ocularis	◆		
Mediterranean Gecko	Hemidactylus turcicus	♋	N	N
Oak Toad	Bufo quercicus	◆		
Peninsula Cooter	Chrysemys floridana	◆		
Peninsula Mole Skink	Eumeces egregius onocrepis	♋		
Peninsula Newt	Notophthalmus viridescens	◆		
Peninsula Ribbon Snake	Thamnophis sauritus sackeni	◆		
Pig Frog	Rana grylio	◆		
Pine Woods Snake	Rhadinaea flavilata	♋		
Pine Woods Treefrog	Hyla femoralis	◆		
Red Rat Snake	Elaphe guttata	◆		
Ringneck Snake	Diadophis punctatus	◆		
Rough Green Snake	Opheodrys aestivus	◆		
Scarlet Kingsnake	Lampropeltis triangulum	♋		
Scarlet Snake	Cemophora coccinea	◆		
Six-Lined Racerunner	Cnemidophorus sexlineatus	♋		
South Florida Swamp Snake	Seminatrix pygaea cyclas	◆		
Southeastern Five-lined Skink	Eumeces inexpectatus	◆		
Southern Black Racer	Coluber constrictor	◆		
Southern Leopard Frog	Rana sphenocephala	◆		
Southern Toad	Bufo terrestris	◆		
Spadefoot Toad	Scaphiopus holbrookii	♋		
Squirrel Treefrog	Hyla squirella	◆		
Stink Pot	Sternotherus odoratus	◆		
Striped Crayfish Snake	Regina alleni	◆		
Striped Mud Turtle	Kinosternon bauri	◆		
Yellow Rat Snake	Elaphe obsoleta	◆		

Appendix H. Prescribed Fire History 2000-2005



Appendix I. Exotic Control 2000-2005