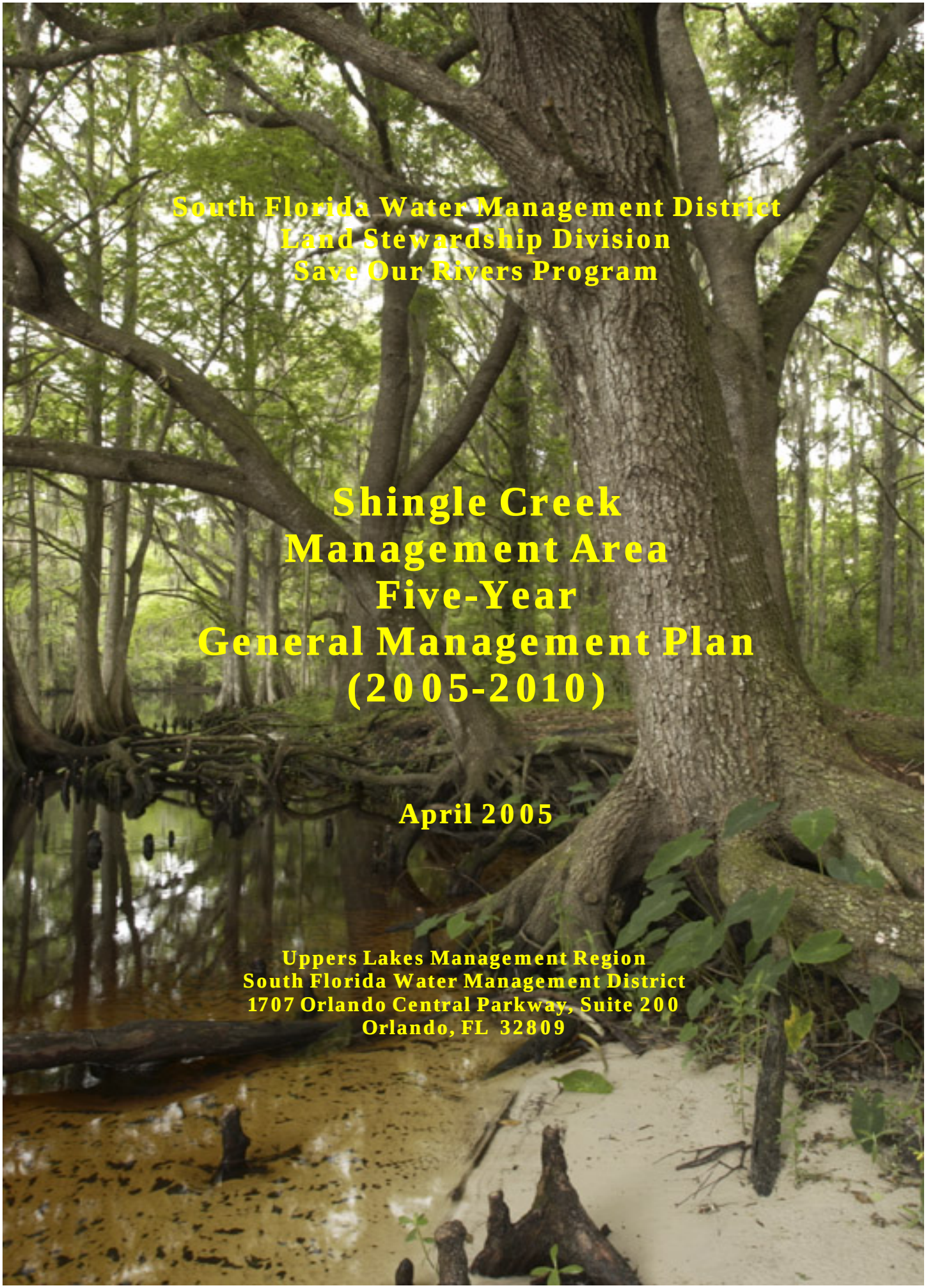

South Florida Water Management District
Land Stewardship Division
Save Our Rivers Program

Shingle Creek Management Area Five-Year General Management Plan (2005-2010)

April 2005

Uppers Lakes Management Region
South Florida Water Management District
1707 Orlando Central Parkway, Suite 200
Orlando, FL 32809

Shingle Creek Management Areas Five-Year General Management Plan (2005 – 2010)

April 2005

Land Stewardship Department
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 7,600 acres of swamp and adjacent uplands within the Shingle Creek watershed as a Save Our Rivers (SOR) project. This plan addresses management for the 1750 acres that have been acquired by the District within the project area known as the Shingle Creek Management Area (MA).

The District has taken a lead role in the acquisition and management of the project, while seeking assistance from other governmental agencies. As of August 2003 acquisition within the project was not complete. As such, management programs and activities will be applied only to those parcels owned by the District or by other cooperating agencies.

The Shingle Creek canal serves as the major flood conveyance in western Orlando and southwest Orange County and remains in its channelized state along the MA to almost the Osceola County line. Sheet flow through the wetlands has also been impeded by berms and utility maintenance roads.

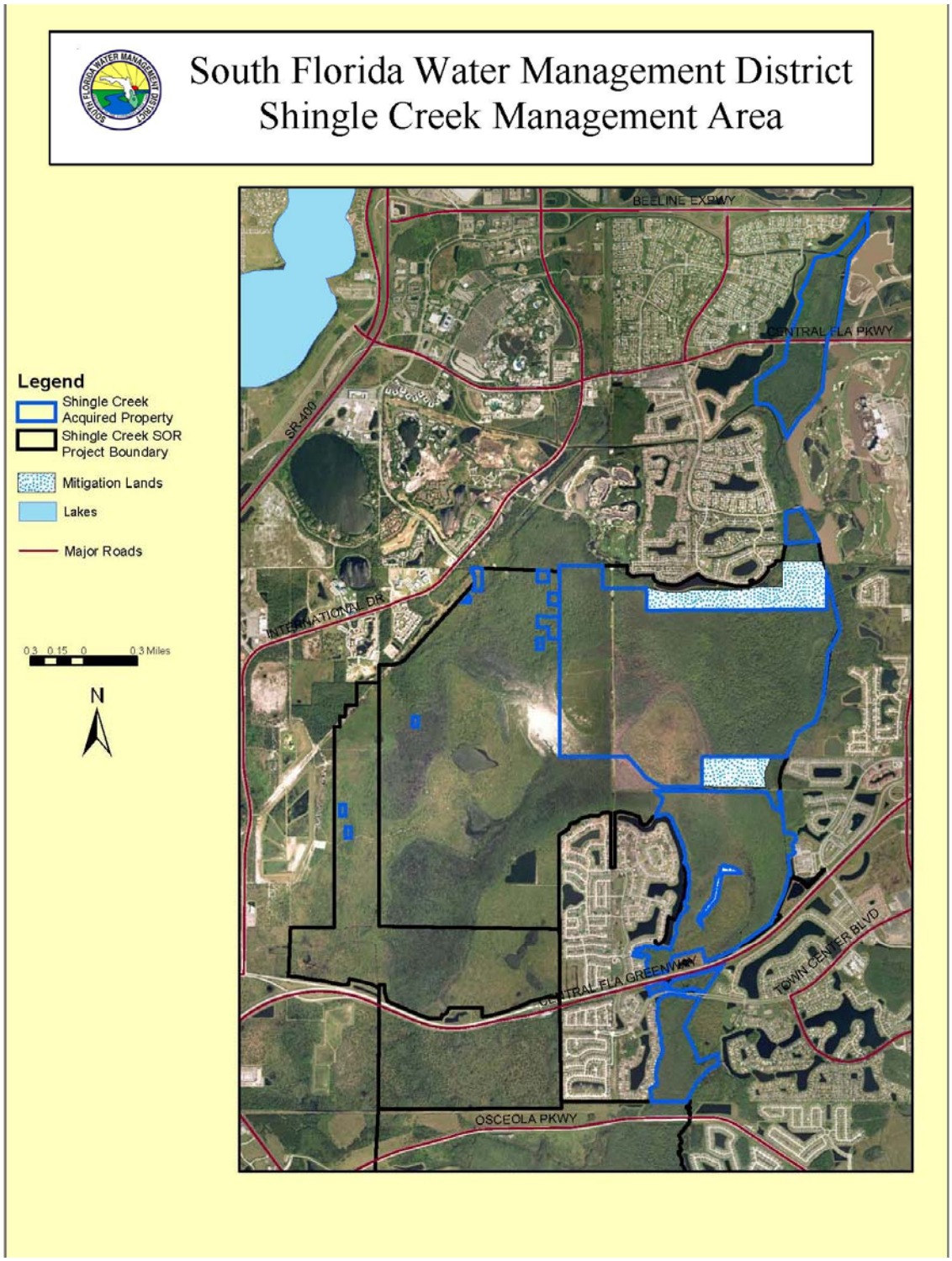
The MA has been classified as a Regional Biodiversity Hotspot with 54 declining species of wildlife and 11 listed plant species. It is characterized by a rich diversity of habitat types including mixed hardwood swamps, pine flatwoods, cypress swamps, oak hammocks, wet prairies, and depression marshes. Wetlands comprise approximately 60 percent of the MA, most of which is within the 100-year floodplain. Consequently, the area is critically important for flood attenuation, water supply, water quality enhancement, and wildlife habitat. Resource management priorities include: retoring an appropriate hydroperiod through the wetlands, regular application of fire, and implementing an aggressive exotic plant control program.

Historically, outdoor recreational activities such as hiking, canoeing, and fishing were common in the area and will likely under the District's management program. As the lead agency, the District will attempt to create cooperative agreements for the management of MA's resource and recreational programs with entities that possess an interest and expertise in the area.

This General Land Management Plan describes the historical, ecological, and managerial aspects of the area as a means to coordinate effective management programs. This plan is a compilation of assessments, research reports, and an earlier conceptual management plan combined with new information and proposals. 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.

Map 1.



2. Management Plan Purpose

This General Management Plan (GMP) consolidates relevant information about the Shingle Creek 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 2005 to 2010. 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 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

The plan consolidates current site information and general guidelines for management of the area. It also updates and replaces the Shingle Creek Conceptual Management Plan (South Florida Water Management District, 1997). As such, it serves as a collective information source for management staff, partners, and the general public.

2.1 Shingle Creek Management Area Goals and Objectives

LSP functions are incorporated in specific MA goals and objectives for the period of this management plan 2004-2008:

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

Objectives:

- Maintain an appropriate hydroperiod through the restoration of sheet flow over berms and backfilling ditches
- Continue the regular application of fire through a well-planned and documented prescribed burning program with a target of 100 acres of flatwoods buned annually (see Section **5.3.1**)
- Continue an aggressive, integrated exotic plant management program to eliminate and control infestations of all invasive exotic plant species. Treatments will be documented and coordinated with other management activities (see Section **5.2.2**)
- Provide resource protection through a partnership with the Florida Fish and Wildlife Conservation Commission (FWC). The District's Resource Protection Coordinator will review enhanced patrol activities biweekly and review program annually

Goal 2: Provide resource-based public use opportunities

Objectives:

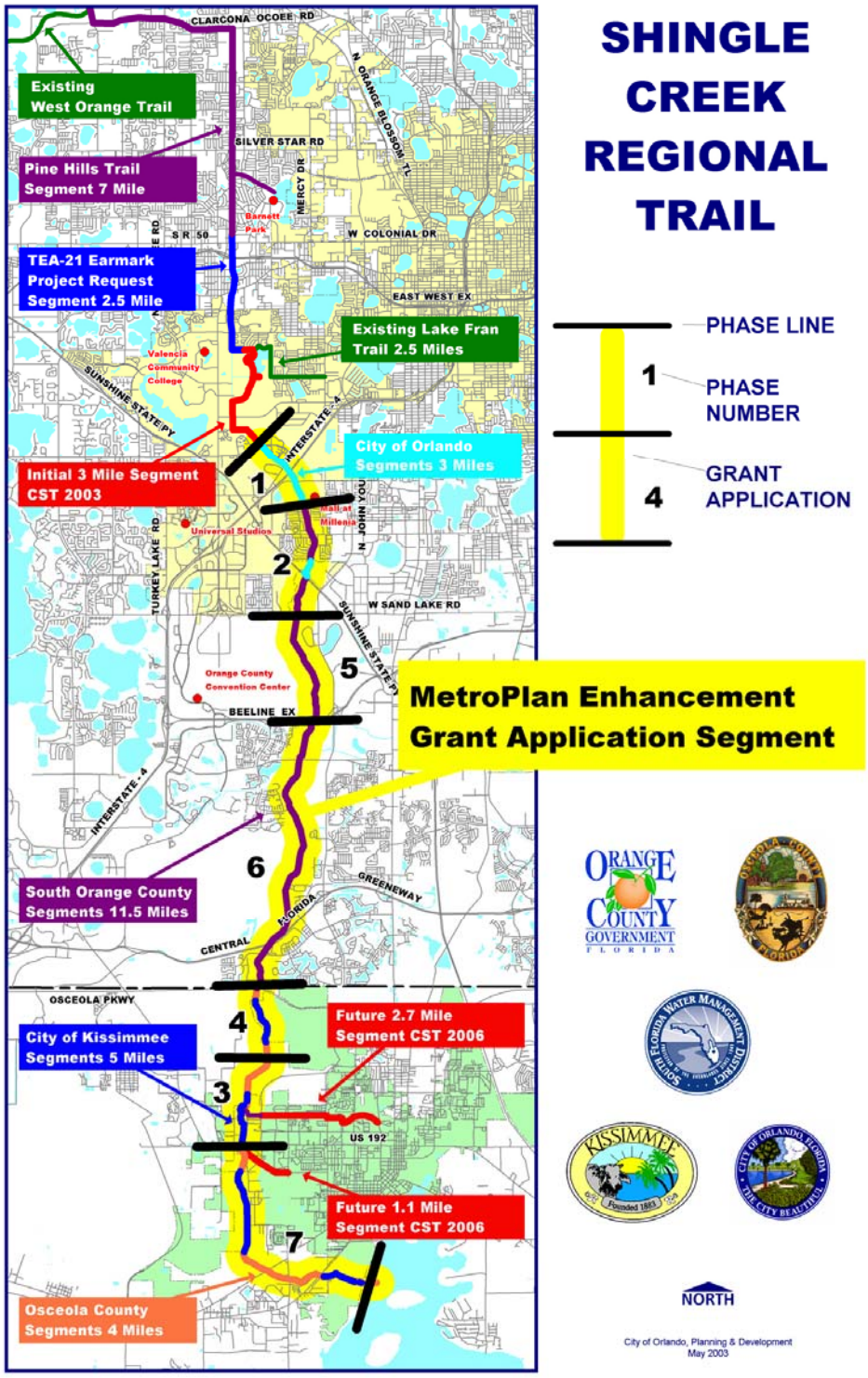
- Maintain present public-use improvements (roads, signs, entrances, structures) using a combination of District maintenance, construction contracts, and user group involvement
- Construct a parking area for public access easement through The Vistas community in Hunter's Creek by 2005
- Construct a foot bridge linking the Hunter's Creek Middle School site with the south unit of the MA on the west side of Shingle Creek by 2005
- Construct a boardwalk through Shingle Creek swamp linking the Marriott Trail to the west pine island (West Management Unit) and other roads and trails within Management Area (MA) by 2006; the boardwalk will also be a recreational centerpiece for the MA and a part of the Everglades Trail system (http://www.evergladestrail.com/)
- Develop and install interpretive signage at key points within the MA to enhance visitor experience and to educate visitors about the MA, particularly its role within the Everglades ecosystem
- Develop and construct a canoe launch on what was formerly known as the "hunt camp" site—a small tract with hard road access that is contiguous with the middle school site—by 2006
- Incorporate the MA into the Regional Trail system being planned by Orange and Osceola Counties, the City of Orlando, and the City of Kissimmee

Goal 3: Implement hydrologic restoration as identified in previous management plans or hydrologic analysis, or where necessary

Objectives:

- Construct hydrologic restoration projects, i.e. at-grade crossings, road removal, and ditch plugs, by FY05 – 06 (see section **5.1**)

MAP 2.


SHINGLE CREEK REGIONAL TRAIL
PHASE LINE
1
PHASE NUMBER
4
GRANT APPLICATION
Existing West Orange Trail
Pine Hills Trail Segment 7 Mile
TEA-21 Earmark Project Request Segment 2.5 Mile
Existing Lake Fran Trail 2.5 Miles
Initial 3 Mile Segment CST 2003
City of Orlando Segments 3 Miles
MetroPlan Enhancement Grant Application Segment
South Orange County Segments 11.5 Miles
City of Kissimmee Segments 5 Miles
Future 2.7 Mile Segment CST 2006
Future 1.1 Mile Segment CST 2006
Osceola County Segments 4 Miles
CLARCONA OCOEE RD
SILVER STAR RD
W COLONIAL DR
EAST WEST EX
W SAND LAKE RD
BEELINE EX
OSCEOLA PKWY
US 192
GREENEWAY
CENTRAL
FLORIDA
INTERSTATE 4
SUNSHINE STATE PY
TURKEY LAKE RD
N JOHN YOUNG
N ORANGE BLOSSOM TL
MERCY DR
S R 50
Barnett Park
Valencia Community College
Universal Studios
Orange County Convention Center
Walt at Millenia
1
2
4
5
6
3
7
NORTH
City of Orlando, Planning & Development
May 2003

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 controlled burning may be conducted. The legislation also requires the districts to develop appropriate public use.

The Shingle Creek drainage basin (map 3. Section 4.1) spans approximately 112 square miles in Orange and Osceola Counties and consists of one main channel, numerous tributaries, canals, and lakes. The District designated a 7600-acre portion of the basin for acquisition in the 1980's. Acquisition in the project area began in 1991 and as of Dec. 2004 the District has acquired approximately 1750 acres through off-site mitigation, Central Florida Beltway Mitigation (F.S. 338.250), and the state's SOR program.

The MA lies within the broader Shingle Creek swamp, a floodplain swamp dominated by cypress, black gum, and red maple. The largest portion of the swamp lies in southwest Orange County. Shingle Creek, channelized in the 1920's, now flows along the eastern edge of the swamp and is one of four primary systems forming the headwaters of the Kissimmee Chain-of-Lakes. The creek originates near State Road 50 in Orlando and flows 23 miles south through Orange and Osceola counties, ultimately discharging into Lake Tohopekaliga.

Shingle Creek swamp is part of a historically extensive mosaic of pine flatwoods communities, mesic hammocks, and isolated wetlands. Today, urban development and agriculture have reduced the mosaic of these native communities considerably, particularly near the creek's headwaters in western Orlando (Exum, 2004). Almost all land adjacent to the swamp has been developed for housing, commerce, or agriculture (although agriculture is quickly declining from development as well).

Since the creek was first channelized in the 1920's by the Taft Drainage District (now defunct), Shingle Creek has steadily become a wetland influenced by stormwater. As development and agriculture encroach, more canals and stormwater ponds are connected to the creek channel for drainage. The Valencia Water Control District (VWCD) illustrates this change well. Created in 1970, the VWCD provides drainage for approximately 4800 acres north of the MA through

ponds, structures, and several miles of canals (maps 3 and 4 section 4.1). All of the water from this system drains into the northwest section of the swamp and, at minimum, has changed the hydroperiod of this section of the swamp (Van Horn, 1997).

Other alterations affecting the swamp include logging, construction of powerline roads, and years of exposure to treated wastewater (suspended in 1986). These have affected the swamp's hydrology, water quality, and integrity (see detail in table 1).

Shingle Creek History – Table 1 (Van Horn, 1997)

	ACTIVITY	EFFECT ON SWAMP
1920's	Upper Shingle Creek channelized by Taft Drainage District.	Isolated creek from swamp.
1920's	Berm breaks cut in western bank	Allowed exchange of water between creek and swamp during high stage periods; may drain swamp..
1920's-40's	Cypress & hardwood harvesting occurred until the 1940's.	Surface water runoff increased, increasing swamp turbidity.
1960's	Main channel north of Florida turnpike channelized.	Enhanced water conveyance to the south through the creek channel to meet drainage needs of surrounding urban area.
Late 1970's	Two sewage treatment plants began to discharge treated effluent directly into Shingle Creek.	Resulted in high nitrogen and phosphorus concentrations within the swamp (O'Dell, 1994).
1972	Orlando Utilities Commission built two power line roads through the swamp.	Obstructed sheet flow across swamp.
1980	North-South powerline road extended southward; 3 culverts installed to improve sheet flow in that area.	Extension of powerline road extended the barrier to sheetflow; culvert installation was first attempt to enhance sheetflow.
1982	Breedlove & Associates studied area for vegetation community shifts and ecological signs of stress.	Conclusion: Shingle Creek Swamp is in good condition.
Mid 1980's	Valencia Water Control District installs plug in its C1 canal.	Attempt to increase water inflow into the northwest corner of Shingle Creek Swamp that was diverted because of drainage improvements of the C1 Canal.
Mid 1980's	RIB's (1) constructed at southwest edge of swamp in Orange County.	Increased flow through groundwater infiltration into western half of swamp.
1986	All wastewater discharges directly into the Creek were stopped (discharge from RIB's still allowed).	Water quality remained somewhat degraded, in spite of declines in nitrogen and phosphorus concentrations (O'Dell 1 994). However, water met Class III standard concentrations, meaning creek waters were safe for public recreation, fishing, and wildlife (Camp et al. 1991, District Hydrolab-unpublished data 1992-1993).
1989	U.S. Army Corps of Engineers-General Design Memorandum proposed projects for providing flood control, as well as lengthening the hydroperiod of swamp.	Conclusion: the swamp is overdrained; project not feasible and the Army Corps of Engineers dropped proposals from consideration in 1992.
1991	Orange County Utilities contracts with Camp Dresser and McKee (CDM) to increase discharge capacity of the rapid infiltration basins (RIB's) to meet discharge needs of the Orlando area.	Conclusion: Water quality within the swamp was degraded by stormwater, unnatural water depths & hydroperiod. CDM concluded that increasing discharge from the RIB's (located in the southwest portion of the swamp) would not further degrade the swamp because increases of stormwater inflow did not affect the southwest corner.
1992-93	SFWMD Study	Conclusion: Loblolly bay trees in the northwest section of the swamp (Orange County) were dying from the extended hydroperiod and increases in water depth on west side of the north-south power line road.
1994	Hunter's Creek developer placed two culverts placed at the south end of the north-south power road as mitigation.	Improve west to east sheetflow at southern end of swamp within Orange County.
1995	As mitigation for the Southern Connector of the Central Florida Beltway, the District installed a 100-ft. swale at the north end of the north-south power road.	Effects not yet quantified, but swale is intended to reduce water level and duration in the northwest corner of the swamp and enhance sheetflow from west to east across the powerline road. Field surveys and bay tree regeneration suggest that the project works according to design.

A Rapid Infiltration Basin (RIB) is a retention pond designed to receive stormwater or treated effluent. Through gradual percolation into the groundwater, biological processes within the pond and groundwater provide additional treatment of the effluent.

(Introduction and Site History, cont.)

Despite the alterations, the swamp appears healthy and plays vital roles in water supply, flood control, wildlife habitat, and water quality. Yet, where feasible, the District envisions restoring or enhancing the alterations within the Shingle Creek project. Ongoing acquisition in Shingle Creek facilitates that goal and is consistent with the District's mission of flood control and protection, water resource conservation and improvement, and the preservation and restoration of environmentally sensitive lands.

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. Additionally, archeological and historic sites considered significant will be inventoried by contracted archeologists sometime by FY 2006.

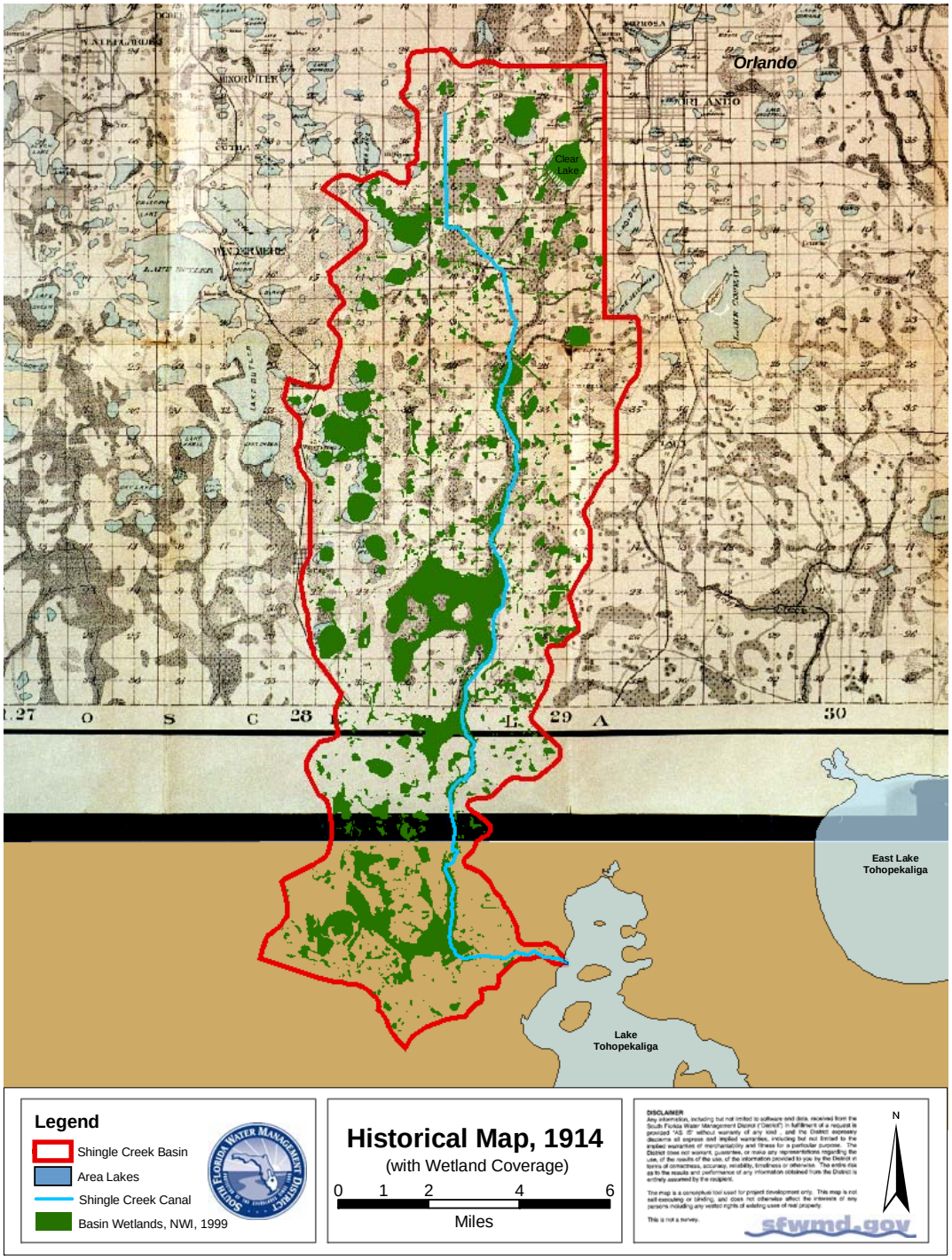
Inventory data is on file within the Planning Section of the LSP and non-sensitive data available for review on the District's computer network server. LSP shares natural areas and species data with the Florida Natural Areas Inventory (FNAI) through a Memorandum of Understanding (MOU).

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 serve as baselines. Additional surveys have been completed with species' lists being updated regularly by volunteers, contractors, and District staff (Appendices A-G). Archeological inventories were conducted by the Department of State, Division of Historical Resources and described in subsequent reports (section 4.5).

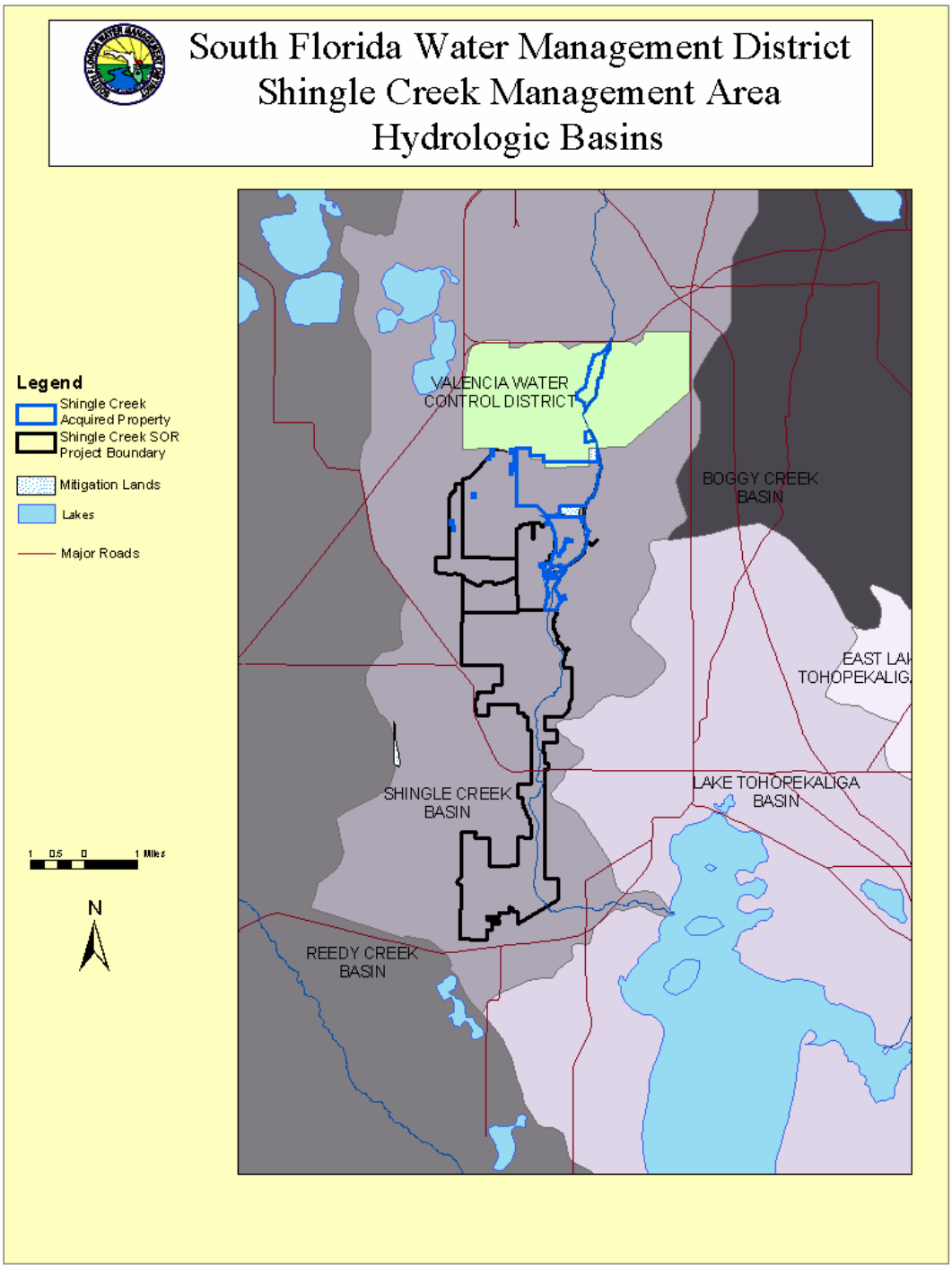
4.1 Hydrology

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

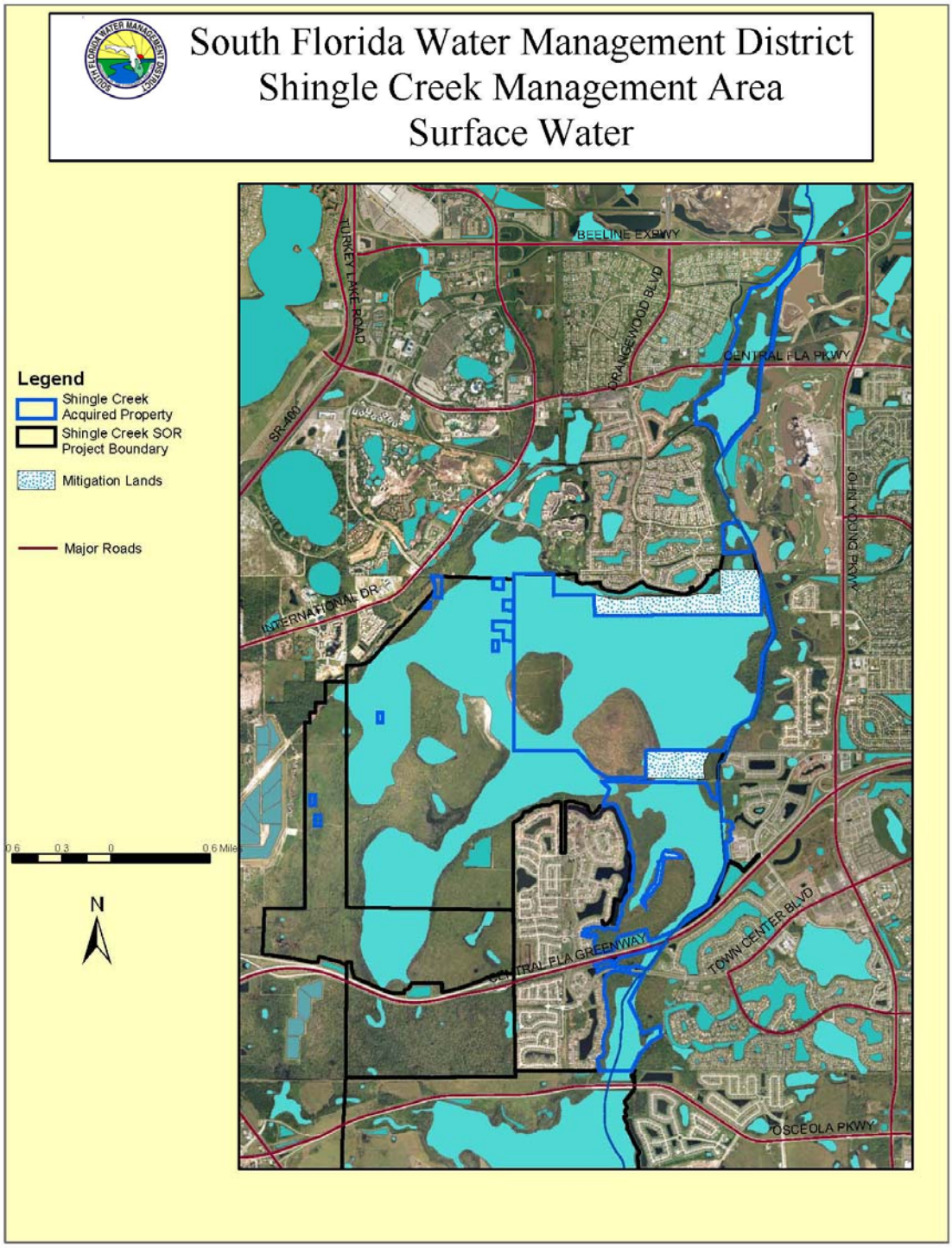
Map 3.


Orlando
Clear Lake
East Lake Tohopekaliga
Lake Tohopekaliga
Legend
Shingle Creek Basin
Area Lakes
Shingle Creek Canal
Basin Wetlands, NWI, 1999
Historical Map, 1914
(with Wetland Coverage)
0 1 2 4 6
Miles
N
sfwmd.gov

Map 4.


South Florida Water Management District
Shingle Creek Management Area
Hydrologic Basins
Legend
Shingle Creek Acquired Property
Shingle Creek SOR Project Boundary
Mitigation Lands
Lakes
Major Roads
1 0.5 0 1 Miles
N
VALENCIA WATER CONTROL DISTRICT
BOGGY CREEK BASIN
EAST LAK
TOHOPEKALIG
SHINGLE CREEK BASIN
LAKE TOHOPEKALIGA BASIN
REEDY CREEK BASIN

Map 5.



The Shingle Creek basin is approximately 112 square miles, whose adjacent basins include Boggy Creek, Reedy Creek, and Lake Tohopekaliga (map 3). The basin lies within the Osceola Plain—generally a broad terrace bounded by the Lake Wales Ridge to the west and the Eastern Valley to the east, both of which are marine scarps. The basin is located in the upper third of the Osceola Plain

and is southeast of a small ridge in Orange County called the Orlando Ridge (White 1970). Although the Osceola Plain locally has little relief and generally has an elevation of 50 to 70 feet National Geodetic Vertical Datum (NGVD), elevations within the upland islands of the MA reach 82 feet NGVD.

Shingle Creek begins its 23-mile journey to Lake Tohopekaliga as a canal in western Orlando around West Highway 50 in the Pine Hills area. The Taft Drainage District, now defunct, dug the canal nearly eight decades ago. Since then, the upper portion of Shingle Creek has become a complex network of canals, culverts, and structures that drain adjacent stormwater ponds, wetlands, lakes, commercial and residential land. Shingle Creek serves as the major flood conveyance in western Orlando and southwest Orange County and remains in its channelized state along the MA almost to the Osceola County line.

Because of its proximity to Orlando and rapidly developing parts of Orange and Osceola Counties, the MA's hydrology is complicated and dynamic. Four major features affect the MA's hydrology:

- Valencia Water Control District (VWCD)
- Utility roads bisecting the swamp
- District-installed Geoweb swale
- Berm breaks in the spoil berm along the canal.

The VWCD plays a considerable role in the MA. Formed in 1970, the VCWD regulates the drainage within a 4800-acre area, captured in 9 miles of canals and funneled through a 600-foot spreader swale at the northwest corner of the main swamp (see map 3). This has likely increased the historic flow in the northwest portion of the swamp and probably has kept this area permanently inundated. In fact, during the drought of 2000, a time in which large portions of the swamp burned during a wildfire, District staff observed that this area remained inundated. More important, though, is VWCD's influence on the swamp's hydrologic dynamics. Greater amounts of stormwater have caused broader, faster fluctuations in the swamp hydroperiod (particularly in the northwest section) and prolonged inundation (Exum, 2004). The overall effect has created conditions more favorable for some species and less for others (Exum, 2004).

A second hydrologic alteration is the utility roads that cut through the swamp. In 1972 the Orlando Utilities Commission (OUC) installed two utility roads in the swamp, bisecting the swamp north-south and east-west. This area is now within the MA. The roads blocked sheetflow, and hydroperiods increased throughout the swamp upstream of the roads, i.e. west of the north-south road, and north of east-west road. Consequently, plant communities became wetter, and less hydrophytic species, e.g. loblolly bay trees (*Gordonia lasianthus*) and pond pine trees (*Pinus serotina*), began to die. In response, the District conducted biological and hydrologic assessments of the swamp and concluded that the western portion of the swamp was inches higher than the swamp portion on the

east side of the utility road. To correct the imbalance, the District installed a stabilized, at-grade crossing for a 100-ft section of the north-south utility road in the MA (District, 1997; District, 1994).

Finally, breaks or cuts have formed in the spoil berm along the Shingle Creek canal. (It is unknown if they formed naturally or if they were dug out; it was probably a combination of both.) In the five-mile section of canal along the eastern MA boundary, about 30 breaks allow the flow of water between the canal and the swamp. Because the canal was dredged lower than the grade of the adjacent swamp, the water generally flows out of the swamp and into the canal, potentially draining the swamp below its historical normal pool. However, because of the system's other hydrological alterations, i.e. the increased stormwater input from the VWCD, it's uncertain if the canal overdrains the swamp enough to harm it ecologically. It is likely that the effects from the breaks are limited to the areas near the canal.

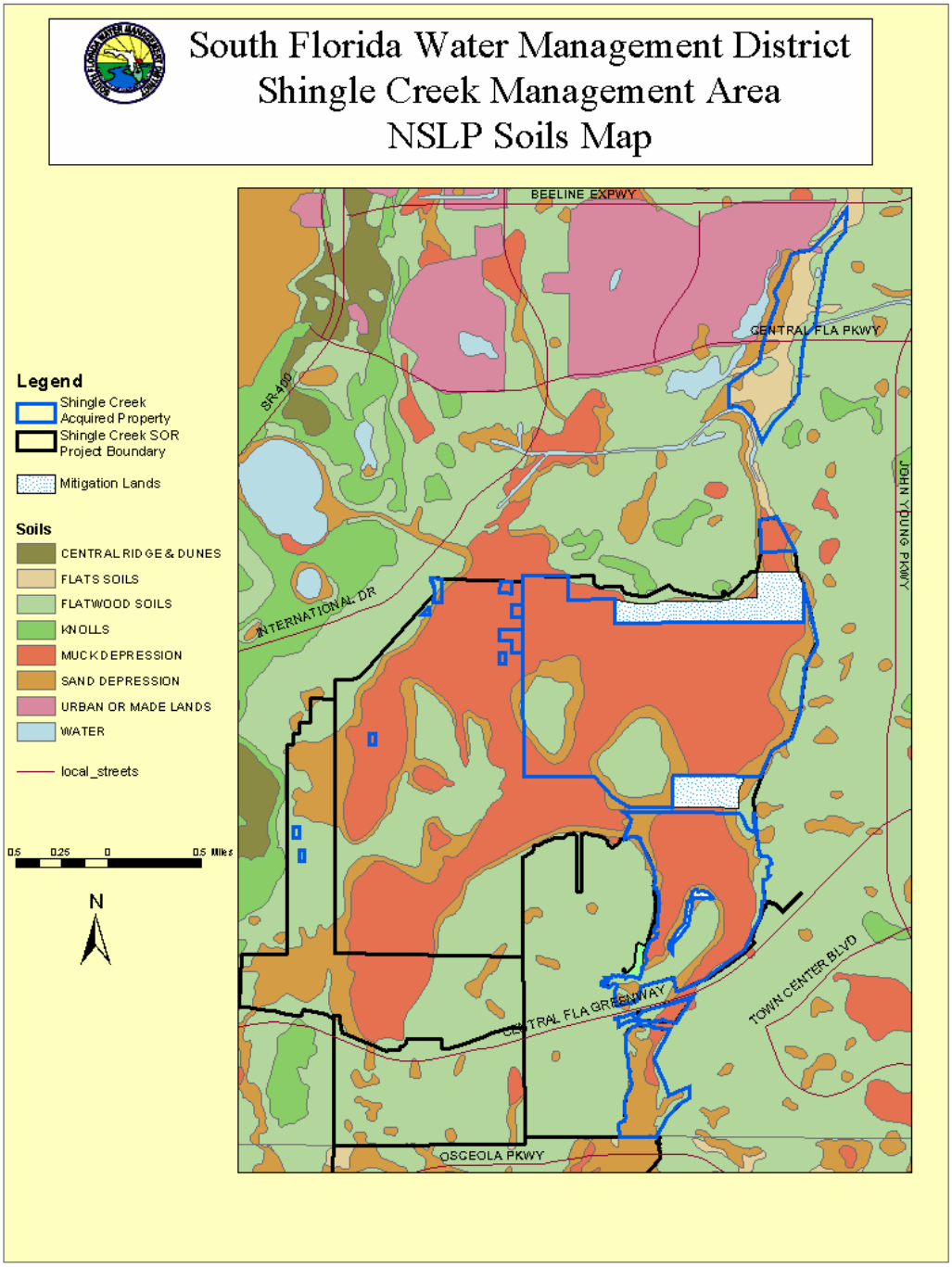
All alterations within the MA have combined to make a very dynamic system that is unlike the swamp historically. While it is uncertain how the collective hydrological changes have affected the natural communities of the swamp, it is clear that the hydrology of the MA is different than it was historically. It floods more rapidly, more deeply, and more extensively. While it stays wetter longer, it paradoxically drains more quickly, probably because of the creek channelization and berm cuts, thus creating the abnormal hydrology (Exum, 2004).

One of the District's primary goals is to restore sheetflow and equalize water levels, particularly in areas impeded by the utility roads. The LSP staff plan to monitor and restore other alterations 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 at-grade crossings, ditch plugs, and road removal (see Restoration Projects, section **5.1**).

4.2 Soils

There are five distinct soil categories within the MA 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).

Map. 6.



<u>Flatwood Soils</u>

Flatwood soils are poorly drained non-hydric, upland soils with sandy marine sediments throughout the profile. The seasonal high water table can range from six to 18 inches below the soil surface for three to six months annually. Natural communities typical of flatwood soils on the MA are mesic flatwoods. Typical

natural vegetation of flatwood soils is scattered slash pine (*Pinus elliotti*) and an understory dominated by saw palmetto (*Serenoa repens*) and grasses.

Flat Soils

Flat (previously referred to as slough) soils are poorly drained hydric soils with sandy marine sediments throughout the profile. Flats are located between the flatwoods and topographic depressions and are generally regarded as transition areas, e.g. a wet prairie or a slough. Generally, the seasonal high water table begins in June and ends from September or thereafter with inundation periods dependent upon seasonal rainfall or large storm events. Within the MA the wet prairie communities best represent this classification; wet prairies are dominated by expanses of grasses, sedges, and rushes with scattered pines or cypress.

Sand Depression Soils

Sand depression soils are very poorly drained hydric soils that typically have sandy marine sediments throughout the profile. Often, these areas are depressions adjacent to flatwoods. The seasonal high water table can range from one foot below to two feet above the soil surface for seven to 10 months annually. Wetland communities dominate this landscape position. Within the MA, cypress (*Taxodium spp*.) and hardwood swamps represent this soil class.

Muck Depression Soils

Muck depression soils are very poorly drained hydric soils that have an organic surface layer underlain by sandy marine sediments. These areas are often depressions adjacent to Flatwood soil-types. The seasonal high water table can range from six inches below to two feet above the soil surface for seven to eleven months annually. Wetland communities dominate this soil type. Examples within the MA include hardwood swamps dominated by bald cypress (*Taxodium distichum*), pond cypress (*Taxodium ascendens*), or red maple (*Acer rubrum).*

Urban or Made Lands

Urban or made land areas have soils that have been altered, excavated, or disturbed and no longer possess their natural morphological features. These soils do not function as they did in their original state, and little information on this subject is available. The seasonal high water table varies by site and is usually controlled to inhibit flooding of developed areas. No ecological communities are representative of this landscape position. The north-south and the east-west utility roads within the main unit and the berms along Shingle Creek fall into this classification.

Water Areas

This classification represents areas that are permanently inundated, with depths usually two feet or more. No soil series or ecological community is associated with this classification. In the MA, the Shingle Creek canal and the historical Shingle Creek channel best represent this category.

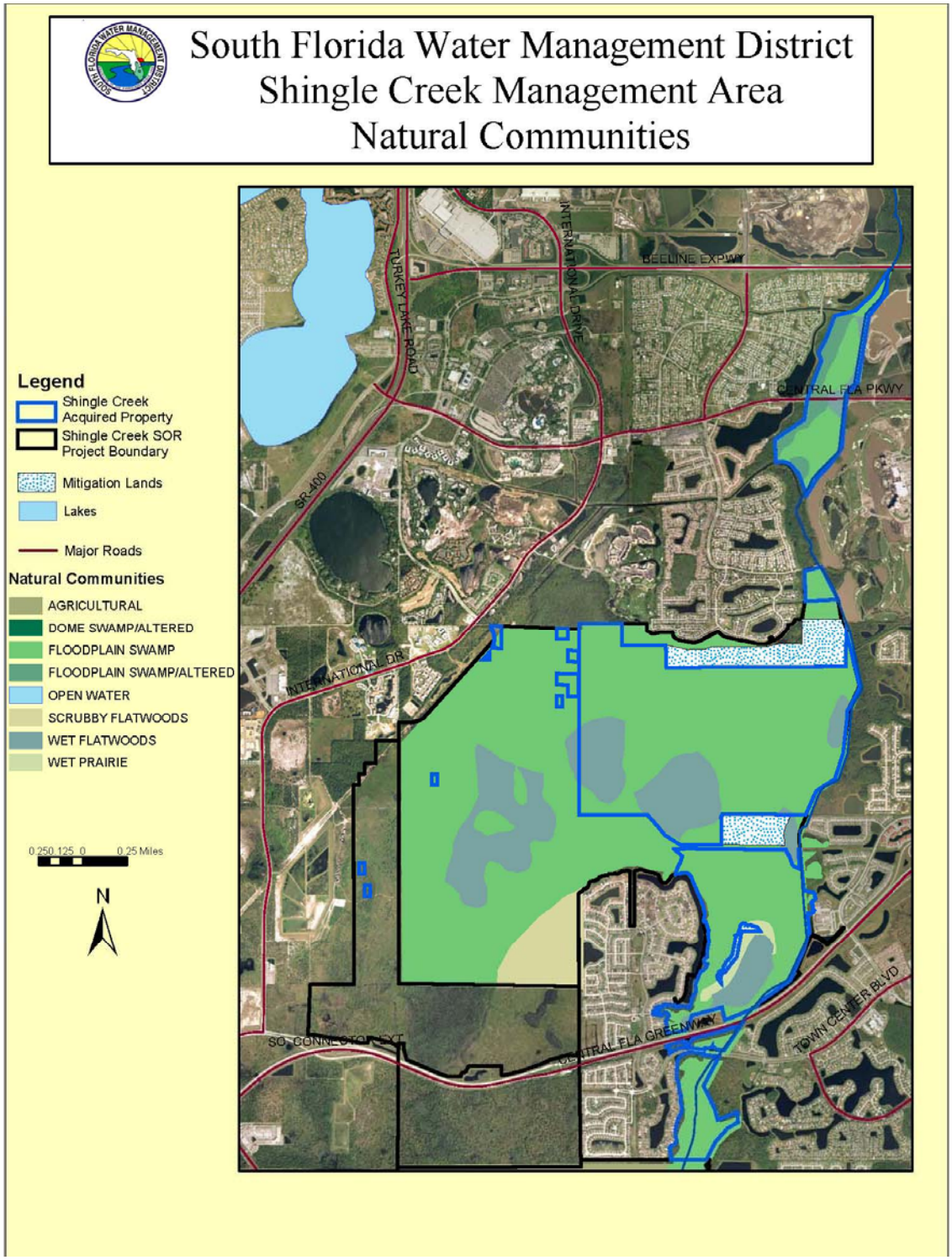
Soil Contamination and Excavation Sites

Throughout the acquisition process, District Environmental Assessments have revealed no known areas of soil contamination (i.e. cattle dipping vats, chemical dumping) or excavation within the MA.

4.3 Natural Communities

Four natural community types, as classified by the Florida Natural Areas Inventory (FNAI), comprise the MA.

Map 7.


South Florida Water Management District
Shingle Creek Management Area
Natural Communities
Legend
Shingle Creek Acquired Property
Shingle Creek SOR Project Boundary
Mitigation Lands
Lakes
Major Roads
Natural Communities
AGRICULTURAL
DOME SWAMP/ALTERED
FLOODPLAIN SWAMP
FLOODPLAIN SWAMP/ALTERED
OPEN WATER
SCRUBBY FLATWOODS
WET FLATWOODS
WET PRAIRIE
0.250 125 0 0.25 Miles
N
TURKEY LAKE ROAD
INTERNATIONAL DRIVE
BEELINE EXPWY
CENTRAL FLA PKWY
SR-400
INTERNATIONAL DR
SO. CONNECTOR EXT
CENTRAL FLA GREENWAY
TOWN CENTER BLVD

Floodplain Swamp (1337 acres)

Floodplain swamp occurs along stream channels and in low spots within river floodplains. Dominant trees include cypress and black gum (*Nyssa sylvatica* var. *biflora*), and typical plant species include wax myrtle (*Myrica cerifera*), dahoon holly (*Ilex cassine*), lizard's tail (*Saururus cernuus*), leather fern (*Acrostichum danaeifolium*), and royal fern (*Osmunda regalis*). Animal species include American swallow-tailed kite (*Elanoides forficatus*), pileated woodpecker (*Dryocopus pileatus*), prothonotary warbler (*Protonotaria citrea*), wood duck (*Aix sponsa*), Southern leopard frog (*Rana sphenocephala*), Two-toed amphiuma (*Amphiuma means*), dwarf salamander (*Eurycea quadridigitata*), Southern cricket frog (*Acris gryllus*), American alligator (*Alligator mississippiensis*), Common musk turtle (*Sternotherus odoratus*), Peninsula cooter (*Pseudemys peninsularis*), Eastern mud snake (*Farancia abacura abacura*), Eastern cottonmouth (*Agkistrodon piscivoru piscivorus*), raccoon (*Procyon lotor*), and bobcat (*Lynx rufus*).

Floodplain Swamps flood during most of the year and are usually too wet to support fire, sometimes having a fire regime similar to dome, strand, or basin swamp, i.e. burning every 75 to 200 years or more. They can burn at the shallower edges of the community, particularly during droughts. (Note: large portions of the Shingle Creek swamp burned during the drought of 2000, mostly in the shallow edges.)

This community dominates the Shingle Creek system and is found throughout all units of the MA, particularly along the Shingle Creek canal; the broadest portions span nearly three miles by two miles in the east, west, and south units. The swamp appears healthy, yet it's unclear how hydrologic alterations are affecting it. Certainly, the swamp receives more water than it did historically, especially in light of the VWCD drainage and stormwater from western Orlando via the Shingle Creek canal. It is likely that this community has increased in extent over the past several decades, while adjacent communities, i.e. Wet Flatwoods and Wet Prairie, have decreased (see below). In addition to its high habitat value, Floodplain Swamp also provides exceptional flood storage and water filtration.

Wet/Mesic Flatwoods (260 acres)

FNAI describes Wet Flatwoods as relatively open-canopy forests of scattered pine trees or cabbage palms (*Sabal palmetto*) with wide variations of shrubs and groundcover in the understory (FNAI, 1990). Typical plants include pond pine, slash pine, sedges (*Cyperus spp.)*, wax myrtle, gallberry (*Ilex glabra*), saw palmetto, deer tongue (*Dichanthelium spp.)*, blue stem (*Andropogon spp.*), pitcher plants (*Sarracenia minor)*, wiregrass (*Aristida stricta*) and wildflowers. Common animals in the flatwoods include white-tailed deer (*Odocoileus virginianus*), cotton rat (*Sigmodon hispidus)*, cottontail rabbit (*Sylvilagus*

floridanus), bobwhite (*Colinus virginianus*), bobcat, red-shouldered hawk (*Buteo lineatus*), oak toad (*Bufo quercicus*), yellow rat snake (*Elaphe obsoleta quadrivittata*), diamondback rattlesnake (*Crotalus adamanteus*), and black racer (*Coluber constrictor priapus*).

Fire and hydrology are the two greatest physical forces shaping the pine flatwoods communities. Historically, Wet Flatwoods experienced fire about every 3 to 10 years and, without frequent fires, Wet Flatwoods succeed into hardwood dominated forests, eventually closing the canopy and eliminating the shrubs and ground cover. Nearly all plant and animals living in the flatwoods communities are adapted to or depend upon periodic fires for their survival. The plants and animals have also adapted to wide variations in the availability of water. During the rainy season, water frequently stands on the surface, inundating the flatwoods for a month or more during the year. After the wet season, more drought-like conditions prevail, and plants are stressed by the scarcity of water.

FNAI makes little distinction between Wet and Mesic Flatwoods, for one often transitions into the other, depending on slight changes in topography. Both natural communities have many plant and animals in common, and both require periodic fire for their continued survival. In the MA, Wet and Mesic flatwoods occur predominantly in three main areas: the West Pine Island (West Unit), East Pine Island (East Unit), and the Thumb (South Unit). Within the Shingle Creek basin, much of the historical flatwoods have been developed, and the remaining flatwoods within the MA are home to the plants and animals that depend upon them.

Hydrologic changes in the Shingle Creek system have most likely affected the flatwoods communities in the MA. Increased stormwater inflow, sheetflow alterations, etc., have probably raised the water table and prolonged hydroperiods beyond those experienced historically. Pond pines dominate the Wet Prairie (see below) around the West and East Pine Islands. With increased soil and/or fuel moisture, fire cannot carry through the prairies as it once did, thus creating conditions more suitable for the fast-growing pines.

<u>Wet Prairie</u> (75 acres)

According to FNAI, the Wet Prairie community is a treeless plain with a sparse to dense ground cover of grasses, sedges, rushes, and herbs, including wiregrass, toothache grass (*Ctenium aromaticum*), maidencane, spikerush (*Eleocharis* sp.), and beakrush (*Rhynchospora* sp.). Other typical plants include hatpins (*Lachnocaulon* sp.), marsh pinks (*Rhexia* sp.), corkwood (*Stillingia aquatica*), wax myrtle, St. John's-wort (*Hypericum* sp.), and Panicums; animals include cotton mouse, marsh rabbit, northern harrier, pygmy rattlesnake, little grass frog, and cricket frog.

Like the flatwoods communities, fire and hydrology are the dominant physical forces in the Wet Prairie community. Wet Prairies are inundated from 50 to 100 days per year, yet because of long seasonal dry periods, Wet Prairie species have also adapted to drought. Fire plays an integral role in the Wet Prairie community, which burn usually every two to four years. Without fire, woody species such as wax myrtle quickly invade.

As mentioned above, hydrologic alterations have probably made the prairie communities wetter than historical conditions, particularly those surrounding the East and West Pine Islands. These seem to be the upland habitats that have been affected the most by the OUC utility roads, especially when one compares recent and historical aerial photography. Historical aerials show the prairies as open, grass-dominated communities; on the other hand, recent aerials (circa. 2003) show the same communities with considerably more tree cover. While the wetter habitat probably inhibited the community's ability to carry fire and allowed pines to establish themselves, it is also likely that fire suppression has played a role in the change of the prairie community.

In the MA the prairie community provides important habitat for the species that require it, and it also provides a rare niche in a system dominated by swamp habitat. Even in its altered condition, what little prairie community remains in the MA is perhaps the best example of a natural community that once had greater extent in the Shingle Creek basin. To perpetuate and restore the prairie communities, the District has implemented a prescribed fire program that mimics historical fire regimes and intends to construct an at-grade swale crossing in the east-west utility road sometime in 2005 (see section 5.1). The swale restoration project should reduce the hydroperiod in the East Basin, create drier conditions in the prairies, and allow fire to carry farther and more frequently.

Scrubby Flatwoods (3 acres)

Scrubby Flatwoods are usually intermixed with mesic flatwoods and have a mix of plant species from both natural communities. Plant species include longleaf pine, slash pine, Chapman's oak, myrtle oak, runner oak, saw palmetto, gopher apple, tarflower, and wiregrass. Common animals include those found in Mesic Flatwoods communities. Scrubby Flatwoods rarely flood, and their higher, drier nature produces less herbaceous vegetation. Consequently, they carry fire less often than Wet or Mesic Flatwoods, and intervals between fires range from eight to twenty-five years.

In the MA, only a small amount of Scrubby Flatwoods exist. It occurs in the West Pine Island and occurs near the center of the island. There is no other example of this natural community within the MA and, even though there are about 200 acres in the Shingle Creek project, only a small portion is in conservation. Until the remainder is protected, the small area on the West Pine Island represents the best protected example of Scrubby Flatwoods within the Shingle Creek project.

The Scrubby Flatwoods in the MA provides habitat, albeit small, for species that need and/or prefer higher and deeper, sandy soils. For example, gopher tortoises inhabit both pine islands in the MA, but the habitat in the West Pine Island, particularly the Scrubby Flatwoods, may give the population the refuge it needs for long-term survival in wetter years. It is possible that this habitat has decreased in extent from increased hydroperiods throughout the swamp.

4.4 Wildlife

The Fish and Wildlife Conservation Commission (FWC) 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 in 1992, it has conducted inventories to determine the natural and cultural resources present. Regular surveys are ongoing by District staff, volunteers, or contractors, and species lists are updated accordingly. To date the District has recorded 106 bird, 9 mammal, 27 reptile, 13 amphibian, 20 fish, and 48 butterfly species within the MA (Appendices XX). 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.

One archeological site registered in the Florida Master Site File is within the MA. The site may date back several thousands of years and has been recommended for further testing (State of Florida, 1983). A nearby site, discovered during the development of Hunter's Creek, contained thousands of artifacts 4,000 to 8,000 years old and was possibly an ancient hunt camp (Ost, 1987).

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 the SCMA. 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 SCMA clarify resource management guidelines necessary to fulfill the District's land stewardship responsibilities. Programs consist of agriculture, archeological and historical, fire, forestry, hydrologic, range, soil, mineral, vegetation, and wildlife management.
At MA, LSP resource management activities and plans include a large scale hydrologic restoration and the continuation of its exotic plant control and prescribed burn programs, where appropriate.

5.1 Restoration Projects

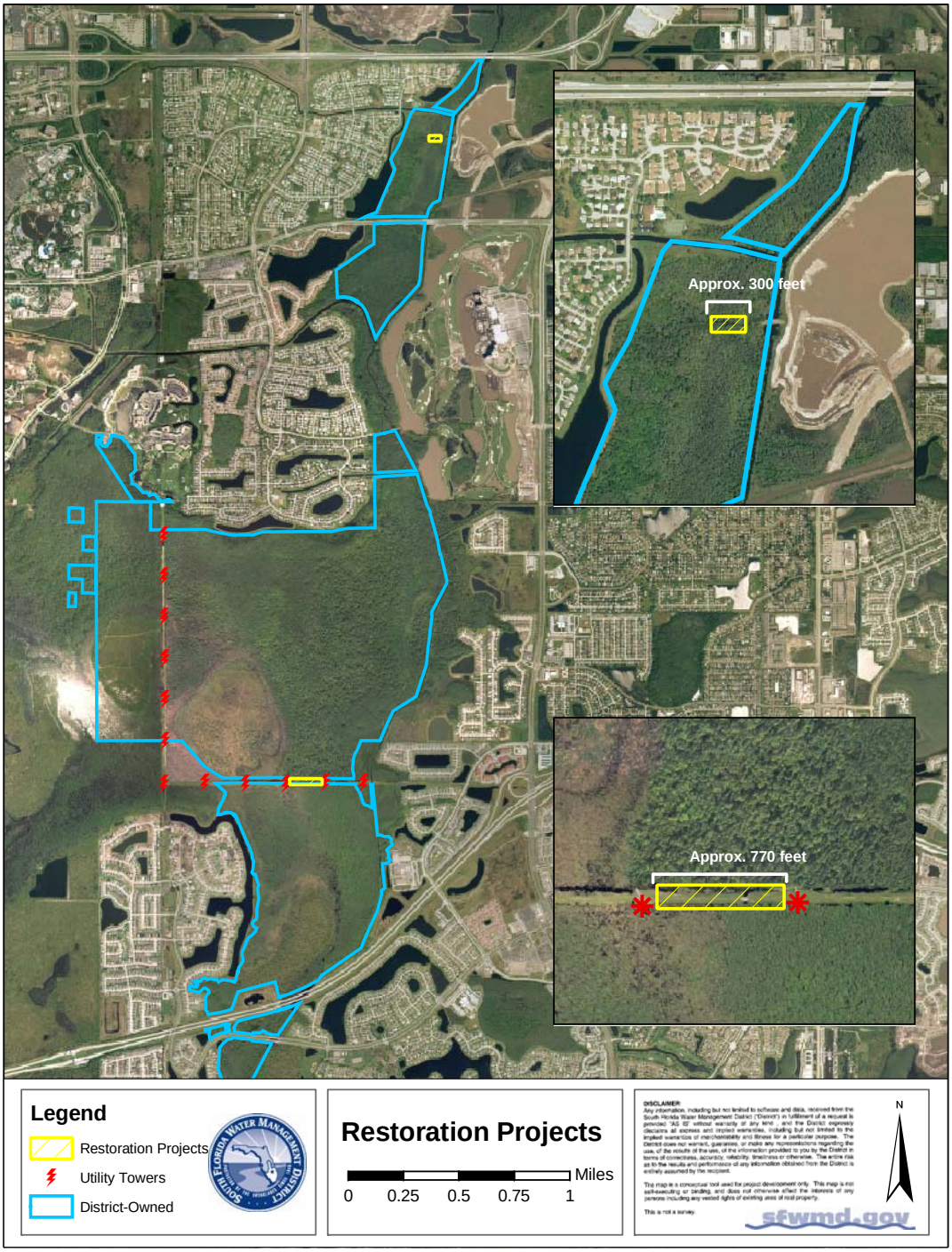
Policy 140-25(1) The *basis for the Land Stewardship Program is the protection and management of natural hydrologic resources.*

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.

- **At-grade Crossings**

In 1972, the Orlando Utilities Commission (OUC) built dirt roads through Shingle Creek swamp for power lines. Although OUC installed several culverts in the roads, the roads altered sheet flow and hydrology in the adjacent areas of the swamp. In the 1980's the VWCD increased stormwater discharge in the northwest section of the swamp, further extending the hydroperiod in that area. As a result, less hydrophytic species (i.e. loblolly bay trees, pond pine) began to die. As partial mitigation for wetland impacts caused by the Southern Connector in Orlando, in 1995 the District replaced a 75-foot section of the north-south

Map 8.



road. Though the District continues to collect data, it appears that the swale enhanced sheetflow and reduced the hydroperiod in the northwest section of the swamp: field observations show seedling and juvenile bay trees returning to areas that previously experienced tree mortality (District, 1997) .

To address similar problems in other parts of the swamp, the District proposes the construction of two additional at-grade crossings to enhance sheetflow in those areas of the MA. At-grade crossings would be installed in two areas: 1) the southernmost end of the north-south road (between the right-of-way intersection and the entrance gate to the south), and 2) the eastern end of the east-west road, creating a crossing long enough to mimic Shingle Creek's historical breadth and flow through that area.

- **Ditch Plugs**

Historically, water from the north basin of Shingle Creek swamp flowed south, eventually draining through a natural channel near Highway 417, approximately one mile to the south. As noted previously, the utility roads altered the swamp's hydrology and sheet flow. Now, the road directs nearly one mile of sheet flow through four culverts along the east-west road. In addition to the sheet flow alteration, ditches along the road direct water to the channelized portion of Shingle Creek, particularly during periods of high flow. To enhance the historical north-south flow in this portion of MA, the District proposes to plug the ditches at the creek in conjunction with the at-grade crossings.

- **Restoration—Road Removal**

Decades ago an unimproved road was built across the Shingle Creek swamp approximately 1/2 mile north of Central Florida Parkway in Orange County in the north unit (Section 8, Township 24 South, Range 29 East). The road is unused. Although there is a culvert in the area of highest flow, the road restricts the natural north-south flow through that part of the swamp. The District proposes to restore the hydrology in this portion of the swamp by removing the road.

5.1.1 Mitigation

The District receives mitigation funds that are used for the preservation, restoration, and management of several LSP lands in accordance with Section 373.414 (1)(b), F.S. The District received mitigation funds for the MA from 1992 through 2002 for several offsite development projects. The District uses mitigation funding for specific activities and management, for which LSD staff have developed plans. The District also received Central Florida Beltway Mitigation Funding in accordance with 338.250 F.S. As directed by the legislation, the District developed conceptual mitigation plans that outline various restoration projects and acquisitions within the Shingle Creek project and others. The plans are formally known as the 1) *Shingle Creek Swamp Mitigation Plan* (District, 1992), and 2) the *Conceptual Mitigation Plan for the Central Florida Beltway, S.R. 429, Part C* (District, 2000); both are on file at the District's headquarters and the Orlando Service Center.

5.1.2 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.

District staff monitor and document hydrologic and vegetative changes within the MA. Hydrologic monitoring began shortly after the District acquired land within the project in 1992. The District installed eight stage recorders and staff gauges along the powerline roads to monitor suspected disparities among the subbasins and to model the hydrology within the MA (District, 1994). The analysis resulted in the construction of the at-grade crossing on the north-south powerline road (1995) which, as required by DEP, established seven photomonitoring points throughout the swamp. In 2000 photopoint data collection ceased in accordance with the project's DEP permit; Subsecquently, two photomonitoring points have been established; one in a pine island and one in a pine/cypress transition area. Nevertheless, hydrologic monitoring continues at all recorders, and data is kept on the District's DB Hydro internal website (http://iweb/dbhydro/).

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.

The District has not used mechanical means to restore or maintain natural communities in the MA. However, some natural communities, particularly the upland buffers, may be maintained by mechanical means. Adjacent development and hydrologic changes have made some of these areas difficult in which to conduct prescribed fires. Some mechanical control may be applied to maintain and perpetuate the fire-dependent upland communities that buffer the floodplain swamp.

5.2.1 Vegetation Control and Maintenance

Vegetation control and maintenance is executed by the LSP field technicians or through contracts. In the MA the District uses private mowing services to maintain trails and access roads.

5.2.2 Exotic/Invasive Plants (map of all area treated)

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.

The District has treated the following Category I plants within the MA: wild taro (*Colocasia esculenta*), Chinese tallow (*Sapium sebiferum*), camphor tree (*Cinnamomum camphora),* common guava (*Psidium guajava*), air potato (*Dioscorea bulbifera*), Japanese climbing fern (*Lygodium japonicum*), water hyacinth (*Eichhornia crassipes*), cogon grass (*Imperata cylindrica*), Old World climbing fern (*Lygodium microphyllum*), torpedo grass (*Panicum repens*), strawberry guava (*Psidium cattleianum*), Brazilian pepper (*Schinus terebinthifolius*), and paragrass (*Urochloa mutica*) (Table 2). Of significant concern is Old World climbing fern, which persists in spite of consistent treatment for over five years. The District treats and surveys Lygodium-infested areas several times a year to control established infestations and locate new ones in the MA. Currently, the species seem contained primarily to one area, although District staff found a small infestation in the western portion of the site in Spring '03.

Table 2. Category I Exotics in the MA

Common Name	Scientific Name	EPPC Category
Air potato	*Dioscorea bulbifera*	I
Brazilian pepper	*Schinus terebinthifolius*	I
Camphor tree	*Cinnamomum camphora*	I
Chinese tallow	*Sapium sebiferum*	I
Cogon grass	*Imperata cylindrica*	I
Common guava	*Psidium guajava*	I
Japanese climbing fern	*Lygodium japonicum*	I
Old World climbing fern	*Lygodium microphyllum*	I
Paragrass	*Urochloa mutica*	I
Strawberry guava	*Psidium cattleianum*	I
Torpedo grass	*Panicum repens*	I
Water hyacinth	*Eichhornia crassipes*	I
Wild taro	*Colocasia esculenta*	I

Invasive exotic plant control measures include a combination of herbicide application, prescribed fire, roller chopping, mowing, 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 twice 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.

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 (FWC), 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 FWC. The plant list of the MA (appendix d) contains several listed species (Table 3).

Table 3. Plants Occuring on the Shingle Creek 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 October, 2003

Common Name	Scientific Name	Status
Giant Leather Fern	*Acrostichum danaeifolium*	C
Catesby's Lily	*Lilium catesbaei*	T
Cinnamon Fern	*Osmunda cinnamomea*	C
Royal Fern	*Osmunda regalis*	C
Blue Butterwort	*Pinguicula caerulea*	T
Yellow Butterwort	*Pinguicula lutea*	T
Yellow Fringed Orchid	*Platanthera ciliaris*	T
Lady's-tresses	*Spiranthes sp.*	E
Hooded Pitcherplant	*Sarracenia minor*	T
Cardinal Wild-pine	*Tillandsia fasciculata*	E
Giant Wild-pine	*Tillandsia utriculata*	E

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 (40E-7.537 General Prohibitions) (District, 2003). 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. Two species of once abundant bromeliads, *Tillandsia utriculata* and *Tillandsia fasciculata*, have been placed on the state's list of endangered 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.

There are currently no sites within the MA that meet District criteria for timber harvest.

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.

The District neither plans nor anticipates any grazing or agricultural activities for the MA.

5.2.6 Monitoring

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.

Additionally, 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.

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 District contacted Division of Forestry (DOF) for fire data on the MA prior to District ownership. While DOF is aware of fire activity within the MA (primarily wildfires), it has no dates, locations, acreage, etc. (Michael Coker, DOF, personal communication, June 2003).

The District began its prescribed fire planning for the MA in 1998 and, following the wildfire of June 2000, has conducted five prescribed fires totaling 340 acres (Table 4). Fire data (prescribed and wild) is maintained in GIS to produce historical burn maps of the property.

Table 4. Prescribed Fire History

Unit	Natural Community	Acreage	Last Burn Date
West Pine Island	Mesic Flatwoods/Wet Prairie	70	Jun 2000 (a)
East Pine Island (EPI)	Wet Flatwoods/Wet Prairie	125	Jun 2000 (a)
Thumb	Wet Flatwoods/Wet Prairie	90	Jun 2000 (a)
West Pine Island (WPI)	Mesic Flatwoods/Wet Prairie	70	April 2003
East Pine Island	Wet Flatwoods/Wet Prairie	125	April 2003
Thumb	Wet Flatwoods/Wet Prairie	90	April 2004
Oak Hammock	Wet Flatwoods (oak-dominated)	15	May 2004
East Pine Island	Wet Prairie	40	May 2004

(a) Burned during wildfire in June 2000

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 practical. 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.

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. The LSP has a five-person prescribed fire crew (Land Stewardship Field Crew) and has utilized other cooperating agency staff—DOF, Orange County Fire Rescue, and Orange C0unty Parks and Recreation—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. The dominant fire-adapted community of MA is Wet Flatwoods with a natural burn frequency of approximately 3 to 10 years (FNAI, 1990). This interval requires that about 100 acres be burned annually. The District concentrates on applying fire to each area of the property, reducing

accumulated fuel loads, and providing a safer basis for future burns of increased frequency and lower intensity. Currently, the District has burned most fire-adapted areas of the MA since District acquisition; all upland islands (WPI, EPI, Thumb) have been burned the since wildfire of 2000. Planning will emphasize yearly burn acreage to attain a 3-year rotation at minimum. To mimic historical fire patterns, the District endeavors to burn during the growing season (Table 5).

Table 5. Projected Prescribed Fire Rotation

Area to be burned	05	06	07	08	09	10	11	12	13	14
North Wet Flatwoods Buffers										
East Oak Hammock										
East EPI Flatwoods										
East EPI Wet Prairie										
West WPI Flatwoods										
West WPI Wet Prairie										
West Marriott Tract Flatwoods										
South Thumb Wet Flatwoods										
South Thumb Wet Prairie										

Note: Shaded areas represent years in which prescribed fire could occur and stay consistent with FNAI regime; intervals between fires would depend upon conditions and, ideally, would vary in length and seasonality.

5.3.3 Wildfire Suppression

<u>Policy 140-25(3)(d)</u> 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 FWC on wildlife management issues

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.

Table 6. Biological Assessments & Inventories

Survey Type	Performed by	Date
Vegetation/community analysis	Breedlove, Dennis, & Associates	1982
Hydrologic/flood control	U. S. Army Corps of Engineers	1989
Biological/hydrologic	Dames & Moore	1989
Water quality	Camp, Dresser, & McKee	1991
General site inspection	District	1991
Biological/hydrologic	District	1994
Vegetative Photomonitoring	District	1999 (a)
Bird Surveys	Volunteer Biologist	2000 (b)
Plant Inventory	Native Plant Society, Tarflower Chapter	2000
Butterfly Surveys	Volunteers	2000 (c)
Herpetological Survey	Glatting, Jackson, et al.	2004
Vegetative Survey	Glatting, Jackson, et al.	2004

(a) Five-year annual monitoring from 1994 – 1999 as required by DEP permit for at-grade crossing
(b) Birds surveys conducted by Lorne Malo, biologist, for one year
(c) Butter surveys conducted by Randy Snyder and Mary Keim for one year

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.

The District most likely will not authorize hunting in the MA as an appropriate public use, because of the MA's size, acquisition intent, and its proximity to homes, schools, and major roads. The District will control hogs when needed.

5.4.2 Exotic/Invasive 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 FWC to define the acceptable level of impact. When population control measures are warranted, land managers consult with the FWC 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.

Currently, feral hog populations in the MA appear to be insignificant. Control methods will be determined in cooperation with the FWC, when necessary, and in conjunction with a District trapping contract.

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.

Several species listed as endangered, threatened, or of special concern by state and federal agencies occur within the MA, including gopher tortoise (*Gopherus polyphemus*), wood stork (*Mycteria americana*), bald eagle (*Haliaeetus leucocephalus*), and Sherman's fox squirrel (*Sciurus niger shermani*) (Table 7). Indigo snakes (*Drymarchon corais couperi*) may also occur (Exum, 2004). Additionally, FWC 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.

Special management attention is given to the area's bald eagles. Bald eagle nesting success has been documented in the area since 1987 and the population status is monitored by the FWC. All nest trees are located and updated maps are maintained. During the breeding season no disruptive land management activities are planned within a 1500' radius of nest sites (USFWS, 1987) and nearby prescribed burns are planned to keep smoke away from nest trees. When non-breeding season burns are conducted, nest trees are protected by cutting vegetation around the tree base to limit fire intensity.

Table 7. Listed Animal Species

Count	Scientific Name	Common Name	Status		Identified by
			Fed	State	
1	*Alligator mississippiensis*	American alligator	T	SSC	LSD-1994
2	*Aramus guarauna*	Limpkin		SSC	LSD-1994
3	*Egretta caerulea*	Little blue heron		SSC	LSD-1994
4	*Egretta thula*	Snowy egret		SSC	LSD-1994
5	*Egretta tricolor*	Tri-colored heron		SSC	LSD-2000
6	*Eudocimus albus*	White ibis		SSC	LSD-1994
7	*Gopherus polyphemus*	Gopher tortoise		SSC	LSD-1999
8	*Grus canadensis pratensis*	Florida sandhill crane		T	LSD-1994
9	*Haliaeetus leucocephalus*	Bald eagle	T	T	LSD-1994
10	*Mycteria americana*	Wood stork	E	E	LSD-1994

11	*Sciurus niger shermani*	Sherman's fox squirrel		SSC	LSD-2000

5.4.4 Monitoring

Bald eagle
No eagles nest within the MA, but a pair has nested nearby in the Shingle Creek swamp since at least 1987. FWC has collected data since then, conducting aerial surveys to determine nesting activity and success. During the nesting season, monthly flights are conducted from January-May to determine nest location, use, and productivity. Ground surveillance may also be used. Since data FWC has documented 22 fledglings produced in the swamp area (FWC, unpublished information, 2003).

Water quality
The District also monitors water quality throughout its 16-county area. One monitoring site is located in lower Shingle Creek in Osceola County. Various water quality parameters are gathered monthly and evaluated. Along with flow and stage data from recorders in the MA, this information is stored in the District's DB Hydro database and is used to monitor long-term trends.

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.

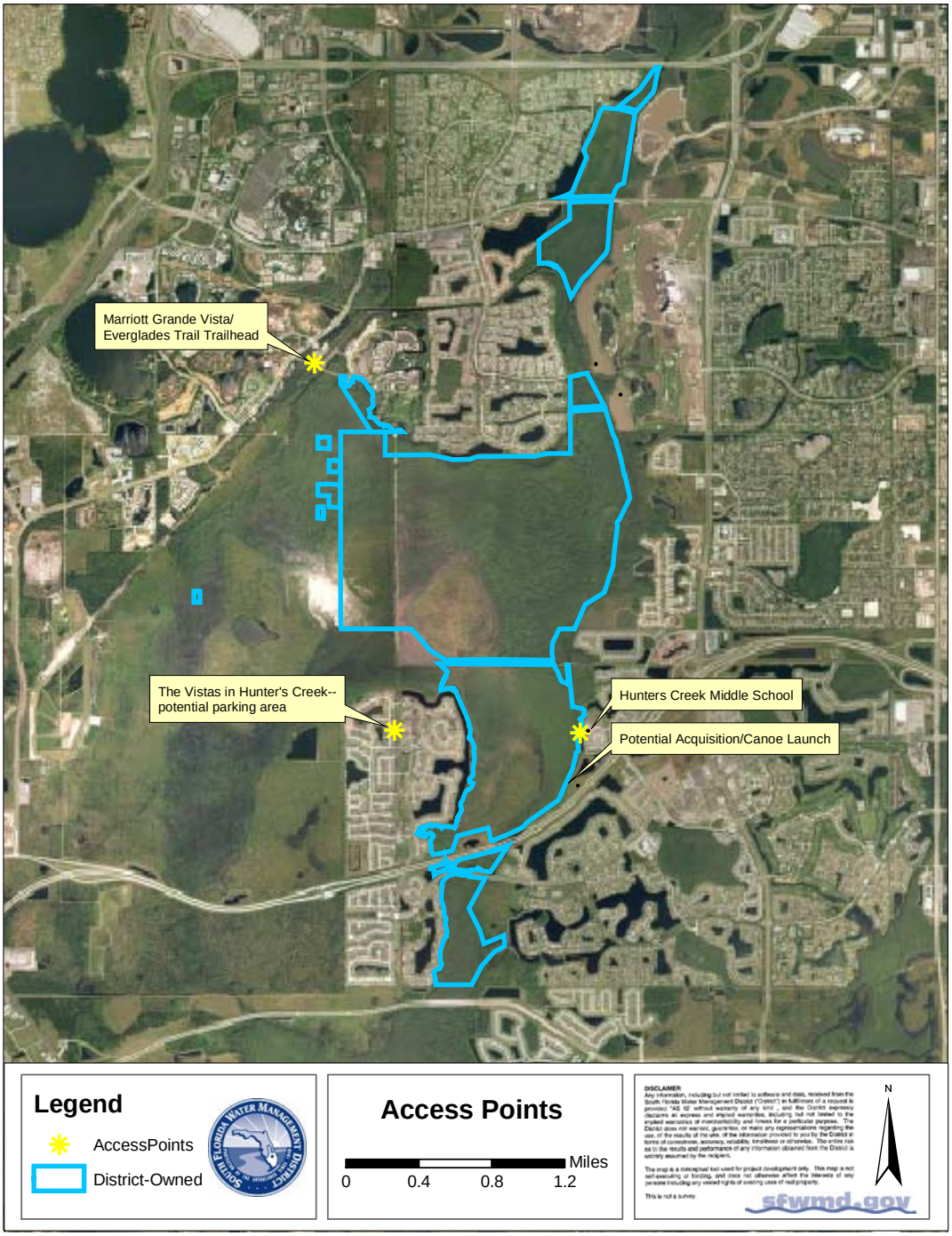
Several recreational activities are appropriate and encouraged on the MA (need map showing trails, trailheads, parking, etc.). Activities include hiking, fishing, birding, canoeing, nature appreciation, and biking. User information concerning recreational activities is located at the MA, Orlando Service Center, West Palm Beach main office, and also at the District's Recreation website (*http://xstage.sfwmd.gov/site/index.php?id=35*).

Approximately 5 miles of interior roadway and hiking trails provide access for public use. Although primitive, the MA trail system covers a range of MA habitats from cypress swamp to pine flatwoods. It spans two access points (Hunters Creek Middle School, and The Vistas) and, for those willing to get their feet wet, affords an opportunity to walk along Shingle Creek for miles. To further expand the trail system, the District plans to construct a boardwalk in the western part of the site, which will connect the access point at the Marriott trail to the rest of trail system and provide hikers the experience of the deep cypress swamp.

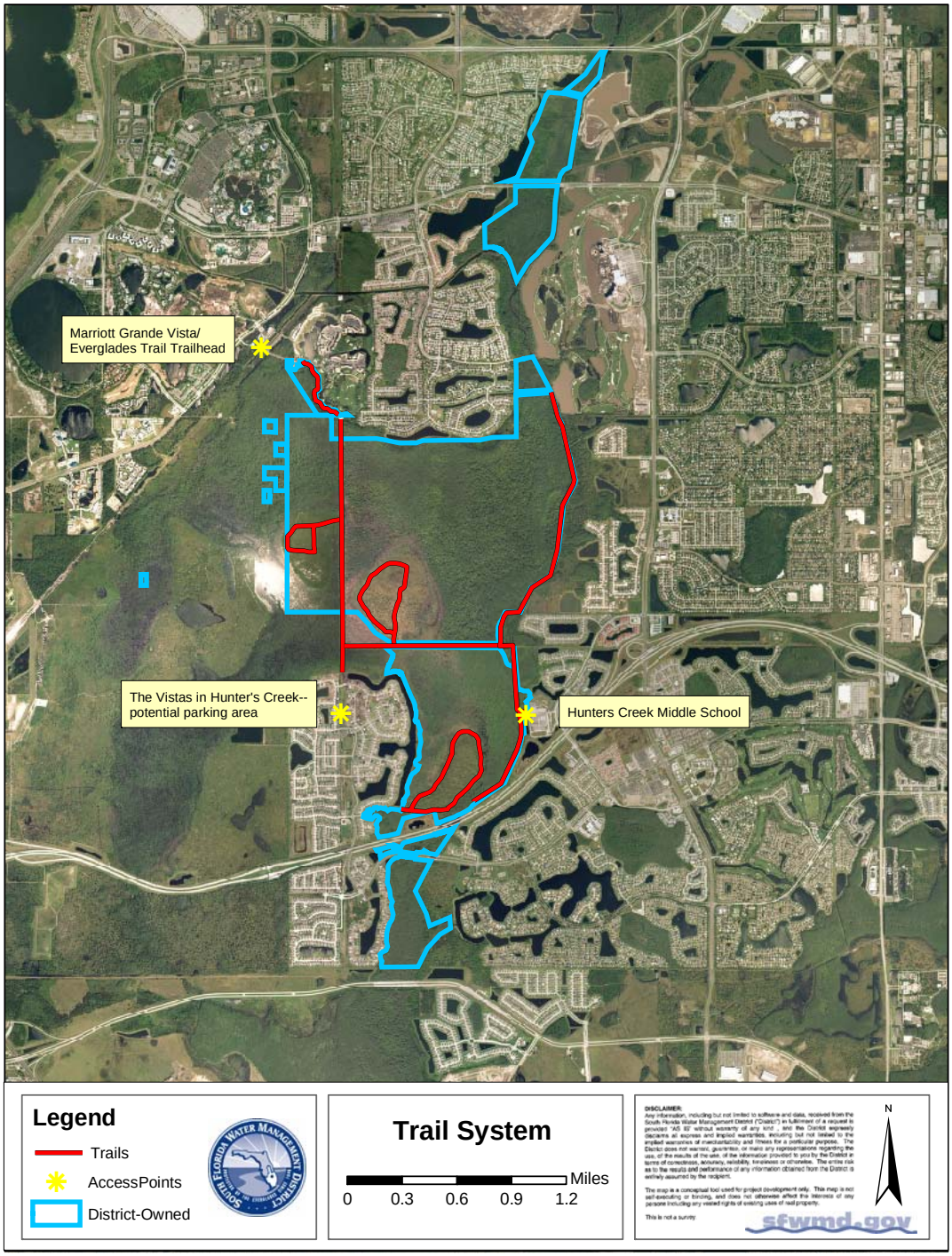
The trail adjacent to the Marriott Grande Vista Resort is also a featured stop of the Everglades Trail (http://www.evergladestrail.com/), a series of 20 trailheads from Orlando to Everglades National Park. As the headwaters of the Everglades, Shingle Creek empties into the Upper Kissimmee Chain of Lakes, which flows into the Kissimmee River, Lake Okeechobee, and ultimately the Everglades itself. The trailheads, like the one in Shingle Creek, illustrate the extent, diversity, and interconnection of the Everglades ecosystem. The Everglades Trail was initiated by U. S. Senator Bob Graham and created cooperatively by the Office of Greenway and Trails (OGT), The Nature Conservancy, DEP, and others.

Finally, the District is exploring the creation of a canoe trail in cooperation with OGT and local interests. While canoeing is allowed in Shingle Creek, there is no canoe launch or take-out platform along the MA, and it is difficult to get a canoe in and out of the creek. Proper facilities would enhance creek access and provide a better opportunity to enjoy the creek system. Water levels in the creek fluctuate greatly, however, and canoeing would depend upon creek depth and navigability. Still, with funding and local support, canoeing could become a popular activity.

Map 9.


Marriott Grande Vista/
Everglades Trail Trailhead
The Vistas in Hunter's Creek--
potential parking area
Hunters Creek Middle School
Potential Acquisition/Canoe Launch
Legend
AccessPoints
District-Owned
Access Points
Miles
0
0.4
0.8
1.2
N
sfwmd.gov

Map 10.


Marriott Grande Vista/
Everglades Trail Trailhead
The Vistas in Hunter's Creek--
potential parking area
Hunters Creek Middle School
Legend
Trails
AccessPoints
District-Owned
Trail System
Miles
0
0.3
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0.9
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sfwmd.gov

Map 11.

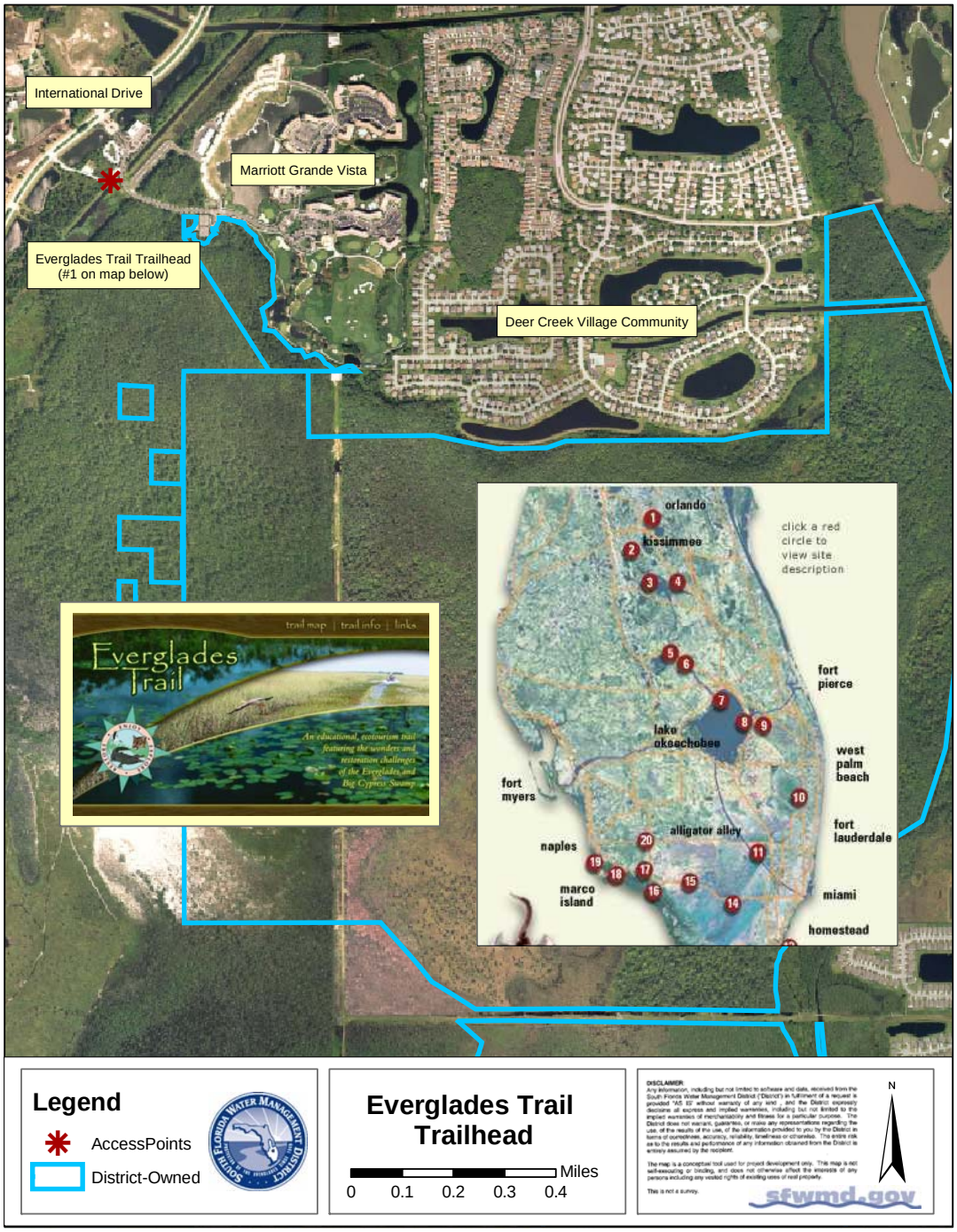
International Drive
Marriott Grande Vista
Everglades Trail Trailhead
(#1 on map below)
Deer Creek Village Community
Everglades Trail
trail map | trail info | links
An educational, ecotourism trail featuring the wonders and restoration challenges of the Everglades and Big Cypress Swamp
orlando
kissimmee
click a red circle to view site description
fort pierce
lake okeechobee
west palm beach
fort myers
fort lauderdale
alligator alley
naples
marco island
miami
homestead
Legend
AccessPoints
District-Owned
Everglades Trail Trailhead
Miles
0 0.1 0.2 0.3 0.4
N
sfwmd.gov

Table 8. Suitability of Land Use Matrix for the SCMA

Potential Use	High Resource Vulnerability	Moderate Resource Vulnerability	Limited Resource Vulnerability	Minimal Resource Vulnerability
Hiking / Wilderness	with restrictions, monitor and restrict number and length of season	restrict number, monitor and restrict number and length of season	yes	yes
Hiking / Seasonal	with restrictions, monitor and restrict number and length of season	restrict number, monitor and restrict number and length of season	yes	yes
Primitive Camping	no	with restrictions, monitor and restrict number and length of season	yes	yes
Bank Fishing	with restrictions, monitor and restrict number and length of season	with restrictions, monitor and restrict number and length of season	yes	yes
Bird Watching / Passive	with restrictions, monitor and restrict number	with restrictions, monitor and restrict number	yes	yes
Bird Blinds	no	with restrictions, depends on specific on site	yes	yes
Canoeing	limit access and number	limit access and number	yes	yes
Picnicking with Facilities	no	no	yes	yes
Picnicking without Facilities	with restrictions, monitor and restrict number and length of season	with restrictions, monitor and restrict number and length of season	yes	yes
Boardwalks	with restrictions, locations to be dependent on drainage and potential water levels and channel conveyance and impedance	with restrictions, locations to be dependent on drainage and potential water levels and channel conveyance and impedance	yes	yes
Seasonal, Unpaved Vehicular Access	no	no	no	no

Suitability of Land Use Matrix (continued)

Potential Use	High Resource Vulnerability	Moderate Resource Vulnerability	Limited Resource Vulnerability	Minimal Resource Vulnerability
Restrooms	no	no	no	yes
Camp Fire	no	no	yes	yes
Fire Pits	no	no	no	yes
Air Boating	no	no	yes	yes
Motor Boating	no	no	yes	yes
Boat ramps – Structured	no	no	no	no
Boat Ramps – Grade Launches	no	no	no	no
Parking	no	no	no	with restrictions, restrictions are site specific
Buildings (e.g. Visitors)	no	no	no	yes
Equestrian Trails	no	no	with restrictions, restrictions are determined by site specific locations	yes
Bicycle Trails	no	no	yes	yes
ATV Vehicles	no	no	no	no
Airstrip	no	no	no	no
Paved Access	no	no	no	with restrictions, restrictions are determined by site specific locations

6.1Resource Protection

<u>Policy 140-25(1)(d)</u> 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.

<u>Policy 140-25(3)(g)</u> 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.

<u>Policy 140-25(4)(b)(1)</u> 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.

Regulations that govern activities within the MA are in the District's *Public Use Guide*, which is available at the Orlando Service Center office and at agency

headquarters in West Palm Beach. Allowed activities include hiking, fishing, birding, biking, and nature study. Prohibited activities include airboating, horseback riding, camping, and hunting. FWC is responsible for enforcing laws, rules, and regulations applicable to MA, along with Orange 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 FWC, FWC 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 FWC, Orange 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, although the District currently finds no need for perimeter fencing.

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.

The District has developed a Memorandum of Understanding (MOU) with Orange County Schools that will provide local schools special access to the MA through District-owned property contiguous with the Hunter's Creek Middle School. Area students will be able to conduct scientific experiments, nature study, etc., and help District staff in its management of the MA. In turn, the District will gain public access through school grounds during non-school hours and holidays.

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 Orlando Service Center office in Orlando. The primary contact for information is the MA land manager, Michael Green, 407-858-6100, x3830.

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 (Appendix K). 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.

SCMA 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 Orlando Service Center and West Palm Beach (Appendix K) .

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 quarterly 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. For the MA, the District derives its management funding primarily from off-site mitigation and Central Florida Beltway Mitigation per 338.250 F.S. To date the District has received approximately $11.4 million in land and funds to compensate for impacts related to the construction of the Central Florida Beltway. The funding has been or will be used to accomplish mitigation alternatives outlined in the District's Central Florida Beltway Conceptual Mitigation Plans (Green 2001; Robbins 1994).

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 the Orlando Utilities Commission (OUC), primarily from its regular maintenance of the powerline corridors. Current MA infrastructure includes three entrances, perimeter posting, firelines, hiking trails and roads, and the proposed bridge and boardwalk, all of 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 Shingle Creek land manager, as well as Upper Lakes Regional land manager and land management technician. 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.

Student interns are also hired on a project-specific, time-limited basis to conduct fieldwork. Interns have been acquired through contracts with the Student Conservation Association and the Center for Environmental Studies to conduct field sampling and develop visitor's center displays.

Land management objectives are also occasionally met by alternative work forces. When available, alternative work forces can be used for projects that demand manual labor and have low technical skill requirements. The MA manager coordinates with local corrections staff for brush clearing, trash pick up, and other maintenance activities. Other volunteer projects to date include Shingle Creek trash clean-ups, plant inventories (Native Plant Society), bird surveys (Lorne Malo, biologist), butterfly surveys, and a bird box project with a local Boy Scout troop.

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:

Orange County Parks and Recreation
The District and Orange County have developed a lease agreement as a pre-requisite for a Florida Recreational Development Assistance Program (FRDAP) grant (Contract C-16029). The 25-year lease states that Orange County will maintain a proposed ½-mile long boardwalk that will be constructed in the northwest portion of the MA and connect with the existing trail at the Marriott tract. The boardwalk will tie in another public access point to the MA trail system and allow visitors an opportunity to experience the more remote parts of the swamp. Contingent upon the grant being awarded, the District will provide matching funds, design, and construct the project.

FWC Resource Protection Contract

The District contracted with the FWC for additional resource protection services (Contract C-10162). These services cover areas throughout the District and include supplemental patrols on the MA during times of higher public use. The District's resource protection coordinator schedules patrols with input from the MA land manager and FWC.

Florida Natural Areas Inventory MOU
The District finalized an MOU with the FNAI to facilitate exchange of listed species data on SOR lands (District Contract C-9341). New data on MA listed species are provided to FNAI.

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.

An MA management review was conducted in 1999, and again in 2005 by eight-person review teams. The team concluded that MA's management was consistent with acquisition intent; however, the 1999 team recommended that prescribed burning be increased, that more acreage be burned in the growing season, and that the management plan be updated. MA managers incorporated these recommendations in subsequent management objectives and activities. The 2005 team gave high marks and positive coments to the current burn frequency and the results of the last several burning seasons. The 2005 team also recommended increased public use opportunities. Results of the management review as well as the District's response to management team recommendations are available at the West Palm Beach offices.

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Appendix A

Definitions

Adaptive Management – a cyclical process in which inventories document resource presence, management actions are applied, and monitoring and research activities evaluate the effectiveness of those actions; management actions are then revised and applied again.

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

Best Management Practices - the best available technology or process that is practical and achieves the desired goal or objective.

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

Cooperative Management Agreement - 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.

Easement - an interest in the land of another that provides the easement holder specified rights without fee-title ownership.

Endemic - native to, and restricted to, a particular geographic region

Enhancement - modification of select physical attributes of a natural community to improve ecosystem function.

Exotic - an organism whose origin is of another continent.

Lease - a legal agreement that defines rights and responsibilities for use of land owned by another party.

Listed Species - species considered at risk (species of special concern, threatened, or endangered) within a specific geographic area by the USFWS and the FWC.

Maintenance - work performed to preserve property conditions on a regular basis.

Management - planned control and manipulation of factors affecting property conditions.

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

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

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

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

Native Species - species considered indigenous to the North American continent prior to European settlement.

Natural Community - a distinct and reoccurring assemblage of plant and animal populations naturally associated with each other and their physical environment.

Prescribed Fire - application of fire to natural communities according to a written prescription; the prescription executed with a defined goal and under specific environmental and physical parameters.

Regional Mitigation Area - Permitted wetland impacts offset through payment for the acquisition, restoration, enhancement, and perpetual management of a Save Our Rivers-identified and duly noticed project.

Reservation - a legal agreement between a property seller and buyer that defines the seller's rights and responsibilities of post-sale property use

Responsible Management - that level of management described in the General Management Plan (GMP).

Restoration - re-creation of physical attributes of a natural system with the intent to return original ecological function.

Sustainable Use - to provide continued use of a natural resource without long-term degradation or loss of that resource

Appendix B

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 C

Acronyms

AWP	Annual Work Plan
DOF	Florida Division of Forestry
DEP	Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
FNAI	Florida Natural Areas Inventory
GMP	General Management Plan
LSP	Land Stewardship Program (SFWMD)
NGVD	National Geodetic Vertical Datum
NSLP	Natural Soil Landscape Positions
OFW	Outstanding Florida Waters
ONRW	Outstanding Natural Resource Waters
SCMA	Shingle Creek Management Area
SFWMD	South Florida Water Management District
SOR	Save Our Rivers Program (SFWMD)
USFWS	United States Fish and Wildlife Service

Appendix D. Plant Species List

Key: (**E**)ndangered, (**T**)hreatened, (**C**)ommercially exploited;
Florida Department of Agriculture and Consumer Services, 2003

Survey Data compiled by District staff, volunteers Lorne Malo, Randy Snyder, Mary Keim, The Native Plant Society/Tarflower Chapter, and Glatting, Jackson, et al.
☠ = Category I Invasive Exotic species

Total Count	GENUS SPECIES	COMMON NAME	FAMILY	Status	
				Fed	State
1	*Acer rubrum*	Red Maple	Aceraceae		
2	*Acrostichum danaeifolium*	Leather Fern	Adiantaceae		
3	*Agalinus sp.*	Foxglove	Scrophulariaceae		
4	*Aletris lutea*	Yellow Colic-root	Liliaceae		
5	*Alternanthera philoxeroides*	Alligator-weed	Amaranthaceae		
6	*Ambrosia artemisiifolia*	Ragweed	Asteraceae		
7	*Ampelopsis arborea*	Pepper Vine	Vitaceae		
8	*Amphicarpum muhlenbergianum*	Blue Maidencane	Poaceae		
9	*Andropogon glomeratus*	Bushy Bluestem	Poaceae		
10	*Aristida purpurea*	Purple Three-awn	Poaceae		
11	*Andropogon virginicus*	Broom Grass	Poaceae		
12	*Andropogon virginicus v. glaucus*	Chalky Bluestem	Poaceae		
13	*Aristida spiciformis*	Three-awngrass	Poaceae		
14	*Aristida stricta*	Wiregrass	Poaceae		
15	*Asclepias curassavica*	Scarlet Milkweed	Asclepiadaceae		
16	*Asclepias longifolia*		Apocynaceae		
17	*Asclepias pedicellata*	Savanna Milkweed	Asclepiadaceae		
18	*Asimina reticulata*	Pawpaw, Dog Banana	Annonaceae		
19	*Aster carolinianus*	Climbing Aster	Asteraceae		
20	*Aster elliotti*	Elliott's Aster	Asteraceae		
21	*Axonopus sp.*	Carpet Grass	Poaceae		
22	*Axonopus furcatus*	Big Carpetgrass	Poaceae		
23	*Azolla caroliniana*	Carolina Mosquitofern	Azollaceae		
24	*Baccharis halimifolia*	Saltbush	Asteraceae		
25	*Bacopa caroliniana*	Lemon Bacopa	Scrophulariaceae		
26	*Bacopa monnieri*	Smooth Water-hyssops	Scrophulariaceae		
27	*Befaria racemosa*	Tarflower	Ericaceae		
28	*Bidens alba*	Spanish Needle	Asteraceae		
29	*Bidens mitis*	Beggar-ticks	Asteraceae		
30	*Bigelowia nudata*	Rayless Goldenrod	Asteraceae		
31	*Blechnum serrulatum*	Swamp Fern	Blechnaceae		
32	*Boehmeria cylindrica*	False Nettle	Urticaceae		
33	*Brachiaria mutica*	Para grass	Poaceae		
34	*Buchnera americana*	American bluehearts	Orabanchaceae		
35	*Bulbostylis ciliatifolia*	Capillary Hairsedge	Cyperaceae		
36	*Burmannia biflora*	Northern Bluethread	Burmanniaceae		

37	*Callicarpa americana*	Beautyberry	Verbenaceae		
38	*Campsis radicans*	Trumpet Vine	Bignoniaceae		
39	*Carex sp.*	Sedge	Cyperaceae		
40	*Carex glaucescens*	Southern Waxy Sedge	Cyperaceae		
41	*Carphephorus carnosus*	Chaffhead	Asteraceae		
42	*Carphephorus corymbosus*	Coastalplain Chaffhead	Asteraceae		
43	*Carphephorus ordoratissumus*	Vanilla Plant; Deer-tongue	Asteraceae		
44	*Ceanothus sp.*		Rhamnaceae		
45	*Centella asiatica*	Spadeleaf	Araliaceae		
46	*Centella erecta*	Coinwort	Apiaceae		
47	*Centrosema virginianum*	Spurred butterfly pea	Fabaceae		
48	*Cephalanthus occidentalis*	Buttonbush	Rubiaceae		
49	*Ceratopteris thalictroides*	Water Horn Fern	Parkeriaceae		
50	*Chamaecrista nictitans*	Partridge pea	Fabaceae		
51	*Cinnamomum camphora*	Camphor Tree	Lauraceae		
52	*Cirsium horridulum*	Thistle	Asteraceae		
53	*Cladium jamaicense*	Saw-grass	Cyperaceae		
54	*Cleome hassleriana*	Pinkqueen Spiderflower	Brassicaceae		
55	*Clitoria mariana*	Atlantic pigeonwings	Fabaceae		
56	*Colocasia esculenta*	Wild Taro	Araceae		
57	*Commelina diffusa*	Dayflower	Commelinaceae		
58	*Conyza sp.*	Horseweed	Asteraceae		
59	*Coreopsis leavenworthii*	Tickseed	Asteraceae		
60	*Crotalaria rotundifolia*	Rabbitbells	Fabaceae		
61	*Cuphea carthagenensis*	Columbia Waxweed	Lythraceae		
62	*Cynodon dactylon*	Bermuda Grass	Poaceae		
63	*Cyperus spp.*	Flatsedges	Cyperaceae		
64	*Cyperus drumondii*	Flat Sedge	Cyperaceae		
65	*Cyperus odoratus*	Flat Sedge	Cyperaceae		
66	*Desmodium sp.*	Tick-trefoil	Fabaceae		
67	*Dichanthelium sp.*	Panic Grass	Poaceae		
68	*Dichanthelium scabriusculum*	Woolly rosette grass	Poaceae		
69	*Dichromena colorata*	White-top Sedge	Cyperaceae		
70	*Diodia virginiana*	Buttonweed	Rubiaceae		
71	*Dioscorea bulbifera*	Air Potato	Dioscoreaceae		
72	*Drosera brevifolia*	Dwarf sundew	Droseraceae		
73	*Drosera capillaris*	Pink Sundew	Droseraceae		
74	*Dulichium arundinaceum*	Three-way Sedge	Cyperaceae		
75	*Echinochloa walteri*	Coast cockspur	Poaceae		
76	*Eichhornia crassipes*	Water Hyacinth	Pontederiaceae		
77	*Eleocharis sp.*	Spikerush	Cyperaceae		
78	*Elephantopus elatus*	Florida Elephant's Foot	Asteraceae		
79	*Eragrostis elliottii*	Elliott's lovegrass	Poaceae		
80	*Erechtites hieracifolia*	Fireweed	Asteraceae		
81	*Erigeron quercifolius*	Oakleaf Fleabane	Asteraceae		

82	*Erigeron vernus*	Fleabane	Asteraceae		
83	*Eriocaulon decangulare*	Tenangle Pipewort	Eriocaulaceae		
84	*Eryngium yuccifolium*	Button Snakeroot	Apiaceae		
85	*Eupatorium capillifolium*	Dog Fennel	Asteraceae		
86	*Eupatorium mohrii*	Dog Fennel	Asteraceae		
87	*Eupatorium rotundifolium*	False Soarhound	Asteraceae		
88	*Euthamia minor*	Flat-topped Goldenrod	Asteraceae		
89	*Fimbristylis sp.*	Fringe-rushes	Cyperaceae		
90	*Fuirena sp.*	Umbrella-grass	Cyperaceae		
91	*Fuirena scirpoidea*	Southern umbrellasedge	Cyperaceae		
92	*Galactia elliottii*	Elliott's Milk-pea	Fabaceae		
93	*Galium tinctorium*	Stiff marsh Bedstraw	Rubiaceae		
94	*Gaura angustifolia*	Southern Beeblossom	Onagraceae		
95	*Gaylussacia dumosa*	Dwarf Huckleberry	Ericaceae		
96	*Geranium caroliniaum*	Crane's Bill	Geraniaceae		
97	*Gordonia lasianthus*	Loblolly Bay	Theaceae		
98	*Gratiola hispida*	Rough Hedgehyssop	Veronicaceae		
99	*Gymnopogon sp.*	Skeleton Grass	Poaceae		
100	*Habenaria quinqueseta*	Spider Orchid	Orchidaceae		
101	*Habenaria sp.*	Rein Orchid	Orchidaceae		
102	*Hedyotis procumbens*	Innocence	Rubiaceae		
103	*Hydrocotyle umbellata*	Pennywort	Apiaceae		
104	*Hypericum brachyphyllum*	Coastalplain St. John's-wort	Clusiaceae		
105	*Hypericum cistifolium*	St. John's Wort	Hypericaceae		
106	*Hypericum crux-andreae*	St. Peter's Wort	Clusiaceae		
107	*Hypericum hypericoides*	St. Andrews Cross	Hypericaceae		
108	*Hypericum myrtifolium*	Hypericum	Hypericaceae		
109	*Hypericum mutilum*	Dwarf St. John's Wort	Clusiaceae		
110	*Hypericum reductum*	Matted Sandweed	Hypericaceae		
111	*Hypericum tetrapetalum*	St. Peter's Wort	Hypericaceae		
112	*Hypoxis spp.*	Yellow-star Grass	Hypoxoidaceae		
113	*Hypoxis juncea*	Yellow-star Grass	Liliaceae		
114	*Ilex cassine*	Dahoon Holly	Aquifoliaceae		
115	*Ilex glabra*	Gallberry	Aquifoliaceae		
116	*Iris hexagona*	Iris	Iridaceae		
117	*Itea virginica*	Virginia Willow	Saxifragaceae		
118	*Juncus effusus*	Soft Rush	Juncaceae		
119	*Juncus marginatus*	Rush	Juncaceae		
120	*Juncus repens*	Creeping rush	Juncaceae		
121	*Lachnanthes caroliana*	Redroot	Haemodoraceae		
122	*Lachnocaulon sp.*	Bog Buttons	Eriocaulaceae		
123	*Lachnocaulon anceps*	Bog Buttons	Eriocaulaceae		
124	*Lachnocaulon minus*	Bog Buttons	Eriocaulaceae		
125	*Lechea minor*	Pinweed	Cistaceae		
126	*Lemna minor*	Duck Weed	Lemnaceae		

127	*Lepidium virginicum*	Poorman's Pepper	Brassicaceae		
128	*Liatris sp.*	Blazing star	Asteraceae		
129	*Lilium catesbaei*	Southern Red Lily	Liliaceae		T
130	*Limnobium spongia*	American Spongeplant	Hydrocharitaceae		
131	*Limnophila sessiliflora*	Asian Marshweed	Scrophulariaceae		
132	*Linaria canadensis*	Blue or Oldfield Toadflax	Scrophulariaceae		
133	*Liquidambar styraciflua*	Sweet Gum	Hamamelidaceae		
134	*Lobelia paludosa*	White Lobelia	Campanulaceae		
135	*Ludwigia sp.*		Onagraceae		
136	*Ludwigia alternifolia*	Seedbox	Onagraceae		
137	*Ludwigia maritima*	Seaside primrose-willow	Onagraceae		
138	*Ludwigia octovalvis*		Onagraceae		
139	*Ludwigia peruviana*	Water Primrose	Onagraceae		
140	*Ludwigia repens*	Red Ludwigia	Onagraceae		
141	*Ludwigia suffruticosa*	Headed Seedbox	Onagraceae		
142	*Lycopodium sp.*	Club Moss	Lycopodiaceae		
143	*Lycopus rubellus*	Water-hoarhound	Lamiaceae		
144	*Lygodesmia aphylla*	Roserush	Asteraceae		
145	*Lygodium japonicum*	Japanese Climbing Fern	Lygodiaceae		
146	*Lygodium microphyllum*	Old World Climbing Fern	Lygodiaceae		
147	*Lyonia fruticosa*	Staggerbush	Ericaceae		
148	*Lyonia lucida*	Shiny Lyonia	Ericaceae		
149	*Magnolia virginiana*	Sweet Bay	Magnoliaceae		
150	*Melia azedarach*	Chinaberry; Chineseberry	Meliaceae		
151	*Melothria pendula*	Creeping Cucumber	Cucurbitaceae		
152	*Micranthemum umbrosum*	Baby Tears	Scrophulariaceae		
153	*Mikania scandens*	Climbing Hempweed	Asteraceae		
154	*Momordica charantia*	Wild Balsam Apple	Cucurbitaceae		
155	*Myrica cerifera*	Wax Myrtle	Myricaceae		
156	*Myrica cerifera var. pumila*	Wax Myrtle	Myricaceae		
157	*Myriophyllum sp.*	Watermilfoil	Haloragaceae		
158	*Nephrolepis sp.*	Sword Fern	Dryopteridaceae		
159	*Nymphaea odorata*	Fragrant Water-lily	Nymphaeaceae		
160	*Nymphoides aquatica*	Floating Hearts	Menyanthaceae		
161	*Nyssa sylvatica var. biflora*	Swamp Tupelo, Blackgum	Nyssaceae		
162	*Oldenlandia uniflora*	Oldenlandia	Rubiaceae		
163	*Orontium aquaticum*	Golden Club/Neverwet	Araceae		
164	*Osmunda cinnamomea*	Cinnamon Fern	Osmundaceae		CE
165	*Osmunda regalis*	Royal Fern	Osmundaceae		CE
166	*Oxalis stricta*	Common Yellow Oxalis	Oxalidaceae		
167	*Oxypolis filiformis*	Water dropwort	Apiaceae		
168	*Panicum anceps*	Beaked panicgrass	Poaceae		
169	*Panicum hemitomon*	Maidencane	Poaceae		
170	*Panicum longifolium*		Poaceae		
171	*Panicum repens*	Torpedograss	Poaceae		

172	*Panicum rigidulum*	Redtop panicgrass	Poaceae		
173	*Panicum verrucosum*	Warty panicgrass	Poaceae		
174	*Parthenocissus quinquefolia*	Virgina Creeper; Woodbine	Vitaceae		
175	*Paspalum notatum*	Bahia Grass	Poaceae		
176	*Paspalum setaceum*	Thin paspalum	Poaceae		
177	*Paspalum urvillei*	Vasey Grass	Poaceae		
178	*Passiflora incarnata*	Passion-flower	Passifloraceae		
179	*Peltandra virginica*	Green Arum	Araceae		
180	*Persea borbonia*	Red Bay	Lauraceae		
181	*Persea palustris*	Swamp Bay	Lauraceae		
182	*Phlebodium aureum*	Golden Polpody	Polypodiaceae		
183	*Phyla nodiflora*	Frog-fruit, Carpetweed	Verbenaceae		
184	*Physostegia purpurea*	False Dragonhead	Lamiaceae		
185	*Piloblephis rigida*	Wild Pennyroyal	Lamiaceae		
186	*Pinus elliotti*	Slash Pine	Pinaceae		
187	*Pinus palustris*	Longleaf Pine	Pinaceae		
188	*Pinus serotina*	Pond Pine	Pinaceae		
189	*Pityopsis graminifolia*	Silk-grass	Asteraceae		
190	*Platanthera ciliaris*	Yellow Fringed Orchid	Orchidaceae		
191	*Pluchea sp.*	Camphorweed	Asteraceae		
192	*Pluchea foetida*	Stinking camphorweed	Asteraceae		
193	*Pluchea odorata*	Camphorweed/Fleabane	Asteraceae		
194	*Pluchea longifolia*	Longleaf camphorweed	Asteraceae		
195	*Pluchea rosea*	Marsh Fleabane	Asteraceae		
196	*Polygala incarnata*	Procession flower	Polygalaceae		
197	*Polygala lutea*	Bog Batchelor's Button	Polygalaceae		
198	*Polygala nana*	Wild bachelor's button	Polygalaceae		
199	*Polygala rugelii*	Yellow Batchelor's Button	Polygalaceae		
200	*Polygala setacea*	Coastal-plain Milkwort	Polygalaceae		
201	*Polygonum hydropiperoides*	Wild Water-pepper	Polygonaceae		
202	*Polygonum punctatum*	Dotted Smartweed	Polygonaceae		
203	*Polypodium polypodiodes*	Resurrection Fern	Polypodiaceae		
204	*Polypremum procumbens*	Rustweed; Juniper Leaf	Buddlejaceae		
205	*Pontederia cordata*	Pickerelweed	Pontederiaceae		
206	*Proserpinaca sp.*	Mermaid-weed	Haloragaceae		
207	*Psidium cattleianum*	Strawberry Guava	Myrtaceae		
208	*Psidium guajava*	Common Guava	Myrtaceae		
209	*Pteridium aquilinum*	Bracken Fern	Dennstaedtiaceae		
210	*Pterocaulon virgatum*	Wand Blackroot	Asteraceae		
211	*Ptilimnium cappillaceum*	Mock Bishop's-weed	Apiaceae		
212	*Quercus geminata*	Sand live oak	Fagaceae		
213	*Quercus laevis*	Turkey oak	Fagaceae		
214	*Quercus laurifolia*	Swamp Laurel Oak	Fagaceae		
215	*Quercus minima*	Dwarf live oak	Fagaceae		
216	*Quercus nigra*	Water Oak	Fagaceae		

217	*Quercus virginiana*	Live Oak	Fagaceae		
218	*Rhexia mariana*	Pale Meadow Beauty	Melastometaceae		
219	*Rhexia nuttallii*	Nuttall's Rhexia	Melastometaceae		
220	*Rhus copallinum*	Winged Sumac	Anacardiaceae		
221	*Rhynchospora sp.*	Beakrush	Cyperaceae		
222	*Rhynchospora chalarocephala*	Loosehead beaksedge	Cyperaceae		
223	*Rhynchospora chapmanii*	Chapman's beaksedge	Cyperaceae		
224	*Rhynchospora fascicularis*	Fascicled beaksedge	Cyperaceae		
225	*Rhynchospora intermedia*	Pinebarren beaksedge	Cyperaceae		
226	*Rhynchospora inundata*	Horned beaksedge	Cyperaceae		
227	*Rhynchospora microcarpa*	Southern beaksedge	Cyperaceae		
228	*Rhynchospora microcephala*	Beaksedge	Cyperaceae		
229	*Rhynchospora rariflora*	Fewflower beaksedge	Cyperaceae		
230	*Ricinus communis*	Castorbean	Euphorbiaceae		
231	*Rubus argutus*	Sawtooth blackberry	Rosaceae		
232	*Rubus betulifolius*	Blackberry	Rosaceae		
233	*Sabal palmetto*	Cabbage Palm	Arecaceae		
234	*Sabatia difformis*	Lance-leaf Rose-gentian	Gentianaceae		
235	*Saccharum giganteum*	Sugarcane plumegrass	Poaceae		
236	*Sacciolepis striata*	American cupscale	Poaceae		
237	*Sagittaria graminea*	Grassy Arrowhead	Alismataceae		
238	*Sagittaria lancifolia*	Bull-tongue Arrowhead	Alismataceae		
239	*Sagittaria latifolia*	Duck Potato	Alismataceae		
240	*Salix caroliniana*	Carolina Willow	Salicaceae		
241	*Salvinia minima*	Water Spangles	Salviniaceae		
242	*Sambucus canadensis*	Elderberry	Caprifoliaceae		
243	*Sapium sebiferum*	Chinese Tallow	Euphorbiaceae		
244	*Sarracenia minor*	Hooded pitcherplant	Sarraceniaceae		T
245	*Saururus cernuus*	Lizard's Tail	Saururaceae		
246	*Schinus terebinthifolius*	Brazilian Pepper	Anacardiaceae		
247	*Schizachyrium sp.*	Bluestem	Poaceae		
248	*Schizachyrium sanguineum*	Crimson bluestem	Poaceae		
249	*Schizachyrium scoparium*	Little bluestem	Poaceae		
250	*Schrankia microphylla*	Sensitive Briar	Fabaceae		
251	*Scirpus cyperinus*	Woolgrass	Cyperaceae		
252	*Scleria ciliata* var. *pauiflora*	Fewflower nutrush	Cyperaceae		
253	*Scleria reticularis*	Netted nutrush	Cyperaceae		
254	*Scleria triglomerata*	Whip nutrush	Cyperaceae		
255	*Scoparia dulcis*	Sweet broom	Veronicaceae		
256	*Scutellaria integrifolia*	Helmet flower	Lamiaceae		
257	*Serenoa repens*	Saw Palmetto	Arecaceae		
258	*Sericocarpus tortofolius*	Dixie whitetop aster	Asteraceae		
259	*Sesbania punicea*	Purple Sesban	Fabaceae		
260	*Sida rhombifolia*	Tea Weed, Cuban Jute	Malvaceae		
261	*Sisyrinchium angustifolium*	Narrowleaf Blue-eyed Grass	Iridaceae		

262	*Sisyrinchium atlanticum*	Blue-eyed Grass	Iridaceae		
263	*Smilax auriculata*	Earleaf Greenbrier	Smilacaceae		
264	*Smilax laurifolia*	Catbrier	Smilacaceae		
265	*Smilax rotundifolia*	Roundleaf Greenbrier	Smilacaceae		
266	*Solanum americanum*	Common Nightshade	Solanaceae		
267	*Solanum capsicoides*	Soda Apple	Solanaceae		
268	*Solidago spp.*	Goldenrod	Asteraceae		
269	*Sonchus asper*	Sow Thistle	Asteraceae		
270	*Sorghastrum secundum*	Lopsided indiangrass	Poaceae		
271	*Spartina sp.*	Cord Grass	Poaceae		
272	*Spartina bakeri*	Sand cordgrass	Poaceae		
273	*Spiranthes sp.*	Ladies' Tresses	Orchidaceae		T/E
274	*Sporobolus sp.*	Dropseed Grass	Poaceae		
275	*Sporobolus indicus*	Smutgrass	Poaceae		
276	*Stachys floridana*	Florida Hedgenettle	Lamiaceae		
277	*Stillingia sylvatica*	Queen's delight	Euphorbiaceae		
278	*Symphyotrichum adnatum*	Scaleleaf aster	Asteraceae		
279	*Symphyotrichum carolinianum*	Climbing aster	Asteraceae		
280	*Symphyotrichum subulatum*	Annual saltmarsh aster	Asteraceae		
281	*Taxodium ascendens*	Pond Cypress	Taxodiaceae		
282	*Taxodium distichum*	Bald Cypress	Taxodiaceae		
283	*Tephrosia hispidula*	Sprawling hoarypea	Fabaceae		
284	*Tillandsia fasciculata*	Wild Pine; Giant Air Plant	Bromeliaceae		
285	*Tillandsia recurvata*	Small Ball Moss	Bromeliaceae		
286	*Tillandsia setacea*	Wild Pine	Bromeliaceae		
287	*Tillandsia usneoides*	Spanish Moss	Bromeliaceae		E
288	*Tillandsia utriculata*	Wild Pine	Bromeliaceae		E
289	*Toxicodendron radicans*	Poison Ivy	Anacardiaceae		
290	*Tradescantia ohiensis*	Spiderwort	Commelinaceae		
291	*Typha angustifolia*	Narrowleaf Cattail	Typhaceae		
292	*Typha latifolia*	Broadleaf cattail	Typhaceae		
293	*Urena lobata*	Caesar-weed	Malvaceae		
294	*Utricularia purpurea*	Purple Bladderwort	Lentibulariaceae		
295	*Utricularia subulata*	Zigzag bladderwort	Lentibulariaceae		
296	*Vaccinium corymbosum*	Highbush Blueberry	Ericaceae		
297	*Vaccinium darrowii*	Darrow's Blueberry	Ericaceae		
298	*Vaccinium myrsinites*	Shiny Blueberry	Ericaceae		
299	*Verbena brasiliensis*	Brazilian Vervain	Verbenaceae		
300	*Vicia acutifolia*	Sand Vetch	Fabaceae		
301	*Viola sp.*	Violet	Violaceae		
302	*Viola lanceolata*	Long-leaf Violet	Violaceae		
303	*Vitis munsoniana*	Muscadine Grape	Vitaceae		
304	*Vitis rotundifolia*	Muscadine Grape	Vitaceae		
305	*Woodwardia areolata*	Netted Chain Fern	Blechnaceae		
306	*Woodwardia virginica*	Virginia Chain Fern	Blechnaceae		

307	*Xyris sp.*	Yellow-eyed grass	Xyridaceae		
308	*Xyris caroliniana*	Yellow-eyed grass	Xyridaceae		
309	*Yucca filamentosa*	Adam's Needle	Agavaceae		
310	*Zigadenus densus*	Crow-poison	Liliaceae		

Appendix E. Bird Species List

Total Count	GENUS SPECIES	COMMON NAME	Status	
			Fed	State
1	American Goldfinch	Carduelis tristis		
2	American Kestrel	Falco sparverius		
3	American Redstart	*Setophaga ruticilla*		
4	American Robin	*Turdus migratorius*		
5	American Swallow-tailed Kite	*Elanoides forficatus*		
6	American Woodcock	*Scolopax minor*		
7	Anhinga	*Anhinga anhinga*		
8	Bachman's Sparrow	*Aimophila aestivalis*		
9	Bald Eagle	*Haliaeetus leucocephalus*	T	T
10	Bank Swallow	*Riparia riparia*		
11	Barn Swallow	*Hirundo rustica*		
12	Barred Owl	*Strix varia*		
13	Belted Kingfisher	*Megaceryle alcyon*		
14	Black and White Warbler	*Mniotilta varia*		
15	Black Vulture	*Coragyps atratus*		
16	Black-crowned Night Heron	*Nycticorax nycticorax*		
17	Black-throated Blue Warbler	*Dendroica caerulescens*		
18	Blue Jay	*Cyancitta cristata*		
19	Blue-gray Gnatcatcher	*Polioptila caerulea*		
20	Blue-headed Vireo	*Vireo solitarius*		
21	Blue-winged Teal	*Anas discors*		
22	Boat-tailed Grackle	*Quiscalus major*		
23	Brown-headed Cowbird	*Molothrus ater*		
24	Brown-headed Nuthatch	*Sitta pusilla*		
25	Carolina Chickadee	*Parus carolinensis*		
26	Carolina Wren	*Thryothorus ludovicianus*		
27	Cattle Egret	*Bubulcus ibis*		
28	Cedar Waxxwing	*Bombycilla cedrorum*		
29	Chipping Sparrow	*Spizella passerina*		
30	Chuck-will's-widow	*Caprimulgus carolinensis*		
31	Common Grackle	*Quiscalus quiscula*		
32	Common Moorhen	*Gallinula chloropus*		
33	Common Nighthawk	*Chordeiles minor*		
34	Common Yellowthroat	*Geothlypis trichas*		
35	Cooper's Hawk	*Accipiter cooperii*		
36	Downy Woodpecker	*Picoides pubescens*		
37	Eastern Blueblird	*Sialia sialis*		
38	Eastern Kingbird	*Tyrannus tyrannus*		
39	Eastern Meadowlark	*Sturnella magna*		
40	Eastern Phoebe	*Sayornis phoebe*		
41	Eastern Towhee	*Pipilo erythropthalmus*		

42	European Starling	*Sturnus vulgaris*		
43	Fish Crow	*Corvus ossifragus*		
44	Florida Sandhill Crane	*Grus canadensis*		T
45	Glossy Ibis	*Plegadis falcinellus*		
46	Gray Catbird	*Dumetella carolinensis*		
47	Great Blue Heron	*Ardea herodias*		
48	Great Crested Flycatcher	*Myiarchus crinitus*		
49	Great Egret	*Casmerodius albus*		
50	Greater Yellowlegs	*Tringa melanoleuca*		
51	Green Heron	*Butorides striatus*		
52	Ground Dove	*Columbina passerina*		
53	Hairy Woodpecker	*Picoides villosus*		
54	Hermit Thrush	*Catharus guttatus*		
55	Hooded Merganser	*Lophodytes cucullatus*		
56	House Wren	*Troglodytes aedon*		
57	Indigo Bunting	*Passerina cyanea*		
58	Killdeer	*Charadrius vociferus*		
59	Limpkin	*Aramus guarauna*		SSC
60	Little Blue Heron	*Egretta caerulea*		SSC
61	Loggerhead Shrike	*Lanius ludovicianus*		
62	Mottled Duck	*Anas fulvigula*		
63	Mourning Dove	*Zenaida macroura*		
64	Norther Harrier	*Circus cyaneus*		
65	Northern Bobwhite	*Colinus virginianus*		
66	Northern Cardinal	*Cardinalis cardinalis*		
67	Northern Flicker	*Colaptes auratus*		
68	Northern Mockingbird	*Mimus polyglottos*		
69	Northern Parula	*Parula americana*		
70	Northern R-W Swallow	*Stelgidopteryx serripennis*		
71	Northern Waterthrush	*Seiurus noveboracensis*		
72	Orange-crowned Warbler	*Vermivora celata*		
73	Osprey	*Pandion haliaetus*		
74	Palm Warbler	*Dendroica palmarum*		
75	Pileated Woodpecker	*Dryocopus pileatus*		
76	Pine Warbler	*Dendroica coronata*		
77	Prairie Warbler	*Dendroica discolor*		
78	Prothonotary Warbler	*Protonotaria citrea*		
79	Purple Martin	*Progne subis*		
80	Red-bellied Woodpecker	*Merlanerpes carolinus*		
81	Red-eyed Vireo	*Vireo olivaceus*		
82	Red-Shouldered Hawk	*Buteo lineatus*		
83	Red-tailed Hawk	*Buteo jamaicencis*		
84	Red-winged Blackbird	*Agelaius phoeniceus*		
85	Rock Dove	*Columba livia*		
86	Ruby-crowned Kinglet	*Regulus calendula*		

87	Ruby-throated Hummingbird	*Archilochus colubris*		
88	Sedge Wren	*Cistothorus platensis*		
89	Sharp-shinned Hawk	*Accipiter striatus*		
90	Snowy Egret	*Egretta thula*		SSC
91	Summer Tanager	*Piranga rubra*		
92	Swamp Sparrow	*Melospiza georgiana*		
93	Tree Swallow	*Iridoprocne bicolor*		
94	Tri-colored Heron	*Egretta tricolor*		SSC
95	Tufted Titmouse	*Parus bicolor*		
96	Turkey Vulture	*Cathartes aura*		
97	White Ibis	*Eudocimus albus*		SSC
98	White-eyed Vireo	*Vireo griseus*		
99	Wild Turkey	*Meleagris gallopavo*		
100	Wood Duck	*Aix sponsa*		
101	Wood Stork	*Mycteria americana*	E	E
102	Yellow-bellied Sapsucker	*Sphyrapicus varius*		
103	Yellow-billed Cuckoo	*Coccyzus americanus*		
104	Yellow-rumped Warbler	*Dendroica coronata*		
105	Yellow-throated Vireo	*Vireo flavifrons*		
106	Yellow-throated Warbler	*Dendroica dominica*		

Appendix F. Mammal Species List

Total Count	GENUS SPECIES	COMMON NAME	Status	
			Fed	State
1	*Dasypus novemcinctus*	Armadillo		
2	*Didelphis virginiana*	Opossum		
3	*Lutra canadensis*	River Otter		
4	*Lynx rufus*	Bobcat		
5	*Odocoileus virginianus*	White-tailed deer		
6	*Procyon lotor*	Raccoon		
7	*Sciurus carolinensis*	Eastern gray squirrel		
8	*Sciurus niger shermani*	Sherman's fox squirrel		SSC
9	*Sigmodon hispidus*	Cotton rat		

Appendix G. Butterfly Species List

Total Count	GENUS SPECIES	COMMON NAME	FAMILY
1	*Agraulis vanillae*	Gulf fritillary	Heliconiidae
2	*Anartia jatrophae*	White peacock	Nymphalidae
3	*Ancloxpha numitor*	Least skipper	Hesperiidae
4	*Ascia monuste phileta*	Great southern white	Pieridae
5	*Atrytone logan*	Delaware skipper	Hesperiidae
6	*Calpodes ethlius*	Brazilian skipper	Hesperiidae
7	*Calycopis cecrops*	Red-banded hairstreak	Lycaenidae
8	*Copaeodes minimus*	Southern skipperling	Hesperiidae
9	*Danaus eresimus tethys*	Soldier	Danaidae
10	*Danaus gilippus berenice*	Queen	Danaidae
11	*Danaus plexippus*	Monarch	Danaidae
12	*Epargyreus clarus*	Silver-spotted skipper	Hesperiidae
13	*Erynnis horatius*	Horace's duskywing	Hesperiidae
14	*Erynnis zarucco*	Zarucco duskywing	Hesperiidae
15	*Euphyes vestris*	Dun skipper	Hesperiidae
16	*Eurema daira daira*	Barred yellow	Coliadinae
17	*Eurema lisa*	Little yellow	Coliadinae
18	*Eurema nicippe*	Sleepy orange	Coliadinae
19	*Eurytides marcellus floridensis*	Zebra Swallowtail	Papilionidae
20	*Heliconius charitonius tuckeri*	Zebra longwing	Heliconiidae
21	*Hemiargus ceraunus antibubastus*	Ceraunus blue	Lycaenidae
22	*Hermeuptychia sosybius*	Carolina satyr	Satyridae
23	*Hylephila phyleus*	Fiery skipper	Hesperiidae
24	*Lerema accius*	Clouded skipper	Hesperiidae
25	*Limenitis archippus floridensis*	Viceroy	Nymphalidae
26	*Nathalis iole*	Dainty sulfer	Coliadinae
27	*Neonympha areolata*	Georgia satyre	Satyridae
28	*Oligoria maculata*	Twin-spot skipper	Hesperiidae
29	*Panoquina ocola*	Ocola skipper	Hesperiidae
30	*Papilio cresphontes*	Giant swallowtail	Papilionidae
31	*Papilio glaucus australis*	Eastern tiger swallowtail	Papilionidae
32	*Papilio palamedes*	Palamedes swallowtail	Papilionidae
33	*Papilio polyxenes asterius*	Black swallowtail	Papilionidae
34	*Papilio troilus ilioneus*	Spicebush swallowtail	Papilionidae
35	*Phoebis sennae eubule*	Cloudless sulfur	Coliadinae
36	*Phyciodes phaon*	Phaon crescent	Nymphalidae
37	*Phyciodes tharos tharos*	Pearl crescent	Nymphalidae
38	*Poanes aaroni howardi*	Aaron's skipper	Hesperiidae
39	*Polites themistocles*	Tawny-edged skipper	Hesperiidae
40	*Polites vibex*	Whirlabout	Hesperiidae
41	*Pontia protodice*	Checkered white	Pieridae

42	*Pyrgus communis*	Common checkered	Hesperiidae
43	*Pyrgus oileus*	Tropical checkered skipper	Hesperiidae
44	*Strymon melinus melinus*	Gray hairstreak	Lycaenidae
45	*Thorybes bathyllus*	Southern cloudywing	Hesperiidae
46	*Urbanus dorantes*	Dorantes longtail	Hesperiidae
47	*Urbanus proteus*	Long-tailed skipper	Hesperiidae
48	*Vanessa atalanta rubria*	Red admiral	Nymphalidae

Appendix H. Fish Species List

Total Count	GENUS SPECIES	COMMON NAME	FAMILY
1	*Amia calva*	Bowfin	Amiidae
2	*Dorosoma petenense*	Threadfin shad	Clupeidae
3	*Elassoma evergladei*	Everglades pygmy sunfish	Centrarchidae
4	*Enneacanthus gloriosus*	Bluespotted sunfish	Centrarchidae
5	*Erimyzon sucetta*	Lake chubsucker	Catostomidae
6	*Esox niger*	Chain pickerel	Esocidae
7	*Fundulus seminolis*	Seminole killifish	Cyprinodontidae
8	*Gambusia affinis*	Mosquitofish	Poeciliidae
9	*Jordanella floridae*	Flagfish	Cyprinodontidae
10	*Labidesthes sicculus*	Brook silverside	Atherinidae
11	*Lepisosteus platyrhincus*	Florida gar	Lepisosteidae
12	*Lepomis gulosus*	Warmouth	Centrarchidae
13	*Lepomis macrochirus*	Bluegill	Centrarchidae
14	*Lepomis marginatus*	Dollar sunfish	Centrarchidae
15	*Lepomis microlophus*	Redear sunfish	Centrarchidae
16	*Lepomis punctatus*	Spotted sunfish	Centrarchidae
17	*Lucania goodei*	Bluefin killifish	Cyprinodontidae
18	*Micropterus salmoides*	Largemouth bass	Centrarchidae
19	*Notemigonus crysoleucas*	Golden shiner	Cyprinidae
20	*Poecilia latipinna*	Sailfin molly	Poeciliidae

Appendix I. Amphibian Species List

Total Count	GENUS SPECIES	COMMON NAME	FAMILY
1	*Acris gryllus dorsalis*	Florida cricket frog	Hylidae
2	*Amphiuma means*	Two-toed amphiuma	Amphiumidae
3	*Bufo quercicus*	Oak toad	Bufonidae
4	*Bufo terrestris*	Southern toad	Bufonidae
5	*Eleutherodactylus planirostris planirostris*	Greenhouse frog	Leptodactylidae
6	*Eurycea quadridigitata*	Dwarf salamander	Plethodontidae
7	*Gastrophryne carolinensis carolinensis*	Eastern Narrowmouth toad	Microhylidae
8	*Hyla cinera*	Green treefrog	Hylidae
9	*Hyla femoralis*	Pinewoods treefrog	Hylidae
10	*Hyla squirella*	Squirrel treefrog	Hylidae
11	*Rana grylio*	Pig frog	Ranidae
12	*Rana sphenocephala*	Southern leopard frog	Ranidae
13	*Siren lacertina*	Greater siren	Sirenidae

Appendix J. Reptile Species List

Total Count	GENUS SPECIES	COMMON NAME	FAMILY
1	*Agkistrodon piscivorus conanti*	Florida cottonmouth	Viperidae
2	*Alligator mississippiensis*	American alligator	Alligatoridae
3	*Anolis carolinensis*	Green anole	Iguanidae
4	*Anolis sagrei sagrei*	Brown anole	Iguanidae
5	*Apalone ferox*	Florida softshell turtle	Trionychidae
6	*Cemophora cemophora coccinea*	Florida scarlet snake	Colubridae
7	*Chelydra serpentina*	Common snapping turtle	Chelydridae
8	*Coluber constrictor priapus*	Southern black racer	Colubridae
9	*Diadophis punctatus punctatus*	Southern ringneck snake	Colubridae
10	*Elaphe guttata guttata*	Corn snake; red rat snake	Colubridae
11	*Elaphe obsoleta quadrivittata*	Yellow rat snake; chicken snake	Colubridae
12	*Eumeces inexpectatus*	Southeastern five-lined skink	Scincidae
13	*Farancia abacura abacura*	Eastern mud snake	Colubridae
14	*Gopherus polyphemus*	Gopher tortoise	Testudinnidae
15	*Kinosternon baurii*	Striped mud turtle	Kinosternidae
16	*Nerodia fasciata pictiventris*	Florida water snake	Colubridae
17	*Nerodia taxispilota*	Brown water snake	Colubridae
18	*Pseudemys floridana peninsularis*	Peninsula cooter	Emydidae
19	*Pseudemys nelsoni*	Florida redbelly turtle	Emydidae
20	*Scincella lateralis*	Ground skink	Scincidae
21	*Seminatrix pygaea*	Black swamp snake	Colubridae
22	*Sistrurus miliarius barbouri*	Dusky pigmy rattlesnake	Elapidae
23	*Sternotherus odoratus*	Common musk turtle	Kinosternidae
24	*Storeria dekayi victa*	Florida brown Snake	Colubridae
25	*Terrapene carolina bauri*	Florida box turtle	Emydidae
26	*Thamnophis sauritus sackenii*	Peninsula ribbon snake	Colubridae
27	*Thamnophis sirtalis sirtalis*	Eastern garter snake	Colubridae

Appendix K. Sample Burn Prescription for Shingle Creek

Authorization No. Burn Date

FIRE PRESCRIPTION

FIELD OPERATIONS - Land Stewardship Division
Construction and Land Management Dept.
South Florida Water Management District
23500 SW Kanner Hwy., Canal Point, FL 33834, 561-924-5310

SFWMD Parcel: Shingle Creek. **S 29, 30, 31, 32 T 24**S **R 29**E

County: Orange

Burn Unit Number / Name: Thumb. **Acres to Burn**: 80 ac. **Distance to Disk**: NA

Burn Unit vegetation: Pine flatwoods-wet prairie sloping into basin swamp.

Overstory Type and Height: long leaf/slash pines (few) to 40 ft.

Understory Type and Height: Saw palmetto and gallberry to 8 ft. Herbaceous vegetation to 3 ft.

Fuel Loading: High Medium**X** Low **Date of last fire**: June 2000.

Topography and Soil: Gentle slope into basin swamp, sand on upland areas changing to muck in depression.

Purpose of Burn: Reduce the fuel load in flatwoods. Reduce vegetation density and improve gopher tortoise habitat. Burn to manage fire-adapted communities. Perpetuate or enhance wiregrass community.

Ignition Plan: Backfire downwind side, strip head through the flatwoods habitat. Backfire out around the dome swamp edge and then create strip head/backing fires through the remaining habitats.

Special Precautions: Clear area of nonessential personnel**.** Burn only if swamp has high soil moisture/standing water.

No Burn Situation: Dry, muck soil.

Range of Desired Weather **Preferred** **Actual**

Surface Winds (speed and direction): 6-15 mph S, SW

Transport Winds (speed and direction): > 12 mph S, SW

Mixing Height: >2000

Min. Relative Humidity: 40%

Max. Temperature: 90

Dispersion Index: 41-65

Days since Rain: 3-14

Fine Fuel Moisture estimate: 8-14

Fire Behavior
Type of Fire: Back, Flank**,** Strip Head fire
Flame Length: 1-15 ft.
Desired Fire Intensity: HOT 5 4 **3** 2 1 COOL
Preferred Month(s) of Burn: Any season.
Starting Time: 9:00 am

Smoke Management (See fire plan for more details)
Smoke Screening Passed - Yes
Smoke Sensitive Areas: I-4, John Young Parkway, International Drive, Hunters Creek, Deer Creek, Hunters Creek Middle School
Smoke Precautions: Monitor smoke column; ensure smoke stays off Hwy. 417

Adjacent landowner Contacts: see day of fire contact list

Routine Contacts:
SFWMD (Fred Davis, Director, Land Stewardship): 561-687-6636
LSD Field Office: 561-924-5310 (DuPuis Reserve)
SFWMD (Olivia McLean, Emergency Manager): 561-687-6218
DOF District Office: (407) 856-6512
Kissimmee Field Station: (407)846-5226

Required Resources: 5 personnel, 2 pumper unit, 2 ATVs.

Holding and Contingency: One pumper unit will be stationed along the west line and will patrol the perimeter. The second pumper will be stationed or will patrol the Vistas communities just west of Lake Gatlin. Fence/pond to the south and west would serve as contingency control lines. Orange County will be stationed on Hwy. 417 along pond as fire progresses toward south fence line along Hwy 417 pond.

Mop up: Extinguish all visible and smoldering flames w/in 100 feet of fenceline. Check swamp perimeter.

Fire out: When mop up is complete.

Safety Check: PPE for entire crew. All equipment operational and in position.

Immediate Evaluation

Burn objectives met:

Spotover/Escapes:

Smoke Problems:

Public Contacts:

Other observations (Wildlife etc.): _____

Prescription done by M Green
Certified Burn Manager Signature_____

Certification No. Date of Prescription: __/__/__

Appendix L. Sample Annual Work Plan

	BUDGET YEAR: FY 2005	MANAGEMENT AREA: Shingle Creek M. A . (Ao03) 211 Funds	Affected Miles	Affected Acres	Budget
I	Resource Preservation / Acquisition				
J					
E	Management Evaluation				
E	Inventories	(5319) FUND 211 SC Plant Inventory		1,500	
		(5319) FUND 211 (Universal C7338-AO1)			
E	Monitoring			1,500	
E	Research				
E	Management Review				
	Resource Management				
	Agriculture Mgmt				
	Arch, Hist, Cult. Resource Mgmt				
N	Fire Mgmt				
N	Prescribed Fire	(5503) Contractor-assisted burn		100	
N	Wildfire Suppression/Control				
U	Forestry Mgmt				
Q	Hydrologic Mgmt	(5319) Swale Installation--Ao02			
R	Range Mgmt	(5319) Road Removal--Ao02			
	Soil & Mineral Mgmt				
K	Veg. Mgmt				
K	T & E Species				
K	mowing	(5312) Road/trail mowing			
T	Nuisance & Exotics	(5404) Chemicals			
		(5319) Exotics Contractor			
H	Wildlife/Habitat Mgmt				
	T & E Species (Non-game)				
	Game Mgmt				
	Pest Mgmt				
	Human-Related Activities				
S	Resource Protection				
S	Patrolling	(5391) C-10162 Enhanced Patrol		1,500	
F	Delineation / Fencing / Posting	(5421) Fencing materials			
P	Natrl Resource-Based Pub. Use	(5422) Lumber for signs, kiosks			
P	Public Use Regulation				
P	Public Use Programs & EE	(5343) Printing costs/interpret Information			
C	Infrastructure Mgmt				
W	Special Management Considerations				
A	Administration	FUND (5101) Environmental Analyst			
B	Budgeting	Fringe Benefits			
B	Planning	(5354) District business travel			
		(5553) Fire suppression/equipment training			
A	Reporting				
D	Equipment & Supplies	(5424) Small tools/equip			
		(5650) Automotive/Fleet			

V		External Entity Coordination/Contract				
			TOTAL	0.0	1,500.0	