

*A Plan for the  
Use and Management  
of the*

# Green Swamp Wilderness Preserve

*January 1994  
Southwest Florida  
Water Management District*



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Southwest Florida  
Water Management District*

Prepared by Eugene Kelly  
Planning Department

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## INTRODUCTION

The Green Swamp Wilderness Preserve is one of a number of properties owned by the Southwest Florida Water Management District (District). The District acquires lands throughout its jurisdiction for a variety of water management purposes. Included among these are flood control, water conveyance, water quality enhancement, groundwater recharge, and the protection or development of potable water supplies. The criteria that guide the District's land acquisition program, as outlined in Chapters 259.101 and 373.59 of the Florida Statutes, also direct that acquisitions should provide for the preservation and/or restoration of natural systems.

The purpose of this plan is to guide the long-term use and management of the District's Green Swamp landholdings, known collectively as the Green Swamp Wilderness Preserve. The Green Swamp, as defined by Pride et al. (1966), is a vast network of wetlands and intermingled flatlands that accounts for a total land area of nearly 560,000 acres. District-owned lands in the Green Swamp currently total approximately 97,775 acres, accounting for almost 18 percent of the entire Green Swamp land area, and additional acquisitions are planned.

This plan begins with a project overview that presents a descriptive summary of the history, water management functions and benefits, land cover and soils of the property. Then, compatible recreational activities and other appropriate land uses are discussed. These are based upon an overall management philosophy which requires that the preservation of water

management benefits and natural systems take priority over other uses. Other uses are permitted to the extent that they are compatible with the preservation goals mandated by Florida Statutes. Land management and security concerns are also addressed in a section of the plan entitled "Resource Protection".

Effective management of the property will require extensive, ongoing coordination between the District and a number of outside interests, as well as inter-departmentally within the District. These administrative needs are discussed in the final section of the plan. Coordination with the Florida Division of Forestry (DOF) and the Florida Game and Fresh Water Fish Commission (FGFWFC) will be of special importance. The Green Swamp Wilderness Preserve, together with adjacent lands that are owned by the State of Florida and managed by DOF as a portion of the Withlacoochee State Forest, comprise a contiguous land area of approximately 146,000 acres. These lands form a core area of protected lands that have been recognized as a natural area of state-wide significance. Additional land purchases have been proposed by both the District and the State of Florida and the addition of these adjoining lands may increase the size, and overall significance, of publicly-owned lands in the Green Swamp.

### The Planning Process

In accordance with District Procedure 61-3, a standard methodology is employed in the development of land use plans for District-owned properties (Christianson, 1988). The first step of this systematic process is to identify special protection areas that occur within the property. These areas may include wetlands, floodplains,

flood control facilities, potable water sources, and significant ecological features. Restrictions on the use of the property are imposed to ensure the protection of these areas. Next, activity zones are delineated on the basis of accessibility to motorized vehicles. Land use constraints resulting from the size of an area are also considered during this phase of the process. The ultimate objective is to concentrate proposed land uses of similar intensity within appropriate activity zones, thereby preventing incompatible or conflicting uses from occurring within a zone.

Each property is also evaluated to determine its placement within a classification system. The two factors upon which the property classifications are based are the population density of the area surrounding the property and the extent to which the property has been developed (Figure 1). The classifications have been devised to provide guidance in the formulation of an overall management philosophy for each property. The management philosophy is an expression of the level of development that should be allowed on the property and the types of uses that are appropriate.

### Management Philosophy

The Green Swamp Wilderness Preserve has been designated a remote wildland on the basis of the methodology described above. This designation is reserved for a very exclusive category of lands. Only the most natural, most isolated sites remaining in the District can satisfy the applicable criteria outlined in Figure 1. Remote wildlands present unique opportunities for preserving natural landscapes in a setting that is far removed from the sights and sounds and other signs of human influence. The Green Swamp Wilderness Preserve is

clearly distinguished from other District landholdings by its large size, state-wide importance as a haven for wildlife, and potential for linkage to other preserve areas. The exceptional natural values of the property assure it lasting recognition as the District's premier landholding. Its significance also places a special responsibility upon the District.

The District's acquisition of lands in the Green Swamp began in 1968 and continue to the present. Most of the lands comprising the present-day Preserve were intensively used for agricultural, extractive, and other uses up to the time they were acquired by the District. Although most of the land area remained in an essentially natural condition, it was not the District's intent to create a natural preserve or public recreational area. Until 1984, when the Green Swamp portion of the Four River Basins flood control project was placed in deferred or inactive status by the District and the United States Army Corps of Engineers (Michael Ornella, ACOE, pers. comm.), the District's motive for these acquisitions was to furnish a site for the construction of an enormous network of flood control systems. A new understanding, or appreciation, of the natural values of these lands led to adoption of the non-structural approach now practiced through simple preservation of on-site floodplains and wetlands.

Since acquisition, there has been a pattern of permitted public usage on these lands that was, and is, consistent with the guidance provided in the Florida Statutes. However, in the future, those established patterns of usage may not continue to be entirely consistent with a new and still-evolving vision of the Green Swamp serving as a "hub" or "core" area for the long-term preservation



Figure 1. District Lands Classification System.

LEVEL OF DEVELOPMENT		
POPULATION DENSITY		
<b>Low</b>	Remote Wildlands	Remote Parklands
<b>Moderate</b>	Urban Fringe Wildlands	Urban Fringe Parklands
<b>High</b>	Urban Wildlands	Urban Parklands
	<b>&lt; 30% Motorized Natural*</b> <b>and</b> <b>&gt; 30% Primitive* and</b> <b>Semi-Primitive</b> <b>Non-Motorized*</b>	<b>&lt; 30% Motorized Natural*</b> <b>or</b> <b>&gt; 70% Motorized Natural*</b> <b>and Semi-Primitive</b> <b>Motorized*</b>
<b>Lands Altered for</b> <b>Water Resource</b> <b>Development</b>		<b>Water Resource</b> <b>Project Lands</b>

\* The categories Motorized Natural, Semi-Primitive Motorized, Semi-Primitive Non-Motorized, and Primitive are activity zones defined on the basis of access by motor vehicles

of viable ecosystems and their associated wildlife populations. Levels and patterns of public usage that may be appropriate for the Preserve area should be founded upon a clearer understanding of the manner in which the site will mesh with ongoing efforts to create a linked, state-wide network of core preserves connected by greenways. The Preserve will very likely serve as a major portion of the Green Swamp core area.

Land usage in the Green Swamp Wilderness Preserve should be permitted in a very conservative manner until more is known regarding creation of the state-wide greenways and core preserve network. Usage by the public will be permitted to the extent that the wilderness character of the site is perpetuated. Physical improvements will be concentrated around the exterior of the Preserve to the greatest extent possible in order to limit human intrusion in the interior. Overall management and usage will be balanced in favor of wildlife and natural ecosystems and the provision of a genuine, quality wilderness experience for recreators.

## OVERVIEW

### Location

The Green Swamp, as defined by Pride et al. (1966), is an 870 square mile expanse (560,000 acres) of wetlands and flatlands, with occasional low ridges, located in the center of the Florida peninsula (Figure 2). It is bounded generally by U.S. Highway 27 on the east, State Highway 50 on the north, U.S. Highway 301 on the west, and U.S. Highway 98 on the south. Topographically, it lies at a high elevation relative to surrounding lowlands, and therefore

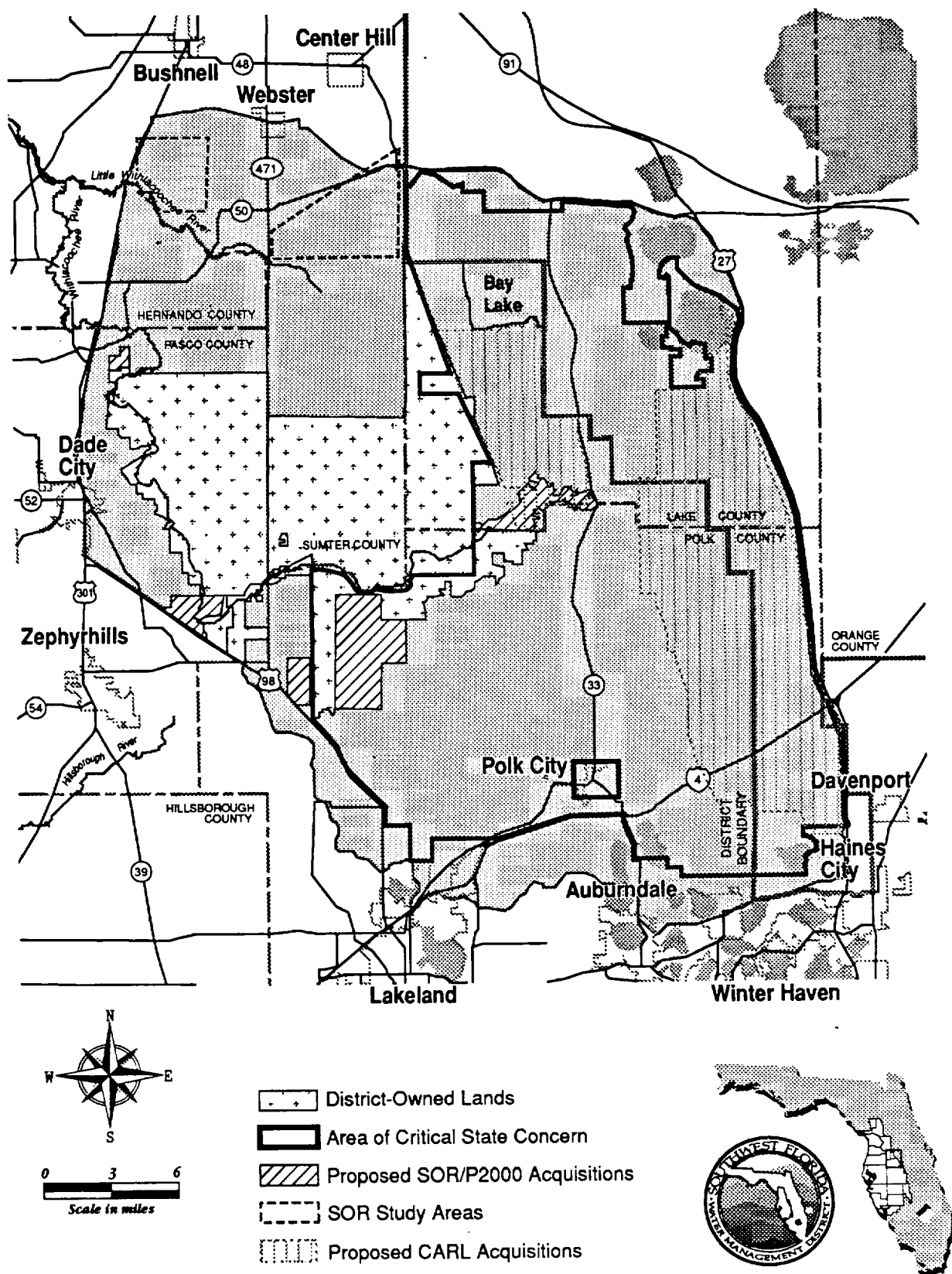
resembles a plateau, enveloped on the east, south and west by sandy ridgelines. These ridgelines represent some of the most prominent topographic features in the State of Florida, including: the Lake Wales Ridge along the eastern and southeastern border; the Winter Haven and Lakeland Ridges along the south; and the Brooksville Ridge to the west.

The District-held Green Swamp Wilderness Preserve lies in the west-central portion of the Green Swamp and, at approximately 97,775 acres in size, it accounts for nearly 18 percent of the total Green Swamp land area. It is located several miles east of Dade City and 10 miles north of Lakeland. In combination with other contiguous, publicly-owned lands, including the 49,000-acre Richloam Tract of the Withlacoochee State Forest, which borders the Preserve on the north, a total land area of approximately 150,000 acres in the Green Swamp have been protected through public ownership. The intent of this plan is to guide the long-term use and management of only those Green Swamp lands encompassed within the Green Swamp Wilderness Preserve.

### History

The history of the Green Swamp area has been influenced to a large degree by its great size and wild nature. Like the Everglades, its remoteness, and the natural obstacles posed by its extensive swamps and other wetlands, have made the Green Swamp relatively inaccessible to all but those intent upon reaping its natural resources. Archaeologists have found evidence of human presence in the region dating back to 6,000 B.C. (Pilcher et al., 1980). Use of the area by aboriginal people was apparently limited to hunting and to

Figure 2. Location Map for the Green Swamp Wilderness Preserve.



the collection of stone for use in the manufacture of knives and arrowheads. Archaeological investigations have failed to discover any evidence of large, permanent habitation sites. The wet, flood-prone nature of the area probably limited aboriginal man to seasonal usage of most of the Green Swamp.

Modern humanity's presence in the Green Swamp has also been characterized by an emphasis on consumptive uses, including ranching, timbering, mining, hunting and agriculture. Timber resources played an especially evident role in the early economy of the Green Swamp and its surrounding area. Many of the original landowners in the Green Swamp derived an income from timber production. Most of the lands comprising the present-day Green Swamp Wilderness Preserve were owned by the Cummer Son's Cypress Company during the first half of this century (Jeffares, 1987). A lumber mill was constructed by the company in the nearby town of Lacoochee to process timber that was logged from their Green Swamp landholdings. The mill also processed timber from sites as far away as the Chassahowitzka Swamp and the Big Cypress region of the Everglades. The mill opened in 1922 and continued operations until 1959, when there was no longer sufficient timber to support the industry. During the period of operation, the Cummer mill and logging industry became the largest such operation in the southeastern United States.

The logging industry left a lasting mark on the Green Swamp, particularly in the floodplain of the Withlacoochee River. A railroad line, including a system of tram lines, was constructed into the heart of the floodplain swamp to transport timber to the Cummer mill. The tram lines remain

conspicuous features in the floodplain and continue to provide overland access to the interior of the swamp. A small settlement known as Cumpressco (Cummer Son's Cypress Company), which served the needs of lumbermen working in the swamp, was established in the heart of the Green Swamp and evidence of that community still remains (Figure 3).

The most lasting impact or reminder of this era may also be described as the least apparent. Inconspicuous by their absence are the extraordinary number of old-growth cypress trees that were harvested from the floodplain and which served as the foundation of local logging operations. Although other tree species were harvested from the Green Swamp, including abundant longleaf pine from the flatwoods, the virgin cypress were of greatest value. Very few old cypress remain in the Green Swamp, as testimony to the efficiency of the logging operations. It is suspected that much of the swamp area from which old-growth cypress were harvested was subsequently recolonized by hardwood species following removal of the cypress. Given that many of the cypress were up to 2000 years in age and older, it will take a very long time for the floodplain forest to assume an appearance, natural grandeur and community structure resembling that which existed as recently as 70 years ago.

Cummer Son's Cypress Company also maintained a ranching operation over their Green Swamp property, as did many of the other Green Swamp landowners. Ranching has now supplanted timbering as the most evident and widely-practiced land use in the Green Swamp. The former Two Rivers Ranch, owned by the Larkin family of Dade City, occupied much of the current Green Swamp West Management Unit of the

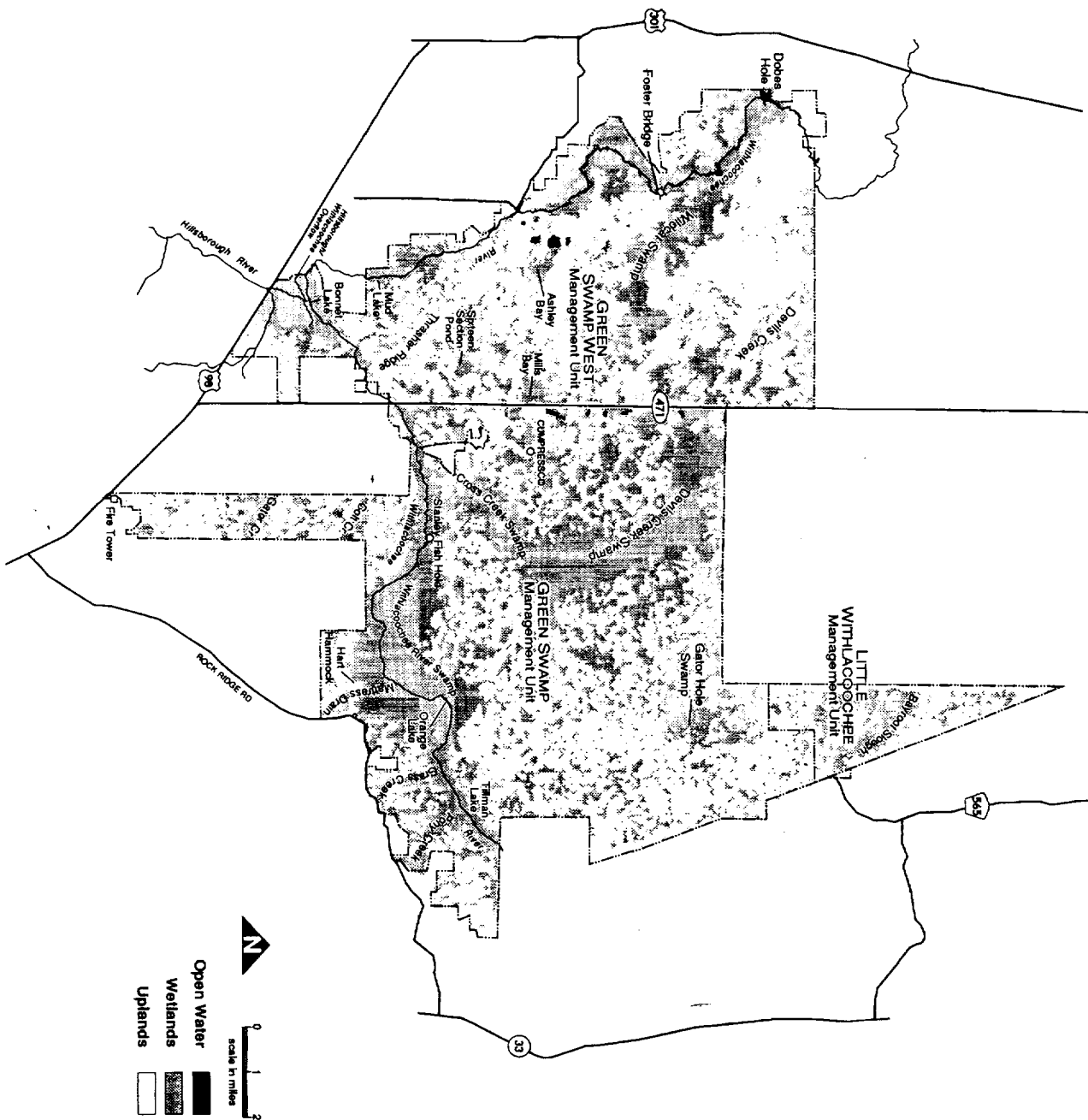


Figure 3. Significant hydrologic and cultural features of the Green Swamp Wilderness Preserve.

Preserve. That ranch included most of the site of the Withlacoochee/Hillsborough River overflow (Figure 3), which serves as the origin of the Hillsborough River. The name of the ranch alluded to the presence of both rivers (Ray Battle, pers. comm.). A cabin built by the Larkin's in 1928, situated along the bank of the Withlacoochee River near the overflow and known then as "Post Larkin Camp", was still present when that site was acquired by the District. The cabin was subsequently removed for preservation by the Pioneer Museum in nearby Dade City.

Many of the early Green Swamp ranchers also made their lands available for turpentine, in exchange for royalties received from the Millard and Overstreet Turpentine Company (Ray Battle, pers. comm.). During this period, which continued through the 1920s, turpentine production was a major industry in Florida, accounting for 20 percent of the world's production (Gannon, 1993). The names of some of the Green Swamp's more prominent natural features, such as Mattress Drain (Figure 3), have been attributed to the local turpentiners.

The wild and remote character of the Green Swamp has attracted a diverse assortment of pioneering individuals and generated a colorful, sometimes tragic history. Much of that history is associated with the area of the present-day Preserve. From Mr. and Mrs. Stewart, homesteaders that were murdered and robbed in 1919 by a nephew intent upon using their money to purchase a new Model A Ford truck in nearby Dade City; to the "Wildman", a Chinese sailor who jumped ship in 1976 to make a home in the United States and then spent the next 6 months hiding in the Green Swamp, living in a hollowed cypress tree in Hart

Hammock (Figure 3) (Lillie Raulerson, pers. comm.), subsisting on armadillo meat and eking a living from what he could steal - always leaving behind something in trade for what he had taken. A pair of headstones still marks the site of the Stewart homestead. The "Wildman" was eventually captured by local law enforcement officers and, shortly afterward, he hanged himself in the Sumter County jail rather than return to his home in Taiwan.

Most of the lands comprising the present-day Green Swamp Management Unit of the Preserve (Figure 3) were acquired from the Cummer Company in phases between 1968 and 1972. In 1976, Cummer sold their remaining Green Swamp lands to Agri-timber. Agri-timber leased their lands for hunting and cattle grazing; conducted an intensive timbering operation, complete with an on-site sawmill and mulching plant; and also operated mines at a number of sites, including sand, peat and limerock mines. The District acquired the Agri-timber lands in increments, beginning with the purchase of a 4,000-acre corridor of Withlacoochee River floodplain swamp in 1984, and culminating with the purchase of over 24,000 acres in 1992. The final purchase from Agri-timber included the bulk of the Green Swamp West Management Unit (Figure 3) and consolidated the District's Green Swamp ownership into a single contiguous land area totaling approximately 97,775 acres. Although additional acquisitions are likely to occur in the future, the District's Green Swamp land acquisition project was substantially completed with the conclusion of the Agri-timber purchases.

District sponsorship of the Four River Basins, Florida Project (FRB) served as the initial motive for the Green Swamp land

purchases. The FRB Project was a massive structural flood control project authorized by the Congress of the United States in the Flood Control Act of October 23, 1962 (PL87-874). The FRB was designed by the United States Army Corps of Engineers (ACOE) in response to severe flooding produced by Hurricane Donna and other storms in 1959-1960 and called for the construction of a series of levees and water control structures across both the Withlacoochee and Hillsborough Rivers. The ultimate aim of the structural improvements was to convert the District-owned Green Swamp lands into a series of three flood detention areas: the Green Swamp Flood Detention Area (GSFDA), which included the area of the Green Swamp Management Unit (Figure 3); the Little Withlacoochee Flood Detention Area (LWFDA), which corresponds generally with the area of the Little Withlacoochee Management Unit; and the Upper Hillsborough Flood Detention Area (UHFDA), which included the site of the Withlacoochee/Hillsborough overflow and downstream reaches of both rivers in the Green Swamp West Management Unit. The southernmost portion of the UHFDA lies outside the southern limits of the Green Swamp area, defined by US Highway 98, and is not addressed in this management plan.

The FRB called initially for the creation of permanent "conservation pools" in both the GSFDA and LWFDA. A cost/benefit analysis conducted by the ACOE suggested that the public water supply values of conservation pools provided important economic justification for the project (Florida State University, 1984). However, the National Environmental Policy Act of 1969 (PL91-190) reflected a new awareness of humanity's potential for inflicting adverse impacts upon natural systems and

provided guidelines for evaluating and limiting the impact of federally-funded projects such as FRB. In concert with environmental concerns expressed by the District, this resulted in a series of reviews to predict environmental impacts associated with the FRB (SWFWMD, 1984a; SWFWMD, 1980).

It was decided that permanent conservation pools could not be justified given the resulting destruction of valuable natural areas and the Green Swamp portions of FRB were subsequently placed in "deferred" or inactive status by the District and ACOE in 1984. The District then adopted a non-structural approach to fulfilling the flood protection goals of FRB. This called for the acquisition of additional portions of the upper Withlacoochee River floodplain. These acquisitions were financed with funds from the Water Management Lands Trust Fund, known also as the Save Our Rivers Program, and later with supplemental funds provided by the Preservation 2000 Program. Both acquisition programs emphasize the preservation of natural systems. Public ownership of the District's Green Swamp Wilderness Preserve ensures that extensive floodplain areas are protected to serve as natural floodwater storage areas and also serves to preserve a wilderness area of state-wide significance.

The state-wide significance of the Green Swamp area, for both its water management and natural systems values, was recognized long before the public began acquiring lands there (Storer, 1962). The State of Florida acknowledged the Green Swamp's natural resource values, and the threat posed to those resources by impending development, when it officially designated approximately 322,000 acres of the Green

Swamp an "Area of Critical State Concern" (ACSC) in 1974. Established by the Florida Environmental Land and Water Management Act of 1972, and described in Chapter 380 of the Florida Statutes, the ACSC designation denotes areas that contain natural resources of regional or state-wide importance; areas that are, or will be, significantly affected by major public facilities; or, areas of major development potential (Department of Administration, 1974). The Green Swamp satisfied all three selection criteria until FRB was declared inactive in 1984. The Green Swamp's proximity to the Disney World complex, and its location between several rapidly growing urban centers, still impart a high degree of development potential.

The original boundary of the ACSC was configured to exclude areas that were under District ownership. The present western boundary of the ACSC still conforms closely with the eastern boundary of the Green Swamp Wilderness Preserve, although some of the lands acquired by the District since 1974 now lie within the ACSC (Figure 2). The rationale for excluding areas under District ownership from the ACSC was the protection afforded to the resources through public ownership. As such, the District's acquisition of lands within the Green Swamp ACSC furthers the intent of the ACSC designation.

The ACSC designation places a higher level of responsibility for ensuring the protection of the Green Swamp's natural values upon the Lake County and Polk County local governments. These local governments are in the process of adopting regulations or other measures to achieve the level of protection desired by the State. In addition, any development order issued by the Polk County or Lake County local governments

for a project within the ACSC is subject to review and appeal by the Florida Department of Community Affairs. Although the District's land management and land use policies should ensure the highest level of protection for the resources within the boundaries of the Green Swamp Wilderness Preserve, the District will consult with the DCA to ensure that District activities in the Preserve remain consistent with the protections sought by the ACSC designation.

## **Water Management Functions**

### ***Natural Flood Control***

As recounted previously, the District's land acquisition efforts in the Green Swamp were initially directed toward the purchase of lands to be used in the Four River Basins structural flood control project. This was in recognition of the Green Swamp's role as the headwater origin of four major rivers. Retaining storm-generated surface waters within the large, flat, natural basin of the Green Swamp would effectively reduce downstream flows into urbanized Tampa and other developed areas and thereby reduce the potential for flooding.

The natural capability of the Green Swamp to detain storm-generated surface waters and attenuate their discharge through the channels of the Withlacoochee and Hillsborough rivers, together with the expense and environmental impacts associated with the structural alternatives of the Four River Basins Project, eventually led to the adoption of a non-structural flood control option. The non-structural approach now employed required the acquisition of additional floodplain areas and adjoining uplands. These additional acquisitions have resulted in the preservation, thus far, of 24,500 acres of riverine floodplain swamp.



Elevations in the floodplain swamp vary between a high elevation of 105 feet National Geodetic Vertical Datum (NGVD) in upstream areas near Eva and a low of approximately 65 feet NGVD where the Withlacoochee River exits the property near its confluence with Devils Creek (Figure 3).

The surface water detention capacity of the Green Swamp property is not limited to the volumes that can be stored in the floodplain swamp. The property includes an additional 17,600 acres of cypress swamp and 4,500 acres of marsh and wet prairie. Much of this acreage is accounted for by cypress domes and other isolated systems. This extensive wetland acreage detains significant quantities of rainfall during storm events, eventually discharging to the floodplain swamp through surface or subsurface flow, and greatly augments the floodwater storage benefits of the property. When combined with low-lying flatwoods and other mesic flatlands that are seasonally inundated and slowly discharge to the floodplain and other wetlands through sheetflow following major storm events, a total of approximately 90,000 acres of land with surface water detention value have been protected within the District's Green Swamp Wilderness Preserve.

Other acquisitions are planned, or have been proposed (see Figure 2), as either additions to the Preserve or as state initiatives under the Conservation and Recreation Lands Program (CARL). These potential acquisitions may expand public ownership in the Green Swamp by up to 132,000 acres (Southwest Florida Water Management District, 1993; Florida Department of Natural Resources, 1993). Approximately 127,000 acres of the expansion area consists of a proposed CARL purchase.

### *Water Conveyance*

The total land area of the Green Swamp is estimated to be 870 square miles, or nearly 560,000 acres. The title of the Four River Basins, Florida Project alludes to the Green Swamp's role as the headwater origin of four major rivers: the Withlacoochee; Hillsborough; Oklawaha; and Peace Rivers. The Green Swamp also serves indirectly as the origin of the Kissimmee River by contributing surface flow to Reedy Creek (Storer, 1962). As such, the headwater river channels and tributaries of the Green Swamp play a vital role in conveying water to significant downstream natural systems.

It has also been estimated that 82 percent of the Green Swamp lies within the upper basin of the Withlacoochee River. Thus, the Withlacoochee River receives and conveys most of the surface discharge that exits the Green Swamp. During periods of high water (ca 78.5 feet NGVD), a portion of the upper Withlacoochee's flow is diverted into the Hillsborough River through a natural overflow channel, which serves as the origin of the Hillsborough River (Pride, et al., 1966). The entire District-owned portion of the Green Swamp, with the exception of approximately 500 acres which drain into the Hillsborough River at the site of the Hillsborough/Withlacoochee overflow (Figure 3), is included within the Withlacoochee River drainage basin. Nearly 36 miles of the Withlacoochee's 110 mile length are preserved within the Green Swamp property. The Green Swamp Wilderness Preserve serves to protect these important upstream reaches of the Withlacoochee and Hillsborough Rivers and the volumes of fresh water which they contribute to Tampa Bay, Withlacoochee Bay, Tsala Apopka Lake, and other off-site natural systems and habitats.

### *Water Quality Enhancement*

Wetland vegetation has a natural ability to filter suspended sediments from the water column and to assimilate certain water-borne pollutants. The property's riverine floodplain swamp and its associated wetlands receive waters originating from off-site that may benefit from the natural water quality enhancement abilities of these wetland systems. Although the entire on-site length of the Withlacoochee River has been designated an Outstanding Florida Water by the State of Florida, which prohibits discharges that result in any diminution of water quality, the sources of discharge discussed below represent pre-designation land uses. (Refer to the Resource Protection section of this plan for additional information on these discharges, the threat that they pose to water quality within the Preserve, and regulatory considerations.)

Off-site drainage enters the Green Swamp Wilderness Preserve from a number of sources. The uppermost reaches of the Withlacoochee River, located in the unincorporated community of Eva around the State Highway 33 road crossing, lie outside the District's property and receive drainage from developed sites in that area. Extensive pastures south of the Withlacoochee River, around Rock Ridge and further south to Polk City, drain to the Withlacoochee through Pony Creek, Grass Creek, Gator Creek and Mattress Drain (Figure 3). The Dade City Canal, which receives treated sewage effluent and untreated stormwater from Dade City, is a significant off-site source of discharge to the Withlacoochee River. These discharges enter the Withlacoochee River at Dobes Hole near the western property line of the Preserve. Agricultural areas in Bay Lake, which include

large citrus groves and cattle pastures, drain into the Preserve's Little Withlacoochee Management Unit and the Bayroot Slough headwaters of the Little Withlacoochee River (Figure 3).

There is no current information which documents that polluted waters are entering the Preserve from any off-site source. However, drainage from developed or otherwise altered lands often contains a variety of pollutants. Agricultural lands typically generate drainage that is high in nutrients. Pesticides, coliform bacteria, and other contaminants may also be present in such drainage. The origin of high nutrient levels in agricultural drainage can usually be traced to fertilizers that are applied to such sites. Pasturelands can generate high nutrient levels and elevated counts of coliform bacteria in drainage that has come into contact with animal wastes. Some pastures in the Green Swamp, located primarily to the south of the Preserve, are fertilized with sewage residuals, or sludges, which can contribute to high nutrient levels when application rates are excessive. Heavy metals may likewise be introduced in sludges, particularly those that come from urban or industrialized areas. Sewage effluent and stormwater may also be high in nutrients or other pollutants. Effluent from the Dade City sewage treatment plant has been documented as excessively high in nutrients and coliform bacteria and that facility was cited for water quality violations as recently as March, 1993 (Department of Environmental Regulation, 1993).

The wetlands of the Green Swamp Wilderness Preserve, especially the forested wetlands of the floodplain, may substantially improve the quality of surface waters that enter the property from adjoining or nearby

upgradient areas. This, in turn, helps to assure that waters exiting the Preserve through the Withlacoochee and Hillsborough Rivers are of good quality.

### *Recharge*

Recharge is defined as the passive, downward transport or percolation of water from the land surface to underlying water-bearing aquifers. The rate at which surface waters can infiltrate to, or "recharge", underlying aquifers is dependent upon the interplay of several key, site-specific factors. These include: the nature of intervening sediments; the degree of aquifer "confinement" based on the occurrence of impermeable clay "confining" layers; and the elevation of the potentiometric surface of the aquifer. High rates of recharge are generally correlated with: the presence of a thick layer of highly-permeable surface sediments that can readily store and transmit water; the absence of a continuous, impermeable layer of sediments, or "confining" layer; and a potentiometric surface that lies below the upper level of the aquifer.

The potentiometric surface of an aquifer is the elevation to which water will rise in a tightly-cased well in response to hydraulic pressure within the aquifer. It is subject to seasonal fluctuations, but in the absence of excessive withdrawals from surface wells it should remain fairly stable. The Green Swamp area is distinguished as the potentiometric high of the Floridan aquifer, which is the primary water supply source for most of the State of Florida. The elevation of the potentiometric surface at the Green Swamp Wilderness Preserve increases progressively across the property, from a low of about 70 feet NGVD at the western property line to a high of about 110

feet NGVD at the southeastern corner of the property (SWFWMD, 1988; Barr and Lewelling, 1986; Anderson and Laughlin, 1982; Grubb, 1977). The actual site of the Green Swamp High, at which the potentiometric surface reaches approximately 120 to 125 feet NGVD, is located just southeast of the Preserve. Topographic contours at the Preserve closely parallel the elevation of the potentiometric surface, ranging from a low of approximately 65 feet NGVD at the western property line and increasing progressively to 110 feet around the southeastern corner. These elevations place the potentiometric surface near, and sometimes above, the land surface over most of the Preserve.

The Green Swamp has historically been regarded as an area of high recharge to the Floridan aquifer. This has been based largely upon supposition and inference. The extremely wet nature of the Green Swamp, due to its ability to retain surface water, increases the residence time of surface waters, thereby increasing the time interval over which these waters can be absorbed by surface sediments and subsequently percolate to the Floridan aquifer. It has also been inferred that the high potentiometric surface is attributable to a high rate of recharge which causes groundwater to "mound" under the Green Swamp.

More recently, investigations of recharge in the Green Swamp suggest that recharge rates actually range from very-low to moderate (SWFWMD, 1988; SWFWMD, 1988a; and SWFWMD, 1987). Generally, recharge rates are estimated to range from 0 to 5 inches per year, although rates in the sandy ridges along the eastern boundary of the Green Swamp may approach 10 to 14 inches per year (Knochenmus and Hughs,

1976). In the low-lying reaches of the Withlacoochee riverbed and floodplain swamp, discharge rates may actually exceed recharge rates, particularly during the wet season.

Grubb (1977) investigated recharge potential in the Green Swamp area and associated low recharge rates with areas where the Floridan aquifer occurs at, or very near, the land surface, with only a thin layer (<20 feet) of unconsolidated, overlying surficial sediments and confining layers with low hydraulic conductivity. The relative absence of unconsolidated sediments in these areas equates with the absence of a well-defined surficial, or water table, aquifer. The potentiometric surface in these low recharge areas also occurs at, or very near, the land surface during much of the year. This combination of hydrologic and edaphic characteristics effectively precludes significant rates of recharge during the wet season, when the potentiometric surface is at its highest level. The absence of surficial sediments also limits the potential for recharge during drier periods because there is no surficial aquifer to capture and store water during rainfall events and allow for prolonged or sustained downward percolation to the Floridan.

Most of the Green Swamp Wilderness Preserve occurs in a portion of the Green Swamp that has been identified as an area of limestone outcropping (Pride et al., 1966). As such, the combination of characteristics that generally limit recharge rates in the Green Swamp may reach their most extreme expression within the area of the Preserve. In contrast, the areas of highest recharge, which occur in the eastern portion of the Green Swamp along ridges that reach up to 250 feet NGVD, feature thick layers of highly permeable surface sediments, a

confining unit with high hydraulic conductivity, and a potentiometric surface that occurs far below land surface (<120 feet NGVD).

Overall, the recharge value of the Green Swamp must be considered in light of the essential role played by the Green Swamp potentiometric high. The hydraulic head maintained by the Green Swamp High induces groundwater to flow outward, or downgradient, toward population centers that are dependent upon groundwater as the primary public supply source. The mound of groundwater at this potentiometric high also serves as a storage site, holding water in reserve that can discharge to river channels and wetlands during periods of drought to maintain minimal baseflows or hydroperiods. Furthermore, although actual rates of recharge are regarded as relatively low, the overall volume of recharge may be significant given the large size of the Green Swamp area.

In summary, the groundwater recharge that occurs in the Green Swamp is an essential element in the maintenance of local and downstream natural systems, including estuaries, that are dependent upon the freshwater contributions made by the Withlacoochee and Hillsborough Rivers. It also helps to maintain functional groundwater systems in surrounding, down-gradient areas where groundwater serves as the primary source of public water supply.

### *Potable Water Supply*

The potential of the Green Swamp area to serve as a source of public water supply has been considered previously in response to development pressures in the surrounding Tampa (30 miles southwest) and Orlando

(20 miles east) metropolitan areas. The groundwater resources of the Green Swamp are relatively untapped, except for limited agricultural, industrial and small-scale residential uses, and have understandably been viewed as an ideal source to meet the needs of an expanding population. However, the District's Water Supply Needs and Sources Plan, which identified regional sources to meet demand through the year 2020, did not include any sites within the Green Swamp (SWFWMD, 1992). It was determined that there were more suitable sources, in closer proximity to the demand centers, to meet water supply needs for the next 30 years. If there had not been more suitable sources, concerns over potential impacts to natural systems in response to groundwater withdrawals from the Green Swamp would have to be addressed.

Grubb and Rutledge (1979) attempted to quantify the volume of water that could be extracted from the Green Swamp. They concluded that groundwater would provide the only dependable source of water supply. Surface water sources, consisting primarily of streamflow down the Withlacoochee River, are too susceptible to seasonal variations in quantity to serve as a reliable source of water. Given the flat nature of the Green Swamp area, surface reservoirs would not provide a practical means of storing water during periods of high streamflow for use during periods of low streamflow and thereby assuring a dependable, year-round supply.

Use of the Green Swamp's groundwater resources was projected to be dependent upon inducing increased rates of recharge through groundwater pumpage. Large-scale groundwater withdrawals from the Floridan aquifer would reduce water levels

in the aquifer, producing a concurrent reduction in the elevation of the potentiometric surface and thus inducing additional recharge. However, the additional volumes of water entering the groundwater system as recharge would be derived from surface waters that would otherwise remain on-site and support the wetlands and other natural communities of the Green Swamp, or exit the area as streamflow to downstream natural systems.

Grubb and Rutledge (1979) predicted groundwater declines of 2 to 6 feet in the Green Swamp under various pumpage scenarios. Information on the hydrologic and hydrogeologic characteristics of the District-owned portions of the Green Swamp (SWFWMD, 1991a; Rutledge and Grubb, 1978; Pride et al., 1966) indicate that the area of the Green Swamp Wilderness Preserve may be especially susceptible to wetland impacts as a result of drawdowns due to local, large-scale groundwater withdrawals.

The potable water supply values of the Green Swamp Wilderness Preserve must be considered in terms of the Green Swamp's contribution to off-site potable water sources, and also in light of the other water management functions and natural values associated with the property. The hydraulic head maintained by the Green Swamp High causes groundwater to flow outward from the Green Swamp to surrounding areas where these waters are withdrawn for potable use. It has been estimated that the average groundwater outflow from the Green Swamp is approximately 2 inches per year (Grubb and Rutledge, 1979). This outflow is equivalent to 83 million gallons per day (mgd) from the entirety of the Green Swamp. Large-scale groundwater withdrawals in the Green Swamp could

short-circuit this outflow, thereby reducing the quantities of groundwater now available in surrounding areas.

As alluded to previously, groundwater withdrawals could also reduce streamflow in the Withlacoochee and Hillsborough Rivers. Reducing streamflow in these rivers could reduce potential withdrawal quantities downstream and affect water levels in all downstream natural systems. Natural systems immediately downstream of the Green Swamp Wilderness Preserve, where any off-site reductions in riverflow would consist of a larger percentage of total normal flow, and therefore be most pronounced, could be subject to the most severe off-site impacts. However, the natural systems and habitat values of the Green Swamp itself, including the Green Swamp Wilderness Preserve, would be most severely affected by large-scale withdrawals. Such impacts would compromise the natural values of an area considered to be one of the most significant natural areas remaining in the State of Florida. As such, the potable water supply values of the Green Swamp Wilderness Preserve hinge upon maintaining its current, incidental contributions to off-site sources by eschewing any large-scale, on-site withdrawals.

### Land Cover

The land cover of the Green Swamp Wilderness Preserve is closely correlated with the unusual physical characteristics that yield the array of water management benefits discussed previously. The large expanse of flat terrain, in combination with a high potentiometric surface, shallow depth to groundwater and poor surface drainage resulting from the lack of well-developed stream channels, have

produced a distinctive mixture and arrangement of natural communities. These physical characteristics have also discouraged large-scale development or settlement within the area and have dissuaded any concerted attempts to engage in wholesale conversion of the area for intensive agricultural uses. The result is one of peninsular Florida's largest remaining natural areas and most significant havens for wildlife.

An earlier analysis of land cover in the Green Swamp region identified frequency and depth of flooding as the factors of prime importance governing composition and distribution of vegetation in the area (McPherson, 1979). A current vegetation map of the Preserve property (Figures 4 and 5) confirms that over 90 percent of the site consists of wetlands or mesic flatlands that are subject to seasonal inundation. Soil types are also consistent with the flat, wet nature of the Green Swamp and are discussed in the following section.

Land cover across the property consists primarily of natural vegetation, with widely-scattered stands of altered land (Figures 4 and 5). Altered lands account for a total estimated land area of 12,400 acres, or about 12 percent of the property. Approximately 4,820 acres of the altered lands (5 percent of total) support stands of planted pine. The stands of planted pine occur on sites that originally supported pine flatwoods. Many of these stands were planted by the District as a means of restoring a natural canopy to converted or impacted flatwoods areas. Ultimately, a natural pine flatwoods canopy is to be restored on all of these sites.

The remaining altered lands consist of approximately 7,225 acres of improved

pasture (7 percent of total) and 340 acres (0.3 percent of total) of other disturbed lands. Most of the pasture areas, and much of the other disturbed lands, also supported pine flatwoods communities prior to alteration. Much of the pasture in the Green Swamp East management unit has been under District ownership and management for an extended period and is now in the early stages of recovery from conversion. Other disturbed or altered lands include: 1) sites that were mined for sand or other surficial deposits; 2) sites of old residences, barns, or other minor structures; 3) former industrial sites; and 4) utility corridors.

Altered lands that are not currently undergoing restoration represent potential restoration sites. For a more detailed discussion of these sites, and of restoration alternatives associated with them, please refer to the section of this plan devoted to habitat restoration projects.

The most extensive natural community on the property, in terms of total land area, is pine flatwoods. Flatwoods account for an area of approximately 30,500 acres, or 31 percent of the entire property. The vegetation map for the Green Swamp includes both wet flatwoods and mesic flatwoods, as defined by the Florida Natural Areas Inventory (FNAI and FDNR, 1990), within the general category of pine flatwoods. As noted above, and in the following discussion related to soils, most of the planted pine and improved pasture areas also supported pine flatwoods prior to alteration, resulting in a total, pre-alteration estimate of 42,545 acres (43.5 percent of total) of flatwoods vegetation on the property.

Floodplain swamp is second only to pine flatwoods in terms of overall extent. It

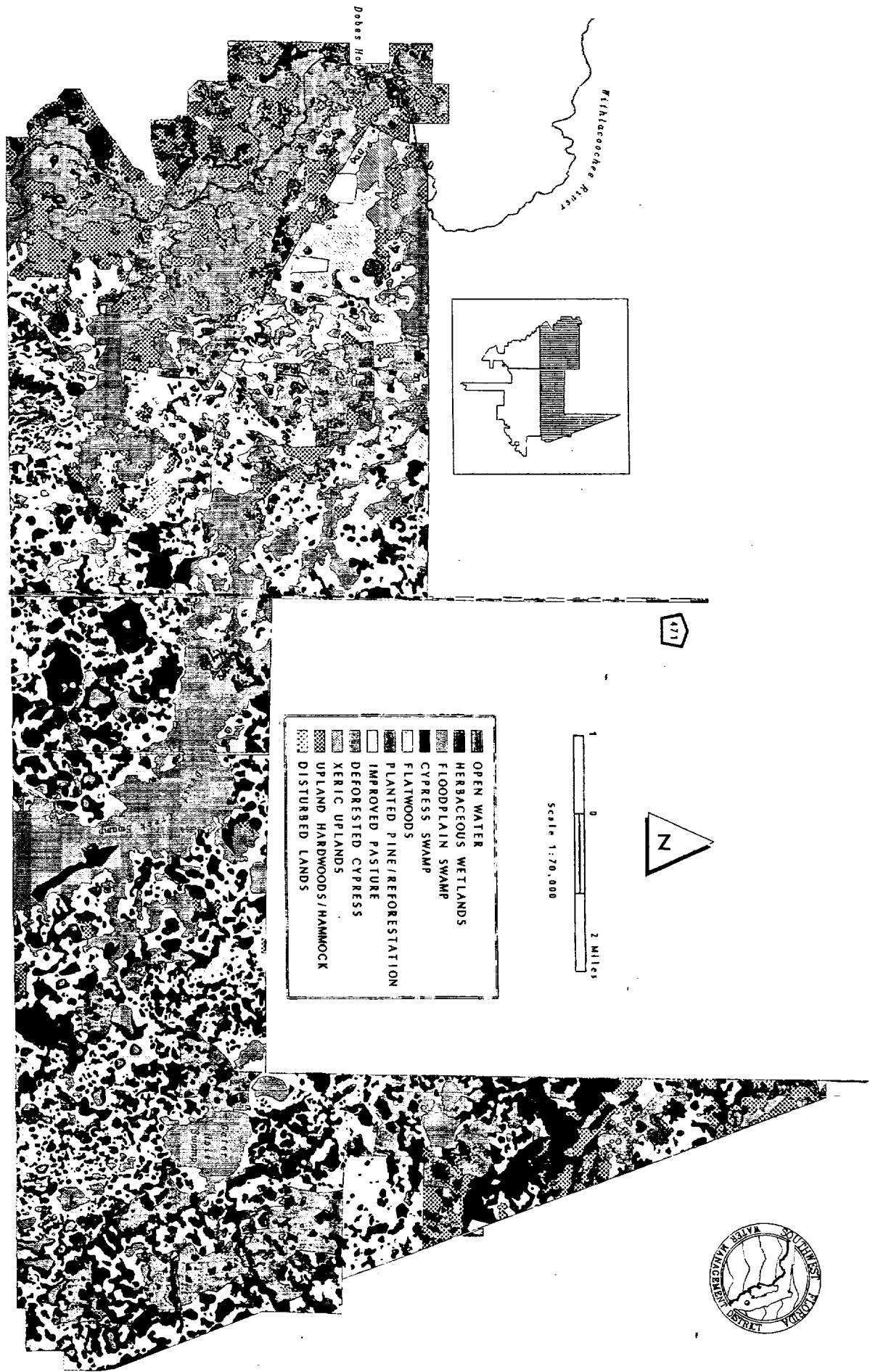
accounts for a total land area of approximately 24,500 acres (25 percent of total). Floodplain swamp, as delineated in Figures 4 and 5, actually consists of a mixture of floodplain swamp, bottomland forest and hydric hammock, with occasional baygalls located along the edges of the floodplain area. These communities share an affinity for sites that are regularly-flooded or saturated and are distinguished from one another by relatively minor differences in hydroperiod and floristic composition of a hardwood-dominated overstory. They occur primarily within the Withlacoochee River floodplain and along major flowways that serve as tributaries to the river.

The cypress swamp community covers an estimated land area of 16,500 acres (17 percent of total). The vegetation map delineates an additional 1,100 acres (1 percent of total) of deforested cypress swamp. The second-growth or third-growth cypress canopy was logged from these sites just prior to their recent acquisition by the District and they are being monitored to track recovery of the cypress.

Cypress swamps occur primarily as dome swamps in isolated depressions and as strands linking disjunct wetland systems, although they are also found within the deepest portions of the floodplain and other natural flowways. Pond cypress (*Taxodium ascendens*) is the dominant canopy species in the cypress swamps, especially within the dome swamps. Bald cypress (*Taxodium distichum*) is dominant in the deep-water flowways and in some of the strands.

It is suspected that cypress swamps once covered a larger proportion of the Preserve property. Large-scale logging operations conducted during the first half of the

FIGURE 4: LAND COVER AND VEGETATION MAP OF THE GREEN SWAMP WILDERNESS PRESERVE (NORTH). See companion map for southern half of Preserve.





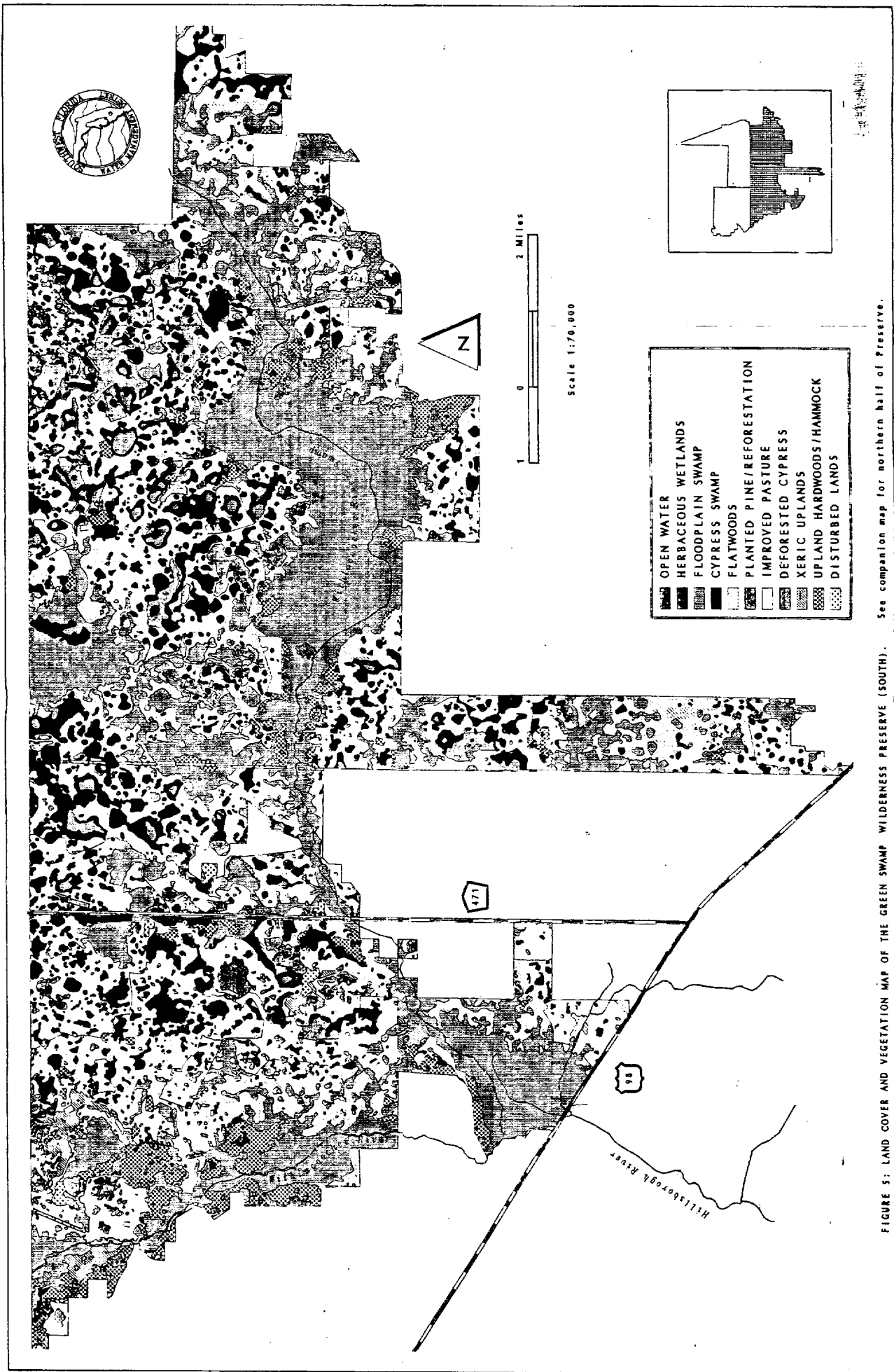


FIGURE 5: LAND COVER AND VEGETATION MAP OF THE GREEN SWAMP WILDERNESS PRESERVE (SOUTH). See companion map for northern half of Preserve.

century removed many thousands of old-growth bald cypress from the floodplain areas, particularly along the channel of the Withlacoochee River. Hardwood species may have colonized logged areas within the floodplain, thereby competitively excluding cypress and preventing regeneration of the pre-existing cypress canopy. Long-term preservation of the floodplain may permit a progressive expansion of cypress into areas that formerly supported cypress swamps (Ewel, 1990).

The balance of the Preserve's wetland communities consists of herbaceous wetlands, which account for a total land area of about 4,500 acres (4.5 percent of total). The majority of the herbaceous wetlands are wet prairies. Many of the prairie areas are associated with other wetland systems. Some occur as shallow, grassy depressions or flowways within flatwoods. Several larger wet prairie systems are located in the Green Swamp West management unit, including Sixteen Section Pond (Figure 3) and Buttonwood Lake. The remainder of the herbaceous wetlands are freshwater marshes. In total, an estimated 46,655 acres (48 percent of total) of the property support wetland communities. An additional 320 acres of open water areas (0.3 percent of total) occur. This acreage is divided among 80 different waterbodies, which include natural openings within the channel of the Withlacoochee River and as well as Dobes Hole and numerous water-filled borrow pits and cattle ponds.

The remainder of the Preserve land area supports vegetative communities that fall within either the Upland Hardwoods/Hammock or Xeric Uplands categories (Figures 4 and 5). Each of these categories

includes several distinct plant communities or associations. Xeric uplands are restricted to sites that are well-drained to excessively-drained and include such communities as sandhills, oak scrub and scrubby flatwoods. Generally, these sites occur at the highest elevations of the property on sandy ridges that represent ancient shorelines. They total approximately 1,120 acres. The upland hardwoods/hammock category includes typical mesic hammocks on upland sites associated with the edges of the floodplain swamp, particularly along the most downstream reaches of the Withlacoochee River, where the river channel is well-incised. Most of these hammock areas are dominated by live oak (*Quercus virginiana*). This category also includes some areas of xeric hammock, which in some cases represent remnant stands of old xeric uplands that have been shielded from fire for extended periods and are succeeding toward a mesic hammock community. These upland communities and their management needs are discussed in greater detail in the Resource Protection section of this plan.

### Soils

Given the large size of the Green Swamp property, it is not surprising that the site is underlain by a diversity of soil types. The riverine floodplain and associated sub-basins and drainage systems are characterized by a variety of mucky soils, including Chobee muck, Hontoon muck, Floridana muck and Gator muck. Some areas around the periphery of the floodplain are underlain by Kaliga muck, and minor or poorly-defined drainages are often distinguished by Pompano fine sands. All of these soils are very poorly-drained and are typical of frequently flooded sites.

The site's isolated wetland systems are characterized by the same mucky soils found in the floodplain. However, a number of the cypress domes and marshes are underlain by fine sands. These include Delray, Sellers, Floridana and Chobee mucky fine sands. These soils, like the mucks, are very poorly-drained, but in contrast to the floodplain soils they are more characteristic of isolated depressions that are inundated by standing water for 4 or more months per year. Hydroperiods in the mucky floodplain may be considerably longer, approaching 6 months or more.

As discussed previously, much of the Green Swamp property lies in an area of limestone outcropping where the Ocala limestone of the Floridan aquifer occurs at, or very near, the land surface. The thin veneer of soils overlying this limestone is especially evident in the flatwoods of the property. Much of the flatwoods is underlain by Paisley or Vero fine sands which are characterized by a stony subsurface. Other soils of the flatwoods include Wabasso, Eau Gallie, Wauchula, Smyrna and Myakka fine sands. These soils are all poorly-drained and typically occur in areas where the water table is within 12 inches of the land surface for much of the year. The property's improved pastures and reforestation sites generally supported flatwoods prior to being altered and are underlain by the same assortment of soils.

The remaining upland communities, including hardwood hammocks, oak scrubs, scrubby flatwoods and sandhills, occur in areas that are better drained and less susceptible to flooding or ponding. Soils common to these sites are Pomello and Tavares fine sands.

The most downstream segments of the Withlacoochee River, located in the north-west corner of the Green Swamp West management unit, are strikingly different from the upstream segments in terms of topography, physiognomy and vegetative composition. The river channel is generally more incised and well-defined and the adjoining uplands exhibit more topographic relief than is typically observed in the flat terrain of the Green Swamp basin. The soils in this portion of the property are also distinctive, consisting of the Anclothe-Tavares-Pomello association. These soils are described as poorly to moderately-well drained and as susceptible to regular flooding. The Anclothe soils are confined to the river channel and low-lying portions of the floodplain. These are the areas that are subject to frequent flooding. The Tavares and Pomello soils occur on low ridges lining the periphery of the floodplain. These soils are described as "draughty" and support plant communities that are infrequently or rarely inundated. As discussed previously in the Land Cover section of this report, the upland vegetation in this area is distinctly different from the remainder of the property, reflecting the differences in topography and soil structure.

### Adjacent Land Use

Land use patterns on the lands surrounding the Green Swamp Wilderness Preserve are consistent with preceding discussions that noted a preponderance of agricultural usage, especially ranching. Most of the lands adjoining the Preserve on its eastern boundary are grazed by cattle and occur as native rangeland. Lands to the south are also grazed but have been largely converted to improved pasture. Other nearby agricultural uses include considerable

acreages of citrus to the northeast around the community of Bay Lake, and silviculture in the Richloam segment of the state-owned Withlacoochee State Forest, which adjoins the Preserve along nearly the entire northern property line (Figure 6). The western property line is adjoined by a mixture of low-density residential and low-intensity agricultural uses associated with the rural lands outside Dade City and Lacoochee.

Notable exceptions to the pattern described above include the Withlacoochee River Park and the Little Everglades Ranch on the west. Other noteworthy land uses include three mine sites. The old Morrel Mine, ultimately leased by the landowner to International Minerals and Chemical Corporation, was mined for limerock until August, 1992, when it was declared inactive. During its period of operation, the mine was required to assist in the management of water levels in the adjacent Little Gator Creek Wildlife and Environmental Area, which is owned and managed by the Florida Game and Fresh Water Fish Commission and adjoins the Preserve (Figure 11). Maynard Ventures Five, Inc., owns an inactive limerock mine that was originally operated by Agri-timber. They are currently seeking permits to reactivate the operation on this site which occurs as an inholding in the extreme south-central portion of the Preserve. The Overstreet sand mine is also located on lands that are proximate to the Preserve, on a site just east of State Road 471.

## THE CONCEPTUAL LAND USE PLAN

### Special Protection Areas

Certain areas within the District-owned portions of the Green Swamp warrant special protection efforts in order to more effectively preserve water management functions and/or other outstanding natural values. Protective measures in these areas take precedence over other land use and management considerations. Special Protection Areas within the Green Swamp will include: the floodplain of the Withlacoochee River and its associated floodplain wetland systems; the Bayroot Slough system; areas known to provide important habitat for wildlife or plant species that are recognized as imperiled; sites of archaeological, historical or cultural significance; and areas that serve as sites for long-term environmental monitoring stations.

Additional special protection areas may be designated in the future on the basis of colonization or regular use by an imperiled species. In the event that Lowry Park Zoo is permitted to establish a captive breeding program on a site within this District-owned property, it will become appropriate to designate that site a Special Protection Area.

### *Withlacoochee Riverine Floodplain*

Approximately 36 miles of the upper-most reaches of the Withlacoochee River meander through the District's Green Swamp property. In the most downstream segments, where the river channel is lined by high bluffs, the associated floodplain forest is a scant 500 feet in width (Figure 3).

This contrasts sharply with the upstream reaches, where the flat terrain that characterizes most of the Green Swamp results in a broad floodplain that approaches 2 miles in width. The Preserve property assures protection of several other large, forested wetland systems, including Devils Creek Swamp, Wildcat Swamp and Gator Hole Swamp (Figure 3). These are often distinguished as separate from the Withlacoochee floodplain, but they are important tributaries to the Withlacoochee River, are often continuous with the riverine floodplain during periods of high water and may be regarded together with the Withlacoochee River as identifiable subelements of one very large hydrologic system. At high stages, water from the Withlacoochee River moves through a shallow gap into Devils Creek, and eventually discharges back into the river just beyond the northwest corner of the property (Pride et al., 1966). Gator Hole Slough drains northwestward from Gator Hole Swamp, into the Withlacoochee State Forest, and discharges to Devils Creek just above its confluence with the Withlacoochee River.

The potential for natural detention and retention of floodwaters in this extensive floodplain area was discussed in a previous section. The mixture of hardwood swamps and pure cypress stands that comprise the majority of the floodplain forest also provides significant habitat for a great diversity of wildlife. It is estimated that nearly 60 percent of all wildlife species that are native to the Green Swamp area depend upon the habitat provided by the floodplain forest (Green Swamp Task Force, 1992). It is particularly important to the amphibian component of the fauna. Only the equally extensive flatwoods community rivals the floodplain in terms of overall importance to wildlife.

Preservation of the natural values of the Withlacoochee riverine floodplain will depend upon maintaining normal surface flows and hydroperiods within the entire system. Structural improvements in the floodplain will be limited to boardwalks and other minor structures considered necessary to facilitate land management activities or reduce physical disturbance associated with compatible recreational uses. Any structures placed in the floodplain areas shall be designed such that they will not alter hydroperiods or flood storage capabilities or impede surface flows. Exceptions to this general management guideline include structures designed to restore altered hydrology or assist in environmentally-appropriate management of critical wildlife habitat areas, e.g., the rookery sites discussed in following sections of this plan.

Major off-site sources of water, including Grass Creek, Pony Creek, Gator Creek, Mattress Drain and Combee Drain, have been channelized to various degrees and may be subject to water quantity and water quality impacts associated with upstream uses extending all the way to the Polk City and Lakeland areas. Coordination with Polk County may be critical to protecting these sources of input to the Withlacoochee River and Green Swamp Wilderness Preserve. Uses of the property that may degrade water quality or adversely alter water quantities will be avoided or directed to less sensitive areas of the property. Habitat values are likewise dependent upon maintenance of the dense, diverse forest canopy. Any activities that would result in excessive destruction of the canopy, or induce unnatural successional changes in the floodplain, will be prohibited.

### *Bayroot Slough*

Bayroot Slough is the major headwater tributary of the Little Withlacoochee River, which is itself the largest single tributary to the Withlacoochee River (Pride et al., 1966). The Slough receives drainage from several small swamps and lakes located off-site to the east of the old Seaboard Airline Railroad corridor (Figure 3). Drainage from Bayroot Slough exits the Little Withlacoochee Management Unit of the Preserve, into the Richloam Tract of the Withlacoochee State Forest, and ultimately becomes the Little Withlacoochee River. The confluence of the Withlacoochee and Little Withlacoochee is located well downstream of the Green Swamp property.

The canopy of Bayroot Slough consists primarily of mixed hardwoods, with occasional cypress restricted to the deeper, wetter, central areas of the slough system. As was the case in the Withlacoochee River floodplain, it is presumed that cypress was a more dominant component of the canopy prior to logging activities conducted through the first half of this century.

The natural values and functions of Bayroot Slough are comparable to those of the Withlacoochee floodplain discussed previously. Protection needs are likewise similar and will consist primarily of maintaining hydroperiods and normal surface flows. Bay Lake and Mill Pond, located in the farming community of Bay Lake (see Figure 2), are two of the largest off-site wetland systems that drain into the Slough. Large-scale groundwater withdrawals, channelization, and any other off-site practices in the vicinity of Bay Lake that may reduce, short-circuit, or otherwise alter the down-gradient flow of water to the Slough, and hence reduce hydroperiods,

could induce changes throughout the entire Bayroot system. The District will coordinate with Lake County to remain apprised of any proposed land uses that could affect surface flows or water quality in this area so that potential impacts can be predicted and avoided. Preservation of the Slough's natural canopy will also be important to assuring that wildlife values are maintained.

### *Wading Bird Rookeries*

A total of five wading bird rookeries have been identified within the District-owned portions of the Green Swamp. The Florida Game and Fresh Water Fish Commission has historically monitored activity levels in colonial nesting sites across the state and has compiled a comprehensive record of nesting activity at those sites (Runde et al., 1991). These data on nesting activity indicate that the Green Swamp Wilderness Preserve sites are utilized by a great diversity of colonially-nesting species, including wood storks (*Mycteria americana*), great egrets (*Casmerodius albus*), snowy egrets (*Egretta thula*), little blue herons (*Egretta caerulea*), cattle egrets (*Bubulcus ibis*), white ibis (*Eudocimus albus*) and others.

Populations of most wading bird species have declined greatly in recent decades. A considerable amount of biological research has focused on identifying the reasons for the declines. Many of these studies have attempted to identify the suite of site conditions that are required for establishment of successful wading bird rookeries. The research has confirmed that rookeries are very susceptible to man-induced disturbance (Tremblay and Ellison, 1979; Buckley and Buckley, 1976). In recognition of the sensitivity of rookery sites, and of the imperiled status of several of the species

using these sites, they have been identified as Special Protection Areas.

Local nesting by wood storks is especially noteworthy. This species has been designated as endangered by both the State of Florida and the United States Fish and Wildlife Service (FGFWFC, 1991). At present, the snowy egret and little blue heron have been designated as species of special concern by the State of Florida (FGFWFC, 1991), and it has been proposed that the white ibis should be listed as a threatened species. These designations, and proposed designations, place additional emphasis on the need to carefully protect the Preserve's colonial nesting sites.

Protection of the rookery sites will require that recreational uses and other potentially-disruptive land uses be directed to other areas of the property (Tremblay and Ellison, 1979). The species using the rookery sites are typically more sensitive to disturbance during the courtship, nest-building and early-nesting stages of the nesting season. This includes the time period extending generally from February through July for most species, and extra precautions may be required during this period to avoid inducing possible abandonment of the sites. The birds are often reluctant to abandon eggs or young, and thus may be somewhat more tolerant of minor disturbance in later parts of the nesting season. Prescribed fires and other land management activities conducted in the vicinity of active rookeries should be restricted whenever possible during this normal period of activity. Smoke from distant fires may also disturb or stress birds in rookeries if there is inadequate allowance for smoke dissipation, and this factor will also be considered in determining prescription parameters for prescribed fires.

Water levels play an important role in determining the success of a rookery site. A successful rookery must have a fairly large and dependable food source within reasonable distance of the site. Most wading birds depend upon the fish and amphibians available in nearby wetlands. It has been estimated that a single family of wood storks must consume up to 440 pounds of fish during a single nesting season (United States Fish and Wildlife Service, 1986). If water levels are too high in the wetlands where the birds must feed, then the food source may not be concentrated sufficiently to permit this level of harvest. Conversely, if water levels are too low within the actual site of the rookery, then the eggs and nestlings serve as easy prey for raccoons, snakes, and other major terrestrial predators. Some researchers have noted a correlation between high water levels within rookery sites, the presence of alligators and cottonmouth snakes to ward off land-based predators, and reproductive success of wading bird rookeries (Jenni, 1969).

Preservation of the extensive wetland communities of the Green Swamp through District ownership will help to ensure that the area remains suitable for the continued use of existing rookeries, and for the establishment of new rookeries. If water levels in these sites are allowed to fluctuate normally in response to rainfall and groundwater levels, then it is likely that in most years the range of water levels required by the birds will be available. However, given the endangered status of the wood stork, and the overall significance of the on-site wood stork rookery, the District should evaluate the propriety and feasibility of installing a water control structure that can be operated to maintain high water levels within the rookery during periods of drought. Any

use of such a structure must be strictly regulated and supervised to ensure that it is operated during only those periods in which it is essential to retain water within the rookery to help facilitate a successful nesting season. A site-specific water resource management plan must first be prepared to document the relationship between water levels and rookery success. An analogous structure has been installed at the nearby Little Gator Creek Wildlife and Environmental Area and it may provide useful information regarding the feasibility, prudence and effectiveness of this approach to rookery management.

Although FGFWFC has historically monitored Florida's wading bird rookery sites, monitoring efforts at these sites will be severely curtailed in future years. Funding and staffing constraints dictate that only the largest and most significant rookeries can continue to be monitored on an annual basis (Nancy Joiner, FGFWFC, pers. comm.). The remainder will be monitored at five-year intervals. The wood stork rookery is the Preserve's only rookery site expected to qualify for annual monitoring. As such, District staff will be directed to monitor all of the rookery sites annually so that changes or trends in nesting activity can be discerned and management actions planned accordingly.

Several other rookeries occur in close proximity to the property and it is presumed that the Preserve lands serve as potential foraging and resting areas for birds nesting at the other sites. This use is not confined to discrete areas and its continuation cannot be assured through designation of additional special protection areas. However, the Preserve's continued value for this purpose will be ensured through preservation of a natural condition in the property's wetland areas.

### Scrub Jay Habitat Areas

The Florida scrub jay (*Aphelocoma coerulescens coerulescens*) is another imperiled bird species known to depend upon habitat provided by the Green Swamp Wilderness Preserve. It is currently designated a threatened species by both the State of Florida and the United States Fish and Wildlife Service (FGFWFC, 1991). Like the colonial wading bird rookeries discussed above, sites that serve as critical habitat areas for scrub jays are discrete and readily defined. However, in contrast to wading bird rookeries, scrub jay sites are inhabited on a year-round basis, are not typically ephemeral or irregular in nature, and are much more exacting in terms of management needs.

Scrub jays are extremely habitat specific, occurring only in immature stands of scrub or scrubby flatwoods. Sites that have become overgrown or over-mature due to long-term absence or suppression of fire will not support jays. As a stand of scrub or scrubby flatwoods becomes progressively more dense since the last incidence of fire, it also becomes progressively more difficult for resident jays to forage for food. The high, dense canopy and shrub growth also makes it difficult for jays to spot and avoid such major predators as the sharp-shinned hawk (*Accipiter striatus*) and Cooper's hawk (*Accipiter cooperii*), both of which are known to occur in the Green Swamp. This specificity for a habitat type that has always been relatively rare, and has become increasingly rare due to fire suppression and man's development activities, has led to the scrub jay's elimination across much of its original range and to its current status as a threatened species (Cox, 1987).



Scrub jays have evolved a number of adaptive behavioral traits that have important implications for their long-term management and preservation. They live in family groups within strictly defined territories that they defend from other jays. There is only one breeding pair, mated for life, within any given territory; other jays residing within a territory are usually offspring of the mated pair that assist in raising of the family's young. Territories are often inherited, usually by a male, after the demise of the breeding pair. Dispersal distances for jays are very short. Although some jays have dispersed distances of several miles in search of habitat suitable for the establishment of new territories, most will never venture more than several hundred meters from the site at which they were fledged. As a result, jays will not readily recolonize a site from which they have been eliminated.

Three families of jays have been documented at the Green Swamp Wilderness Preserve. Occasional sightings suggest that there may be several other families. The District's Land Management section, with cooperation of the Resource Projects Department and other appropriate staff, will maintain up-to-date maps delineating the extent of all known scrub jay habitat, as well as potential habitat, and will conduct prescribed fires in those areas in a manner designed to be compatible with scrub jay habitat needs. Initially, prescribed fires should be conducted such that no more than 60 percent of any known jay territory will be consumed by a fire. Jays will not abandon a territory following fire provided that about 40 percent of the stand remains intact (John Fitzpatrick, Archbold Biological Station, pers. comm.). This will reduce stress among the birds by allowing them to remain within familiar territories and will

reduce the likelihood of forced emigration to areas that provide unsuitable habitat which will not support them. Natural fire intervals for the scrub and scrubby flatwood communities in which the scrub jays are found are estimated at once every 20-80 years and 8-25 years, respectively (FNAI and FDNR, 1990), although return frequencies in the Green Swamp area may tend toward the shorter end of this range. Fire intervals should be determined on a case-by-case basis and should be designed to produce stands of vegetation at various stages of maturity.

The overall extent of scrub and scrubby flatwoods in the Preserve is very limited, being confined to either narrow ridges that are highly dissected by wetlands, or to small, isolated patches. These areas are presently in a very degraded state due to years of inappropriate fire management or to logging, roller chopping, and other land uses and management techniques that were practiced on the lands prior to District acquisition. In the future, as more of the property has been restored to a state that is suitable for jays and areas of open territory become available, it may not be as critical to plan fires in the manner described above. Initially, consideration should also be given to avoiding fires during the nesting season, which normally extends from March through June, although jays will often produce a second clutch if the first clutch is lost early in the nesting season. But again, such factors must be weighed on a case-by-case basis. For example, special precautions may not be necessary when it is known that any active nests present at the site are located outside the targeted burn units, or that adequate unburned habitat within existing territories will remain after the prescribed burn has been completed. There are additional factors related to scrub

jay biology that must be carefully considered as part of any long-term strategy to preserve this species on-site. For example, the small size of the known population makes it extremely susceptible to both random elimination and the adverse effects of inbreeding. Ongoing research into the genetics and population biology of this species may suggest additional management needs and should be carefully followed.

### *Pitcher Plant Habitat Areas*

The hooded pitcher plant (*Saracenia minor*) is one of several species of pitcher plants known to occur in the southeastern United States, and the only species known to occur as far south as the Green Swamp. Pitcher plants are quite distinctive in appearance, and especially distinctive in their habit as insectivorous plants. Although this species often grows in large numbers at the sites where it occurs, sites of occurrence are very infrequent. Very few populations are adequately protected and many are in a degraded state due to improper management. As a result, the species is considered rare (Bell and Taylor, 1982; Wunderlin, 1982) and it has been designated a threatened species by the State of Florida (FGFWFC, 1991).

At least one small population of these plants, consisting of perhaps a dozen individuals, is known to occur within the Green Swamp Wilderness Preserve. The site of this population, and any other populations that may be discovered in the future, will be recognized as Special Protection Areas. Management activities at these sites will be planned and conducted in a manner that seeks to perpetuate and expand these populations. The wet prairies that provide habitat for pitcher plants are one of

Florida's many pyric, or fire dependent, plant communities. The wet prairie that supports the known population of this species has been managed through application of prescribed fire; however, many years of inappropriate fire management were practiced at this site prior to District acquisition. This allowed dense thickets of gallberry (*Ilex glabra*) to develop and the thick shrub growth is now crowding, shading, and otherwise threatening to displace the pitcher plants. Future fire management at this site should emphasize growing-season fires to promote the long-term perpetuation and rejuvenation of the population. Fires that occur during the growing season may be more effective at controlling or reducing the extent of gallberry and other woody shrubs. Roller chopping is sometimes employed as a site preparation technique prior to conducting prescribed burns, especially for burns designed to reduce areas of heavily overgrown shrub cover. The sensitivity of pitcher plants to such physical disturbance is unknown and shall be considered a factor when planning prescribed fires for known pitcher plant habitat.

One other site in the Preserve, very close to the known population, is reported to have recently supported pitcher plants. Rooting by feral hogs has destroyed all of the plant cover at this site. As such, feral hogs must be considered a potential threat to this species and this factor provides additional motive for intensified hog control measures.

### *Archaeological/Historical Sites*

As a prelude to completing the final design and engineering work for the planned Four River Basins, Florida Project, the District commissioned a series of investigations to document the occurrence of any archaeo-

logical or historical resources that would be subject to loss or destruction as a result of the Project. These investigations collectively identified a total of 89 individual archaeological sites within the current Preserve area (Weisman and Marquardt, 1988; Wharton, 1984; Piper and Piper, 1980; and Wharton, 1979). An additional 7 were identified within the 19,000 acre easement that the District holds over lands in the Withlacoochee State Forest (Weisman and Marquardt, 1988). A study sponsored by the Pasco County Division of Parks and Recreation investigated 2 archaeological sites within the boundaries of the adjacent Withlacoochee River Park (Williams et al., 1988). All identified sites were subsequently listed in the Florida Master Site File. At least 8 sites were determined to be of significance.

In addition to the archaeological sites, there are several sites of local and regional historical interest. Traces of the community of Cumpressco, located within the Green Swamp Management Unit (Figure 3), still remain on the property. An old railroad car, dating from the turn of the century, still sits on a length of rail in the clearing that was once the heart of the community. It will soon be removed by the Hernando Historical Museum Association and will be placed on exhibit at the 1885 Train Depot in Brooksville, Florida. The Pioneer Florida Museum, located in Dade City, recently received approval to remove an old hunting cabin of local historical interest from a location on the Withlacoochee River. The cabin is to be reassembled at the Museum. Other structures of historical significance or interest have been donated previously, including the Old Cumpressco line shack and the Smith smoke house.

Any future structures or recreational improvement planned for the Preserve area, including foot trails, will be directed away from the known archaeological sites. Management priorities for these sites will focus primarily on the prevention of looting by amateur archaeologists. Security personnel assigned to the Preserve will be apprised of the locations of the sites and will be instructed to monitor the areas of recognized significance for signs of looting. Although the District does not generally provide funding to support archaeological investigations and assessments, the Preserve sites will be made available for supervised study by professional archaeological researchers. Proposals to conduct such investigations will be reviewed by the District on a case-by-case basis and must satisfy any requirements or protocols dictated by the Division of Historical Resources of the Florida Department of State.

Protection will also be extended to sites of continued historical interest, including the Cumpressco area. Grave sites at the old Stewart homestead will also be afforded Special Protection Area status.

#### *Hydrobiological Monitoring Stations*

A series of hydrobiological monitoring stations were established in the Green Swamp beginning in 1979 (Rochow and Lopez, 1984). Detailed monitoring of water levels and vegetative composition at these sites commenced in 1981 and continues at regular intervals. The cypress dome wetlands that are monitored at these stations serve as control sites for similar monitoring programs conducted at several off-site wellfields. These off-site monitoring programs are designed to elucidate any wetland or groundwater impacts associated

with operation of the wellfields. Some of the wellfield monitoring programs are mandatory research efforts required as conditions of the District-issued water use permits that authorize operation of the wellfields. It is essential that the control sites be maintained in a natural, undisturbed state to ensure continuity of data collection and to permit accurate analysis and interpretation of changing wetland conditions. The large, isolated nature of the Green Swamp Wilderness Preserve ensures that the monitoring stations are suitably buffered from local changes in groundwater levels and other impacts or confounding variables commonly associated with developed areas. The stations also provide baseline information on wetland conditions in the Green Swamp and may be valuable for detecting and preventing hydrologic changes within the property.

The Resource Projects Department is responsible for all monitoring activities conducted at these sites and will ensure that the Land Resources Department is provided with up-to-date maps depicting the locations of all Green Swamp monitoring stations. The Land Management Section will consult with the Resource Projects Department regarding prescribed burns and other land management operations to be conducted around monitoring stations so that any precautions considered necessary to protect the stations can be outlined and implemented.

### Activity Zones

The delineation of activity zones, on the basis of the criteria outlined in Figure 6, is an important step in guiding future land uses on District-owned properties. The designations assist in identifying appropriate areas for the siting or clustering of

compatible land uses, thereby avoiding conflicts among uses and ensuring that the natural resource values of the property are preserved to the utmost. It is a procedure that was developed by the United States Forest Service and it has been adapted by the District to serve as a guiding principle for evaluating and siting various land uses.

The current activity zone map for the Green Swamp Wilderness Preserve (Figure 7) indicates that the property encompasses three different activity zones. Motorized natural zones occur as corridors along the edges of Class I motor routes (see Figure 8 for a description of roadway classifications) and waterways. The upstream reaches of the Withlacoochee River are too shallow, narrow, and blocked by logjams and other obstacles to be readily accessible to motorized boat traffic. As such, that portion of the river has been classified a Class III throughway, in contrast to the more accessible portions of the river lying downstream of the River Road entrance.

Motorized natural zones exhibit moderate evidence of human influence or alteration and motorized use is often permitted. These zones are most suitable for any minor structural improvements considered necessary for accommodating permitted public uses, provided that the improvements are compatible with resource protection goals and will harmonize with the primarily natural surroundings. Such structural improvements may include parking areas, restrooms, picnicking facilities, and environmental or interpretive centers.

The majority of the property falls within the semi-primitive motorized and semi-primitive non-motorized zones. These differ from one another in permissibility of motorized vehicular

Figure 6. Criteria for Designation of Activity Zones.

	CRITERIA FOR DESIGNATION	
ACTIVITY ZONE		
<b><i>Primitive</i></b>		
Area is characterized by essentially unmodified natural environment of fairly large size. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.	At least 2 miles from all roads, railroads, or trails with motorized use.	At least 5,000 acres
<b><i>Semi-Primitive Non-Motorized</i></b>		
Area is characterized by a predominantly natural or natural appearing environment of moderate-to-large size. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is not permitted.	At least 1/4 mile from Class II and Class I roads but less than 2 miles from some roads.	At least 2,500 acres
<b><i>Semi-Primitive Motorized</i></b>		
Area is characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. The area is managed in such a way that on-site controls and restrictions may be present, but are subtle. Motorized use is permitted.	Within 1/4 mile of Class II roads but more than 1/4 mile from any Class I road.	At least 2,500 acres
<b><i>Motorized Natural</i></b>		
Area is characterized by a predominantly natural-appearing environment with moderate evidence of the sights and sounds of man. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design facilities.	Within 1/4 mile of Class I roads.	No size criterion

Figure 7. Current activity zone map of the Green Swamp Wilderness Preserve.

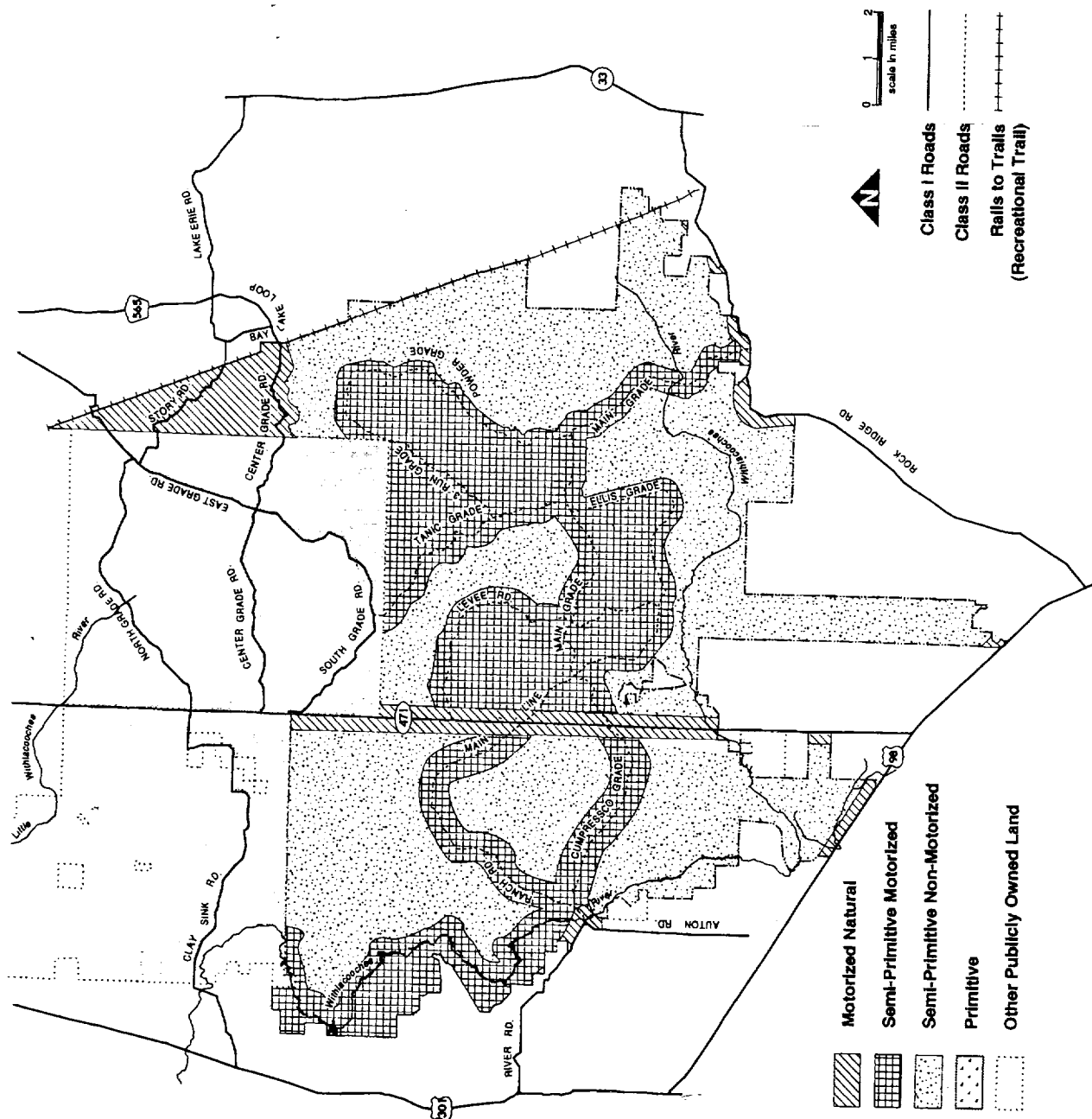


Figure 8. Classification System for Roads.

CONDITION	ACCESSIBILITY		
	<i>Open</i>	<i>Seasonally Open</i>	<i>Closed</i>
<i>Improved</i>	Class I	Class II	Class II
<i>Primitive</i>	Class II	Class II	Class III
<i>Trail</i>	Class II	Class III	Class III

access. The non-motorized zones are limited to resource-based uses that are not dependent upon the use of motorized vehicles. These zones are more strictly dedicated to the preservation of habitat values and the wilderness aesthetic. Only the most passive recreational uses will be promoted in such zones. Land uses that require structural improvements or alterations will be directed away from semi-primitive zones, especially the non-motorized areas, in favor of maintaining or restoring natural conditions. Any physical improvements that are approved for semi-primitive zones will be subjected to stringent review and will be limited to the minimum necessary to accommodate a compatible use. Generally, all structural improvements should be directed to motorized natural zones. Physical improvements or alterations in the semi-primitive zones should remain limited to those designed to achieve resource protection or restoration objectives, such as bridges, culverts, and firelanes, or to such minor recreational amenities as footpaths.

### **Preserve Design Considerations and a Proposed Primitive Zone**

The science of conservation biology has defined several guiding principles for designing preserve areas (Soule and Simberloff, 1986). The primary rule of preserve design postulates that "bigger is better". Although small preserves can fulfill important conservation objectives, most notably the protection of highly imperiled plant or animal populations (White, 1987), only large areas are likely, or able, to encompass a diverse range of natural communities that can be managed with such necessary land management techniques as prescribed burning. And

only the very largest can provide sufficient suitable habitat to ensure the long-term survival of genetically-viable populations of many species. This is particularly true for large mammals. For example, the normal home range of a Florida black bear (*Ursus americanus floridanus*) has been estimated at 28 square kilometers (km<sup>2</sup>) for females and 170 km<sup>2</sup> for males (Maehr and Wooding, 1992). These estimates, equivalent to about 7,000 and 42,000 acres respectively, pale in comparison to those offered for the endangered Florida panther (*Felis concolor coryi*). Large, contiguous areas of habitat are required to support such species.

The current extent of habitat fragmentation and alteration in Florida dictates that many of our existing preserves will not support populations of large mammals, and many other species, unless these areas are connected to one another by natural corridors that permit wildlife movement within a linked network of preserves. A hypothetical network for linking Florida's premier centers of wildlife habitat has been outlined previously (Noss, 1987) and the need to create such a network was recognized recently by the Governor of Florida and resulted in establishment of the Florida Greenways Commission. The Green Swamp has been identified as one of the primary core areas of habitat that should be linked into the state-wide network of preserves. It is recognized as one of the few remaining habitats of the Florida black bear, now designated a threatened species by the State of Florida and proposed for listing as threatened by the USFWS. It has also been identified as a candidate site for the reintroduction of captive-bred Florida panthers (Jordan, 1991).

The size, location, and public ownership of the Green Swamp Wilderness Preserve



make it a logical choice to serve as the nucleus or hub of the Green Swamp core area. The natural corridors of the Withlacoochee and Hillsborough Rivers provide an ideal means of connecting the property to other publicly-owned natural areas. Although the adjoining lands of the Withlacoochee State Forest are also publicly-owned, those lands are managed more intensively than District-owned lands for purposes of timber production. As such, given the District's statutory mandate to emphasize preservation over all other land uses, the District must accept a major role in protecting the wildlife resources and overall habitat viability of the Green Swamp system. That responsibility, and the state-wide significance of the Green Swamp, suggest that it is appropriate to consider placing an even higher premium upon preservation objectives.

The current configuration of activity zones, as discussed previously, includes 3 of the 4 possible zone categories. A proposed activity zone map, predicated upon future closure of the Powder Grade and Three Run Grade roads to vehicular traffic (Figure 9), has been prepared for the Green Swamp Wilderness Preserve (Figure 10). The proposed map illustrates the effect that levels of vehicular access can have on the configuration of activity zones and, therefore, on the management philosophy, character and public usage of a tract. The proposed map encompasses the full range of all four activity zones and reflects a significant increase in the extent of the semi-primitive non-motorized category.

Among all the District-held properties for which formal land use and management plans have been prepared, this is the only scenario under which a site has met the criteria for designation of a primitive zone.

Primitive zones must be at least 2 miles from any road over which public vehicular access is permitted. There is also a size threshold requiring that the area be at least 5,000 acres in total size. Primitive zones are to be managed to preserve an essentially unaltered state. Motorized access to primitive zones would remain limited to the absolute minimum considered necessary for the performance of critical land management activities, such as prescribed burning. Such areas are to be regarded as inviolate and the highest management priority is to be maintenance of the natural condition. Public uses should be limited to foot traffic and day use only. The level of protection afforded by primitive zone status may provide areas of refuge that are essential to ensuring the on-site persistence or immigration of species that are exceptionally sensitive to man's presence, including such imperiled species as the Florida black bear and Florida panther.

The primitive zone, as currently delineated under this proposed scenario, is approximately 7,000 acres in size. The northern portion of the Green Swamp West Management Unit satisfied the requirements for isolation from roadways but could not meet the size requirements. In the event that motorized access to that portion of the property becomes more restrictive than is currently proposed, it could be reassessed to determine if it meets the criteria for classification as a primitive zone and should be managed accordingly.

Although the future closure of Powder Grade and Three Run Grade to vehicular traffic will create a 7,000-acre site in which the District would achieve the highest possible level of preservation, that closure would also disrupt established patterns of public use. Existing recreational uses are

one of the many factors that will be weighed in all future decisions to limit or reduce vehicular access within the Preserve in order to create primitive wilderness zones.

The effectiveness of a primitive zone in achieving intended habitat protection or enhancement objectives must also be considered and will depend largely upon the nature and use of surrounding lands. A primitive zone in the northern portion of Green Swamp West would lie on the extreme western periphery of the Green Swamp area and would adjoin lands of the Withlacoochee State Forest. Those lands are managed for timber production and are open for relatively unrestricted vehicular use. Developed areas and agricultural lands associated with the towns of Lacoochee and Dade City are also located nearby. These characteristics would limit the potential for achieving all of the desired objectives of a primitive zone designation.

The primitive zone proposed for the eastern portion of the Preserve is also located on the edge of the property; however, it lies within the center of the Green Swamp area and adjoins a large tract of privately-owned lands that have been approved for public acquisition through the CARL Program. These adjoining lands total approximately 25,000 acres, are within Phase I of the larger Green Swamp CARL Project (total area = 126,800 acres), and are currently ranked 17th on the CARL acquisition list (Florida Department of Natural Resources, 1993). About 15,000 acres are identified as a priority acquisition area and encompass several large forested wetland systems, including Green Bay Swamp and Alligator Lake Swamp, which provide high-value wildlife habitat. If these adjoining lands are protected through

public ownership, then a rare opportunity will exist for the long-term preservation of the Preserve's large core area of primitive wilderness. These additional public lands would buffer the primitive zone from human intrusions and, if managed in a manner that is consistent with the goals of primitive zone designation, would prevent future development and incompatible land uses from encroaching into the eastern portion of the 2-mile roadless zone necessary for the continued maintenance of primitive conditions within the Preserve.

The District will initiate measures to establish the proposed primitive zone along the eastern edge of the Preserve and will manage the zone in a manner that is consistent with such a designation. Public acquisition of adjoining lands, through the CARL Program, will be actively promoted. The acquisition of adjoining lands by the District will also be considered. In the event that the CARL project lands are acquired, the District will foster a cooperative management effort with the state agency given responsibility for management of those lands to ensure that they are managed in a manner that is consistent with maintaining primitive conditions within the primitive zone. In the event that the adjoining lands are not acquired, or are otherwise devoted to uses that diminish, negate, or compromise the wildlife values and primitive nature of the primitive zone, the District will evaluate alternative approaches to achieving primitive zone conditions within interior portions of the Preserve.

### Access

As a matter of course, foot access is permitted to the vast majority of District-owned lands. This holds true for the entire Green Swamp Wilderness

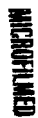


Figure 9. Roads and trails in the Green Swamp Wilderness Preserve and adjoining area.

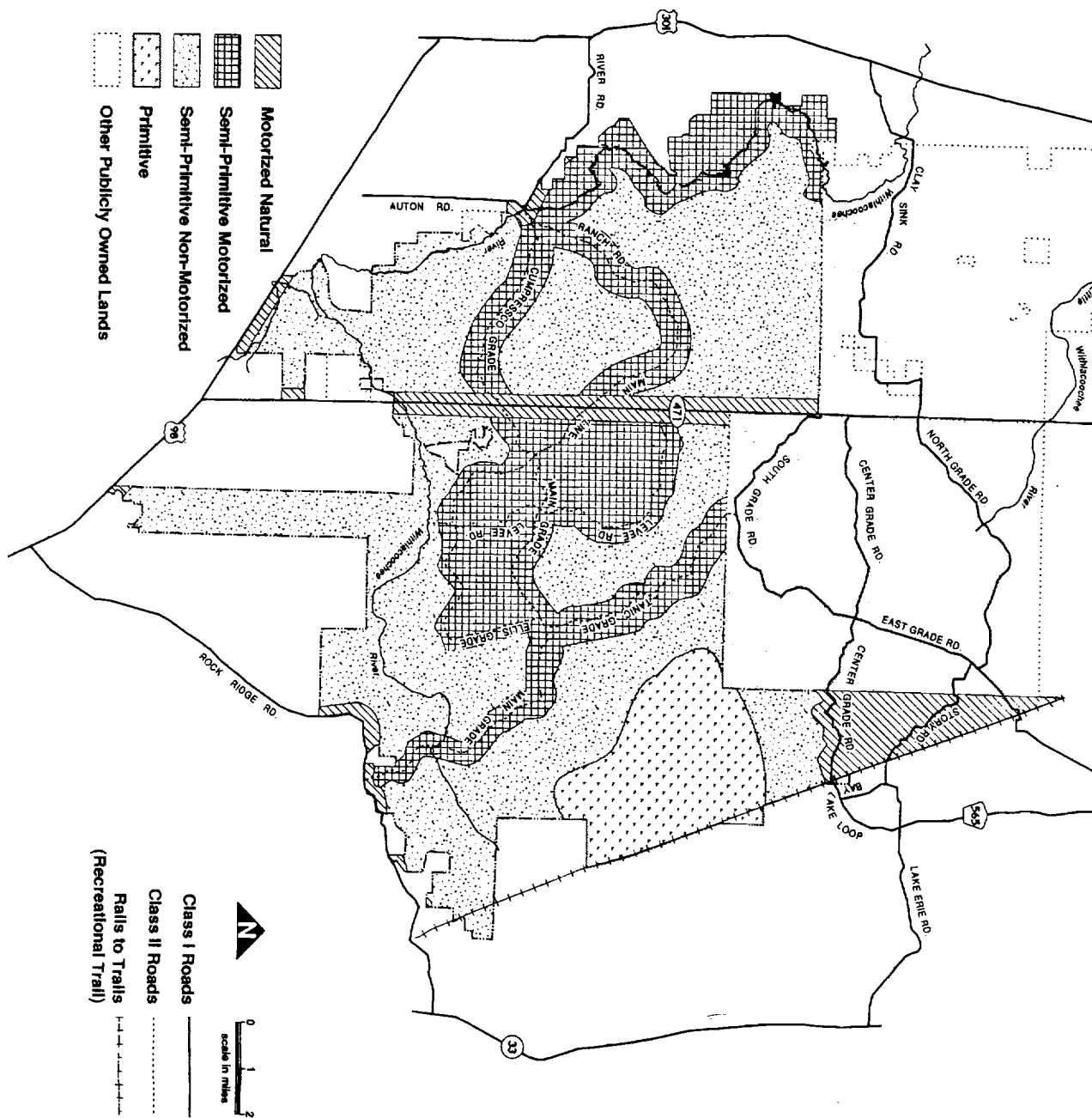


Figure 10. Proposed activity zone configuration for the Green Swamp Wilderness Preserve.

Preserve. Improved access for passive users will be afforded by providing parking areas and walk-thru entrances at the primary access points indicated in the Conceptual Land Use Plan (Figure 11). At present, vehicular access is permitted only into the Green Swamp Management Unit of the Preserve, and only during hunting season. At that time, vehicles may travel on the graded, maintained roads designated as Class II roads in Figure 10. During the remainder of the year, that portion of the property is also closed to entry by vehicle.

The Conceptual Land Use Plan calls for future expansion of vehicular access to include the Green Swamp West Management Unit, and to allow that access to occur on a year-round basis. The actual extent of future vehicular access will be designed to ensure the protection of sensitive areas and to maintain the wilderness character of the Preserve while making it possible for the public to more readily reach interior portions of the Preserve. Small parking areas will be provided at appropriate locations so that recreators can engage in day hikes and other passive uses. Any future vehicular access across the Green Swamp West Management Unit must be designed and controlled to prevent usage of the road as a throughway by motorists traveling between County Road 471 and nearby Dade City. The establishment of strictly enforced speed limits may discourage such thru-traffic. Alternatively, vehicular access could be limited to short spurs.

The current pattern of vehicular access, which limits vehicle use to designated roads during hunting season, has not posed any serious security concerns because it has been supervised by staff of the Florida Game and Fresh Water Fish Commission

(FGFWFC). All vehicular entry takes place through secured check stations in order to control hunting levels and collect data on the game taken by hunters. Until security can be expanded to include supervision of additional access points, and to maintain supervision on a year-round basis, access by vehicle will remain limited to the current degree.

### Recreational Uses

It is the policy of the District (Board Policy 610-3) that appropriate, public recreational usage of District-owned lands be permitted, provided that the usage is compatible with water resource management and protection needs. Generally, the development and maintenance of approved recreational facilities must be at the expense of outside entities. Board policy directs that the developed facilities must be open to the public. Recreational activities that are not dependent on the natural resource values of the site will not normally be allowed. Permitted uses of the Green Swamp Wilderness Preserve will include hunting, fishing, horseback riding, camping, hiking, canoeing, birding, bicycling and nature study. Some of the permitted recreational uses are discussed below in greater detail.

To date, the District has entered into several cooperative relationships to provide for public use of lands in the Green Swamp Wilderness Preserve. On September 6, 1977, the District executed an agreement with the FGFWFC to make the District's Green Swamp landholdings available to hunters as the Green Swamp Wildlife Management Area (WMA). This use is discussed in greater detail in a following section of the plan. In 1987, the District initiated a cooperative relationship with Pasco County to provide for the development of the

Withlacoochee River Park. The District sold 260 acres to the County to serve as a site for developed facilities. An additional 146 acres, owned by the District and located between the County property and the Withlacoochee River, were incorporated into the park by way of a license agreement. Recreational amenities on the District-owned portion of the site include a hiking trail and canoe launch. The County-owned portion includes parking areas, restrooms, picnic pavilions and interpretive facilities. The District and Pasco County are now discussing the feasibility of expanding the park to include a 400 acre District-owned parcel located immediately north of the existing park. The proposed addition would provide for equestrian use and primitive camping.

The District has entered into other cooperative agreements to provide for public recreational use of the Green Swamp Wilderness Preserve and these are discussed in greater detail in following sections of the plan. The District will remain amenable to other such cooperative efforts provided that the proposed facilities and uses are compatible with preservation goals for the property.

### *Hunting*

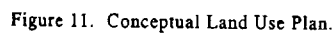
As indicated above, the District and the FGFWFC have worked jointly since 1977 to provide the public with hunting opportunities in the Green Swamp WMA. The Green Swamp WMA currently accounts for a total land area of 48,050 acres, all of which is located within the boundaries of the Green Swamp Wilderness Preserve. The WMA portion of the Preserve includes nearly the entire portion of the Green Swamp Management Unit (Figure 3) lying north of the Withlacoochee River. The original

agreement between the District and FGFWFC covered an area of approximately 37,000 acres. Amendments executed in 1984 and 1985 increased the total area of the Green Swamp WMA to its current size of 48,050 acres, or nearly 50 percent of the entire Preserve land area.

The agreement between the District and the FGFWFC established the site as a Type I wildlife management area. Consistent with a Type I designation, the FGFWFC is responsible for administering all hunting activities, which include separate seasons for: archery hunting; general guns; spring turkey; and small game. Collectively, the seasons extend from late September through late April, although the archery and small game seasons are limited to weekends only. Fishing and frogging are permitted year-round, with vehicular access permitted during weekends in May and June. Approximately 110 days per year are open for hunting within the WMA. The 1991-1992 season accounted for 26,793 man-days of hunting, fishing and frogging. Each man-day is equivalent to one visitation.

The District retains responsibility for maintaining roads in the WMA, although the FGFWFC makes an annual contribution for road maintenance. Camping areas are provided for hunters at each of the two official check stations and these are maintained by FGFWFC. These sites are not available for camping during the remainder of the year.

The FGFWFC rules that regulate hunting activities in the WMA are subject to amendment on a biannual basis, provided that both the District and the FGFWFC are in agreement as to proposed rule changes. A rule change recently proposed by the



District would remove bag limits and size limits for feral hogs in order to more effectively control hog populations and reduce the damage caused by hog rooting. The proposed rule would not become effective until the 1994-1995 hunting season.

The Green Swamp WMA is currently the site of ongoing research into the management of wild turkey (*Meleagris gallopavo osceola*) populations. One goal of the research has been to refine the manner in which pre-season harvest levels are predicted (Cobb and Elliott, 1991). Other on-site research or management efforts undertaken by the FGFWFC include the selective placement of nesting boxes for wood ducks. Such efforts are consistent with the District's and FGFWFC's commitment to protecting and properly managing the resources of the Green Swamp and will continue to be promoted.

Sport hunting has a long tradition in the Green Swamp, and there is currently a high level of demand for more hunting areas. The nearby Upper Hillsborough WMA, which is also on District-owned lands, provides an additional 5,180 acres to hunters. Together with the 46,000-acre Richloam WMA, which is part of the Withlacoochee State Forest and adjoins the northern boundary of the Green Swamp WMA, approximately 100,000 acres of publicly-owned lands are available for hunting in the immediate area. The 4,480-acre Little Withlacoochee Management Unit of the Preserve (Figure 3) is contained within the Richloam WMA, as discussed in greater detail in subsequent sections of the Plan. Thus, a total of 52,530 acres of Preserve lands, or 54 percent of the total Preserve land area, are currently hunted as Type I WMAs.

The Green Swamp West Management Unit of the Preserve is not presently open for hunting but it may provide some degree of additional hunting opportunities. The need to control swelling hog numbers, and the frequent inadequacy of trapping methods to effectively control hog populations, may dictate that some level of public hunting will be required to serve as a resource protection measure in Green Swamp West. These needs are discussed in greater detail in the Resource Protection section of the plan. However, the demand for other types of recreational uses suggests that any future hunting in the Green Swamp West Management Unit must be carefully balanced with recreational usage by the non-hunting public. Although hunting seasons in the Green Swamp WMA account for only about 110 days per year, those days occur during the fall, winter, and early spring seasons. These periods coincide with the favored time of year for engaging in outdoor activities in Florida's hot, humid climate.

Although hunting and other recreational uses are not entirely incompatible or mutually exclusive, many non-hunters avoid hunted areas in favor of other sites. Many hunters, sensitive to safety concerns and embracing solitude and isolation as an important element of a fulfilling and successful hunting experience, prefer to hunt in sites that are not heavily visited by other users. The presence of sensitive habitat areas in Green Swamp West (see discussion of Special Protection Areas), and the occurrence of developed areas and established recreational uses along the riverine corridor, suggest further that any future hunting should be limited to eastern portions of the area and should possibly be limited to primitive weapons only.



Future hunting in the Green Swamp Wilderness Preserve, including any future expansion of hunting into the Green Swamp West Management Unit, must be conducted in a manner that is sensitive to the needs and safety of all potential recreators. It must also be consistent with the overall management philosophy established for the Preserve, which is a reflection of the tremendous significance of these lands as a core preserve area that will be essential to ensuring the future integrity of wildlife populations in Florida. The need to balance hunting and other competing public uses with preservation goals established for the property will pose a major challenge in long-term management of the Preserve.

### *Hiking and the Florida National Scenic Trail*

As a purely non-consumptive, passive recreational use, hiking may represent the most easily accommodated public use of the property. Footpaths and hiking may be the most unobtrusive public use of the lands and the least likely to conflict with preservation goals. The size and wilderness character of the Green Swamp is particularly conducive to satisfying a variety of hiking needs, ranging from short trail segments suitable for day hikes to extended loops or linked networks for overnight backcountry hikes, and the District has worked jointly with the Florida Trail Association (FTA) to provide such hiking opportunities in the Green Swamp Wilderness Preserve.

The FTA is a private, non-profit educational group dedicated to developing a state-wide trail network. The District issued a permit to FTA in 1982 that allowed the organization to develop and maintain a primitive footpath across the Green Swamp lands.

The 21-mile Green Swamp Trail bridges the entire distance between the Tanic Grade entrance and the Rock Ridge entrance (Figure 11) and it has been open for public use since 1987. Three primitive, hike-in campsites have been designated at various points along the trail. They are open for use by hikers only and must be reserved in advance through pre-arrangement with the District. This trail segment is being considered for certification as an official segment of the Florida National Scenic Trail by the United States Forest Service. The Florida National Scenic Trail is the Florida component of the National Scenic Trail, which was established by the National Trails System Act of 1968, and it is intended to create a continuous outdoor recreational trail that showcases the natural attributes of Florida's subtropical environment (United States Department of Agriculture, 1986). The potential certification of the Green Swamp Trail is a tribute to the natural and scenic qualities of the Preserve.

The FTA has also worked cooperatively with both the District and Pasco County to create a short hiking trail at the Withlacoochee River Park. Current discussions with FTA may result in the establishment of additional trails in the Green Swamp West Management Unit and may also extend the Withlacoochee River Park trail. Long-term trail goals for the Preserve should seek to link the Preserve's trail system with trails on adjoining publicly-owned lands, including the Withlacoochee State Forest and the District-owned Upper Hillsborough Riverine Corridor project. The State of Florida's Rails-to-Trails Program, administered by the Florida Department of Environmental Protection, recently converted an abandoned Seaboard Air Line Railroad to a recreational trail. The new Van Fleet Trail borders the eastern property line of the

Preserve (Figure 11) and represents another possible link for creation of a larger trail network. Any future expansion of the hiking trail network will be carefully designed to avoid adverse impacts and new trail segments will be directed away from Special Protection Areas.

### *Camping*

Preceding discussions have mentioned the FGFWFC-maintained campsites for hunters, located near the WMA check stations, and the hike-in campsites located along the Green Swamp Trail. In addition to these sites, there are two larger sites that have been reserved for youth groups (Figure 11). Like the sites discussed previously, there are no restroom facilities or water available at these camping areas. Use of the youth group sites is permitted only by pre-arrangement with the District and is reserved for use by recognized youth groups, e.g., the Boy Scouts of America. Vehicular access to the youth group sites is also permitted by pre-arrangement. Any camping permitted in the Green Swamp Wilderness Preserve will remain restricted to designated camping areas only.

Additional camping areas may be appropriate for certain sections of the Preserve. These may include a hike-in site along the proposed Withlacoochee River Park trail extension, and equestrian camping at a site in the equestrian area proposed as an addition to the Park. The campground located at the Rock Ridge entrance, presently limited to use during hunting season, may serve as an ideal site for drive-in camping by the general public. Such campgrounds are subject to more intensive use than backcountry or seasonal sites and must be provided with restrooms, a potable water source, animal-proof trash receptacles and

regular maintenance. The provision of these facilities at the Rock Ridge site will require the cooperative assistance of another public agency or of a local government. The Rock Ridge site is located in Polk County and the Polk County government will be solicited to serve as a sponsor to fund, support and maintain the described facilities. Concurrence of the FGFWFC will also be required to open that site for year-round use. In keeping with the management philosophy outlined for the Preserve, a recreational facility that requires the listed physical improvements should be restricted to such peripheral sites. Other areas around the periphery of the Preserve may also serve as appropriate sites for camping areas. Consistent with Board Policy 610-3, and with the management philosophy established for the Preserve, camping areas will not be designed to accommodate R.V. camping.

One management concern associated with camping is related to the campers' propensity for building campfires. The practice generates possible sources of ignition for wildfires. It also encourages campers to collect wood from surrounding environs, which disrupts normal nutrient cycling and diminishes the natural appearance of the area. However, campfires are a traditional indulgence in most campsites and they may be a safe indulgence given proper precautions. Campfires will be allowed in designated camping areas only and must be confined to established fire rings. The reigning backcountry ethic encourages "minimum impact" camping, which relies upon the use of backpacking stoves in order to preclude or limit the need for campfires, and this camping approach will be promoted for backcountry sites where wildfire occurrences may be especially problematic and where a "picked-clean"

forest floor may diminish the wilderness experience.

### *Equestrian Use and Bicycling*

Until such time as vehicular access is expanded, equestrians and bicyclists will be required to enter the property via walk-thru entrances located at the main access points. These uses will be restricted to designated trails, which correspond generally with the main roadways indicated in Figure 12.

Additional trails may be designated or created in the future to allow these uses to occur on areas other than roadways. Any trail systems for such off-road uses will be routed to avoid Special Protection Areas and other sensitive areas and will generally be designed as narrow, "single-track" trails that result in minimal impacts to natural areas while providing a more pleasing trail riding experience that is compatible with the wilderness quality of the Preserve. They will also be designed to serve as multiple-use trails. The establishment of such trails will normally be contingent upon gaining cooperation from the appropriate user groups. Proposals for such cooperative arrangements will be considered on a case-by-case basis. Trail needs in the Green Swamp West Management Unit may be especially acute if use of that area is to be targeted for non-hunting recreators.

The control of non-native "exotic" species is a special land management concern in Florida, and one that may have implications for use of the Preserve by equestrians. Florida's natural areas have proven to be a hospitable environment for dozens of exotic plant and animal species, many of which are highly invasive and can displace native species or degrade natural communities. Horses have been implicated as a potential

vector in the spread of some exotic species. Until more is known regarding the possible relationship between horses and the introduction or dispersal of exotics, it will be prudent to limit equestrian use to the main roadways and to the equestrian area currently proposed as an expansion of the Withlacoochee River Park. For additional discussion regarding the control of exotic species, please refer to the Resource Protection section of this plan.

### **Other Uses**

#### *Cattle Grazing*

The longstanding use of the Green Swamp area for grazing of cattle was noted in a preceding discussion of the history of the Green Swamp Wilderness Preserve. Much of the land comprising the present day Preserve was grazed by cattle at the time of acquisition, and many of these grazed areas were leased back to the private individuals and families from whom the lands were acquired. In some cases, the leases were offered as a condition of the sale. Several of these "lease-backs" are still in effect, renewing automatically on an annual basis, and the lands are still supporting cattle. A total of 2,624 acres are currently leased for cattle grazing, generating revenues to the District of approximately \$17,000 per year. A number of other leases have expired, including the Devils Creek lease, which covered approximately 20,500 acres that consisted almost entirely of "native range".

District policy directs that District-owned lands should not be leased for cattle grazing purposes unless significant resource management or security benefits are derived through the lease. Most of the existing leases cover lands that have been intensively improved to serve as pasture

areas and they are located along peripheral portions of the Preserve (Figure 11). Grazing that remains confined to the improved pastures results in few impacts to adjoining natural areas and, until active restoration measures are initiated in the pastures, it may be consistent with District policy to allow the continuation of grazing at those sites. However, areas of "native range" usually occur as flatwoods and various other natural communities. The presence of cattle in these areas is not consistent with resource protection and restoration goals for the Preserve. Pastures that are only semi-improved, or that are considered capable of passive restoration through natural successional processes if cattle are removed, may also be inappropriate for continued grazing. In addition, the presence of cattle may often conflict with permitted recreational usage of the property. The grazing of cattle within the interior reaches of the Preserve, in areas that now support healthy or recovering natural communities, does not provide significant resource management or security benefits and will not be continued in the future.

Restrictions on the leasing of Preserve lands for cattle grazing should not be interpreted to preclude the incorporation of minimal areas of "native range" within a leased site when those lands are required as a practical measure to ensure manageability. Such is the case for an impending lease that will make approximately 8,000 acres of the Green Swamp West unit available for cattle grazing, essentially increasing the total extent of leased Preserve lands by 300 percent. The great majority of the area proposed for leasing consists of improved pasture, although some areas of flatwoods, wet prairie and cypress were included on the basis of existing fencelines in order to

facilitate the movement and regular rotation of cattle among the network of pastures. Conditions of the lease will allow for the total extent of grazed lands to be reduced in phases, at the discretion of the District, on the basis of public use levels or habitat restoration objectives.

The Micalony lease, which covers a total of 903 acres, is another noteworthy lease that illustrates the balance of factors that will be considered in future leases. Approximately 600 acres of the total lease area consists of high quality improved pasture. The remainder is adjoining "native range" and semi-improved pasture. Stocking rates are based upon recommendations of the United States Soil Conservation Service (SCS) and a lease requirement which stipulates that there shall be no adverse impacts as a result of overgrazing. The leased area is on the periphery of the Preserve, at the southern end of the Little Withlacoochee unit now under DOF management (Figure 11), and thus results in minimal impacts on wildlife populations and recreational users in interior portions of the Preserve.

Revenues generated by the leases are deposited into the Water Management Lands Trust Fund, through which the District's land acquisitions are financed, and are then applied toward future acquisition, management or restoration costs. As such, cattle leases can provide a clear public benefit that is consistent with preservation goals, provided that they are properly administered as an interim measure between the periods of initial land acquisition and planned, active restoration of a natural state.

## *Apiaries*

Board Policy 610-3 allows apiaries to be established on District-owned lands provided that the use will not result in long-term impacts. A 250-acre area within the Florida Power Corporation utility easement was leased for such use for a three year term that expired in January, 1993. Use of altered areas like the power line corridor reduce concerns that such private uses will result in impacts to the District's lands, and the presence of bee apiaries may produce a beneficial increase in the rate of pollination in the Preserve's plant communities. However, there is no information to suggest that there is a shortage of natural pollinators within the area of the Preserve, and the continued use of the disturbed lands of the power line corridor may not be compatible with future efforts to improve habitat conditions in that area. Although the Green Swamp apiary lease was profitable, the funds generated by such leases may often be insufficient to cover the costs associated with administering them, and apiaries frequently attract Florida black bears and represent a possible source of conflict between humans and bears. The Green Swamp Wilderness Preserve provides important habitat for this threatened species and resource management goals should seek to improve conditions for bears and reduce the incidence or likelihood of interaction with humans. All of these factors will be considered before additional leases are granted for the placement of apiaries in the Preserve.

## *Commercial Silviculture*

Consistent with Governing Board Policy 610-3, commercial silvicultural operations will be prohibited in the Green Swamp Wilderness Preserve. Such consumptive

usage is incompatible with statutory directives to maintain or restore a natural condition on these lands. This prohibition should not be construed to limit the District's right to conduct salvage harvests or engage in tree-thinning procedures associated with reforestation projects. Whenever possible, prescribed fire will be used to thin any natural canopies that have become so dense as to degrade habitat values.

## *Management of Little Withlacoochee Unit by Division of Forestry*

As noted in preceding discussions, the Little Withlacoochee Management Unit of the Preserve corresponds generally with a land area that was originally intended to serve as site of the Little Withlacoochee Flood Detention Area (LWFDA). Structural improvements proposed for the LWFDA, which was to be a component of the Four River Basins (FRB) flood control project, included two water control structures and an extensive system of canals and levees. These facilities would have converted the area into a large reservoir for the dual purpose of protecting downstream areas from flooding and providing a supplemental public water supply source.

An easement that was conveyed to the District by the Florida Board of Forestry in 1967 permitted approximately 19,000 acres of the Withlacoochee State Forest to be incorporated into the LWFDA project (Figure 11). These adjoining lands were to form the majority of the LWFDA. Provisions of the easement allowed the Florida Board of Forestry, precursor of the present-day Florida Division of Forestry (DOF), to continue managing the timber resources of the easement area. As compensation for the easement lands and timber resources that were projected to be

lost through eventual construction and operation of the LWFDA, the DOF was also granted permission to manage and harvest timber on an equivalent area of District lands. These provisions of the easement resulted in the prompt harvest of timber within the easement area and also induced DOF to plant and manage slash pine on approximately 1,500 acres of the District's 4,480-acre Little Withlacoochee Management Unit.

After FRB was placed in deferred status in 1984, the DOF continued to manage the Little Withlacoochee Management Unit as a portion of the Richloam Tract of the Withlacoochee State Forest. About 1,000 acres of the on-site pine plantation were planted by DOF immediately after the easement was conveyed in 1967. Much of that timber is now mature and thinning harvests have been planned. The remaining 500 acres of plantation were planted in 1986 in an area where a 1985 wildfire had destroyed the existing tree cover.

The deferred status of FRB reflects the District's emphasis upon non-structural alternatives for the control of flood waters and essentially negates the District's need for the easement lands, greatly reducing the degree and legitimacy of any DOF claim to timber management rights on District lands. As noted previously, the use of District lands for commercial silvicultural operations is not consistent with statutory directives that guide the management of District lands. However, the standing pine plantations on the Little Withlacoochee tract represent a substantial investment by DOF. The planned thinning harvest of the planted timber will allow DOF to recoup this investment while restoring the pine canopy to a more natural density.

There are several factors which suggest that continued management of the area by DOF would be appropriate, provided that future forest management practices conform with those prescribed for District lands. For example, overland access to the Little Withlacoochee unit from the adjoining District lands is hindered by Bayroot Slough and other natural wetland barriers. The area's inclusion in the Richloam Wildlife Management Area, and DOF supervision of the Bay Lake camping area and other established recreational uses, would be administered most effectively if DOF retained management responsibility. The District will confer with representatives of DOF and seek to modify the existing management arrangement so that the Little Withlacoochee Management Unit can continue to be managed as a portion of the Withlacoochee State Forest.

### *Scientific Research*

A series of hydrobiological monitoring stations that serve as control sites for assessing wetland conditions in off-site wellfields have been afforded protective status as Special Protection Areas. These sites are part of an ongoing research project. There are other programs of biological research currently underway within the Preserve. These include a study of insect herbivory by the Institute of Food and Agricultural Sciences of the Florida Cooperative Extension Service, and studies of wild turkey being conducted by the FGFWFC. Other projects have been completed here, including taxonomic collections by researchers from Cornell University.

The use of District-owned lands for bonafide scientific research is promoted as an appropriate use of these lands, provided that the projects will not result in long-term

impacts to the property's resources. The District will continue to make the lands of the Green Swamp Wilderness Preserve available for scientific research. Proposals to conduct research on these lands will be considered on a case-by-case basis. Typically, the District will require interim and/or final reports that summarize the results or information generated by the research and copies of any associated articles or other publications.

### *Environmental Education*

The natural systems of the Green Swamp Wilderness Preserve provide an ideal setting for nature study and environmental education programs. A former hunting lodge, located on a riverfront site immediately across from the Withlacoochee River Park, has been identified as a potential site for establishment of an educational or interpretive center. The proximity of the lodge to the Park may provide an opportunity for expanding the Park to include the lodge. A foot bridge linking the two locations would provide direct access from the Park. Pasco County has already expressed an interest in using the lodge as an educational facility.

There may be other appropriate sites for educational centers and the District will remain amenable to making the Preserve lands available for that use. To remain consistent with the management philosophy and resource protection goals established for the Preserve, any physical improvements needed for such use should be restricted to peripheral areas of the Preserve.

### *Utilities and Other Public Facilities*

As stipulated in Board Policy 610-3, utility and other public rights-of-way not directly associated with District functions or approved recreational development will not be allowed on District property except as a last resort in cases of overwhelming public interest. One major utility easement crosses the property (Figure 11) and is discussed in detail below. The Sunshine Pipeline Company has applied for permits to install a gas pipeline along the abandoned Seaboard Air Line Railroad right-of-way, currently site of the Van Fleet State Trail Rails-to-Trails project. In the event that the proposal includes installation of pipeline on lands of the Preserve, the District will require that the company demonstrate overwhelming public interest.

#### FLORIDA POWER ELECTRICAL TRANSMISSION LINE

A Florida Power Corporation electrical transmission line was constructed through the area of the Preserve in 1985 (Figure 11). A 6-mile segment of the corridor borders the western property line of the Little Withlacoochee River Management Unit, and another 6-mile segment adjoins the southwestern property line of the Green Swamp Management Unit (Figure 3). Between these segments is an 8-mile length of corridor that cuts a path through the heart of the Preserve. Some of the Preserve's most significant wetland systems, including the floodplain swamp of the Withlacoochee River, Devils Creek Swamp, Cross Creek Swamp and Bayroot Slough, are traversed by the utility line. Several more minor systems, including Gator Creek and Pony Creek, are also affected by the utility corridor.

A number of studies have documented the adverse impacts of cleared utility corridors on many species of wildlife (KBN Engineering, 1992; Gates, 1991). There is a perceived need to maintain a corridor that is essentially free of trees and other normal plant growth in order to permit unhindered access for maintenance purposes. This usually produces a distinct break in the natural landscape that fragments the natural communities through which the utility line passes. This effectively reduces the size of the habitat "islands" formed by the on-site natural communities and permits "edge" effects, such as heightened noise and light levels, to intrude further into fragmented forest systems. Although "edge" effects appear to benefit some species that may preferentially feed on the grassy vegetation and herb growth that is characteristic of these areas, especially such favored game species as deer and turkey, most species do not derive any benefits from these corridors and many will abandon adjoining forests which are rendered unsuitable as habitat by the unnatural break in the forest cover. A precipitous, nationwide decline in the populations of many species of songbirds has been attributed to the large-scale fragmentation of forests by roadways and other corridors. Many animal species require the safe refuge offered by large, unbroken expanses of forest in order to avoid predators or to successfully reproduce. The response of many wildlife species to cleared corridors also suggests that they often act as barriers to normal movements or migrations.

Some of the studies that have documented the adverse impacts of utility corridors have also identified a method by which these impacts can be reduced or minimized (KBN Engineering, 1992). Small mammals, including rodents and rabbits, and some

ground-nesting bird species, may benefit greatly when a natural shrub understory is retained, or permitted to develop, within the majority of the corridor area. The natural cover provided by a shrub layer allows many animal species to cross the corridor without greatly increasing their susceptibility to predators. The natural vegetation also provides a greater variety of forage, and allows a correspondingly greater utilization by wildlife. Management to reduce the wildlife impacts of utility corridors should ultimately seek to reduce the degree of contrast between the corridor and adjoining natural communities. The creation of a "feathered" edge, with young trees permitted to grow along the periphery, and the establishment of lobes or peninsulas of shrubby vegetation across the corridor, may create bridges that would permit more normal movement by wildlife, while also reducing the expense of corridor maintenance (Gates, 1991; Cairnes, 1988).

The Florida Department of Environmental Regulation (DER), which recently merged with the Florida Department of Natural Resources to form the Department of Environmental Protection (DEP), issued a permit to the Florida Power Corporation which allows the utility to use herbicides to keep their Green Swamp utility corridor free of excessive plant growth. To date, Florida Power has not exercised its right to apply herbicides within the corridor and a moderate-to-dense growth of shrubs and weedy vegetation has regenerated. Retaining or enhancing this growth, to the greatest extent possible given the maintenance needs of Florida Power, will minimize the adverse environmental impacts of the corridor and may reduce the need for future herbicide applications. It will also minimize the aesthetic intrusion of the utility line through the wilderness landscape of the Preserve.



The District will coordinate with Florida Power Corporation to identify the level and nature of plant growth that can be allowed to remain in the corridor area without unduly restricting access by Florida Power maintenance and repair teams. The District's Land Management section will investigate the feasibility of incorporating portions of the easement into the Preserve's prescribed burning program. Prescribed fire may provide an effective means of controlling the species composition of plant growth in the corridor and may also help to limit the height and density of plant growth to acceptable levels. The northernmost 6 miles of the utility corridor straddle the shared property line of the Preserve and the adjacent Withlacoochee State Forest (Figure 11). The Florida Division of Forestry will be solicited for cooperative assistance in the event that Florida Power is amenable to joint management approaches that will maximize the habitat potential of the corridor area. Ongoing discussions between the District, FGFWFC and the National Wild Turkey Federation (discussed in more detail below), may also result in cooperative efforts to improve habitat conditions in the corridor. In all, nearly 440 acres of altered lands, and 40 linear miles of affected lands, could benefit from such a joint management approach.

#### FIRE TOWER LEASE

A lease granted to the Florida Division of Forestry (DOF) in May, 1990, allowed the construction of a 90 foot steel fire observation tower. Other improvements permitted by the lease are a storage room and restroom facilities, including a well and septic tank. The leased site is one acre in size and is located on an old pasture site fronting on U.S. Highway 98 at the southernmost extent of the Preserve

(Figure 11). The term of the lease is 20 years, with an expiration in May, 2010. The DOF has requested use of an old house site in the Little Withlacoochee Management Unit for a ranger residence and site of an additional fire tower. The positive security and resource management benefits of the proposed lease suggest that it would be a valuable and appropriate use of this altered site and will be considered by the District in its evaluation of the proposal.

#### *Wild Turkey Federation*

The National Wild Turkey Federation (NWTF) is a private, non-profit organization dedicated to enhancing wild turkey populations in the United States. Wild turkey numbers were once greatly reduced across the country, but turkey populations have rebounded considerably as a result of active management measures. As stated in the preceding discussion of recreational hunting at the Preserve, the property supports a healthy turkey population and serves as an area for research studies of turkey biology.

The Wild Turkey Federation offers funding and/or management assistance for projects that will improve habitat conditions for turkey populations. These cooperative projects include improvement efforts for utility rights-of-way. The District will seek assistance and funding from the Federation to promote improved habitat conditions in the Florida Power utility corridor, including possible seeding for plant species that provide forage for turkeys. The FGFWFC and Florida Division of Forestry should be asked to participate in this proposed project

### ***Lowry Park Zoo Captive Breeding Program***

The Lowry Park Zoo in Tampa, Florida, is one of three wildlife facilities officially chosen by the USFWS and FGFWFC to participate in the Florida panther captive breeding program. This species is currently classified as endangered by both USFWS and the State of Florida. The District is reviewing a request to lease a portion of the Green Swamp Wilderness Preserve to the Zoo to serve as a site for their breeding program. The proposal also includes provisions for captive breeding of the red wolf (*Canis rufus floridanus*) and the whooping crane (*Grus americanus*). These species also are listed as endangered, and both are native to Florida, but they were extirpated from the state in the early part of this century (USFWS, 1982). A small group of captive-bred whooping cranes has recently been released in Florida in an attempt to re-establish a resident population. If captive breeding programs like the one proposed by Lowry Park Zoo are successful, then these three significant species could eventually be re-established in the wilds of the Green Swamp Wilderness Preserve or on other publicly-owned lands.

Constraints associated with such captive breeding programs dictate that they be conducted on remote sites that are closed to the public. The offspring generated by the program are intended for eventual release to the wild. As such, the animals must be reared in large, specially designed enclosures that resemble natural landscapes. The enclosures must also be located in areas that are adequately buffered from the sights, smells and sounds of man.

District policy does not normally condone or endorse private, exclusive use of lands

under its ownership and management. However, Lowry Park Zoo is a non-profit organization engaged in a program that could be of significant public benefit. The proposal requests use of a site that was altered for agricultural use prior to District purchase. The site still supports structural improvements, including a pole barn, well and electrical service, that could be used in the captive breeding program. The Zoo has also proposed the possible establishment of an environmental education program at the site. Given the altered nature of the proposed site, and the potential public benefits that could be realized through such captive breeding and environmental education programs, the District will attempt to accommodate the proposed use. In the event that this use is permitted, the site of the captive breeding facility will be designated a Special Protection Area. District review of the request will consider the nature of any proposed structural improvements and will ensure that adequate safeguards are implemented to maintain security and protect the public.

The District's review will also attempt to identify some level of restricted public use that may be compatible for surrounding areas. The District and the Florida Trail Association are engaged in ongoing discussions regarding the establishment of hiking trails that would link the Hillsborough River State Park with the Green Swamp Trail. The proposed site of the captive breeding facility is within a likely corridor for the proposed trail system.

### ***Access Easements***

Three access easements authorizing passage over Preserve lands have been issued to private interests. These easements are for ingress and egress only. One easement

grants access privileges to the Florida Power Corporation. The electrical transmission line easement discussed previously can be accessed directly from U.S. Highway 98; however, several intervening wetlands along the corridor prevent vehicular access along the full length of the corridor and Florida Power personnel are authorized to use short, designated segments of trail roads in the Preserve to bypass the wetland barriers. Another access easement allows use of a 30-foot wide corridor for ingress and egress to a south-central privately-owned inholding within the area of the Preserve (Figure 11). The landowner and holder of the easement, Maynard Ventures Five, Inc., is seeking permits that would allow a resumption of limerock mining operations at the currently inactive mine site located on the parcel. A small inholding near the River Road entrance to the Green Swamp West Management Unit serves as the site of a small church and cemetery, and an additional access easement provides for continued ingress and egress. Although this easement is non-exclusive, it is not expected to pose undue management problems due to its proximity to a Preserve entrance. The affected length of roadway is enclosed by fencelines and gates which confine traffic to an existing, maintained Preserve road.

## RESOURCE PROTECTION

### Land Management

The District engages in a variety of land management activities designed to protect or enhance the natural resource values of its properties and to ensure public safety. The following is a discussion of some of the land management practices and resource protection measures to be employed at the Green Swamp Wilderness Preserve.

### *Habitat Restoration*

Chapter 373 of the Florida Statutes directs that the District must attempt to restore a natural state to altered lands under its ownership and management whenever practicable. Habitat restoration needs in the Green Swamp Wilderness Preserve will pose a major challenge to the District. Although restoration projects have already been implemented in many altered portions of the Preserve, accounting for a total estimated land area of 4,820 acres, there are extensive areas of altered lands in the newly acquired portions of the Green Swamp West Management Unit. These include: old mine sites from which sand and peat were extracted; two sites that supported industrial operations, including a sawmill and plant for mulching and bagging cypress; and large areas of clearcut or heavily-logged pine forests and cypress stands.

An integrated plan for restoring all of these sites is now in preparation. Since acquisition of the Agri-timber lands in 1992, approximately 800 acres of clear-cut slash pine plantation have been replanted with longleaf pine at a density estimated to attain a natural flatwoods tree density following projected mortality among the seedlings. Additional planting of pines is being planned.

The areas of cypress that were heavily logged by Agri-timber immediately prior to District acquisition are being monitored to evaluate the level of natural recovery through coppice sprouting among remnant cypress stumps. The current rate and level of natural recovery suggest that the timing of the logging, in relation to moisture levels and other site conditions existing at the time of timbering operations, were ideal for

promoting recovery through coppice regeneration. Monitoring will continue in these areas; however, it appears that active restoration of the cypress canopy will not be required.

Restoration of the former mining and industrial sites will prove more difficult and problematic than the reforestation projects discussed above. These areas were subjected to a much more extreme level of alteration. In most cases, the native soils have either been removed completely or are so mixed, disturbed and compacted that they no longer exhibit natural soil profiles and will not support natural communities in their current condition. Soils at the Thrasher Ridge sand mine site, and at the two former industrial sites, must be analyzed to determine the nature of any soil improvements and vegetation that will be needed for restoration. The restoration of one former peat mine has been initiated with funds provided as a result of an enforcement action taken by the District. Restoration of this and other on-site peat mines will seek to create marsh systems with more natural side slopes and vegetation than is currently present.

There has also been extensive hydrologic alteration of the Preserve lands. It is presumed that most of these alterations were motivated by attempts to enhance drainage of upland areas to improve their suitability for cattle grazing and other uses. Although it appears that the effects of these alterations are limited in scale and do not affect off-site areas, the true nature and extent of these alterations has never been intently studied. The District will evaluate the hydrologic effects of existing alterations, especially roadways, and will consider means for restoring natural surface flows where they have been disrupted. Any

ditches or other artificial drainage features should be backfilled or plugged if such actions will not increase the threat of flooding in off-site, privately-owned lands. Opportunities for coordinating with DOF and other adjoining landowners to implement hydrologic restoration projects that would affect multiple ownerships will be considered and encouraged.

The level of detail associated with planning for large-scale restoration projects like those under consideration for the Green Swamp Wilderness Preserve are beyond the scope of this plan. However, the integrated restoration plan currently in preparation shall be incorporated into this plan upon its completion.

### *Gopher Tortoise Relocation Projects*

The Florida Game and Fresh Water Fish Commission (FGFWFC) has designated the gopher tortoise (*Gopherus polyphemus*) a Species of Special Concern. This designation prohibits the taking of gopher tortoises and reflects an ongoing, rapid loss of gopher tortoise habitat and an associated decline in tortoise numbers. As part of FGFWFC's effort to preserve this species, permits are occasionally issued which authorize the relocation of tortoises from areas scheduled for development to areas that will be protected from development. Generally, wildlife relocation projects are considered to be a conservation technique reserved for situations of last resort and are permitted only when there are no other practical alternatives. The potential drawbacks of wildlife relocation projects, which include the possible introduction or spread of disease, disruption of locally-adapted populations, and exceeding a given habitat's carrying capacity, require that relocation projects must be conducted very carefully on the rare occasions when they are considered appropriate.

In response to an increased number of requests to make its lands available for tortoise relocation projects, and in recognition of the threat posed by a recently-discovered respiratory disease that is attacking Florida's gopher tortoise populations, the District has adopted a formal policy to guide the review of proposed tortoise relocation projects (Board Policy 610-8). Some of the upland habitats in the Green Swamp Wilderness Preserve, particularly the xeric upland sites (Figures 4 and 5), provide suitable habitat for gopher tortoises as evidenced by active populations in many areas. The central portions of the Green Swamp West Management Unit served as receiving sites for large numbers of displaced gopher tortoises prior to the purchase of those lands by the District. Future proposals to relocate off-site tortoises to areas within the Preserve will be reviewed on a case-by-case basis to ensure consistency with the guidelines provided in Board Policy 610-8.

### *Feral Hog Control*

Spanish explorers introduced feral hogs into Florida during the 16th century. Since then, this non-native "exotic" species has proliferated in an environment that lacks any natural predators. Hogs now represent a significant land management problem in many natural areas, and their presence in large numbers is incompatible with the District's most basic land management goal of preserving or restoring the land's natural state. The disturbance caused by hog's rooting activities can severely damage hardwood hammocks, pinelands, hardwood swamps, herbaceous wetlands, and even archaeological sites. Hog rooting also creates conditions that promote invasion by exotic plant species (U.S. Department of the Interior, 1989) and, as discussed previously,

it has destroyed one of the two sites within the Preserve that were known to support pitcher plants (see page 33). The site from which pitcher plants were eliminated is within the Green Swamp Wildlife Management Area (WMA) portion of the Preserve, in an area where hogs are hunted.

A proposal submitted to the FGFWFC by the District may result in revision of the rules that govern hunting in the WMA. The proposed rule revision would remove the possession and size limits that restrict the number of hogs taken in the WMA during hunting season. This proposed measure is intended to reduce hog numbers and more effectively control local hog populations. The continued use of possession and size limits to manage feral hogs as a game species is not consistent with a management philosophy directed toward preserving a natural state and condition on the lands. The control of hog populations in the Little Withlacoochee Management Unit will continue to be achieved through its incorporation into the Richloam Wildlife Management Area. The DOF has proposed that possession and size limits be removed from here as well.

Recent observations of hog numbers and rooting damage on the Green Swamp West Management Unit indicate that hog numbers in that portion of the Preserve have increased significantly since the District's purchase of the Agri-timber Tract in 1992. Prior to the District's acquisition of that tract, it had been leased to three private hunting groups and the hunting helped to control hog numbers. The increased incidence of hog sightings and the extent of hog rooting suggest that a strategy for controlling hogs will need to be quickly implemented. Trapping methods are not typically effective as a sole means of reducing and controlling hog numbers,

particularly on very large, remote sites. However, it may function well as a means of supplementing other control measures. The large demand for hunting in the Green Swamp area, the need to control local hog populations, and the suspected inability of trapping to serve as a stand-alone control measure argue that some form of hunting program should be implemented in the Green Swamp West Management Unit. The tendency for most non-hunters to avoid hunted areas during hunting season, and the great extent of hunted areas in the Green Swamp region suggest that any hunting program implemented in the Green Swamp West Management Unit should be designed so that it provides for balanced use by non-hunters. The ultimate goal of hunting in this management unit should be to provide the resource management benefit of controlling hog populations. An intensive hunting program conducted during narrow time periods may prove most effective at meeting resource protection goals while also providing for balanced use of publicly-held lands in the Green Swamp area by the non-hunting segment of the population. The flexibility to schedule hunts on an as-needed basis, or during times of year that do not conform with normal hunting seasons but may be conducive to greatly increasing the success of these hunts, may require that the District be able to act more autonomously in controlling hunts within this management unit than is possible in a Type I WMA.

The District will carefully consider the full range of options that are available for controlling hog numbers in the Green Swamp West Management Unit, including such new approaches as the designation of a Type II wildlife management area, scheduling special dog and gun hunts, and instituting a trapping program. Type II

WMAs, in which enforcement responsibilities rest with FGFWFC but supervision and management of the hunts are the responsibility of the landowner, have been successfully implemented by two other water management districts. A hunting program reserved for users of primitive weapons may help to satisfy demands for additional primitive hunting opportunities, and may address concerns associated with the site's proximity to developed public-use areas along the western property line and riverine corridor, but may not provide the desired level of hog control. All of these factors will be weighed in order to develop an appropriate strategy for controlling hogs in the Green Swamp West Management Unit.

### *Other Exotic Species*

The Preserve appears to have been spared any large-scale invasions by exotic species other than hogs. However, scattered occurrences of cogongrass (*Imperata cylindrica*) have been noted in some roadside portions of the Preserve. Cogongrass is a highly invasive species, native to Southeast Asia, and it has been listed as one of the world's 10 worst weeds (Tanner and Werner, 1986). Repeated applications of herbicide are the only known method of effectively eradicating the dense clumps that occur at sites of invasion. An eradication program has been implemented at the Preserve and will continue on a permanent basis to prevent its establishment within the Preserve. As noted in the discussion of equestrian use, horses have been implicated as a possible vector for the dispersal of exotics, including cogongrass. Land management staff will attempt to discern any correlation between the incidence of cogongrass occurrences and regular use by equestrians. It is expected

that any increase in levels of public recreational use will require an increase in staff efforts to monitor for invasion by exotic species and to control identified invasions.

Other exotic species occurring on the Preserve include papery mulberry (*Broussonetia papyrifera*), eucalyptus (*Eucalyptus sp.*), and sesbane (*Sesbania emerus*). These species, in contrast to cogongrass, are restricted largely to disturbed areas and are not highly invasive. Nonetheless, they are non-native species and their occurrence will be controlled. Papery mulberry and eucalyptus appear to reproduce through vegetative means only within the Preserve and thus remain restricted to very few sites. Sesbane is much more widespread, occurring in many of the pasture areas, and its eradication may be more difficult and labor intensive.

### *Fences and Signage*

District policy requires that the perimeter of all District-owned properties be fenced (Board Policy 610-3). A perimeter fence will be maintained around the Green Swamp Wilderness Preserve in accordance with that policy. Internal sections of fence that do not fulfill essential land management or security functions will be dismantled. These may include remnants of cross fencing in areas that were formerly grazed or fencelines that mark defunct property lines.

Standard District signage that identifies the District as the landowner will be maintained around the entire perimeter of the property, with the exception of specified public access points. Access points for recreational users will be marked with signs that clearly acknowledge the public's right to enter and will include informational displays that summarize permitted and

prohibited activities. The informational signs should include a statement attesting to the status of the Preserve as a refuge for wildlife and affirming that all plants and animals within the Preserve are protected.

### *Potential Threats to Water Quality*

The cattle industry has a long history in the Green Swamp area. Two possible threats to water quality in the Preserve are associated with this longstanding use of local lands. One of the potential threats is related to an historic cattle management practice which used dipping vats to control tick fever, and the other is associated with a much more contemporary range management practice that uses sewage sludge to fertilize pasture areas.

In 1906, the United States Department of Agriculture launched the Cattle Tick Fever Eradication Program, which was the harbinger of a 1917 declaration that placed most of the State of Florida, including the Green Swamp region, under federal quarantine. During this period, cattle tick fever was devastating the cattle industry throughout the entire southern United States.

By an act of legislature, also in 1917, Florida's State Live Stock Sanitary Board was given authority to enact and enforce rules intended to control and eradicate cattle tick fever. Federal, state and county personnel worked cooperatively to construct and operate an extensive network of dipping vats which were used for immersing cattle into arsenic-based solutions as the chosen method for treating tick-infested cattle. State workers enforced the quarantine and stipulated that dipping vats should be located such that cattle would never have to move more than 2 or

3 miles for dipping. In 1944, after 27 years of operation, the State of Florida was declared free of cattle tick fever, the quarantine was lifted, and the dipping program was terminated.

Limited studies conducted at some of the abandoned dipping vat sites indicate that there is potential soil and groundwater contamination related to the historic dipping use. Ongoing assessments by the Florida Department of Environmental Protection (DEP) are attempting to determine the extent of contamination and the level of threat. Arsenic, heavy metals and various petroleum-based or volatile organic solvents are some of the suspected contaminants. Historical records suggest that there are hundreds of these sites scattered across Florida, and several old dipping vats are located within the area of the Green Swamp Wilderness Preserve. The identification of responsible parties will pose a critical and difficult question in the event of future enforcement actions: the program was mandatory and was operated by federal and state agencies. Given the remote location of the Preserve's dipping vats, a risk assessment may indicate that there is little threat associated with these sites. District staff will remain apprised of the results of ongoing assessments in order to identify appropriate management or remediation needs for the Preserve's old dipping sites.

A range management practice utilized on grazing areas around the Preserve may also pose a possible water quality threat. Many of the grazing lands in the Green Swamp, primarily those areas of Polk County to the south of the Preserve, are fertilized with sewage residuals generated by sewage treatment plants. The application of sewage residuals, or sludges, to agricultural lands has been implicated as a source of ground-

water and surface water contamination in areas throughout the United States (Bruggeman and Mostaghimi, 1993; Trommer, 1992; USEPA, 1977 and 1976). Heavy metal and nitrogen contamination have been of primary concern. The incidental ingestion of sludge residues by livestock was also investigated as a possible public health threat (Kienholz et al., 1977).

Federal legislation adopted in the mid-1970s, including the Federal Water Pollution Control Act and the Resource Recovery and Conservation Act, required secondary treatment of sewage, provided federal funding for the up-grade of treatment systems, and resulted in creation of the Environmental Protection Agency's Residual Sludge Working Group. Dramatic improvements in the quality of sludges, and the adoption of stringent new federal regulations (40 CFR Part 503) that became effective in 1993, have alleviated most concerns associated with the land application of sewage sludges. Concentrations of 10 heavy metals are now strictly regulated and application rates must conform with the "agronomic rate", or agricultural needs, of the vegetation at the application site.

State regulations (Chapter 17-640, FS) complement the federal rules and include a prohibition against the land application of sludges within 3000 feet of any Outstanding Florida Water (OFW) or within any area where the water table is less than 2 feet below land surface. These prohibitions will prevent any off-site applications from occurring within 3000 feet of the Withlacoochee River, which is designated an OFW downstream of the State Road 33 highway crossing (Figure 2). There is currently no evidence of groundwater or surface water contamination in the Green Swamp;



nonetheless, in recognition of the Green Swamp area's special significance and susceptibility to groundwater contamination, the DEP will soon implement a program of random soil sampling in the Green Swamp to detect and gauge any impacts. The program may also include an analysis of groundwater.

There are several other potential water quality threats associated with off-site land uses. The recently-closed East Pasco Sanitary Landfill is located on a site immediately west of the Withlacoochee River Park. A closure plan for the landfill, effective until May, 1994, calls for grading and sealing of the landfill surface with a low-permeability layer of earthen fill. Retention ponds receive any stormwater draining from the site. Groundwater contamination is a nearly universal concern associated with landfills, particularly those that were in operation before more modern engineering practices were implemented. The Withlacoochee River, which is a discharge site for groundwater and is approximately 0.5 miles from the closed landfill, may induce groundwater from the landfill site to flow to the river and may ultimately represent a possible avenue for surface water or groundwater contamination. The design of the landfill, the direction of local groundwater flows, and the capability of the landfill closure strategy to prevent the escape of contaminated waters should be examined by the District.

The Dade City Canal/Larkin Canal system is another possible source of input for contaminated water. The canal system receives stormwater drainage and various point-source discharges within Dade City and then discharges to Dobes Hole and the Withlacoochee River in the northwestern

corner of the Preserve. The final 2 miles of the canal cross Preserve property. Historic water quality conditions in the canal are reflected by references to "stink ditch" from local residents and others familiar with past conditions in the canal. Currently, the major point-source inputs to the canal system originate from the Lykes-Pasco, Inc., citrus processing plant and the Dade City Waste Water Treatment Plant (WWTP).

After the Dade City Canal/Larkin Canal system was excavated in 1936-1937 to relieve flooding in the San Antonio area (Ray Battle, pers. comm.), heavy discharges from citrus processing plants in Dade City regularly produced high flows through the canal. During periods of low river flow, the volumes of effluent flowing from Dade City would often exceed the base flow of the river. Lykes-Pasco is the only plant still discharging to the canal, and the quantity and quality of the Lykes-Pasco discharge have changed considerably. Lykes-Pasco, although still the largest user of water in the local area, has implemented water conservation measures that reduced their consumption from a rate of about 30 mgd in 1966-1967 to a rate of 9 mgd in 1977 (Tibbals et al., 1980). Effluent volumes exhibit a corresponding decrease. Lykes-Pasco recently installed an effluent treatment system that includes aeration, a clarifier, and polishing ponds. That system has improved the quality of effluent discharged to the canals and a December, 1992, water sample was analyzed by the Florida Department of Environmental Regulation (DER, now DEP) and found to meet water quality standards.

In contrast, recent analyses of effluent from the Dade City WWTP reflected elevated metals and nutrients in the effluent. Levels of silver exceeded water quality standards

and DER concluded that extremely high nutrient levels in the canal were also attributable to these discharges. DER has issued a temporary operating permit to the WWTP to allow time for the construction of a treatment system that will employ modern land application methods. The temporary permit includes a requirement that the WWTP must meet water quality standards by September, 1995.

A limerock mine formerly operated by Agri-timber may also threaten water quality at the Preserve. Agri-timber initiated mining operations at the site but relinquished the land to Maynard Ventures Five, Inc., following a foreclosure action in 1992. The mine property occurs as an inholding within the Preserve and, although it is not currently in operation, the owners are actively seeking permits from Pasco County that would allow them to resume operations. A spill from the mine during its period of operation severely damaged a cypress stand on adjoining Preserve lands. The District will consider intervening in the ongoing litigation between Sumter County and Maynard Ventures Five, Inc., and will strongly oppose efforts to resume or initiate mining on any lands adjoining the Preserve. In the event that mining operations are permitted on adjoining lands, the District will seek assurances that spills or other water quality or natural resource impacts will not result as conditions of any permits issued to the mine owners.

The DEP exercises oversight on most water quality issues, and is directly involved in monitoring or investigating many of the potential water quality concerns discussed above. The District will maintain contact with appropriate DEP staff regarding these issues and will remain alert to the presence of any additional water quality threats.

### *Other Threats*

In April, 1993, the United States Army Corps of Engineers released a report to the United States Congress describing chemical weapons testing that had been conducted within the current boundaries of the Richloam Tract, Withlacoochee State Forest, during the latter part of World War II. These tests, conducted to evaluate the action of mustard gas in semi-tropical environments, included test bombing within an 18,000-acre tract acquired by use permit from the Florida State Department of Agriculture. The use permit was relinquished in 1946.

Removal operations conducted by the Army in 1950 produced over 250 unexploded, mustard-filled bombs. Local residents and forestry personnel from Richloam report that discoveries of unexploded ordinance have occurred regularly over the years. Congressional concerns regarding dangers in "Formerly Used Defense Sites" (FUDS) motivated additional investigations into use of the former Lacoochee Bombing and Gunnery Range. An archival study was to be completed by October 1, 1993, and a more detailed study, including site visits, may be also be initiated depending upon the conclusions of the archival study.

Although the investigation is focusing on the Richloam Tract, descriptions of the bombing site place it 23 miles southeast of Bushnell. That distance reaches into the center of the Green Swamp Wilderness Preserve. If test bombing was restricted to the current area of the Richloam Tract, some ordinance may have strayed into adjoining areas. The District will evaluate the results of the ongoing investigation to determine the potential for threat within the Preserve.

## Security

Many of the security needs in the Green Swamp Wilderness Preserve are fulfilled by other entities. The FGFWFC maintains security within the WMA portions of the property, which include the Little Withlacoochee Management Unit (Richloam WMA) and most of the Green Swamp Management Unit (Green Swamp WMA). Security in the Green Swamp West Management Unit is provided more exclusively by District staff, although the Pasco County Parks and Recreation Department supervises use in those portions within the Withlacoochee River Park and supplemental security is provided by two resident security officers (Figure 11).

## ADMINISTRATION

### External Coordination

The District must coordinate with many outside public agencies and private interest groups to effectively manage its properties. This section identifies those management and land use activities which cross, or potentially cross, the limits of jurisdictional authority and interest and will require outside coordination.

#### *United States Fish and Wildlife Service (USFWS)*

The United States Fish and Wildlife Service (USFWS) is the primary federal agency responsible for protecting the nation's wildlife resources. That responsibility includes administration of the Endangered Species Act (ESA). The USFWS may be consulted regarding special management needs of any species that is protected under provisions of the ESA and known to occur in the Green Swamp Wilderness Preserve.

They will also be solicited for advice on management techniques that may improve the suitability of the Preserve for the Florida black bear.

A Habitat Conservation Plan (HCP) will be prepared by the District and submitted to USFWS, as required under Section 10 of the ESA, to minimize the risk of "incidental take" of any species currently listed as threatened or endangered. The HCP will address protection and management needs of all federally listed species that are known or expected to occur on the Preserve. A detailed Environmental Assessment will be prepared as a prerequisite to submission of the HCP.

#### *United States Environmental Protection Agency (EPA)*

The EPA is responsible for administering federal rules that regulate the land application of sewage residuals (40 CFR Part 503). Sewage residuals, or sludges, have been proven effective as soil conditioners in land reclamation projects and several restoration sites in Green Swamp West may benefit from proper use of these materials. Appropriate permits will be secured from EPA in the event that any Green Swamp restoration sites are determined to be in need of soil conditioning as a prelude to restoration.

The EPA also administers rules of the National Pollution Discharge Elimination System (NPDES) and other federal regulations designed to protect water quality. These regulations may apply to water quality threats facing the Preserve and will be employed as appropriate to ensure that existing water quality is either maintained or improved.

### ***United States Army Corps of Engineers (ACOE)***

The ACOE is currently investigating the potential threat posed by mustard gas bombs and other munitions that were dropped onto a bombing range in the Green Swamp during the mid-1940s. Although historical information suggests that the bombing range was located wholly within adjoining lands of the Withlacoochee State Forest, the District will request access to any pertinent information regarding this former land use to confirm that there is no danger of unexploded munitions occurring within the area of the Preserve. The ACOE is presently completing an archival search report.

### ***Florida Game and Fresh Water Fish Commission***

The Florida Game and Fresh Water Fish Commission (FGFWFC) is the agency with primary responsibility for protecting and managing the state's wildlife resources. As such, FGFWFC personnel monitor activity in the Preserve's wading bird rookeries and manage hunting activities within both the Green Swamp and Richloam Wildlife Management Areas (WMAs). Public use of the campgrounds associated with the Green Swamp WMA is also supervised by the FGFWFC. The District will coordinate closely with FGFWFC to ensure that the on-site wading bird rookeries, other critical habitat areas, and WMAs, are managed and monitored appropriately. FGFWFC will also be consulted for advice regarding alternative hunting strategies for the Green Swamp West Management Unit and for assistance in improving habitat values of the existing Florida Power Corporation electrical transmission line right-of-way.

### ***Florida Division of Forestry (DOF)***

The DOF manages the Richloam Tract of the Withlacoochee State Forest, which adjoins the northern boundary of the Preserve for a distance exceeding 20 miles. This extensive shared property line presents numerous opportunities for cooperation in conducting prescribed fires, controlling wildfires, maintaining or restoring natural surface water flows and connections, and accommodating or managing recreational uses. The District routinely cooperates with DOF in such matters and will actively seek ways to promote additional cooperative or joint efforts that will result in more efficient management of these adjoining public lands.

The DOF currently accepts primary responsibility for managing the Little Withlacoochee Management Unit of the Preserve, which has essentially been incorporated into the Richloam Tract. The District will confer with DOF personnel in order to draft and execute a formal agreement that clearly outlines the responsibilities of each agency in future management of the Little Withlacoochee unit. Strategies that bring DOF's forest management practices at Little Withlacoochee into compliance with the land management philosophy mandated for District lands will also be formulated.

The northern third of the Florida Power Corporation transmission line that traverses the Green Swamp is located on the eastern edge of the Richloam Tract and adjoins the western boundary of the Little Withlacoochee Management Unit. The District will coordinate with DOF, FGFWFC, Florida Power Corporation and the National Wild Turkey Federation to improve habitat values of the existing utility right-of-way. As the agency with primary

management responsibility for all public lands bordering the northern segment of the right-of-way, DOF will play a vital role in any habitat improvement program for that area.

### ***Florida Department of Environmental Protection (DEP)***

The DEP administers many of the State of Florida's environmental regulations, particularly those that are designed to protect water quality. As such, the District must coordinate closely with DEP to identify and resolve any threats to Preserve water quality, including: off-site drainage that enters the Preserve through the Dade City Canal or via other surface water drainage features; possible soil or groundwater contamination associated with the on-site cattle dipping vats; and groundwater or surface water contamination exiting the site of the closed East Pasco Sanitary Landfill. DEP also regulates the land application of sewage residuals for use in reclamation or restoration projects.

The District is typically responsible for reviewing and permitting proposed stormwater and surface water management systems. However, any such systems that are proposed by the District for sites within the boundaries of the Preserve will be subject to the review and permitting authority of DEP. Some possible examples of projects that may require such permits include the installation of culverts and the implementation of restoration projects that will require the backfilling of drainage ditches or alteration of surface flows. The State of Florida, through DEP, may ultimately assume responsibility for administering some federal regulatory programs, including those related to the land application of sewage residuals and NPDES. The

District will remain consistent with all existing regulatory programs by securing permits from both agencies, as required, until such time as any transfer of authority or jurisdiction is finalized.

Recreational sites and facilities that are owned and managed by the State of Florida are also administered by DEP. As such, the District will coordinate with DEP in the management and use of the Van Fleet State Trail (Figure 11) and in any plans to link that trail with the Preserve's trail network.

### ***Florida Department of Community Affairs (DCA)***

DCA is responsible for ensuring that resource protection goals for the Green Swamp Area of Critical State Concern are met through appropriate action and regulation by other state agencies and by the Polk County and Lake County governments. The District's acquisition and protection of the lands that comprise the Preserve are an effective means of assisting in DCA's efforts to protect the Green Swamp. The District will cooperate as appropriate with DCA to maintain the natural values of the Preserve and will solicit DCA support, as necessary, to assure continued protection.

### ***Local Governments***

The Green Swamp Wilderness Preserve encompasses lands located within four different counties: Pasco County, which accounts for the entire Green Swamp West Management Unit; Lake County, whose lands encompass the entire Little Withlacoochee Management Unit and the eastern portion of the Green Swamp Management Unit; Polk County, which accounts for all lands south of the Withlacoochee River and east of State Road 471; and Sumter County,

which includes the central core of the Preserve located north of the Withlacoochee River. Each of these local governments exercises land use authority over all lands located within their area of jurisdiction. As such, the District must work cooperatively with each county government to exclude land uses that may contaminate the ground-water or surface water resources of the Preserve, or that are otherwise incompatible with the property's status as a wilderness preserve and recreational area. Concerns specific to each county are highlighted below.

#### PASCO COUNTY

The District has worked jointly with Pasco County to develop the Withlacoochee River Park, which includes District lands that were made available to the county by means of a license agreement. Recent discussions between the District and the County may lead to expansion of the park or to a lengthening of the riverfront hiking trail. The County has also expressed an interest in establishing an equestrian area on Preserve lands to the north of the existing park. Any use of Green Swamp West lands for hunting will require additional coordination with the County to ensure that the hunting will not conflict with the established recreational use of the park and normal public use of river channel and adjoining areas.

#### SUMTER COUNTY

The location of the Preserve, relative to the configuration of Sumter County, suggests that the only land management or land use issue that will require careful coordination between the District and the County is related to the Maynard Ventures Five mine site. This parcel, which totals approxi-

mately 300 acres, occurs as an inholding and represents the only privately-owned lands in Sumter County that adjoin the Preserve. The existing limerock mine is inactive and the Sumter County Future Land Use Map has designated the property as a site that cannot be mined. The County recently denied the landowner's request that the land use designation for the property be amended; however, the landowner subsequently filed suit against the County and is now seeking a determination that the mine is a vested land use so that mining operations may be resumed. Previous operation of the mine resulted in adverse impacts to adjoining Preserve lands. The District will consider intervening in the ongoing legal proceedings as an affected party and will recommend that the site remain designated as an area that is unsuitable for mining. In the event that mining operations are permitted to resume, the District will insist that appropriate safeguards be required as a condition of the mining permit to ensure that the Preserve is adequately protected.

#### POLK COUNTY

The Rock Ridge Road entrance to the Preserve provides ready access to the upstream reaches of the Withlacoochee River and could serve as an ideal staging area for recreational users of the property. Existing improvements at this entrance include a check station and campground that are used only during the hunting season. The District will approach Polk County to determine their willingness to manage access and year-round camping at the site, which could serve as one of the primary gateways to the Preserve.

## LAKE COUNTY

Bayroot Slough and the up-gradient wetlands that contribute surface flow to that system serve as the origin of the Little Withlacoochee River. Some of the contributing wetlands lie outside the Preserve in the farming community around Bay Lake. This plan identifies Bayroot Slough as a Special Protection Area and off-site activities, especially agricultural uses, are recognized as a potential source of water quality and water quantity impacts. The District will request that Lake County keep the District apprised of any development proposals for the Bay Lake area so that possible impacts to the Preserve can be averted or minimized.

### *Adjacent Property Owners*

As the area surrounding the Preserve continues to develop and the number of adjoining property owners progressively increases, the potential for conflicts with adjoining property owners will likewise increase. The District will closely monitor the development of the surrounding area to ensure that land use conflicts are averted or resolved. In order to avoid conflicts related to public access to the property, future access will remain limited to officially-designated public access points.

### *Private Interests*

There are a number of private interests that may be involved in the future management and use of the Green Swamp Wilderness Preserve. The Florida Trail Association, Inc., has played a continuing role in the development of the Preserve's network of hiking trails and additional trail development is planned. The Lowry Park Zoological Society has requested that a portion of

the Preserve be set aside to serve as a center for the captive breeding of endangered species of wildlife, including such native species as the Florida panther and red wolf. A coordinated effort to improve habitat conditions in the Florida Power electrical transmission line right-of-way will necessarily require the involvement of Florida Power Corporation, and may also include assistance of the National Wild Turkey Federation. The District will be prepared to cooperate and work jointly with such groups in endeavors that are consistent with established management or land use goals. Assistance from volunteer groups will also be accepted or solicited whenever it is considered appropriate or practicable. Generally, private uses or undertakings will be restricted to non-profit organizations and projects with a clear public benefit.

### *Internal Coordination*

District staff from the Land Resources Department, Planning Department, Environmental Section of the Resource Projects Department, and the Office of the General Counsel have played key roles in the development of this land use plan. Many of the land management and land use initiatives that have been proposed will also require the participation of the Resource Regulation Department and/or the Operations Department. Effective implementation of the plan will require the continued cooperation of these and other departments of the District.

## REFERENCES

- Barr, G.L. and B.R. Lewelling. 1986. Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida, May and September 1986. Open File Report 86-409W. United States Geological Survey. Tallahassee, Florida.
- Bell, C.R. and B.J. Taylor. 1982. Florida Wild Flowers. Laurel Hill Press. Chapel Hill, North Carolina.
- Brown, M.T., T. Snyder and P. Green. 1993. Ecological Evaluation of the Green Swamp Riverine Corridor Tract. Wetlands and Water Resources Research Center. University of Florida. Gainesville, Florida.
- Brown, S.L. 1984. The Role of Wetlands in the Green Swamp. From: Cypress Swamps. Ewel and Odum, Editors. University of Florida Press. Gainesville, Florida.
- Bruggeman, A.C. and S. Mostaghimi. 1993. Sludge Application Effects on Runoff, Infiltration, and Water Quality. Water Resources Bulletin. 29(1):15-26.
- Buckley, P.A. and F.G. Buckley. 1976. Guidelines for Protection and Management of Colonial Nesting Waterbirds. National Park Service. Boston, Massachusetts.
- Cairnes, J. 1988. Increasing Diversity By Restoring Damaged Ecosystems. From: Biodiversity. Wilson and Peters, Editors. National Academy Press. Washington, D.C.
- Christianson, R.A. 1988. Guidelines for the Development of Site-Specific Plans for the Use and Management of District-Owned Properties. Southwest Florida Water Management District. Brooksville, Florida.
- Cobb, D.T. and P.M. Elliott. 1991. Predicting Wild Turkey Harvest Levels. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 45:227-234.
- Denton, S.R. and S.R. Patton. 1989. Ecological Resource Protection Study: Withlacoochee Riverine Corridor "A", Withlacoochee Riverine Corridor "D", Withlacoochee Riverine Corridor "B", Upper Hillsborough River Flood Detention Area. Biological Research Associates, Inc. Tampa, Florida.
- Department of Administration, Division of State Planning. 1974. Final Report and Recommendations For the Proposed Green Swamp Area of Critical State Concern, Lake and Polk Counties, Florida. Bureau of Land Planning. Tallahassee, Florida.
- Ewel, K.C. 1990. Swamps. From: Ecosystems of Florida. Myers and Ewel, Editors. University of Central Florida Press. Orlando, Florida.



- Fernald, E.A. and D.J. Patton, Editors. 1984. Water Resources Atlas of Florida. Florida State University and Institute of Science and Public Affairs. Tallahassee, Florida
- Florida Department of Natural Resources. 1993. Conservation and Recreation Lands Annual Report: 1993. Florida Department of Natural Resources. Tallahassee, Florida.
- Florida Game and Fresh Water Fish Commission. 1990. Official Lists of Endangered and Potentially Endangered Fauna and Flora in Florida. Florida Game and Fresh Water Fish Commission. Tallahassee, Florida.
- Florida Natural Areas Inventory and Florida Department of Natural Resources. 1990. Guide to the Natural Communities of Florida. Florida Natural Areas Inventory. Tallahassee, Florida.
- Gannon, M. 1993. Florida: A Short History. University Press of Florida. Gainesville, Florida.
- Gates, J.E. 1991. Powerline Corridors, Edge Effects, and Wildlife in Forested Landscapes of the Central Appalachians. From: Wildlife and Habitats in Managed Landscapes. Rodiek and Bolen, Editors. Island Press. Washington, D.C.
- Green Swamp Task Force. 1992. The Green Swamp System: A Scientific Analysis. Polk County Board of County Commissioners. Bartow, Florida.
- Grubb, H.F. 1977. Potential for Downward Leakage to the Floridan Aquifer, Green Swamp Area, Central Florida. Water Resources Investigation 77-71. United States Geological Survey. Tallahassee, Florida.
- \_\_\_\_\_ and R.T. Rutledge. 1979. Long-Term Water Supply Potential, Green Swamp Area, Florida. Water Resources Investigation 78-99. United States Geological Survey. Tallahassee, Florida.
- Jeffares, C. 1987. Pasco Heritage. The Tribune Company. Tampa, Florida.
- Jenni, D.A. 1969. A Study of the Ecology of Four Species of Herons During Breeding Season at Lake Alice, Alachua County, Florida. Ecological Monographs 39:245-270.
- Jordan, D.B. 1991. Supplemental Environmental Assessment: A Proposal to Establish a Captive Breeding Population of Florida Panthers. United States Fish and Wildlife Service. Gainesville, Florida.
- KBN Engineering and Applied Sciences, Inc. 1992. Utilization of Transmission Line Rights-of-Way by Wildlife: A Literature Review. Florida Power Corporation. Tampa, Florida.

- Kienholz, E., G.M. Ward and D.E. Johnson. 1977. Health Considerations Relating to Ingestion of Sludge by Farm Animals. In: Sludge Management Disposal and Utilization: Proceedings of the Third National Conference on Sludge Management Disposal and Utilization. Information Transfer, Inc. Rockville, Maryland.
- Knochenmus, D.D. and G.H. Hughs. 1976. Hydrology of Lake County, Florida. United States Geological Survey Water-Resources Investigation 76-72. United States Geological Survey. Tallahassee, Florida.
- Maehr, D.S. 1992. Florida Panther Distribution and Conservation Strategy. United States Fish and Wildlife Service. Bethesda, Maryland.
- \_\_\_\_\_ and J.B. Wooding. 1992. Florida Black Bear: *Ursus americanus floridanus*. From: Rare and Endangered Biota of Florida, Volume I, Mammals. Stephen R. Humphrey, Editor. University Press of Florida. Gainesville, Florida.
- Noss, R.F. 1987. Protecting Natural Areas in Fragmented Landscapes. Natural Areas Journal 7:2-13.
- Pilcher, H.G., B.E. Russell and G.E. Bray. 1980. A Geological/Archaeological Study of a Primitive Site in the Green Swamp, Polk County, Florida. Early Man Journal. 5:7-20. Peninsular Archaeological Society
- Piper, H.M. and J.G. Piper. 1980. An Archaeological Survey of the Levee Corridors of the Proposed Green Swamp Flood Detention Area: Polk, Sumter and Lake Counties, Florida. Piper Archaeological Research, Inc. St. Petersburg, Florida.
- Pride, R.W., F.W. Meyer and R.N. Cherry. 1966. Hydrology of the Green Swamp Area in Central Florida. Report of Investigations No. 42. United States Geological Survey, Florida Geological Survey, Florida Division of Water Resources and Conservation, and the Southwest Florida Water Management District. Tallahassee, Florida.
- Rochow, T.F. and M. Lopez. 1984. Hydrobiological Monitoring of Cypress Domes in the Green Swamp Area of Lake and Sumter Counties, Florida: 1979-1982. Environmental Section Technical Report 1984-1. Southwest Florida Water Management District. Brooksville, Florida.
- Runde, D.E., J.A. Gore, J.A. Hovis, M.S. Robson and P.D. Southall. 1991. Florida Atlas of Breeding Sites for Herons and Their Allies: Update 1986-89. Nongame Wildlife Program Technical Report No. 10. Florida Game and Fresh Water Fish Commission. Tallahassee, Florida.

- Rutledge, A.T. and H.F. Grubb. 1978. Hydrogeologic Maps of a Flood Detention Area Proposed By Southwest Florida Water Management District, Green Swamp Area, Florida. Open-File Report 78-460. United States Geological Survey. Tallahassee, Florida.
- Soil Conservation Service. 1988. Soil Survey of Sumter County, Florida. United States Department of Agriculture.
- \_\_\_\_\_. 1988a. Soil Survey of Polk County: Interim Report, Third Edition. United States Department of Agriculture.
- \_\_\_\_\_. 1982. Soil Survey of Pasco County, Florida. United States Department of Agriculture.
- Soule, M.E. and D. Simberloff. 1986. What Do Genetics and Ecology Tell Us About the Design of Nature Reserves? Biological Conservation 35:19-40.
- Southwest Florida Water Management District. 1993. Save Our Rivers/Preservation 2000 Five Year Plan: 1993. Southwest Florida Water Management District. Brooksville, Florida.
- \_\_\_\_\_. 1992. Water Supply Needs and Sources, Southwest Florida Water Management District, 1990-2020. Southwest Florida Water Management District. Brooksville, Florida.
- \_\_\_\_\_. 1991a. Ground-Water Quality of the Southwest Florida Water Management District: Northern Region. Southwest Florida Water Management District. Brooksville, Florida.
- \_\_\_\_\_. 1988. Ground-Water Resource Availability Inventory: Pasco County, Florida. Southwest Florida Water Management District. Brooksville, Florida.
- \_\_\_\_\_. 1988a. Ground-Water Resource Availability Inventory: Polk County, Florida. Southwest Florida Water Management District. Brooksville, Florida.
- \_\_\_\_\_. 1987. Ground-Water Resource Availability Inventory: Sumter County, Florida. Southwest Florida Water Management District. Brooksville, Florida.
- \_\_\_\_\_. 1984. The Green Swamp Project: Engineering Report. The Southwest Florida Water Management District. Brooksville, Florida.
- \_\_\_\_\_. 1984a. The Green Swamp Project: Environmental Report. The Southwest Florida Water Management District. Brooksville, Florida.

- \_\_\_\_\_. 1980. Upper Hillsborough Flood Detention Area: Environmental Assessment. Southwest Florida Water Management District. Brooksville, Florida.
- Storer, J.H. 1962. The Green Swamp. Florida Naturalist. Volume 35, Number 3.
- Tanner, G.W. and M.R. Werner. 1986. Cogongrass in Florida: An Encroaching Problem. Florida Cooperative Extension Service. University of Florida. Gainesville, Florida.
- Tibbals, C.H., Anderson, W. and C.P. Laughlin. 1980. Ground-Water Hydrology of the Dade City Area, Pasco County, Florida, With Emphasis on the Hydrologic Effects of Pumping From the Floridan Aquifer. Water-Resources Investigations 80-33. United States Geological Survey. Tallahassee, Florida.
- Tremblay, J. and L.N. Ellison. 1979. Effects of Human Disturbance on Breeding of Black-Crowned Night Herons. The Auk 96:364-369.
- Trommer, J.T. 1992. Effects of Effluent Spray Irrigation and Sludge Disposal on Ground Water in a Karst Region, Northwest Pinellas County, Florida. United States Geological Survey. Water Resources Investigations Report 91-4181.
- United States Department of Agriculture. 1986. Florida National Scenic Trail Comprehensive Plan. United States Forest Service. Tallahassee, Florida.
- United States Department of the Interior. 1989. Draft General Management Plan and Draft Environmental Impact Statement, Big Cypress National Preserve. National Park Service. Ochopee, Florida.
- United States Environmental Protection Agency. 1983. Process Design Manual For Land Application of Municipal Sludge. Environmental Protection Agency. Cincinnati, Ohio.
- \_\_\_\_\_. 1977. Municipal Sludge Management: Environmental Factors. MCD-28, Technical Bulletin. United States Environmental Protection Agency. Washington, D.C.
- \_\_\_\_\_. 1976. Application of Sewage Sludge to Cropland: Appraisal of Potential Hazards of the Heavy Metals to Plants and Animals. MCD-33, Technical Bulletin. United States Environmental Protection Agency. Washington, D.C.
- United States Fish and Wildlife Service. 1986. Recovery plan for the U.S. breeding population of the wood stork. United States Fish and Wildlife Service. Atlanta, Georgia.
- \_\_\_\_\_. 1982. Red Wolf Recovery Plan. United States Fish and Wildlife Service. Atlanta, Georgia.

- Weisman, B.R. and W.H. Marquardt. 1988. Archaeology of the SWFWMD Projects: A Comprehensive Archaeological Resource Inventory for the Southwest Florida Water Management District, Brooksville. Florida Museum of Natural History, University of Florida. Gainesville, Florida.
- Wharton, B.R. 1984. Archaeological Resources of the Upper Hillsborough Flood Detention Area, Pasco and Polk Counties, Florida. Environmental Section Technical Report 1984-2. Southwest Florida Water Management District. Brooksville, Florida.
- \_\_\_\_\_. 1979. An Archaeological Assessment Survey of the Construction Impact Areas of the Upper Hillsborough Flood Detention Area, Southeastern Pasco County, Florida. Southwest Florida Water Management District. Brooksville, Florida.
- White, P.S. 1987. Natural Disturbance, Patch Dynamics, and Landscape Pattern in Natural Areas. Natural Areas Journal 7:14-22.
- Williams, J.R., S.M. Layman, A.L. Snapp, L. Hutchinson-Neff and L. Clifford. 1988. An Archaeological Assessment of Sites 8-PA157D and 8-PA-53E: Agri-Timber Park, Pasco County, Florida. Pasco County Division of Parks and Recreation. Dade City, Florida.
- Wunderlin, R.P. 1982. Guide to the Vascular Plants of Central Florida. University Presses of Florida. Gainesville, Florida.

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