

**Lee County Board Of County Commissioners
Agenda Item Summary**

Blue Sheet No. 20051418

1. ACTION REQUESTED/PURPOSE:

Approve the Imperial Marsh Preserve (IMP) Land Stewardship Plan.

2. WHAT ACTION ACCOMPLISHES:

Approving of the IMP Plan establishes guidelines for restoration and public use facilities at IMP.

3. MANAGEMENT RECOMMENDATION: Approve the plan so Land Stewardship staff can begin implementation.

4. Departmental Category: 11 CIAA		5. Meeting Date: 10-18-2005
6. Agenda: <input checked="" type="checkbox"/> Consent <input type="checkbox"/> Administrative <input type="checkbox"/> Appeals <input type="checkbox"/> Public <input type="checkbox"/> Walk-On	7. Requirement/Purpose: (specify)	
	Statute	
	<input checked="" type="checkbox"/> Ordinance	Lee Plan
	Admin. Code	
	Other	
		8. Request Initiated: Commissioner _____ Department Parks & Recreation Division _____ By: <u>John Yarbrough, Director</u> John Yarbrough

9. Background:

A Land Stewardship Plan is necessary for appropriate and planned restoration, management and public use facility development of any Conservation 20/20 Preserve. The CLASAC (Conservation Lands Acquisition and Stewardship Advisory Committee) unanimously passed a motion on August 11, 2005, accepting the Imperial Marsh Preserve Land Stewardship Plan.

The plan was available for public review on the internet, as well as at the East County and Forth Myers-Lee County Public Libraries. A public meeting was held August 30, 2005.

10. Review for Scheduling:

Department Director	Purchasing or Contracts	Human Resources	Other	County Attorney	Budget Services				County Manager/P.W. Director
					Analyst	Risk	Grants	Mgr.	
<i>JG</i>				<i>KBO</i>	<i>10/4/05</i>	<i>10/4/05</i>	<i>10/5/05</i>	<i>10/5/05</i>	<i>[Signature]</i>

11. Commission Action:

- Approved
- Deferred
- Denied
- Other

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4pm
COUNTY ADMIN FORWARDED TO:
10/4/05
[Signature]

Rec. by CoAtty
Date: 10/4/05
Time: 2:35pm
Forwarded To: Co.Mgr.
10/4/05

Imperial Marsh Preserve

Land Stewardship Plan



Prepared by the Land Stewardship Section
Lee County Department of Parks and Recreation

Approved by the Lee County Board of County Commissioners: (Date)

Table of Contents

VISION STATEMENT	1
I. EXECUTIVE SUMMARY	2
II. INTRODUCTION	3
III. LOCATION AND SITE DESCRIPTION.....	9
IV. NATURAL RESOURCES DESCRIPTION.....	11
A. Physical Resources	11
i. Climate.....	11
ii. Geology.....	11
iii. Topography	13
iv. Soils	15
v. Hydrologic Components and Watershed	20
B. Biological Resources	22
i. Ecosystem Function.....	22
ii. Natural Plant Communities.....	22
iii. Fauna	28
iv. Designated Species	28
v. Biological Diversity.....	36
C. Cultural Resources	39
i. Archaeological	39
ii. Land Use History.....	39
V. FACTORS INFLUENCING MANAGEMENT.....	40
A. Natural Trends and Disturbances	40
B. Internal Influences.....	40
C. External Influences	43
D. Legal Obligations and Constraints	43
i. Permitting and Mitigation Issues	43
ii. Relationship to Other Plans.....	45

E. Management Constraints	46
F. Public Access and Resource Based Recreation	47
G. Acquisition	47
VI. MANAGEMENT ACTION PLAN	50
A. Management Unit Description.....	50
B. Goals and Strategies	53
VII. PROJECTED TIMETABLE FOR IMPLEMENTATION.....	57
VIII. FINANCIAL CONSIDERATIONS.....	58
IX. LITERATURE CITED	59
X. APPENDICES	61

List of Exhibits

Figure 1: Location Map	5
Figure 2: 1944 Historic Aerial Photograph	6
Figure 3: 1953 Historic Aerial Photograph	7
Figure 4: 1958 Historic Aerial Photograph	8
Figure 5: 2002 Aerial Photograph	10
Figure 6: Topography Map.....	14
Figure 7: Soils Map	19
Figure 8: Watershed Map	21
Figure 9: Natural Plant Communities Map	27
Figure 10: Panther Strategic Habitat Conservation Areas	34
Figure 11: Conservation Lands Map	38
Figure 12: Timberland and Tiburon Boundary Map.....	42
Figure 13: DOT Mitigation Boundary.....	44
Figure 14: Conservation 20/20 Nominations and Acquisitions.....	49
Figure 15: Management Unit Map.....	52
Table 1: Summary of Soil Characteristics	18
Table 2: Exotic Wildlife at Imperial Marsh Preserve.....	28
Table 3: Listed Species Found at IMP and Their Designated Status	30
Table 4: Management Recommendations for Designated Species	35

Appendix A: Plant Sightings

Appendix B: Wildlife Sightings

Appendix C: Proposed Mitigation Plans

Appendix D: Projected Costs and Funding Sources Table

Vision Statement

It is the vision of the Lee County Department of Parks and Recreation and the Conservation 20/20 Program to conserve, protect and restore Imperial Marsh Preserve to a productive, functional and viable ecosystem. It is a piece of a larger conservation area, connected to the Corkscrew Mitigation Bank and Port Authority's Imperial Marsh Preserve. Also, the Preserve is an important part of a larger watershed that protects groundwater and recharges the aquifer in the Imperial River Watershed. The primary management objective for Imperial Marsh Preserve will be pasture restoration in the abandoned agricultural fields that comprise 75% of the Preserve. After this restoration, the northern portion of the Preserve will resemble mesic flatwoods and the southern portion of the Preserve will be maintained as wet prairie and open marsh areas for wading and migratory birds. These areas will be maintained either through mechanical and chemical applications or prescribed fire.

I. EXECUTIVE SUMMARY

Imperial Marsh Preserve (IMP) was acquired in one parcel on July 28, 2000 through Lee County's Conservation 20/20 (C2020) program for \$1.26 million. The Conservation 20/20 Program was established in 1996 after Lee County voters approved a referendum that increased property taxes by up to .5 mil (\$.50/\$1,000 in property value) for the purpose of purchasing and protecting environmentally sensitive lands.

IMP is located in the southeastern portion of Lee County and totals 234 acres, including abandoned farm fields, cypress swamps and pine flatwoods. In March 2005, mitigation funds from Timberland and Tiburon Limited were used to reimburse C2020 for the cost of the southern 117 acres and to provide funds for restoration and stewardship. The Preserve is an important piece of a larger conservation area in southwest Florida. To the northwest is the Port Authority's 6,000 acre Imperial Marsh Preserve, to the west is South Florida Water Management District's 640 acre Corkscrew Mitigation Bank which is bordered to the south by the Flint Pen Strand (9,000 acres), a part of the Corkscrew Regional Ecosystem Watershed. Altogether, this corridor includes almost 70,000 acres of protected conservation land.

The portion of Florida that IMP is located within was created during the Pleistocene Epoch between 1.8 million to 10,000 years ago. Much of Lee County, including IMP, is located in the Caloosahatchee and Fort Thompson geologic units, which consist of a quartz sand blanket covering limestone and clay. All of Lee County is located within the Coastal Lowlands of Florida that extend around the coastal periphery of the state where elevations are generally less than 100 feet above sea level. Natural elevations at IMP range from 30 feet at the northeast corner to 27 feet in the five cypress depressional wetlands scattered throughout the Preserve.

Imperial Marsh Preserve consists of six different soil types, all of which are described as nearly level, poorly drained soils with severe limitations for urban development because of the high water table. All have low natural fertility, generally rapid permeability, and generally low available water capacity. There are five different plant communities within IMP ranging from mesic flatwoods to basin swamps. These communities are home to many plant and animal species, including sandhill cranes, Big Cypress fox squirrels, pygmy rattlesnakes, herons and egrets. Exotic species present at IMP include but are not limited to Brazilian pepper, melaleuca and West Indian marsh grass.

Since the 1960's IMP has had major alterations to its hydrologic components. Ditches were created on the Preserve and surrounding areas to drain the land for agriculture. Construction of Corkscrew Road to the south slows sheet flow from the north and creates a wetland for wading birds to forage during the wet season. The abandoned agricultural fields comprise about 75% of the Preserve and have

remnant swales from row cropping that create micro-habitats within the farm fields. These fields were abandoned in the late 1990's and are in various stages of succession with plant species such as south Florida slash pine, live oak and wax myrtles present.

This land stewardship plan was written by Lee County Department of Parks and Recreation Land Stewardship staff with the assistance of students from Florida Gulf Coast University. The goal of this plan is to identify Preserve resources, develop ways to protect those resources and implement restoration activities to restore IMP to a viable, functioning, natural system. The primary management objective for Imperial Marsh Preserve will be pasture restoration in the abandoned agricultural fields. Pasture restoration activities will include leveling old farm field furrows, filling ditches and removal of exotic species. A Management Action Plan that outlines restoration and stewardship goals has been developed. This plan outlines these goals and strategies and explains how to accomplish the goals and includes cost estimates and a timetable for completion.

Funding opportunities for the restoration and possible future public facilities will include applying for grants and seeking mitigation opportunities. A partnership for mitigation has been approved for a portion of the Preserve with Lee County's Department of Transportation.

II. INTRODUCTION

The Imperial Marsh Preserve (IMP) was acquired in one parcel on July 28, 2000 through Lee County's Conservation 20/20 (C2020) program for \$1.26 million. The site totals 234 acres and is located north of Corkscrew Road directly across from the Corkscrew Country Store (Figure 1). The site currently is a mixture of wetland communities, pine flatwoods, an oak hammock and abandoned agricultural fields. The wetlands vary in size and are not connected by native plant communities but are connected hydrologically.

Historic aerials (Figures 2-4) show the Preserve and its adjacent lands were once connected as a vast system of dome and basin swamps. Conversion to agricultural lands in the early 1960's began to slowly alter this landscape. Ditches and berms associated with this agriculture dramatically changed the hydrologic components of IMP and its surrounding lands. The construction of Corkscrew Road also altered the north/south flow of water on the Preserve. More recently, cattle and their associated management have affected the property.

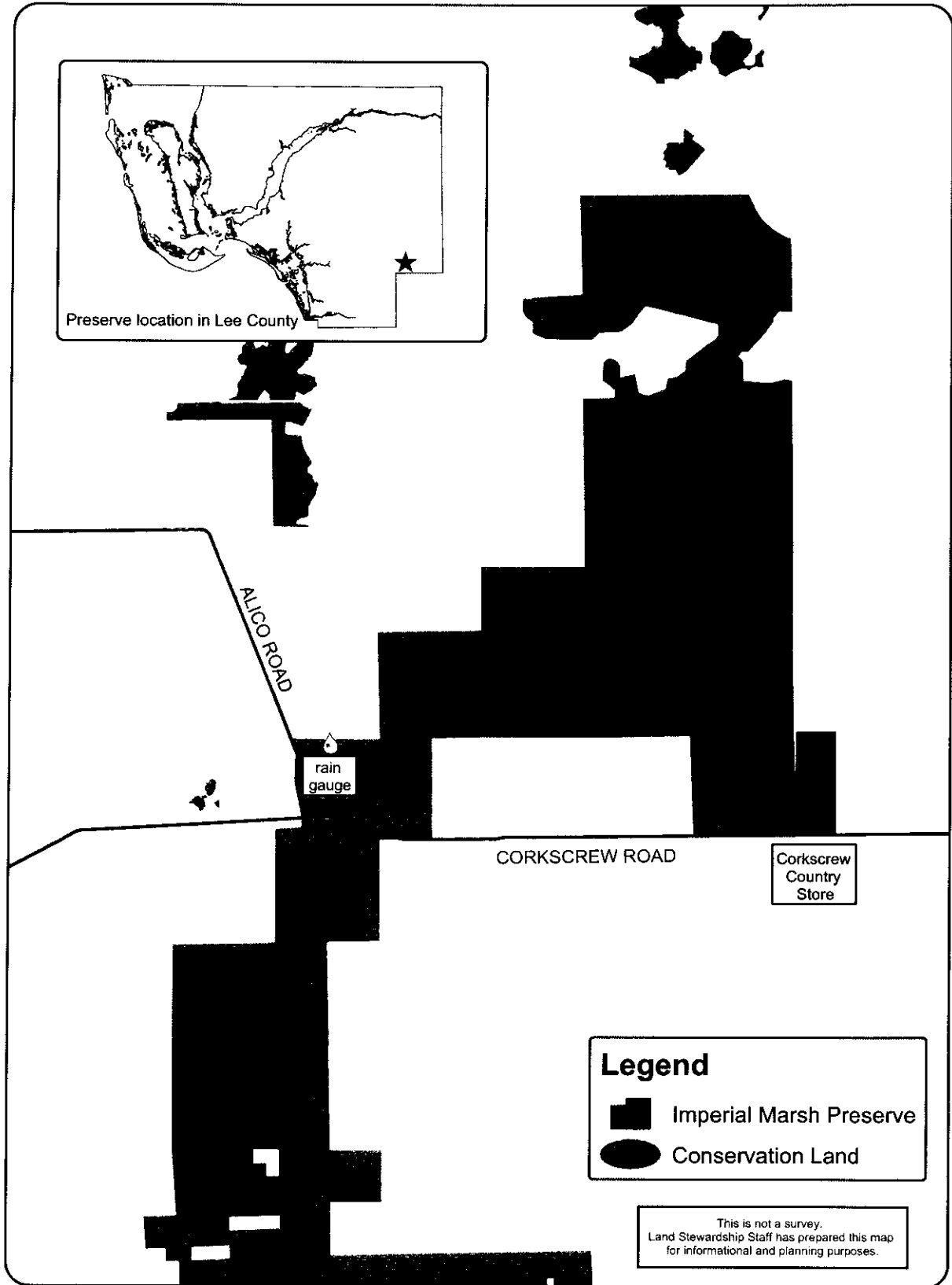
Land stewardship challenges for the site include invasive exotic plant control and pasture restoration. Exotics are present throughout the site in both disturbed and non-disturbed areas. Exotic control in the northwest portion may be complicated

due to location of melaleuca (*Melaleuca quinquenervia*) within the cypress swamp. One cypress swamp on the south end of the Preserve has a heavy Brazilian pepper infestation. All of the agricultural ditches and berms have a dense growth of Brazilian pepper (*Schinus terebinthifolius*) and impede natural sheet flow. Row cropping on the Preserve has left a series of shallow swales in the abandoned fields that will need to be leveled to restore historic sheet flow to the Preserve.

The purpose of this stewardship plan is to define conservation goals for IMP that will address the above concerns. It will serve as a guide for Lee County's Department of Parks and Recreation to use best management practices to ensure proper stewardship and protection of the Preserve. It also can be used as a reference guide as a significant amount of field surveys were conducted along with researching scientific literature, studies and historical records to understand how the Preserve functions in the ecosystem, what wildlife and plants are found within its boundaries as well as influences from human use.

The main management goal for IMP will be to restore the hydrologic components and ground cover in the agricultural fields to a more natural ecosystem. This will also increase species richness and diversity. Removal or alteration of existing berms and ditches will aid in the restoration of the historic hydrologic regime to the Preserve. Restoring the historical fire regime through the use of prescribed fires in the pine flatwoods will help protect native plant species and provide habitat for wildlife. Exotic species, both in the form of flora and fauna will be controlled.

Figure 1: Location Map





Imperial Marsh Preserve

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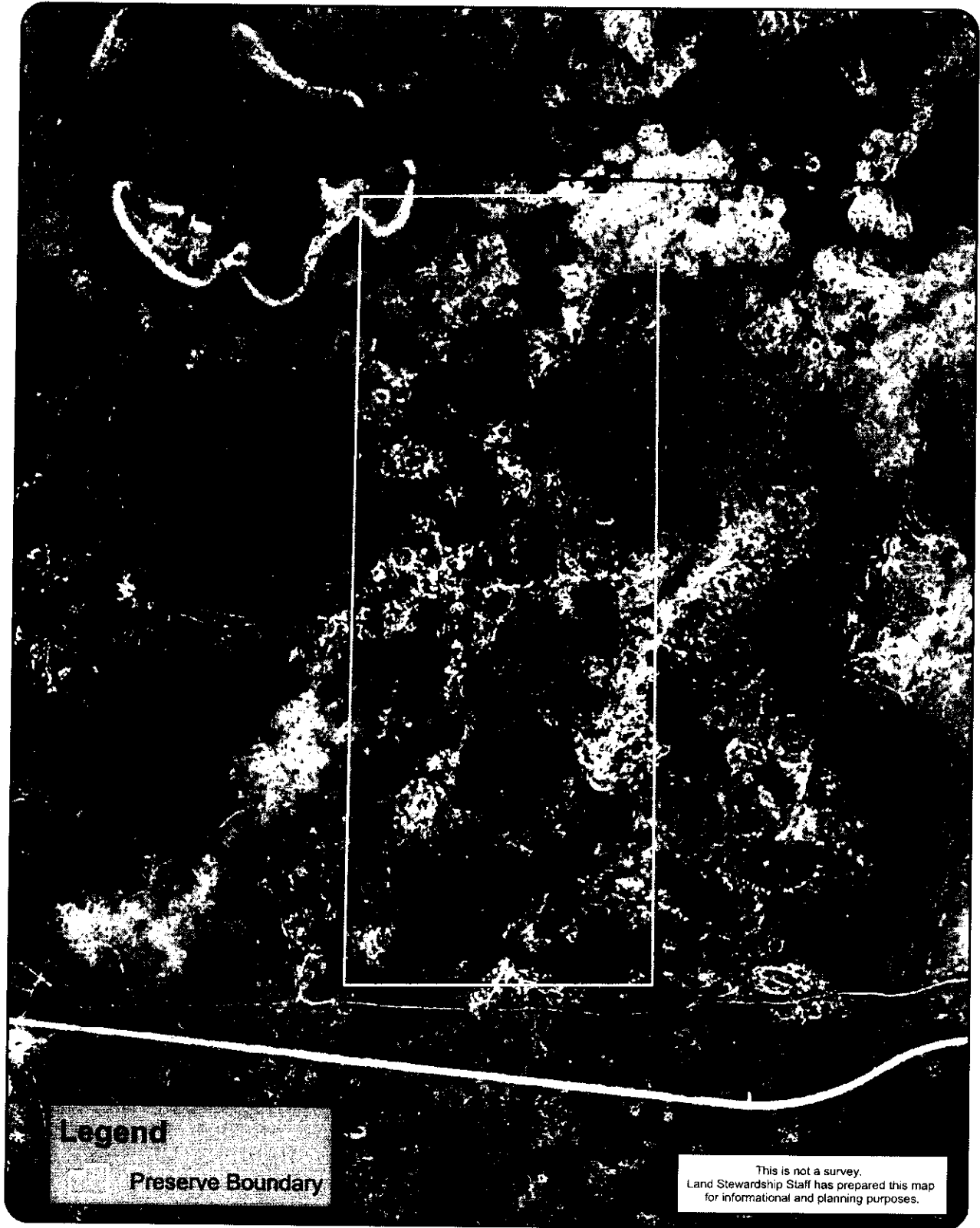


Figure 2: 1944 Historic Aerial Photograph



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Figure 3: 1953 Historic Aerial Photograph



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Figure 4: 1958 Historic Aerial Photograph



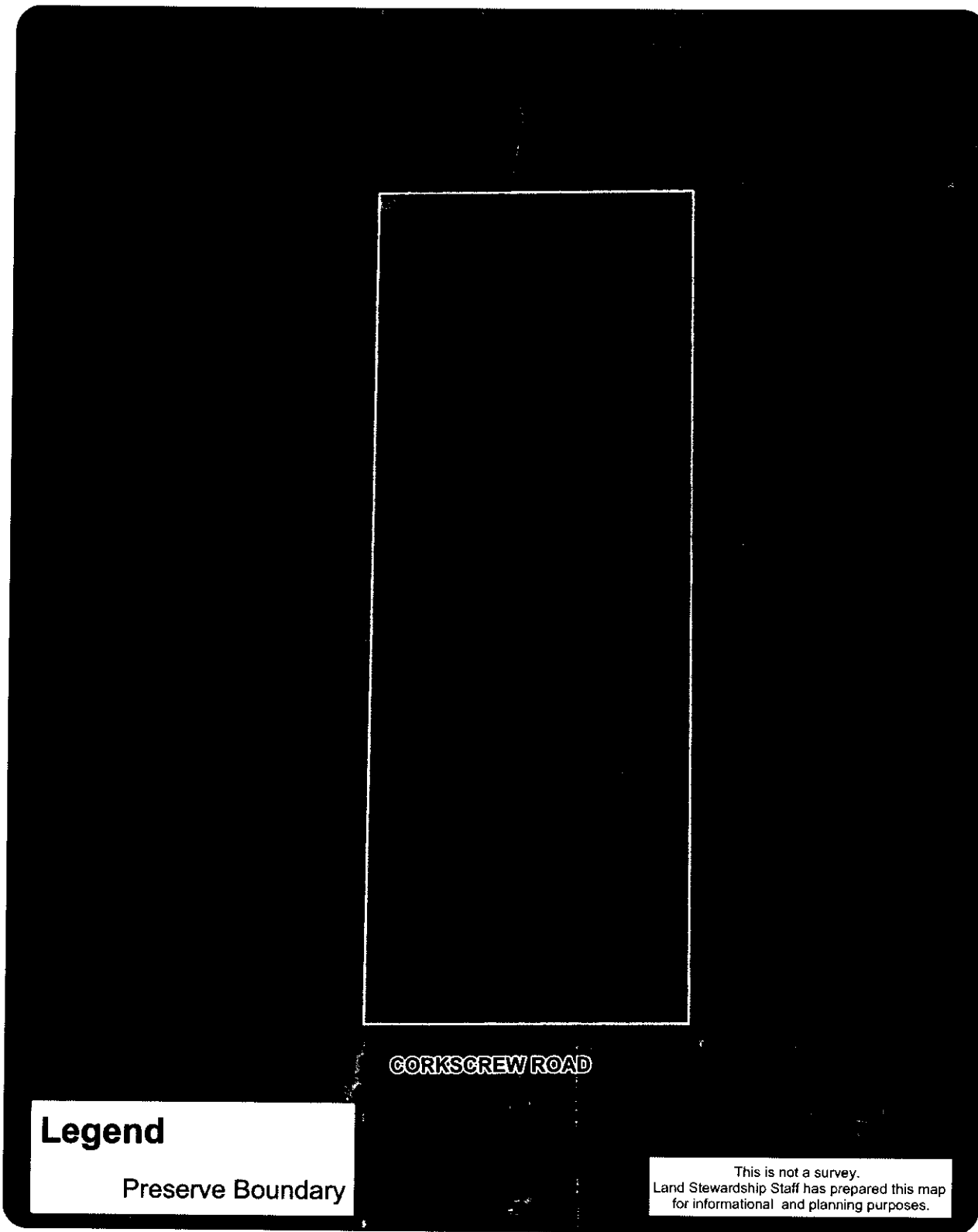
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III. LOCATION AND SITE DESCRIPTION

IMP is located in southeastern Lee County in the western portion of Section 21, Township 46 South, Range 27 East. The southern boundary is along Corkscrew Road approximately 7 miles east of I-75. There is an agricultural berm and ditch along the western boundary and a berm along the northern boundary. The eastern boundary runs through improved pasture land. See Figures 1 and 5.

The Preserve consists of a mosaic of both human-altered and natural plant communities including swamps, pine flatwoods, oak hammock, and improved pasture lands. Past agricultural practices have disturbed about 75% of the Preserve.

Figure 5: 2005 Aerial Photograph



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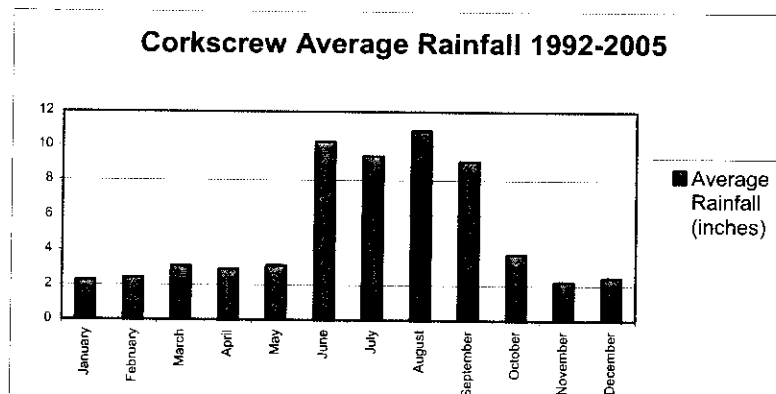
IV. NATURAL RESOURCES DESCRIPTION

A. Physical Resources

i. Climate

Southwest Florida has a humid, sub-tropical climate due to its maritime influence from the Caribbean Sea and the Gulf of Mexico. Temperate climate influences are exerted as well, with infrequent but significant freezes occurring. These freezes prevent some of the more tropical plants from becoming established and occasionally damage the subtropical vegetation. Cold fronts regularly push cool, sometimes moist weather from the southeastern U.S. to southwest Florida during the winter. These cold fronts also encourage birds to utilize the preserve as either a stop off point on a longer migration, or as a winter roosting and feeding area. This intricate balance between tropical, subtropical, and temperate regimes offers a climate that is unique, and results in a large biodiversity in both flora and fauna. "Weather and climate are very important factors in the economy of southwest Florida. The combination of warm weather, decreased humidity, and low rainfall during the winter months encourage tourism and an influx of seasonal residents" (SWFRPC, 2005).

The graph below depicts the rainfall data collected by Lee County Division of Natural Resources on a daily basis from the Corkscrew Water Plant. The gauge is located near the corner of Alico Road and Corkscrew Road, approximately 5 miles west of the Preserve. Average annual rainfall from 1992-2005 was 55.39 inches.



ii. Geology

Imperial Marsh Preserve is located within the Immokalee Rise physiographic region. The Immokalee Rise borders the Southwestern Slope to the southwest, the Big Cypress Spur to the south, the Gulf Coastal Lowlands to the north and functions as a border to the Everglades to the east (SWFRPC, 2005). The

Immokalee Rise, like the Atlantic Coastal Ridge south of West Palm Beach, is a southerly extension of Pamlico marine sand invading the Distal Zone (the southern part) of the Florida Peninsula from the sand dominated Central Zone to the north. However, unlike the Atlantic Coastal Ridge, the Immokalee Rise shows little evidence of a Pamlico shoreline. It seems to have been built as a sub-marine shoal extending south from a mainland cape at the south end of the Desoto Plain much in the same way that the present off-shore shoal extends southward from Cape Romano (White, 1970). The figure below is from SFWMD Water Management Plan 2000 (Fernald and Purdam, 1998).

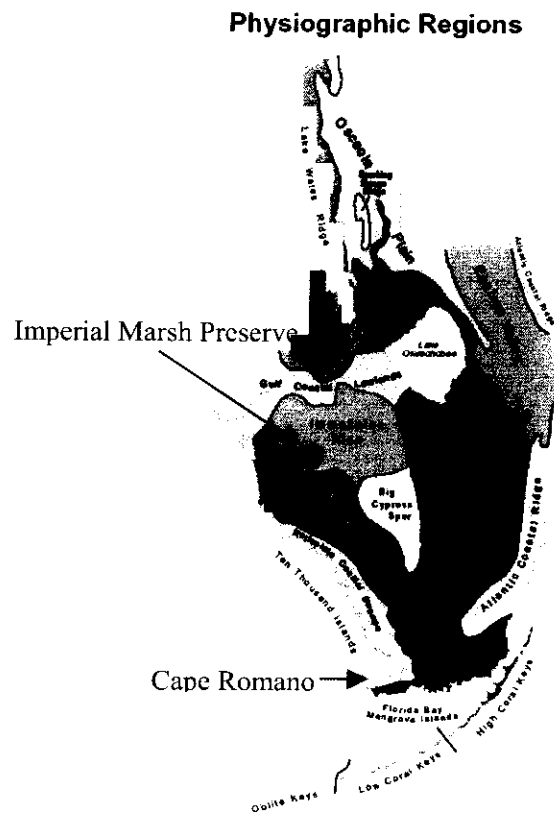


Figure 8. Physiographic Regions within the SFWMD (Fernald and Purdam, 1998).

The portion of Florida that IMP is located within was created during the Pleistocene Epoch between 1.8 million to 10,000 years ago. This period is also known as the Ice Age, where huge ice sheets formed across Canada and the northern United States. When these ice sheets were formed, they consumed large quantities of seawater, dropping the current sea level 300 or more feet, which greatly increased the land area of what is now Florida. As the glaciers shrank, sea levels rose, and the Florida peninsula was again flooded. During the peak warm periods, sea level reached 150 feet above the current level. The waves and currents during these high sea level periods reworked the sediments and formed a series of geological units (Caloosahatchee, Ft. Thompson,

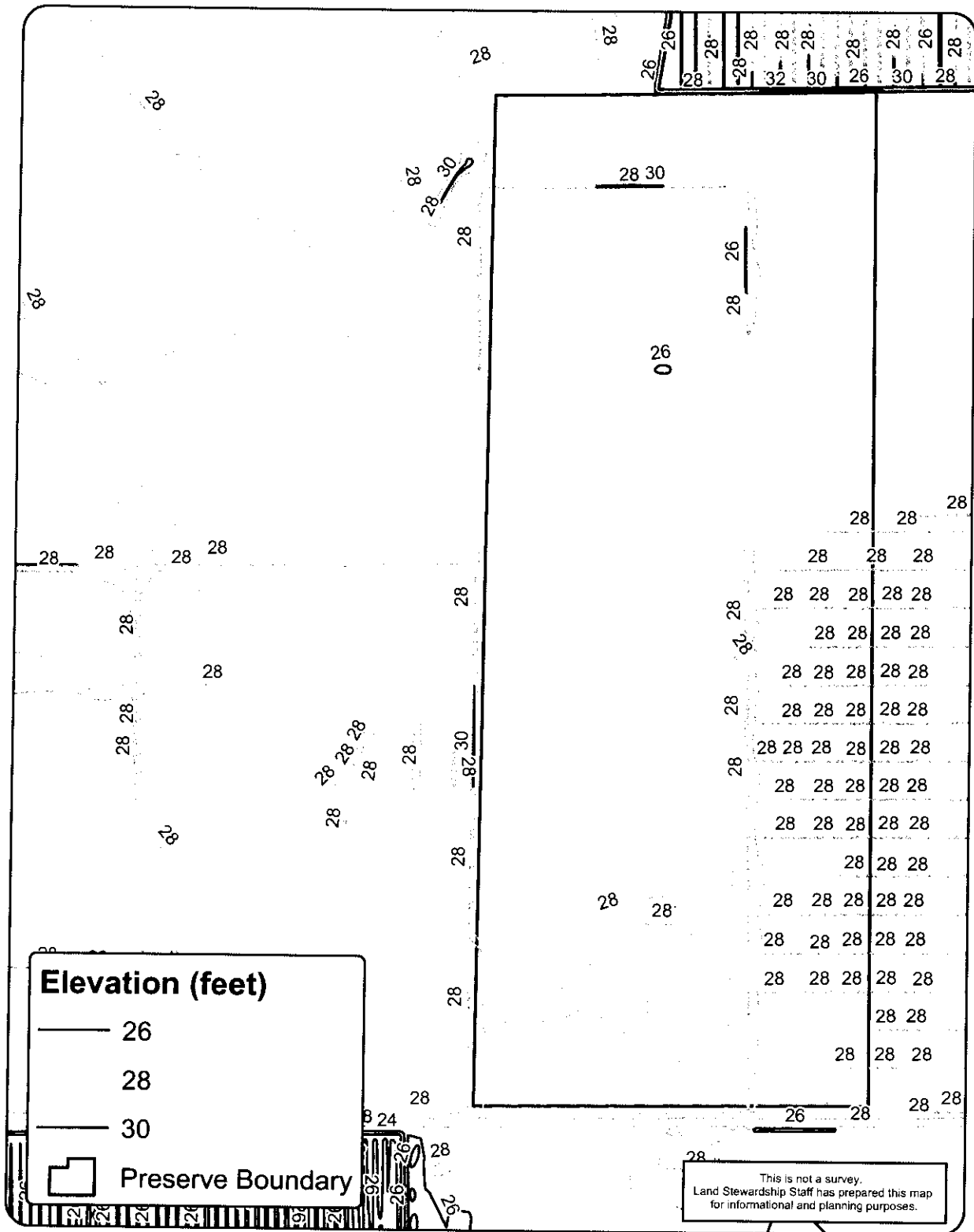
Anastasia, Miami Limestone and Key Largo Limestone). Each of these geological units is characterized by their unique compositions. The Pleistocene Epoch had four separate freezing and melting periods (Rupert, 1989). Previously, Lee County was divided into several different geologic units. However, throughout much of Lee County, including the area where IMP is located, the Caloosahatchee and Fort Thompson units are somewhat indistinct and have been lumped together as undifferentiated Tertiary/Quaternary shell-bearing units. This unit consists of a quartz sand blanket covering limestone and clay. Fossils, including mollusks and corals, are very common and usually in excellent condition (Missimer and Thomas, 2001).

iii. Topography

All of Lee County is located within the Coastal Lowlands of Florida that extend around the coastal periphery of the state where elevations are generally less than 100 feet above sea level (Stubbs, 1940; Cooke, 1945).

There is very little change in natural elevations at IMP. Elevations in the pasture areas range from 26 to 28 feet with berms ranging from 28 to 32 feet in elevation. (Figure 6). The ground slopes in a general south to southwesterly direction.

Figure 6: Topography Map



Imperial Marsh Preserve

0 410 820 1,640 Feet

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iv. Soils

The Soil Survey of Lee County, Florida (Henderson, 1984) was designed for a diverse group of clients to be able to comprehend soil behavior, physical and chemical properties, land use limitations, potential impacts, and protection of the environment. Based on these classifications, six different soil types are found at IMP. Table 1 summarizes the characteristics of the soils found at IMP and Figure 7 shows the location of these soils. These characteristics have been organized in the table to quickly provide land stewards with pertinent soils information for understanding restrictions and/or results regarding future habitat restoration and probable recreational plan limitations and expenses. The descriptions below explain the soil characteristics found in Table 1.

Habitats (Range Sites):

Based on the Soil Survey of Lee County, there are eight generalized range site categories in the county and three are found on IMP. These categories are not Florida Natural Areas Inventory (FNAI) designations and may not correspond with the vegetation that is currently present on site. The ranges identified on the Preserve are:

- South Florida Flatwoods - Nearly level areas with scattered to numerous pine trees (*Pinus* spp.), saw palmetto (*Seronea repens*), gallberry (*Ilex glabra*), and other woody plants.
- Slough - Open grassland where nearly level areas act as broad natural drainage courses in the flatwoods. Potential plant community is dominated by maidencane (*Panicum hemitomon*) and bluestems (*Andropogon* spp.).
- Freshwater marshes and ponds - Open grassland marshes or ponds (depressions) with the potential to produce significant amounts of various grasses, sedges, and rushes. Water fluctuates throughout the year. The areas at IMP where soil types are designated as marshes or ponds have a cover type of cypress or mixed cypress/pine. Standing water occurs during the wet season.

Wetland Classification:

- F-Flooding: Soil flooded by moving water from stream overflow, runoff or high tides.
- S-Slough (sheet flow): A broad nearly level, poorly defined drainage way that is subject to sheet-flow during the rainy season.
- P-Ponding: Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Hydrologic group:

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped

according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms. The four hydrologic soil groups are:

- A - Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. High rate of water transmission.
- B - Soils having a moderate infiltration rate (low to moderate runoff potential) when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well-drained soils that have moderately fine texture to moderately coarse texture. Moderate rate of water transmission.
- C - Soils having a slow infiltration rate (moderate to high runoff potential) when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. Slow rate of water transmission.
- D - Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist mainly of clays that have a high shrink-well potential, soils that have a permanent high water table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. Very slow rate of water transmission.

Note that some of the soil types are shown as having dual hydrologic groups, such as B/D. A B/D listing means that under natural conditions the soil belongs to D, but by artificial methods the water table can be lowered sufficiently so that the soil fits in B. The Preserve has received an extensive level of hydrological alterations including agricultural berms and ditches which has affected the soil hydrology and behavior.

Imperial Marsh Preserve consists predominantly of Immokalee and Valkaria fine sands with smaller areas of Malabar fine, Pompano fine, and Pompano fine and Valkaria fine sands, both depressional. All of these soils are described as nearly level, poorly drained soils with severe limitations for urban development because of the high water table. All have low natural fertility, generally rapid permeability, and generally low available water capacity.

Immokalee sands are listed in the south Florida flatwoods range site. Natural vegetation on these sites consist of saw palmetto, fetterbush (*Lyonia lucida*), pineland threawn (*Aristida* spp.), and south Florida slash pine (*Pinus elliotii* var *densa*).

Malabar fine, Pompano fine and Valkaria fine sands are in the Slough range site. Natural vegetation in Malabar fine and Pompano fine sands is pineland threawn, saw palmetto, maidencane, and south Florida slash pine. Malabar fine sands also include wax myrtle (*Myrica cerifera*), panicums and bluestem. Natural vegetation for Valkaria fine sands is sparse saw palmetto, south Florida slash pine and maidencane.

Pompano fine and Valkaria fine sands, both depressional, are in the fresh water marshes and ponds range site. Pompano fine sands, depressional, are largely covered by natural vegetation of St. John's-wort (*Hypericum* spp.) and wax myrtle. Valkaria fine sands, depressional, typically have cypress (*Taxodium* spp.) and water-tolerant grasses.

Table 1: Soils Attributes

Soil Types	Total Acres	% of Preserve	Habitats (Range Site)	Wetland Class (1)	Hydrologic Group (2)	Physical Attributes			Biological Attributes			Limitations for Recreational Paths & Trails		
						Surface Permeability	Subsurface Permeability	Water Table within 10" of surface	Water Table below 10-40" of surface	% Organic Matter	Potential as habitat for wildlife in Openland		Woodland	Wetland
Innokalee Sand	73.75	32.10	flatwoods		B/D	rapid	rapid	1-3 months	2-3 months	1-2%	poor	poor	poor	Severe: wetness, too sandy
Malkania Fine Sand	107.9	46.98	sloughs, edge flatwoods	S	B/D	rapid		1-3 months	6 months	1-4%	poor	poor	good	Severe: wetness, too sandy

* Water table is above the surface of soil

Color Key:

Wet



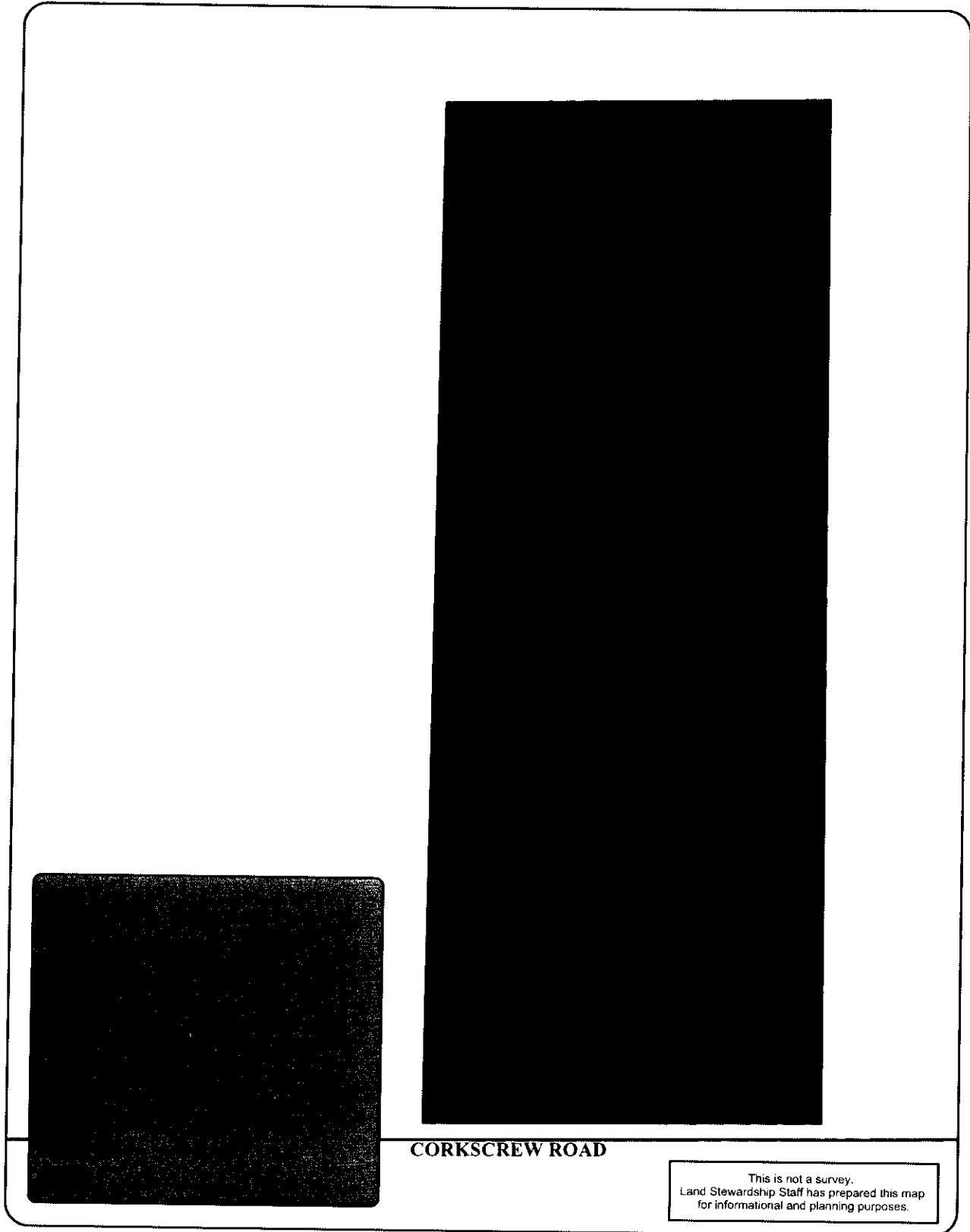
(1) - Wetland Classification:

- P - Ponding: Standing water on soil in closed depressions
- S - Slough (sheet flow): A broad nearly level, poorly defined drainage way that is subject to sheet-flow during the rainy season.

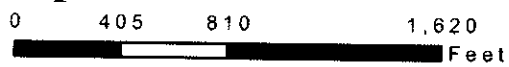
(2) - Hydrologic Group:

- B - Moderate rate of water transmission
- D - Very slow rated of water transmission

Figure 7: Soils Map



Imperial Marsh Preserve



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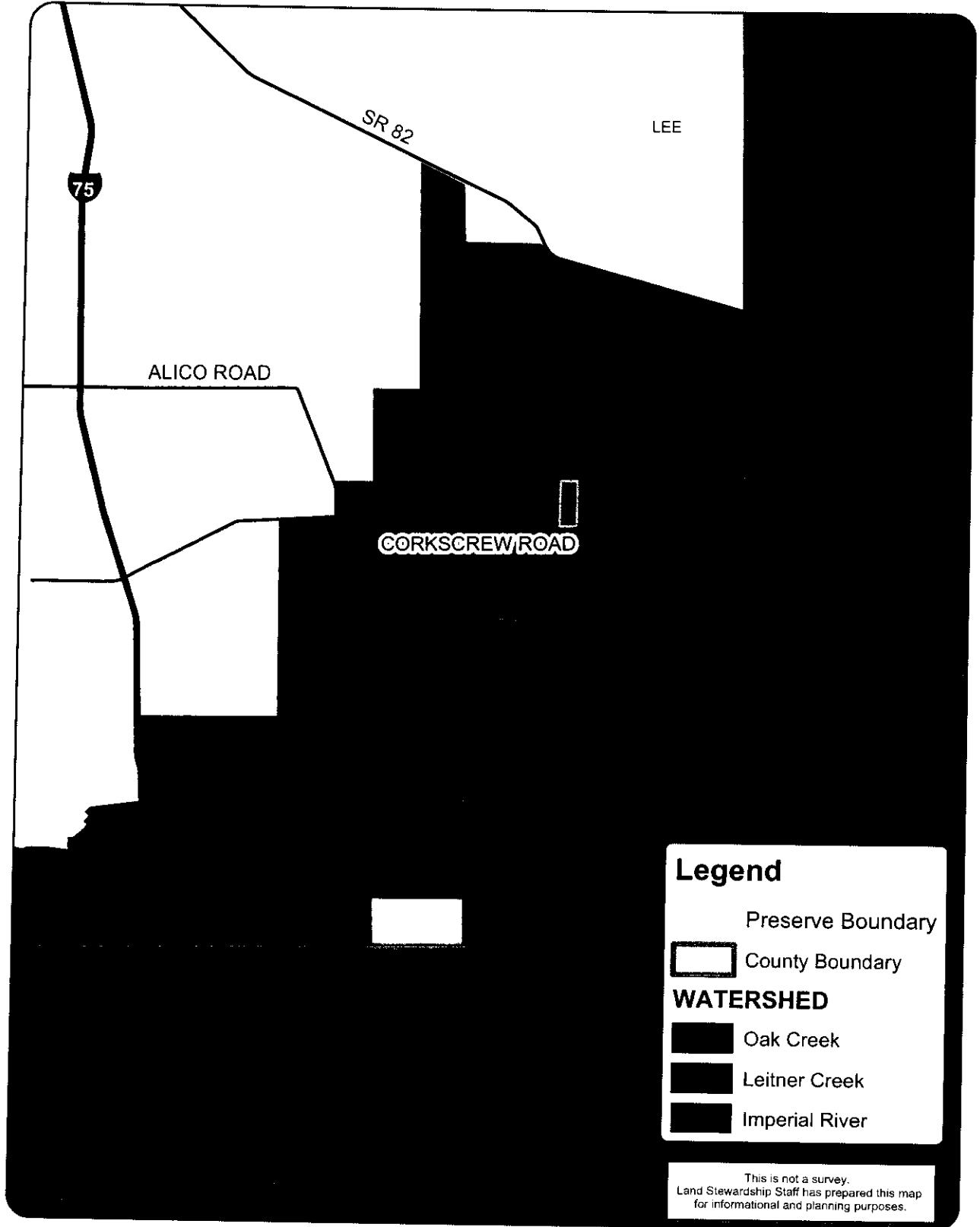
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v. Hydrologic Components and Watershed

Imperial Marsh Preserve is within the Big Cypress Basin of the South Florida Water Management District's (SFWMD) Lower West Coast Region. Within the Big Cypress Basin, Imperial Marsh Preserve lies within the Imperial River Watershed (IRW) (Figure 8). The IRW is approximately 86 square miles, the largest in Lee County. It contains two sub-basins, Leitner Creek and Oak Creek in the southern portion of the watershed. Most of IRW to the west of I-75 has been developed as single-family homes and other urban uses. Portions of IRW that are east of I-75 are mostly agriculture and wetlands, which play an important role in storm water run-off and ground water recharge. At its western most point, the Imperial River flows into the Estero Bay and is an important fresh water source for the Bay.

Two agricultural ditches and their associated berms running north/south affect the sheet flow across the property. One ditch located along the western boundary of the Preserve and is entirely on the neighboring SFWMD property. The second ditch divides the eastern third of the southern half of the property. Both are double ditches with their associated berms between the ditches (Figure 6). Two additional ditches run east/west. One in the northern portion of the preserve dividing the basin swamp from the agricultural fields and another on the southern boundary. All of these berms and ditches severely alter the sheet flow at IMP. Numerous swales from previous row-cropping run in an east/west direction in the abandoned fields. In addition, Corkscrew Road on the southern boundary impedes normal sheet flow and may retain more water than under natural conditions. Finally, three cattle wells and their associated spoil piles were created on the Preserve for livestock use.

Figure 8: Watershed Map



 **Imperial Marsh Preserve**

0 1 2 4 6 Miles

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Prepared on: 02/10/05, by lboyd@leegov.com

B. Biological Resources

i. Ecosystem Function

The wetlands of south Florida are important to people and to a variety of wildlife. Wetlands at IMP provide places for birds to feed and for fish and frogs to live and breed. Additionally, people rely on these marshes to improve water quality and recharge the aquifer. The seasonal changes in southwest Florida profoundly affect the hydrologic components at this Preserve. During the late spring and summer months, the rain begins to fall and the wetlands fill to capacity. The larger basin swamp is home to many egrets, anhingas (*Anhinga anhinga*), turtles and alligators (*Alligator mississippiensis*). This open swamp area contains two cow wells with deeper water that provide feeding areas even in the dry season. The surrounding cypress areas provide excellent cover and foraging for warblers and other migratory song birds.

The pine flatwoods surrounding the wetlands also serve as important habitat. Several species of birds find shelter in the palmetto understory, nest in the tall pines and forage in the grasses. The oak toad (*Bufo quercicus*) will dig burrows in the sandy soil and hunt for spiders and insects. During a severe flood, the flatwoods serve as a water storage area to help protect adjacent land owners from flooding (Tiner 1998). Fire has many purposes in the flatwoods: creation of soil conditions suitable for germination of seeds of some species, turnover of litter, humus and nutrients, reduction of competition from hardwoods and increasing the hardiness of some plant species (Myers and Ewel 1990). Following initial exotic control, fire will be a very useful management tool at IMP.

The abandoned row crop fields that comprise a majority of the Preserve also create habitat for many wildlife species. In the wet summer months standing water creates feeding grounds for many wading birds including snowy egrets (*Egretta thula*), lesser yellow-legs (*Tringa flavipes*) and great blue herons (*Ardea herodias*). The fields also provide foraging habitat for sandhill cranes (*Grus canadensis*). In the fall these fields provide habitat for resident mottled ducks (*Anas fulvigula*) and migratory blue-winged teal (*Anas discors*).

ii. Natural Plant Communities

Imperial Marsh Preserve consists of a wide variety of plant communities ranging from mesic flatwoods to cypress domes. Figure 9 shows the plant communities found at IMP. They are defined using the Guide to the Natural Communities of Florida (1990) prepared by the Florida Natural Areas Inventory (FNAI) and the Florida Department of Natural Resources (FDNR). The following are descriptions of the dominant plants and characteristic animals found within each FNAI community (with exception to the improved pasture, designated by Florida Land Use and Cover Forms Classification System (FLUCCS)). A complete list of

plant species identified on numerous site inspections to IMP can be found in Appendix A. This list will be updated on a seasonal basis to identify plants in their inflorescence phase.

Abandoned Cropland – Improved Pasture (FLUCCS #211) – 177.8 acres, 76.6% coverage

This area was previously used for row cropping and has been heavily impacted by these activities. While it does contain some characteristics of a wet prairie community in the south and mesic flatwoods community in the north, it cannot be considered a natural community due to these disturbances. The hydrology and plant succession have been changed by water pooling in the swales.

The southern portion (117 acres) is a nearly treeless plain or shrubby wetland with a dense ground cover of grasses, herbs, and low shrubs. Plants found in this community at IMP include flatsedge (*Cyperus* spp.), swamp smartweed (*Polygonum hydropiperoides*), capeweed (*Phyla nodiflora*), buttonweed (*Diodia virginiana*), dog fennel (*Eupatorium capillifolium*), cabbage palm (*Sabal palmetto*) and wax myrtle.

The northern portion (61 acres) has an open canopy with widely spaced slash pine trees and a dense ground cover of herbs and shrubs. Typical plants growing in this area at IMP include south Florida slash pine, saw palmetto, cabbage palm, wax myrtle, and myrtleleaf St. John's-wort (*Hypericum tetrapetalum*).

Birds found in this community include blue jay (*Cyanocitta cristata*), blue-gray gnatcatcher (*Poliioptila caerulea*), sandhill crane, snowy egrets, palm warblers (*Dendroica palmarum*) and killdeer (*Charadrius vociferous*).

The exotic plant cover in this abandoned cropland/improved pasture area includes torpedo grass (*Panicum repens*), West Indian marsh grass (*Hymenachne amplexicaulis*), alligator weed (*Alternanthera philoxeroides*) and Brazilian pepper. The southern portion contains 25% - 50% exotic plant coverage and the northern portion contains 50% - 75% exotic plant coverage.

Mesic Flatwoods Community – 29.8 acres, 12.9% coverage

The mesic flatwoods community is found in the northeast corner of the Preserve. Synonyms for this plant community include pine flatwoods and pine savannahs. Mesic flatwoods occur on relatively flat, moderately to poorly drained soils. Standing water is common for brief periods during the rainy season. Mesic flatwoods are characterized as having an open canopy with widely spaced pine trees and a dense ground cover of herbs and shrubs. Typical plants growing in these communities at IMP include south Florida slash pine, saw palmetto, wax myrtle, and St. John's-wort.

A few animals that have been documented utilizing mesic flatwoods at the Preserve include narrowmouth toad (*Gastrophryne carolinensis*), pygmy rattlesnake (*Sistrurus miliarius*), white-eyed vireo (*Vireo griseus*), red-bellied woodpecker (*Melanerpes carolinus*) and Big Cypress fox squirrel (*Sciurus niger avicennia*).

Historically, natural fire probably burned in these communities every 1-8 years. Without frequent fires mesic flatwoods will succeed into hardwood dominated forests whose closed canopy will gradually eliminate the groundcover of herbs and shrubs. On the other hand, too frequent or too hot fires would eliminate pine recruitment and eventually transform the mesic flatwoods into palmetto prairie.

The mesic flatwoods community portion of the Preserve contains exotic plant coverage of 0 – 25% consisting of Brazilian pepper and melaleuca.

Wet Flatwoods – 25.7 acres, 11.7% coverage

This area is located on the northern border of the Preserve, between the basin swamp and mesic flatwoods. Wet flatwoods occur on relatively flat, poorly drained terrain and water frequently stands on the surface for 1 or more months of the year. Many plants here are under the stress of water saturation during the wet season and under the stress of dehydration during the dry season. Wet flatwoods, or hydric flatwoods, at IMP are relatively open-canopy forests of scattered south Florida slash pine trees with a sparse understory and a dense ground cover of herbs and shrubs. Other plants here include wax myrtle, pond apple (*Annona glabra*), saw palmetto and other grass species. Brazilian pepper is present in less than 25% cover.

Natural fire regimes for this plant community range from every 3-10 years. Without a regular fire regime, wet flatwoods will succeed into hardwood dominated forests whose closed canopy would gradually eliminate the groundcover herbs and shrubs. Lack of fire will allow pine needle drape and the height of flammable understory shrubs to increase, which will increase the probability of a catastrophic canopy fire.

Hydric Hammock Community – 0.4 acres, 0.2% coverage

There is an area on the eastern boundary in the dome swamp community that is characteristic of a hydric hammock community. It is a well-developed hardwood and cabbage palm forest with a variable understory dominated by palmettos and ferns. Plants found in this community at IMP include live oak (*Quercus virginiana*), cabbage palm, saw palmetto, strangler fig (*Ficus aurea*) and myrsine (*Rapanea punctata*).

Hydric hammocks are generally saturated, although only inundated for short periods following heavy rains. The normal hydroperiod is seldom over 60 days per year. Because of their generally saturated soils and the sparse herbaceous cover, hydric hammocks rarely burn.

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

Basin Swamp Community – 4.0 acres, 1.7% coverage

The basin swamp community in the northwest region of IMP is part of a larger community that continues outside the Preserve boundary. A basin swamp is generally characterized as a relatively large and irregularly shaped basin that is not associated with rivers, but is vegetated with hydrophytic trees and shrubs that can withstand an extended hydroperiod. Dominant plants include pond cypress (*Taxodium ascendens*) and bald cypress (*Taxodium distichum*). Other typical plants here include wax myrtle, and pickerelweed (*Pontederia cordata*). A small area of this community (less than 0.1 acres) resembles a bay gall with dahoon holly (*Ilex cassine*) and swamp bay (*Persea palustris*) dominant in the canopy and an understory of saw palmetto and swamp fern (*Blechnum serrulatum*).

Animals found in the basin swamp community include egrets, herons, turtles, fish, frogs and alligators.

Basin swamps may act as a reservoir releasing groundwater as adjacent upland water tables drop during drought periods. The typical hydroperiod is approximately 200 to 300 days. If water levels must be artificially manipulated, somewhat deeper than normal water is not likely to do much harm. But extended hydroperiods will limit tree growth and prevent reproduction. Shortened hydroperiods will permit invasion of mesophytic species and change the character of the understory or will allow a devastating fire to enter which would drastically alter the community.

Regular fire intervals are essential for the maintenance of cypress dominated basin swamps. Without fire, hardwood invasion and peat accumulation will eventually create a bottomland forest or bog. Typical fire intervals in basin swamps may be anywhere from 5 to 150 years. Cypress are very tolerant of light surface fires, but muck fires burning into the peat can kill the trees, lower the ground surface, and transform a swamp into a pond or lake.

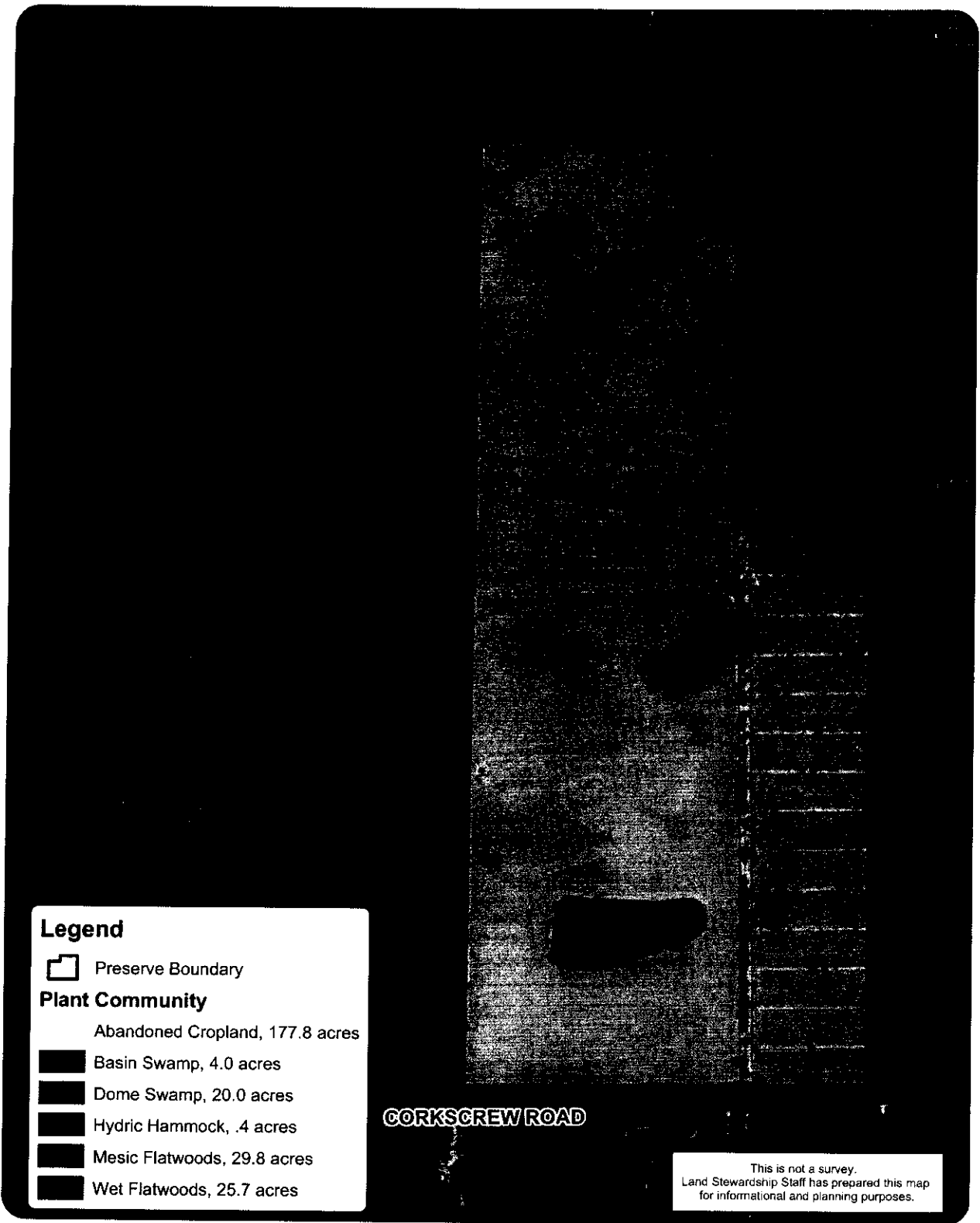
The basin swamp community at IMP is impacted by exotic plant coverage of 25% – 50% consisting of melaleuca and Brazilian pepper. Aquatic exotic species include Wright's nutrush (*Scleria lacustris*), water lettuce (*Pistia stratiotes*) and alligator weed.


Dome Swamp Community – 20.0 acres, 8.6% coverage

There are four dome swamp communities located throughout the Preserve. Dome swamps are characterized as shallow, forested, usually circular depressions that generally present a domed profile because larger trees growing in the center and smaller trees growing on the periphery. Typical plants found in these communities include bald cypress, pond cypress, pond apple, golden polypody (*Phlebodium aureum*), Virginia chain fern (*Woodwardia virginica*), resurrection fern (*Pleopeltis polypodioides*), orchids (Orchidaceae) and American white water lily (*Nymphaea odorata*).

Typical animals include Florida cricket frog (*Acris gryllus dorsalis*), narrowmouth toad, barred owl (*Strix varia*), and great-crested flycatcher (*Myiarchus crinitus*). Exotic plants here are Brazilian pepper and melaleuca and coverage varies from 5% in the southernmost dome where exotics removal has already occurred to 75% in a portion of the eastern dome.

Figure 9: Natural Plant Communities Map






Imperial Marsh Preserve

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Prepared on: 03/24/05, by lboyd@leegov.com

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Feet

iii. Fauna

IMP has a large diversity of fauna and a variety of bird species. On site, numerous species of special concern and endangered wildlife have been recorded. See Appendix B for a list of wildlife documented at the Preserve. Wildlife species were recorded during numerous site inspections and the fieldwork conducted by students from Florida Gulf Coast University (FGCU) for a land stewardship course. Future sightings through site inspections, university classes, and possible Lee County Bird Patrol volunteers will continue to be recorded. There are also several exotic wildlife species that have been documented at the Preserve (Table 2). Of primary concern is the feral hog (*Sus scrofa*). A majority of the abandoned farm fields show damage from the hogs and soil and vegetation damage is apparent in the understory of the hydric hammock.

Table 2: Exotic Wildlife at Imperial Marsh Preserve

<u>Scientific Name</u>	<u>Common Name</u>
<i>Osteopilus septentrionalis</i>	Cuban treefrog
<i>Anolis sagrei</i>	brown anole
<i>Sus scrofa</i>	feral hog
<i>Sturnus vulgaris</i>	European starling

Wildlife management at the Preserve will focus on providing optimal habitat for native species. Restoration of the abandoned agricultural fields, control of invasive exotic plants and application of prescribed fire will be critical restoration components to provide habitat for wildlife. Imperial Marsh Preserve is part of a countywide quarterly site inspection program for all Conservation 20/20 Preserves. A copy of the site inspection form is available in the Land Stewardship Operations Manual (LSOM). These inspections allow staff to monitor for any impacts and/or changes to each preserve and include lists of all animal sightings and new plant species that are found. If, during these inspections staff finds FNAI listed species, they will be reported using the appropriate forms.

iv. Designated Species

There are a variety of listed animal and plant species found at Imperial Marsh Preserve (Table 3). Although all native plant and animal species found at the Preserve have some protection due to the preservation of this property, certain species need additional attention. For stewardship purposes, all plants and animals listed by the U.S. Fish and Wildlife Service (USFWS), Florida Fish and Wildlife Conservation Commission (FWC), Florida Department of Agriculture and Consumer Services (FDACS) and Florida Natural Areas Inventory (FNAI) will be given special consideration. Typically, designated species will benefit from

proper management of the biological communities in which they occur. However, some species may require additional measures to ensure their protection. Management practices likely to benefit wildlife at the Preserve including exotic plant control, prescribed burning, trash removal, wildlife monitoring and feral animal control, restricting trails in certain areas and enforcement of no littering, no weapons and no motorized vehicles regulations will all help with the protection of listed species.

Table 3: Listed Species Found at IMP and Their Designated Status

Scientific Name	Common Name	USFWS	FWC	FNAI	FDA	Occurrence
REPTILES						
<i>Alligator mississippiensis</i>	American alligator	T (S/A)	SSC	G5/S4		confirmed
BIRDS						
<i>Egretta caerulea</i>	little blue heron		SSC	G5/S4		confirmed
<i>Egretta tricolor</i>	tricolored heron		SSC	G5/S4		confirmed
<i>Egretta thula</i>	snowy egret		SSC	G5/S3		confirmed
<i>Eudocimus albus</i>	white ibis		SSC	G5/S4		confirmed
<i>Mycteria americana</i>	wood stork	E	E	G4/S2		confirmed
<i>Ajaja ajaja</i>	roseate spoonbill		SSC			confirmed
<i>Elanoides forficatus</i>	swallow-tailed kite			G5/S2		confirmed
<i>Grus canadensis pratensis</i>	Florida sandhill crane		T	G5/T2T3/S2S3		confirmed
<i>Haliaeetus leucocephalus</i>	bald eagle	T	T	G4/S3		expected
MAMMALS						
<i>Sciurus niger avicennia</i>	Big Cypress fox squirrel		SSC	G5T2/S2		confirmed
<i>Puma concolor coryi</i>	Florida panther	E	E	G5T1/S1		expected
<i>Ursus americana floridanus</i>	Florida black bear		T			expected
PLANTS						
<i>Tillandsia fasciculata</i> var. <i>densispica</i>	stiff-leaved wild-pine, cardinal airplant				E	confirmed
<i>Tillandsia utriculata</i>	giant airplant				E	confirmed
KEY						
USFWS-U.S. Fish & Wildlife Service		FWC-Florida Fish & Wildlife Conservation Commission		FNAI-Florida Natural Areas Inventory		
FDA - Florida Department of Agriculture & Consumer Services				G-Global rarity of the species		
CE - Commercially Exploited				S-State rarity of the species		
E-Endangered				T-Subspecies of special population		
T-Threatened				1-Critically imperiled		
T S/A-Threatened due to Similarity of Appearance				2-Imperiled		
SSC-Species of Special Concern				3-Rare, restricted or otherwise vulnerable to extinction		
				4-Apparently secure		
				5-Demonstrably secure		

The following is a brief summary of each designated species explaining why they are in decline. Unless stated otherwise, the reasons for the species decline and the management recommendations were obtained from Hipes et. al, 2000.

American Alligator

American alligators have recovered dramatically since the 1960's. There are even some populations large enough to support limited harvests. Pollution and destruction of wetlands are currently the main threat to this species. Protecting wetlands from ditching, filling and pollution are the management recommendations for this species.

Wading Birds

The little blue heron's (*Egretta caerulea*), tricolored heron's (*Egretta tricolor*) and the snowy egret's declines are due to loss of freshwater wetlands and alteration of their natural hydroperiod. Similar to the herons listed above, the white ibis (*Eudocimus albus*) and roseate spoonbill (*Ajaia ajaja*) are declining throughout their range, probably due to the reduction and degradation of wetlands as well as human disturbances to their rookeries. Removing invasive exotic plants (particularly melaleuca) and hydrologic restoration of the Preserve to restore the natural hydroperiod by filling ditches and leveling berms will benefit these species.

Wood Stork

Wood storks (*Mycteria americana*) are very sensitive to water levels in freshwater wetlands, as they require high concentrations of fish in fairly shallow water for foraging. Unnaturally high water levels during nesting seasons and extended droughts are both threats that wood storks face. Management recommendations at IMP for the protection of this species will be the same as for other wading birds listed above.

Florida Sandhill Crane

Florida sandhill cranes (*Grus canadensis pratensis*) and the migratory greater sandhill crane (*Grus canadensis tabida*) are indistinguishable from each other. Threats to Florida sandhill cranes include loss and degradation of wetlands, fire suppression, free ranging dogs and cats and entanglement in fencing (Rodgers et. al., 1996). Management practices at Imperial Marsh Preserve that will benefit sandhill cranes (both migratory and non-migratory sub-species) include hydrologic restoration and implementing a prescribed fire plan.

Swallow-tailed Kite

Swallow-tailed kites (*Elanoides forficatus*) migrate to southwest Florida from South America in late February/early March for their nesting season that lasts through late July/early September. In the early 1900's, swallow-tailed kites were confirmed as nesting in 21 states, today they only nest in 7 southeastern states. Loss of nesting sites through development and conversion to agriculture are the major threats to this species.

This raptor has not been confirmed as nesting at IMP, but nesting behavior has been observed. In the future, if it is discovered that they are nesting on the property, the nest trees will be protected from disturbance during breeding season and planned management activities that could disturb the nesting pair(s) will be postponed.

Bald Eagle

Bald eagle (*Haliaeetus leucocephalus*) numbers have steadily increased in Florida after a low of 120 active nests in 1973. Still, loss of habitat and human disturbance due to development is a primary concern for this species.

Big Cypress Fox Squirrel

The Big Cypress fox squirrel is in decline throughout its range primarily due to loss and degradation of habitat. Although the number of this sub-species of fox squirrel in Florida is unknown, "based on the amount of known habitat loss, fox squirrel populations have undoubtedly declined by at least 85% from pre settlement levels" (Humphrey, 1992). Much of the fox squirrel's pine-oak forest has been converted to pine plantations, agriculture and development. Additionally, regular burn regimes of 2-5 years during the growing season (April-July) are critical to maintain their habitat with an open canopy with minimal understory. Two fox squirrels were seen by FGCU students on numerous occasions in the hydric hammock near the eastern border. Another was seen by Land Stewardship staff in the mesic flatwoods. Exotic plant removal/control and the implementation of regular prescribed burning will improve the habitat for this species.

Florida Panther

The Florida panther (*Puma concolor coryi*) is extirpated from most of its historic range in the southeastern United States, but exists in small populations in south Florida. The panther's decline is due mainly to loss, fragmentation, and degradation of habitat. Other habitat related threats include inbreeding, insufficient numbers of large prey, disease, and mercury and other environmental contaminants. Institutional constraints and negative public perception also threaten the future survival of the Florida panther. The large cats require extensive areas of mostly forested communities. Large wetlands that are generally inaccessible to humans are important for diurnal refuge. They will tolerate improved areas in a mosaic of natural communities.

The presence of Florida panthers has not been confirmed at IMP, but the Preserve is a Priority 2 land delineated in the Florida Panther Habitat Preservation Plan issued by the Florida Panther Inter-agency Committee, consisting of four state and federal wildlife agencies (see Figure 10). To protect the expected presence of the Florida panther, management activities include preservation of the mosaic of habitat across the Preserve. This includes control

of exotic plants, plugging ditches, leveling berms, and restoring a fire regime to the flatwoods.

Florida Black Bear

This species faces numerous challenges including poaching, roadkill mortality, low reproductive rate and most importantly loss of habitat to timber harvesting, development and other uses. “Long-term conservation of the Florida black bear is dependent upon preservation of large contiguous woodlands”. Scientists with FWC have found the average home range for female black bears is almost 7,000 acres and males average over 42,000 acres (Humphrey, 1992).

Imperial Marsh Preserve is not large enough to support black bears, but may be an excellent foraging site, or portion of a larger home range for black bears. The Preserve could also serve as a safe corridor for the travel of black bears throughout a larger conservation area. Scientists have found that large scale winter burning reduces the diversity of food available to bears as compared to growing season burns (Humphrey, 1992). Prescribed burns conducted in the late spring would not only be beneficial to bears, but to several other species listed above. Bears have not been sighted on the Preserve, but two bear have been seen a few miles west of the Preserve on Corkscrew Road.

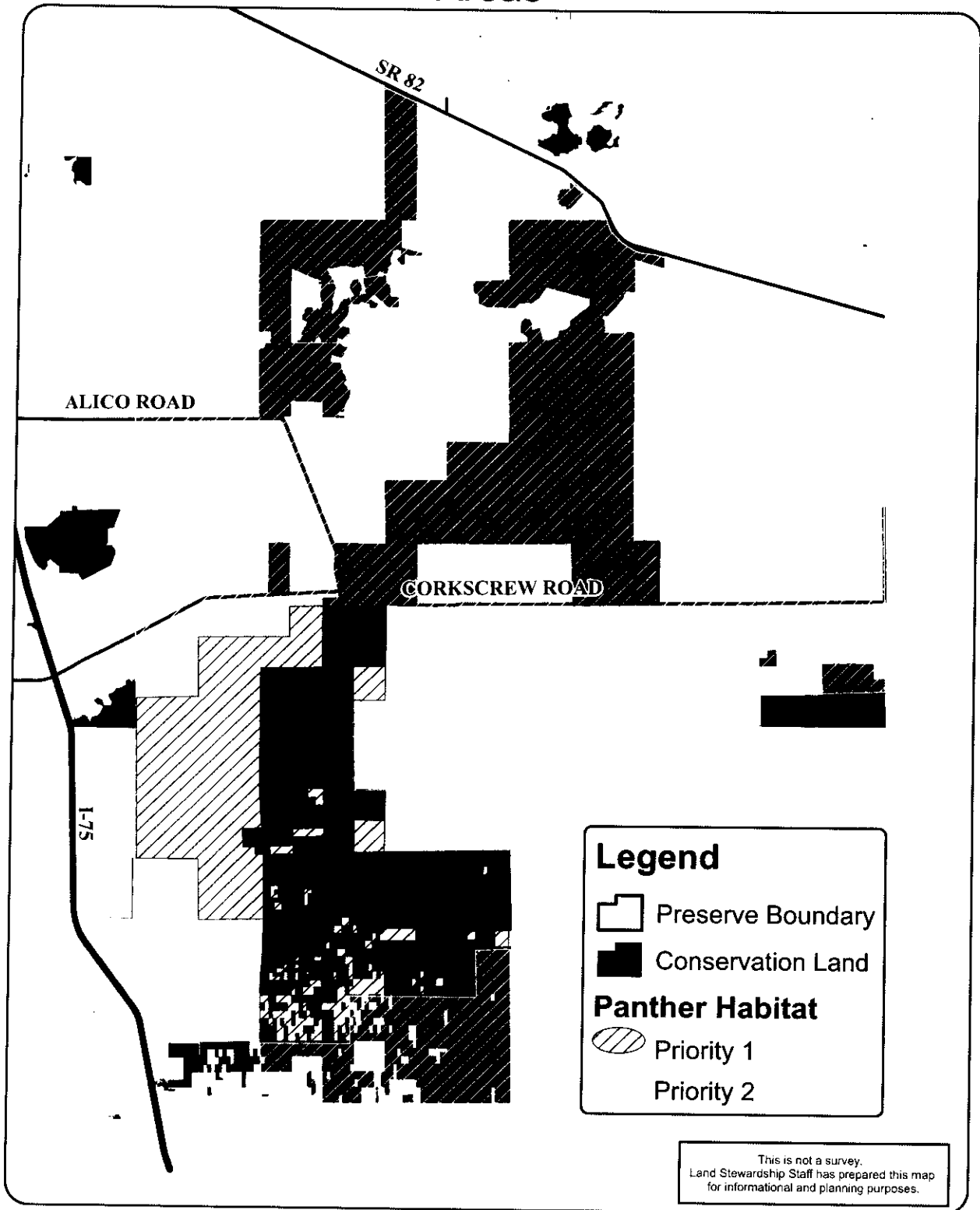
Plant Species


Cardinal and Giant Airplants

Cardinal airplants (*Tillandsia fasciculata* var. *densispica*) and giant airplants (*Tillandsia utriculata*) are found in hammocks, cypress swamps and pinelands at IMP. Scattered plants have been documented in several portions of the Preserve. Threats to these plants include illegal collecting, habitat destruction and the Mexican bromeliad weevil (*Metamasius callizona*) (Save, 2004). Now listed as Endangered, they were once considered common before the arrival of the weevil in Florida. Currently, scientists are researching biological control agents for the exotic weevil. Staff will follow the research developments and work with scientists in the future if it is determined that these insects are affecting epiphytes and the United States Department of Agriculture (USDA) is in need of release sites.

Table 4 outlines some specific management and restoration activities at the Preserve that will be taken to protect the species listed above. If additional listed species are documented on the Preserve they will be added to the list in Appendix B. A map with listed species burrow/nest locations will be created for staff use only and will not be included in the plan.

Figure 10: Panther Strategic Habitat Conservation Areas



 **Imperial Marsh Preserve**

0 0.5 1 2 3 4 Miles

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Table 4: Management Recommendations for Designated Species

Species	Common Name	Restoration Activities			Management Recommendations	
		Exotic Control	Hydrologic Restoration	Prescribed Fire	Mark Location	Relocation
<i>Alligator mississippiensis</i>	American alligator	x	x		x (nests)	
<i>Egretta caerulea</i>	little blue heron	x	x			
<i>Egretta tricolor</i>	tricolored heron	x	x			
<i>Egretta thula</i>	snowy egret	x	x			
<i>Eudocimus albus</i>	white ibis	x	x			
<i>Mycteria americana</i>	wood stork	x	x			
<i>Ajaia ajaja</i>	roseate spoonbill	x				
<i>Elanoides forficatus</i>	swallow-tailed kite	x			x	
<i>Grus canadensis</i>	sandhill crane	x				
<i>Haliaeetus leucocephalus</i>	bald eagle	x			x (nests)	
<i>Sciurus niger avicennia</i>	Big Cypress fox squirrel	x		x	x (nests)	
<i>Puma concolor coryi</i>	Florida panther	x		x		
<i>Ursus americana floridanus</i>	Florida black bear	x		x		
<i>Tillandsia fasciculata</i>	cardinal airplant	x			x	x
<i>Tillandsia utriculata</i>	giant airplant	x			x	x

Restoration Activities:

Activities on the Preserve that will benefit and protect designated species for the long term.

Explanation of Management Recommendations:

Mark Location – location of individual plants, nest sites or burrows will be recorded using GPS for land stewardship staff knowledge and protection during restoration activities.

Relocation – a permit will be obtained to relocate any plant that could be damaged during exotic removal, if it is economically feasible.

v. Biological Diversity

Many species of birds, reptiles, invertebrates, fish and mammals inhabit the Preserve. There are several reasons for a high level of biological diversity on this site. Four natural wetlands, surrounded by uplands, provide habitat for a variety of species. IMP, although only a 15-20 minute drive from human population centers remains a somewhat remote retreat for animal species that are quickly losing habitat. Additionally, even though the Preserve itself is small, it is bordered to the west by the approximately 640 acre Corkscrew Mitigation Bank owned by the South Florida Water Management District (SFWMD) and to the northwest the approximately 7,000 acre Port Authority Imperial Marsh Preserve extending north to State Road 82. The Corkscrew Mitigation Bank is bordered to the south by the 9,000 acre Flint Pen Strand, owned by Lee County and SFWMD and managed by SFWMD. Corkscrew Regional Ecosystem Watershed (CREW) manages 13,000 acres in Lee County and extends into Collier county totaling 27,500 acres (Figure 11). Altogether this corridor, including Corkscrew Swamp Sanctuary and Panther Island Mitigation Bank, totals almost 60,000 acres of protected conservation land. This corridor provides good habitat for species with large home ranges such as whitetail deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), sandhill crane, wood stork and panther.

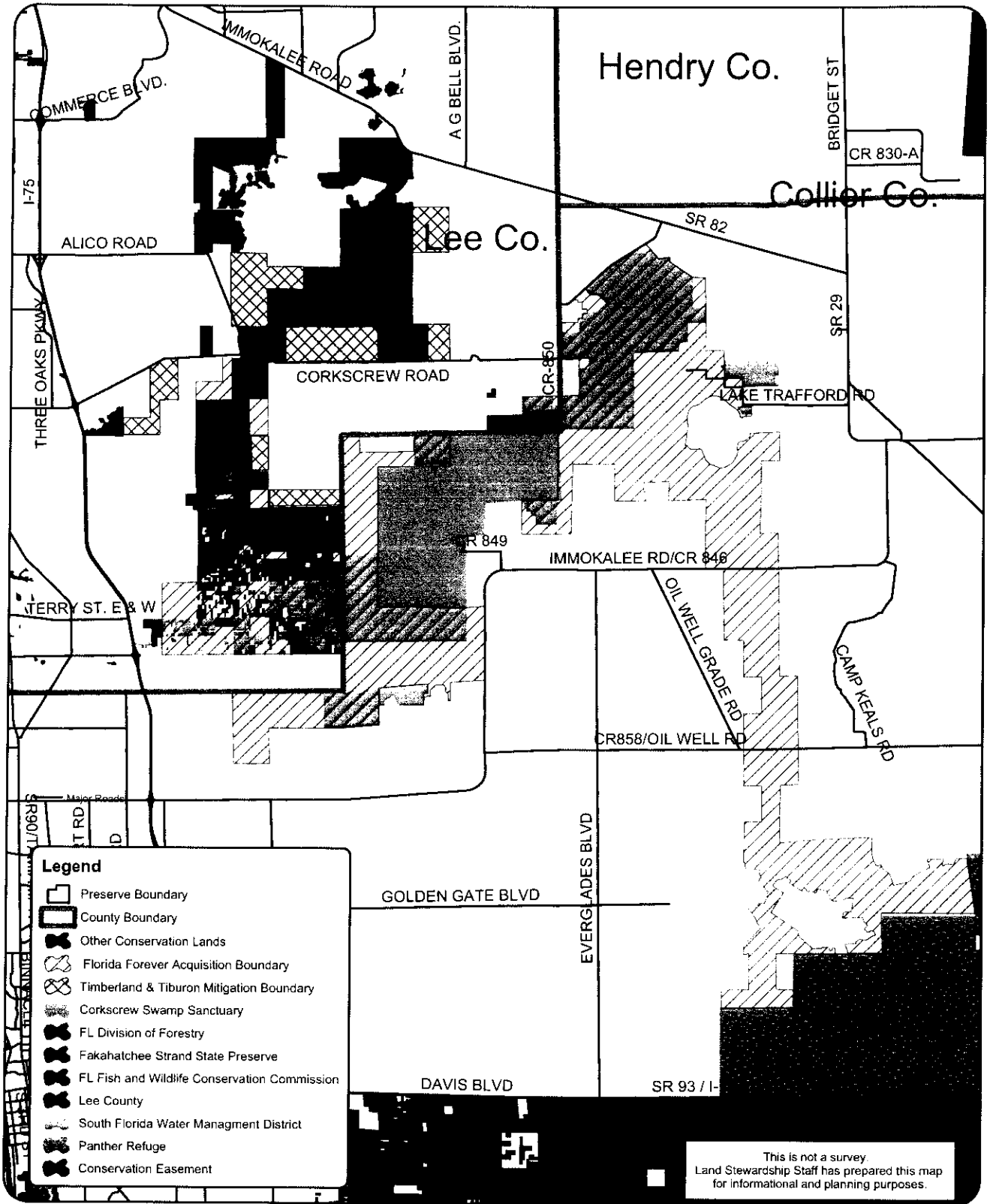
Corkscrew Road has created an artificial wetland on the south boundary of the Preserve attracting birds such as wood storks and blue-winged teal (*Anas discors*) to feed on congregations of fish and aquatic plants. Oak toads, eastern narrowmouth toads, barking (*Hyla gratiosa*) and squirrel treefrogs spend more time in surrounding uplands, utilizing the wetlands strictly for breeding (Jensen, 2003). Additionally, barking treefrogs and oak toads breed almost exclusively in seasonal wetlands. Because of the short hydroperiod, larger predatory fish like Florida largemouth bass (*Micropterus salmoides floridanus*) and bluegill (*Lepomis macrochirus*) are unable to become established and feed on the developing tadpoles. As these temporary wetlands slowly dry, the fish, tadpoles and aquatic invertebrates become quite concentrated, providing an excellent food source for the numerous water birds that utilize the Preserve.

The integrity and diversity of IMP must be protected when and where possible. Land Stewardship staff will perform the following actions in this regard:

- Control of invasive exotic vegetation followed by annual maintenance to provide more suitable habitat for native aquatic and terrestrial species.
- Secure the boundaries with fencing and signs to eliminate illegal access to the Preserve and protect fragile ecosystems.
- Hydrologic restoration, including plugging and/or filling the numerous ditches to allow sheet-flow, and aid in restoration of natural hydroperiods.
- Implement a prescribed fire program to closely mimic the natural fire regimes for different plant communities to increase plant diversity and insure the canopies remain open.

- Control feral hog populations to reduce their impacts on the herbaceous plants and soils.

Figure 11: Conservation Lands Map



Imperial Marsh Preserve

0 1 2 4 6 8 Miles

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Prepared on: 04/10/05, by lboyd@leegov.com

C. Cultural Resources

i. Archaeological

In 1987, Piper Archaeological Research, Inc. conducted an archaeological site inventory of Lee County. They were able to identify 53 additional sites increasing the total number of known archaeological sites in Lee County to 204. They also created a site predictive model and archaeological sensitivity map for the county that highlighted potential areas likely to contain additional archaeological sites. There are no known archaeological sites or potential areas predicted by the model at Imperial Marsh Preserve.

ii. Land Use History

According to aerial photography dating back to 1944 (Figure 2) land use on this property has included various agricultural activities starting with row crop farming and most recently cattle grazing. Intense logging of slash pine from the late nineteenth century until the 1930's virtually eliminated all virgin stands of the southern mixed forest in south Florida. This activity is likely to have reduced slash pine densities throughout the Preserve and explains the lack of old growth pine trees found on the site. In the 1960's and 1970's, the stumps of the logged slash pines were removed from many properties in the region. This activity, referred to as stumping, was conducted to extract turpentine from the wood. Stumping created depressions in the soil, which created a microhabitat where soil moisture is higher for longer periods than adjacent habitats. For this reason different plant species are likely to occur in these depressions.

Row crop farming on the Preserve took place in two fields on the property. These fields comprise about 75% of the Preserve. Historic aerials show that Corkscrew Road was moved from a slightly southern position north to its current position between 1958 and 1966. During this same time, the row crop fields were created. The southeastern field shows signs of abandonment as indicated in the 1974 aerial and through natural succession, has recovered with south Florida slash pine, cabbage palm, saw palmetto, live oak, wax myrtle, St. John's wort and numerous species of native grasses. Exotic vegetation occurs in this field at less than 25% of all vegetation cover. The southwestern field initially extended to the west into what is now the Corkscrew Mitigation Bank. The western berm separating IMP from Corkscrew Mitigation Bank was installed between 1966 and 1970 and by 1974 shows evidence of the initial growth of the current hedge of Brazilian pepper. The vegetation within this field is similar to what occurs in the southeast field but is at a more recent successional stage. The southern half of this field contains more open grassy areas. Grazing was started on the preserve in the early 1980's and aerial photographs show three cow wells were installed between 1980 and 1984.

V. FACTORS INFLUENCING MANAGEMENT

A. Natural Trends and Disturbances

Natural trends and disturbances influencing native communities and stewardship at IMP include hurricanes, flooding, wildfire, occasional freezes and the pattern of wet and dry periods. Implementation of the Management Action Plan will take into consideration the possibility of these factors and their influence on projects at IMP. For example, a tropical storm or hurricane could damage large amounts of vegetation. It may be necessary to remove or mulch downed vegetation following a hurricane if it increases the chance of negative impacts to wildlife habitat from a wildfire.

Wildfires caused by lightning strikes are a natural occurrence in Florida. The Florida Division of Forestry (DOF) – Caloosahatchie District - and Lee County Department of Parks and Recreation are developing a wildland firefighting protocol for County preserves. The DOF has been provided a map of the Preserve showing the locations of gates, firebreaks and management units. The DOF will utilize existing firebreaks to contain wildfires at IMP whenever possible. No new fire breaks, such as plow lines, will be created unless there is potential for the wildfire to harm property outside the IMP boundary. This agreement between DOF and the County will protect IMP from the potential damage associated with emergency firefighting equipment. Land stewardship staff will lead periodic site visits in order to familiarize DOF with IMP and current management efforts. A comprehensive C20/20 fire plan, to be completed in 2005, will help decrease the impact of catastrophic wildfires on the preserve and neighboring lands.

Management (exotic plant control, prescribed burning, etc.) of IMP is influenced by seasonal hydroperiods. The Land Stewardship Operations Manual's (LSOM) exotic plant prescription form will be used to define the conditions for control activities. Care shall be taken to prevent herbicide from running off during a typical summer thunderstorm so as not to affect non-target plants. Only herbicides approved for aquatic application will be used for treatment of vegetation in standing water or where flooding may occur. The use of heavy equipment will be limited to the dry season for the majority of the site. The timing of prescribed burns will also be influenced by seasonal rain, weather and wind patterns.

B. Internal Influences

IMP has been altered by past agricultural practices. Ditches were dug throughout the Preserve to drain agricultural fields both on and off-site. These

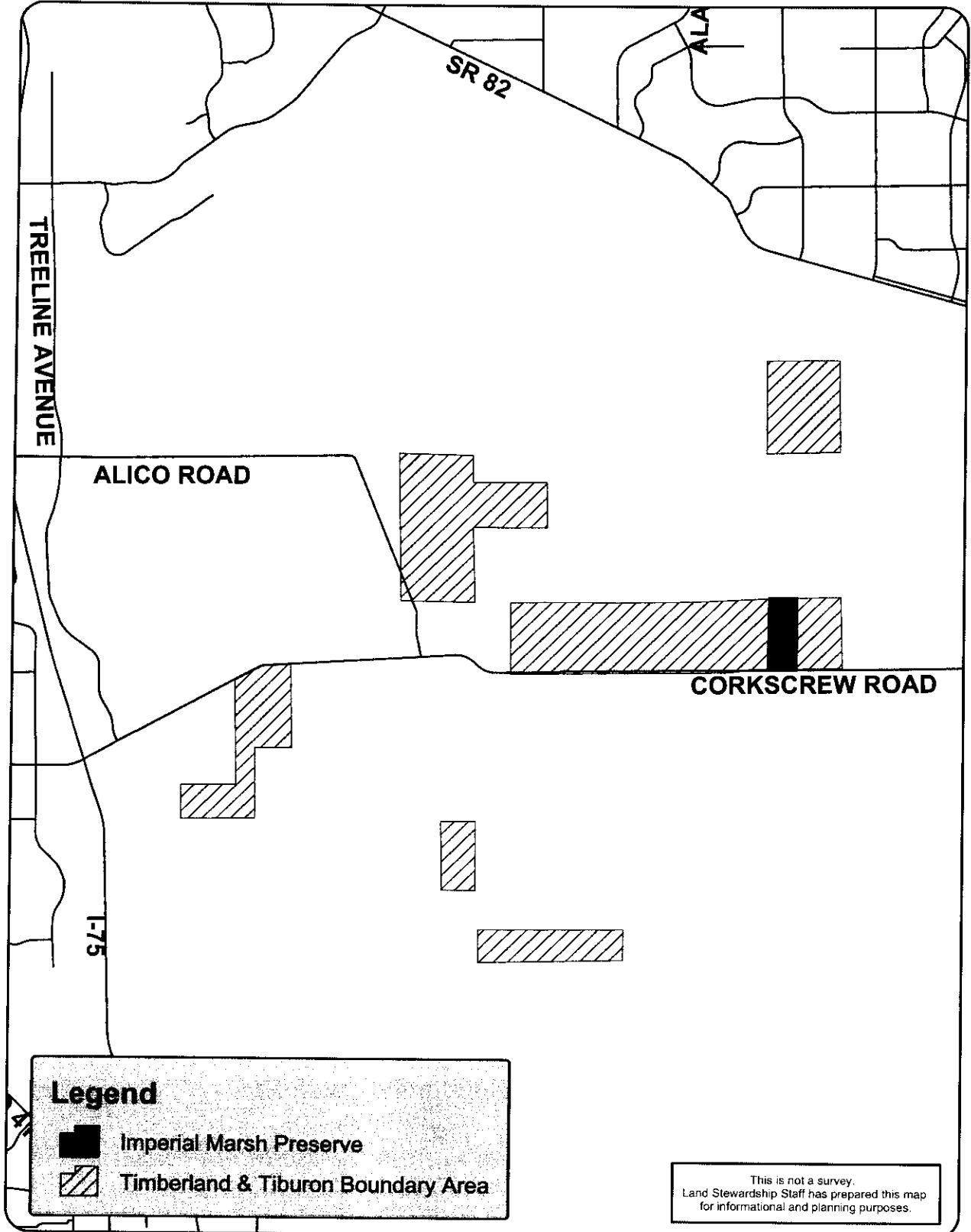
ditches affect the hydrologic conditions of the site and may limit access during the wet season.


In May 2000, after the Preserve was purchased, Lee County granted a cattle lease to a local rancher across the entire Preserve. The interior barbed wire fencing, cattle pens and gates will be removed after the existing lease has been terminated.

In the 1990's, the Timberland and Tiburon Limited (T & T) development company entered into a developer's agreement with Lee County for the construction of Miromar Outlet Mall, and a sports complex and a golf course community north of Corkscrew Road and east of I-75. This large-scale development was classified as a Development of Regional Impact (DRI) because its character, magnitude and location could have a substantial effect upon the health, safety or welfare of the citizens of Lee and Collier Counties. At that time, a mitigation agreement was approved by T & T, the Lee County Board of County Commissioners (BOCC) and United States Army Corps of Engineers (ACOE) as part of the DRI review that rather than mitigating the effects of the development on their own land, T & T would instead provide incremental payments to Lee County that would be used to purchase conservation land within an established boundary area (Figure 12). Because the acquisition area is fragmented, it was very difficult to match up the funds available with appraised value of a parcel that is contiguous with the other conservation lands. Unfortunately, the money came in quite slowly at first and by the time enough accumulated, the land values increased to a point where the County was unable to purchase land in the designated areas.

In April 2000, the BOCC voted to use the T & T monies in the C2020 program for land acquisition and to provide management in the established T & T boundary. In March of 2005, T & T funds were used to reimburse Conservation 20/20 for the purchase the southern half (117 acres) of Imperial Marsh Preserve for a total cost of \$634,202.01. As of May 2005, \$191,129 remains in the T & T existing mitigation fund. Land Stewardship staff has requested that \$250,000 of the fund (utilizing the remaining funds as well as future payments) be made available for the maintenance and restoration of the southern 117 acres of IMP. The total amount to be paid by T & T for mitigation is \$1.3 million, allowing there to be some funds remaining for acquisition and management of land. The Conservation Lands Program will utilize the remaining money for future conservation land acquisitions and management.

Figure 12: Timberland & Tiburon Boundary Map



 **Imperial Marsh Preserve**

0 1 2 4 Miles

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Prepared on: 05/05/05, by lwewerka@leegov.com

C. External Influences

A variety of external influences affect Imperial Marsh Preserve. The construction and improvements to Corkscrew Road have slowed historic sheet flow to the south and have altered wildlife habitat and movement patterns. These alterations affect the amount, duration and timing of water flow that reaches IMP, thus altering the communities present on the Preserve.

The South Florida Water Management District owns conservation land adjacent to the western and northwestern boundaries of IMP. Land Stewardship staff will coordinate with SFWMD and Mariner Properties Inc., which manages the mitigation bank, regarding the mitigation efforts on the Corkscrew Mitigation Bank, located just to the west of IMP. Land Stewardship staff will request that the berm and ditch on the western property boundary be removed to allow sheet flow between the two properties. Land Stewardship staff will contact prior to restoration work to coordinate with them on this project. The Southwest Florida International Airport (Lee County Port Authority (LCPA)) presently owns 6,000 acres to the northwest of IMP. Land Stewardship staff will work to initiate joint management agreements with LCPA, SFWMD and Mariner Properties, which would allow conservation at a landscape scale.

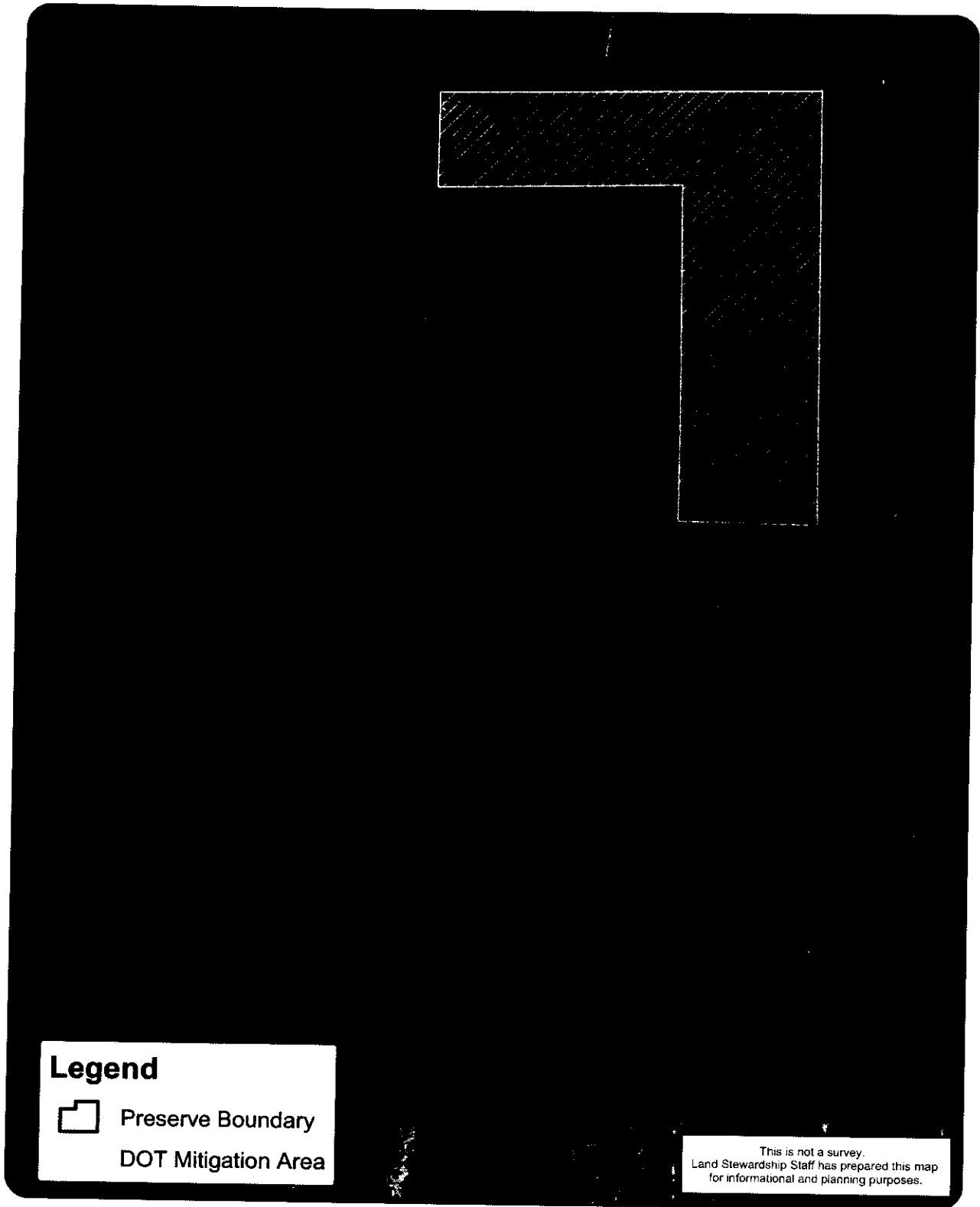
D. Legal Obligations and Constraints


i. Permitting and Mitigation Issues

Land stewardship activities at Imperial Marsh Preserve may involve obtaining permits from regulatory agencies. The proposed hydrologic improvements to the site will require obtaining permits from the Florida Department of Environmental Protection (FDEP), the U.S. Army Corps of Engineers (ACOE) and SFWMD. Once invasive exotic plants have been removed and controlled in the upland portions of the preserve, prescribed fire will be used as a management tool, requiring burn authorization from the Florida Division of Forestry.

The Lee County Department of Transportation (DOT) is planning a road widening project on Corkscrew Road just west of IMP. Mitigation for this project will occur on 47 acres in the northern portion of the Preserve (Figure 13). Mitigation efforts will focus on improving panther habitat in pine flatwoods and wetlands primarily through exotic plant control. Permit conditions will require DOT to initiate a 5-year monitoring program for the mitigation project. Once permit monitoring activities are complete, Land Stewardship staff will be responsible for maintenance of these areas. The mitigation area will be placed under a conservation easement with SFWMD according to permit conditions (Appendix C).

Figure 13: DOT Mitigation Area



 **Imperial Marsh Preserve**

0 440 880 1,760
Feet

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Prepared on: 05/05/05, by lwewerka@ieegov.com

ii. Relationship to Other Plans

The Lee Plan, Lee County's comprehensive plan, is designed to depict Lee County as it will appear in the year 2020. Several themes have been identified as having "great importance as Lee County approaches the planning horizon" (Lee County, 2003). These themes are:

- The growth patterns of the County will continue to be dictated by the Future Land Use map.
- The continued protection of the County's natural resource base.
- The diversification of the County's traditional economic base.
- The expansion of cultural, educational and recreational opportunities.
- A significant expansion in the County's physical and social infrastructure.

The entire Lee Plan can be found on the Internet at: <http://www.lee-county.com/dcd1/Leeplan/Leeplan.pdf>. The two chapters that affect the management of IMP are **Chapter V – Parks, Recreation and Open Space** and **Chapter VII – Conservation and Coastal Management**.

Chapter V provides that Land Stewardship staff will ensure that any public use facilities and recreational opportunities will comply with **Goal 60: Park Planning and Design**, which requires that parks are planned, designed and constructed to comply with the best professional standards of design, landscaping, planning and environmental concern. Staff will also work to provide, whenever staffing and funding permit, appropriate environmental programs to the public in order to meet **Goal 61: Environmental and Historic Programs**.

Chapter VII, Objective 74.1: ENVIRONMENTALLY CRITICAL AREAS provides that Land Stewardship staff has the responsibility of managing the environmentally critical areas found at IMP, such as the wetlands, pine flatwoods and the live oak hammock, to conserve and enhance their natural functions.

Chapter VII, Objective 77.1, Policy 77.1.1, Section 4e RESOURCE MANAGEMENT PLAN provides that the IMP management plan was written for the long term maintenance and enhancement of the Preserve's health and environmental integrity. The management plan addresses any necessary visitor management including fences and signage to prevent incompatible uses and to regulate allowable uses. Incompatible uses include vehicles and hunting. The plan addresses surface water management and restoration, ecosystems restoration, litter control, fire management, invasive exotic plant and animal control and, where appropriate compatible recreational use facilities. The plan also addresses funding of expected maintenance.

Chapter VII, Objective 77.3, Policy 77.3.1 WILDLIFE provides that Land Stewardship staff is directed to preserve uplands in and around preserved wetlands to provide habitat diversity, enhance edge effect and promote wildlife

conservation. Initiating a prescribed fire regime and removing invasive exotics will follow this policy.

Chapter VII, Objective 77.10, Policies 77.10.1 and 77.10.2 WOOD STORK provides that Land Stewardship staff will continue to document wood stork utilization of the Preserve and ensure that the IMP management plan follows United States Fish and Wildlife Service's (USFWS) "Habitat Management Guidelines for the Wood Stork in the Southeast Region."

Chapter VII, Objective 77.11, Policies 77.11.1, 77.11.4 and 77.11.6 Florida Panther and Black Bear provides that Land Stewardship staff will maintain and update data on sightings and habitat for the black bear and Florida panther. Staff will continue to support expansion of land acquisition for areas connecting the Corkscrew Regional Ecosystem Watershed, a nearby greenway connecting priority panther habitat, with areas adjacent to Wild Turkey Strand Preserve. Where appropriate, IMP's habitat restoration projects will include plant species that provide forage for the prey of the Florida panther and forage for the black bear due to its proximity to these frequented panther habitat locations.

Chapter VII, Objective 84.1 WETLANDS provides that Land Stewardship staff is directed to protect and conserve the natural function of wetlands and wetland systems through the enforcement of the county's wetland protection regulations and the goals, objectives, and policies in this plan. "Wetlands" include all of those lands, whether shown on the Future Land Use Map or not, that are identified as wetlands in accordance with F.S. 373.019(17) through the use of the unified state delineation methodology described in FAC Chapter 17-340, as ratified and amended by F.S. 373.4211 (Amended by Ordinance No. 94-30, 00-22).

E. Management Constraints

The principle stewardship constraints for IMP include limited funding, the brief dry season for stewardship activities and adjacent land uses. Land Stewardship staff has requested that a portion of the money from the T & T acquisition reimbursement be placed in a stewardship fund for restoration activities on the southern portion of the Preserve (Figure 13). Although some restoration will be funded through the DOT mitigation, efforts to obtain additional funding through grants and/or monies budgeted for mitigation of County infrastructure projects will be pursued. These funds will be used to supplement the operations budget to meet the restoration goals in a timely manner. Additionally, Imperial Marsh Preserve is very wet most of the year; January through April are typically the driest months. Stewardship activities will need to be concentrated in these months.

The adjacent land uses pose some obstacles to stewardship of conservation land. Current adjacent land uses include agriculture to the north, previous agricultural use and potential impacts from pending development to the east, a roadway to the south and mitigation lands to the west. The current agricultural use to the north and previous agricultural use to the east may provide a seed source for exotic plants as well as altered hydrologic conditions on the site. Vegetation monitoring projects will provide detection of exotic species and allow prompt control. Potential development scenarios will be monitored and recommendations will be provided. Coordination with other agencies and adjacent landowners will also be an important part of managing the Preserve.

F. Public Access and Resource Based Recreation

Historically, IMP was utilized for both row crops and cattle ranching. The agricultural uses and fencing discouraged the general public from entering.

At this time, no public recreation amenities are proposed at Imperial Marsh Preserve. Restoration activities over the next several years will not be conducive to recreation on the Preserve. Corkscrew Regional Ecosystem Watershed (CREW) Land and Water Trust has property located 7 miles east of IMP with five miles of hiking trails through three native plant communities. Restoration activities are prioritized over public recreation at this time, particularly since resource based recreational opportunities are present nearby. Potential future amenities may include a small parking area and hiking trails with educational signs explaining the restoration activities that have occurred and native plant communities that exist on the Preserve. Recreational amenities will be reexamined during the 5-year revision of this plan. The opportunities for trails and any other public use facilities will be determined based on the soil types, listed species utilization and hydrologic components at the Preserve.

G. Acquisition

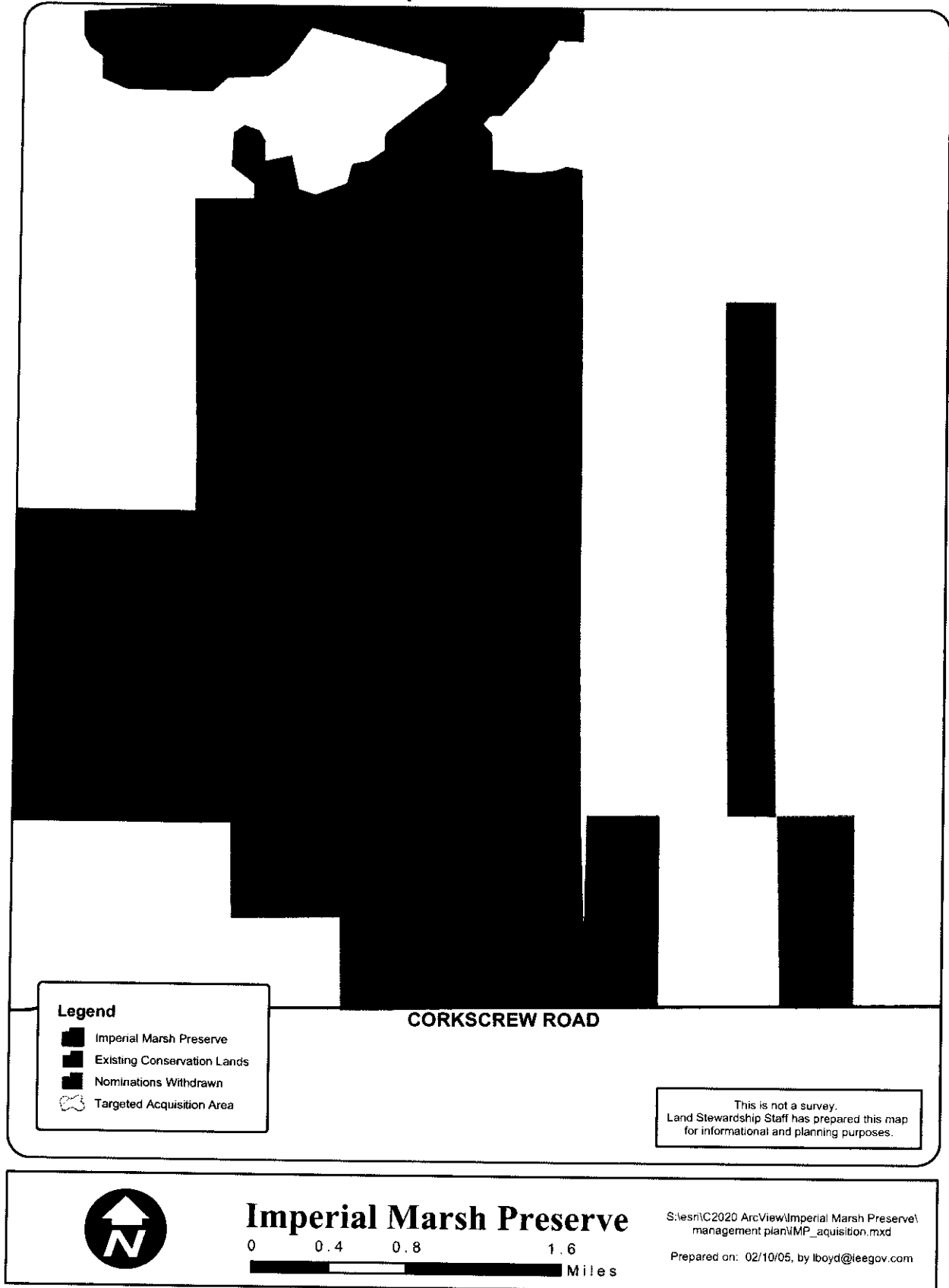
Imperial Marsh Preserve was purchased on July 28, 2000 from Biagio Cirrincioni and Carmella La Cascio for \$1,261,900. This site was nomination #93, consisting of 233.7 acres, nominated by Lisa Wiskowski of Florida Resale Properties on September 23, 1998.

Two other properties, located west of IMP, were also nominated. In 1996 nominations #1 (182 acres) and #2 (160 acres) were nominated to the program. Nomination #1 was at an impasse because the owner had a pending offer from a third party, and both parcels were eventually sold to the Bonita Bay Group for golf course development. A third piece east of the Preserve, nomination #252 (255 acres), was nominated in October 2003. The Conservation Lands Acquisition and Stewardship Advisory Committee (CLASAC) did not forward this property to secondary review because the asking price was significantly higher

than staff's estimated market value analysis of other similar properties in the area.

There is additional undeveloped land in the vicinity of IMP that would be beneficial to pursue for acquisition. Under the direction of the Public Works Department, Lee County has created a master mitigation plan that includes a map of targeted areas considered appropriate for acquisition and conservation. Land Stewardship staff supports acquisition of properties that fall within these boundaries as long as they pass standardized review criteria established by CLASAC. The future land use for these areas is either Wetlands or Density Reduction/Groundwater Resource and the current zoning designation is either Agriculture or Industrial Planned Development. See Figure 14 for the locations of nominations and targeted acquisition area.

Figure 14: Conservation 20/20 Nominations and Acquisitions



VI. MANAGEMENT ACTION PLAN

A. Management Unit Description

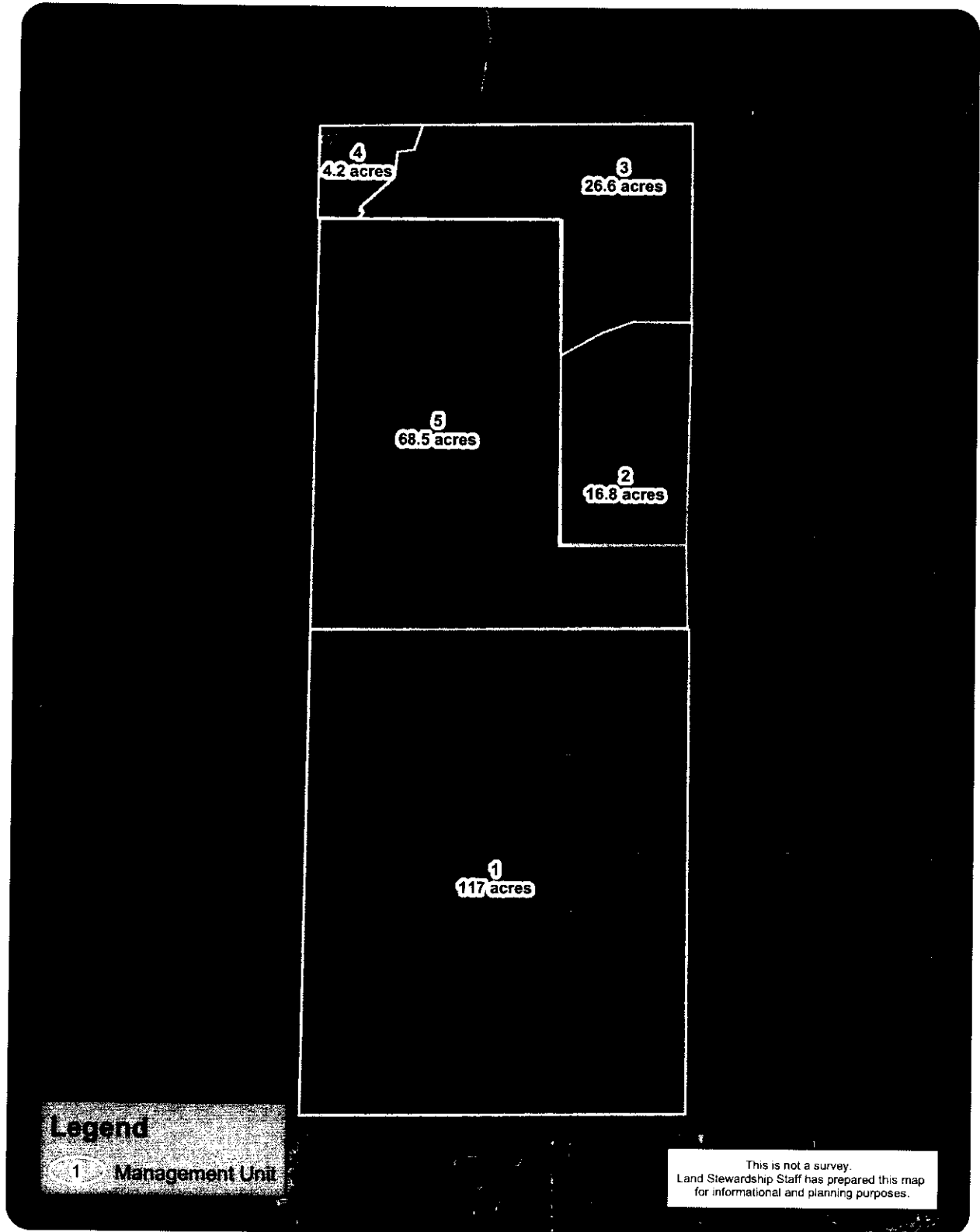
Imperial Marsh Preserve has been divided into 5 management units to better organize and achieve management goals. Figure 15 delineates the management units that were created based on existing trails, berms and plant communities.

- Management Unit 1 (117 acres) consists of the southern half of the Preserve. Timberland and Tiburon mitigation funds were used to reimburse the County for acquisition costs of this piece of the Preserve. It contains abandoned agricultural fields and two dome swamps. A double ditch runs on the western property boundary and another divides the eastern third of the unit. The southern boundary is delineated by a ditch and Corkscrew Road. The eastern portion of the unit has larger, more scattered cabbage palms and oaks than the western portion with larger remnant swales from row cropping. Invasive exotics have been removed from the southern dome swamp. The northern dome contains melaleuca and Brazilian pepper. The old agricultural field contains West Indian marsh grass, torpedo grass and alligator weed.
- Management Unit 2 (16.8 acres) is located on the eastern side of the Preserve just north of Unit 1 and is separated from Unit 3 to the north by an abandoned farm road. This unit contains a dome swamp, a small hydric hammock community and mesic flatwoods. It is bordered to the east by the property boundary and to the west by a ditch separating the abandoned agricultural fields of Unit 5. This unit has scattered Brazilian pepper and melaleuca throughout, and thick Brazilian pepper in the abandoned agriculture field.
- Management Unit 3 (26.6 acres) is located in the northeastern corner of the Preserve. The majority of the management unit is mesic and wet flatwoods with a small dome swamp. It is divided from Unit 2 by an abandoned farm road and from Unit 5 by a ditch and berm. This unit borders Unit 4 to the west. There is a small amount of melaleuca and Brazilian pepper present in this unit.
- Management Unit 4 (4.2 acres) is located in the northwest corner of the Preserve and is dominated by a basin swamp community. This unit is bordered to the north and west by the continuation of the basin swamp through which the property boundary runs. It is bordered to the east by a transition from dome swamp to wet flatwoods community of Unit 3 and to the south by an agricultural berm marking the boundary of Unit 4. There are two small cattle wells in the open area of the swamp. Melaleuca is

present around the rim of the open water.

- Management Unit 5 (68.5 acres) is located in the middle of the Preserve. It is bordered to the north by an agricultural berm marking the boundaries of Units 3 and 4, to the east by an agricultural berm marking the boundary of Units 2 and 3, to the south by the boundary of Unit 1 and to the west by an agricultural berm marking the boundary of the Corkscrew Mitigation Bank. This unit is an abandoned row crop field currently used for improved pasture and succeeding into scattered pine trees and cabbage palms with a dense ground cover of wax myrtle, herbs and Brazilian pepper.

Figure 15: Management Unit Map and Acres



 **Imperial Marsh Preserve**

0 445 890 1,780 Feet

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Prepared on: 02/25/05, by lboyd@leegov.com

B. Goals and Strategies

The primary management objective for Imperial Marsh Preserve will be pasture restoration in the abandoned agricultural fields that comprise 75% of the Preserve. Pasture restoration activities will include leveling old farm field furrows, filling ditches and removal and control of exotic species by September 2010.

Additional stewardship activities at Imperial Marsh Preserve will focus on the following, prioritized in order of importance and ease of accomplishment:

- Fencing and Signage
- Overall Protection of the Preserve
- Exotic Species Control
- Prescribed Fire

Fencing and Signage

Before any work is done at Imperial Marsh Preserve, the eastern and western boundaries will be re-surveyed and marked with boundary signs on permanent posts. The cattle lease will be terminated in September 2005 and an interior fence and a small cattle pen on the border of Units 1 and 5 will be removed. The cattleman will have the option of removing these fences with the right to retain the materials removed. A new fence will be installed along the eastern boundary. Since there will be no public access along this fenceline, the fence will consist of 4 strands of barbed wire, to allow for wildlife to continue to use the Preserve as a corridor. Once these tasks are completed, restoration work can begin on the Preserve. All perimeter fencing activities will be complete by September 2006.

Pasture Restoration

To add community diversity to the Preserve, staff will restore 177 acres of improved pasture to native plant communities (Units 1 and 5). An environmental consultant will be hired to assist in the pasture restoration process. Restoration will require several months of data collection in order to determine appropriate plant communities. Deep soil samples will be taken and analyzed in several portions of the pasture. A rain gauge and monitoring wells will be set up in strategic areas to monitor water levels over a rainy season and a portion of the dry season. Once the data are analyzed, appropriate plans for native plantings will be developed. Replanting options may include seeds, plants or a combination of both.

The area will be re-graded with heavy equipment to remove the old farm field furrows. The northern portion of the Preserve will be restored to resemble mesic flatwoods. Areas where large oaks and pines are currently present will be

protected as upland areas. The southern portion of the Preserve will be restored to wet prairie and open marsh land to create habitat for wading and migratory birds. Wetlands will be created in lower areas where soils indicate hydric conditions and large trees are not present. Invasive exotic species, such as Brazilian pepper and native species, especially wax myrtle, that have become dominant due to the lack of fire or disturbance in this area will be removed during the re-grading process. The small ditches around the two dome swamps will be back-filled. The cow well located on the western side of the pasture will be re-contoured to resemble a more natural wetland. Although the cow well in the northwest corner is not located in the pasture, native plants will be planted here also to create shade for wading birds. This work will be conducted in conjunction with restoration work on the Corkscrew Mitigation Bank to the west of the Preserve.

Once the area has been re-graded, pasture grasses will need to be removed in order to prepare the area for planting. This will be accomplished by repeated disking followed by treating the exotic pasture grasses with an appropriate herbicide. Once the exotic plants are under control, the established planting plan will be executed. The re-contoured cow well will be replanted with native species.

Photo points will be established before restoration work begins in order to track the progress of the project. A baseline photo will be taken, followed by biannual photos taken during the elimination of pasture grasses and planting phases. Finally, annual photos will be taken during the growing season for 5 years from completion of the planting project as documentation of the process. A consultant may also be contracted to create two transects and monitor the plants within them over a given year period.

Ditches border all of the abandoned farm fields. A double ditch that runs north/south through the center of Unit 1 will be back-filled and leveled. The ditch on the western boundary is entirely on the adjacent property and restoration will be coordinated with SFWMD and the Corkscrew Mitigation Bank to approve and possibly fund this work. All of the existing vegetation within the ditches, mostly Brazilian pepper, will be cleared and piled for burning. Some small, isolated wetlands may be created in areas where there is not enough fill present. The northern and western borders of Unit 5 have smaller single ditches that will need to be filled completely. Small wetlands can be created in these areas if there is not enough fill to level the ditches.

Overall Protection

Currently, IMP is zoned Ag-2. The Future Land Use for IMP was changed to Conservation Lands at the time of purchase. To better protect all Conservation 20/20 Preserves, Land Stewardship staff has made it a priority to change the Zoning to "Environmentally Critical" whenever possible as long as those

designations do not interfere with the restoration process. Land Stewardship staff is evaluating each Preserve with the assistance of the Division of Planning to determine whether the zoning category should be changed and in what order each Preserve will be changed.

Exotic Species Control

The dominant invasive exotic plant species at IMP are Brazilian pepper and melaleuca. Additional invasive plants include Wright's nutrush, alligator weed and water lettuce in the wetlands. The goal will be to remove or treat these plants in place, followed with semi-annual treatment of resprouts and new growth. This goal will be implemented by bringing each unit to a maintenance level, defined as less than 5% invasive exotic plant coverage. An exotic prescription form will be filled out before any work is conducted. All contractors will be required to fill out our Daily Report Control forms, which are both found in the Land Stewardship Operations Manual.

The removal of invasive exotic plant species (outside of the pasture areas) will be divided into two areas: the northern dome swamp in Unit 1 and a combination of Units 2-4. The northern dome swamp in Unit 1 contains a few large melaleucas on the southern border and large Brazilian peppers throughout the dome. Some of the larger pepper bushes on the edge of the cypress dome may be removed with heavy equipment during the pasture restoration. Those that cannot be removed with heavy equipment will be removed via chainsaw and treated with wetland-approved herbicides. The exotic vegetation will be piled in the field surrounding the wetland and burned.

The second area for exotic control includes Management Units 2, 3 and 4. Exotics present in Units 2 and 3 include melaleuca and Brazilian pepper. The communities in these units are relatively intact so the exotics will be hand cut, the stumps will be treated with approved herbicides and piled in log cabin style where possible to minimize the effects on water flow. Management Unit 4 contains numerous melaleuca trees surrounding the open marsh area. These trees will be cut, treated and piled log-cabin style. Exact procedures and herbicide application rates for exotic removal in these areas are outlined in the DOT mitigation plans for Imperial Marsh Preserve (Appendix C). Work for this project will begin in June 2007 and be followed up annually until all exotics are controlled.

Feral hog trapping will also occur at IMP before the restoration activities are completed. This will be necessary before native plants are established so as to not disturb them after planting.

Prescribed Fire

A prescribed fire plan will be implemented at IMP to closely mimic the natural fire regimes, increase plant diversity, reduce fuel loads and maintain open canopies. There are only two management Units (2 & 3) whose plant communities rely on fire. Mesic flatwoods historically burned every 1-8 years and wet flatwoods burned every 3-10 years, with wetter areas having a longer fire return interval. Since most natural fires would have occurred in the growing season the goal of the initial burn for prescribed fire program will be to emphasize growing season burns. Prior to the initial burn for each unit, Land Stewardship staff will evaluate the condition of the fuels and vegetation to determine appropriate treatment. Areas having heavy fuel loads may need either mowing or cool season prescribed burns to reduce fuels before the first growing season burn. Once the desired fuel conditions are attained a fire interval of 4-6 years will be sufficient to maintain vegetation and enhance wildlife habitat, while maintaining wildland fuels at a safe level for growing season burns. Burning with the 4-6 year range will allow an approximation of the natural variability of burn frequencies and intensities across the Preserve. Firing techniques will be planned to create a mosaic effect beneficial to wildlife. This fire plan will be implemented once exotic control is complete across the entire Preserve.

The following prioritized Projected Timetable for Implementation is based on obtaining necessary funding for numerous land stewardship projects. Implementation of these goals may also be delayed due to changes in staff, extreme weather conditions or a change in priorities on properties managed by Lee County.

VII. PROJECTED TIMETABLE FOR IMPLEMENTATION

Natural Resource Management		Hydrologic Components		Pasture Restoration		Prescribed Fire		Maintenance (On-going/Annual)		Outside Consultants		Overall Protection	
Initial exotic plant control													
Re-grade ditches/berms													
Improvements to cow well													
Data collection													
Re-grade agricultural fields													
Exotic grass removal													
Supplemental plantings													
Create fire breaks													
Mechanical brush reduction													
Implementation of Rx FMP													
Follow up exotic plant control													
Exotic animal removal													
Install photo point station													
Photo point monitoring													
Boundary re-survey and stake													
Environmental consultant													
Permitting													
Boundary sign installation													
Cattle removal													
Change zoning													
Install fencing on east/west lines													
Remove cattle pen and interior fencing													

VIII. FINANCIAL CONSIDERATIONS

There is a management fund established in perpetuity for all Conservation 20/20 preserves. Monies from this fund primarily serve to meet the operational needs of the Management section of the C2020 Program, but a certain amount of this fund will be set aside for planned restoration projects. The \$250,000 requested from the T & T acquisition of the southern portion of the Preserve will be used for restoration and exotic removal in this area. DOT mitigation will cover the costs of exotic removal in the northern portion of the Preserve, and the County will be responsible for maintenance following this removal. Other possible funding for these projects may be requested through grants from agencies such as SFWMD, FDEP and USFWS as well as additional mitigation opportunities. Projected costs and funding sources are listed in Appendix D.

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X. APPENDICES

Appendix A: Plant Sightings

Appendix B: Wildlife Sightings

Appendix C: Proposed Mitigation Plans

Appendix D: Projected Costs and Funding Sources Table

Appendix A: Plant Sightings

Appendix A: Plant Sightings at Imperial Marsh Preserve

Scientific and Common names from this list were obtained from Wunderlin 2003.

Scientific Name	Common Name	Native Status
Family: Blechnaceae (midsorus fern)		
<i>Blechnum serrulatum</i>	swamp fern	native
<i>Woodwardia virginica</i>	Virginia chain fern	native
Family: Nephrolepidaceae (sword fern)		
<i>Nephrolepis exaltata</i>	sword fern	native
Family: Polypodiaceae (polypody)		
<i>Phlebodium aureum</i>	golden polypody	native
<i>Pleopeltis polypodioides</i>	resurrection fern	native
Family: Psilotaceae (whisk-fern)		
<i>Psilotum nudum</i>	whisk-fern	native
Family: Salviniaceae (floating fern)		
<i>Salvinia minima</i>	water spangles	native
Family: Schizaeaceae (curly-grass)		
<i>Lygodium microphyllum</i>	Old World climbing fern	exotic
Family: Thelypteridaceae (marsh fern)		
<i>Thelypteris hispidula</i>	hairy maiden fern	native
Family: Vittariaceae (shoestring fern)		
<i>Vittaria lineata</i>	shoestring fern	native
Family: Cupressaceae (cedar)		
<i>Taxodium ascendens</i>	pond cypress	native
<i>Taxodium distichum</i>	bald cypress	native
Family: Pinaceae (pine)		
<i>Pinus elliottii</i> var. <i>densa</i>	south Florida slash pine	native
Family: Alismataceae (water plantain)		
<i>Sagittaria graminea</i> var. <i>graminea</i>	grassy arrowhead	native
<i>Sagittaria lancifolia</i> subsp. <i>lancifolia</i>	bulltongue arrowhead	native
Family: Araceae (arum)		
<i>Lemna obscura</i>	little duckweed	native
<i>Pistia stratiotes</i>	water lettuce	exotic
<i>Wolffia columbiana</i>	Columbian watermeal	native
Family: Arecaceae (palm)		
<i>Sabal palmetto</i>	cabbage palm	native
<i>Serenoa repens</i>	saw palmetto	native
Family: Bromeliaceae (bromeliads)		
<i>Tillandsia fasciculata</i> var. <i>densispica</i>	cardinal airplant	native
<i>Tillandsia pruinosa</i>	fuzzywuzzy airplant	native
<i>Tillandsia recurvata</i>	ball-moss	native
<i>Tillandsia setacea</i>	southern needle leaf airplant	native
<i>Tillandsia usneoides</i>	Spanish moss	native
<i>Tillandsia utriculata</i>	giant airplant	native
Family: Commelinaceae (spiderwort)		
<i>Commelina diffusa</i> var. <i>diffusa</i>	dayflower	native
Family: Cyperaceae (sedge)		
<i>Cladium jamaicense</i>	Jamaica swamp sawgrass	native
<i>Cyperus haspan</i>	haspan flatsedge	native
<i>Cyperus odoratus</i>	fragrant flatsedge	native
<i>Fuirena scirpoidea</i>	southern umbrellasedge	native

Appendix A: Plant Sightings at Imperial Marsh Preserve (continued)

Scientific Name	Common Name	Native Status
Family: Cyperaceae (sedge) - continued		
<i>Rhynchospora colorata</i>	starrush whitetop	native
<i>Rhynchospora microcarpa</i>	southern beaksedge	native
<i>Scleria lacustris</i>	Wright's nutrush	exotic
Family: Eriocaulaceae (pipewort)		
<i>Lachnocaulon minus</i>	Small's bogbutton	native
Family: Haemodoraceae (bloodwort)		
<i>Lachnanthes caroliana</i>	Carolina redroot	native
Family: Iridaceae (iris)		
<i>Iris hexagona</i>	Dixie iris	native
Family: Poaceae (grass)		
<i>Andropogon virginicus</i>	broomsedge bluestem	native
<i>Aristida stricta</i>	wiregrass	native
<i>Axonopus furcatus</i>	big carpetgrass	native
<i>Cynodon dactylon</i>	Bermuda grass	exotic
<i>Dichanthelium commutatum</i>	variable witchgrass	native
<i>Dichanthelium erectifolium</i>	erectleaf witchgrass	native
<i>Hemarthria altissima</i>	limpogress	exotic
<i>Oplismenus hirtellus</i>	woodsgrass	native
<i>Panicum hemitomon</i>	maidencane	native
<i>Panicum repens</i>	torpedogress	native
<i>Panicum rigidulum</i>	redtop panicum	native
<i>Paspalum conjugatum</i>	hilogress	native
<i>Sacciolepis striata</i>	American cupscale	native
<i>Stenotaphrum secundatum</i>	St. Augustine grass	native
Family: Pontederiaceae (pickerelweed)		
<i>Heteranthera limosa</i>	blue mudplantain	exotic
<i>Pontederia cordata</i>	pickerelweed	native
Family: Smilacaceae (smilax)		
<i>Smilax bona-nox</i>	saw greenbrier	native
<i>Smilax laurifolia</i>	laurel greenbrier	native
<i>Smilax tamnoides</i>	bristly greenbrier	native
Family: Acanthaceae (acanthus)		
<i>Blechum pyramidatum</i>	browne's blechum	exotic
Family: Adoxaceae (moschatel)		
<i>Viburnum obovatum</i>	Walter's viburnum	native
Family: Amaranthaceae (amaranth)		
<i>Alternanthera philoxeroides</i>	alligatorweed	exotic
Family: Anacardiaceae (cashew)259		
<i>Schinus terebinthifolius</i>	Brazilian pepper	exotic
<i>Toxicodendron radicans</i>	eastern poison ivy	native
Family: Annonaceae (custard-apple)		
<i>Annona glabra</i>	pond apple	native
Family: Aquifoliaceae (holly)		
<i>Ilex cassine</i>	dahoon	native
<i>Ilex glabra</i>	gallberry	native
Family: Araliaceae (ginseng)		
<i>Centella asiatica</i>	spadeleaf	native

Appendix A: Plant Sightings at Imperial Marsh Preserve (continued)

Scientific Name	Common Name	Native Status
Family: Asteraceae (aster)		
<i>Chaptalia albicans</i>	white sunbonnets	native
<i>Cirsium nuttallii</i>	Nuttall's thistle	native
<i>Eclipta prostrata</i>	false daisy	native
<i>Eupatorium capillifolium</i>	dogfennel	native
<i>Mikania scandens</i>	climbing hempvine	native
<i>Pseudognaphalium obtusifolium</i>	sweet everlasting	native
<i>Symphotrichum carolinianus</i>	climbing aster	native
Family: Bignoniaceae (trumpet creeper)		
<i>Campsis radicans</i>	trumpet creeper	native
Family: Boraginaceae (borage)		
<i>Heliotropium</i> ssp.	heliotrope	depends on species
Family: Cabombaceae (watershield)		
<i>Cabomba caroliniana</i>	Carolina fanwort	native
Family: Clusiaceae (mangosteen)		
<i>Hypericum hypericoides</i>	St. Andrew's-cross	native
<i>Hypericum myrtifolium</i>	myrtleleaf St. John's-wort	native
Family: Cucurbitaceae (gourd)		
<i>Momordica charantia</i>	balsampear	exotic
Family: Droseraceae (sundew)		
<i>Drosera</i> ssp.	sundew	native
Family: Fabaceae (pea)		
<i>Sesbania vesicaria</i>	bladderpod	native
<i>Vigna luteola</i>	hairy pod cowpea	native
Family: Fagaceae (beech)		
<i>Quercus laurifolia</i>	laurel oak	native
<i>Quercus virginiana</i>	Virginia live oak	native
Family: Lamiaceae (mint)		
<i>Hyptis alata</i>	musky mint	native
Family: Lauraceae (laurel)		
<i>Cassytha filiformis</i>	love vine	native
<i>Persea palustris</i>	swamp bay	native
Family: Lentibulariaceae (bladderwort)		
<i>Pinguicula pumila</i>	small butterwort	native
Family: Lythraceae (loosestrife)		
<i>Cuphea carthagenesis</i>	Colombian waxweed	exotic
<i>Lythrum alatum</i>	winged loosestrife	native
Family: Malvaceae (mallow)		
<i>Kosteletzkya virginica</i>	Virginia saltmarsh mallow	native
<i>Urena lobata</i>	Caesarweed	native
Family: Moraceae (mulberry and figs)		
<i>Ficus aurea</i>	strangler fig	native
Family: Myricaceae (bayberry)		
<i>Myrica cerifera</i>	wax myrtle	native
Family: Myrsinaceae (myrsine)		
<i>Rapanea punctata</i>	colicwood	native
Family: Myrtaceae (myrtle)		
<i>Melaleuca quinquenervia</i>	punktree	exotic

Appendix A: Plant Sightings at Imperial Marsh Preserve (continued)

Scientific Name	Common Name	Native Status
Family: Nymphaeaceae (waterlily)		
<i>Nymphaea elegans</i>	tropical royalblue waterlily	native
Family: Onagraceae (eveningprimrose)		
<i>Ludwigia octovalvis</i>	Mexican primrosewillow	native
<i>Ludwigia peruviana</i>	Peruvian primrosewillow	exotic
<i>Ludwigia repens</i>	creeping primrosewillow	native
Family: Orobanchaceae (broomrape)		
<i>Buchnera americana</i>	American bluehearts	native
Family: Polygonaceae (buckwheat)		
<i>Polygonum hydropiperoides</i>	swamp smartweed	native
Family: Rubiaceae (madder)		
<i>Cephalanthus occidentalis</i>	common buttonbush	native
<i>Diodia virginiana</i>	Virginia buttonwood	native
<i>Psychotria nervosa</i>	wild coffee	native
<i>Psychotria sulzneri</i>	shortleaf wild coffee	native
<i>Spermacoce assurgens</i>	woodland false buttonwood	native
Family: Salicaceae (willow)		
<i>Salix caroliniana</i>	Carolina willow	native
Family: Sapotaceae (sapodilla)		
<i>Sideroxylon celastrinum</i>	saffron plum	native
Family: Urticaceae (nettle)		
<i>Boehmeria cylindrica</i>	false nettle	native
Family: Verbenaceae (vervain)		
<i>Phylla nodiflora</i>	capeweed	native
Family: Veronicaceae (speedwell)		
<i>Bacopa monnieri</i>	herb-of-grace	native
<i>Gratiola ramosa</i>	branched hedgehyssop	native
<i>Scoparia dulcis</i>	sweetbroom	native
Family: Violaceae (violet)		
<i>Viola lanceolata</i>	bog white violet	native
Family: Vitaceae (grape)		
<i>Ampelopsis arborea</i>	peppervine	native
<i>Parthenocissus quinquefolia</i>	Virginia creeper	native
<i>Vitis rotundifolia</i>	muscadine	native

Appendix B: Wildlife Sightings

Appendix B: Wildlife Sightings at Imperial Marsh Preserve

Scientific Name	Common name	Designated Status	
		FWC	FWS
REPTILES			
Family: Alligatoridae (alligator and caiman)			
<i>Alligator mississippiensis</i>	American alligator		
Family: Emydidae (box and water turtles)			
Genera: Trachemys, Pseudemys and chrysemys (sliders, cooters, redbellies and painted turtles)			
<i>Pseudemys nelsoni</i>	Florida redbelly turtle		
Genera: Terrapene (dry-land turtles)			
<i>Terrapene carolina bauri</i>	Florida box turtle		
Family: Polychrotidae (Anoles)			
<i>Anolis sagrei</i>	Cuban brown anole		
Family: Anguidae (glass lizards and alligator lizard)			
<i>Ophisaurus ventralis</i>	eastern glass lizard		
Family: Colubridae (colubrids)			
<i>Coluber constrictor priapus</i>	southern black racer		
<i>Thamnophis sauritus sackenii</i>	peninsula ribbon snake		
Family: Viperidae (vipers)			
Subfamily: Crotalinae (pit vipers)			
<i>Sistrurus miliarius barbouri</i>	dusky pigmy rattlesnake		
BIRDS			
Family: Anatidae (swans, geese, ducks)			
Subfamily: Anatinae (dabbling ducks)			
<i>Anas discors</i>	blue-winged teal		
<i>Anas fulvigula</i>	mottled duck		
Family: Anhingidae (anhingas)			
<i>Anhinga anhinga</i>	anhinga		
Family: Ardeidae (herons, egrets, bitterns)			
<i>Ardea alba</i>	great egret		
<i>Ardea herodias</i>	great blue heron		
<i>Bubulcus ibis</i>	cattle egret		
<i>Egretta caerulea</i>	little blue heron	SSC	
<i>Egretta tricolor</i>	tricolored heron		
<i>Egretta thula</i>	snowy egret	SSC	
<i>Ixobrychus exilis</i>	least bittern		
Family: Threskiornithidae (ibises and spoonbills)			
<i>Ajaia ajaja</i>	roseate spoonbill	SSC	
<i>Eudocimus albus</i>	white ibis	SSC	
<i>Plegadis falcinellus</i>	glossy ibis		
Family: Ciconiidae (storks)			
<i>Mycteria americana</i>	wood stork	E	E
Family: Gruidae (cranes)			
<i>Grus canadensis</i>	sandhill crane		
Family: Cathartidae (new world vultures)			
<i>Cathartes aura</i>	turkey vulture		
<i>Coragyps atratus</i>	black vulture		

Appendix B: Wildlife Sightings at Imperial Marsh Preserve (continued)

Scientific Name	Common name	Designated Status	
		FWC	FWS
BIRDS (continued)			
Family: Accipitridae (hawks, kites, accipters, harriers, and eagles)			
Subfamily: Elaninae and Milvinae (kites)			
<i>Elanoides forficatus</i>	swallow-tailed kite		
Subfamily: Buteoninae (buteos)			
<i>Buteo lineatus</i>	red-shouldered hawk		
Family: Phasianidae (pheasants, grouse, turkey, and allies)			
Subfamily: Meleagridinae			
<i>Meleagris gallopavo</i>	wild turkey		
Family: Rallidae (coots and gallinules)			
<i>Gallinula chloropus</i>	common moorhen		
Family: Charadriidae (plovers)			
<i>Charadrius vociferus</i>	killdeer		
Family: Scolopacidae (sandpipers)			
<i>Tringa flavipes</i>	lesser yellowlegs		
Family: Columbidae (pigeons and doves)			
<i>Zenaida macroura</i>	mourning dove		
Family: Picidae (woodpeckers)			
<i>Melanerpes carolinus</i>	red-bellied woodpecker		
Family: Tyrannidae (tryant flycatchers)			
<i>Myiarchus crinitus</i>	great crested flycatcher		
<i>Sayornis phoebe</i>	eastern phoebe		
Family: Hirundinidae (swallows)			
<i>Tachycineta bicolor</i>	tree swallow		
Family: Troglodytidae (wrens)			
<i>Thryothorus ludovicianus</i>	Carolina wren		
Family: Sylviidae			
Subfamily: Polioptilinae (gnatcatchers)			
<i>Polioptila caerulea</i>	blue-gray gnatcatcher		
Family: Mimidae (mockingbirds and thrashers)			
<i>Dumetella carolinensis</i>	gray catbird		
Family: Corvidae (crows, jays, etc.)			
<i>Cyanocitta cristata</i>	blue jay		
<i>Corvus ossifragus</i>	fish crow		
Family: Bombycillida (waxwings)			
<i>Bombycilla cedrorum</i>	cedar waxwing		
Family: Vireonidae (vireos)			
<i>Vireo griseus</i>	white-eyed vireo		
Family: Parulidae (wood-warblers)			
<i>Dendroica coronata</i>	yellow-rumped warbler		
<i>Dendroica palmarum</i>	palm warbler		
Family: Cardinalidae (grosbeaks, finches, sparrow, buntings)			
<i>Cardinalis cardinalis</i>	northern cardinal		
Family: Icteridae (blackbirds, orioles, etc.)			
<i>Quiscalus quiscula</i>	common grackle		

Appendix B: Wildlife Sightings at Imperial Marsh Preserve (continued)

Scientific Name	Common name	Designated Status	
		FWC	FWS
BIRDS (continued)			
Family: Strigidae (owls)			
<i>Strix varia</i>	barred owl		
Family: Sturnidae (starlings)			
<i>Sturnus vulgaris</i>	European starling		
MAMMALS			
Family: Cervidae (deer)			
<i>Odocoileus virginianus</i>	white-tailed deer		
Family: Felidae (cats)			
<i>Lynx rufus</i>	bobcat		
Family: Mustelidae (weasels)			
<i>Lutra canadensis</i>	river otter		
Family: Sciuridae (squirrels)			
<i>Sciurus carolinensis</i>	eastern gray squirrel		
<i>Sciurus niger avicennia</i>	Big Cypress fox squirrel	T	
Family: Suidae (pigs and worthogs)			
<i>Sus scrofa</i>	feral hog		
FISH			
Family: Clariidae			
<i>Clarias batrachus</i>	walking catfish		
Family: Cyprinodontidae (killfishes)			
<i>Jordanella floridae</i>	flagfish		
<i>Lucania parva</i>	rainwater killfish		
Family: Poeciliidae			
<i>Gambusia holbrooki</i>	mosquito fish		
AMPHIBIANS			
Family: Bufonidae (toads)			
<i>Bufo quercicus</i>	oak toad		
Family: Hylidae (treefrogs and their allies)			
<i>Acris gryllus dorsalis</i>	Florida cricket frog		
<i>Hyla cinerea</i>	green treefrog		
<i>Hyla gratiosa</i>	barking treefrog		
<i>Hyla squirella</i>	squirrel treefrog		
<i>Osteopilus septentrionalis</i>	Cuban treefrog		
Family: Microhylidae (narrowmouth toads)			
<i>Gastrophryne carolinensis</i>	eastern narrowmouth toad		
Family: Ranidae (true frogs)			
<i>Rana grylio</i>	pig frog		
<i>Rana utricularia</i>	southern leopard frog		
BUTTERFLIES			
Family: Danidae			
<i>Danaus gilippus</i>	queen butterfly		
Family: Nymphalidae (brushfoots)			
<i>Anartia jatrophae</i>	white peacock		

Appendix C: Proposed Mitigation Plans

Imperial Marsh Preserve

Mitigation and Management Details

Enhancement This work includes the exotic removal from existing wetland areas (26.37 acres).

The wetland will be walked and all exotic vegetation shall be killed. Melaleuca will be treated with Garlon 3A and any Brazilian pepper will be treated with Garlon 4. The trees will be cut and stacked and the stumps treated. These exotic plants will be killed in a manner consistent with current exotic removal practices while ensuring that neighboring plants are left unharmed and the soil left as undisturbed as possible. Use of herbicides will be supervised by a licensed herbicide applicator. The trees and saplings will be cut and stacked with either the log cabin or teepee methods. The goal is to achieve a 0 percent cover of exotics immediately following any maintenance and that the total exotic and nuisance species shall constitute no more than 5 percent of total cover. If after two years 80 percent coverage with native non-nuisance species is not achieved a supplemental planting plan will be submitted to District staff for review and approval.

Upland Compensation This work includes the exotic removal from the upland areas (20.33 acres).

The exotic plants will be killed in a manner consistent with current exotic removal practices while ensuring that neighboring plants are left unharmed and the soil left as undisturbed as possible. Melaleuca will be treated with Garlon 3A and Brazilian pepper with Garlon 4. It is recommended that any use of herbicides be supervised by a licensed herbicide applicator. Trees and smaller saplings will be cut and stacked with either the log cabin or teepee methods. The goal is to achieve a 0 percent cover of exotics immediately following any maintenance and that the total exotic and nuisance species shall constitute no more than 5 percent of total cover.

Management

Lee County DOT will be responsible for the mitigation activities and follow up maintenance on the mitigation parcel. Lee County DOT will be responsible for the mitigation and monitoring activities. Lee County C20/20 will be responsible for the maintenance after the initial 5 year monitoring period. The mitigation area will be placed under a conservation easement granted to the SFWMD. The success criteria outlined above will be maintained in perpetuity by Lee County C20/20.

Wetland Monitoring Plan

The objective of the monitoring will be to determine the health of the wetland, upland buffers and upland compensation areas in terms of vegetation composition. Lee County DOT will conduct monitoring for five years and a report will be prepared and submitted to the SFWMD, C20/20 and Corps documenting the following parameters:

- Panoramic Photographs (see monitoring map for location).
- Description of vegetation composition and percent coverage along four transects (see monitoring map for location).
- Percent cover of nuisance and exotic plant species.
- Wildlife observations
- Rainfall Data will be gathered and summarized as monthly amounts

A report summarizing the data gathered will be prepared. The reports will evaluate the success of the mitigation/maintenance effort, activities conducted to date, and any remedial activities that are necessary to ensure the success of the mitigation areas.

See attached Monitoring Maps showing the location of the proposed vegetation sampling transects, staff gauge, and photo points. Following is the approximate work schedule for enhancement work and subsequent monitoring reports.

<u>COMPLETION DATE</u>	<u>ACTIVITY</u>
March 1, 2006	Baseline Monitoring report
June 1, 2006	Exotic Removal Completion
June 1, 2006	Record Conservation Easements
June 1, 2007	Time Zero Monitoring Report
June 1, 2008	First Annual Monitoring Report
June 1, 2009	Second Annual Monitoring Report
June 1, 2010	Third Annual Monitoring Report
June 1, 2011	Fourth Annual Monitoring Report
June 1, 2012	Fifth Annual Monitoring Report
July 1, 2012	Site Inspection

Appendix D: Projected Costs and Funding Sources Table

Appendix D - Projected Costs and Funding Sources Table

Resource Enhancement and Protection

Item	Possible Funding Source	Estimated Costs
Invasive exotic plant control	T & T, LCDOT, C20/20, SFWMD	\$220,000
Re-grade ditches/berms/furrows		\$100,000
Mechanical pepper removal & burning		\$50,000
Re-grade cow well	T & T, C20/20, SFWMD, FDEP, USFWS, future mitigation	\$1,000
Cow well plantings		\$500
Environmental consultant-pasture renovation		\$45,000
Exotic grass removal		\$1,700
Supplemental plantings		\$42,000
Create fire breaks		\$1,000
Mechanical brush reduction		\$5,000
Exotic animal removal	T & T, C20/20	\$1,200
Boundary survey		\$5,000
Fence installation		\$58,000

Signage

Item	Possible Funding Source	Estimated Costs
Boundary Signs	T & T, C20/20	\$300

TOTAL COST ESTIMATE

\$530,700

Site Management and Maintenance

Item	Possible Funding Source	Estimated Costs
Exotic Plant Control	LCDOT, T & T, C20/20	\$65,000
Prescribed Fire Regime	LC P&R, C20/20	In-house
Fence Repairs	T & T, C20/20	\$500

Yearly Maintenance Estimate

\$65,500

All costs are rough estimates based on information currently available. Every effort will be made to not exceed this budget by more than 10%.