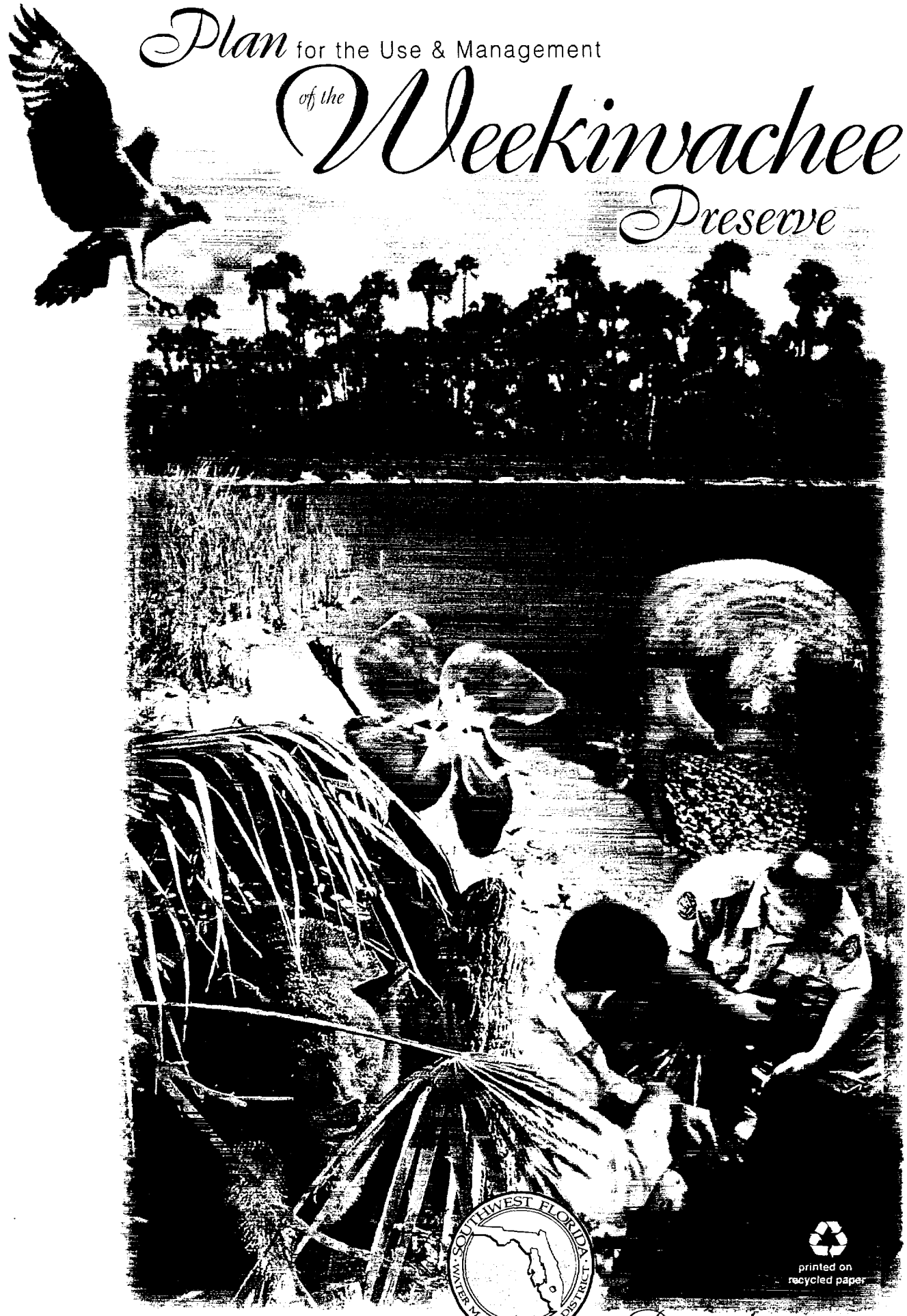
Plan for the Use & Management *of the* *Weekinvachee Preserve*



SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

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A Plan for the Use and Management of the

Weekiwachee Preserve

December 1997

Southwest Florida Water Management District

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EXECUTIVE SUMMARY

The 7,136-acre Weekiwachee Preserve (Preserve), located in coastal Hernando County, was acquired by the Southwest Florida Water Management District (District) through a series of successive land purchases conducted between 1993 and 1996. Hernando County contributed funds toward the acquisition of the Preserve through its Environmentally Sensitive Lands Program, which was established to provide a local funding source for the acquisition of significant natural lands. The superlative natural values of the Preserve distinguish it as an area of state-wide significance. This plan is designed to guide the future management and public use of the Preserve in a manner that will ensure protection of those natural attributes which served as the impetus for public acquisition of the area.

Water management values associated with the Preserve include water conveyance, natural flood protection and water quality maintenance. The northern boundary is defined by nearly 4 miles of frontage on the Weekiwachee River. Preservation of this natural shoreline will help to preserve the water conveyance function of the river channel and help to maintain water quality in the both the river and downstream estuary. Approximately 84 percent of the Preserve lies in the 100-year floodplain. Maintaining the natural condition of the lands comprising the Preserve will perpetuate the area's natural ability to store floodwaters and buffer inland areas from storm-generated tidal surges.

Approximately 70 percent of the total land area of the Preserve supports native wetland communities including hydric hammock, salt marsh and freshwater marsh. In combination with the mixture of upland communities represented on the remainder of the Preserve, the site provides habitat for a great diversity of wildlife. Many species that have been recognized as threatened or endangered occur in the Preserve including the Florida black bear, Southeastern bald eagle and West Indian manatee. Protection of the resident black bear population has been identified as a management priority on the basis of the species' threatened status and its recognized role as an "umbrella" species due to its broad habitat needs. A research program designed to assess the health of the population and identify critical habitat management needs has been implemented and the results of the research will be employed to guide future management of the Preserve.

A number of sites within the Preserve have been designated Special Protection Areas. These include: a shorebird nesting area located within the lake complex; a Research Area located at the northeast corner of the lake complex; three active bald eagle nest sites; stands of scrub vegetation; the shoreline of the Weekiwachee River; and a number of archaeological sites. Protection of these sites will take precedence over all other land management and public use considerations. Recreational uses will be directed to other portions of the property and management actions such as prescribed burning and control of exotic species will be tailored to meet the site-specific needs of all Special Protection Areas.

Major management needs for the Preserve include the implementation of a prescribed burning program, control of invasive exotic species, habitat restoration, and management and monitoring of wildlife to maintain existing biodiversity. Establishment of an on-site residence to provide housing for a

security officer will be a high priority to minimize the incidence of illegal activities and enhance public safety.

Recreational use of the Preserve will be limited to day use only. Two access points have been designated. The primary access point, which will allow for vehicular entry, is located on Shoal Line Boulevard. A secondary access point, which is located on the southern boundary of the Preserve along Osowaw Boulevard, will provide a parking area and a walk-thru entrance for hikers and bicyclists. Pets will be prohibited on the Preserve.

Permitted recreational uses of the Preserve will include hiking, bicycling on a designated network of trails around the lake system, fishing, birding, picnicking, boating and swimming. Boating in the lakes will be restricted to boats that are not powered by internal combustion engines and swimming will be permitted only within a proposed beach and picnic complex. Development of the complex will be conducted in partnership with Hernando County and management of the facilities at this site will be the responsibility of the County. Carrying capacities that are consistent with maintenance of a wilderness setting will be established for the developed recreational facilities.

LIST OF FIGURES

INTRODUCTION

Description of Property

The Weekiwachee Preserve (Preserve) is located along coastal Hernando County and is bounded generally by County Road 595 (Osowaw Blvd.) to the south, U.S. Highway 19 to the east, County Road 595 (Shoal Line Blvd.) and the Gulf of Mexico to the west, and the Weekiwachee River to the north (Figure 1). The lands comprising the Preserve, which is approximately 7,136 acres in total land area, were acquired by the Southwest Florida Water Management District (District) through a series of successive purchases conducted between 1993 and 1996. Hernando County, through its Environmentally Sensitive Lands Program, contributed funds toward most of the individual acquisitions. An additional 9,500 acres are targeted for acquisition as part of the Weekiwachee Riverine System Save Our Rivers Project. It is anticipated that future acquisitions will increase the total size of the Preserve substantially. This management plan is intended to guide the management and public use of the existing Preserve area, and will be updated as necessary to address the management of future additions. The interim management of additions will be conducted in a manner that is consistent with the general approach and philosophy established for the existing Preserve land area.

The Preserve encompasses a natural area of state-wide significance. The diverse assemblage of natural communities protected within the Preserve provide habitat for a large number of imperiled plant and animal species. Perhaps most significantly, the Preserve serves as core habitat for a critically-imperiled population of the Florida black bear (*Ursus americanus floridanus*). In addition, approximately 70 percent of the Preserve supports sensitive wetland communities and 84 percent lies within the 100-year floodplain. The ability of these wetlands and floodplain to store floodwaters generated by major storm events, and to absorb tidal surges generated by such storms, will help to shield inland areas from the full force of hurricanes and winter storms. Nearly 4 miles of natural, undisturbed frontage on the Weekiwachee River will remain natural in perpetuity and contribute to the maintenance of water quality on this pristine river and in the downstream estuary. The estuary will also benefit from the protection of coastal salt marshes and tidal creeks that originate along the western boundary of the Preserve. Opportunities for resource-based recreational use provide additional values to the public.

The landscape surrounding the project area includes a multitude of land uses and types. Major transportation corridors that adjoin or occur in close proximity to the Preserve include U.S. Highway 19, C.R. 595 and C.R. 550. Several large residential subdivisions and numerous commercial enterprises are associated with these road systems in the immediate vicinity of the Preserve. The coastal communities of Aripeka, Hernando Beach, Pine Island, Bayport, and Weeki Wachee are serviced by C.R. 595 and the sprawl of Spring Hill abuts the Preserve along its entire eastern boundary. Although many of these communities in the surrounding area originated as small fishing villages, the area now supports a large and growing population. The Preserve protects the last remaining expanse of significant natural lands remaining along the developed coastline of Hernando County. It also serves

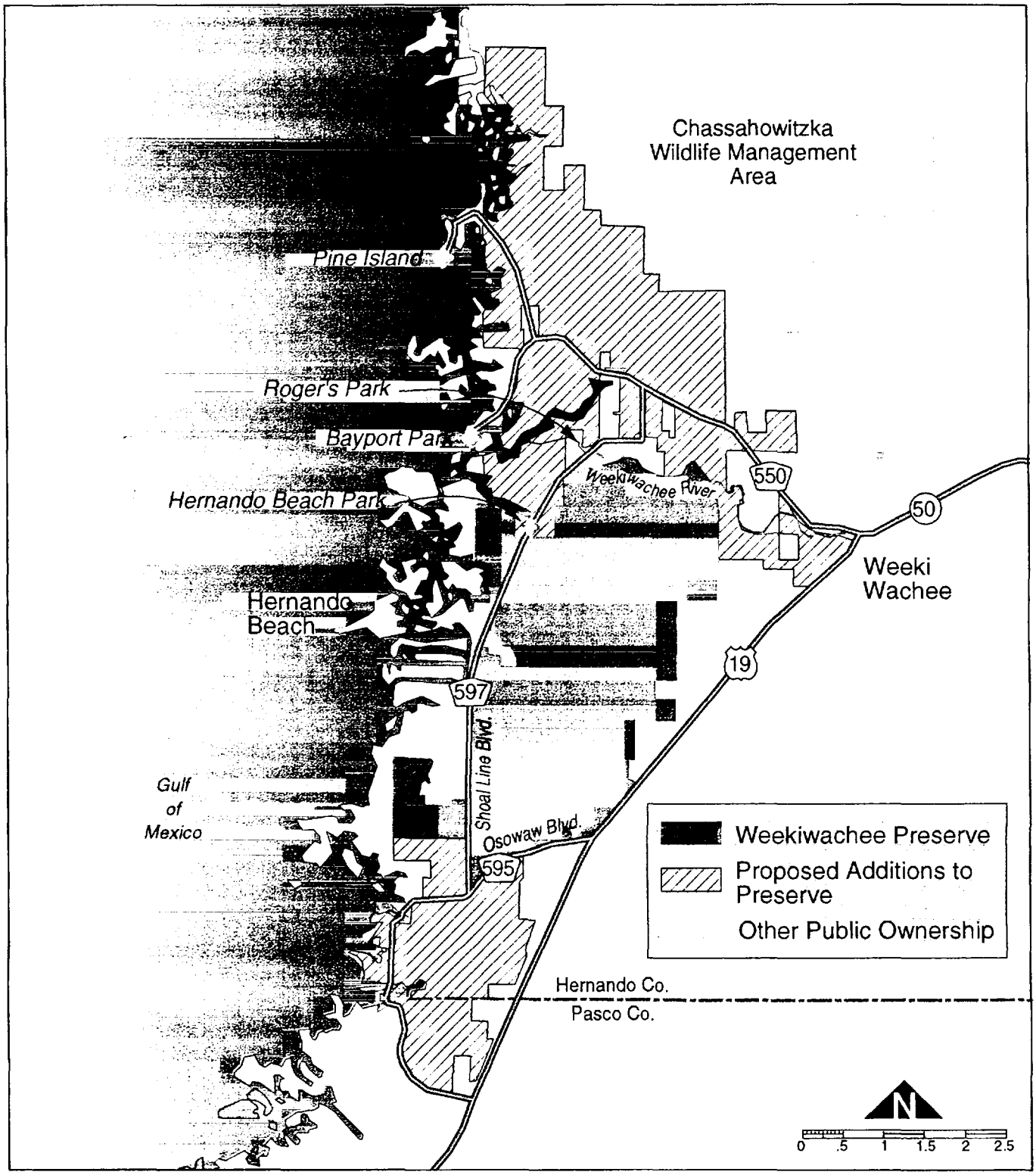


Figure 1. Weekiwachee Preserve Location Map

as the southern end of a continuous, uninterrupted swath of natural lands that runs northward to Crystal River. The majority of these other coastal lands, which include the Chassahowitzka National Wildlife Refuge, Chassahowitzka Wildlife Management Area, Homosassa Reserve, and the District-held Chassahowitzka Riverine Swamp Sanctuary, have also been protected through public acquisition and, in combination with the Preserve, serve to protect a large and extremely significant natural area (Figure 2).

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 the identification of 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. Land use constraints resulting from the size and configuration of an area also considered during this phase of the process. The ultimate objective is to concentrate land uses in appropriate areas and to prevent incompatible or conflicting uses from occurring within a property.

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 or altered. 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.

The planning process is initiated by an inter-disciplinary team of District staff. Affected local governments and others with a vested interest in the property may also be invited to appoint a representative to the plan development team. A Hernando County representative was appointed to the Weekiwachee Preserve plan development team to address issues of local concern associated with management of the Preserve. Prior to presenting the plan for approval of the District's Governing Board and the appropriate Basin Board, management plans must be reviewed and approved by the Land Management and Acquisition Task Force. This committee is composed of senior District staff assigned various roles in directing the management and use of District-held lands. Final review and approval of all plans by the Governing Board is conducted in a public hearing during which members of the public may provide comments or recommendations regarding the plan.

Management Philosophy and Emphasis

On the basis of the high population density of the area surrounding the Preserve, and the proximity of roads open to unrestricted motorized traffic, the Preserve has been designated an urban fringe parkland. This designation recognizes the influence that a large human population and easy access can have upon the character of a natural area. It also alludes to the tremendous challenge

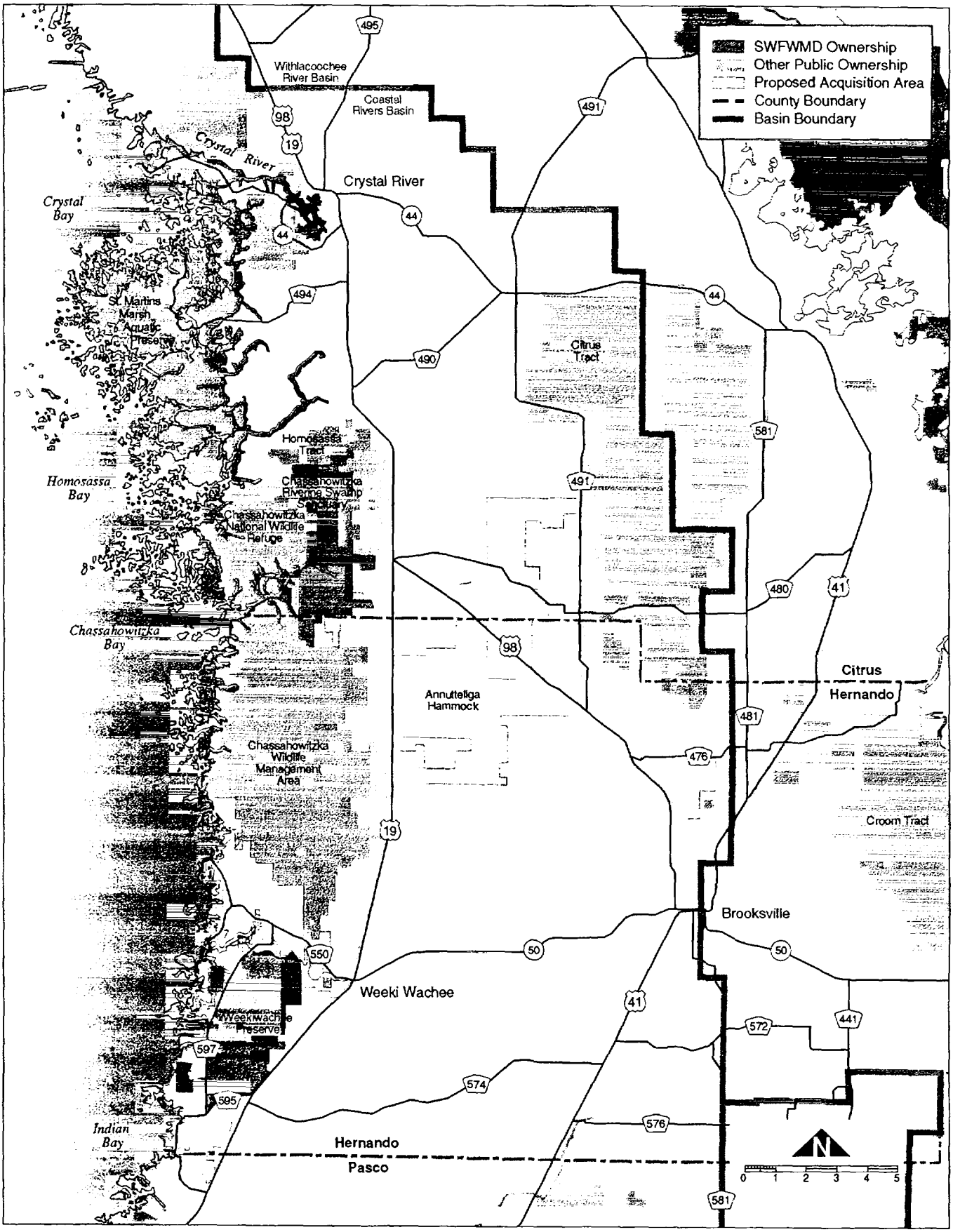


Figure 2. Regional Network of Preserve Lands.

facing the District in terms of the future management and protection of the Preserve. As noted previously, the Preserve is part of a much larger ecosystem that includes several other extensive tracts of publicly-owned land. This patchwork of public lands protects the last large remnant of natural coastline remaining in west-central Florida. It is also located in one of the fastest growing areas of the state. The abrupt transition from wilderness area to urbanized landscape that occurs along most of the Preserve's boundary will impose certain unavoidable constraints on essential management actions, including especially the use of prescribed fire. The close proximity of a large human population to populations of sensitive wildlife species will require an equally sensitive approach to the management of wildlife. In combination, these characteristics pose a uniquely difficult challenge to the District in terms of it's statutory mandate to achieve the appropriate balance of ecological protection and public use.

The natural attributes of the Weekiwachee Preserve far exceed those of a typical urban fringe parkland. This is primarily a function of its large size and physical linkage with other large tracts, which imparts a wild and isolated character more normally associated with sites far removed from developed, highly populated areas. Another factor that contributes to its atypical character is its coastal location. The salt marshes, tidal creeks, and open water of the Gulf of Mexico add to the diversity of habitats available to support wildlife, while buffering a large section of the western boundary from the severe human influence so characteristic of the eastern boundary. Finally, human intrusion prior to District acquisition was limited by private ownership which restricted access and maintained secluded conditions across the majority of the Preserve. These secluded conditions are manifested clearly in the occurrence of a population of the Florida black bear.

The Florida black bear is a shy species that requires the privacy and refuge conferred by dense forest and expansive habitat. The extent to which human development and population growth has deforested and fragmented the Florida landscape has produced a corresponding reduction in the extent of suitable bear habitat and has eliminated this distinct subspecies of the American black bear from most of its former range. In response to a decline in bear numbers and the ongoing destruction and fragmentation of suitable habitat, the Florida Game and Fresh Water Fish Commission (FGFWFC) has designated the bear a threatened species. It is currently being evaluated for designation as a threatened species under the U.S. Endangered Species Act. The presence of this threatened species on the Preserve, and its extreme sensitivity to human intrusion and disturbance, will require a cautious approach to the management of public use.

Research being conducted jointly by the District, FGFWFC, the Florida Division of Forestry (DOF) and the U.S. Fish and Wildlife Service (USFWS) is attempting to gain insights into the ecology and habitat requirements of the resident bear population so that management of the entire coastal ecosystem can be tailored to preserve this important wildlife resource while accommodating public recreational use. Ultimately, the research will help to identify those recreational uses that would be compatible with bear preservation. This plan outlines a cautious and conservative

approach to public use with the goal of maintaining the wilderness character and habitat values of the Preserve while accommodating public use and access. Recreational usage beyond that outlined in this plan may be permitted in the future as the results of the research become available to provide more knowledgeable guidance of future management activities. Expansion of the Preserve area through future acquisitions of surrounding lands may also offer opportunities for an expansion of public recreational use.

Description of Land Cover

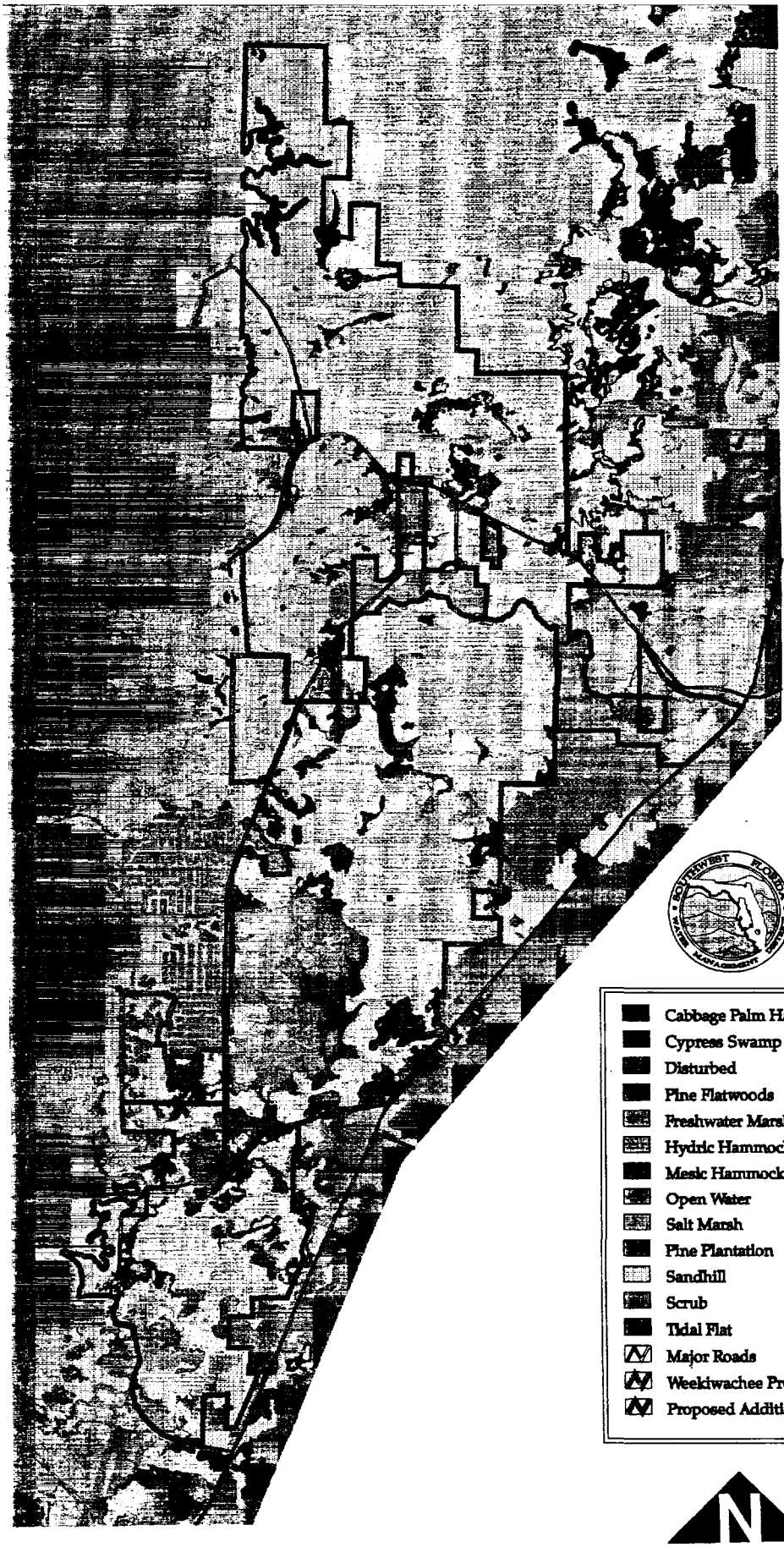
The majority of the Weekiwachee Preserve (3,800 acres, or 53 percent of the total land area) supports a dense cover of hydric hammock (Figure 3). The canopy of this forested community consists of a very diverse mixture of tree species, including cabbage palm (*Sabal palmetto*), bald cypress (*Taxodium distichum*), pop ash (*Fraxinus caroliniana*), live oak (*Quercus virginiana*), laurel oak (*Quercus laurifolia*), water oak (*Quercus nigra*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), red cedar (*Juniperus silicicola*), sweet bay (*Magnolia caroliniana*), red bay (*Persea borbonia*), loblolly bay (*Gordonia lasianthus*), pignut hickory (*Carya glabra*) and basswood (*Tilia americana*). The distribution of these species across the forest is highly variable, with some species attaining a greater dominance in wetter areas. Periods of inundation occur less frequently in hydric hammocks than in typical floodplain forests, which may otherwise support a fairly similar canopy.

The understory in hydric hammocks can be relatively sparse due to the dense canopy, but includes such species as cinnamon fern (*Osmunda cinnamomea*), shield fern (*Dryopteris leudoviciana*), swamp fern (*Blechnum serrulatum*) and dahoon holly (*Ilex* cassine). Cinnamon fern and shield fern have both been designated as threatened species by the Florida Department of Agriculture (FDA). Other noteworthy plant species that occur in the understory of the Preserve's hydric hammock include Florida milkweed (*Matela floridana*) and needle palm (*Rhapidophyllum hystrix*), which have been designated as endangered and commercially exploited, respectively, by the FDA.

Wildlife dependent upon the hydric hammock forests, and the associated cabbage palm hammocks and mesic hammocks discussed below, are highly varied. The occurrence of a black bear population in this area is highly dependent upon these communities, which provide the dense cover and seclusion so coveted by this species. An assortment of resident and migratory bird species also depend on the dense, unbroken canopy provided by these forests.

Cabbage palm hammock, which may actually be considered a variant of the hydric hammock community discussed above, accounts for approximately 137 acres, or 2 percent of the total Preserve land area. These hammocks support a much less diverse canopy, consisting primarily of cabbage palm, live oak and red cedar. They occur as islands scattered through the salt marsh, or as stands sandwiched between hydric hammock and salt marsh. The canopy of cabbage palm hammock consists of the most salt-tolerant species found in hydric hammock.

Vegetation Map for the Weekiwachee Preserve



- Cabbage Palm Hammock
- Cypress Swamp
- Disturbed
- Pine Flatwoods
- Freshwater Marsh
- Hydric Hammock
- Mesic Hammock
- Open Water
- Salt Marsh
- Pine Plantation
- Sandhill
- Scrub
- Tidal Flat
- Major Roads
- Weekiwachee Preserve
- Proposed Addition

Scale 1:62,000

Like the hydric hammock community, the Preserve's cabbage palm hammocks have special significance to the black bear population. The fruits produced by cabbage palms are an important seasonal food source for black bears.

Small stands of mesic hammock colonize slightly elevated ridges scattered through the hydric hammock. These forests cover approximately 170 acres, or around 2 percent of the Preserve. The composition of the overstory in these areas is similar to that of the hydric hammock, but supports a larger component of hickories, basswoods and oaks. They also support magnolia (*Magnolia grandiflora*).

In contrast to the wetland and mesic communities discussed above, the xeric scrub and sandhill communities occur on well-drained sands that coincide with the areas of highest elevation, generally above 10 feet NGVD. These elevations correspond with relict dune lines and, as such, are configured as a broken series of narrow ridges scattered throughout the hydric hammock forest. Scrub sites are dominated by a sand pine (*Pinus clausa*) overstory and a diverse understory of shrubs including sand live oak (*Quercus geminata*), myrtle oak (*Quercus myrtifolia*), Chapman oak (*Quercus chapmanii*), shiny blueberry (*Vaccinium myrsinites*) and saw palmetto. Although accounting for a total land area of only 170 acres (2.4 percent of total), the scrub sites provide critical habitat for some of the Preserve's most significant wildlife species, including the gopher tortoise (*Gopherus polyphemus*), Eastern indigo snake (*Drymarchon corais couperi*), and Florida black bear. It is likely that many species more dependent on the low lying forests that dominate the Preserve may take refuge in these sites during tidal surges that flood much of the property.

Sandhill accounts for only 5 acres of Preserve area. It supports a canopy of longleaf pine and turkey oak (*Quercus laevis*), and a groundcover of wiregrass (*Aristida stricta*). Like the scrub sites, the sandhill provides habitat for gopher tortoise, Eastern indigo snake, and other upland dependent species.

Pine flatwoods is the second-most prevalent natural community in the Preserve. Nearly 1,000 acres, or 13 percent of the Preserve, supports the longleaf pine (*Pinus palustris*), slash pine (*Pinus elliottii*) and saw palmetto (*Serenoa repens*) that distinguish this community. Pine flatwoods generally occur along the upland-wetland interface, at elevations that are intermediate between those of the wetland communities and the higher scrub and sandhill sites. Like the xeric communities discussed previously, the pine flatwoods support a complement of wildlife species that require upland habitats. They also provide important seasonal foraging areas for the opportunistic black bear.

Salt marsh and freshwater marsh account for 590 acres (8 percent of total) and 190 acres (2.5 percent of total) of total Preserve area, respectively. Both communities are dominated by herbaceous vegetation, with the former representing a transitional community interposed between the marine system of the Gulf of Mexico and the terrestrial areas of the Preserve. It is restricted to intertidal zones and is characteristic of coastlines that are subjected to waves of very low energy. Scattered tidal flats, which support very sparse vegetation, are interspersed within the salt marsh. Salt

marsh is dominated by a dense growth of black needlerush (*Juncus roemerianus*) and provides habitat for a number of distinctive wildlife species, including Marian's marsh wren (*Cistothorus palustris marianae*) and Scott's seaside sparrow (*Ammodramus maritimus peninsulae*). Both species have been designated species of special concern by the FGFWFC. Other wildlife species that depend on habitat provided by the salt marshes of this coastline include the bald eagle, Florida clapper rail (*Rallus longirostris scottii*) gulf salt marsh snake (*Nerodia clarkii clarkii*) and diamondback terrapin (*Malaclemys terrapin*).

Freshwater marshes are scattered widely across the property and grade into salt marsh at some locations. The freshwater marshes of the Preserve are dominated by sawgrass (*Cladium jamaicense*) and an assortment of shrubs, including wax myrtle (*Myrica cerifera*) and St. Johns Wort (*Hypericum sp.*). These systems support an array of wading birds and amphibians. The gopher frog, which has been designated a species of special concern by the FGFWFC, is dependent upon freshwater wetlands as breeding habitat. The little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*) and white ibis (*Eudocimus albus*) are also listed as species of special concern and are sighted regularly in the Preserve's freshwater marshes.

Open water accounts for approximately 500 acres, or 7 percent of the Preserve area. Natural surface waters include the headwater springs of Minnow Creek and small areas associated with the Weekiwachee River. The vast majority of open water consists of water-filled mine pits, which are remnants of commercial limerock mining conducted prior to the District's acquisition of the Preserve. Disturbed lands on the Preserve are likewise associated with this historic use of the property and account for a land area of 560 acres surrounding the pits. Together, the pits and adjoining disturbed lands comprise 15 percent of the total Preserve area. Reclamation of the pits resulted in the creation of littoral shelves along some sections of shoreline. Overall, there is very little shallow water habitat in these artificially-created lakes, where average depths range between 40 and 60 feet. However, the lakes draw increasing numbers of waterfowl, particularly during seasonal migrations. The disturbed lands surrounding the lakes support very little native vegetation. The substrate in these areas consists of either exposed limerock or a thin veneer of depauperate soil overlying limerock.

In spite of the degraded, unnatural character of the mine area, the open water of the lakes fulfills an important habitat need for wildlife in the remainder of the Preserve. During the dry season and periods of drought, the water may satisfy a critical need of wildlife. Signs of wildlife use are common around the perimeter of the lakes in the Research Area. The lakes are also the primary attractant for the waterfowl species that use Preserve. Finally, the recreational appeal of the lakes provides the potential for a number of recreational uses that could otherwise not be accommodated on the property. It is anticipated that the lakes will serve as the focal point for most recreational use of the Preserve.

WATER MANAGEMENT BENEFITS

The District acquires land to achieve a number of different water management benefits, in addition to outright preservation or restoration of natural systems. These benefits include protection of water conveyances, enhancement of water quality and maintenance of natural flood controls. The following discussion describes some of the hydrological features of the Weekiwachee Preserve, the functions associated with them and the benefits expected from their management. This includes any land management objectives or strategies that are critical to maintaining or preserving those benefits.

The primary water management benefits served by public ownership of the Weekiwachee Preserve include preservation of natural water conveyances and discharge areas, as well as the maintenance of surface water quality. Also, since roughly 84 percent of the property is in the 100-year floodplain, flood protection is a major benefit obtained from public ownership. Maintaining the property in a natural, undeveloped state provides a buffer against severe storm damage for nearby inland residential communities such as Spring Hill. These water management functions and benefits are described in greater detail below.

Water Conveyance

The Weekiwachee River and associated lowland forests drain a local watershed that is approximately 34 square miles in total area. The Weekiwachee system is part of the larger Upper Coastal Watershed, which extends roughly from the Withlacochee River in the north to the Anclote River in the south. Most of this water comes from recharge areas located to the east of the Preserve, along the Brooksville Ridge, rather than from percipitation. Most rainfall returns to the atmosphere through evapotranpiration.

Surface Water

The Weekiwachee River is a 7.5 mile run that forms part of the northern border of the Weekiwachee Preserve. The Preserve includes about 5.8 miles of the southern bank of the river, which is designated as a Class III surface-water body (suitable for recreational uses and propagation and maintenance of healthy fish and wildlife population). The majority of the river's flow originates from the Weekiwachee Springs complex, a first magnitude spring having an average discharge of 176 cubic feet per second (5 m^3/s; from period of record 1931 to 1984; Fretwell, 1985). The complex lies outside the Preserve's eastern boundaries and is the site of a well-known tourist attraction. Additional sources of flow are contributed by Little Springs and other lesser seeps along the river's course. The flow is rapid through its natural reaches but becomes sluggish downstream in areas where it has been dredged and canalized for riverfront developments. Water movement in the canals is negligible and occurs mainly due to tidal fluctuations.

Numerous other smaller springs and seeps occur in the region in addition to those along the Weekiwachee River. Most of them are tidally influenced and may discharge brackish water. Mud Springs and its associated river emanate from just such a tidally-influenced head and joins the Weekiwachee River near its mouth at the

Gulf of Mexico. Both the Weekiwachee River and the Mud River serve as conveyance channels for spring discharges and do not receive significant surface runoff from adjacent bottomlands because most precipitation enters directly into the aquifer through the porous land surface (SWFWMD, 1991). It has been suggested that the bottomlands themselves function as one large, diffuse spring (Fretwell, 1985). A shallow watertable, moderate hydroperiod and low frequency of fire are the typical conditions that perpetuate this wet flatland. Water flow through these areas is generally westward toward the Gulf, although evapotranspiration and percolation affect outflow.

The coastline within and adjacent to the Preserve is an area of moderate tidal range (2.4 feet) and very low wave energy. These low energy conditions give rise to extensive salt marshes dominated by black needlerush. The continuous and copious flow of freshwater into the Gulf from the inland areas effectively forms an estuarine environment along the entire coast. Marine flooding of the marsh occurs irregularly as a result of seasonal rises in sea level and by a combination of lunar and windblown tides.

In addition to the natural hydrologic features already mentioned, several artificial features are present inside the Preserve. Nearly 500 acres of the Preserve was mined for limerock prior to the District's acquisition. As a result, a series of 15 pits ranging in depth from 35-60 feet (10 to 18 m) were excavated in the southwest portion of the Preserve. This mining activity exposed the underlying Floridan Aquifer, filling the pits with water. In 1995, reclamation was performed on these artificial lakes as a prerequisite to District acquisition. Additional reclamation was conducted in compliance with mining permit requirements imposed by Hernando County. Several of the lakes were linked together by dredging and culverts to redirect water flow and some of the spoil was recontoured to established littoral vegetation zones along their edges. However, there are still major restoration challenges remaining around the mined area, including: the steep dropoff of the lake edges; altered surface and subsurface soil layers; large overburden mounds and erosion gullies; nuisance and exotic plants and unvegetated limerock and littoral shelf. In addition to the lakes, there is a ditch that extends about 1.25 miles between the mined area and Shoal Line Boulevard. It serves to limit all but pedestrian access along that portion of the Preserve.

Groundwater

The Weekiwachee Preserve lies within the Northern West-Central Groundwater Basin (also called the Coastal Springs Basin, SWFWMD, 1991). An area of approximately 3,400 square miles (8806 km^2) contributes groundwater to the basin, with most of it occurring in the Floridan Aquifer system. This serves as the primary potable water source in Hernando County since the yield and quality of the water is generally high. Groundwater in the aquifer generally flows northwesterly toward Weekiwachee Springs from a potentiometric high southwest of Dade City. The top of the Floridan Aquifer outcrops at the coastline and is approximately 600 feet deep (Yobbi, 1989a). This aquifer is generally unconfined at the Preserve because of the lack of thick clays or low-permeability limestone that may retard vertical flow of water (Fretwell, 1985). As a result, groundwater rises to an

elevation approximately 10 feet below NGVD at the southern and eastern portions of the Preserve. Infiltration from the aquifer and seepage back into it is quite common in the area. A surficial aquifer system also exists in some areas of Hernando County, although in the area of the Weekiwachee Preserve it is too thin or clayey to comprise a significant secondary aquifer (SWFWMD, 1991).

Hydrographs from two Floridan Aquifer wells located near the Preserve showed a normal seasonal trend with minimum water levels in late spring (Fretwell, 1985). Maximum water levels were recorded in early fall, at the end of the wet season. Water levels for the Weekiwachee Well fluctuated only 10.3 feet (3.14 m) over a 17 year period (1966-1983). Even though water levels have fluctuated seasonally over the years, the hydrographs do not indicate any long-term trend toward higher or lower levels (SWFWMD, 1991).

Several test-wells were drilled on the southwest portion of the property in the vicinity of the mined areas, but these were plugged prior to District acquisition. However, one remnant 3-inch well remains in use as a groundwater monitoring site for tracking conditions in the Floridan Aquifer. It was originally used to supplement water supplies to Hernando Beach residents and it is still referred to as the "Hernando Beach Supply Well." A reinforced foundation remains next to the wellhead from this historic usage. Since the wellhead is adjacent to the area of heaviest recreational use, the liability resulting from leaving this concrete and metal structure in place should be evaluated and, if necessary, the foundation should be removed. The wellhead itself will be raised to a height of three feet and given an aluminum case lock to prevent vandalism (Chris Tomlinson, pers. comm.).

The potential for future groundwater supply development at the site is limited because of its proximity to the saltwater interface and because of the presence of major springs in the area. Pumping from wells or nearby sinks would certainly lower the potentiometric surface of the Floridan Aquifer, thereby increasing saltwater intrusion and lowering spring discharge (SWFWMD, 1991). This would have an adverse impact on the estuaries and other natural communities that rely on the regular, steady flow of freshwater from the Weekiwachee River and other associated sources.

Management Actions and Strategies:

- ❑ **Secure and protect the remnant well for continued use as a monitoring site.**

- ❑ **Refrain from initiating any large-scale withdrawals of groundwater from the Preserve in order to avoid impacts to spring discharge and prevent inducement of saltwater intrusion.**

Water Quality Maintenance

In general the quality of groundwater and surface water at the Preserve is good. Keeping the Preserve in a natural state will help maintain this condition by removing the potential for adverse development on its rivers, estuaries and other sensitive areas. Even so, the Preserve's proximity to the coast and the development already located

along its borders have a great impact on its water quality. These influences must be considered in order to appropriately manage the Preserve.

The Influence of Salinity

Along the Nature Coast, saltwater is present in the upper reaches of the Floridan Aquifer and within the tidal reaches of the coastal rivers and creeks. Both natural and man-induced actions influence the extent of this saltwater intrusion. Natural causes of intrusion include severe weather, tides and fissures through the aquifer. The underground saltwater/freshwater interface ranges from shallow along the coastline (0-250 feet) to a depth in excess of 2,000 feet further inland. The surface advance of saltwater is largely a function of tidal stages and is held in dynamic equilibrium by the overriding freshwater moving seaward. Along the Weekiwachee River this process results in a salinity gradient which generally extends up to the State Road 597 bridge (Figure1.).

Estuaries occur where freshwater mixes with saltwater at the surface, as at the confluences of the Weekiwachee and Mud rivers and the Gulf of Mexico. The constant, reliable input of freshwater is a critical component in the healthy maintenance of this system. The grassbeds, saltmarshes and other estuarine habitats provide essential foraging and refuge areas for many marine organisms. For instance, oysters (*Crassostrea spp.*) are more tolerant of the lower salinities found in the estuary than are their major predators and commensals. Flow changes caused by freshwater diversion can increase salinity and lead to greater predation and fouling of the oysters (Wolfe, 1990). Many other commercially important fish and shellfish species also depend on estuaries during their larval and juvenile stages. This is of significant importance to human consumers. In Hernando County, nearly 371,000 pounds of shellfish were landed in 1995, representing over 95 percent of all the seafood landings in the county (UF Bureau of Economic Research, 1996). Bluecrabs and shrimp accounted for the majority of shellfish landed.

Much of the productivity of the estuary can be traced to the saltmarshes. The total production of biomass in salt marsh communities may exceed that of intensively-managed agricultural lands (FNAI, 1990). It has been estimated that the economic value of an acre of saltmarsh, based on its overall productivity and contribution to fisheries, is 4-5 times that of high quality farmland (US Fish and Wildlife Service and Minerals Management Service, 1990).

Human activities can have serious negative impacts on this productivity. Flow changes caused by freshwater diversion or alteration can increase salinity. In particular, large withdrawals of water from the aquifer, particularly near the coast, can increase saltwater intrusion. Another major human-induced cause of intrusion is uncontrolled dredging and channel improvements and the excavation of lateral canals along coastal rivers. This may remove natural controls upstream which can lead to lower flow levels and the migration of Gulf tides farther upstream. The water conveyance role of the Weekiwachee and associated rivers is critical to the maintenance of the estuary and the extremely productive habitat it represents. Thus, the long-term protection of the estuary will depend on the preservation of natural

freshwater flow from the Weekiwachee River and other related sources.

Management Actions and Strategies:

- ❑ **Prevent impacts to the freshwater discharge rate of the Weekiwachee and Mud Rivers by avoiding any large-scale withdrawals of groundwater.**

Elevated Levels of Nitrate

Waters from the Weekiwachee River are characterized by a dilute, relatively constant mineral content (Yobbi, 1989b). However, groundwater nitrate concentrations have been increasing steadily along the entire Coastal Springs basin since the 1960's. The mean nitrate level of the Weekiwachee main headwater spring is 0.53 mg/l, or over 50 times higher than natural background levels (<0.01 mg/l) (Jones et al., 1997). Recent District studies indicate that the greatest local source of groundwater nitrogen is the inorganic nitrate of turf fertilizers used on nearby golf courses and residential lawns. A comparatively minor contribution is made by organic nitrate, with poultry, pasture fertilizer and cattle identified as the greatest sources. Since this nitrogen loading has occurred for so many years it is now entrained in the groundwater system, and there is little that can be done to immediately reduce the load. If nitrogen loading were reduced in the recharge areas to the east of the Preserve, it would likely take a decade or more of flushing time before levels decreased in the Weekiwachee system. Future management of the Preserve must actively promote measures that will minimize additional nitrogen loading to the area. Such measures will include connecting any future restroom facilities to a central sewer system and avoiding the use of managed turf areas or other landscaping that would require the use of fertilizers.

It will be important to determine what impact elevated nitrogen levels are having on the natural communities of the Preserve and the Weekiwachee River channel. At the initiative of the Coastal Rivers Basin Board, the District recently began a two-year study to examine the consequences of the changes occurring in the basin. The study, undertaken by the District's Surface Water Improvement and Management (SWIM) Department and the University of Florida, will examine the nutrient content of the Withlacoochee, Crystal, Homosassa, Chassahowitzka and Weekiwachee rivers. Since nitrogen is a limiting nutrient in the estuary and saltmarsh environments, there is a strong likelihood that significant biotic changes are occurring in these systems as a result of its greater availability. Changes in vegetative composition of the springruns and estuary, relative to baseline conditions documented in the initial stages of monitoring, will provide a basis for projecting future conditions and may suggest methods of remediation. Management recommendations should consider the results of this District study and should be incorporated into future updates to this conceptual plan.

Management Actions and Strategies:

- ❑ **Ensure that any future restroom facilities on the Preserve are sited to accommodate connection to central sewer.**

- ❑ **Avoid establishment of any managed turf areas or other**

landscaping that would require the use of fertilizer.

- ❑ **Monitor the results of research investigating the impact of elevated nitrates on the natural communities of the Preserve and Weekiwachee River to identify remedial measures for mitigating the impact.**

Elevated Bacteria Counts

In addition to elevated nitrate concentrations, the Weekiwachee River has also periodically experienced increased levels of coliform bacteria. Even as early as 1968, concern was raised about the elevated bacteriological counts found in the lower reaches of the Weekiwachee (SWFWMD, 1968). The highest bacterial counts usually come from the areas of greatest development along the river. Elevated counts can be the result of animal waste and septic tank leachate, stormwater runoff, as well as a result of the natural conditions in the adjacent bottomlands. Coliform counts have exceeded health department standards on several occasions, resulting in closure of the swimming area at Roger's Park. Maintaining the Weekiwachee Preserve in a natural state will eliminate the potential for human-induced coliform contamination originating from the Preserve property.

Former Mining Pits

The former limerock pits are generally considered biologically "sterile" in comparison to a natural lake environment and since the water comes directly out of the Floridan Aquifer, the overall quality is excellent. These conditions have invited an interest in the development of a swimming beach along one of the pits. Such recreational usage may possibly lead to deterioration in overall water quality in the pits, which will be the subject of regular water quality monitoring in order to comply with statutory requirements established for the management of public bathing areas. Adherence with the public health standards dictated by these requirements will be adequate to protect users of the lakes. Increased and continuing use of the pits by shorebirds and migratory waterfowl may also have an impact on water quality through increased nutrient contribution by the birds. The results of regular water quality monitoring, once such a program has been implemented, will be tracked by land management staff for any trends indicative of eutrophication of the lakes.

Management Actions and Strategies:

- ❑ **Evaluate the results of regular water quality monitoring conducted in association with establishment of a public swimming area, to identify trends in nutrient levels.**

Oil Spills

Oils spills may represent the most potentially-catastrophic threat facing the saltmarsh communities of the Nature Coast. The sensitivity of the local coastline to oil contamination has been analyzed and it was determined that of all the various forms of shoreline represented in the region, saltmarsh and mangrove systems are the natural communities that would be most severely affected by oil contamination (Research Planning Institute, Inc., 1984).

Long-term environmental impacts would be least severe along sandy beaches. It has also been suggested that marshes would be extremely difficult, if not impossible, to clean or rehabilitate following contamination. The District should examine any emergency response strategies that have been outlined for the coastline along the Weekiwachee Preserve and be prepared to assist or expedite the implementation of such measures. In the event that an adequate emergency response strategy has not been elucidated, the Florida Department of Community Affairs should be strongly encouraged to develop such a strategy with a clearly established chain-of-command and assignment of responsibility.

Management Actions and Strategies:

- ❑ **Develop an emergency response strategy for oil spills that may occur along the Preserve's coastline.**

Natural Flood Control

Maintaining the Weekiwachee Preserve as an undeveloped natural area has two major flood control benefits. First, the Preserve functions as a natural buffer between the coast and existing inland developments, providing protection against tidal surge, erosion, high-velocity winds, and other impacts of severe weather. A majority of the Preserve lies within the 100-year floodplain and is extremely susceptible to inundation, as demonstrated during a severe weather event in March, 1993. The wetland areas and floodplains of the Weekiwachee Preserve have a natural ability to store water and slow run-off generated by storms. The loss of this capacity may increase flood heights and runoff velocities elsewhere (FDCA, 1986). Thus the pubic interest in preserving this function is great and is one of the major factors motivating contemporary efforts to preserve such wetlands. This strategy of non-structural flood protection has been embraced by the District and has received greater emphasis as the environmental and fiscal impact of structural controls, and the consequences of their catastrophic failure, have become evident. In addition, structural control is usually a long and costly process, with the price often borne by the majority of the public for the benefit of relatively few.

Unfortunately, communities lying to the west of the Preserve do not receive the major benefit of the Preserve's storm buffering ability. However, in order to alleviate the fears of local residents, the District cut several 100 foot breaches at 500 foot intervals into a berm that parallels Shoal Line Boulevard on the western perimeter of the property. Residents were concerned that the berm would block dispersal of storm surges.

The second flood control benefit of the Weekiwachee Preserve is the effective elimination of future developmental impacts within its boundaries. Unlike other disaster events, flooding occurs in areas which can be defined with a fair degree of certainty. It is therefore possible to prevent catastrophic property damage by avoiding development in flood-hazard areas, like the Preserve. The conservation of this area eliminates the potential cost of rescue operations, disaster relief, rebuilding of flood-damaged public infrastructure, public health precautions and general economic disruption.

In contrast to coastal flooding, the potential for out-of-bank flooding from rivers associated with the Preserve is nominal. Most of the riverine discharge comes from spring flow and is relatively steady on a year-round basis. In addition, the local watershed is extremely flat and contributes little additional discharge to the rivers. Tidal movement, especially during severe coastal storm surges, is much more likely to influence channel stages and the river floodplain. Only during very high volume storm events (over several days) would the storage volume of adjacent bottomlands be exceeded and produce high discharge rates (SWFWMD, 1991).

Sea Level Rise

One final consideration regarding the water management functions of the Preserve may place increased emphasis and urgency on the need for a thoughtful long-term approach to District stewardship. It has been projected that sea level will rise from 1-2 meters over the next century in response to human-induced global warming trends. If those estimates prove accurate, then 30-80 percent of the nation's coastal wetlands will be inundated by rising water levels (US Environmental Protection Agency, 1987). The ability of coastal wetlands to migrate inland in response to rising tides will be severely limited by a lack of undeveloped uplands adjoining the coast and the relative rapidity of the rise. The marshes of Florida's Gulf Coast, especially those of the Nature Coast, may be among the most resilient given the expanse of natural lands that adjoin the existing salt marsh system and the physical configuration of the shoreline. It has been projected that these salt marshes could expand in total area (USEPA, 1987), although such expansion would be of short duration and would occur at the expense of existing hydric hammock and adjoining upland communities that are also of noteworthy natural value. In any event, the adverse environmental consequences of the projected rise in sea level attaches additional long-term importance to maintaining the integrity of this unaltered coastal system.

CONCEPTUAL LAND USE PLAN

Special Protection Areas

Certain areas within the Preserve will warrant special protection efforts to more effectively preserve water management functions and/or other outstanding natural values. Any areas that are extremely sensitive to disturbance; that harbor unique or regionally-significant natural features; or that play a critical role in maintenance of the water management values attributed to the property will merit designation as a Special Protection Area. Typically, Special Protection Areas must be discrete features that can be readily defined. Protective measures in these areas must take precedence over other land use and management considerations.

Special Protection Areas designated for the Weekiwachee Preserve include: the Shorebird Nesting Area; the Research Area located in the northeast corner of the mined portion of the Preserve; protection zones around active bald eagle nesting sites; stands of scrub vegetation; the on-site shoreline of the Weekiwachee River; and any archaeological sites known to occur on the property. Additional Special Protection Areas may be designated in the future on the basis of colonization or regular use by an imperiled species, establishment of a colonial nesting site, or in recognition of other significant resource values or concerns.

Shorebird Nesting Area

A central portion of the lake complex has served as a seasonal nesting site for Least terns *(Sterna antillarum)*, Wilson's plovers *(Charadrius wilsonia)*, and killdeers *(Charadrius vociferus)*. Although monitoring of the site during the 1997 nesting season indicated that some of the plover nests successfully fledged young, it was also observed that the terns abandoned the site prior to the end of the nesting season. This abandonment was an apparent response to disturbance associated with recreational use of the area. The nesting area will be closed to human use at the onset of the nesting season and will remain closed until nesting has concluded. Appropriate signage and barriers or fencing will be erected to protect the site from disturbance and exposure to predators. Closure will be discontinued at the conclusion of each nesting season. Measures to reconfigure recreational trails will be considered in order to facilitate uninterrupted recreational use while bypassing the sensitive area around the nesting site.

Management Actions and Strategies:

- ❑ **Close the Shorebird Nesting Area to public access throughout the nesting season.**

Research Area

A segment of the mined portion of the Preserve has been designated a Research Area (Figure 4). This area, which encompasses 4 water-filled mine pits and totals approximately 200 acres in size, is located in the northeast corner of the mined area. Several experimental habitat restoration techniques have been employed at this site to determine their relative effectiveness at restoring natural vegetation to the mined lands. Contiguity of the Research Area with natural lands that

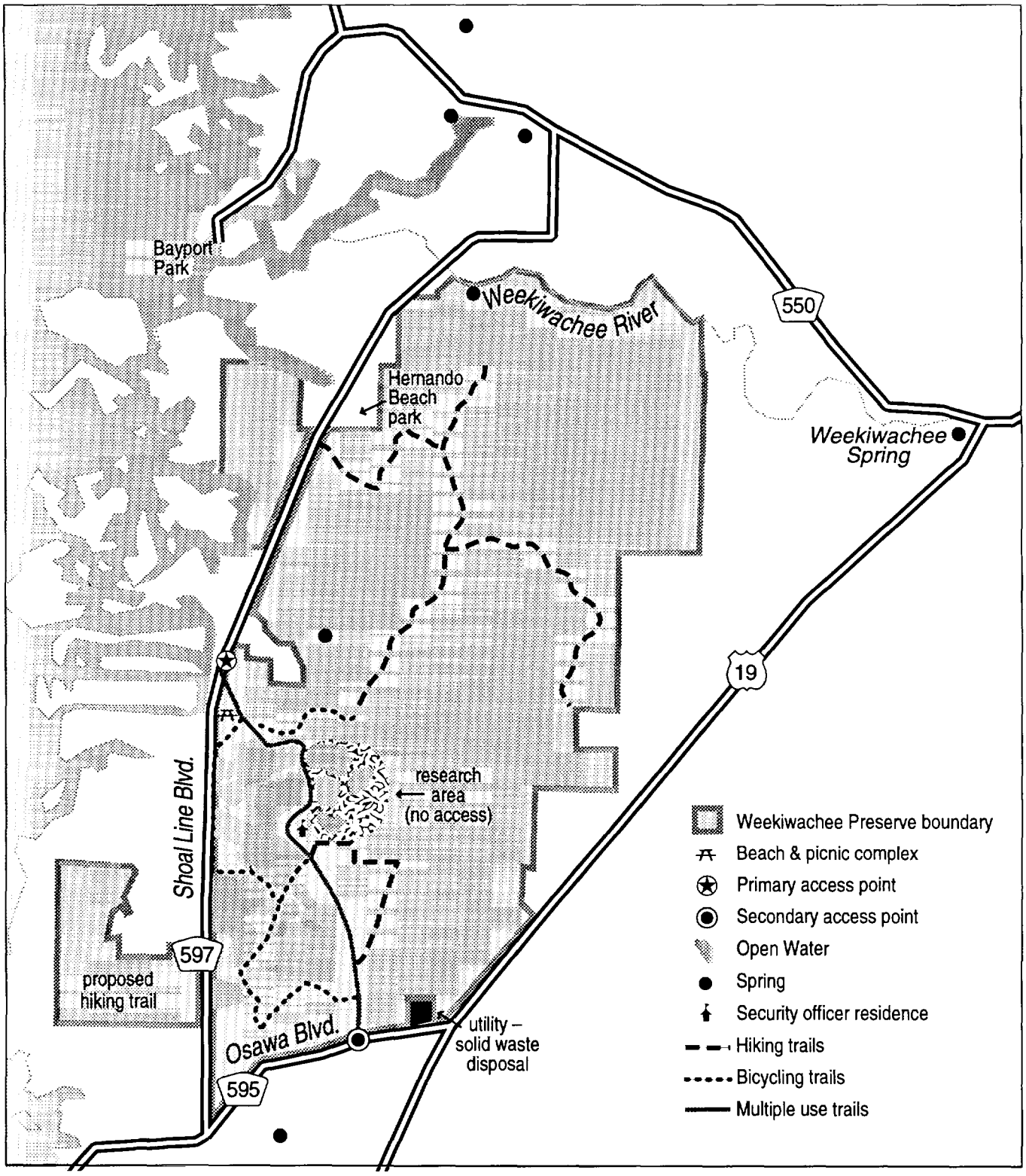


Figure 4 . Conceptual Land Use Plan

constitute the natural core of the Preserve make restoration at this location a high priority. The reestablishment of vegetative cover will provide additional habitat and cover for wildlife, in addition to enhancing the attractiveness of the pits for wildlife usage. The refinement of restoration techniques through experimentation, and the monitoring of results, will also allow for the application of appropriate technologies to the remainder of the mined lands. Such restoration across the entirety of the mined lands would significantly increase the area's suitability for wildlife while enhancing the aesthetic qualities for recreational users.

A portion of the Research Area will be dedicated to the creation of a sand beach that would be suitable for use by groundnesting shorebirds. As noted above in the discussion of the shorebird nesting area, it is presumed that disturbance associated with recreational use of the lake complex induced abandonment of the site during the 1997 nesting season. The beach creation project will be conducted in order to address long-term concerns regarding conflicts between future recreational use of the lake complex and successful nesting by shorebirds. Various methods will be employed to attract shorebirds to the created beach and to make it attractive for nesting in order to promote a natural shift in future nesting from the existing site to the protected refuge offered by the created site.

The Research Area will remain closed to public access to protect experimental sites and to reserve an undisturbed portion of the lake complex for use by wildlife. Appropriate signage and barriers will be maintained around the perimeter of the area to ensure that the public is clearly informed of its closure to access.

Management Actions and Strategies:

- ❑ **Implement and monitor the success of experimental restoration techniques.**

- ❑ **Maintain closure to public access within the Research Area.**

Bald Eagle Nesting Sites

A total of 3 bald eagle nests have been identified on the Preserve property. Annual monitoring of these nests by the FGFWFC suggests that they are active on a regular basis. The most recent monitoring results indicate that all were active during the 1996-1997 nesting season. Long-term records have documented a cumulative total of 24 fledglings produced by these nests during the 10-year period of 1987-1997.

Riparian areas along the coast or in close proximity to large inland lakes are the preferred habitat of the bald eagle. Historically, the bald eagle population of the central Gulf coast of Florida, together with that of the central Atlantic coast of Florida, comprised one of the most dense concentrations of a large, breeding raptor known to occur anywhere in the world (Florida Committee on Rare and Endangered Plants and Animals, 1978). Wholesale development of the Atlantic coast has essentially eliminated the eagle from that area; however, the west Central coastline, including especially the block of coastal habitat that encompasses the Preserve and extends northward, remains a primary stronghold of Florida's bald eagle population. Eagles are sighted regularly over the forests and water-filled mine pits of the Preserve.

Individual eagles can differ greatly in terms of their sensitivity to human presence and disturbance. However, disturbance around a nesting site can often induce abandonment of the nest and prevent successful breeding. Eagles that nest in extremely isolated sites may be particularly sensitive to human presence, in contrast to those that nest in more populated areas and may have developed a certain tolerance for human presence. The USFWS has drafted guidelines regarding activities that should be avoided around bald eagle nests (United States Fish and Wildlife Service, 1987). These guidelines, which are described in detail in the Wildlife Management section of this plan, recommend the establishment of exclusion zones around nests. Protective measures for the Preserve's eagle nests will be based on the recommended exclusion zones; however, this shall not preclude the possibility that restrictions on public usage of areas within exclusion zones may exceed those recommended by USFWS.

It is not unusual for a mated pair of eagles to maintain more than one nesting site. As a result, there may be intervals of inactivity at nests that are otherwise considered active. The Special Protection Area status extended to an active eagle nesting site will not be rescinded unless it has experienced at least 5 consecutive years of inactivity.

Management Actions and Strategies:

- ❑ **Establish exclusion zones around active nesting sites, consistent with USFWS guidelines.**

- ❑ **Maintain accurate records of nesting through annual monitoring.**

Scrub Habitat

There are several small stands of scrub habitat occurring on the Preserve. These sites, which account for a cumulative land area of approximately 170 acres, will be managed as Special Protection Areas on the basis of their importance to wildlife and sensitivity to disturbance. Protected species that depend on the Preserve's scrub areas include the Florida black bear, Eastern indigo snake, gopher tortoise, gopher frog and Curtiss milkweed. Although the densely-forested hydric hammock serves as the primary habitat of the Preserve's bear population, these forests cannot provide all the long-term habitat needs of the population. Areas that are inhabited by resident populations of the Florida black bear usually consist of large tracts that support several different types of forested communities (Maehr and Wooding, 1992). Intermingled stands of scrub and pine flatwoods provide valuable areas for foraging. It is suspected that the scrub sites satisfy an essential habitat need of the Weekiwachee/Chassahowitzka bear population on the basis of visual evidence and behavioral observations(Simons, 1990). This species is described as an opportunistic feeder that frequently depends on acorns produced by fall mast as an important seasonal food source (Maehr and DeFazio, 1985). Other highly favored food items, including palmetto berries, blueberries and armadillos, also occur in greater abundance in the scrub than in the adjoining forests. In addition to fulfilling this important seasonal habitat need, the high, well-drained scrub stands may provide important areas of refuge for bears and other wildlife during storm-related tidal flooding of the low-lying hydric hammock that constitutes the bulk of the Preserve.

Scrub is a fire-maintained community and the primary management need for these sites will be the periodic application of prescribed fire. This need is discussed in greater detail in the Prescribed Burning section of the plan. Protection from disturbance will also represent an important management need. The well-drained sands that are characteristic of scrub cannot support sustained traffic by motorized vehicles, bicycles, or people on horseback. Given the importance of these sites to an array of wildlife species, the shy nature of the Florida black bear, the limited areal extent of scrub, and the inability of the loose scrub sands to support high levels of traffic, human intrusion and disruption will be minimized by reserving access to those on foot only. Vehicular traffic will be restricted to those engaged in official management or related functions.

Management Actions and Strategies:

- ❑ **Use prescribed fire to maintain habitat values for wildlife.**
- ❑ **Prevent disturbance and soil damage by limiting scrub areas to foot access only.**

Weekiwachee River Shoreline

The northern boundary of the Preserve is defined by nearly 4 miles of frontage on the Weekiwachee River. The entire riverfront along this reach of the river is composed of lush, densely-forested hydric hammock. As a wetland community that is frequently saturated and subject to irregular flooding, it is not well-suited to the development of recreational amenities, nor can it support high levels of concentrated physical activity without experiencing possible erosion and compaction of sensitive hydric soils.

Much of the Weekiwachee River shoreline remains in a natural state and provides a beautiful back-drop for canoeists, kayakers, fisherman, and other recreational users of the river. The endangered West Indian manatee *(Trichechus manatus latirostrus)*, which resides in the spring-fed coastal rivers of the region, is sighted regularly in the Weekiwachee. The appeal of the manatee, in combination with the beauty and pristine nature of the river, draw large numbers of recreationists. The recreational use of the river and downstream estuary contribute to the economic base of the surrounding area by drawing residents and tourists to local marinas, bait shops, restaurants, and other nearby commercial enterprises.

In recognition of the natural, aesthetic and economic values of the Preserve's riverfront, it will be managed as a Special Protection Area. No recreational development or physical improvement will be permitted, and access to the Preserve along the designated shoreline will be limited to those on foot. A growing infestation of invasive skunk vine will be aggressively controlled to prevent its spread and maintain the natural character of the river, consistent with District policy regarding invasive exotic species.

Management Actions and Strategies:

- ❑ **Preserve the natural, aesthetic, and economic values of the shoreline by preventing physical alteration or recreational development.**

- ❑ **Aggressively control the riverfront infestation of skunk vine.**

Archaeological Sites

Although the property does not contain any archaeological sites that are listed in the National Register of Historic Places, it is known to contain a number of sites that have been recorded in the Florida Master Site File. The District will coordinate with the Division of Historical Resources of the Florida Department of State (DHR) to determine the significance of these sites. Any future structures or recreational improvements planned for the Preserve, 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 unauthorized collectors, or "pot hunters". Security personnel assigned to the Preserve will be apprised of the locations of the sites and will be instructed to monitor the areas for signs of looting. Any currently undocumented sites will, upon discovery, be reported to the DHR for entry into the Master Site File and be afforded Special Protection Area status.

Although the District does not generally provide funding to support archaeological investigations and assessments, the Preserve sites may 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, or by accepted methods of professional investigation. The results or conclusions of any such research, including published literature, must be provided to the District for archival purposes and to ensure appropriate future management.

Management Actions and Strategies:

- ❑ **Consult with the DHR regarding the significance of known archaeological sites.**
- ❑ **Prevent disturbance of archaeological sites by directing recreational usage and improvements away from such sites.**
- ❑ **Monitor sites for evidence of looting and implement appropriate security measures.**
- ❑ **Review proposals for professional research to ensure consistency with accepted protocols and methodology.**
- ❑ **Report any undocumented sites to the DHR upon discovery and extend Special Protection Area status.**

Land Management

Prescribed Burning

Approximately 2,372 acres, or 18 percent of the total Preserve area, supports fire-maintained upland communities. These communities, which include scrub, sandhill and pine flatwoods, are dependent upon recurring fire for their long-term maintenance and viability. In the prolonged absence of fire, the structure and species

composition of these communities would gradually change and be of reduced value to wildlife. Given the degree to which the natural Florida landscape has been altered, and the need to prevent fires from escaping to adjoining private lands, the natural mechanism of lightning-induced fires cannot be expected to fulfill the fire needs of these communities. The use of prescribed fire will be necessary to achieve many of the stated land management objectives for the Preserve. Long-term fire management on the tract will be critical to maintaining these fire dependent communities in a natural, biologically productive state and to maintaining fuel loads that pose less potential for catastrophic wildfires. Appropriate burn seasons and fire return frequencies will be established for each fire-maintained community and will be adhered to whenever possible.

A long history of fire suppression on the lands comprising the Preserve has resulted in high fuel loads in the pine and scrub communities. The duff layer ranges in depth from 1-3 feet in some of the more productive areas, and many of the sand pine stands are extremely dense with low limbs that could act as ladder fuels and promote destructive, hard-to-control wildfires. Many of these on-site uplands are nested in a matrix of low-lying hydric hammock that will function as a natural barrier to the spread of fire and cleared fire lanes are maintained around the perimeter of the Preserve to prevent the off-site spread of fire. Smoke management may ultimately be the most problematic issue associated with implementation of a prescribed burning program due to the density of residential and commercial development adjoining the property and the proximity of heavily-traveled transportation corridors. Prescribed burn units have already been identified and initial hazard-reduction burns, designed to reduce fuel loads and the threat of wildifes, will be conducted in a timely manner. The constraints discussed above necesitate that burn units be small in size and that the prescription parameters guiding the scheduling of burns be carefully defined. Parameters such as wind speed and direction, relative humidity, and soil moisture levels will be carefully monitored prior to igniting any on-site prescribed fires to ensure that fires and smoke can be safely and effectively controlled.

Salt marsh communities are naturally susceptible to fire but the importance of recurring fire to maintenace of these communities remains undetermined. The natural disturbance mechanisms that maintain many coastal systems are primarily physical and geological processes such as wind, wave and tidal actions (Montague and Wiegert, 1991). Very little research has been performed to determine historic fire patterns in coastal vegetation communities or to identify the advantages and disadvantages of burning salt marshes. The USFWS currently utilizes prescribed fire to control encroachment of woody species and to enhance habitat value for wading birds, ducks and geese in the salt marshes of the Chassahowitzka National Wildlife Refuge (Olson, pers. comm.). It has been hypothesized that fire may also function to maintain open channels, or tidal creeks, that permit movement of salt marsh invertebrate species between areas of densly-vegetated marsh and open-water breeding ponds. One of the potential negative effects of marsh burning may be a reduction of detritus in both the water column and sediments. Since detritus is the food base for the estuarine community, severe depletions in such food

resources may result when burns are conducted. Literature on the burning of salt marsh will continue to be assessed to ascertain prescribed fire needs. If prescribed fires are conducted in these areas, they will be applied conservatively using small burn units on 5-6 year rotation cycles. The USFWS will be consulted to track the success of prescribed burning in the salt marshes of the Chassahowitzka National Wildlife Refuge.

Visions of fire burning through a natural area often evoke an understandable apprehension among neighboring landowners. The public is sometimes skeptical of the need for prescribed fire and may harbor fears or concern for their physical safety and for that of their property. The District will, upon request, provide workshops or seminars for residents of the area surrounding the Preserve apprising them of the rationale for conducting prescribed burns on the property. To the extent feasible, the District will also attempt to provide advance notice of impending prescribed fires to neighboring homeowners to minimize concerns and discomfort.

Management Actions and Strategies:

- ❑ **Maintain cleared fire lanes around the perimeter of the Preserve.**
- ❑ **Reduce fuel loads and the threat of wildfire in fire-maintained communities by conducting fuel-reduction burns.**
- ❑ **Restore, maintain or enhance habitat values of fire-maintained communities by implementing a prescribed fire program that mimics the natural frequency and seasonality of fire in these communities.**
- ❑ **Prescription parameters for prescribed fires will place a priority on careful management of smoke to avoid fouling of populated areas and major transportation corridors.**
- ❑ **To the extent feasible, provide advance notification of prescribed fires to surrounding residents and other affected members of the public.**
- ❑ **Provide educational workshops and literature to the community explaining the importance of prescribed fire to resource management and hazard reduction.**

Exotic Species Management

Management of exotic, or non-native, flora and fauna on District-held lands is addressed by District Procedure 61-9, *Control of Terrestrial Exotics on District-Owned Lands (Flora and Fauna).* Exotics pose one of the most severe threats to the function and integrity of native landscapes and the ultimate goal of the exotics program is complete eradication of the most invasive species. At a minimum, exotics on the former mine complex will be maintained below current density levels and areal coverage. No encroachment into natural systems will be tolerated, and spot treatment of species that have invaded into

these communities should occur immediately upon observation.
Exotics are problematic on the Weekiwachee Preserve, especially on the old mine lands and adjacent natural communities, and along the Weekiwachee River shoreline. Exotic plant control efforts around the mine pits will focus on eradicating and controlling Brazilian pepper (*Schinus terrebinthifolius*). One of the primary seed dispersal mechanisms for pepper is via wildlife, especially songbirds. The Preserve's black bear population may be another vector for the spread of pepper. Bears have been observed feeding on the ripe fruits of the pepper plants, which fruit prolifically in this portion of the property. Therefore, the ability of Brazilian pepper to encroach into natural systems on the site is high. An eradication strategy has already been implemented at the mined area, and treatment of spot invasions in the natural areas surrounding the mined lands have also been initiated.

Cogongrass (*Imperata cylindrica*) is another non-native species known to aggressively invade natural areas in Florida. Due to its ability to disperse by both seed and vegetative means, and its proclivity for invasion of a variety of habitat types, it will also be a primary target of eradication efforts. Initial herbicide treatments on all known infestations of this plant have already been conducted. Treatment of invasive vines, specifically air potato and skunk vine (*Paederia foetida*) will also receive high priority. Severe spot infestations of these species have been observed along the Preserve's Weekiwachee riverfront. Control of this infestation, given the inaccessibility of the location by overland approach, will require that the sites be accessed via the river.

Cattail and torpedo grass that occur on the littoral zones of the mine pits will be treated on an as-needed basis. These species probably are serving to stabilize the newly created littoral shelves and functioning as filters to trap fine sands eroding from the limestone substrate. Herbicide treatments followed by revegetation will be conducted in phases.

A former Hernando County solid waste transfer station was located on the north side of CR 595 (Osowaw Boulevard), directly adjacent to the southern access gate and abutting the south side of the property. This facility, now closed, contains yard debris and plant cuttings from local residents, and is a point source for the introduction of exotic and nuisance species into the Preserve lands. With the opening of a new facility a short distance to the east, Hernando County is in the process of cleaning up the old site. Following several applications of post-emergent herbicides, one or two treatments of a nonselective pre-emergent may be beneficial to prevent the establishment of assorted nuisance and exotic plant species. The retired site and the perimeter of the new site, which is also adjacent to the Preserve, will be monitored periodically to ensure that there is no spread of undesirable plant species onto the property.

The residential and commercial developments that border most of the Preserve represent additional sources of potential introduction of exotic species. Where property boundaries abut these areas, regular monitoring will be conducted to prevent encroachment of exotics into natural areas.

Management Actions and Strategies:

- ❑ **Aggressively control known infestations of invasive exotic species and any nuisance species that interfere with the success of restoration projects.**

- ❑ **Monitor the Preserve, particularly boundary areas, for new occurrences of exotic species and eradicate such occurrences to prevent establishment.**

Forest Management

Pine plantation comprises 54 acres, or less than 1 percent, of the total Preserve land area. Approximately 125 acres of planted slash pine, which were installed along the upland perimeters of some of the mine pits and also along road frontages, remain in former plantation sites. These pines range in age from 21 to 25 years (SWFWMD, 1996). The stands were heavily thinned prior to District acquisition of the property, and the groundcover and understory species typical of pine flatwoods have begun to regenerate at these sites. These stands will be maintained in the present condition until future thinning harvests achieve natural stand densities. In stands that are known to support pines of non-local, or "off-site", origin, the ultimate goal will be to remove the off-site species in favor of naturally occurring species.

The District's timber management program has historically established timber management zones on altered sites only, particularly pastures. Natural communities are not displaced in order to site silvicultural operations. Within the Preserve area there are no appropriate sites available for the establishment of a productive plantation. Altered lands on the Weekiwachee Preserve are extensive, but are almost exclusively old mine lands targeted for reclamation and recreation. Due to the highly altered soil strata and the absence of adequate soil depths, establishment of productive pine plantation on the mine landscape is not feasible.

Management Actions and Strategies:

- ❑ **Refrain from establishing or maintaining plantation on the Preserve in recognition of the marginal suitability of the site for silviculture, and of the need to maximize the extent of protected natural habitat in the local area.**

- ❑ **As trees in pre-existing plantation sites achieve appropriate age structure, conduct thinning harvests to restore a natural canopy coverage and promote recovery of natural understory and groundcover vegetation.**

- ❑ **Remove "off-site" pines where they occur and re-establish a canopy consisting of native species and local stock.**

Game Wildlife Management

Several factors make the Weekiwachee Preserve unsuitable for the intensive game management practices associated with tracts made available for public recreational hunting. The property's long, narrow configuration and adjacency to

heavily-populated areas and major transportation corridors render it unsafe for hunting with firearms. Management goals and needs related to threatened non-game species call for limiting public use of the natural areas of the Preserve to only passive, non-consumptive activities. The imperiled status of the resident black bear population, and the species' need for seclusion, lends additional emphasis to the need for maintaining the Preserve as a haven where bears and other wildlife are protected from a seasonal infusion of hunters.

Over 28,000 acres of publicly-owned land are made available to sport hunters in the Chassahowitzka Wildlife Management Area (Figure 3). Other publicly-owned tracts that are open for hunting provide a combined total of more than 243,000 acres of land that are available to hunters in the local area. This amounts to the vast majority of public landholdings in the region and provides an abundance of hunting opportunities. It also places a premium on sites that are reserved for year-round use by non-consumptive recreationists.

Hunting can fulfill an important wildlife management need when populations of typical game species exceed the carrying capacity of the habitat available to them. Overpopulation can result in damage to the natural resources of an area and produce unhealthy conditions in the population. Prior to the District's acquisition of the Preserve property, the site was leased for hunting and white-tailed deer was a favored game species. At present, deer populations appear to be moderate to high; however, there is no evidence of the vegetative destruction normally associated with overpopulation. Damage from feral hogs also appears to be minimal. If these or other species attain numbers that threaten the health and stability of the population, or the resources of the Preserve, then the District will consider conducting special public hunts as a management measure.

Management Actions and Strategies:

- ❑ **Reserve the property for non-consumptive recreational uses.**
- ❑ **Monitor the Preserve for evidence of game species populations that have exceeded the carrying capacity of the Preserve.**
- ❑ **Implement special public hunts, as necessary, to control wildlife populations.**

Habitat Restoration

A large percentage of the property remains in a relatively natural condition. The former mine area constitutes the most severe category of altered lands within the project boundary, and should be a priority target for restoration efforts. Minimal reclamation standards have already been achieved, including littoral zone creation, rechanneling of surface water flow, and minor recontouring of overburden. For various reasons, the mine pits should be maintained at current depths; these reasons include the recreational and ecological value of these features in their current condition, the inadequate amount of overburden available to fill the pits, and the need to replace upland soils with existing material.

Currently, the mine features provide habitat niches for an array of protected and rare species that was formerly provided by

natural communities which have been impacted to such a degree that they can no longer provide the required habitat function. For instance, rare plants adapted to karst outcroppings and alkaline conditions have colonized the steep walls of the mine pits, and various shorebirds are utilizing the exposed lime substrate as nesting habitat. Reclamation should be designed to either enhance habitat for these species or to provide vital habitat for other species that may occupy the site.

Revegetation of the limestone surface around the pits must be preceded by reestablishing a soil layer in some areas. The quality of stockpiled overburden will be determined via borings and, if appropriate, the overburden will be spread as evenly and deeply as possible at selected locations. Only plants adapted to high alkalinity levels and exhibiting high salt tolerances should be installed. Due to the limited depth of the soil, the installation of small trees and shrubs should be favored over large trees, especially in areas slated for recreational activities and facilities. Cattails and torpedo grass that currently dominate the littoral zones around the lakes should gradually be treated and replaced with more desirable macrophytes. Methods to recontour and stabilize the interface between the sand pit on the east side of the mine land and the existing sandhill and sand pine scrub habitat may be considered. Reclamation efforts should also target the eradication and control of exotic species, perhaps by removing or reconfiguring features that provide optimal habitat for the most invasive species.

The four lakes in the northeast quadrant of the mine complex have been designated a Research Area. Several experimental restoration efforts are underway in this area. Black bears and other wildlife utilizing this area will be monitored and efforts will made to restore or encourage habitat conducive to increased black bear and shorebird utilization. Efforts will be made to minimize the human impact in this area. Physical and visual buffers (vegetation, boulders, cables) may be established along the west boundary of these pits and the main north-south access road to deter human encroachment. Restoration in this area will focus on wildlife habitat needs.

The area designated for the most intensive recreational use (the western lake area) should be restored to increase aesthetic value, ensure public safety, and enhance fishery production. To increase the aesthetic value of the property, the breaches cut into the berm that extends parallel to Shoal Line Boulevard may be vegetated. It may be possible to spread a thin layer of overburden at these gaps to make them available for plant installation. Small trees and shrubs should be utilized in these areas.

The following provides a tentative restoration plan and implementation schedule for the Weekiwachee Preserve. Additional information, including on-site data and new restoration techniques, will continue to be collected and analyzed to direct restoration and allow appropriate revisions to the plan outlined in this document.

The most severe landscape impacts on the property have resulted directly from limerock mining activities. Approximately 800 acres were mined in the southwest portion of the proposed Oak Sound Development of Regional Impact prior to District ownership. Mining resulted in a series of pits and an exposed limestone

surface which supports sparse vegetation. The pits range in depth from 40-60 feet, and comprise approximately 430 acres of open water surface. The surface and subsurface soil layers were removed or drastically altered during the mining activities, and large overburden mounds were left in open areas around the pits. A berm approximately 2,900 feet in length was constructed parallel to Shoal Line Road as a visual and sound barrier to mining operations. In 1995, reclamation was performed prior to District acquisition to establish littoral zones, vegetate slopes, redirect water flow, and recontour spoil. Five breaches, each approximately 100 feet long, were cut into the berm at 5oo foot intervals in order to alleviate fears from local residents that it would block disbursement of storm surges and extreme tidal conditions during major storm events. Erosion gullies, nuisance and exotic plants, large spoil mounds, unvegetated limerock and littoral shelf, and deep pits still pose restoration problems.

The mine pits and the surrounding landscape are used heavily by local and migratory wildlife populations, particularly birds. Many of the mine features at least superficially replicate natural habitats which have been lost to development, fragmentation, and human disturbance. This artificial surface feature can be manipulated best to benefit avians. Therefore, shorebirds, waterfowl, wading birds, and songbirds will be monitored in order to ascertain how the current landscape is being utilized and then restoration efforts will be implemented to enhance this habitat function. Birds are also good indicators of how the restoration is progressing, since they are highly visible, very mobile, and require a variety of habitat parameters in order to meet their life needs. Preliminary data suggest that the mine pits provide significant habitat for waterbirds (migratory ducks, terns, gulls, anhingas, cormorants) and, to a lesser extent, marshbirds and shorebirds (plovers, killdeer, oystercatchers, herons, egrets). Although depth profiles have not been generated for all the pits, many of the diving ducks prefer larger open water bodies and deeper depths than wading birds. Habitat parameters that may require evaluation for various avian species include open water requirements, water depth, shoreline slope, shoreline vegetation, existing water conditions, and food/cover plants.

In this plan, each type of restoration is assigned to a classification indicating its priority. Priority 1 is the highest priority and Priority 3 is the lowest. This plan may be revised as more data are collected.

PRIORITY I

The two most urgent problems pertaining to restoration within the mine complex are erosion and exotic plant proliferation. Also requiring attention is hydrological restoration of forested wetlands, enhancement of shorebird nesting habitat, and establishment of plant donor sites.

Erosion - Dissolution of the limestone as surface water drains into the mine pits is causing large gullies and washouts. If left unresolved, sediment will continue to be deposited in the open water pits, degrading water quality and threatening the plant and animal life that is now utilizing the area. More importantly, the formation and expansion of deep gullies pose a safety risk to District staff and the general public, and eventually will reduce or eliminate access at some locations.

As a condition to purchase of the property, the District required the previous landowner to seed grasses and install sod directly onto the limestone surface. This method has not resulted in sufficient revegetation of the mine surface. Methods used by limerock mines in the local area to control erosion consist primarily of revegetation. Overburden is distributed uniformly over the reclamation unit at depths ranging from 6" - 12" and fast-growing herbaceous plant material is directly seeded over it. Turf grasses such as bahia or bermuda are commonly used. In addition, mixtures of little bluestem and native wildflowers have been used to successfully reduce erosion. The planting method suggested to minimize the effects of erosion while simultaneously establishing native ground cover is interseeding. Using this method, the entire reclamation unit is seeded with native vegetation, and strips of a suitable turf grass are planted at uniform intervals perpendicular to surface runoff flow into the pits. In areas designated for recreation, overburden may be spread at 6" and then seeded with turfgrass.

One technique currently being used to control erosion and establish vegetation cover is the Bonded Fiber Matrix System, which is a hydraulically-applied polymer that bonds to the soil surface, protecting against erosion caused by wind, rain, and surface flow. The compound can be used in combination with a hydroseeder. This method will be investigated more thoroughly to determine if it may provide desired reclamation results.

Control of erosion by distributing overburden on the limerock surface and planting vegetation tolerant of alkaline conditions should proceed as soon as possible. Prior to spreading, all exotics present on the overburden should be treated. The soil texture of the overburden is classified as sandy loam and is an adequate planting substrate; however a phosphorus/magnesium fertilizer should be added prior to or during planting/seeding to restore needed elements to the soil. Aesthetic plantings around those mine pits slated for recreational use should be conducted simultaneously with erosion control measures and should consist of small native trees and shrubs at strategic locations.

Exotic and Nuisance Plants - Exotic and nuisance vegetation is problematic throughout the Preserve area, but poses the most severe threat in the highly-altered mine landscape. The complete removal of native vegetation and the surface and subsurface soil layers, and subsequent exposure of the limerock substrate, has created conditions conducive to the establishment and proliferation of exotic and nuisance plant species. Brazilian pepper (*Schinus terebinthifolius*) is probably the most significant of these species. Other exotic species that occur on terrestrial portions of the mined landscape include cogongrass (*Imperata cylindrica*), pampas grass, lantana (*Lantana camara*), natal grass (*Rhynchelytrum repens*), castorbean (*Ricinus communis*), air potato (*Dioscorea bulbifera*), brake fern (*Pteris vitatta*) and the golden raintree (*Koelreuteria formosana*). On the littoral shelves, dense cattails (*Typha* spp.) are preventing the establishment of more desirable vegetation. In areas not dominated by nuisance cattails, non-native torpedo grass (*Panicum repens*) is encroaching.

Control of exotic and nuisance species must be conducted simultaneously with reintroduction of native plant cover in the mined landscape. Movement of overburden that is heavily infested with exotic species and their seeds may result in widespread reinfestation of these same exotics. One method that may control exotics, particularly Brazilian pepper, entails recontouring the spoil piles. In South Florida, Brazilian pepper has been found to be a favored food for black bears, and if bears are found to heavily utilize this species at Weekiwachee, elimination of Brazilian peppers should be followed by replacement with an ecologically-equivalent species such as saw palmetto or swamp dogwood. Methods of cost-effective soil sterilization will be further investigated. Phosphate mining companies will also be contacted to identify others methods to control exotics on material needed for later restoration efforts.

Shorebird Nesting

The literature indicates that several shore nesting birds utilize mined landscapes as nesting habitat. In 1996, several shorebird species were observed using the limestone substrate for nesting, including least terns, Wilson's plovers and killdeer. Several characteristics make mined landscapes attractive to shore-nesting species. These include light-colored substrate, lack of adjacent forested habitat, and proximity to an open water body that is similar to oceanic habitat - an unvegetated littoral shelf that drops rapidly to a deep water environment. Many shorebirds, including least terns, return to the same nesting habitat year after year. As such, it is imperative that suitable breeding sites be reserved for continued use.

Artificial beach habitat has been created at St. Marks National Wildlife Refuge. Similar work is proposed for the Preserve. Habitat enhancement would consist of spreading a sand mixture of suitable grade, porosity, and color onto the limestone substrate at the recommended configuration and depth. The best location to create shorebird nesting habitat will be in the Research Area, which would provide a protected and secluded site. Recreational use centered around the mine lakes appeared to induce abandonment of the existing nesting area during the 1997 nesting season (see discussion of Special Protection Areas). If it is determined that the proximity of forested edge in the Research Area would result in high incidences of egg and chick predation, then another alternative may consist of creating nesting habitat on the large east-west oriented island located in the northwest pit. An island would provide safety from predators and isolation from recreationists using the property. Nuisance plants may also be less easily dispersed onto the island due to its remoteness from seed sources. The need to control erosion will need to be evaluated against the need to replace dwindling nesting habitat. Ideally, a technique that controls erosion and enhances nesting habitat should be found, although the need to control erosion should take precedence over creation of nesting habitat.

Hydrological Restoration of Forested Wetland

Hydrologic restoration of the forested system to the south of the lake complex should be implemented immediately. Due to the extensive effort that will be required to repair the mine landscape, any simple procedure that can be conducted now that

will prevent large expenditures at a later date should proceed before the benefits are lost. According to representatives from Coastal Engineering, the wetland previously referred to was cleared just prior to acquisition by the District. Currently, species such as willow, red maple, sawgrass, and weedy ruderal vegetation are recruiting. Soil disturbance has been minimal and many of the hydric soils remain intact. Installation of one or more culverts under the existing limestone road should effectively reestablish hydrology, preventing oxidation of the soil and providing a seed source for progressive colonization of the site by wetland species. Planting of red maples, dahoon holly, and cypress would accelerate complete restoration of this wetland, and will be conducted at a later date.

Establishment of Plant Donor Site

Restoration of the littoral zones around many of the mine pits can be readily accomplished using a combination of herbicide application followed by planting of herbaceous species. The plant material can be propagated in some of the small depressions found on or near the mine complex. Pickerelweed, arrowhead, pond flag, soft rush, cordgrass, sawgrass, spikerush, and smartweed can be planted and allowed to proliferate in these areas, and then harvested periodically for installation on unvegetated littoral shelves. Establishment of on-site donor wetlands will eliminate the need to purchase the material or harvest it from natural on-site wetlands. Plant installation could be conducted during special "Restoration Days" that utilize both District staff and volunteers from the community and various non-profit organizations.

PRIORITY II

Littoral Zone Restoration

Restoration of the aquatic, open water systems should be conducted to improve habitat for water birds, which will entail enhancing and diversifying vegetation composition and structure. These improvements should lead to an increase in invertebrate populations and subsequently, fish populations. The mine pits contribute approximately 430 acres of open water surface to the site and thousands of feet of littoral zone. Currently, most of the littoral shelves are vegetated by cattails (*Typha domingensis*). Although this species can be problematic, it's not as aggressive as *Typha latifolia*. Restoration of the littoral zone will entail progressive replacement of cattails with more desirable macrophytes such as arrowhead, pickerelweed, pond flag and smartweed. Bulrush should be one of the dominant species used along the littoral shelf since it competes well against cattail and is also an extremely valuable duck food along the Gulf coast. Submergent species heavily favored by aquatic turtles and many duck species are already present, including muskgrass and pondweed. Depending on salinity measurements (>15-20 ppt), widgeongrass may be considered for installation in the westernmost pits. Prior to planting, cattails will be removed using a combination of manual removal and spot herbicide treatments. Floating plants and floating leaf plants such as water lotus (*Nelumbo lutea*) may be installed in the open water areas to provide cover for fish and additional substrate for invertebrates. Logs and floating basking sites for aquatic reptiles may also be considered for placement around the littoral zones and in open water.

Wetland Visual Buffers

Wetland visual buffers will be established between the lake area dedicated to recreational use and those of the Research Area in order to enhance wildlife function. Forest species will be installed adjacent to the ponds and parallel to the defined road. Due to the limited depth of soil, the species chosen for planting must be of sufficient size to provide a visual buffer, yet small enough to receive adequate root penetration and stability in the shallow soil. Suggested species include buttonbush, swamp dogwood, dahoon holly, wax myrtle, and coastal saltbush.

Forested Corridor Linking Mine Lakes to Natural Forest

Several large mammals utilize the lake complex, although the degree of use and habitat function of this area for some of these species is not yet understood. Black bear, deer, and bobcats are known to frequent the area. Signs of these species are frequently observed and several sightings have been documented. A forested connection to the lakes of the Research Area will be created to allow these species to continue to utilize the open water surfaces as public use increases. Forested landscape can be created by spreading overburden at depths of 5-6 feet to connect to existing forests. The forested corridors will be created around an existing wetland core. Both the wetland habitat and the created upland will be planted with tree and shrub species. Upland groundcover can be restored in methods similar to those discussed previously for erosion control.

PRIORITY III

Wading Bird Rookery

Wading birds are frequently observed foraging on the littoral shelves. However, the mine lakes are not as suitable for rookery sites as are shallow marshes and ponds. This is due to limited availability of suitable shallow habitat; low vegetation to water edge ratio; the ability of prey to quickly escape into deep waters; and absence of a diverse selection of such prey items as fish, insects, invertebrates, amphibian and reptile species. Wading birds give birth to young which require protected conditions, and can carry food to their young over long distances since the adults regurgitate their food to their nestlings. Hence, wading birds tend to select for protected, safe nesting sites as opposed to local food availability. One of the favored nesting habitats for these species are shrub/tree islands that are surrounded completely by open water. Great blue herons prefer tall trees for nesting, including red maples, oaks, and mangroves. A number of species will nest in willows; these include wood storks and many of the heron and egret species. Natural recruitment of willows is already occurring on some of the smaller islands, and can be encouraged further by grading surfaces to a lower elevation.

Upland Visual Buffers

Prior to District ownership, berms were erected parallel to Shoal Line Road as sound barriers and visual buffers to the active mine operation. Following closure of the mine and acquisition by the District, gaps were cut into the berm. These gaps, which average 100 feet in length, were constructed to existing grade to allow storm surges to flow

onto the Weekiwachee property unimpeded. The berms are vegetated primarily with Brazilian pepper, although eastern cedar, cabbage palm, dahoon holly, and pines are also present. Optimal upland species to install are those tolerant of alkaline conditions and include those native species which appear to be well-established on the berms: cedar, cabbage palm, dahoon holly, oaks, and pines. If left unplanted, some native species will colonize, but Brazilian pepper may also become problematic.

FUNDING SOURCES FOR RESTORATION

The suitability of the Weekiwachee Preserve for establishment of a mitigation bank to help offset restoration costs appears limited. No significant hydrologic alterations are evident and the riverine systems, hydric hammocks, estuarine marshes and springheads appear unimpaired. As a rule, agencies regulating wetland impacts grant very little credit for upland restoration/reclamation and littoral zone creation/restoration. Exceptions may be granted if an upland restoration technique restores hydrologic function to an important system, provides significant habitat value for listed species, or provides important regional functions.

The location and configuration of altered uplands in the Preserve severely limits alternatives for restoration that could result in wetland enhancement credit. The mine landscape may possibly qualify for mitigation credit since upland restoration may enhance surface water quality of the pits and improve wildlife habitat in both the uplands and wetlands. The District will be amenable to exploring options or alternatives whereby on-site restoration projects can be funded as compensation for off-site impacts through a mitigation banking approach. In the absence of such external funding sources, funds available through the Water Management Lands Trust Fund will be used to finance restoration projects.

Biodiversity Management

PLANT COMMUNITIES

The composition and vigor of the Preserve's native plant communities, and the species diversity of these communities, will be enhanced and maintained primarily through implementation of the prescribed fire program. Prescribed fire will restore the vigor of the Preserve's fire-maintained communities which are currently in a degraded, overgrown condition as a result of years of fire exclusion and suppression. All natural communities will also be protected from impacts associated with recreational use by excluding incompatible uses. The eradication and control of exotic species, which has been addressed in other sections of this plan, will also be critical to maintaining the biodiversity of the Preserve.

PROTECTED FLORA

A number of protected plant species have been confirmed on the Weekiwachee Preserve, and several others are anticipated to occur either on lands already acquired or proposed for acquisition. Most of these species are afforded sufficient protection by the preservation status of the land and by implementation of natural systems management strategies such as exotic vegetation control and prescribed fire application. Vehicular access will be confined to a disturbed area at the Preserve's

periphery, which will prevent disturbance to natural areas. Collection of plant or animal species for commercial or private use will not be permitted on any portion of the Preserve and this policy will be strictly enforced. Such collection will be permitted only in association with approved research projects.

Management guidelines for protected plant species will be implemented as described in Table 1. Several of these species occur in wetlands and will not require special management beyond protection from illegal collection or harvest. Inventories of plant species will continue to be updated and species-specific management practices will be implemented as necessary. For any federally protected plant species discovered on the property, USFWS recovery plans will be obtained and special management recommendations implemented. Plant species of special concern will be mapped using a Global Positioning System and these sites will be added to the Land Management GIS Database.

General Wildlife Management

The Preserve provides habitat for a great diversity of wildlife. These range from the relatively common, such as white-tailed deer and raccoon, to species less common or more rarely sighted, including Florida black bear, bobcat and river otter. Like the plant communities discussed previously, the primary management tool for maintaining populations of these species will be prescribed fire. The foraging value of the Preserve's natural communities will be enhanced and maintained for a broad array of wildlife through use of prescribed fire. Populations of typical game species, as noted in the section of the plan devoted to game management, will be controlled through special hunts, as necessary. At present, there is no apparent need to implement such hunts and hunting will be prohibited on the property.

Protected Wildlife

Many rare and protected animal species have been documented on the Weekiwachee Preserve and many others are suspected to occur there. Natural landscape management techniques, including prescribed fire, exotic vegetation control, and natural systems restoration/mine reclamation will be conducted to maintain or expand suitable habitat and help perpetuate these species. When necessary, species-specific management strategies will be employed. Protected species known to occur on the property, and their current status, are listed in Table 2.

For any federally protected wildlife species discovered on the property, USFWS recovery plans will be obtained and special management recommendations implemented. Areas that serve critical habitat needs for listed species, such as rookeries and denning sites, will be mapped using a Global Positioning System and these sites will be added to the Land Management GIS Database.

Table 1. Protected plant species documented at the Weekiwachee Preserve, their current listing status, and general management needs or guidelines.

FDA	USFWS	SCIENTIFIC NAME	MANAGEMENT GUIDELINES
T		*Acrostichum aureum*	Wetland protection
E		*Anemia wrighti*	Access restrictions
E		*Asclepias curtissii*	Prescribed fire application.
T		*Dryopteris leudoviciana*	Prevent disturbance in hydric hammock
T		*Garberia hetrophylla,*	Prescribed fire application.
T		*Lilium catesbaei*	Enforcement of no collecting policy.
T		*Lobelia cardinalis*	Enforcement of no collecting policy.
E		*Matela floridana*	Wetland protection.
CE		*Osmunda cinnamomea*	Enforcement of no collecting policy and wetland protection.
CE		*Osmunda regalis*	Enforcement of no collecting policy.
T		*Pinguicula caerulea*	
CE		*Rhapidophyllum hystrix*	Enforcement of no collecting policy.
CE		*Zamia floridana*	Enforcement of no collecting policy.
T		*Zephyranthes atamasco*	Enforcement of no collecting policy.

Key: T = Threatened
E = Endangered
CE = Commercially Exploited

Table 2. Protected wildlife species documented at the Weekiwachee Preserve, their current listing status, and general needs or guidelines.

GFC	USFWS	SPECIES	MANAGEMENT ACTIONS
SSC	T (S/A)	American Alligator *(Alligator mississippiensis)*	Warning signs in swimming area
SSC		Gopher Tortoise *(Gopherus polyphemus)*	Prescribed fire for habitat maintenance
T	T	Eastern Indigo Snake *(Drymarchon corais couperi)*	Prescribed fire for habitat maintenance. Resource protection against illegal collecting and user education.
T		Short-tailed Snake *(Stilosoma extenuatum)*	Minimize barriers in sandhill/scrub soils. Resource protection and user education.
SSC		Gopher Frog *(Rana capito)*	Identify and maintain breeding ponds. Maintain tortoise habitat
SSC		Limpkin *(Aramus guarauna)*	Littoral shelf reclamation
SSC		Little Blue Heron *(Egretta caerulea)*	Littoral shelf reclamation. Protect rookeries.
SSC		Snowy Egret *(Egretta thula)*	Littoral zone reclamation. Protect rookeries.
SSC		White Ibis *(Eudocimus albus)*	Littoral zone reclamation. Protect rookeries.
T		Southeastern American Kestrel *(Falco sparverius paulus)*	Prescribed fire for habitat maintenance. Maintain snags and tree cavities.
SSC		American Oystercatcher *(Haematopus palliatus)*	Littoral zone reclamation.
SSC		Marian's Marsh Wren *(Cistothorus palustris marianae)*	Protect salt marsh habitat. Conduct any prescribed burns in small blocks.
SSC		Scott's Seaside Sparrow *(Ammodramus maritimus peninsulae)*	Protect salt marsh habitat. Conduct any prescribed burns in small blocks.

GFC	USFWS	SPECIES	MANAGEMENT ACTIONS
E	E	Wood Stork (*Mycteria americana)*	Littoral zone reclamation. Protect rookeries and water quality.
T	T	Southern Bald Eagle (*Haliaeetus leucocephalus leucocephalus)*	Protect nest sites and water quality. Monitor annual nesting activity.
E		Arctic Peregrine Falcon (*Falco peregrinus tundrius*)	
T		Least Tern (*Sterna antillarum)*	Maintain and enhance nesting habitat. Protect nesting site during breeding season.
T	under review	American Black Bear (*Ursus americanus floridanus)*	Minimize human disturbance. Maintain movement corridors and feeding habitat. Public Education. Prescribed fire.
E	E	West Indian Manatee (*Trichechus manatus*)	Post signs on river if needed. Maintain natural shoreline.

Key: SSC = Species of Special Concern
T = Threatened
E = Endangered

More detailed species-specific management actions and strategies are discussed below. The proposed management of these species will be adapted, as appropriate, to meet changing circumstances or to be consistent with new information derived from research and resource monitoring.

SOUTHERN BALD EAGLE

The Southern bald eagle is designated a threatened species at both the state and federal level. Three active bald eagle nests have been identified within the Weekiwachee Preserve and two others are known to occur within areas proposed for future acquisition. Eagles nest from October 1 to May 15, and it is during nesting that they are most vulnerable to disturbance. All active eagle nests have been designated Special Protection Areas (see preceding discussion) and habitat management guidelines outlined by the USFWS will be implemented.

Management Actions and Strategies:

- ❑ **Establish primary zone 750-1,500 feet around nest. Within this zone, no chemicals toxic to wildlife will be used and no additional clearing or tree removal will occur. During nesting season, no human entry will be allowed and no**

District-employed aircraft will operate within 500 feet vertical distance or 1,000 feet horizontal distance of nest. Recreational uses will be directed to areas outside the primary zone.

- ❑ **Establish secondary zone extending 750 feet beyond primary zone. No new trails or roads will be developed in this zone and chemicals toxic to wildlife will not be utilized at any time. Prescribed fire will not be conducted within this zone during nesting season. Intensive recreational use will be directed to areas outside the secondary zone.**

- ❑ **Monitor all eagle nests on the property and map locations using GPS equipment. Maintain a cumulative history of nest use and success.**

ROOKERIES AND COLONIAL GROUND-NESTING SITES

At present, there are no known wading bird rookeries on the Preserve. Jim Rodgers (pers. comm.) reports that wood storks nested in forested wetlands on the north side of the Weekiwachee River directly west of the Weekiwachee Springs attraction, several years prior to development of this plan. Great blue herons were also observed nesting during this time. Several wading bird species, including great blue herons (*Ardea herodias*) and occasionally wood storks *(Mycteria americana)* currently utilize the mine lakes and wet depressions on the mine surface for foraging and loafing. Solitary nesting by green herons (*Buterides striatus*) has been observed in willows growing along the mine lakes. As the lakes age and suitable vegetation such as willows and other hardwood shrubs and trees colonize the lake perimeters and islands, nest site availability will increase and there is high potential for rookery establishment. Features of the lake complex that make it favorable for wading bird rookeries include open water habitat, presence of small islands, inhospitable nature of the landscape to predators, and protected coves and windbreaks provided by spoil mounds and rough terrain.

Several species of shorebirds utilize the mine landscape for nesting, including killdeer (*Charadrius vociferus*), Wilson's plovers (*Charadrius wilsonia*) and the least tern *(Sterna antillarum).* Several characteristics of the lake complex make it an attractive alternative to traditional nesting beaches, including a large expanse of open water bodies, the physical and chemical similarity of the limestone substrate to beaches, and the remoteness of the site to forested habitat. Least terns and plovers utilized a large portion of the mine landscape for nesting in both 1996 and 1997. The 1996 nesting season was successful; however, the 1997 season was unsuccessful for least terns and only marginally successful for plovers. Empirical and anecdotal evidence suggests that human disturbance and coyote predation may have caused the nesting failure during of 1997.

Human disturbance is a major cause of colonial nesting bird failure and nest abandonment (Burger 1984, Gotmark, 1992). When disturbed, adults flush and leave eggs and nestlings unprotected from predators (seagulls and crows) and direct sun (high temperatures). Vehicular traffic has

also been shown to cause mortality of chicks, who typically leave the nest soon after hatching and forage on the ground with adult birds (Cox et al. 1994, Melvin et al. 1994). Koenen et al. (1996) found that predation by coyotes and flooding were the two main causes of nesting failure in simulated least tern and snowy plover nests on an alkaline flat in Oklahoma.

A beach creation project planned for the Research Area (see discussion of Habitat Restoration), which is off-limits to public use, will provide a protected site more suitable for shore-nesting birds, particularly least terns. The unauthorized recreational use and coyote predation thought to be the main causes of nesting failure in 1997 will not be as critical a factor at the proposed site. It has been demonstrated that least terns will nest on a beach created with sand dumped 24 inches (61 cm) deep over an area at least .70 acres in size. Creation of a 3.1 acre protected breeding site is proposed for the Research Area. The proposed site is surrounded by water on three sides, and fencing will be used to deter predators and unauthorized recreational use. Additional earthwork may also be conducted to further protect the beach from predators. Suitable sand will be transported to the site and decoys will be utilized to attract terns to the site. The site will then be maintained in an early successional stage characterized by sparse grasses, which will entail removal of additional grasses.

Management Actions and Strategies:

- ❑ **Close the Research Area and created beach to public access using appropriate buffers, signs, and barriers. Buffer distance will be based on the composition of species nesting and nesting period, per guidelines recommended by Rodgers (1993) and O'Meara (1988).**

- ❑ **Maintain and enhance nesting habitat, as appropriate and practicable, using herbicide application, mechanical recontouring and earthmoving, predator control, tree/shrub installation, and other applicable methods.**

- ❑ **Limit vehicular access into the property. This will be accomplished by locating high activity zones at periphery of property.**

WATERFOWL

Several migratory and resident duck species have been documented utilizing the Preserve's mine pit lakes, including gadwells, redheads, red-breasted mergansers, lesser scaups, blue-winged teal, mottled ducks, and American coots. The Florida coasts are important resting and foraging habitat for migrating shorebirds in the spring and fall, and the Weekiwachee Preserve is a strategically-significant refuge along the important Atlantic Flyway migratory route. Along the Gulf coast, wintering birds occur most frequently from Apalachicola to Tampa Bay. In fact, there is a series of protected preserves along the Gulf coast which are managed as refuges for these migrants, including St. Marks National Wildlife Refuge, St. Martins Marsh Aquatic Preserve, Chassahowitzka National Wildlife Refuge, and Pinellas County Aquatic Preserve. The Weekiwachee Preserve

supplements this chain of protected marshes and open water surfaces and adds habitat diversity to the landscape.

Several landscape features make the Preserve particularly attractive to waterfowl. These characteristics include the extensive open water surface, the vegetated littoral zones, the irregular shoreline, a few broad littoral shelves which are protected by steep banks, the presence of isolated islands, and high spoil mounds which may function as thermal coves. Other physical characteristics of the lakes are less desirable for waterfowl, including depths ranging from 25-60 feet. Although plant and animal forage is currently low, aquatic invertebrates and shoreline/littoral zone vegetation will increase and diversify as the lakes age and as habitat restoration projects progress. Restoration performed on the lakes will enhance their overall habitat value for many species, including migratory waterfowl.

Management Actions and Strategies:

- ❑ **Increase diversity of vegetation and structure along the littoral zone by planting native herbaceous aquatic plant species.**
- ❑ **Increase cover and substrate surface over open water surface by installing floating and emergent vegetation.**
- ❑ **Promote continued development of dense cover of shrub and grasses in certain areas to improve nesting habitat for species such as mottled ducks and blue-winged teal.**
- ❑ **Plant native mast-producing trees as a component of habitat restoration to provide forage for ducks and other species utilizing the Preserve, including the Florida black bear. Preferred species include swamp dogwood, hackberry, blackgum, cypress, water oak, and elm.**
- ❑ **Enhance shallow, wet depressions on the mined surface to improve habitat for dabbling ducks, such as teals, gadwells, mergansers, and mottled ducks.**

FLORIDA BLACK BEAR

The Florida black bear is perhaps the most critically-imperiled wildlife species documented on the Weekiwachee Preserve, and its presence on the Preserve has important management implications due to its wide-ranging habitat needs and its sensitivity to human intrusion. This species is designated a threatened species by the FGFWFC and is a candidate for protection under the United States Endangered Species Act. A decision regarding the federal designation is due by December, 1998. There are five major black bear populations in the state, centered in the following areas: Osceola National Forest; Ocala National Forest; Big Cypress National Preserve; Apalachicola National Forest; and Eglin Air Force Base (Cox et al. 1994). Based on habitat analyses that considered land cover classifications, proximity of habitat areas to protected lands of sufficient size, road densities, habitat diversity, and a carrying capacity estimate of 0.05 breeding individuals per km2, Cox et al.(1994) estimated the Weekiwachee/Chassahowitzka population at <20 breeding individuals and concluded that the population was too small for long-term survival. However, bear

density in the region was determined using average density values derived from bear studies in Ocala National Forest and Osceola National Forest. In these forests, habitat suitability is only moderate and low, respectively, and bear densities are estimated to be lower than in most other bear populations throughout the United States. In addition, recent field studies (Maehr 1997; Marchington 1995) have demonstrated that bears can tolerate much higher densities than habitat modeling estimates suggest.

Maehr (1994) conducted field studies on the Big Cypress population in Collier County and arrived at a population estimate of approximately 1,000 bears, significantly higher than the previous estimate of 105-210 individuals estimated by the GFC using habitat models. Similarly, Marchinton (1995) and Anderson (unpub. data) reported unusually high black bear densities in agricultural fields 10 miles north of Tensas National Wildlife Refuge in Louisiana. At least 30 bears occupy and reproduce in highly fragmented woodland patches that range in size from 1,359 to 2,100 acres, interspersed among agricultural fields. These and other studies suggest that high quality habitat can support higher bear densities.

Based on field observations, the Weekiwachee Preserve appears to be an enormously productive environment for black bears. Signs of bear activity are abundant and the population appears stable, with sightings of females with cubs relatively common. Preferred bear habitat, specifically sand pine scrub and hardwood swamp, is present on the Preserve. Thick and diverse vegetation provides adequate cover and abundant food resources. Within the region the Weekiwachee, Chassahowitzka, and Homosassa Rivers, as well as the Weekiwachee Preserve's mine lakes, provide abundant and non-lapsing freshwater resources.

The key to black bear persistance in the region will be the human element. Bears are tolerant of human disturbance to a degree, but extensive habitat loss and fragmentation in the region has left the population concentrated in a much smaller core area than more secure populations in the remainder of the state. Even in these secure populations, which inhabit much larger expanses of habitat with protected cores, researchers have documented impacts related to human disturbance. When disturbance is severe enough, black bears will abandon an area, resulting in additional habitat loss. The smaller the total area of core habitat available to them, the more critical any additional loss can be to the security of the population. This suggests that it will be essential to prevent any additional habitat loss for this region's population.

Human disturbance disrupts normal bear behavioral patterns, which typically include more activity during daylight hours, or at dawn or dusk (Amstrup and Beecham 1976, Garshelis and Pelton 1980). Ayres et al. (1986) showed that bears shifted from diurnal activity patterns to nocturnal ones in areas of heavy human disturbance. Hellgren et al. (1991) studied macrohabitat use by black bears in a southern wetland and found that black bears were sensitive to human disturbance and recommended limiting public access to roads within preserves in order to maintain feeding and travel corridors. Several other researchers have found that although bears utilize trails, they tend to avoid roads (Hamilton 1978,

Hugie 1982, Beringer et al. 1990). Mollohan and LeCount (1989) argued for the maintenance of corridors between useable blocks of habitat, especially to permit access to seasonally important but spatially clumped food supplies. Similar findings that human encroachment limited bear use of important habitat were reported by Pelton (1986) and Brody and Pelton (1989). The Hellgren study also investigated denning ecology and found that den sites subjected to human disturbance were often abandoned, which can lead to decreased productivity or force bears into even more inhospitable habitat in search of den sites. The importance of sufficiently large upland buffers to large forested swamp systems was recognized by Mykytka and Pelton (1989), who advocated limiting construction of new roads and closing roads in preserves. Many experts recommend human access management in occupied black bear habitat (Hillman and Yow 1986, McLellan 1989).

In order to maintain black bears in west-central Florida, resource managers need to know how many bears are in the population, what type of habitat they use, what their seasonal and daily movement patterns are, where they den, and how they respond to natural systems management, recreational activities, and surrounding land use patterns. The District, in conjunction with the USFWS, has contracted with the University of Kentucky Research Foundation to conduct a 2-year study of the Weekiwachee/Chassahowitzka black bear population. The purpose of the study is to assess population demographics and health and to determine home ranges, movement patterns, seasonal habitat use, food habits and den ecology. A genetic analysis will also be conducted to estimate the rate of gene flow within and between this, and other, bear populations. The subsequent data will then be analyzed to identify important landscape connections and to describe the possible effects of current land practices and natural resource management practices on the behavior and distribution of black bears. One of the products of the study will be a black bear management plan and a population monitoring methodology for the region.

Upon the completion of the black bear study, the District will implement the management guidelines recommended in the black bear management plan. In the interim, the District will utilize best management practices based on studies of other bear populations in the United States.

Management Actions and Strategies:

- ❑ **Conduct prescribed burns in small blocks using existing swamps and other features as firebreaks whenever possible. Any scheduled winter burns should be preceded by an extensive search for active dens, and canceled if dens are located within the burn unit. After initial fuel reduction burns, firelanes should be allowed to revegetate and larger burn units defined.**

- ❑ **Prescribed fire application will include both winter and summer burns to maintain good production of both hard and soft mast. Develop strategy to monitor mast production.**

- ❑ **Establish and maintain fencelines and other barriers in conjunction with bear movement patterns.**

- ❑ **Confine all but the most passive recreational uses to small areas at the periphery of property.**

- ❑ **Confine public vehicular access within the Preserve to the high-use beach and picnic area.**

- ❑ **Maintain important foraging habitat, movement corridors and denning habitat through appropriate management of recreational use and vehicular access.**

- ❑ **Require the use of bear-proof trash receptacles in the Preserve.**

- ❑ **Deter human/bear conflicts and black bear habituation to humans by providing undisturbed habitat where likelihood of encounters between bears and humans will be minimized.**

Land Maintenance

Primary routine maintenance needs will consist of maintaining a secure perimeter fenceline and adequate signage. Fencelines will be planned to accommodate black bear movement patterns while preventing unauthorized access and use. Alternatives to fencing, such as maintaining dense growths of vegetation and strategic placement of barriers, may effectively deter illegal access while allowing unimpeded wildlife movement. In other areas, fencing could be used to direct safer passage across roads and other landscape features. Interior fencing used to limit and direct public vehicular and pedestrian traffic will also be designed to accommodate wildlife movement.

Signage that identifies the District as steward of the Preserve lands and lists prohibited activities will be maintained at strategic locations around the perimeter of the property. Improved 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 will also include statements attesting to the protected status of the Preserve as a refuge for wildlife and affirming that all plant and animal life in the Preserve is protected.

Maintenance of the improved facilities proposed for the northwest corner of the lake complex, including restrooms, picnic areas and a beach and bathing area, will be the responsibility of Hernando County. A cooperative relationship with the County will permit the establishment of these high-use facilities and greatly enhance recreational potential.

Land Use

Access

The large human population combined with the lack of certain recreational amenities within the project region indicates the need for comprehensive visitor and property management. Management of the visitor and property includes considerations for access, infrastructure, maintenance of visitor experience, carrying capacity, vehicle traffic, provision of amenities, security and

coordination with other local and state agencies. Before the District can make thoroughly-informed decisions about the location, type and intensity of public use that is appropriate for the tract, it is imperative that the District gain a more intimate knowledge of the biota and natural limitations of the system. In order to assure that any future public use and management program implemented on the tract is in harmony with the important natural attributes which exist there, the aforementioned monitoring program is crucial. This program has been initiated and public use and management programs will be phased in gradually and carefully as knowledge of the system increases.

The determination of visitor carrying capacity is a complex and comprehensive evaluation of many use factors, their possible impacts, and a determination of an acceptable level of impact. Such a determination is outside the scope of this plan but it is considered an important concept in the evaluation of potential use of the property. The District, in developing the use of this property, should establish a level of impact that is acceptable. Once that level is determined, the Land Management and Land Use and Protection sections will work together to monitor, assess, and prevent unacceptable impacts.

A preliminary survey of the property boundary identified more than 20 access points. Of these 20 access points, most are located in remote areas and are not readily accessible by the public. The property offers two convenient entry points that are easily accessed by the public and that were used by the previous owner for such purposes. These two access points will be used in combination. The primary access point, which will eventually provide direct vehicular access to a planned beach and picnic complex, is located on Shoal Line Boulevard along the Preserve's western boundary (Figure 4). The secondary access point is located on the southern boundary on Osowaw. A parking area and walk-thru entrance will be provided at this site.

A more detailed discussion of public access to sites within the Preserve is provided below, in association with the discussion of permitted recreational use.

Security

The Weekiwachee Preserve has experienced episodes of poaching, vandalism, destructive use of all-terrain vehicles and other problems commonly associated with publicly-owned natural areas. Maintaining property integrity and ensuring visitor safety will be dependent upon the placement of warning signs, vehicle barriers, fencing, and regular patrol by law enforcement officers.

The poaching, vandalism, and all terrain vehicle use that are currently experienced at the Preserve indicate the need for a law enforcement presence. Most of the criminal activity and all-terrain vehicle use have been centered around the lake complex, whereas the poaching is concentrated in the forested areas. Law enforcement needs will be met through the combination of a resident security officer and contracted services. A residence for an officer will be placed in a central area of the lake complex to provide a 24-hour presence, control crime, observe the general activities of visitors and detect unauthorized entry when the property is closed. The officer will also serve as a point of contact during emergencies. Although the officer's residence should allow a

panoramic view of the lakes, it should also be visually buffered from the high-use recreational area so that it does not detract from the aesthetic character of the recreational area. The interior forests and perimeter are best served by contracted security officers. Contract officers can also augment the services of the resident officer or be used for resource protection issues that are beyond the capabilities of the resident officer. Resource protection issues such as large-scale poaching, pot hunting at archaeological sites, and vandalism will require a 24-hour presence. Through a well-implemented security program, the safety of the visitor and protection of the property's natural resources will be assured.

Approximately half the Preserve perimeter adjoins densely forested wetland or canal, making it inaccessible to all but pedestrian entry. However, there are approximately 18 remote access points that could allow for unauthorized entry by vehicles. These sites will be secured and monitored to prevent unauthorized vehicular use. The primary and secondary access points (Figure 4) will maintain barriers to control entry during off-hours and direct vehicles to designated parking or staging areas during daytime operation. Roads associated with these access points are bounded by forest precluding the need for fencing. However, open areas and crossroads will require interior fencing, gates, or other barriers. The final choice of barrier type should be dependent upon considerations for aesthetics and wildlife.

Informational signage will be important for guiding visitors. An informational sign indicating the rules for use of the property and directional information will be placed at the primary and secondary access points. Warning signs such as "no parking" and "no swimming" may also be required at various points within the property's interior. Interior trail signs indicating trail name and authorized uses will also be required to direct and inform the public.

Additional security presence will be afforded by Hernando County staff after development of the beach and picnic complex discussed in following sections of this plan. Although the District will be responsible for maintaining security outside the developed facilities, the daily presence of park staff may help to dissuade illegal and prohibited activities.

Management Actions and Strategies:

- ❑ **Provide a resident security officer on the Preserve.**
- ❑ **Maintain appropriate perimeter fencing and other barriers to unauthorized access while minimizing disruption of normal wildlife movements**
- ❑ **Maintain appropriate signage to apprise the public of permitted and prohibited activities.**

Recreational Use

It is the policy of the District (Board Policy 610-3) that appropriate public recreational usage of District 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 recreational uses of the Preserve will include hiking, bicycling, fishing, swimming, picnicking, birdwatching, nature interpretation, canoeing, and boating use by small craft that lack internal combustion engines. The Preserve will also be made available for environmental education.

The primary goal in developing a program of recreational use for the Preserve is to provide a high-quality user experience while protecting the resources that led to acquisition of the lands, and which make the Preserve attractive for such use. The State of Florida and the District have adopted an ecosystem approach to land management that requires a holistic, landscape-level perspective to ensure the protection of entire natural systems. Public use must likewise be viewed from a landscape perspective. The Weekiwachee Preserve is part of a vast network of protected lands that provide valuable economic and environmental benefits to the rural counties and communities in the area (see Figure 2). Each of the protected areas is managed by a separate public agency that is guided by their own rules and objectives for the lands under their stewardship. However, in combination they provide a wide array of recreational opportunities, including some that have been deemed incompatible for the Preserve. The following is a brief listing of the public agencies and the properties they manage, and a summary of the comprehensive, cumulative recreational benefits provided by these public lands:

Hernando County parks in proximity to the Weekiwachee Preserve include **Hernando Beach** and **Jenkins Creek**, which are located on the northwest border of the Preserve (Figure 2), and **Rogers Park** which lies a short distance north on the shores of the Weekiwachee River. It is estimated that nearly 60,000 people attended Rogers Park during the County's 96/97 fiscal year. The county also has two other nearby facilities at **Pine Island** and **Bayport**. Attendance at Pine Island was estimated at 70,000 during fiscal year 96/97.

The **Chassahowitzka Wildlife Management Area** lies a short distance north of the Weekiwachee Preserve. It is an 18,707-acre state-owned property managed by the Florida Game and Fresh Water Fish Commission. A separate segment of the Chassahowitzka WMA lies along the northern bank of the Weekiwachee River. Proposed additions to the Preserve would bridge the gap between these two tracts.

The District-owned **Chassahowitzka Riverine Swamp Sanctuary** is a 5,676-acre property that lies to the north of the Chassahowitzka Wildlife Management Area. A lease agreement between the District and Citrus County allows the county to manage recreational usage of the Chassahowitzka River Campground. The total of boat and site attendance at the campground during 1997 was 17,854.

There are two National Wildlife Refuges to the north of the

Weekiwachee Preserve. They are the **Chasshowitzka** and **Crystal River National Wildlife Refuges**. These areas are managed by the US Fish and Wildlife Service. An estimated 91,515 people visited the Crystal River NWR in 1996. Most visitors participated in some form of water related activity. The Chassahowitzka NWR is a 30,465-acre area. It received an estimated 33,340 overall visitors in 1996 (Ilene Nunez, pers. comm.).

Between the two Natonal Wildlife Refuges lies the Florida Department of Environemtal Protection's **St. Martins Marsh Aquatic Preserve** (23,100 acres). The FDEP **Crystal River Buffer Preserve** (36,000 acres) is adjacent to the USFWS Crystal River NWR. Hiking and fishing are the main recreational activities available in the preserves.

The **Withlacochee State Forest**, managed by the Florida Division of Forestry, is a 143,348-acre complex with tracts lying to the north and east of the Weekiwachee Preserve. These feature natural wildlands dotted with improved recreational areas. About 500,000 people visit the forest annually to hunt, fish, camp, picnic, hike and nature watch. There are five major divisions of the State Forest: the Citrus tract (42,613-acres); the Croom tract (21,359-acres); the Richloam tract (49,200-acres); the Jumper Creek tract (10,068-acres); and the 5,500-acre Homosassa Tract which is contiguous with the District's Chassahowitzka Riverine Swamp Sanctuary.

The FDEP Division of Parks and Recreation maintains over 70 miles of recreational hiking, biking and horseback riding trails within the area. These are the **Withlacoochee** and **General James Van Fleet State Trails**.

Fishing

Demographic profiles of the surrounding population and observations of pubic use of the Preserve during the period preceding development of this plan suggest there is a high level of interest in fishing opportunities. This interest is focused on the lakes created by limerock mining conducted prior to District acquisition of the property. The lakes provide approximately 472 acres of open water, accounting for nearly all the open water occurring in the Preserve. Fishing opportunities are extremely limited elsewhere in the property given the relative absence of open water areas that are both accessible and capable of supporting sport fish.

The mine pit lakes are readily accessible from the two approved points of entry to the Preserve; however, the mining origin of the lakes results in physical characteristics that hamper access for fishing. Most of the extensive shoreline can be characterized as a shallow shelf of silt and limestone that extends approximately 6-10 feet into the lake, followed by a shear vertical drop to a depth of 40-60 feet. Although this gives the appearance of a stable shoreline, the clay silts cannot safely support the weight of an individual attempting to fish from the bank, nor are they suitable for attempting to launch

canoes or small boats. The extreme drop in depth also limits the amount of shallow water habitat available to support fish. This factor is compounded by the relative "sterility" of the water, or an absence of the nutrients and food base required to support a growth of the planktonic and invertebrate faunas that are necessary to support the subsequent growth and production of the sport fish sought by recreational fishermen. Water quality analyses have confirmed the nutrient-poor condition of the water and field sampling has confirmed that the lakes support a depauperate complement of aquatic organisms.

Surveys of other mine lakes in the area indicate that uncontrolled numbers of fisherman taking the legal limits of sport fish have resulted in the depletion of entire lakes within one month. A sustained fishery and the maintenance of a quality fishing experience would therefore be dependent upon limiting the numbers of people fishing and restricting the size and number of their take. The natural inability of the lakes to support a large-scale fishery, coupled with the funding and staffing resources that would be required to manage a regulated fishing program on the tract, render such an approach impractical. It is anticipated that fishing in the lakes will be self-regulated by supply (fish) and demand (fishermen).

The littoral zones that have been created by shoreline reclamation activities and native plant installation, and the additional habitat restoration measures described previously in this plan, will significantly enhance the fishery potential of the lakes over time. These measures will be managed and implemented with the dual goals of habitat restoration and improvement of fisheries potential. More immediate measures to enhance fishing will also be implemented, including the construction of a stable launching site for boats in order to expand access for fishermen. Signage warning of the unstable nature of the shoreline will be maintained around the perimeter of the lakes to ensure public safety.

Hiking

Hiking is a low-impact recreational activity that can appeal to a broad segment of the public. Some hikers derive their enjoyment of the activity from the physical exercise associated with it, while others are more inclined to seek an outdoor experience. It is anticipated that those seeking exercise will generally hike the lake area due to its accessibility. The remainder of the Preserve provides exceptional opportunities for those seeking an outdoor experience in an area that showcases a natural Florida landscape. When planning trails, the needs of these two contrasting groups will be carefully considered, as will be the sensitivity of the Preserve's wildlife and natural communities. Any improved trails will be comprehensively planned and marked, and will highlight areas of natural significance and interesting scenery. Rest areas and points of interest will also be considered in any trail plans. The District has coordinated with the Florida Trail Association in the development of trails at other sites and will be solicited for assistance in the planning and construction of trails on the Preserve.

A short interpretive nature trail will be developed in association with the swimming beach and picnic complex planned for the northwest corner of the lake area (Figure 4). The site possesses a variety of natural communities including hydric hammock, cabbage palm hammock, pine flatwoods,

scrub and freshwater marsh, within a small and well-defined area that will be immediately adjacent to the picnic complex. The short length of the trail will allow it to easily accommodate day-visitors and children, and should permit the installation of an improved or stabilized surface that will meet the needs of mobility-impaired individuals. The diverse nature of the terrain should appeal to both experienced and inexperienced nature lovers and offer a valuable opportunity for environmental education. Interpretive signs will be installed at appropriate points of interest and construction of a kiosk containing literature describing the Preserve's natural history and land management program will be considered.

A longer and more primitive trail will be developed for users interested in a more lengthy hike. The site proposed for this trail is located west of County Road 597 and would be conveniently located for vehicular access to the trailhead (Figure 4). It also features a variety of natural communities and affords the opportunity to view an expansive Gulf saltmarsh coastline in a secluded setting. Construction of an observation tower will be considered for a coastal location on the trail to showcase a sweeping view and offer a special point-of-interest for users.

In addition to the developed trails discussed above, the unimproved trail roads of the Preserve will be open for foot use. The trail roads provide access to the most remote areas of the property and will appeal to more experienced hikers and those interested in a true backcountry hiking experience. Development of new trails through these remote reaches will not be undertaken until wildlife surveys and research now in progress has been completed. Information provided by the surveys and research will be essential to guiding future decisions regarding any expansion of public use.

The District will consider offering guided interpretive walks that capitalize on the diversity offered by the trail system. These walks may be sponsored by District personnel or other experienced naturalists, or through development of a volunteer naturalist program. The walks should be scheduled to take advantage of seasonal variation. The subject matter of the walks should highlight the ecology of the Preserve, land management goals, and the natural values which served as the motivation for preservation of the property.

Bicycling

As in the case of fishing, demographic profiles for the area and observations of public use of the Preserve during the period preceding development of this plan suggest a strong interest in bicycle riding. It is expected that most of this use has been by local residents. For most participants, bicycling provides a healthful exercise or sport where enjoyment of a pristine natural area is not a primary concern; however, a growing number of people are using the bicycle as a means of experiencing the outdoors. Off-road bicycling on the Preserve has been limited to use of the lake area and an approach for expanding or enhancing such use will be explored; however, no new trails will be developed in the undisturbed natural areas that surround the lake complex. Although off-road bicycling can be a compatible use of natural areas when directed to sites with dry, stable soils, the predominance of wetland communities in the Preserve severely limits

such opportunities. Management concerns associated with wildlife needs and ongoing research place additional constraints on the use of off-road bicycles in areas outside the lake area. Upland communities in the heart of the Preserve are configured as narrow fingers within a large matrix of hydric hammock and include scrub sites with coarse, sandy soils that are not conducive to bicycle use. The habitat value of the scrub to the local black bear population, in combination with its limited areal extent and the sensitivity of black bears to human presence, suggest that public use of the backcountry trail roads be reserved for the most passive use possible. As such, they will remain limited to foot traffic and day-use only.

The enhancement of existing trails that remain open for bicycling (Figure 4) will consider a variety of alternatives in order to satisfy the needs of both the resource-based and exercise-based riding groups. Loop trails of various lengths will be provided to accommodate different levels of riders and will be clearly marked. The trails could be shortened or lengthened through the use of cross-links. This kind of network may also be necessary to allow bicycle use during periods when segments of the trail system must be closed due to adverse conditions or when sensitive migratory wildlife are present. Localized nesting by least terns and Wilson's plovers, and increased seasonal use of the lakes by migratory waterfowl, have been observed during recent years. The need to close trail segments will be evaluated on a case-by-case, as-needed basis. The construction of several covered rest areas that would shelter riders and other users from sun or rain will also be considered.

As ongoing research of wildlife needs in the interior of the Preserve progresses, the results of the research will be examined to identify backcountry areas that might support off-road bicycle use. Opportunities for incorporating the Preserve into a regional network of multiple use trails will also be explored. Such opportunities may expand considerably if additional lands are added to the Preserve. It is also worth noting that the Croom Tract of the Withlacoochee State Forest provides 35 miles of unpaved, off-road bicycling trails.

Swimming

The present configuration of the lakes, with unstable shorelines and precipitous drops in depth, make them unsuitable for swimming and this use will be prohibited. Shorelines will be clearly posted to warn the public of the dangers and inform of the prohibition of swimming; however, a site at the northwest corner of the lake complex has been identified as a beach and picnic area (Figure 4). Safe accommodation of this use will require the excavation and development of an enclosed swimming area and beach where supervision of the use can be provided. Hernando County suffers from a deficiency of public swimming areas and development of a beach at the Preserve will assist in addressing this deficiency while providing for public enjoyment of the natural setting offered by the property. At present, the total of the County's public swimming access in the coastal region is limited to 3.5 acres of beach and 4.2 acres of swimming area, divided among 4 separate sites. The site earmarked for development of a beach and swimming area at the Preserve is approximately 8 acres in size and may double existing capacity in the local area. Swimming at the Preserve will be limited to

the developed beach area and will be prohibited in the remainder of the lake complex.

The clear and pristine quality of the mine lakes makes them attractive for swimming and provides an ideal setting for picnicking conducted in conjunction with a day at the beach. A picnic area and interpretive nature trail, discussed in other sections of this plan, will be developed adjacent to the beach and swimming area. It is anticipated that this location will serve as the focal point for most recreational use of the Preserve, and parking adequate to meet the needs of hikers, bicyclists, fishermen, and other users will be sited here.

The supervision and maintenance needs associated with such a high-use area will require that full-time staffing be provided. Hernando County's active promotion of the proposed facilities and expressed interest in management of the use ensures the presence of a local sponsor and manager. Appropriate management will require the provision of lifeguards and routine maintenance staff. As a public swimming area, there would also be water quality monitoring requirements in order to ensure compliance with state-mandated standards. The County's experience in management of such sites, and cooperative relationship with health department personnel that supervise the required water quality monitoring, will help to ensure that the area remains safe for public use.

The clarity and depth of the water in the lakes may appear enticing for scuba diving. However, the risks associated with this activity and the possibility for conflicts with other uses requires that recreational scuba diving be prohibited on the property. This will not preclude scuba diving associated with training exercises for professional divers or search and recovery operations.

Picnicking

Many people picnic in conjunction with another outdoor activity and often do not use defined areas for such a purpose. However, tourists and visitors from urbanized areas often incorporate the use of designated picnic areas into their outdoor recreation plans and are typically families or large social groups. The picnic experience is primarily dependent upon the immediate surroundings with scenic views and nearby water features being desirable. Land requirements for such an activity are typically small and involve facilities such as tables, grills, garbage cans and restroom facilities.

The Preserve's lake system provides an appropriate setting for a picnic area and one will be developed in conjunction with the beach and bathing area discussed previously (Figure 4). Direct access to the interpretive nature trail and a parking area that can accommodate large groups will also be provided. The facilities associated with the site will be designed to serve as a staging area for all recreational users of the Preserve and to provide fishermen, hikers and bike riders with convenient parking and a place to rest. They will also be designed to accommodate mobility-impaired visitors. The forested site chosen for the picnic area will provide shade from the sun in an aesthetically pleasing, natural setting. Development of a picnic pavilion or complex of pavilions will provide shelter from rain and meet the needs of a variety of user groups. Management and maintenance of the improved facilities and supervision of

public use will be the responsibility of Hernando County and will be conducted in tandem with management of the adjoining beach and bathing area.

Black bears are frequently attracted to picnic areas and other sites where food may be easily obtained, and this poses an important management concern. The use of bear-proof trash receptacles will be required at the beach and picnic area complex, at the secondary access point, and at any other sites where trash may be generated.

Bird Watching

The coastal location, diversity of habitats and opportunity to view a diversity of species makes the Preserve an ideal site for bird watching. Preliminary surveys of the property confirm the presence of a great diversity of bird species, including an impressive array of seasonal migrants. The lakes currently attract moderate numbers of waterfowl and these numbers should increase as the enhanced littoral zones become established.

Existing trail roads, which will be open to foot access, serve as a ready-made trail system for birding enthusiasts. The District will be amenable to making the property available for scheduled birding by organized, guided groups and will also consider constructing observation sites at strategic locations.

Canoeing/Boating

The qualities of the mine lakes that make them attractive, yet unsuitable, for swimming holds true for canoeing and boating. The unstable shoreline is unsuitable for landing or launching boats and canoes. As noted in the discussion of fishing, an improved launching site will be constructed at the site of the beach and swimming area. Launching of canoes and small boats powered by electric motors will be permitted. The use of internal combustion engines on boats will be prohibited to prevent shoreline erosion and to maintain the quiet and aesthetic qualities associated with a preserve area. A floating dock may also be provided at the launching site for the convenience of boaters and canoeists.

The Weekiwachee River, which forms the northern boundary of the Preserve, serves as a very popular site for canoeing, kayaking and boating. As noted in the discussion of the Weekiwachee shoreline's designation as a Special Protection Area, the natural shoreline of the Preserve provides a scenic and environmentally-significant backdrop for recreational use. These qualities will be maintained for future recreational users of the river.

Creation of a Salt Water Paddling Trail

On October 20, 1992, the Governor and Cabinet of the State of Florida passed a resolution designating the vast length of coastline between Pasco County and Wakulla County as the "Nature Coast". This stretch of coastline, also known as the Big Bend, is easily distinguished as the most natural and pristine coastline remaining in the state. The Weekiwachee Preserve is situated near the southern end. Formal designation as the Nature Coast is intended to reflect the prevailing natural condition of the coastline. It also seeks to unite affected local governments in an effort to promote the development of a tourist industry that would be compatible with the superlative

natural resources of the region. Much of the Big Bend/Nature Coast shoreline is protected through public ownership. Appropriate tourist-related recreational usage of these protected lands may provide important economic benefits to the rural counties and communities in the area.

The State of Florida has developed an extensive network of recreational trails, including a marked system of canoe trails. However, the Big Bend Historic Salt Water Paddling Trail, which extends from the mouth of the St. Marks River to the mouth of the Suwannee River, and a trail presently being established through St. Martin's Marsh Aquatic Preserve, are the only formally-established state trails that highlight coastal habitats. The springrun rivers, coastal hammocks and salt marshes of the Hernando County and Citrus County section of the Nature Coast may provide the finest setting for a coastal paddling trail in the entire State of Florida. The maze-like arrangement of salt marsh and hydric hammock that characterize this shoreline create a more sheltered environment for canoeists and kayakers than the comparatively open waters of the Big Bend trail. The scenic vistas and extensive swathes of natural coastline that lie off the Citrus/Hernando shoreline are punctuated by the mouths of the Crystal River, Homosassa River, St. Martins River, Chassahowitzka River and Weekiwachee River. The coastal communities and developed facilities associated with the upstream reaches of these rivers would greatly enhance the utility of any trail established along this shoreline. Users could choose among many different sites for embarking upon the trail, and alternatives for use would range from day-trips to overnight treks of 2 or 3 days. At the discretion of the paddler, overnight accommodations could range from commercial lodging to primitive campsites.

During development of a management plan for the Chassahowitzka Riverine Swamp Sanctuary (Figure 2), the District proposed development of a coastal kayak and canoe trail in this region in cooperation with the FGFWFC, USFWS, DOF, and Citrus and Hernando County local governments. The District will continue to explore the feasibility of establishing a paddling trail along the Citrus and Hernando shoreline. As noted, a trail through the St. Martin's Marsh Aquatic Preserve, which lies at the northern end of the study area, has recently received formal designation. Linkage with this trail, from a southern terminus associated with the Weekiwachee Preserve, would create a trail system that includes access to the Weekiwachee, Chassahowitzka and Homosassa Rivers. Hernando Beach Park, which is situated at the head of Jenkins Creek near the mouth of the Weekiwachee, would provide a logical southern terminus for the hypothetical trail. Restrooms and launching facilities are available at the county-operated park, which allows for vehicular access and convenient access to lodging.

The practicality of establishing the coastal paddling trail hinges primarily upon the occurrence of upland sites at regular, frequent intervals along the entire length of the trail. Upland sites provide important areas of refuge during storms and other life-threatening emergencies. Campsites or other overnight landings must also be available at intervals that conform with the daily range of paddlers. Other needs, beyond these essential physical requirements, include a system of numbered trail markers installed along the length of the

trail and accurate maps that would be available to all users of the trail. Responsibility for the maintenance of trail markers and campsites, and for the proper administration of a reserved network of campsites, would need to be assigned appropriately.

In the event that all of the affected agencies and local governments support establishment of a coastal paddling trail, a joint proposal will be submitted to the Florida Department of Environmental Protection (DEP) in accordance with Chapter 16D-7 of the Florida Administrative Code. The proposal will delineate a conceptual route and a network of essential support facilities, including campsites. The DEP will be solicited to seek formal designation of the trail as a component of the Florida Recreational Trails System and to play a lead role in securing permits and funding assistance necessary for installing trail markers and preparing maps and guidebooks.

Horseback Riding

The incompatibility of the Preserve for horseback riding parallels that discussed previously for bicycling. However, in contrast to the compatibility of the lake area for bicycling, the limerock surface of the former mine lands cannot accommodate horses. The limerock fragments that litter the surface make it unsuitable for horses. As such, the entire Preserve will be closed to equestrian use.

Camping

Profiles of the population in the region surrounding the Preserve indicates that there is not a high demand for camping. Other public lands in the area provide such opportunities and should be adequate to meet current demand. However, the only camping opportunity along the local coastline is at the Chassahowitzka River Campground in Citrus County. Management concerns associated with wildlife issues and the high fuel loads resulting from an extended period of fire suppression make the Preserve unsuitable for camping at this time. As ongoing research and resource monitoring continue, and as a prescribed burning program is implemented, the District will evaluate the Preserve for suitable camping sites in order to meet future demand and better serve the local population. The acquisition of additional lands, and their incorporation into the Preserve, may present new possibilities for providing camping opportunities.

Opportunities for Environmental Education

Most people who are attracted to visiting a property like the Weekiwachee Preserve are committed to protecting the area and the ecosystems it sustains. However, many of these visitors may be totally unaware of the dynamics of the surrounding environment and of the effects their recreational activities may have on ecological processes at work within the Preserve. Opportunities to learn about the ecology of the Preserve will be woven into the recreational activities occurring on the property through development of the interpretive nature trail. The District will facilitate and promote opportunities for environmental education at the Preserve.

District staff, the Hernando County School Board, volunteers, and non-profit organizations will be solicited to provide

interpretive hikes and implement outreach efforts to the local community. Volunteer opportunities to assist in activities like tree planting, habitat surveys, or wildlife observation will also be provided when possible. Local schools may be permitted to use the Preserve as an outdoor classroom for environmental education purposes, provided the planned activities are approved and coordinated through the District.

Coordination With Hernando County Government

A continuing, cooperative relationship with Hernando County will be a necessary prerequisite to implementing many of the public uses proposed in this plan. County sponsorship and management of the facilities associated with the beach and swimming area will be essential to constructing them and making them available to the public. Limiting the Preserve to day-use activities will also require a daily presence for opening and closing the primary access point (Figure 4).

In addition to the management of public use, the District will work closely with the County to ensure that incompatible uses do not occur on lands adjoining the Preserve. The Future Land Use Element of the Hernando County Comprehensive Plan identifies the patterns and types of development proposed within the county. Achieving the management goals and objectives established in this plan will be partially dependent upon land use and development patterns for lands surrounding the Preserve. The actual lands comprising the Weekiwachee Preserve are designated as a mixture of *Conservation, Residential* and *Strip Commercial* future land use categories. Future land uses around the Preserve property include *Residential, Strip Commercial*, and *Conservation* categories. A vast majority of the surrounding lands have already been developed in a manner consistent with these categories. The *Conservation* future land use category was established to ensure the protection of forests and wetlands, and promote preservation of wildlife and marine habitat. The *Residential* and *Strip Commercial* future land use categories identify areas where residential and commercial growth and development is expected to occur because of favorable infrastructure or site development conditions. While the *Conservation* category is consistent with the goals of this plan, the *Residential* and *Strip Commercial* categories are clearly inappropriate and incompatible with management goals for the property. The Future Land Use Map should be amended to designate the entire Weekiwachee Preserve as *Conservation* land. The District will coordinate with Hernando County to appropriately amend the Future Land Use Map and to ensure that undeveloped areas surrounding the Preserve are not dedicated to incompatible uses.

In the future, similar cooperation with Pasco County government may be required. A portion of the lands proposed for acquisition and eventual addition to the Preserve are located in Pasco County, adjacent to the community of Aripeka. If these lands are acquired, the District will initiate such a cooperative relationship with Pasco County.

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