LITTLE MANATEE RIVER NATURE PRESERVE

LAND MANAGEMENT AND LAND USE PLAN

REGIONAL PARKS AND CONSERVATION SECTION

HILLSBOROUGH COUNTY PARKS, RECREATION AND CONSERVATION DEPARTMENT

JANUARY 2009

LITTLE MANATEE RIVER NATURE PRESERVE

LAND MANAGEMENT AND LAND USE PLAN

Hillsborough County
Florida

Prepared for

ENVIRONMENTAL LANDS ACQUISITION
AND
PROTECTION PROGRAM

HILLSBOROUGH COUNTY PARKS, RECREATION
AND
CONSERVATION DEPARTMENT
CONSERVATION SERVICES SECTION
10940 McMullen Road
Riverview, Florida 33569-6226
(813) 672-7876

PREPARED BY

4925 Independence Parkway, Suite 120
Tampa, Florida 33634

JANUARY 2009

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1.0 GENERAL INFORMATION

1.1 Location of the Little Manatee River Nature Preserve

The Little Manatee River Nature Preserve (Preserve) consists of three separate sections along the Little Manatee River in southern Hillsborough County. The easternmost section is the largest totaling 5,154 acres and encompassing all or part of Sections 13, 14, 15, 22, 23, 24, 25, 26, 27, 28, 33, and 34 of Township 32, and Range 20, and Sections 17, 18, 19, 20 of Township 32, Range 21. The central section is the smallest with 667 acres, and this is located in Sections 30, 31, and 32 of Township 32, Range 20, and in Sections 32 and 36 of Township 32, and Range 19. The third section is the westernmost section and totals 1,345 acres. This section of the Preserve is located in Sections 19, 20, 21, 27, 28, 29, and 30 of Township 32, Range 19. These sections were assembled through the purchase of individual neighboring parcels over two decades to achieve the combined total of 7,166 acres. The three sections comprising the Preserve are not contiguous, but are separated by Little Manatee River State Park, agricultural areas, and residential lands. Adjacent land uses around the Preserve include high intensity row-crop agriculture, cattle ranches, low to medium density residential, and other public and recreational lands. Figure 1 displays the location of the Preserve.

1.2 History and Objective of the Preserve

The Little Manatee River Nature Preserve was purchased in phases over the last 16 years. The first purchase was the Dickman Ranch property which included approximately 740 acres of the estuarine system inland from Cockroach Bay. A majority of the subsequent purchases were conducted in cooperation with the Southwest Florida Water Management District (District), with the notable exception of Camp Bayou, which is wholly owned by the County. The preservation of these lands along the Little Manatee River fulfills the objectives the District identified in the Comprehensive Watershed Management Plan for the Little Manatee River, published in 2002. These objectives are to protect the District's primary Areas of Responsibility; water supply, flood protection, water quality, and natural systems (SWFWMD, 2002). The District has entered into a lease agreement with Hillsborough County wherein the County has lead responsibility for land jointly purchased (Appendix A).

Reviews of the assorted environmental audits and assessments for the lands purchased indicated that the lands comprising the Preserve were historically either agricultural lands or wilderness. The agricultural lands range from intensive row crop farming, to improved pasture, to rather passive use as cattle range lands. A few homesteads were present on some of the lands, but most of these have been removed (references are in Section 9).

Legend

- Rivers/Creeks
- Little Manatee River Preserve (7,166 acres)
- Other Public Land
- County Line

Balm Scrub Nature Preserve

674

75

301

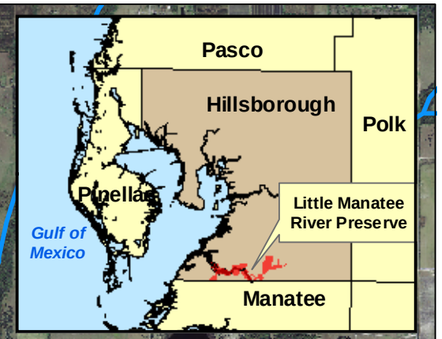
579

Little Manatee River State Park

Little Manatee River

Hillsborough

Manatee



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0 2,250 4,500 Feet

Aerial Source: Hillsborough County 2007
ELAPP Boundaries: Hillsborough County 2007

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FIGURE 1
Little Manatee River Preserve Location Map

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2.0 NATURAL RESOURCES

2.1 Soil Resources

2.1.1 Soils Distribution

According to the United States Department of Agriculture/Natural Resource Conservation Service (formerly Soil Conservation Service) Soil Survey of Hillsborough County (USDA 1989), there are twenty-four different classifications of soils found in the Little Manatee River Nature Preserve. Table 1 lists the soils and the surface area they cover within the Preserve. Figure 2 highlights the twenty-four soil types and shows their distribution throughout the Preserve.

Table 1
Little Manatee River Nature Preserve
Soils Distribution

Map Number	Soil Type	Acreage
3	Archbold fine sand	139.49
4	Arents, nearly level	0.68
5	Basinger, Holopaw, and Samsula soils	138.13
7	Candler fine sand	183.97
14	Eaton mucky sand, depressional	26.25
15	Felda fine sand	0.25
16	Felda fine sand, occasionally flooded	274.70
21	Immokalee fine sand	413.42
27	Malabar fine sand	101.35
29	Myakka fine sand	2776.04
30	Myakka fine sand, frequently flooded	346.05
33	Ona fine sand	185.81
35	Orlando fine sand	34.16
36	Orsino fine sand	56.24
38	Pinellas fine sand	9.66
41	Pomello fine sand	520.21
46	St. Johns fine sand	602.05
47	Seffner fine sand	21.32
52	Smyrna fine sand	88.87
53	Tavares-Millhopper fine sands	4.50
57	Wabasso fine sand	21.89
60	Winder fine sand, frequently flooded	934.31
61	Zolfo fine sand	153.02
99	Water	134.00
	Total Acreage	**7,166**

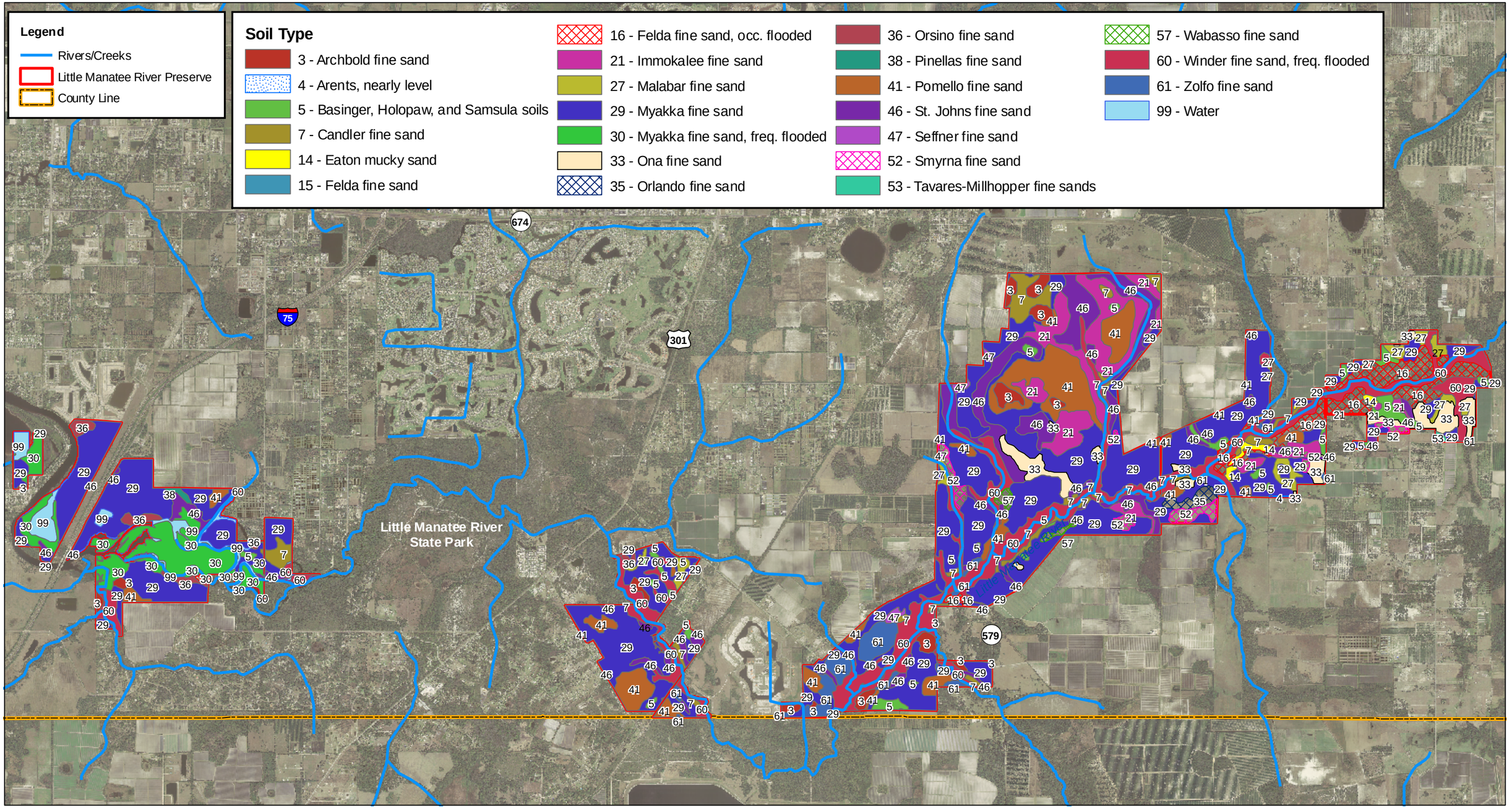
USDA Natural Resource Conservation Service, Soil Survey Graphic (SSURGO) Database for Hillsborough County, Florida, 2004.

Legend

- Rivers/Creeks
- Little Manatee River Preserve
- County Line

Soil Type

- 3 - Archbold fine sand
- 4 - Arents, nearly level
- 5 - Basinger, Holopaw, and Samsula soils
- 7 - Candler fine sand
- 14 - Eaton mucky sand
- 15 - Felda fine sand
- 16 - Felda fine sand, occ. flooded
- 21 - Immokalee fine sand
- 27 - Malabar fine sand
- 29 - Myakka fine sand
- 30 - Myakka fine sand, freq. flooded
- 33 - Ona fine sand
- 35 - Orlando fine sand
- 36 - Orsino fine sand
- 38 - Pinellas fine sand
- 41 - Pomello fine sand
- 46 - St. Johns fine sand
- 47 - Seffner fine sand
- 52 - Smyrna fine sand
- 53 - Tavares-Millhopper fine sands
- 57 - Wabasso fine sand
- 60 - Winder fine sand, freq. flooded
- 61 - Zolfo fine sand
- 99 - Water



N W E S

0 2,250 4,500 Feet

Aerial Source: Hillsborough County 2007
ELAPP Boundaries: Hillsborough County 2007
Soil: USDA NRCS, SSURGO 2004

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FIGURE 2
Little Manatee River Preserve Soil Types

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2.1.2 Soils Description

Archbold fine sand (3). This soil has developed thick beds of very loose fine sand, and is nearly level and found on low ridges in flatwoods. The soil is extremely low in organic matter and mineral nutrients and is strongly acidic. The soils drain quickly and contain little moisture, even during the rainy season. Typical vegetation supported by these soils are those found in sand pine scrub/xeric oak plant communities. This soil type comprises only 1.95% of the Preserve and is found in two locations in the western-most portion, one location in the portion east of 301, and in twelve locations within the large eastern portion of the Preserve.

Arents, nearly level soil (4). This soil type comprises 0.01% of the total soils and is located in one area on the southern boundary of the large, eastern portion of the Preserve. This is a heterogeneous soil created by earth moving equipment.

Basinger, Holopaw, Samsula soils (5). This soil type makes up 1.93% of the total surface soil cover and is found in one location in the western portion, seven locations in the central portion, and 16 locations in the eastern portion of the Preserve. This soil complex supports small cypress domes, freshwater marshes, and wet prairie communities. Native vegetation on undisturbed sites includes cypress in the canopy, with saw grass, panicum, bluestem, and maidencane in the understory.

Candler fine sand (7). This soil type is found in one location in the western portion, three locations in the central portion, and in twenty small locations within the eastern portion of the Preserve, and comprises 2.57% of the total soils. The soil is nearly level to gently sloping and excessively drained in its natural condition, and typically supports sand live oak, turkey oak, running oak, and native grasses in the understory.

Eaton mucky sand, depressional (14). This nearly level, poorly drained soil is found in depressions in flatwoods. On the Preserve, this soil type comprises only 0.37% of the surface soils, and it is found in three locations along the Little Manatee River in the eastern portion of the Preserve. Under normal conditions, the soil supports cypress and sweet gum, with sand cordgrass, maidencane, bluestem, and wax myrtle as an understory.

Felda fine sand (15). Felda fine sand is nearly level and poorly drained, and makes up only a trace of the surface soils of the Preserve. The natural vegetation on this soil includes canopy species such as cabbage palm and slash pine, and understory species such as saw palmetto and wax myrtle.

Felda fine sand, occasionally flooded (16). This nearly level, poorly drained soil is found on low terraces of major rivers and streams. The natural vegetation on undisturbed areas of this soil includes red maple, cabbage palm, slash pine, and sweet gum, with an understory of saw palmetto, pineland three-awn, and wax myrtle. This soil

comprises 3.83% of the surface soils in the Preserve, and is found in eight locations along the river in the eastern portion.

Immokalee fine sand (21). This soil is nearly level and poorly drained and is typically found in the flatwoods. The soil normally supports typical flatwoods vegetation such as longleaf and slash pine in the canopy, with lopsided Indian grass, gallberry, saw palmetto, pineland three-awn and wax myrtle in the understory. Immokalee fine sand comprises 5.77% of the total surface soils and is located in twelve locations along the river in the eastern portion of the Preserve.

Malabar fine sand (27). The Malabar fine sand soils are usually found in depressions within pine flatwoods. The native vegetation on this soil type includes cabbage palm, longleaf pine, slash pine, saw palmetto, and wax myrtle. Malabar fine sands comprise 1.41% of the total surface soils in the Preserve and are found in two locations in the central portion, and in ten locations in the eastern portion.

Myakka fine sand (29). This soil type comprises the majority of the Preserve with approximately 38.74% of the surface soils. This soil is found in twelve locations in the western portion, seven locations in the central portion, and forty-three areas of varying size within the large eastern portion of the Preserve. This soil type is nearly level and poorly drained, and supports pine flatwoods with longleaf and slash pine in the canopy and saw palmetto, gallberry, running oak, and wax myrtle in the understory.

Myakka fine sand, frequently flooded (30). This soil is level, very poorly drained, found in tidal areas and subject to shallow flooding by the highest of normal tides. The natural vegetation supported by this soil includes mangroves and salt marsh species. This soil type is found thirteen locations in the western portion of the Preserve and comprises only 4.83% of the total surface soils.

Ona Fine Sand (33). This soil type is found in eleven locations in the eastern portion of the Preserve and comprises approximately 2.59% of the total surface soils. In its natural state it supports mesic pine flatwoods.

Orlando Fine Sand (35). This soil type is found in one location along the river in the large eastern portion of the Preserve. This soil comprises about 0.48% of the Preserve and is nearly level or gently sloping, well drained, and usually supports sand hill vegetation such as turkey oak, live oak, and slash pine.

Orsino fine sand (36). This soil occupies ridges or knolls and is strongly acid. It is excessively well drained and low in organic matter and nutrients. The natural vegetation occurring on these soils is characteristic of sand pine scrub. This soil occupies only 0.78% of the Preserve and is found in four locations in the western portion and in one location in the central portion.

Pinellas fine sand (38). This soil is nearly level and poorly drained and is found on broad plains in flatwoods. The natural vegetation consists of those species associated with flatwoods. This soil comprises only 0.13% of the Preserve and is located in the western portion of the Preserve, on the northern boundary.

Pomello fine sand (41). This soil is moderately to poorly drained and strongly acidic. The natural vegetation community on this soil is flatwoods. This soil occupies 7.26% of the surface soils in the Preserve and is found in two locations in the western portion, four locations in the central portions, and in eighteen locations in the eastern portion.

St. Johns fine sand (46). This soil is nearly level and poorly drained and is found on low-lying plains in the flatwoods. The vegetation usually found on undisturbed sites includes flatwoods species such as longleaf and slash pines, saw palmetto, wax myrtle, gallberry, running oak, and pineland three-awn. This soil type comprises 8.40% of the Preserve and is found in six locations in the western portion, in seven locations in the central portion, and in twenty-eight locations in the large, eastern portion.

Seffner fine sand (47). This soil is nearly level and poorly drained and found on the rims of depressions and on broad, low ridges in flatwoods. The natural vegetation includes longleaf pine, slash pine and laurel oak in the canopy, with creeping bluestem, grassleaf golden aster, lopsided Indian grass, and saw palmetto. This soil type makes up only 0.30% of the surface soils in the Preserve, and is found in five areas in the eastern portion.

Smyrna fine sand (52). This soil classification provides 1.24% of the surface soils in the Preserve and is found in five locations in the eastern portion. This soil type is found on broad low-lying, convex swells in drier flatwoods communities. The native vegetation would typically include longleaf and slash pine, gallberry, running oak, saw palmetto, wax myrtle, and other species common to pine flatwoods.

Tavares-Millhopper fine sands (53). This soil type is found in nearly level, gently sloping, moderately well-drained areas in the uplands and low ridges in the flatwoods. The vegetation found on undisturbed Tavares-Millhopper fine sand soils includes sandhill species such as turkey oak, live oak, bluejack oak, longleaf pine, creeping bluestem, panicum, lopsided Indian grass, and pineland three-awn. There is only one location of this soil type located within the eastern portion of the Preserve. This area comprises 0.06% of the total surface soils on the Preserve.

Wabasso fine sand (57). This soil type comprises 0.31% of the Preserve and is found at only one location within the eastern portion. This nearly level, poorly drained soil supports flatwoods vegetation such as longleaf, slash pine, and cabbage palm with an understory of saw palmetto.

Winder fine sand, frequently flooded (60). This soil type comprises 13.04% of the total surface soils in the Preserve and is found in five locations within the western portion, five

locations within the central portion, and in eight locations within the eastern portion. This soil type typically supports Carolina willow, red maple, cabbage palm and sweet gum, as well as buttonbush, saw grass, smartweed, and sedges in the understory.

Zolfo fine sand (61). This soil classification comprises 2.14% of the surface soils within the Preserve and is found in two locations on the southern boundary of the central portion, and in twelve locations within the eastern portion. Under natural conditions, this soil type supports xeric oak, pine, saw palmetto, and other species found in oak scrub vegetative associations.

Water (99). Open water provides 1.87% of the area within the Preserve and predominantly includes the waters of the Little Manatee River in the western portion where the main stem of the river is more visible.

2.1.3 Soils Management Measures

Management measures for the Preserve include protecting the natural vegetation to prevent soil erosion, preventing off-road vehicles from accessing the Preserve, and maintaining fire breaks. The goals and objectives of the management plan will preserve the integrity of the native soils by preserving the native vegetation communities on the Preserve and by taking action to prevent erosion. There are no facilities or actions proposed in this ten-year plan that would require impacts to soils with the exception of the maintenance of the existing fire breaks and the removal of exotic vegetation. Any future management measures not included in this plan that require earthwork will implement Best Management Practices prior to construction to preserve the character of the ecosystems (http://www.na.fs.fed.us/spfo/pubs/n_resource/wetlands/index.htm). There are no known oil, gas, phosphate or other mineral resources on the Preserve.

2.2 Natural Communities and Land Cover Types

2.2.1 Mapping Process

The discussion of ecological communities describes the fourteen distinct vegetation associations and land cover types on the Little Manatee River Nature Preserve. The system employed in this plan of classifying the natural communities was developed by the Florida Natural Areas Inventory (FNAI). The premise of this system is that physical factors such as geology, climate, soils, hydrology, and fire determine the species composition of an area and that areas which are similar with respect to these factors will tend to have natural communities with similar species compositions. The land cover types were classified using the Florida Land Use, Cover, and Forms Classification system (FDOT, 1999).

Appendix B provides a list of the plant species found to date on the Little Manatee River Nature Preserve. The fourteen vegetation communities and land cover types identified

are listed in Table 2 with the total area that each community occupies within the Preserve.

Table 2
Little Manatee River Nature Preserve
Natural Vegetation Communities and Land Cover Types

Vegetation Community	Acres	%
Cypress swamp	64.60	0.90
Forested wetlands	870.80	12.15
Former agriculture	1141.57	15.94
Freshwater marsh	22.32	0.31
Tidal marsh	338.67	4.73
Mesic hardwoods	369.94	5.16
Oak hammock	25.54	0.36
Oak scrub/sandhill	598.67	8.35
Old field	673.76	9.40
Open water	134.05	1.87
Pasture	342.32	4.78
Pine flatwoods	2375.07	33.14
Sandpine scrub	52.36	0.73
Pond	3.61	0.05
Scrubby flatwoods	152.72	2.13
Total acres	**7166.00**	**100.0**

2.2.2 Vegetation Community Descriptions

The following paragraphs describe the fourteen distinct communities and land cover types and Figure 3 shows their estimated extent and location within the Preserve. As stated previously, the mapping was completed with limited ground truthing and the locations of the plant communities and descriptions of the vegetative cover are approximations. As part of the 10-year management process, the Conservation Services Section may continue ground-truthing and refining the delineation of plant community types, as well as continue to update the flora and fauna species lists.

Pine flatwoods. Pine flatwoods is the most prevalent natural community in the Preserve and is found in all three sections from east to west. The nearly level pine flatwoods areas are burned on a 2 to 3 year cycle which maintains an open canopy of longleaf and slash pine. The understory varies in composition depending on the timing and intensity of the last fire. Some areas support a dense understory of saw palmetto, while others have a mixture of wire grass, broomsedge, wax myrtle, paw paw, and other common species. The pine flatwoods are found throughout the Preserve, and encompass 33.14% of the total area.

Legend

- Preserve Boundary
- County Line

Community Type

- Cypress Swamp
- Forested Wetlands
- Former Agriculture
- Freshwater Marsh
- Tidal Marsh
- Mesic Hardwoods
- Oak Hammock
- Oak Scrub/Sandhill
- Old Field
- Open Water
- Pasture
- Pine Flatwoods
- Pond
- Sandpine Scrub
- Scrubby Flatwoods

Balm Scrub
Nature Preserve

674

75

301

Little Manatee River
State Park

Little Manatee River

Burrowing Owl
Management Areas

579

N
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0 2,250 4,500
Feet

Aerial Source: Hillsborough County 2007
ELAPP Boundaries: Hillsborough County 2007

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FIGURE 3
Little Manatee River Preserve Natural Communities

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The pine flatwoods vary in condition depending on the accessibility of the site and the time the land was purchased. This photograph was taken in the westernmost section in an area which has been burned on a regular basis.

Management measures for pine flatwoods. The proper management of pine flatwoods includes such measures as conducting prescribed burns every two to four years (Myers *et al*., 1990), controlling exotic vegetation, roller-chopping, and preventing impacts to the soil and native vegetation. Minor changes in the flat topography can have significant impacts to the character of the habitat by changing drainage patterns. Other management measures include preventing wildfires, off-road vehicles, and other forms of vandalism.

Oak hammock. The oak hammock communities comprise less than one percent of the total land area, but are found throughout the Preserve. These areas are characterized by a dense canopy of live oak draped in Spanish moss, and a thick carpet of leaf litter in the understory. Very few ground cover species are present in the deep shade. Many of the oak hammock areas are located on sand deposits along the steep banks of the river.

Management measures for oak hammock. Current management recommendations include the maintenance of exotic vegetation, prevention of off-road vehicles and other forms of vandalism. Many of these communities support gopher tortoise populations, so management measures to preserve these species should be included.

Freshwater marsh. The freshwater marsh areas in the Preserve total only 22.31 acres or 0.31% of the total land area. There are no freshwater marshes in the western section of the Preserve, four in the central section and seven in the eastern section.

This photograph shows a small marsh within a flatwoods community. The characteristic vegetation is the sand cord grass and soft rush with pickerelweed visible in the background.

Management measures for freshwater marsh. Maintenance of natural hydrology is critical for seasonally flooded marshes to survive. These wetland areas usually burn every 2 to 4 years (FNAI, 1990); without occasional fires these wetlands would become shrub swamps with Carolina willow and buttonbush becoming established in the central portions. Other management measures include the maintenance of invasive species including plants, channeled apple snails and feral pigs. Security measures to prevent impacts from vehicles or heavy equipment are also needed.

Cypress swamp. There are five large and one small area of cypress swamp within the eastern section of the Preserve, and these areas comprise approximately 0.9% of the total land cover. These communities are characterized by a canopy dominated by bald cypress with occasional cabbage palms or laurel oak. The composition and density of ground cover species is dependent upon the canopy closure, and species present include soft rush, water penny wort, lizard's tail, water hyssop, hornwort, blue flag iris, day flower, and a variety of ferns.

Management measures for cypress swamp. The management of the cypress swamps includes preventing the infestation of exotic vegetation and maintaining the hydrology by filling any historic drainage ditches. Exotic species which are particularly threatening to cypress swamps are old world climbing fern, air potato, and skunk vine. Maintaining the hydrology is important not only to support the chemical and physical processes of the ecosystem, but to support the physical properties of the soil that sustains the ecosystem.

The improved pasture areas are characterized by lush herbaceous graminoid species and few other opportunistic species such as dog fennel. This particular area will be transformed to upland forest and grasslands when funding is available.

Improved pasture. Improved pasture areas are those areas that were formerly used for cattle grazing but in which the natural soils appear to be intact. These areas do not appear to have ever been used for row crops or other invasive agricultural activity, but they have not been abandoned long enough to revegetate with native or exotic species. The pasture supports bahia grass and other herbaceous species for the cattle, and comprises 4.78% of the total land cover. Pasture areas are found within the eastern section of the Preserve.

Management measures for improved pasture. Some of the improved pasture areas will be managed (mowed or burned) to maintain the open pasture character, especially those areas that support or once supported the burrowing owl. Other areas may be leased for cattle or hay to maintain the site as improved pasture until restoration funding is available. The remaining pasture areas will be allowed to return to native vegetation or planted for restoration. A description of the restoration efforts for some of these pasture areas is provided in Section 6.0 Habitat Restoration and restoration plans are provided in Appendix G.

Forested wetlands. The forested wetlands comprise 12.15% of the total land area in the Preserve and are mainly associated with the Little Manatee River and its tributaries. These areas support trees such as red maples, water oak, Carolina willow, bays, cabbage palms, and other hydric species. The understory, if present, supports ferns and grasses tolerant of inundation.

This photograph shows the forested wetlands community along the Little Manatee River. There is a high level of species diversity in this forested wetland.

Management measures for the forested wetlands. There are several important management measures for the preservation of the forested wetlands along the Little Manatee River, one of which is to prevent the infestation of exotic vegetation. Species such as air potato and old world climbing fern can engulf habitats like this in a matter of a few years, and once the vines are established, it will be extremely difficult to keep them from recurring.

Another important management measure is the identification of areas being impacted by runoff and soil erosion. Some of the runoff into the river is laden with agricultural plastic and debris, which covers some areas of the river. Other runoff areas have caused scouring and/or sediment deposition in the river bottom. The County has already identified two of these areas and taken measures to restore habitat and treat the runoff (see Section 6.0). This effort should continue for all areas of the Preserve.

Oak Scrub/sandhill. These dry, sandy areas comprise 8.45% of the Preserve and are found on all three sections. These areas are typically characterized by an open canopy of widely spaced longleaf pine or sand pine trees with turkey oak as a subcanopy, and a sparse ground cover of wire grass.

Those areas that have experienced fire suppression have become dense with hardwood species in the subcanopy and shrub layer that natural fires usually eliminate or reduce. The ground cover includes runner oak and gopher apple, with wire grass as a subdominant species.

This oak scrub area is located along the southern side of Safford Road in the eastern section of the Preserve. This is a restoration site in which the native species are being allowed to recruit and the non-native species are controlled. The tire is evidence of continuing problems with trash dumping.

Management measures for oak scrub/sandhill. Sandhill is a fire dependent community, with natural fires occurring approximately every two to five years (http://www.fnai.org/PDF/Natural_Communities_Guide.pdf). Some sandhill communities in the Preserve support several state-listed species such as gopher tortoise, so prescribed burns are an important part of habitat management. Other management measures include the control of exotic vegetation, the control of hardwood species, and the prevention of erosion of the sandy soils. Studies have shown that reducing the hardwoods in sandhill communities, especially through the use of prescribed burns, increases the occurrence of some bird species that have declined due to habitat loss (Provencher *et al*., 2002).

Former agricultural lands. These areas were recently in row crops and the evidence of this use is still visible in the deep furrows and irrigation swales in the soil. There is little vegetation present and what has recruited appears to be exotic or opportunistic native species. These lands comprise 13.97% of the Preserve.

Management measures for former agricultural lands. Some of these lands will be leased for the production of hay. If left alone, these areas become overrun with woody weed species that require heavy equipment and/or intensive management with strong herbicides to control. In addition, over the years of neglect, a seed source develops in the soil that makes control more difficult. Lands that will not be placed into hay production will be allowed to recruit with natives or will be planted and monitored to ensure that exotic species do not infest the area.

The sandy soils of the former row crop areas are evident in this photograph. Species recruiting on this site include dog fennel, flea bane, tassel flower, rabbit bells, indigo, bush bean, and numerous opportunistic species.

Mesic hardwoods. The mesic hardwoods comprise 5.16% of the Preserve and are located in the eastern section, associated with the main stem and tributaries of the Little Manatee River. This vegetation community typically consists of red maples, sweet gum, laurel, Virginia live, and water oaks, occasional cypress, and other trees tolerant of infrequent inundation. Most of these communities appear to be relatively intact. These areas are not fire-dependent (http://www.fnai.org/PDF/Natural_Communities_Guide.pdf).

This photograph shows the mesic hardwoods from the edge of the community. The saw palmetto in the foreground is less common as ground cover in the mesic hardwoods community where vines, ferns and other species dominate.

Management measures for mesic hardwoods. Management measures for this vegetation community includes the control of exotic vegetation, especially vines such as skunk vine, air potato and old world and Japanese climbing fern. These vines can act as fire ladders and bring fire into the community with catastrophic results. Other management measures include the prevention of erosion by maintaining vegetative cover, and controlling feral hog populations.

Old field. The old field areas are former cattle grazing areas that are recruiting native vegetation. There are old field areas within the eastern and western sections in the Preserve, and these areas comprise 10.88% of the total area within the Preserve boundary. These areas differ from the former agriculture and pasture areas in the vegetative cover present and the assumed former use of the land. Pasture areas have been used recently and still maintain a grassy ground cover. Former agricultural lands still show signs of intensive farming, such as discernable row and swales common to tomato and strawberry farming, for example. Some of the old field lands appear to support a significant cover of native plant species as well as the grasses commonly used in pastures.

This photograph shows one of the old field areas within the Little Manatee River Preserve. Note the mix of herbaceous dicots within the grasses in the ground-cover.

Management measures for old field. Management measures for this habitat should include two assessments – first, to determine whether listed species are present and if so, decide on the best recommendations for management based on recovery plans and literature. Second, if invasive plants are present in these areas, an assessment and work plan to control the plants should be completed and implemented as soon as possible. Then, a determination should be made whether to lease these areas in order to keep the habitat open.

Open water. The open water on the Preserve comprises 1.87% of the total area within the Preserve boundaries. The open water consists of a borrow pit on the east side of I-75 and the tidal waters of the lower Little Manatee River. The borrow pit does not provide significant habitat due to its substantial depth and the lack of shallow littoral areas. The estuary of the Little Manatee River is one of the richest systems in the County and it provides habitat for numerous threatened and endangered species.

This photograph was taken at Camp Bayou at the end of 24th Street. The land across the Little Manatee River from the camp is owned mainly by the state as the Little Manatee River State Park. The water in this area is relatively clear, though stained by tannins.

Management measures for open water. The main management concern for open water is to protect water quality, especially within the Little Manatee River. The river is one of the most pristine areas in the County and an Outstanding Florida Water (see Section 2.3.1). To protect water quality certain precautions must be undertaken:

- maintain bank vegetation and avoid soil disturbances to prevent erosion,
- treat stormwater runoff prior to discharge to the river or tributaries,
- employ best management practices during any construction activities,
- control exotic vegetation using methodologies that will not impact water quality,
- continue to remove trash and debris as it accumulates, and
- discourage boaters from encroaching into shallow areas to avoid groundings.

Pond. There are four areas identified as ponds in the Preserve; all located within the eastern section. The four areas provide only 0.05% of the total area within the Preserve boundary and are too small to be seen in Figure 3. Two of these areas are distinguished from other wetlands by their man-made character and from the Open water areas by their small size and origin. They appear to be former freshwater marsh areas that have been excavated and enlarged by farmers to provide water for range cattle.

This pond is located at the southern end of Leonard Lee Road. It will be restored as a part of the habitat restoration for this area. See Section 6.0 for details.

The remaining two ponds were created as part of a County mitigation area. These ponds are located east of Leonard Lee Road, south of an off-site agricultural area. The intent of the mitigation area is to treat the agricultural runoff before it reaches the river, thus improving water quality in the river. Additional information regarding the mitigation area is available in Section 6.

Management measures for ponds. The management measures for the ponds are to keep them free of nuisance exotic vegetation and to protect the planted vegetation from the potential effects of exotic animals. Feral hogs and nutria can decimate the vegetation and cause water quality problems in a matter of hours, and channeled apple snails can eliminate the vegetation in a matter of a few days. See Section 5.2 for more information on these and other exotic species.

Scrubby flatwoods. The scrubby flatwoods is located in the eastern section of the Preserve, west of Leonard Lee Road. This community comprises 2.13% of the total land cover and consists of long leaf and slash pines in the overstory and a shrub layer dominated by saw palmetto, with tar flower, gopher apple, and wiregrass in areas where the palmetto is not as dense. Sand pines may be present, but not as dominant canopy species.

This photograph shows the typical vegetation in a scrubby flatwoods that has not been burned in a while. The cover provided by hardwood species will decline with a regular fire schedule.

Management measures for scrubby flatwoods. The scrubby flatwoods is a fire-dependent community with a natural fire cycle of 8 to 25 years between fires (http://www.fnai.org/PDF/Natural_Communities_Guide.pdf). Prescribed fires prevent the community from succession into hardwood hammock or xeric oak. Roller-chopping is also a valuable management tool in this habitat. The control of exotic plants and animals is important in this community. While the invasion of exotic plants in this community is not common when the native species and soils are intact, any soil disturbance will invite Brazilian pepper, chinaberry, lead tree and other nuisance species. Exotic animals frequently found in the scrubby flatwoods include the nine-banded armadillo and feral hog. The feral hog can do extensive damage to this community by destroying the vegetation and rooting up the soil making it susceptible to exotic plant infestations.

Mangroves. Mangrove ecosystems lie at the interface of land and sea and provide essential habitat for approximately 220 species of fish, 24 species of reptiles and amphibians, 18 species of mammals, and 181 species of birds in Florida. In addition, mangrove systems are important to the estuarine nutrient-cycling processes, and they have an important role in the stabilization of sediments deposited by physical processes. Mangroves also act as a buffer during hurricanes or extreme storm events, protecting upland areas from flooding and erosion. Mangroves tolerate highly variable salinity regimes and have adapted to life in highly anaerobic soils by developing specialized root systems for the exchanges of gases (USFWS, 2004).

Mangroves, especially those located within estuary systems such as the Little Manatee River, usually also support salt marshes and salterns within the community. This photograph shows the black rush marsh within the mangroves.

Mangrove communities are highly variable, but in the Preserve there are three common species. These are red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*), and black mangrove (*Avicennia germinans*). Another species usually found in the landward fringe behind mangroves is buttonwood (*Conocarpus erectus*). The mangrove community composes 5.72% of the Preserve.

Management measures for mangroves. Mangroves are not fire-dependent communities, so prescribed burns are not required to maintain the habitat. They are susceptible to invasive plant species on spoil islands and on the interface with uplands, just above mean high tide. Species commonly found in disturbed areas within the mangroves include Brazilian pepper, Australian pine and melaleuca. These areas must be treated carefully when using herbicides because of the sensitivity of the aquatic habitat. Mangroves are protected by state laws and removal of them is prohibited without prior approval from the Florida Department of Environmental Protection (FDEP).

Regular trash removal is also necessary and important to protect the wildlife that use the mangroves for habitat. Trash is deposited by high tides or left behind by careless boaters and fishermen.

2.3 Water Resources

2.3.1 Aquatic Preserves and Outstanding Florida Waters

The Little Manatee River, for most of its length and all tributaries, has been classified as Class III waters. This classification indicates that the river is suitable for recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife.

In addition to this classification, Little Manatee River is designated as an Outstanding Florida Water (OFW) from State Road 674 to the mouth of the river at Tampa Bay. This designation includes specific regulations including:

- 62-640.770(4)(f), F.A.C. Domestic Wastewater Residuals increases the setback distance for land application of sludge from 200 feet to 3000 feet, and requires that the setback be vegetated.

- 62-312.08(3), F.A.C. Standards for Issuance or Denial of a Permit, states that no permit shall be issued for dredging or filling which significantly degrades or is within an OFW.

- Responsibility for Management and Storage of Surface water (MSSW) (Chapter 373, F.S.) which provides for the permitting of stormwater pretreatment ponds, was delegated to the water management districts. The District's guidelines (Chapter 40D-4, F.A.C) require that developments which discharge to OFWs provide treatment of a 50 percent greater volume of stormwater runoff than otherwise required.

The Cockroach Bay Aquatic Preserve (CBAP) is located from Highway 301 downstream to the mouth of the Little Manatee River and includes all submerged lands from this point to those within Cockroach Bay, south of the mouth of the river. The CBAP is managed by the Florida Department of Environmental Protection in cooperation with Hillsborough County.

2.3.2 Water Quality

The Little Manatee River has its headwaters in a wetland area east of Fort Lonesome in southeastern Hillsborough County and flows westward through southern Hillsborough and northern Manatee counties to discharge into Tampa Bay near Ruskin (SWFWMD, 2002). The river drains approximately 222 square miles of land, with about 158.8 square miles of this in Hillsborough County. The watershed contains 6 named lakes and ponds and 16 named rivers, streams, and canals within Hillsborough County (http://www.hillsborough.wateratlas.usf.edu/watershed/default.asp?wshedID=13).

Water quality in the Little Manatee River is considered to range from good to fair. Good water quality is reported for the entire watershed except for the basins adjacent to the main stem and North Fork. There are no severe water quality problems reported, but elevated nutrients and bacteria levels are attributed to agricultural (pesticides and nutrients) and range land (bacteria and nutrients) in the upstream reaches, and on agriculture, septic tanks, package wastewater treatment plants, and fish farms in the downstream reaches. Encroaching residential development, agricultural irrigation, and phosphate mining activities are cited as potential threats to water quality in the Little Manatee River in the future (Hillsborough County, 2002).

The Little Manatee River, along with the Alafia River, receives the greatest runoff volume in west central Florida. Water quality is generally good in the watershed, although stream flow and water quality data indicate agricultural runoff, originally pumped from the deep aquifer, contributes to dry seasons flows and pollutant loadings. The Little Manatee River has historically good water quality and, of all the rivers flowing to Tampa Bay, it is in the best hydrobiological condition (Hillsborough County, 2002).

Water quality issues and areas of concern in the Little Manatee River watershed include:

- groundwater pumping for agricultural applications and commensurate impacts to groundwater levels as well as stormwater runoff, and saltwater intrusion;

- future expansion of phosphate mining industry into the central portion of the watershed along the Little Manatee River and associated impacts to surface water runoff, and

- increased urbanization and associated increases in impervious surfaces and commensurate increases in stormwater runoff.

The Environmental Protection Commission of Hillsborough County (EPCHC) has a monitoring station at the southern end of Leonard Lee Road (Figure 6). The purpose of the monitoring station is to gather data regarding the water elevation and water quality parameters in Carlton Branch Creek, a tributary to the Little Manatee River. Some of the parameters tested include pH, temperature, salinity, conductivity, dissolved oxygen, nutrients, ortho phosphorus, color, chlorophylls, fecal coliform, turbidity, and other standard water quality parameters (Alex Roberts, EPCHC, personal communication, 2008). The water quality index in the creek has been ranked near the top of the range for several years with ratings of 10 within the Good range of 0 to 45 for all parameters (http://www.hillsborough.wateratlas.usf.edu/river/waterquality.asp?wbodyid=20&wbodyatlas=river).

Stream-Waterwatch is a program initiated by Hillsborough County in 1998 to develop volunteer monitoring of streams and rivers in Hillsborough County. In addition to collecting water chemistry and biological samples, volunteers learn about principles of water management and become more involved in resolving local issues affecting their flowing waters. The pilot Stream-Waterwatch program was funded by the Florida Game and Freshwater Fish Commission (now the Florida Fish and Wildlife Conservation Commission); funding is now shared between Hillsborough County and the SWFWMD. With monitoring stations along the river, including one at Camp Bayou, Stream-Waterwatch will provide water managers and citizens with water chemistry and biological data for better assessing stream conditions and identifying management issues (Hillsborough County Public Works, 2002).

2.3.3 Water Resource Management Measures

Management measures required with respect to maintaining or improving the water quality in the vicinity of the Preserve and in the Little Manatee River would be to:

- increase water quality monitoring stations and monitoring efforts to determine causes of water quality impacts,
- control exotic vegetation with an approved herbicide used according to the label, or use biocontrol agents if available,
- avoid soil disturbances to prevent erosion and subsequent turbidity and sedimentation in surface waters, and
- always implement best management practices during any construction or other disturbance of the soils or vegetation,
- require farmers on adjacent properties to properly dispose of the plastic sheeting used on row crops at the end of growing season. Currently the sheeting is stockpiled or burned but the plastic is not completely destroyed and tattered pieces often make their way into surface waters and flora (SWFWMD, 2002),
- reduce agricultural runoff by providing treatment on site. This would require incentives and coordination with the Environmental Protection Commission and the Agricultural Extension Service, Hillsborough County Planning & Growth Management, Environmental Protection Council, and SWFWMD (Hillsborough County Public Works, 2002).

SWFWMD and Hillsborough County have made it a priority to purchase lands along the river to protect riparian habitat and to provide a buffer to preserve water quality. In addition to the 7000+ acres that have been purchased to date, more than 27,000 acres have been authorized for simple acquisition.

2.4 Fish and Wildlife Resources

2.4.1 Existing Conditions

The Little Manatee River Nature Preserve provides over 7,000 acres of nearly contiguous riparian habitat along one of Florida's most pristine water bodies. The habitat provided is a variety of uplands and wetlands with only a few breaks for roads, agriculture areas, and residential development. Informal surveys of the Preserve indicate that there are 37 species of herpetophiles, 45 species of birds, and 20 species of mammals. Lists of the flora and fauna known to occur as a result of these informal surveys on the Little Manatee River Nature Preserve are provided as Appendix B.

2.4.2 Management Measures for Fish and Wildlife

Prior to implementing any specific management measures for fish and wildlife, it would be beneficial to know all species present, the extent of the population, and where they are

located. Formal surveys which include trapping and tagging are recommended to identify the wildlife resources on the site. These surveys should be conducted seasonally to include the use of the site by migrant species and those species only active on a seasonal basis to provide a truly comprehensive list of the species present. Surveys should include herpetofaunal drift fencing or pitfall arrays, small mammal trapping, and conducting pedestrian transects throughout the Preserve, sampling all habitat types. GPS should be used to mark the locations of important populations.

Informal plant and animal surveys have been conducted on the Preserve by staff to produce the lists that are provided in Appendix B. The informal surveys will continue in perpetuity and as new species are observed, the list will be updated.

The main management measures for the protection and conservation of wildlife on the Preserve are the prescribed burn program to enhance and manage the habitat, and the control of nuisance exotic vegetation and animals. These management measures are conducted in the Preserve on an as-needed basis, and as prioritized by the Conservation Services staff. Other measures include maintaining site security to prevent trespassing, poaching, dumping, arson, and other illegal activities.

2.5 Special Status Species

Information regarding the special status species on Little Manatee River Nature Preserve was obtained from the Conservation Services staff, local experts, and relevant literature. State and/or federally listed plant and animal species observed on the Preserve include those listed in Table 3. According to the Florida Fish and Wildlife Conservation Commission (FFWCC) website (http://myfwc.com/eagle/eaglenests/Default.asp), there are no bald eagle nests on the Little Manatee River Nature Preserve, but there are some near the western portion of the Preserve, near Tampa Bay. However, an eagle's nest was in the Preserve just west of I-75 several years ago, and was abandoned after the host tree was struck by lightning and died. The bald eagle is no longer listed in the state of Florida.

The manatee is one of the most readily recognized endangered species in the Little Manatee River Nature Preserve. This slow-moving mammal is facing extinction due to impacts from speeding boaters, water control structures, water quality degradation, and loss of habitat.

Table 3
Special Status Species Observed in the
Little Manatee River Nature Preserve

Species		Ranking	
Common Name	**Scientific Name**	**FED (3)**	**STATE (1,2)**
Birds			
Florida Scrub-Jay	*Aphelocoma coerulescens*	T	T
Limpkin	*Aramus guarauna*		SSC
Burrowing Owl	*Athene cunicularia*		SSC
Snowy Egret	*Egretta thula*		SSC
Little Blue Heron	*Egretta caerulea*		SSC
Reddish Egret	*Egretta rufescens*		SSC
Tricolored Heron	*Egretta tricolor*		SSC
White Ibis	*Eudocimus albus*		SSC
SE American Kestrel	*Falco sparverius paulus*		T
Florida Sandhill Crane	*Grus canadensis pratensis*		T
Wood Stork	*Mycteria americana*	E	E
Roseate Spoonbill	*Platalea ajaja*		SSC
Mammals			
West Indian manatee	*Trichechus manatus*	E	E
Sherman's fox squirrel	*Sciurus niger shermani*		SSC
Reptiles and Amphibians			
American alligator	*Alligator mississippiensis*	SAT	SSC
Eastern indigo snake	*Drymarchon corais couperi*	T	T
Gopher tortoise	*Gopherus polyphemus*		T
Plants			
Curtiss' milkweed	*Asclepias curtissii*		E
Florida golden aster	*Chrysopsis floridana*	E	E
Garberia	*Garberia heterophylla*		T
Nodding pinweed	*Lechea cernua*		T
Dry sand pinweed	*Lechea divaricata*		E
Cardinal flower	*Lobelia cardinalis*		T
Giant orchid	*Pteroglossaspis ecristata*		T
Toothed lattice-vein fern	*Thelypteris serrata*		E
Giant air plant	*Tillandsia utriculata*		E

Notes:
1) http://fac.dos.state.fl.us/
2) http://www.fl-dof.com/forest_management/plant_conserve_list.html
3) http://www.fws.gov/endangered/wildlife.html

The individual habitat needs for each species are discussed in the following paragraphs. Some survey work has occurred in the scrub habitat restoration areas. Future surveys should determine the locations of foraging, roosting, and nesting areas of the protected species. The knowledge gained in the surveys will allow the planning for future facilities in areas that won't disturb the protected species. ELAPP policies regarding the management of special status species are provided in Appendix C.

2.5.1 Descriptions of Special Status Species

Florida Scrub-Jay. The Florida Scrub-Jay has very specific habitat requirements, and this has exacerbated the decline of this species. Optimal Florida Scrub-Jay habitat is dominated by shrubby scrub live oaks, myrtle oaks, or scrub oaks from 3 to 10 feet tall, covering 50-90% of the area. They also require bare ground or sparse vegetation less than 6 inches tall covering 10 to 50% of the area, and scattered trees with no more than 20% canopy cover. The Preserve provides scrub habitat in varying degrees of suitability and efforts to improve and maintain this habitat for the jays are ongoing. Florida Scrub-Jays have been observed in the western and eastern portions of the Preserve.

Management measures for the Florida Scrub-Jay. In the first land management plan for the Little Manatee River Nature Preserve (Hillsborough County, 1997), it was mentioned that there were two active nests of Florida Scrub Jays near the Sundance Marina. A commitment was made to manage appropriate sites for the preservation of existing habitats and with the coordination of FFWCC and FNAI, to develop new or former sites to encourage additional families.

In May 2003, the Pinellas County Environmental Fund (PCEF), with the support of the National Fish and Wildlife Federation (NFWF) awarded Grant Number 2002-0005-011 to the Hillsborough County Parks, Restoration, and Conservation Services Department in order to restore fire-suppressed oak scrub habitat on three County ELAPP Preserves. The goal of the project was restoration of the oak scrub to benefit not only the Florida Scrub Jay, but endangered plant species as well. One 99 acre area within the Little Manatee River Nature Preserve was determined to be suitable for restoration. This area had developed into mixed oak/pine habitats due to fire suppression, and was not the optimal habitat for Florida Scrub Jays. The objectives of the restoration project were to remove canopy trees to create area suitable for ground cover, to reduce the height of oaks to a level suitable for Florida Scrub Jays, and establish bare ground areas throughout each scrub.

Restoration consisted of mechanically reducing the density of sand pines and lowering the overall height of the sand live oaks with a roller-chopper and hydro-axe. Many of the sites were subsequently burned to decrease fuel loads. Surveys were subsequently conducted during the spring and summer of 2006 to determine the progress of the restoration sites. The survey found an increase of ground cover species, including

endemic species, and the sighting of two Florida Scrub Jays (Hillsborough County, no date).

The USFWS has prepared a Florida Scrub Jay Recovery Plan that provides additional species information with recommendations regarding the preservation and conservation of this species (http://www.fws.gov/verobeach/images/pdflibrary/fsja.pdf).

Limpkin. The Limpkin is a heron-like brown and white flecked bird with a long neck, bill and legs. Limpkins were once hunted for food, but that practice ceased in the early 1950s and populations began to recover. The primary food staple of the Limpkin is the apple snail and as a result, Limpkins can be found along wide, well-vegetated shallows of rivers and streams state-wide, as well as around lake perimeters, marshes, and swamps of central and south Florida. This dependence upon apple snails has lead to another decrease in populations due to the alteration of the apple snail habitat and the influx of exotic aquatic vegetation such as water hyacinth, elodea and hydrilla. The exotic plants crowd out the native eelgrass which is the most important forage plant for the apple snail. (Rodgers *et al.*, 1996)

Limpkins nest in a wide variety of habitats, including piles of slowly sinking aquatic vegetation, among tall marsh grasses, in the tops of sabal palms, and on the knees or high in the branches of cypress trees (Rodgers *et al.*, 1996).

Management measures for Limpkin. The most important measures for protecting populations of Limpkins are to protect their nesting and foraging habitat, preventing impacts to apple snails, and the judicious use of herbicides on aquatic vegetation. Spraying of pesticides can sometimes leave large swaths of area barren of vegetation, which impacts the food source for the apple snail, which in turn impacts the Limpkin (Rodgers *et al.*, 1996).

Burrowing Owl. The Florida burrowing owl is a small, brown and tan speckled bird which nests in burrows in open, treeless prairies where the ground cover is short. They feed predominantly on insects such as grasshoppers, roaches, mole crickets and beetles, as well as lizards, frogs, and other smaller birds. The birds frequently nest in developed areas of non-native turf, including airports, golf courses, pastures, etc. Nesting occurs usually between February and late May and broods can include 2 to 6 eggs. Rarely the owls may produce two broods a year (Rodgers *et al.*, 1996).

The burrowing owl population within the Little Manatee River Nature Preserve is located within the eastern portion of the Preserve (see Figure 6), in 200 acres of pasture that

extends from Leonard Lee Road to SR 579. This land was purchased for the purpose of preserving the burrowing owls and their habitat.

Management measures for Burrowing Owls.. Prescribed burning or mowing of the habitat is important to preserve the nesting areas of the Burrowing Owl. If the ground cover gets too high, the owls will not be able to see predators and will not nest in the area in subsequent years. Other threats include human interference or harassment of nesting pairs, and dogs, cats, and other non-native predators (Rodgers *et al.*, 1996).

The current status of the Burrowing Owl population within the Little Manatee River Nature Preserve is unknown at this time. The County has conducted prescribed burns and has mowed periodically in an effort to maintain the appropriate level of vegetation, which was managed by cattle grazing prior to the purchase of the Preserve. Annual surveys of the habitat are needed to assess the population.

Snowy Egret. The Snowy Egret nests in both inland and coastal wetlands, often in mangroves or willows, but also in cypress, buttonbush and Brazilian pepper. Nesting occurs over shallow water or on islands separated from the mainland by broad expanses of open water. They forage almost anywhere the water is shallow and calm, and their diet consists of small fish, frogs, small rodents, prawns, crayfish, grasshoppers, worms, and a variety of other aquatic invertebrates. The Snowy Egret is declining due predominantly to the loss of nesting and foraging habitats (Rodgers *et al.*, 1996).

Management measures for the Snowy Egret. The Little Manatee River Nature Preserve provides foraging habitat for the Snowy Egret, and survey work could be conducted to determine whether egrets are nesting on site. This species prefers to nest on islands over a broad expanse of open water to reduce nest predation (Rodgers *et al.*, 1996), and suitable islands are present in the Preserve. Management of the habitat includes the preservation of existing wetlands on site, control of exotic species, especially in wetlands, and limiting human interference. All of these management measures are currently being addressed and will continue in perpetuity.

Little Blue Heron. Little Blue Herons require shallow freshwater, brackish or saltwater habitats for foraging. Their diet consists of fish, amphibians, and invertebrates, but nesting herons need freshwater fish for their young. Their numbers have been steadily declining due to the loss of foraging habitat as more and more wetlands are drained or altered. Also contributing to their decline is exposure to pesticides and heavy metal contamination, and the alteration of wetland hydrocycles (Rodgers *et al.,* 1996).

Management measures for the Little Blue Heron. Little Manatee River Nature Preserve provides foraging and roosting habitat for the Little Blue Heron, and survey work could be conducted to determine whether herons are nesting on site. This species,

as well as the other wading bird species listed below, prefer to nest on islands surrounded by a broad expanse of open water to reduce nest predation. Management of foraging habitat includes the preservation of wetlands on site, control of exotic species, and limiting human interference. All of these management measures are currently being addressed and will continue in perpetuity.

Reddish Egret. The Reddish Egret nests exclusively on coastal islands located near suitable foraging habitats. They nest in mangroves, and sometimes in Brazilian pepper or other terrestrial vegetation on spoil islands. These egrets forage in the shallow water on tidal flats, salt barrens, and in the open scrubby mangrove areas. The mangrove communities on the western end of the Preserve may provide nesting and foraging habitat for the reddish egret. These birds are declining due to the loss of the coastal habitat upon which they rely, and to human disturbance during nesting season.

Management measures for Reddish Egret. The Reddish Egret is a habitat specialist and it requires tidal salt flats for foraging. The management measures for this species should included keeping feral dogs and cats out of the Preserve, maintaining water quality to support fish populations, controlling exotic vegetation, preserving the natural vegetation on the site, and limiting human interference (Rodgers *et al.*, 1996)**.**

Tricolored Heron. The Tricolored Heron prefers mangrove islands for their nesting colonies, but can also be found nesting in Carolina willow in freshwater wetlands. Other less frequent nesting trees include Australian pine, cypress, Brazilian pepper, and saltbush. Almost all nesting areas are over standing water or on islands. The Tricolored Herons forage in almost any shallow wetland and on the edges of ponds and lakes. Their diet is similar to that of the snowy egret, but small fish are their most preferred food. These birds are declining due to the loss of nesting and feeding habitat, and due to disturbance during breeding (Rodgers *et al.*, 1996).

Management measures for the Tricolored Heron. As with the birds listed previously, the Preserve provides foraging and roosting habitat for the Tricolored Heron, but no known nesting habitat. The management measures listed for the previous species also apply to the Tricolored Heron.

White Ibis. The White Ibis has been observed on numerous occasions foraging on the Preserve for insects, crayfish, and small amphibian and reptiles. Ibis will also eat fish when abundant. There are no known nesting colonies of White Ibis on the Preserve. Nesting ibis require freshwater foraging areas because their fledglings cannot tolerate salt and will decline and die if salt is ingested (Rodgers *et al.*, 1996). White Ibis are very vulnerable to disturbance and one episode of human impact on a nesting colony can result in massive mortality of young birds (Rodgers *et al.,* 1996).

Management measures for White Ibis. The shallow wetland areas in the Preserve are essential foraging areas for the White Ibis, especially during the breeding season. These wetlands support fish populations which are concentrated during the dry season when

the water recedes. The White Ibis and other wading birds forage on the fish and expend less energy for the effort.

Management measures for this species should include controlling feral animal populations of dogs, cats, pigs, etc., maintaining water quality to support fish populations, controlling exotic vegetation, and preserving the hydrology and open integrity of the shallow freshwater wetlands in the Preserve. In addition, the maintenance of open fields and pastures along with grazing and/or hay leases will continue to provide foraging habitat.

Southeastern American Kestrel. The kestrel is an inhabitant of open spaces where they feed on insects, small rodents, and reptiles. While the northern races are abundant and are frequently observed in central Florida as migrants and winter residents, the locally breeding sub-species has undergone recent statewide population declines and is currently listed as threatened, and considered to be very rare in Florida (Rodgers *et al.*, 1996).

Management measures for Southeastern American Kestrel. The primary reason for the decline of this bird is the loss of nesting habitat. They prefer to nest in longleaf pine snags in open areas with low herbaceous cover. Habitat restoration and prescribed burns are recommended to provide the low, open habitat requirements of this species.

Florida Sandhill Crane. Young Sandhill Crane chicks have been observed in and around the Preserve. The adults require freshwater marshes with substantial emergent aquatic vegetation for nesting, and relatively stable water elevations. Sandhill Cranes feed mainly on plant tubers, seeds, and berries but have also been known to eat insects, invertebrates and small vertebrates (Rodgers *et al.,* 1996).

Management measures for the Florida Sandhill Crane. The greatest threats to the Florida Sandhill Cranes are loss or degradation of habitat and human interference (Rodgers *et al.,* 1996). The foraging habitat in the Preserve is conserved in perpetuity but this does not prevent the potential for human interference. Feral animals are a potential threat to nesting and fledgling Florida Sandhill Cranes; thus a removal/control program must continue in the Preserve. In addition, the hydrology of any freshwater wetlands in or around the Preserve must be maintained, and invasive plants must be controlled in wetlands and in the crane's foraging habitat.

Wood Stork. Wood Storks are birds of freshwater and brackish wetlands, primarily nesting in cypress or mangrove swamps. They feed in freshwater marshes, narrow tidal creeks, or flooded tidal pools. Wood Storks use a specialized feeding behavior called tactolocation, or grope feeding. A foraging Wood Stork wades through the water with its beak immersed and partially open. When it touches a prey item, a Wood Stork snaps its mandibles shut, raises its head, and swallows what it has caught. Storks will often stir

the water with their feet, a behavior which appears to startle hiding prey. Tactolocation allows Wood Storks to feed at night and use water that is turbid or densely vegetated. However, the prey must be concentrated in relatively high densities for Wood Storks to forage effectively (http://www.fws.gov/verobeach/images/pdflibrary/wost.pdf). Particularly attractive feeding sites are depressions in marshes or swamps where fish become concentrated during periods of falling water levels. The Wood Stork has been observed foraging in the Preserve.

Management measures for the Wood Stork. The Little Manatee River Nature Preserve provides foraging and roosting habitat for the Wood Stork, but no known nesting habitat. Management of foraging habitat includes the preservation of existing natural wetlands on site, control of exotic species, especially in wetlands, and limiting human interference. All of these management measures are currently being addressed and will continue in perpetuity.

Roseate Spoonbill. The numbers of Roseate Spoonbills nesting in the Tampa Bay area is steadily increasing from 183 pairs in 2001 to 303 pairs in 2003 (Zink, 2003). Most of the nests are in the Alafia Bank Sanctuary, but a few pairs nest in Pinellas County coastal waters. While the Preserve provides abundant foraging opportunities for Spoonbills and other wading birds, there are no nesting colonies of Roseate Spoonbills. These species prefer nesting on islands separated from the mainland by broad areas of open water to protect their nests from predation by raccoons and other land mammals. Spoonbill diets consist mainly of small fish, but they are also known to eat shrimp, crayfish, isopods, amphipods, and insects (Rodgers *et al.,* 1996). While the populations in Tampa Bay are increasing, management measures should be implemented to ensure that this trend continues.

Management measures for the Roseate Spoonbill. Management of foraging habitat for the Roseate Spoonbill includes the preservation of existing natural wetlands on site, control of exotic plant species and feral animals, maintaining water quality to protect fish populations, and limiting human interference. All of these management measures are currently being addressed and will continue in perpetuity.

American alligator. Alligators have been observed in the Preserve by staff and visitors over the years. It is not known how many alligators are present at this time. The American alligator is the largest reptile in North America. The alligator can be distinguished from the endangered American crocodile by its short, rounded snout and darker color. Adult alligators can reach 18 feet in length, but the average length and weight is 13 feet and 450 to 600 pounds. An alligator's tail accounts for half the length. Male alligators are generally larger than females. Alligators can be found in rivers, swamps, marshes, bogs, lakes, ponds, creeks, canals, and bayous. They can tolerate some salt water. (Moler, 1992)

Alligators eat just about anything, including lizards, fish, snakes, turtles, small mammals, birds, crustaceans, and even small alligators. They hunt for prey underwater and often

swallow their meal whole. Alligators that have been fed by humans lose their fear and become a potential hazard, which usually results in the destruction of the "nuisance" alligator.

Management measures for the American alligator. Protecting the alligators on the Preserve will require protection from poaching, avoiding impacts to water quality, and preventing human interference. Alligators which have lost their fear of humans and are considered a nuisance will be removed by the Florida Fish and Wildlife Conservation Commission.

Gopher tortoise. The gopher tortoise lives in extensive subterranean burrows in dry upland habitats such as longleaf pine sandhill, xeric oak hammocks, scrub, pine flatwoods, dry prairies, and coastal dunes. Tortoises can also live in man-made environments, such as pastures, old fields, and grassy roadsides. To be suitable for gopher tortoises, the habitat must have well-drained sandy soils for digging burrows, herbaceous food plants, and open sunny areas for nesting and basking. Periodic natural fires play an important role in maintaining tortoise habitat by opening up the canopy and promoting growth of herbaceous food plants.

Gopher tortoise burrows remain at a fairly constant temperature and humidity level year-round, thus providing shelter for the tortoise during periods of extreme temperatures, drought, and fire. Tortoise burrows also afford refuge to other animals including listed species such as the eastern indigo snake, Florida pine snake, gopher frog, Florida mouse, and gopher cricket.

In 2007, the Florida Fish and Wildlife Conservation Commission (FWC) took action to upgrade the status of gopher tortoise from "species of special concern (SSC)" to "threatened". The species has been under siege due to the rampant development throughout the state and currently, little habitat remains for the tortoise. In addition, the SSC status allowed developers to apply for a permit to conduct an "incidental take". This permit allowed developers to entomb or bury the tortoises alive on the site in return for making a payment to a mitigation fund. The FWC estimates that approximately 200,000 tortoises were entombed in this manner. The reclassification will provide some protection for the tortoise in that an "incidental take" will no longer be permitted.

Management measures for gopher tortoise. Management measures for the gopher tortoise include collecting GPS coordinates for all burrows. Areas where the burrows occur should be restricted against all vehicular traffic to prevent the crushing of active burrows. Prescribed burns should continue in these areas to keep the herbaceous layer fresh and low. Egg and hatchling predation should be reduced as much as possible, and if possible, should include controlling raccoon and fire ant populations on the Preserve. The Conservation Services staff has prepared gopher tortoise relocation policies that use the guidelines established by the FWC. These policies are provided in Appendix C. The

revised state management plan for gopher tortoises is available at http://www.myfwc.com/imperiledspecies/plans.htm.

Eastern indigo snake. The eastern indigo snake is a large, docile, non-venomous snake that has declined in numbers over the last 100 years due to the loss of habitat, pesticide use, and collection for pet trade. The snake is a commensal species with a number of burrowing animals, using their burrows for egg-laying and denning. The preferred diet of these snakes is frogs, other snakes, toads, salamanders, small mammals, and birds. The eastern indigo snake can be found in many habitat types from wetlands to xeric pinelands and scrub.

Management measures for the eastern indigo snake. Protection and management of the eastern indigo snake's habitat is all that is required to ensure the success of this species. Conducting the prescribed burns, controlling the exotic vegetation, and preventing or controlling the influx of exotic animals such as feral pigs are measures that would protect the eastern indigo snake and its habitat. These are measures that the Preserve staff is currently undertaking. The USFWS recovery plan for this species is located at http://www.fws.gov/verobeach/images/pdflibrary/eisn.pdf.

Sherman's fox squirrel. Sherman's fox squirrel is one of three subspecies of fox squirrels that occur in Florida. The Sherman's fox squirrel is found in the Florida panhandle from northern counties to the Tampa Bay area over to Lake Okeechobee. Fox squirrels south of this region are Big Cypress fox squirrels. These squirrels are larger than the common gray squirrel and are declining due to the loss of their specific habitat areas to development. These squirrels require mature, fire maintained long-leaf pine-turkey oak sandhill and flatwoods community types. Acorns from turkey oak and live oak, as well as long-leaf pine seeds are the major components of the fox squirrel diets, but they also eat fungi, other nuts, bulbs, vegetative buds, and insects. They build leaf nests in large oaks, and typically have two breeding periods per year, with only 2 to 3 young per season (Humphrey, 1992).

Management measures for the Sherman's fox squirrel. Fox squirrels live in colonies. The number of animals in a colony depends on the habitat available, but most habitat supports a density of one fox squirrel per 20-35 acres. They are wide ranging animals – male home ranges average 200 acres, females average 80 acres. Adult females are territorial towards other females, such that each female occupies a territory that is exclusively hers. Males are not territorial, and are free to range across the territories of females. These squirrels prefer woods with open, low-growing groundcover and an open canopy of seed bearing pines and oaks. Occupied habitat includes pine sandhills,

frequently burned flatwoods, golf courses, and cattle ranches. A prescribed burn program is important for maintaining the habitat for these species (Coggins *et al*., 1999).

West Indian manatee. Manatees have been observed in the waters of the Little Manatee River Nature Preserve on a regular basis. Manatees live in salt and freshwater with depths from 1.5 to 6 meters. During cooler periods they are known to seek warmer waters such as springs and industrial waste effluent discharge areas.

The West Indian Manatee is a large gray or brown aquatic mammal. Adults average about 10 feet long and weigh 1,000 pounds. They have no hindlimbs, and their forelimbs are modified as flippers. Manatee tails are flattened horizontally and rounded. Their body is covered with sparse hairs and their muzzles with stiff whiskers. Sexes are distinguished by the position of the genital openings and presence or absence of mammary glands. Manatees will consume any aquatic vegetation available to them and sometimes even shoreline vegetation. Although primarily herbivorous, they will occasionally feed on fish. Manatees may spend about 5 hours a day feeding, and may consume 4 to 9 percent of their body weight a day (USFWS 1993).

Management measures for the West Indian manatee. The USFWS (1989) developed a recovery plan for the manatees which made the following recommendations:

- Minimize human-caused injuries and mortalities to manatees;
- Rescue and rehabilitate sick, injured, and orphaned manatees;
- Minimize injury from boat and barge collisions, water control structures, and poaching;
- Minimize alteration, degradation, or destruction of habitat used by manatees and monitor it for impacts;
- Minimize harassment of manatees from boat and barge traffic, diving, fishing, and swimming and determine and monitor status of manatee population and determine effects of life history and ecology.

The Federal government has recognized the threats to the continued existence of the Florida manatee for over 30 years. The West Indian manatee was first listed as an endangered species in 1967 under the Endangered Species Preservation Act of 1966 (16 U.S.C. 668aa(c)) (32 FR 48:4001). The Endangered Species Conservation Act of 1969 (16 U.S.C. 668aa(c)) continued to recognize the West Indian manatee as an endangered species (35 FR 16047), and the West Indian manatee was also among the original species listed as endangered pursuant to the Endangered Species Act of 1973. Critical habitat was designated for the manatee in 1976. The justification for listing as endangered included impacts to the population from harvesting for flesh, oil, and skins as well as for sport, loss of coastal feeding grounds from siltation, and the volume of injuries and deaths resulting from collisions with the keels and propellers of powerboats. Manatees are also protected under the provisions of the Marine Mammal Protection Act of 1972, as amended (16 U.S.C. 1361 *et seq*.) and have been protected by Florida law since 1892. Manatees were designated as endangered species in 1976 and are

protected under the Endangered Species Act. A recovery plan for the West Indian manatee can be found at http://www.fws.gov/verobeach/images/pdflibrary/wima.pdf.

Florida golden aster. The Florida golden aster is a perennial herb which resembles many other asters in Florida with the exception of the densely haired leaves. The wooly, almost white appearance of the leaves makes this yellow-flowered species stand out among the many other aster species in the area. The aster is found in several preserves and private land holdings in Hillsborough and Manatee County, and several areas of the Little Manatee River Nature Preserve have small aster populations.

Management measures for Florida golden aster. The Florida golden aster requires the well-drained, sandy soils of sand pine scrub, and seems to prefer disturbed soils, such as that excavated by gopher tortoises or armadillos. Fire is an important management tool to ensure that sites remain open and sunny for the asters. According to recent studies (Lambert and Menges, 1996), the optimal fire cycle for sand pine scrub is every ten years, and in transitional or sandhill areas, fires every 1 to 10 years.

Invasive plant species are also a serious threat to the Florida golden aster, particularly cogon grass. Cogon grass spreads vegetatively and can aggressively crowd the aster out of its native habitat. In addition, cogon develops a large amount of biomass which burn significantly hotter than a fire would under normal circumstances. The hotter fires will destroy the Florida golden aster and its seed reserve (USFWS, 1999).

Conservation Services conducts regular prescribed burns on the Preserve and monitors and treats infestations of invasive plant species in order to protect the Florida golden aster. Staff has identified and recorded locations of each Florida golden aster population with GPS and are monitoring these populations to determine the success of the habitat maintenance and restoration. The US Fish and Wildlife Service management and recovery plan for the Florida golden aster is available on line at http://www.fws.gov/verobeach/images/pdflibrary/chfl.PDF.

Garberia. Garberia is a native, evergreen shrub that prefers the acid, sandy soils of scrub. The low-growing shrub has distinctive gray foliage and attractive lavender flowers in the fall and is a butterfly attractant (http://edis.ifas.ufl.edu/pdffiles/UW/UW05700.pdf).

Management measures for garberia. As with the other scrub species described in this plan, garberia requires fires to maintain the open habitat, and can succumb to encroachment by invasive exotic vegetation such as cogon grass. Conservation Services conducts regular prescribed burns on the Preserve and monitors and treats infestations of invasive plant species in order to protect the garberia. It is recommended that GPS locations be identified for each population and regular surveys be maintained to determine the success of the habitat maintenance and restoration.

Nodding pinweed. Nodding pinweed is another plant endemic to scrub habitat. This low, herbaceous species requires open, well-drained, sandy soils to survive (Coile, 2003).

Management measures for nodding pinweed. As with the other scrub species described in this plan, the nodding pinweed requires fires to maintain the open habitat, and can succumb to encroachment by invasive exotic vegetation such as cogon grass. Conservation Services conducts regular prescribed burns on the Preserve and monitors and treats infestations of invasive plant species in order to protect the nodding pinweed. It is recommended that GPS locations be identified for each population and regular survey work be conducted to determine the success of the habitat maintenance and restoration.

Dry sand pinweed. This spreading species is a perennial herb with small alternate leaves and small lavender flowers. It prefers the dry, sandy soils of scrubby flatwoods and is found in central Florida counties from Miami-Dade to Hernando (Coile, 2003).

Management measures for dry sand pinweed. As with other listed plant species in the Preserve, this plant is dependent upon periodic fires to keep the habitat open. In addition, exotic plants can crowd out these species in a very short period of time. In order to protect the dry sand pinweed, the Conservation Services staff conducts prescribed burns on a regular basis and monitors and treats exotic vegetation infestations.

Cardinal flower. This beautiful red-flowered perennial is found on riverbanks, in springs and hammocks where moisture is plentiful (Coile, 2003). This species is found throughout the United States and Canada, except for the northwestern states.

Management measures for the cardinal flower. The beautiful flowers of this perennial make it popular with collectors, which have contributed to its decline throughout the country. Changes in hydrology and loss of wetlands have also impacted the cardinal flower. In order to protect the cardinal flower in the Preserve, prohibiting off-road vehicles, recreational facilities, and other human activities that may impact wetlands are recommended (http://plants.ifas.ufl.edu/lobcar.html). Documentation of the locations and a regular monitoring program are essential.

Giant orchid. This orchid is found in the southeastern United States, on the eastern seaboard. The spectacular orchid can get as much as five feet tall and has beautiful yellow-green flowers in July through September. It is found in open, sunny, sandy patches in sandhill, scrub, and pine flatwoods (http://www.fnai.org/).

Management measures for the giant orchid. This orchid is a fire dependent species which requires fire to create open spaces for germination. It is also sensitive to soil disturbances - all activities which may compact or otherwise disturb the soil should be avoided (http://www.fnai.org/). Populations of this orchid should be located using GPS and monitored to protect this orchid from impacts.

Curtiss' milkweed. This perennial plant is an endemic of the scrub areas of central peninsular Florida. It thrives on the bleached, excessively drained sandy soils along with Chapman and myrtle oaks, and other scrub species. The plants grow individually, widely spaced so that an acre of scrub habitat may have only one plant (http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Asclepias+curtissii).

Management measures for Curtiss' milkweed. The main reason for the decline of this species is the loss of habitat. Many of the scrub areas where this species is found have been developed for agriculture or residential subdivisions. Only a few areas have been preserved. Measures to protect this species include conducting prescribed fires, keeping hikers from trampling the plants by routing trails away from known habitat, and discouraging collectors from gathering the remaining plants. The locations of known populations should be marked using GPS and photo-monitored for protection (http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Asclepias+curtissii).

Toothed lattice-vein fern. This species of fern is found in hydric hammocks, cypress swamps and sloughs, and is identified by its once-pinnate leaves with sharply serrated margins. Little information is available regarding this specific fern species, but it is widely known that most ferns like moist, shady locations in rich, humus soil. It is known only to Florida in the US, but is found in some parts of central and South America (http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233501303).

Management measures for toothed lattice-vein fern. To protect the fern and its habitat, invasive plants and animals must be controlled, and the integrity of the natural plant communities must be maintained. As with the giant orchid, the locations of the toothed lattice-vein fern should be marked using GPS and the population monitored.

Giant air plant. The giant air plant is native to the cypress swamps, hammocks, pinelands, tree islands, sloughs, scrub, mangrove swamps, and many other similar natural habitats, both wet and dry, throughout central and southern Florida and the Keys. It is one of the largest species of bromeliads in Florida, sometimes reaching 2 or 3 feet. This species is epiphytic on tree trunks, branches, and large twigs that can support the plant's weight. This species is found in many varied natural habitats such as swamps, sloughs and cypress forests to pine flatwoods, sandhill, scrub, and oak hammocks. This species was listed as endangered because of habitat destruction, collecting, and infestation by the Mexican bromeliad weevil (*Metamasius callizona*) (http://bromeliadbiota.ifas.ufl. edu/flbrom.htm).

Management measures for giant air plant. The Mexican weevil has been documented on the Little Manatee River Nature Preserve. The weevil is responsible for decimating large populations of this bromeliad throughout Hillsborough County. Recent efforts to develop a natural predator program for the weevil look optimistic with a new parasitic fly recently released into a Hillsborough County Park and other locations around the state http://savebromeliads.ifas.ufl.edu/.

2.5.2 Management Measures for All Special Status Species

Management measures for all protected species in the Preserve include the management of exotic vegetation and animals, the maintenance of natural hydroperiods and drainage patterns, the restriction of vehicular traffic and inappropriate recreational uses, the apprehension and prosecution of poachers and trespassers, and periodic monitoring to assess the status of the various species. Dogs are allowed in the Preserve, but they must be kept on a hand-held leash at all times. In areas where the public is allowed access, they should be educated so that they know to avoid disturbing the flora and fauna and that their carelessness with trash, cigarettes, and other debris could contribute to the decline of these protected species. Wildlife surveys on an annual basis are recommended to determine the presence and monitor the status of the protected species on the Preserve. Additional GPS tracking of burrows, nests, territories, and the location of listed plant populations is recommended for resident species or important foraging areas, and habitat restoration should continue to prioritize the needs of listed species. As stated previously, ELAPP's specific resource management policies are provided as Appendix C**.**

3.0 CULTURAL RESOURCES

3.1 Definition of Terminology

There are five widely accepted categories of cultural resources: 1) archeological resources; 2) historic structures; 3) cultural landscapes; 4) ethnographic resources; and 5) museum collections. In the Little Manatee River Nature Preserve, only archaeological or historic resources are likely to be present. As defined in the National Historic Preservation Act and its implementing regulations in *36 Code of Federal Regulations* (CFR) 800, historic properties are those buildings, Area of Potential Effects, sites, districts, artifacts, and remains that are related to culturally important places and events, and that are listed in or eligible for inclusion in the National Register of Historic Places. The significance of historic properties is assessed by the property's ability to meet the following four criteria for inclusion in the National Register of Historic Places (36CFR60.4):

- Association with events that made a substantial contribution to the patterns of our history;
- Association with the lives of persons important in our past;

- Sites that embody characteristics of a type, period, or methods of construction or that represent the work of a master, possess high artistic value, or represent a distinguishable entity; or
- Have yielded, or may be likely to yield, information important to prehistory or history.

Properties may be eligible for the National Register of Historic Places for contribution at the national, state, or local level. In order for a structure to be listed in the National Register of Historic Places, it must possess historic integrity of those features necessary to convey its significance, such as location, designs, setting, workmanship, materials, feeling, and association in accordance with National Register guidelines.

3.2 Agency Correspondence

A Geographic Information Systems (GIS) model and archaeological survey testing was conducted on nine ELAPP sites in 2004, including portions of the Little Manatee River Nature Preserve (Weisman 2004). The survey was a site-specific GIS cultural suitability modeling and archaeological test conducted by the University of South Florida. Field-testing was conducted by USF to map and identify any archeological sites or historic structures within the Preserve that may be affected by proposed management activities or by public use and access to the property. In addition, sites were assessed for eligibility for listing on the National Register of Historic Places (NRHP). The sites assessed included lithic and artifact scatters, mounds and middens, and the Willow Company Town, an historic town associated with a sawmill and turpentine production company adjacent to a railroad. The portion of this report that describes the results of the Little Manatee River Nature Preserve assessment is provided as Appendix D.

3.3 Management Measures for Cultural Resources

County staff is working closely with the local Florida Public Archaeology Network (http://www.flpublicarchaeology.org/) to learn more about the protection and interpretation of cultural resources, and staff has requested assistance with additional survey and file listing of cultural resources in the Preserve. Looting is a concern, along with possible excavation or earthwork for projects such as the installation of firelanes, fences, trailheads, or restoration areas. Best Management Practices for Protecting Archaeological Sites are provided as Appendix D.

4.0 RECREATIONAL RESOURCES

4.1 Existing Recreational Facilities

The Camp Bayou Outdoor Learning Center is located three miles south of 674, at the south end of 24th St SE in Ruskin, Florida, along the north bank of the Little Manatee River, in the central section of the Preserve. The camp is a public/private partnership between the Ruskin Community Development Foundation and Hillsborough County. It

was created to preserve a sample of Florida's original habitats in the Little Manatee River Watershed, and to promote appreciation and better understanding of our natural resources and of our local culture and history. The camp provides educational programs for children and adults, as well as nature trails, picnic areas, and a native plant nursery. The 160 acre site was a Recreational Vehicle (RV) park that was purchased by the County in 1999 (Ardaman & Associates, Inc., 1990). It now supports the Camp Bayou Outdoor Learning Center and with the support of the town of Ruskin and a large number of volunteers, the site is a popular and well-attended spot for environmental and archeological education for adults and children, as well as for birding, etc (http://www.hillsboroughcounty.org/parks/resources/forms/conservationservices/elapp184.pdf).

This photograph shows the teaching pavilion at the Camp Bayou Outdoor Learning Center in Ruskin. The pavilion is used as a classroom, a meeting hall, and for other events.

Trails are available for the easternmost section of the Preserve, also known as Upper Little Manatee River Nature Preserve. There is a day-use hiking trail within the southern portion of this Preserve, accessible from a parking area and walk-through gate on the east side of CR 579 or from the southern terminus of Leonard Lee Road, heading west. The trail traverses former pastures, flatwoods, oak scrub, sand pine scrub, hardwood hammocks, and ephemeral ponds along the Little Manatee River. Figure 4 shows the access points and parking areas.

Legend

- Little Manatee River Preserve
- County Line

Greenway Trails

- Hiking Trails
- Canoe Trail
- Service Road
- Proposed Trail

- Site Security
- Bridge
- Picnic Pavillion
- Walk-thru
- Service Gate
- Camp Bayou

- Access Point and Parking
- Backpack Camping
- Parking

Balm Scrub Nature Preserve

674

75

301

579

Proposed South Coast Greenway

Proposed Cross County Greenway

Leonard Lee Rd

Camp Bayou

Nature Center

Little Manatee River State Park

Canoe Launch

Little Manatee River

579

N
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0 2,250 4,500 Feet

Aerial Source: Hillsborough County 2007
ELAPP Boundaries & Access Points: Hillsborough County 2007
Trails: Greenways and Trails 2007

PARSONS
4925 Independence Parkway, Suite 120
Tampa, Florida 33634
813-933-4650

Prepared for:
Hillsborough County
Florida

FIGURE 4
Little Manatee River Preserve Recreational Resources

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This photograph shows the parking area on the east side of County Road 579, just south of the bridge over the Little Manatee River. The walk-through gate is visible on the right side of the photograph. From this point, the trail connects to a parking area on Leonard Lee Road.

The western portion of the Preserve is accessible only from the water, so the only recreational facilities at this time consist of two remote camping areas (Figure 4). The future greenway (Section 4.3) discussed below will connect with this section of the Preserve, and provide public access for day use hiking.

The Florida Department of Environmental Protection has designated the Little Manatee River as a "paddling trail" as part of the Greenways and Trails Program. The trail originates at the Canoe Outpost, a privately owned and operated canoe rental site, on the west side of the US 301 bridge. The trail has stops in the Little Manatee River State Park approximately 3 miles downstream (west) of the Canoe Outpost, and another stop approximately 3.5 miles downstream at the southern terminus of 24th Street near Camp Bayou. Camp Bayou is a Hillsborough County Park, operated in conjunction with the Ruskin Community Development Foundation. The final stop on the canoe trail is approximately 3.5 miles farther downstream at Wildcat Park, a Hillsborough County park west of the I-75 bridge. For more information on the canoe trail, go to http://www.dep.state.fl.us/gwt/guide/designated_paddle/LManatee_guide.pdf.

4.2 Proposed Recreational Facilities

The Preserve will be maintained as a resource-based recreation area with only passive uses permitted. As described above, the hiking trail may be marked in the future.

An additional access point may be established from the future greenway connection proposed south of 21st Street (Figure 4). Currently, staff access still needs to be developed through the District's right-of-way from 21st Street to the Preserve.

4.3 Greenways and Trails

Figure 5 shows the existing and proposed trails in the vicinity of the Preserve and throughout Hillsborough County. Existing trails are shown in the Little Manatee River State Park. Proposed trails that will access the Little Manatee River Preserve include the Cross County Greenway that extends from the northern county line south through the central section of the Preserve to Manatee County. The South Coast Greenway extends from downtown Tampa to the western section of the Preserve. These greenways are multiuse trails that will be constructed in the future when funding is available.

5.0 RESOURCE MANAGEMENT

5.1 Site Security

Four site security residents are present, two in the eastern section of the Preserve near the southern end of Leonard Lee Road, one in Camp Bayou, and one on Stephens Road. These residents are required to patrol designated portions of the Preserve to observe any irregularities such as fencing gaps, signs of trespass and poaching and other illegal activities. The residents are also required to coordinate with deputies from the Sheriff's Department and Wildlife Officers from the Florida Fish and Wildlife Conservation Commission when violations occur. One of the security residents is a deputy. The site security residences are shown on Figure 4 and the site security agreements are provided in Appendix A with the other legal documents**.**

Security problems on the Preserve include illegal access through cut or damaged fences, poaching, clearing, and arson. Bike riding and horseback riding are prohibited in the Preserve due to the sensitivity of the habitat and lack of access. Figure 4 shows the access gates for the Preserve. These gates remain locked and the boundary is posted against trespassing and hunting.

In order to improve security in the Preserve, the Preserve needs to be posted with the current county ordinance around the entire upland perimeter as per the requirements of state statutes. In addition, security can be improved with the addition of much more perimeter fencing as funding becomes available.

5.2 Exotic Species Management

Exotic, "alien" or "non-native" species refer to plants, animals, fungi or other organisms that have been accidentally or purposefully introduced to an area outside of their origin. Exotic species can come from another continent, another part of a country or even from another watershed. Organisms evolve with other species that moderate their population (for example, plant pests and diseases). When an organism is taken out of its original environment and placed in another, species that help keep it in check may not be a part of this new environment (http://mdc.mo.gov/nathis/exotic/).

Hillsborough Greenway System

NATURAL CORRIDORS

- Proposed Natural Areas and Preserves
- Public or Otherwise Protected Conservation Lands

RECREATIONAL CORRIDORS

Existing Trails

- Multi-Use, Paved
- Multi-Use, Soft path
- Equestrian
- Hiking
- Mountain Biking
- Paddle

Proposed Trails

- Trail

Bikeways

- Bike lane*, route or side path

INTER-COUNTY CONNECTIONS

- Possible connections to Natural Corridors
- Possible connections to Recreational Corridors

- Cities
- Unincorporated County
- Rivers & Streams
- Major Roads

* For a map of existing bike lanes, see http://www.hillsboroughmpo.org/plans/bicycle.htm

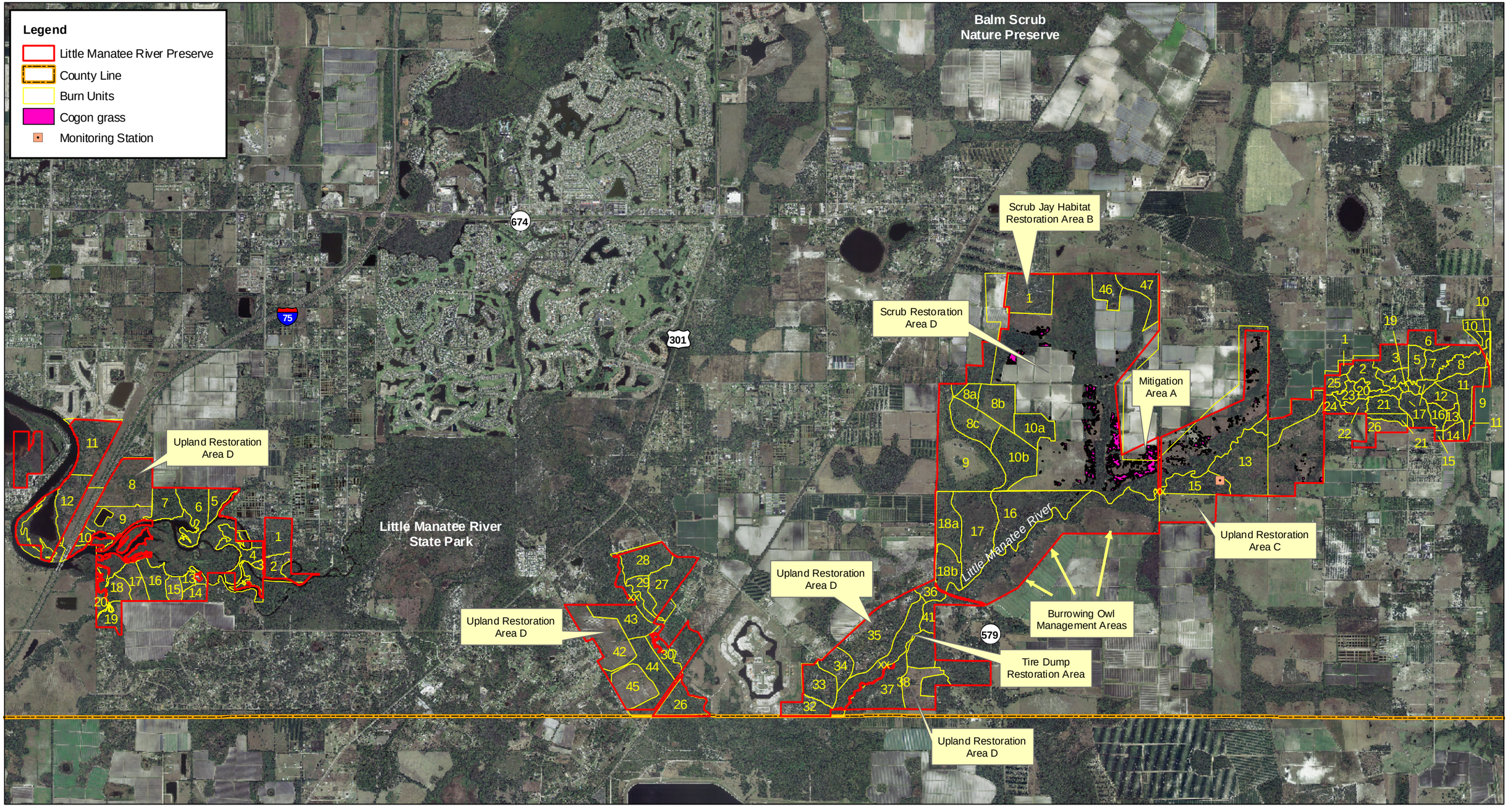
0 5 Miles

Hillsborough County Florida

Parks Recreation and Conservation Department
Parks Planning and Design Section

Carol Boteler June 28, 2007 ..\Projects\Greenways\Greenways_AL_20070522.mxd

Figure 5 Greenways and Trails Map



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Feet

Aerial Source: Hillsborough County 2007
ELAPP Boundaries & Cogon grass: Hillsborough County 2007
Burn Units: Hillsborough County 2008

PARSONS
4925 Independence Parkway, Suite 120
Tampa, Florida 33634
813-933-4650

Prepared for:
Hillsborough County
Florida

FIGURE 6
Little Manatee River Preserve Resource Management

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5.2.1 Invasive Exotic Plants

The predominant invasive exotic plants known to occur in the Little Manatee River Nature Preserve are cogon grass, old world climbing fern, Brazilian pepper, and strawberry guava. Some of the cogon grass infestations are shown on Figure 6. New species and new infestations can occur frequently and the staff surveys the Preserve on a regular basis to prevent new infestations from becoming established. Sites are treated on an as needed basis, prioritized by the staff according to resources available. Brazilian pepper is a major problem on private lands as well as the adjacent Department of Transportation right-of-way on I-75, and they provide a continuing seed source for Preserve infestations.

Exotic plants can be treated by mechanical, physical, chemical or biological methods or combinations of one or more of these methods. Mechanical treatments include the cutting or pulling of the vegetation and often is followed by the use of chemical spraying. Physical treatments include the use of prescribed fire or water impoundment to kill or at least slow the spread of the exotic plants.

Chemical treatments are the most widely used and usually most effective methodology. This involves the use of herbicidal sprays applied from back pack sprayers or even from helicopters.

Biological controls are the slowest methodology of treatment, but when implemented properly, can be the most effective over the long term. Biological control involves the introduction of a natural predator or pathogen that destroys the exotic species. Biological treatment requires long years of testing to ensure that the introduced control does not create problems in the environment.

Treatment methodologies for exotic plant species are continually changing as new herbicides and biological controls are developed. There are numerous references available for types of chemical herbicide application and biological treatment and the science is changing all the time. The Conservation Services Team is committed to using the latest technology and the safest methodology available to reduce existing infestations. Some resources on line include:

Center for Aquatic and Invasive Plants Web site http://plants.ifas.ufl.edu.

Florida Exotic Pest Plant Council Web site http://fleppc.org.

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The 2007 list of invasive exotic plant species, prepared by the Florida Exotic Pest Plant Council is provided as Appendix E.

Although there have been grant-funded efforts and treatment of several areas of invasive plants in the Preserve, some of the infestations, particularly cogon grass, have become very serious. A separate cogon grass management plan and survey is needed for this Preserve, as well as an ongoing program of integrated pest management to begin to control the species.

Hay and cattle leases are recommended as soon as possible to further control the spread of invasive plant species.

5.2.2 Invasive Exotic Animals

The exotic animals observed on the Preserve to date are feral pigs, nine-banded armadillo, feral dogs and cats, nutria, Cuban tree frog, and the brown anole. Periodic monitoring to determine the presence of nuisance feral species is recommended so that removal action may be taken before feral animals breed on site and become a serious problem. Monitoring can be conducted during routine maintenance events, such as mowing, maintaining firebreaks, and exotic vegetation maintenance and during native wildlife surveys.

Feral hogs are especially destructive to natural areas in that they root up the soil when foraging. This disturbance may cause erosion problems and facilitates the introduction of exotic vegetation. Feral hogs also can be dangerous and have been known to attack people. Additional information regarding feral hogs is provided in Appendix E – Exotic Species Information.

Nutria have become a major problem in west-central Florida, with recent estimates at around ten million within the state (http://aquat1.ifas.ufl.edu/mcmasys.html). They breed prolifically and feed on native species in coastal and inland wetlands, competing for habitat with native muskrats and waterfowl. They destroy natural wetlands by creating tunnels through the vegetation and causing erosion. They carry parasites, some of which are water borne and can cause severe rashes in humans. Although the nutria have been seen in the Preserve, the infestation is not thought to be severe because of the presence of their main predator, the alligator (http://nis.gsmfc.org/nis_factsheet.php?toc_id=213).

The Asian green mussel is a large bivalve with a smooth, elongate shell with visible concentric rings and a characteristic greenish color. The mussels are able to tolerate a wide range of depths and salinity, as well as levels of turbidity and pollution. The mussels attach themselves to pilings and other structures and have been reported at densities of 9,000 to 12,000 per square meter in the mouth of the Little Manatee River.

These densities indicate that the green mussel is a formidable spatial competitor for native species such as oysters. In addition, they are common nuisance organisms fouling manmade structures such as intake and outfall pipes, buoys, bridges, pilings and seawalls (http://www.sms.si.edu/irlSpec/Perna_viridis.htm).

5.3 Prescribed Burns

5.3.1 The importance of fire

Prescribed fire is a land management tool used to restore and maintain fire-dependent ecosystems, enhance forest health, improve wildlife habitat, and prevent dangerous, uncontrolled wildfire by reducing hazardous fuels. Fire promotes healthy ecosystems by clearing out competing vegetation, cycling nutrients into the soil, providing food for wildlife, and stimulating fire-dependent plants to grow and produce seed (http://www.fs.fed.us/fire/fireuse/rxfire/rx_index.html). Concerns regarding smoke created by prescribed fire are a priority, especially considering the residential areas and major roadways around the Preserve.

One of the greatest benefits of prescribed fire is that it reduces "fuels" such as the underbrush, branches, pine needles, leaves, and dead plant debris that have built up on the forest floor over time. If fuels are not reduced every few years, wildfires can become intense, hot, and destructive (http://www.fs.fed.us/fire/fireuse/rxfire/rx_index.html).

Because of Florida's long history of lightning fires, many of the state's natural systems are adapted to fire and depend on periodic fire to remain healthy. Prescribed burning is a vital tool for managing pine flatwoods, pine sandhills, and sand pine/oak scrub found in the region. These natural systems shelter many threatened and endangered plant and animal species that rely on fire to survive, such as Florida black bear, Florida Scrub-Jay, eastern indigo snake, gopher tortoise, and scrub holly. When fire is suppressed in these areas, some plant and animal populations decline and eventually disappear (Myers *et al*., 1990).

Because natural fires can no longer move across the landscape as they did historically, prescribed fire at appropriate intervals is necessary to maintain these unique natural communities. For example, prescribed fire reduces the height of scrub vegetation to a level that is suitable for the Florida Scrub-Jay and opens up sandy areas which allows the jays to store their acorns. Fire also generates fresh seeds, fruits, and native plant growth, providing food for these rare species (Myers *et al*., 1990).

Many people have expressed concern about the safety of wild animals during prescribed fires. Most wild animals migrate to safety during the relatively slow-moving prescribed fires. Some animals take refuge by moving to unburned or previously burned areas. Small animals seek shelter under logs, in old trees, and in burrows like those of the gopher tortoise. Few animals are killed by fire, especially during the growing season when it's warm and most animals are active. Mammals are rarely killed, and ground

nesting birds build new nests and benefit from increased numbers of insects after the fire (Myers *et al*., 1990).

Prescribed fire is also beneficial to the people of Florida. It reduces the severity of wildfires and provides improved wildlife habitat, forest, and grazing land. As Florida's population continues to grow, more and more areas will be developed that will require fire protection services. Prescribed fire is a safe and effective land management tool for reducing the severity of wildfires (Myers *et al*., 1990).

5.3.2 Management Measures for Fire

Prescribed fires are conducted on County lands as resources become available and when climate conditions are appropriate. The Little Manatee River Nature Preserve has an ongoing prescribed fire program. Preparation for burns includes the preparation of a burn plan, creation of fire lanes, surveying pre-burn site conditions, and notifying homeowners that may be affected by the burn. Some of these responsibilities will be shared by the Conservation and Regional Parks staff and some occur with the assistance of the State of Florida Division of Forestry, or specialized contractors. The burn zones established for the Preserve are shown in Figure 6. A sample burn plan is included as Appendix F.

Part of the management measures for prescribed burning is to increase public awareness regarding the benefits of fire to wildlife and to the general public. The Conservation Services staff has participated in the Great American Teach-In in area schools to reach students. The County also provides lectures and brochures to meetings and conferences and the staff have contributed to websites regarding prescribed burning.

This photograph shows the Conservation Services staff on a prescribed burn in the Little Manatee River Nature Preserve. These fires are sometimes conducted by expert contractors.

6.0 HABITAT RESTORATION

Habitat restoration in the form of management activities such as prescribed burns, exotic vegetation control, and roller-chopping and mowing overgrown habitat were implemented upon purchase of the property. These activities improve the habitat for wildlife and reduce the severity of wildfires.

Many areas in the Preserve were farmed prior to purchase and need active restoration. The following paragraphs detail proposed and existing restoration areas.

Restoration Area A.

A mitigation wetland was constructed on the eastern section of the Little Manatee River Preserve, east of Leonard Lee Road and north of the Little Manatee River (Figure 6). The mitigation wetland was created to compensate for wetland impacts incurred by the Hillsborough County Public Works Department as a result of the replacement of four bridges over the river and tributaries. The bridge construction locations included two bridges on CR 579, and one each on Grange Hall Loop Road and CR 39. The mitigation included 20 acres of restored wetlands, 5 acres of enhanced wetland habitat, and 8 acres of enhanced upland habitat.

Restoration Area B

In 2004 the County received a $25,000 grant from the Pinellas County Environmental Fund (PCEF) to restore Florida Scrub-jay habitat on 100 acres of overgrown scrub land within the northern corner of the eastern section of the Little Manatee River Nature Preserve (Figure 6). The grant supplemented the cost of the mechanical treatment of the overgrown vegetation. The final report to PCEF is provided in Appendix G.

Restoration Area C

An 80-acre former pasture area at the southern end of Leonard Lee Road has been identified as a candidate for restoration in the near future. A planting plan has been created and is provided in Appendix G. Also provided is a plan view drawing of the planting plan. After ridding the site of the existing ground cover, the generally accepted methodology at this time is to plant an herbaceous ground cover layer first and allow it to mature to the point that it can withstand at least one prescribed burn, preferably more. Trees should be planted a few years after the ground cover has become established. It is important to burn these young communities to keep the unwanted plant species from germinating and to enrich the soil.

The native soils on the 80-acre restoration site indicate that the original plant communities included sandhill and pine flatwoods, and those are the communities that are proposed in the restoration planting plan.

Restoration Areas D

Some of the most abundant types of land cover within the uplands of the Preserve are agricultural lands, old field, and pasture areas. Some of these areas are in the process of recovering to native plant communities, and some are in need of significant restoration. A qualitative survey of all uplands that have been altered for agricultural uses should be undertaken. These areas are vulnerable to infestation by cogon grass, which is now present on many portions of the Preserve (Figure 6).

Former agricultural croplands and pastures form 30% of land cover within the Preserve; with large contiguous tracts in all three sections. Restoration of native herbaceous ground cover within these agricultural areas would substantially increase the amount of available habitat for upland dwelling species, especially if it were done in coordination with hardwood reduction of the fire-suppressed natural areas. The most cost-effective means of returning a diverse herbaceous plant community to this area would likely be the direct seeding of material either harvested from other natural areas or purchased commercially. Successful restoration of a native herbaceous plant community also could be beneficial in that it could potentially serve as a source of seed for future upland habitat restoration projects on other sites (Hillsborough County, 2008).

7.0 COMPLIANCE

7.1 ELAPP Policies and Ordinances

On January 7, 1987, the Board of County Commissioners approved an Environmentally Sensitive Land Ordinance (Ordinance No. 87-1) that took effect upon the passage of a referendum on March 3, 1987. The voters of Hillsborough County passed the Environmentally Sensitive Lands Referendum by a three to two margin, providing for a one-quarter mil tax over a four-year period to purchase sensitive land in Hillsborough County. The tax was projected to raise approximately twenty-one million dollars in revenues over a four-year period for the purchase or protection of these lands. In June 1990, another ordinance was approved (Ordinance No. 90-19) providing (among other things) for the issuance of general obligation bonds not to exceed $100 million and the levy of ad valorem taxes not to exceed a quarter of a mill in any one year for a period not to exceed 20 years for the purpose of acquiring, preserving, protecting, managing and restoring environmentally sensitive lands, beaches and beach access, parks and recreational lands. In 2008, a third referendum was approved by an overwhelming show of support from voters in the County. Almost 80% of all votes cast in the County voted for the extension of the ELAPP program for another ten years. The referendum will provide $200 million for the ELAPP program starting in 2011.

ELAPP was established for the purpose of acquiring, preserving, and protecting endangered and environmentally sensitive lands, beaches, parks, and recreational lands in Hillsborough County. The purpose of acquiring such lands will be for resource protection; however, all lands shall be open for public use and enjoyment to the extent

that the County finds such use compatible with the preservation and protection of these lands (Hillsborough County, 2005). The Environmentally Sensitive Land Ordinance is provided as Appendix H.

In 2008, Parks ordinance 97-14 was repealed and replaced with Ordinance 08-17 to provide additional protection to the park and conservation lands of Hillsborough County. This ordinance provides regulations that conformed to those of the state and federal government with respect to public lands. This ordinance is provided in its entirety in Appendix H.

7.2 Compliance with Comprehensive Plans

The Little Manatee River Nature Preserve will assist Hillsborough County in implementing the goals, objectives and policies of the Conservation and Aquifer Recharge Element, Future Land Use Element, and Recreation and Open Space Element of the County's Comprehensive Plan. The preservation of wildlife habitats and the development of public recreation and environmental conservation activities on the Preserve will help to accomplish or further enhance the goals and objectives described in Section 8.0. A copy of the relevant elements of the County's Comprehensive Plan is included as Appendix I. The county's Comprehensive Plan may be viewed in its entirety at http://www.theplanningcommission.org/hillsborough/comprehensiveplan.

8.0 SUMMARY OF MANAGEMENT GOALS AND OBJECTIVES

Hillsborough County has a centralized management operation for all natural preserve lands which have been acquired by the ELAP program. With the exception of the capital improvement projects, such as fencing, road construction, site security residences, etc., site management expenses are not budgeted on a site specific basis. The program is funded to cover capital equipment, personnel, and operating expenses for the Regional Parks and Conservation Services Section of the Hillsborough County Parks, Recreation, and Conservation Department.

The Conservation Services Section budget derives funds from several sources, but primarily from the revenue set aside for the ELAP Program by the voter approved referenda, which stipulated that 2% of all proceeds, whether Ad Valorem or Bond generated, could be available for site management. The current revenue structure does not generate sufficient funding to fully support the current management program, and recent budget cuts have further exacerbated the lack of management and operational funding. Additional funds for personnel are provided by the Phosphate Severance Taxes, since some lands acquired to date in other locations in the County have been mined for phosphate (Hillsborough County, 1997). The 2008 referendum provided funds for management and operations, but a continuing hiring freeze has left key staff positions unfilled.

General revenue funds are also supporting existing personnel. Additional funds for operation and capital improvements have been secured by earmarking interest revenue from reimbursements received from agencies participating in joint acquisitions. This option is only available for projects which were originally acquired with Ad Valorem proceeds, since reimbursement funds for Bond funded acquisitions must be used to retire the Bonds. Some additional funding for site restoration and maintenance efforts has been secured through grants, and other agencies have entered into restoration partnerships for large scale habitat restoration projects.

The estimated costs to support the proposed management goals and objectives for the next ten years are listed in Table 4 below. These items are not in any prioritized order, but it is likely that the treatment of exotic vegetation and the prescribed burn program will take precedence over the other objectives.

TABLE 4
PROPOSED MANAGEMENT GOALS AND OBJECTIVES
FOR
LITTLE MANATEE RIVER NATURE PRESERVE

OBJECTIVE	SCHEDULE	ESTIMATED COST
Restoration	Ongoing	$500,000.00
Roller chopping	Ongoing	$50,000.00
Invasive species control	Ongoing	$300,000.00
Prescribed burn program	Ongoing	$80,000.00
Maintenance supplies (road, fence repair, temporary fencing, etc.)	Ongoing	$7,000.00
Fencing	Ongoing	$40,000.00
Ecological studies	Ongoing	$20,000.00
Access improvements		TBD
Total		**$997,000.00**

The goals and objectives of the Preserve are listed below, not necessarily in a prioritized manner.

Goal #1: Continue to Protect and Manage All Listed Species Populations. Management activities will continue to protect the habitat of the gopher tortoise, Florida Scrub-Jay, Florida golden aster, and other listed species.

Goal #2: Continue to Conduct Prescribed Burns. Continue to conduct prescribed burns in pine flatwoods and other fire dependent communities, and continue with other vegetation management measures such as roller-chopping, if necessary, to improve habitat conditions and reduce fuel loads for prescribed burns. Continue fire lane creation and maintenance as needed for fire control and land management as per Best Management Practices.

Goal #3: **Continue to Control Invasive Exotic Plants and Animals in the Preserve**. Continue to map and survey for invasive plant species, monitoring populations using GPS, and photography. Cogon grass mapping and management strategies are needed as soon as possible and should be a priority. Maintain contact with professional and government associations involved in these efforts to ensure that the most effective and environmentally friendly methodologies are being used.

Goal #4. Continue Wildlife Surveys. Continue wildlife survey work in the Preserve, with emphasis on listed species. Continue to map locations of listed species using GPS, and implement management strategies for protection of these species. Coordinate efforts with other professionals and government agencies.

Goal #5. Continue Environmental Education and Recreational Efforts in the Preserve. Continue environmental education interactions by providing guided tours to select groups. Promote the Preserve through brochures, web interaction, and signage. Keep the Preserve open to the public as much as possible without potentially endangering the public and while preserving the integrity of the habitat and protection of wildlife populations.

Goal #6. Continue Site Security Efforts. Continue site security efforts, complete posted signage around perimeter, and continue to install perimeter fences. Coordinate with the Sheriff's Department to control poaching, dumping, and other illegal activities.

Goal #7. **Seek Continued Funding**. Supplement existing budget with outside sources of funds to cover shortcomings. Grant opportunities will continue to be pursued aggressively.

Goal #8. Improve Access to Preserve. Access is needed from 21st Street SE.

Goal #9. Restoration needs must be quantified and implemented. Continue lease program for cattle and/or hay operations to keep habitat managed until restoration areas can be addressed.

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