Section 4
Upper Coastal Watershed

SECTION 4

Upper Coastal Watershed

4.1 INTRODUCTION

The Upper Coastal Watershed mitigation plan (Upper Coastal Plan) has two components: 1) wetland enhancement at the Homosassa Tract of the Withlacoochee State Forest (WSF) and 2) restoration and enhancement at Five Mile Creek which is owned by Pasco County (**Exhibit 4-1-1**).

The mitigation is designed to be regionally-significant and sustainable, focused on the enhancement and restoration of wetland and ecosystem functions across a large landscape area, and in association with existing public lands. The chosen sites are located near the northern and southern extents of the certified transmission lines corridor. These sites were determined to be the most suitable, cost prudent and ecologically-meaningful of the eleven sites assessed. This plan clearly addresses the FDEP's requirements for assuring long term viability and provision of greater ecological value than would a conventional on-site mitigation proposal.

4.2 IMPACT SUMMARY – UPPER COASTAL WATERSHED

In the Upper Coastal Watershed, construction of the proposed project will result in wetland impacts to 76.8 acres of wetlands, most of which consist of the conversion of forested wetlands to herbaceous wetlands due to clearing. **Table 4-1** depicts the amount of impact proposed to herbaceous and forested wetlands, as well as the type of impact. Herbaceous wetland impacts resulting from construction of the transmission and blowdown pipelines will be relatively minor. The majority of the wetland impacts will be due to clearing forested wetlands. The types of wetlands being affected by the project are ditches, small waterbodies, freshwater marsh, wetland shrub, wet prairie, mixed forested hardwoods, cypress and mixed wetland forest.

Table 4-1. Wetland Impacts by UMAM Functional Loss and Acreage (Upper Coastal Watershed).

Area	Herbaceous (including Open Water)		Forested		Total	
	Acres	Functional Loss	Acres	Functional Loss	Acres	Functional Loss
Impacts						
Fill	6.9	-4.7	11.6	-7.7	18.5	-12.4
Clearing	NA	NA	58.3	-21.2	58.3	-21.2
Total Impacts	**6.9**	**-4.7**	**69.9**	**-28.9**	**76.8**	**-33.6**

4.3 MITIGATION PROGRAM

The mitigation plan was developed to provide full, functional, sustainable and regionally significant mitigation for these wetland impacts. Forested wetland impacts will be offset at the Homosassa Tract; herbaceous and other surface waters wetland impacts will be offset, as described below, at Five Mile Creek.

4.3.1 Homosassa Tract

Working with the DOF PEF will partner on a wetland rehabilitation and restoration project that will be to the regional benefit of wildlife species and vegetative communities by enhancing lands in the Homosassa Tract (HT) of the WSF. The WSF is currently under State of Florida ownership and management, therefore the mitigation is limited to unfunded wetland rehabilitation and restoration work. The detailed projects within the HT will yield significant UMAM functional lift by rehabilitating and restoring primarily forested wetland habitats.

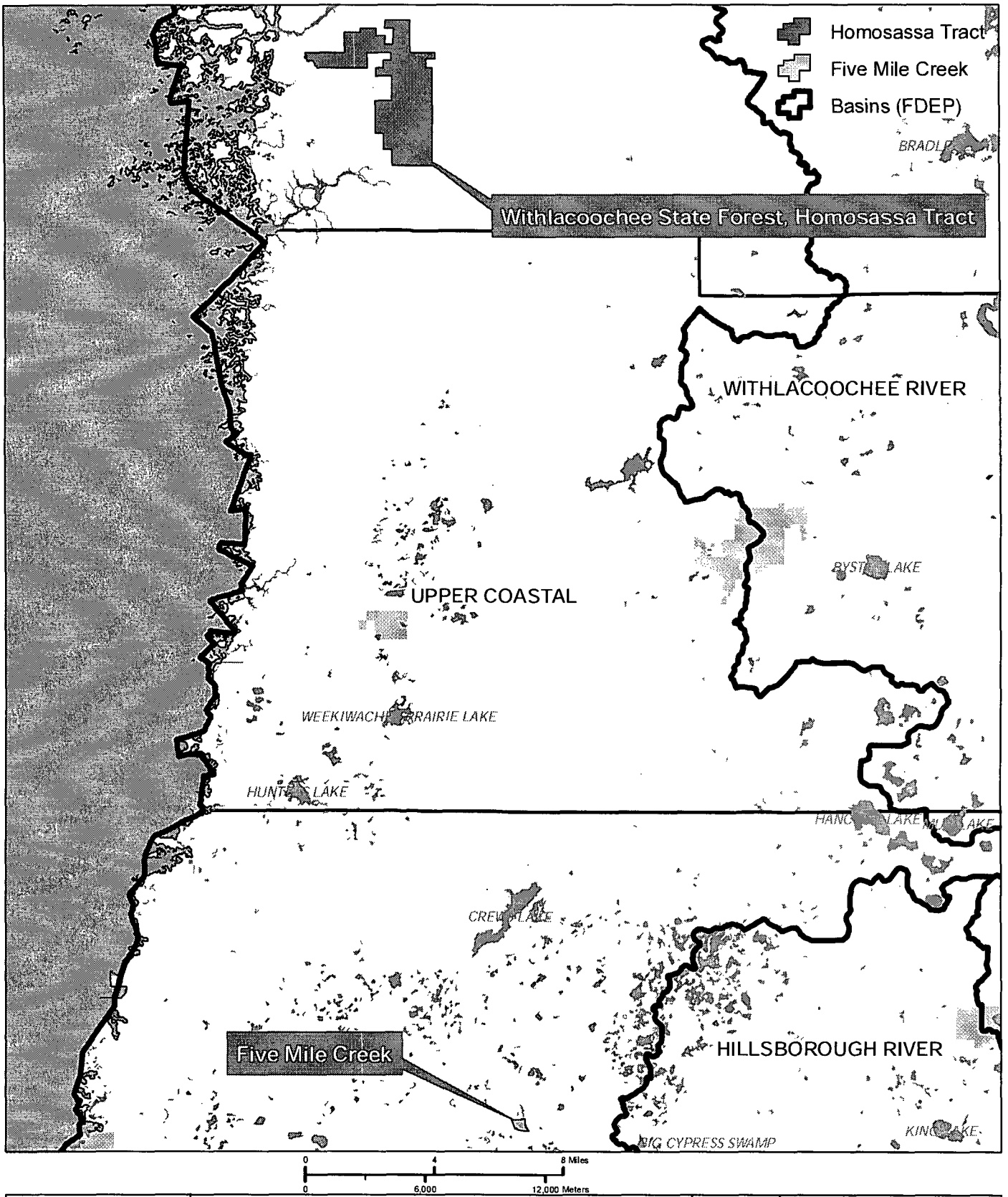

Exhibit 4-1-1
Upper Coastal Watershed - Location of Mitigation Sites Relative to Basin Boundaries

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Date: 03/25/2010 Rev. Date: n/a PM: SRD GIS Analyst: GdA Map Document: loc_upper_coastal_A_20100325.mxd Project Number: 6691-020 PDF Document: loc_upper_coastal_A_20100325.pdf Plot Size: 8.5 x 11

4.3.2 Five Mile Creek

Working closely with Pasco County's Environmental Lands Department, PEF will partner on a wetland enhancement and restoration project that will be to the regional benefit of wildlife species by not only enhancing and creating suitable habitat, but also by enhancing a significant link in a corridor for movement across the landscape. The area will also benefit from the project because the project will also provide additional flood water storage treatment and attenuation. The Five Mile Creek site is already under Pasco County ownership and management, so the mitigation is limited to unfunded wetland rehabilitation. The Five Mile Creek project mitigation will yield significant UMAM functional lift by restoring and enhancing herbaceous wetland habitats.

4.4 MITIGATION PLAN OBJECTIVE – HOMOSASSA TRACT

The objective of this mitigation plan is to compensate for the loss of forested wetland functions within the Upper Coastal Watershed that are associated with the LNP Project. This project may result in funtional losses in 69.9 acres of forested jurisdictional wetlands and other surface waters. The proposed wetland impacts to forested wetlands in this watershed are to mixed wetland hardwoods, cypress, and wetland forested mixed. The mitigation activities within the HT and wetlands slated for impact both occur within the Upper Coastal Watershed. This mitigation plan focuses on an assessment area in the northeast region of the HT. The assessment area was identified as historically impacted and containing degraded wetlands possessing a large lift potential.

This mitigation plan is consistent with the goals and management objectives established by the DOF for the WSF – HT (FDACS undated ac, b; LLACLS & FNAI 1990). This plan has been designed to restore and/or enhance wetland structure and function to wetland systems historically impacted by logging activities and cattle operations. The enhancement activities will increase wildlife habitat and beneficially affect water quality as well as vegetative structure and assemblage.

4.4.1 Site Description

The WSF is the second largest state forest in Florida. It is comprised of 157,479 acres on 7 tracts in several counties. The HT is made up of several parcels of land totaling 5,529 acres in Citrus County, Florida, **Exhibit 4-4-1**, and has several inholdings. A USGS Quad map is provided to depict general site topography, **Exhibit 4-4-2**. The HT was purchased under the Conservation and Recreation Lands (CARL) program starting in 1992 and incorporated into the WSF. The HT is adjacent to the Chassahowitzka Riverine Swamp Sanctuary. Other public lands located in close proximity to the Homosassa Tract include Crystal River Preserve State Park, Crystal River Archaeological State Park, and Homosassa Springs Wildlife State Park. The tract is adjacent to but not within an aquatic preserve or an Area of Critical State Concern. The Chassahowitzka National Wildlife Refuge has designated a Migratory Bird Sanctuary in a portion of the Refuge that adjoins the HT. The Crystal River Preserve State Park is located 6 miles to the north.

The HT lies within the coastal region of Citrus County between the Homosassa River and the Chassahowitzka River. The sharp demarcation between the hydric swamp and the more xeric vegetative communities immediately to the east is a result of the relatively abrupt elevation change along a relict shoreline. This change represents the boundary between two physiographic zones, the coastal swamp and Gulf coastal lowlands. The swamp portion is part of the Chassahowitzka Swamp, the largest coastal hardwood swamp along the Gulf Coast of Florida south of the Suwannee River. The tract encompasses portions of Mason Creek and Otter Creek.

The DOF is currently managing this tract under a multi-use concept with the primary emphasis on the restoration and maintenance of native ecosystems, especially the restoration of the pastureland. The DOF management activities are restoration, maintenance and protection of all native ecosystems; integration of compatible human use; and ensuring long term viability of populations and species considered endangered, threatened or of special concern.

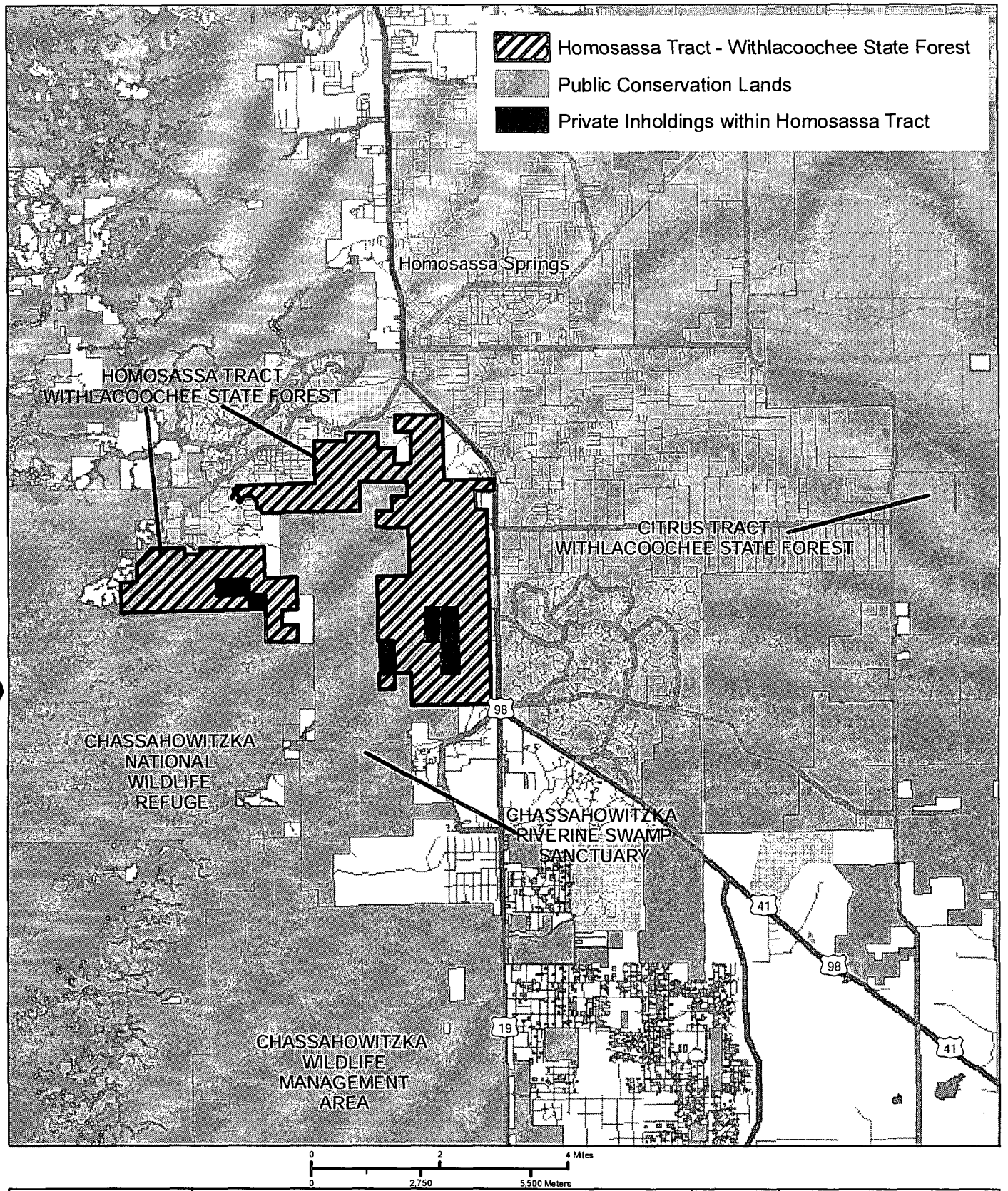

Exhibit 4-4-1
Homosassa Tract
Location Map

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Date: 03/26/2010 Rev. Date: 04/05/2010 PM: SRD GIS Analyst: GdA Map Document: homosassa_loc_A_20100326.mxd Project Number: 6681-020 PDF Document: homosassa_loc_A_20100326.pdf Plot Size: 8.5 x 11

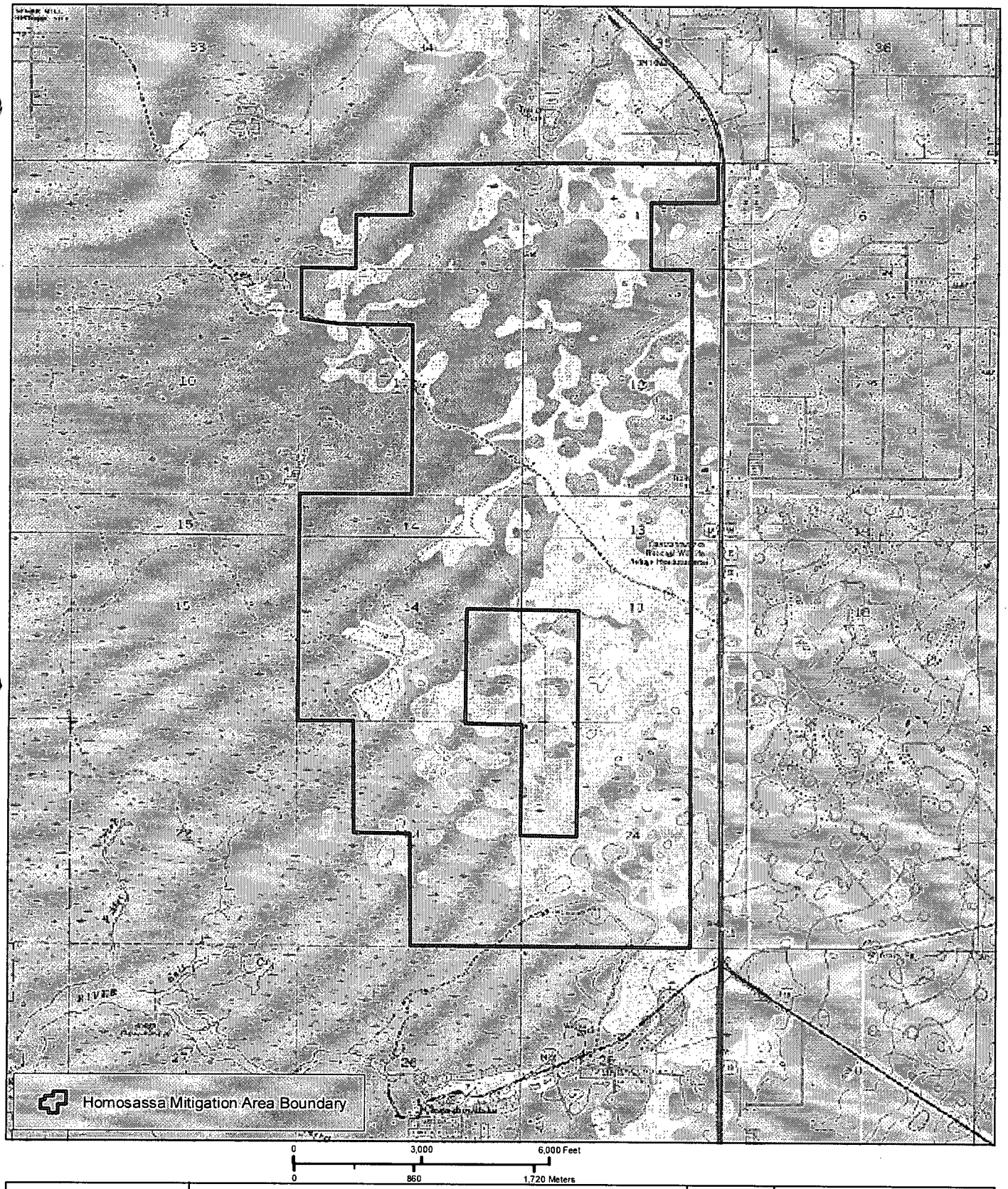

Exhibit 4-4-2
Homosassa Tract
USGS Quadrangle Map

Image:USGS Quad
Homosassa &
Chassahowitzka

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Date: 03/25/2010 Rev. Date: 04/05/2010 PM: SRD GIS Analyst: GdA Map Document: homosassa_quad_A_20100405.mxd Project Number: 6691-020 PDF Document: homosassa_quad_A_20100405.pdf Plot Size: 8.5 x 11

This mitigation plan focuses on the assessment area identified as possessing the greatest lift potential. The assessment area limits were established using historic and current vegetative community limits and topographic data. Topographic data was used to approximate the likely extent of hydrologic influence subsequent to hydrologic improvements.

The NRCS soils survey (USDA SCS 1996a) was utilized to determine the approximate extent of the different soil units known to exist within the assessment area. Additionally, the *Hydric Soils of Florida Handbook*, Fourth Edition (FAESS 2007) was utilized to evaluate the potential presence of hydric soils. According to the soil survey (USDA SCS 1996a) six soil units are present within the targeted assessment area, **Table 4-2**. Locations of soil units within the assessment area and in the remainder of the HT land parcel are shown in **Exhibit 4-4-3**. The table below also lists the type of plant community that typically occupies each soil type in the undisturbed condition, as well as the percent of the mapped soil unit that is expected to have hydric soils inclusions (USDA SCS 1989, FAESS 2007). NRCS identified typical plant community types, aerial interpretation of historic aerial signatures and field analysis of relict vegetation was utilized to establish target site conditions within the selected assessment area.

Table 4-2. USDA NRCS Soil Types on the Homosassa Tract Assessment Area.

Soil Number	Soil Type	Percent Hydric	Typical Plant Community Type
002	Adamsville Fine Sand	5%	Flatwoods
005	Basinger Fine Sand	95%	Slough
006	Basinger Fine Sand, Depressional	92%	Marshes and Ponds
007	Myakka Fine Sand	23%	Flatwoods
012	Immokalee Fine Sand	23%	Flatwoods
036	Eau Gallie Fine Sand	25%	Flatwoods

4.4.2 Historic Conditions

Black-and-white 1944 aerial photographs were determined to provide the best high resolution historical images available and were therefore selected as the best representation of historic vegetative communities and distribution patterns. Although these aerials depict ditching activities and wetland fill roads, it is likely that these activities were conducted in close enough proximity to 1944 that any affect of these actions would not have yet altered that the overall wetland/upland configurations. No obvious signs of logging are visible.

Historic aerial site photographs identify the HT as a mosaic of intertwining forested and herbaceous wetlands grading to upland sandhill and mesic flatwoods, **Exhibit 4-4-4**. Vegetative signatures present on 1944 aerials are primarily indicative of mesic flatwoods, wet flatwoods and basin swamps with scattered dome swamps and upland sandhill.

4.4.3 Current Conditions

Like much of Florida, many of the swamps and hammocks within the Homosassa Tract have been logged repeatedly. Logging operations in the Chassahowitzka Swamp region began around 1900, when local sawmills began processing old-growth bald cypress (*Taxodium distichum*) and red cedar (*Juniperus virginiana*). More recent timber harvests have concentrated on hardwood species, which apparently increased in density following the removal of the cypress and cedar. Most of the tract now supports third-growth forests. Many remnants of the logging operations remain, including elevated roadbeds and logging ramps. Beginning in the 1950s and 1960s the uplands were converted to pasture to support a cattle operation that existed until 1992. Dirt roads resulting from the cattle operation traverse the forest (FDACS undated a, b; LLACLS and FNAI 1990). Recently, large areas of upland sandhill, mesic flatwoods and wet flatwoods have been planted in longleaf pine (*Pinus palustris*) and to a lesser degree slash pine (*Pinus elliottii*). Herbicide has been applied within some pine plantations to eliminate bahia grass (*Paspalum notatum*) and other relict pastoral grasses. Prescribed burns have also been implemented in sections of the HT (Priest 2010).

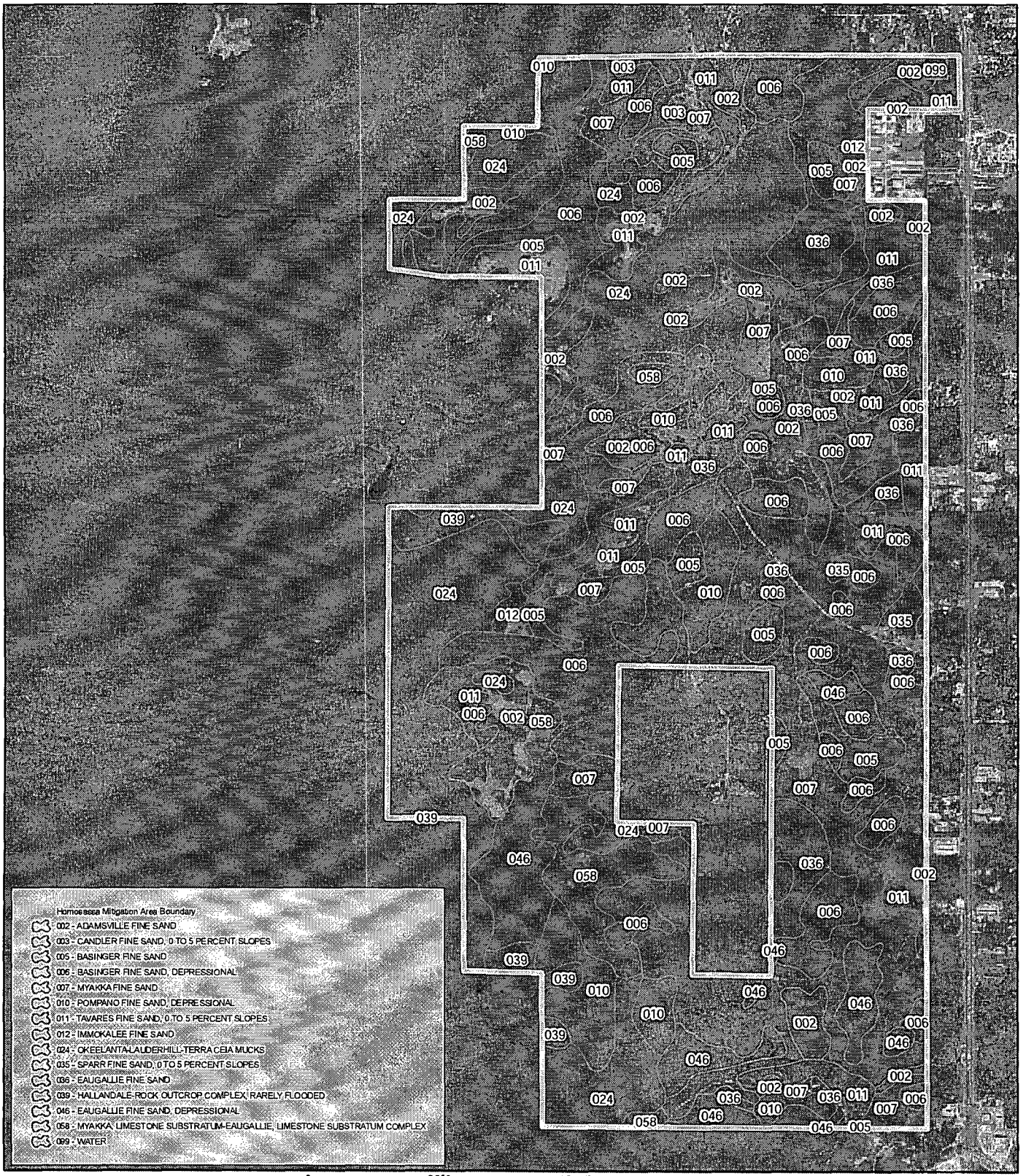

Exhibit 4-4-3
Homosassa Tract
NRCS Soils Map

Image: 2008

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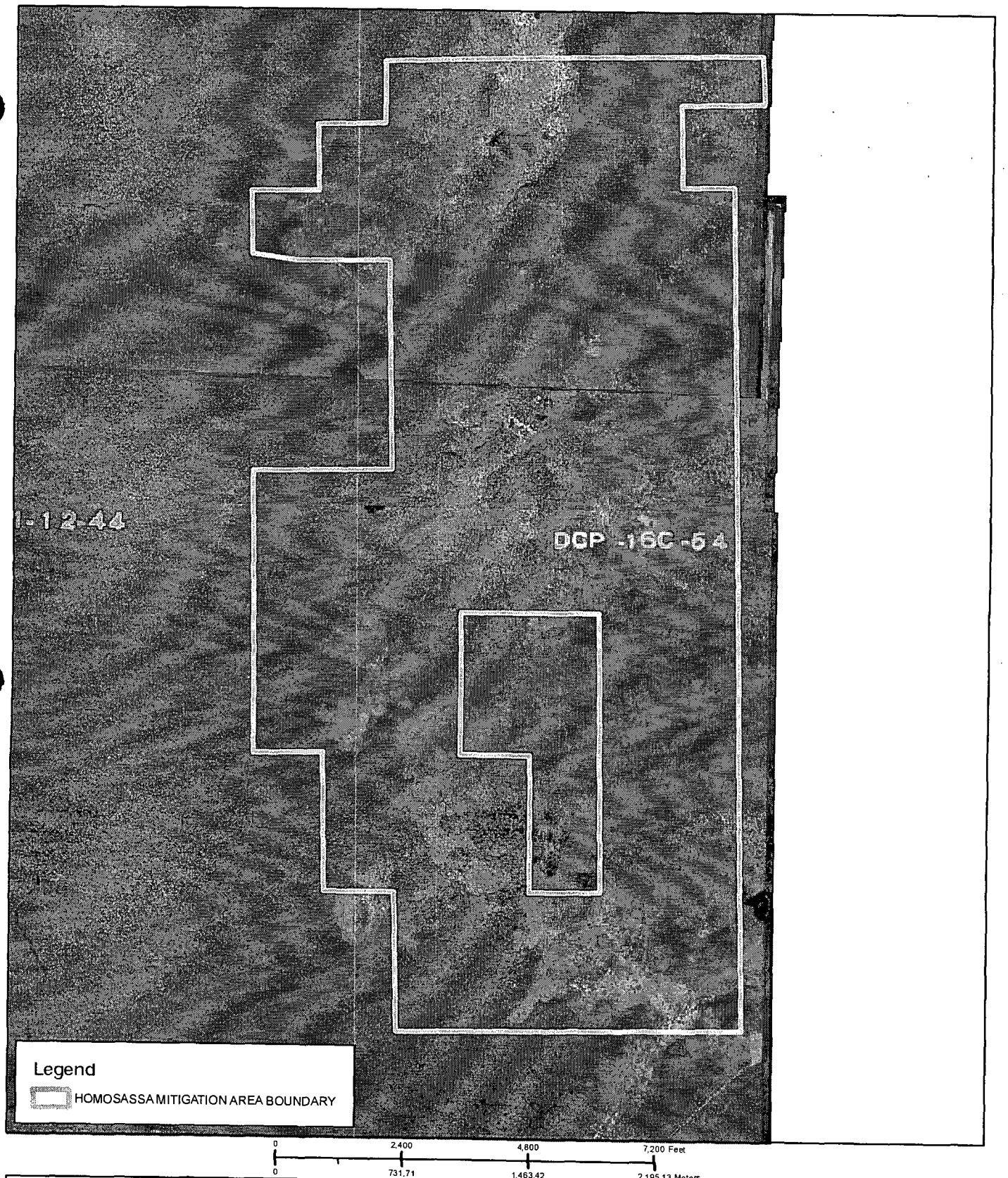

EXHIBIT 4-4-4

Homosassa Tract
1944 Historica Aerial

Image:1944

Center Sec 13
Twp 20 S
Rng 17 E

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Date: 03/10/2010 Rev. Date: 03/15/2010 PM: AMR GIS Analyst: JPB Map Document: EX_4_4_4.mxd Project Number: 6681-202 PDF Document: EX_4_4_4 Plot Size: 8.5 x 11

Hydrological conditions in most areas within the HT have been altered. This has brought about changes in plant communities as water levels have been manipulated. Generally, there has been a shift from more hydric plant communities to more mesic or xeric communities. Identified alterations that affect the site are off-site, upstream development; plantations of dense planted pine; and wetland fill roads. These conditions have been compounded by accumulations of organic material in wetlands due to shortened hydroperiods, pine encroachment (PE) and fire suppression.

A 2008 aerial showing the current condition of the property is shown in **Exhibit 4-4-5**. As is common with lands purchased using CARL funds, the current land uses and land cover types at the HT were mapped by FNAI using their Natural Community systems (FNAI 1990). The vegetative community limits located within the assessment area targeted for mitigation were recently refined following field review and review of current aerial photography. Further, vegetative assemblages have been updated here to the nomenclature of FNAI's 2009 system (FNAI 2009), **Exhibit 4-4-6**. A summary of the current vegetative community assemblages and land uses within the assessment area targeted for enhancement is detailed in **Table 4-3**.

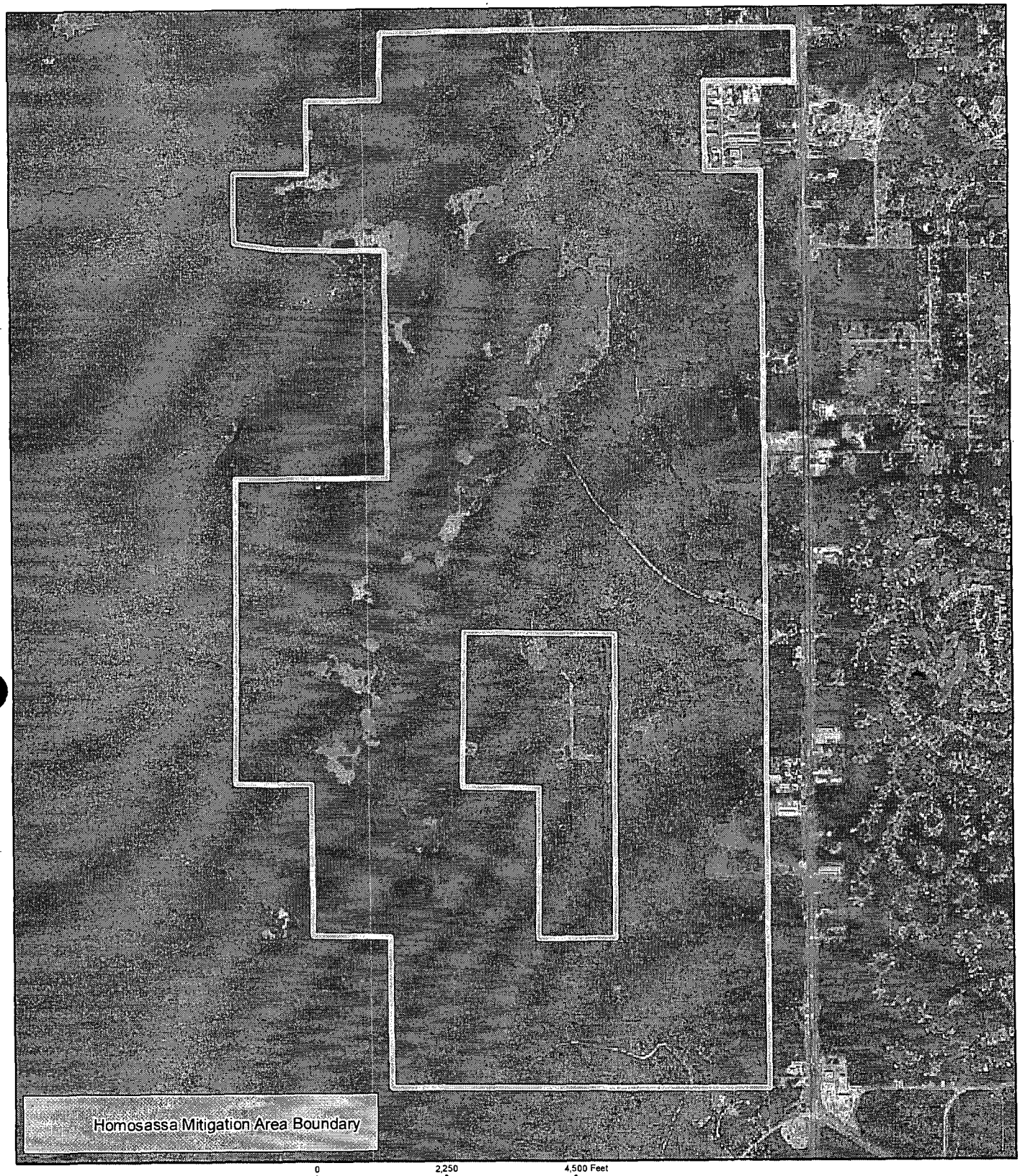
Table 4-3. Summary of Current Vegetative Communities/Land Use within the Assessment Area on the Homosassa Tract.

FNAI Description	Code	Wetland (Y/N)	Acreage
Basin Swamp	BS	Yes	78.8
Basin Swamp-Pine Encroachment	BSPE	Yes	112.7
Depression Marsh	DM	Yes	3.1
Depression Marsh-Pine Encroachment	DMPE	Yes	3.7
Dome Swamp	DS	Yes	1.2
Dome Swamp-Pine Encroachment	DSPE	Yes	1.6
Improved Pasture	IP	No	13.8
Improved Pasture-Wet	IPW	Yes	8.2
Planted Pine	PP	No	4.4
Planted Pine-Wet	PPW	Yes	4.4
Sandhill	SH	No	1.6
Wetland Shrub	WS	Yes	26.9
		Total	**260.4**

Because of the contiguous nature of the wetlands on the property, all wetlands would fall under the jurisdiction of both USACE and SWFWMD. The following is a brief description of the vegetative community assemblages and land uses within the assessment area targeted for enhancement. Site photos representative of each existing vegetative community/land use are provided in **Section 4.10.2**.

BASIN SWAMP/BASIN SWAMP-PINE ENCROACHMENT

This forested community comprises the majority of the forested wetlands targeted for restoration/enhancement. This community designation encompasses all historic basin swamp limits as well as historic wet flatwoods that have evolved basin swamp characteristics due to fire exclusion. The closed canopy is dominated by hardwood species including red maple (*Acer rubrum*), laurel oak (*Quercus laurifolia*), sweetgum (*Liquidambar styraciflua*), swamp bay (*Persea palustris*), sweetbay (*Magnolia virginiana*), loblolly-bay (*Gordonia lasianthus*) and swamp tupelo (*Nyssa sylvatica* var. *biflora*). Bald cypress ranges from common to absent within the canopy and understory. Portions of this community contain both slash pine (*Pinus elliottii*) and longleaf pine (*Pinus palustris*) at low to high densities. Pines encroachment is present primarily within areas of higher elevations with a short hydroperiod. Slash pine encroachment is less common overall, most prevalent at lower elevations and appears to be occurring naturally. Longleaf is present primarily landward of the lands occupied by slash pine occurring primarily within ecotones. High density pine encroachment areas commonly contain a 1-2.5 feet thick duff layer from needle cast.



0 2,250 4,500 Feet

0 575 1,150 Meters

Exhibit 4-4-5
Homosassa Tract
2008 Aerial Map

Image:2008

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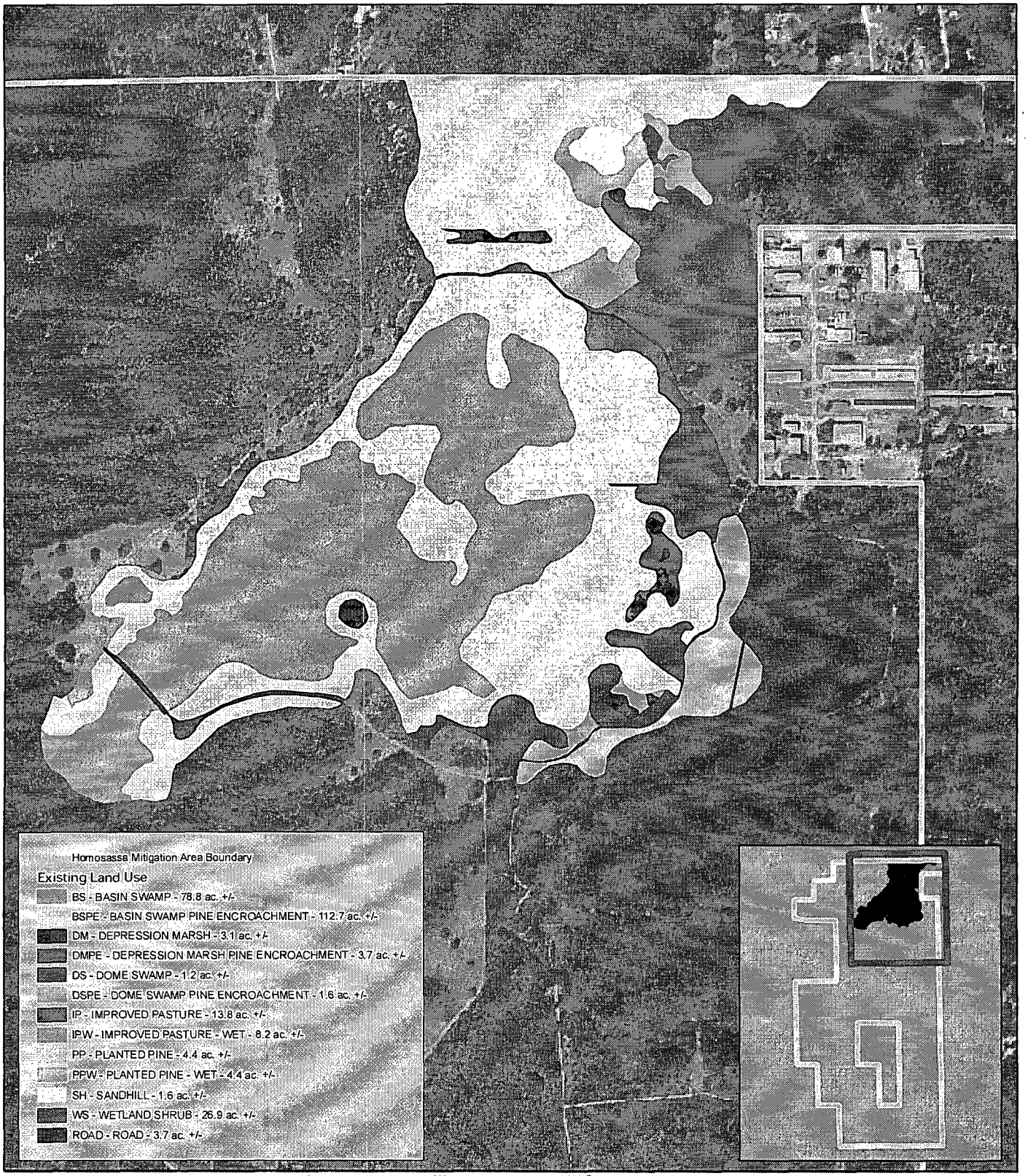

Exhibit 4-4-6
Homosassa Tract
Existing Land Use and Land Cover
Mitigation Wetlands

Image:2008

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Understory and shrub species are dominated by overstory recruits, dahoon holly (*Ilex cassine*), cabbage palm (*Sabal palmetto*), wax myrtle (*Myrica cerifera*), fetterbush (*Lyonia lucida*), gallberry (*I. glabra*) and blueberry (*Vaccinium elliottii, V. corymbosum*). Ground cover species present include marsh fern (*Thelypteris palustris* var. *pubescens*), wood fern (*Dryopteris ludoviciana*), redtop panicum (*Panicum rigidulum*), royal fern (*Osmunda regalis* var. *spectabilis*), Virginia chain fern (*Woodwardia virginica*), laurel greenbrier (*Smilax laurifolia*), and sawgrass (*Cladium jamaicense*). Shrub layer and ground cover densities ranged from spare to dense. Higher shrub and ground cover densities were typically located downstream of wetland fill roads. Shrubs species compositions within these areas contain higher proportions of facultative-wet and facultative species than the wetter upstream lands. Shrubs and ground cover upstream of fill roads was usually open-sparse and rooting limited to hummocks.

The bisecting wetland fill road appeared to be culverted sufficiently for the normal flow conditions of the system. The fill road bisects the wetland partially severing up and downstream hydrologic connectivity and essentially act as a dam during storm events. Soil oxidation was commonly observed downstream of the wetland fill road. Tree fall and subsequent mortality was occasionally observed and may be attributed to weakened rooting strength following soil oxidation. Wetlands upstream of the fill road appear to experience hydroperiods appropriate or longer than typical for this type of system. Lichen lines on trees were often well defined and water stain lines appeared to match fill road elevations upstream of the wetland fill road where hydrologic connectivity to areas downstream of the road is insufficient.

DEPRESSION MARSH

Several small graminoid dominated depression marshes occur within the assessment area. All but one of these marshes is natural and visible on historic aerials. One marsh is manmade, resulting from clear cutting of a basin swamp. This linear clear cut is dominated by broomsedge bluestem (*Andropogon virginicus*), coastalplain St. John's-wort (*Hypericum brachyphyllum*), tall yelloweyed-grass (*Xyris platylepis*), and occasional recruiting bald cypress. Naturally occurring marsh lands are small, shallow, bluestem-dominated depressions occurring with historic wet flatwoods. Higher elevations within these depressions have been planted with longleaf pine or contain some pine recruitment. Adjacent lands are currently dominated by pastureland, planted pine or wetland hardwood trees species with a dense woody understory. Depression marshes adjacent to pasturelands contain some bahia grass encroachment.

DOME SWAMP/DOME SWAMP-PINE ENCROACHMENT

This area exists as a small polygon in the northeastern corner of the assessment area. Understory species included small overstory recruits, swamp bay (*Persea palustris*), sweetbay (*Magnolia virginiana*), loblolly bay (*Gordonia lasianthus*) and swamp tupelo (*Nyssa sylvatica* var. *biflora*). Herbaceous vegetation is dominated by Virginia chain fern. Signs of soil oxidation are occasional. Duff layer is very thick within areas of planted pine and pine encroachment.

IMPROVED PASTURE/IMPROVED PASTURE-WET

Several small disjunct areas of pasture land occur within the assessment area. Historically these lands were mesic and wet flatwoods. Currently these areas contain bahia grass, broomsedge grasses (*Andropogon* spp.) and numerous other common herbaceous pastoral species. Some areas appear to be occasionally maintained through mowing or prescribed burns. Areas allowed to go fallow contain small early successional woody shrubs and trees.

PLANTED PINE/PLANTED PINE-WET

Several dense stands of planted longleaf pine occur within the assessment area. Stands were planted in 1993 and 2000. Historically these lands were sparsely canopied, herbaceous mesic and wet flatwoods. These were converted to pastureland then to pine plantation. The majority of the understory was herbicided with glyphosate and triclopyr in fall 2009 to eliminate bahia grass. Currently, understory and herbaceous vegetation is primarily absent although bahia grass was observed within some stands. No relict flatwoods woody or herbaceous species were observed.

ROADS

Numerous dirt roads resulting from the cattle operations and elevated limerock roads occur within and adjacent to wetland and mesic lands throughout the assessment area. Fill roads within wetlands occasionally contained culverts. Road sections subject to repeated wash-out due to water breaching the road are reinforced with crushed limestone.

SANDHILL

One small, upland sandhill is located within the assessment area. With the exception of prescribed fire, no mitigation activities are proposed for this community type.

WETLAND SHRUB

This shrub dominated community occupies the northeast corner of the assessment area. Historically these lands were sparsely canopied, herbaceous wet flatwoods. Currently these areas are dominated by dense stands of wax myrtle, dahoon holly (*Ilex cassine*), large gallberry (*I. coriacea*), young red maple, sawtooth blackberry (*Rubus argutus*) and laurel greenbrier.

According to FNAI the following listed (threatened/endangered/species of special concern) animals have been known to occur in plant communities similar to those on this tract. They include the gopher tortoise (*Gopherus polyphemus*), eastern indigo snake (*Drymarchon corais couperi*), southeastern American kestrel (*Falco sparverius paulus*), osprey (*Pandion haliaetus*), Sherman's fox squirrel (*Sciurus niger shermani*) and Florida black bear (*Ursus americanus floridanus*). One Sherman's fox squirrel was recently observed on-site during wetland mitigation investigations. No listed plants were observed.

4.4.4 Target Conditions

The mitigation goals are to reestablish historic vegetative assemblages and community limits within the assessment area to the greatest extent possible. This goal will be achieved through hydrologic improvements, supplemental planting, pine removal and prescribed burns. The vegetative community limits and designations within the assessment area were refined following field review and review of historic and current aerial photography. Six community types have been identified as historically occurring within the assessment area targeted for the detailed restoration activities; they are basin swamp, depression marsh, wet flatwoods, dome swamp, mesic flatwoods, and sandhill (FNAI 2009). Target conditions within these communities, with appropriate continued management, will be similar to historical native structure and vegetative assemblages as shown in **Exhibit 4-4-7** and further described below. Target community types and acreages are approximated based on aerial interpretation of 1944 historic aerials. A summary of the target vegetative community assemblages/land uses within the assessment area targeted for restoration and/or enhancement is detailed in **Table 4-4**. Descriptions typifying the historic/target communities found within the assessment area can be found in **Sections 6.3** and **6.4**.

Table 4-4. Summary of Historic/Target Vegetative Communities within the Assessment Area on the Homosassa Tract.

FNAI Description	Code	Wetland (Y/N)	Acreage
Basin Swamp	BS	Yes	134.2
Depression Marsh	DM	Yes	5.8
Dome Swamp	DS	Yes	2.8
Mesic Flatwoods	MF	No	18.2
Sandhill	SH	No	1.6
Wet Flatwoods	WF	Yes	97.8
		Total	**260.4**

Healthy and sustainable populations of flatwoods and forested swamp animal species are present locally and regionally. Indicator species such as Sherman's fox squirrels, and Bachman's sparrows are known to occur within these portions of the WSF. Red-cockaded woodpeckers (RCW are not currently present but the habitat should be capable of sustaining them following site restoration.

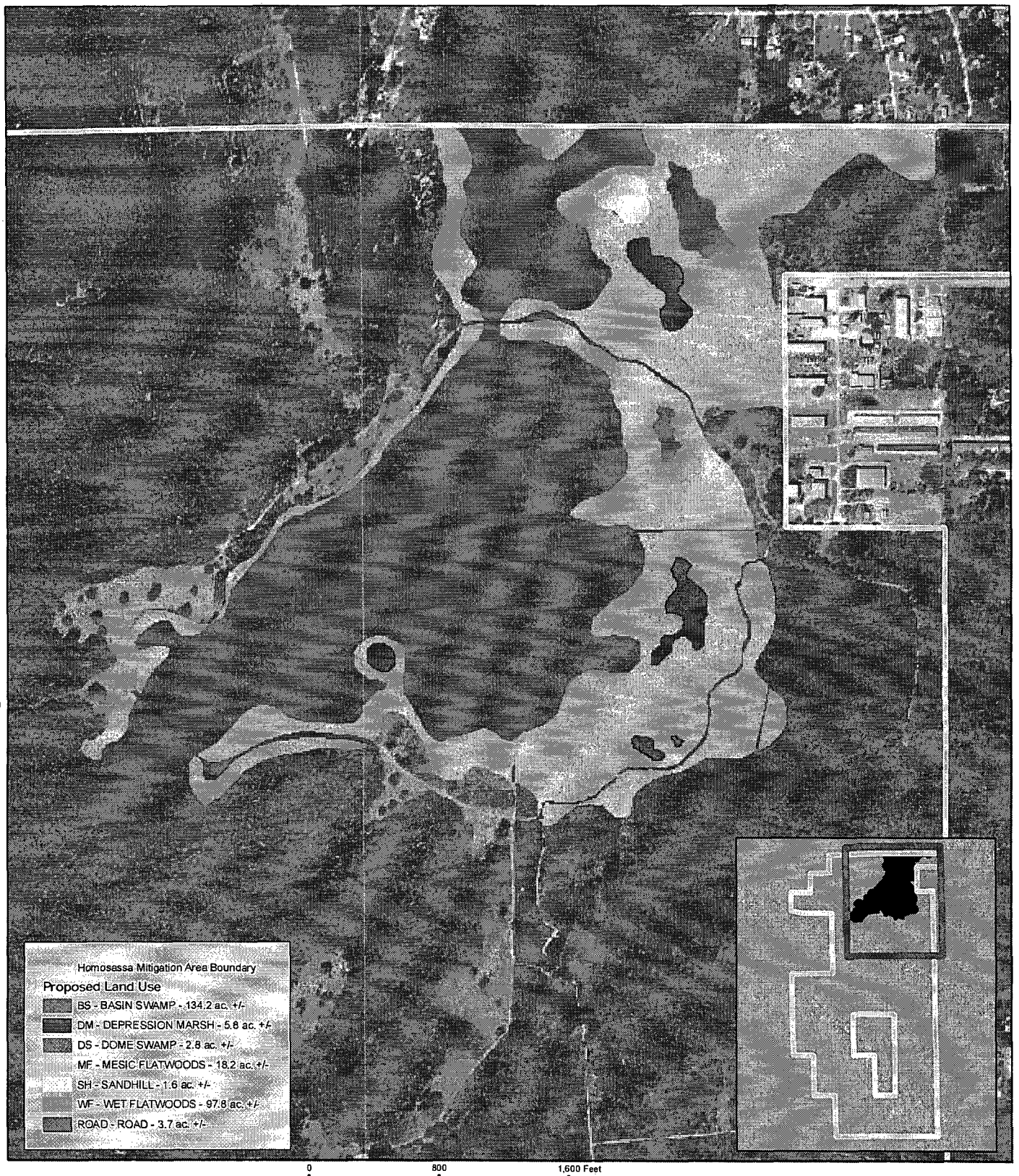

Exhibit 4-4-7
Homosassa Tract
Proposed Land Use and Land Cover
Mitigation Wetlands

Image:2008

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4.4.5 Mitigation Activities

Exhibit 4-4-8 shows the mitigation plan. The conversion of specific types of current communities to their target community types, and potential acreages, is depicted in **Table 4-5**. The plan consists primarily of a combination of wetland restoration and enhancement of freshwater forested wetlands and selected adjacent mesic flatwoods. A planting plan is provided as **Exhibit 4-4-9**. Mitigation activities include installation of low water crossings, pine thinning, herbicide application, gyrotrac or mowing, supplemental planting and prescribed fire. Specific details of the plan are described in **Section 4.5**.

Table 4-5. Matrix of Existing to Target Vegetative Communities, Land Uses, and Acreages.

Current Communities	Target Communities						
	Wet Flatwoods	Basin Swamp	Depression Marsh	Dome Swamp	Mesic Flatwoods	Sandhill	Total (Ac.)
Basin Swamp		78.8					78.8
Basin Swamp-Pine Encroachment (PE)	58.3	54.4					112.7
Depression Marsh		1.0	2.1				3.1
Depression Marsh-PE			3.7				3.7
Dome Swamp				1.2			1.2
Dome Swamp-PE				1.6			1.6
Improved Pasture-Wet	8.2						8.2
Planted Pine-Wet	4.4						4.4
Wetland Shrub	26.9						26.9
Improved Pasture (uplands)					13.8		13.8
Planted Pine (uplands)					4.4		4.4
Sandhill (Uplands)						1.6	1.6
Total	97.8	134.2	5.8	2.8	18.2	1.6	260.4

Specific restoration techniques will be conducted in general accordance with the existing management plan for the WST-HT. The DOF general management practices at HT are to focus on the restoration and maintenance of native ecosystems, especially the restoration of the pastureland and planted pine stands. Specific restoration techniques per community conversion type are summarized in **Table 4-6**.

Table 4-6. Proposed Restoration Technique per Community Conversion Type.

Current Communities	Target Communities	Restoration Technique					
		LWC Installation	Pine Thinning	Gyrotrac/ Mowing	Herbicide	Seeding/ Planting	Prescribed Burn
Basin Swamp	Basin Swamp						
Basin Swamp-PE	Basin Swamp	X	X				
Basin Swamp-PE	Wet Flatwoods		X				X
Depression Marsh	Basin Swamp					X	
Depression Marsh	Depression Marsh				X	X	
Depression Marsh-PE	Depression Marsh		X		X	X	
Dome Swamp	Dome Swamp						
Dome Swamp	Wet Flatwoods			X			X
Dome Swamp -PE	Dome Swamp		X				
Improved Pasture-Wet	Wet Flatwoods				X	X	X
Planted Pine-Wet	Wet Flatwoods		X		X	X	X
Wetland Shrub	Wet Flatwoods			X		X	X
Improved Pasture (uplands)	Mesic Flatwoods				X	X	X
Planted Pine (uplands)	Mesic Flatwoods		X		X	X	X
Sandhill (uplands)	Sandhill						X

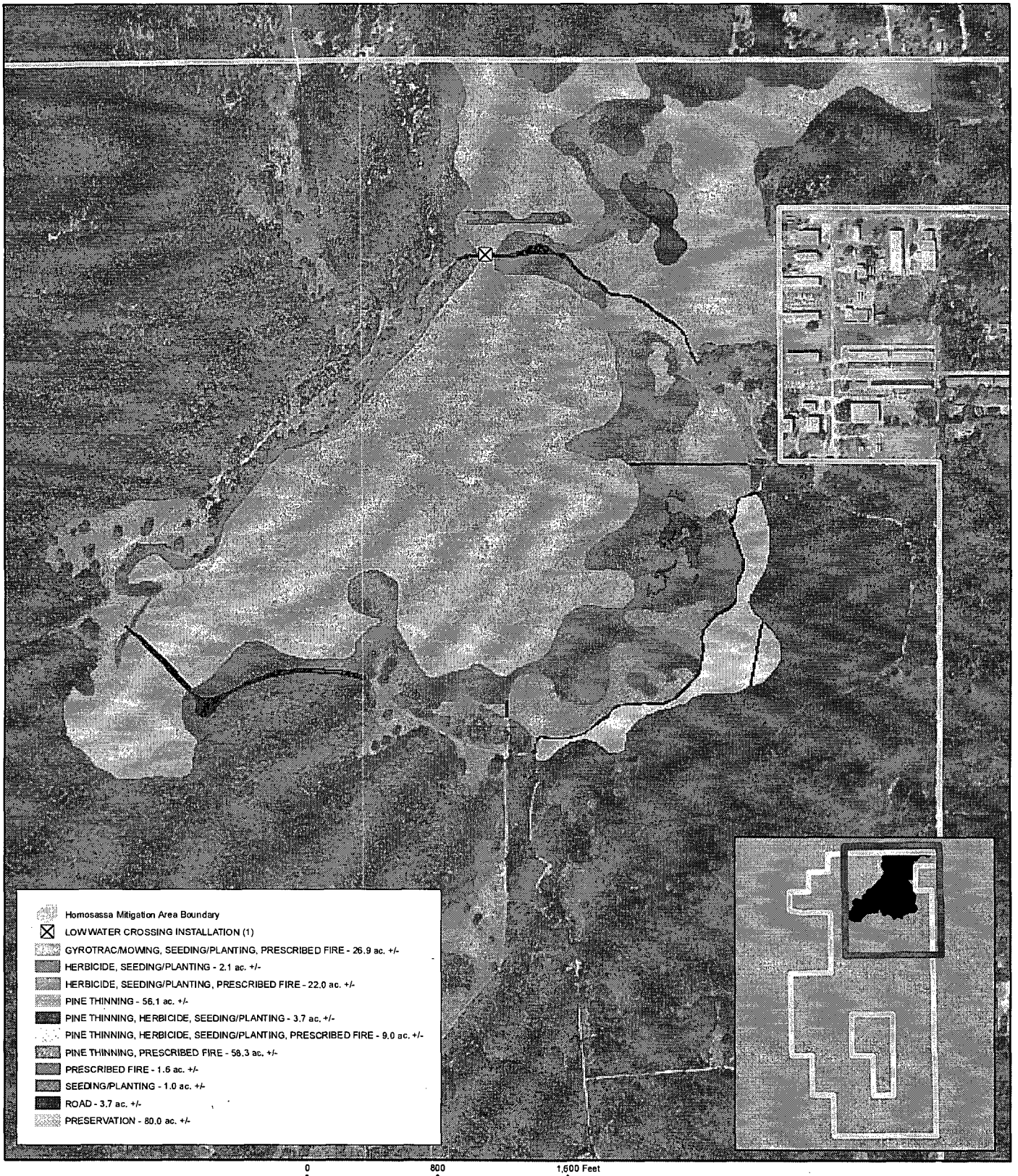

Exhibit 4-4-8
Homosassa Tract
Mitigation Activities Map
Mitigation Wetlands

Image:2008

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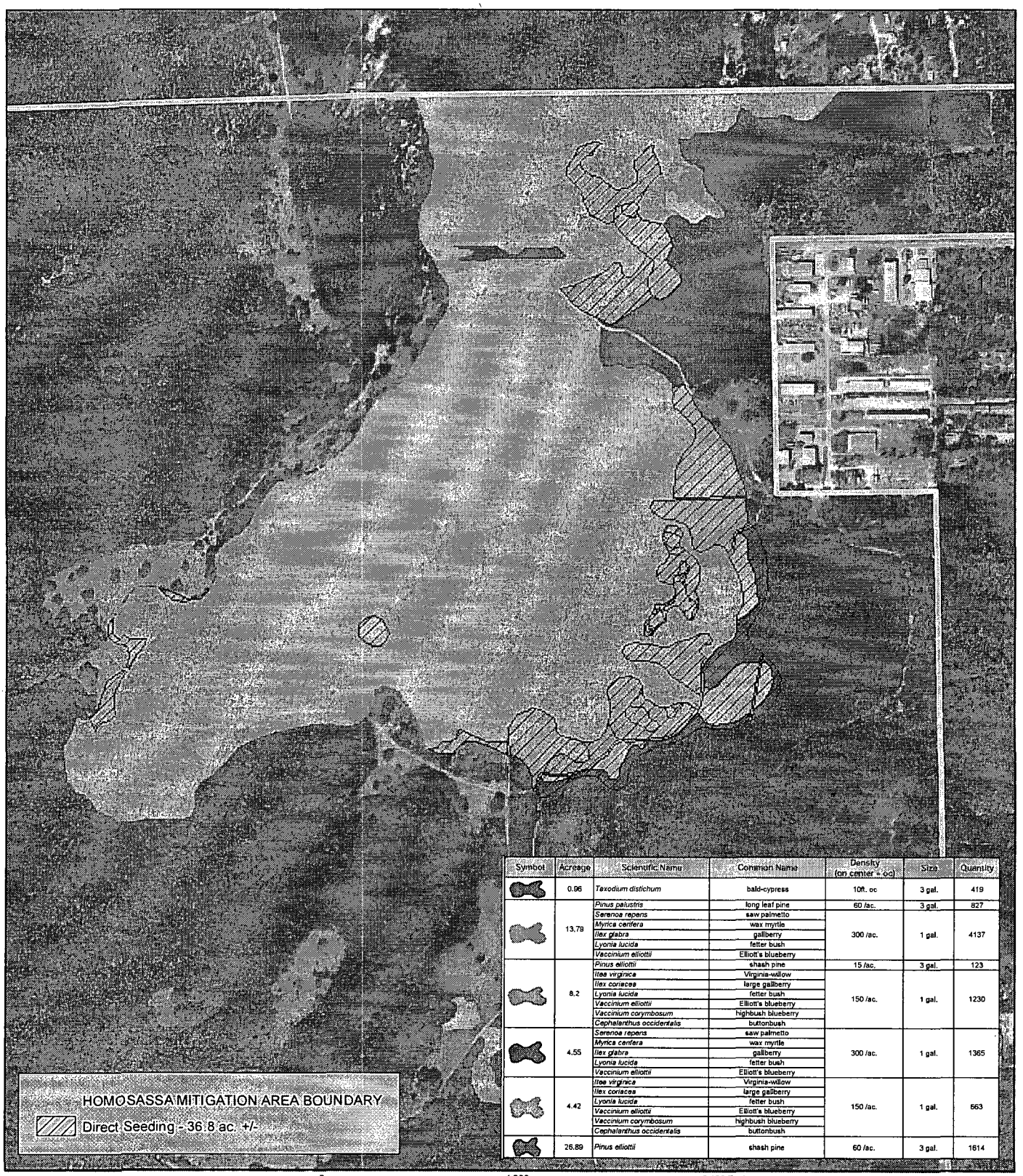
Date: 04/06/2010 Rev. Date: 04/07/2010 PM: SRD GIS Analyst: GdA Map Document: homosassa_mit_activities_A_20100406.mxd Project Number: 6591-020 PDF Document: homosassa_mit_activities_A_20100406.pdf Plot Size: 8.5 x 11



Symbol	Acreage	Scientific Name	Common Name	Density (on center - oc)	Size	Quantity
	0.96	*Taxodium distichum*	bald-cypress	10ft. oc	3 gal.	419
	13.79	*Pinus palustris*	long leaf pine	60 /ac.	3 gal.	827
		Serenoa repens	saw palmetto	300 /ac.	1 gal.	4137
		Myrica cerifera	wax myrtle			
		Ilex glabra	gallberry			
		Lyonia lucida	fetter bush			
		Vaccinium elliottii	Elliott's blueberry			
	8.2	*Pinus elliottii*	shash pine	15 /ac.	3 gal.	123
		Itea virginica	Virginia-willow	150 /ac.	1 gal.	1230
		Ilex coriacea	large gallberry			
		Lyonia lucida	fetter bush			
		Vaccinium elliottii	Elliott's blueberry			
		Vaccinium corymbosum	highbush blueberry			
		Cephalanthus occidentalis	buttonbush			
	4.55	*Serenoa repens*	saw palmetto	300 /ac.	1 gal.	1365
		Myrica cerifera	wax myrtle			
		Ilex glabra	gallberry			
		Lyonia lucida	fetter bush			
		Vaccinium elliottii	Elliott's blueberry			
	4.42	*Itea virginica*	Virginia-willow	150 /ac.	1 gal.	663
		Ilex coriacea	large gallberry			
		Lyonia lucida	fetter bush			
		Vaccinium elliottii	Elliott's blueberry			
		Vaccinium corymbosum	highbush blueberry			
		Cephalanthus occidentalis	buttonbush			
	26.89	*Pinus elliottii*	shash pine	60 /ac.	3 gal.	1614

0 1,200 2,400 Feet

0 210 420 Meters

Exhibit 4-4-9
Homosassa Tract
Planting Plan
Mitigation Wetlands

Image:2008

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No RCW cavities were observed or previously recorded within the HT. If determined to be present, work will be limited to areas outside the 250-foot work setback zone and restricted from occurring during their nesting season (April-June).

HYDROLOGIC RESTORATION

Historic hydrologic connectivity will be restored to the greatest extent possible through the installation of a low water crossing. The historically wetter hydroperiods in the basin and dome swamps primarily limited woody shrubs to hummocks. Reestablishment of historic hydroperiods will help facilitate appropriate restoration of historic vegetative distributions and community structure. Hydrology will also be greatly improved with removal of encroaching wetland pines and thinning of densely planted wetland and upland planted longleaf pine. Pine stands are between 17 and 10 years old.

If needed, on-site fill sources will be used to the extent possible, especially when available in close proximity to fill locations. Any necessary fill imported from off site for low water crossing work shall be clean, construction-grade sand material void of nuisance vegetation and debris. Graded areas shall be allowed to revegetate naturally or will be replanted with native vegetation.

Although hydrologic improvements will be designed to restore historic site conditions, field engineering is needed to refine the specific placements and elevations so that these activities will not affect site access and adjacent non-target lands. Specific modeling of the sites current or future hydrologic conditions resulting from mitigation activities have not yet been conducted. Site specific topographic and hydrologic surveys will be conducted and the hydrologic response to mitigation actions analyzed prior to commencing earth works. Survey and modeling results will be shared with and approved by HT DOF and other review agencies as appropriate prior to implementing restoration activities. Adjustments to this restoration plan may be warranted following these investigations.

PINE THINNING

Community structure restoration within the basin swamps and pine plantations will be facilitated primarily through removal or thinning of longleaf and slash pine and reestablishment of historic hydroperiods. Planted pine stands will need to be thinned to clusters of pines not exceeding target initial pine thinning densities in **Table 4-7**. Trees will be thinned and forestry operations will be conducted as described in **Section 6.5.** Target stand densities are based on review of 1944 aerial photography. Pine thinning will occur only once within any area but this single thinning may take multiple actions since factors such as flooding and weather may impact work schedules.

Table 4-7. Target Pine Densities per Target Community.

FNAI Community Type	Target Density (per acre)
Basin Swamp	≤15
Depression Marsh	0
Dome Swamp	≤5
Mesic Flatwoods	≤60
Wet Flatwoods	≤15

SHRUB/BRUSH REDUCTIONS

Use of a gyrotrac and/or mowing is proposed for shrub and brush reduction in all historic mesic flatwoods, wet flatwoods and depression marshes currently forested but not slated for pine thinning/removal. A brown brush cutter or similar equipment should be used to mow areas dominated by herbaceous and smaller shrubby vegetation. A gyrotrac, set 10-18 inches off-grade, can be used in areas containing dense, mature brush and small trees. Low impact machinery will be used within wetlands to minimize rutting and soil disturbance. Further, restoration activates will occur following periods of extended rainfall. Chainsaws and hand removal of slash pine will occur where necessary to avoid rutting.

PRESCRIBED FIRE

Prescribed fire will be implemented in concert with the WST-HT management plan; although there will be a need for more frequent fire in the implementation phase. It will be critical to the success of the longleaf

pine/wiregrass management program to maintain a 2 to 7 year burn interval with the average interval being four years. Recently, pine straw harvesting operations have limited the number of prescribed burns initiated within planted pine stands. Burning implementation schedules specific to planted pine and pasture restoration lands are detailed further below. Slash should be allowed to dry following gyrotracing, mowing, or logging operations prior to initiating prescribed burn.

No firelines will be used to prevent fire from going into forested wetlands unless drought conditions or smoke management concerns override the preference to maintain the natural ecotone. If a fireline is necessary, heavy equipment can be used only to mow or "lay down" vegetation by driving equipment over the area of concern, with attention to avoiding wet, mucky areas. If the previous two methods are unsatisfactory and the situation is considered a serious threat, careful planning and consideration for a lightly harrowed line as determined by staff may be required.

Growing season burning will be used whenever possible to mimic natural fires. Firelines will avoid ecotones and prescribed fires will be encouraged to burn into wetland ecotones when sufficient hydration exists to allow burning to be conducted without the risk of canopy or muck fires. The protocol for fire in wetlands is to allow fires to reduce woody plants on the wetland edges and within the ecotone.

PINE PLANTATION RESTORATION

Longleaf pines that are densely planted will need to be thinned to clusters of pines ranging from 40 to 60 pines per acre after harvest. Where present, relict bahia grass pasture will need to be treated with herbicide and restored. Please see pasture restoration details, below. Portions of the planted pine stands have already been herbicided, follow up herbicide treatments and further site preparation will be needed to prepare the site for receiving native seed. Additional care will need to be taken to preserve the pines remaining post logging, as longleaf pines are easily killed by disturbing the fine roots near the surface.

PASTURE RESTORATION

For lands that have been converted to bahia grass pasture, direct seeding will be necessary to restore the pyrogenic (fire-dependent) groundcover. The pasture grasses will need to be removed (typically through herbicide application) and then re-seeded with native groundcover seed. Pastureland occupying historically wet flatwoods may require fewer herbicide applications and a less intensive planting/seeding plan. These areas will require inspection following treatment and management plan revisions based on field inspection results. A traditional timeline would be as follows:

- Initial herbicide in March/April of the year of seeding
- Follow up herbicide treatment mid-summer
- Disk remaining vegetation and remaining thatch in August/September
- Roll site following disking
- Mid to late October, final herbicide application
- Seed with native seed mix between November 15 and December 15
- Prescribed fire summer of year two
- Plant trees (longleaf) and native shrubs year three
- Maintenance throughout (at least quarterly)

Herbicide application will use Roundup®, Arsenal or other appropriate herbicide per label rates and criteria. Following initial broadcast application, follow up spot treatments can be used to control re-growth. Proper site preparation is essential for success of the native seed germination. The site will need additional disking, rolling and herbiciding prior to seeding in the fall.

Donor sites will be prepared while the restoration site is being prepared. Donor sites in close proximity to the restoration site are preferred. The sites will have similar plant communities. The harvest must occur after the donor site has been treated with a growing season burn of the same year as seeding (May-July). Additional hand collected seed is recommended to enhance species richness and to allow for the introduction of selected species whose seeds cannot be harvested in November thru mid-December when the primary harvest will occur.

Seed will be transferred directly from the donor site to the restoration site and sowed (direct-seeded) immediately. Depending on harvest method (green silage chopper or flail vac) the seed will be sown with a modified sod sprigger or with a Grasslander. Harvesting and sowing most native seeds when they are ripe and fresh in mid-December to mid-January will prevent greatly reduced germination.

Site maintenance is very important. Periodic mowing by a skilled operator can promote growth of desirable species while controlling colonization of groundsel bush, dogfennel and other invader plant species into the newly restored site. Spot treatment with herbicide will be used to control bahia, Bermuda, and cogon grasses, and some sites may benefit from a Plateau herbicide treatment prior to shrub and tree planting.

Following the direct seeding (typically within 2 years) the typical pasture restoration site forms enough fuel to allow for a growing season burn. Typically this burn will be completed in May/June; and then in August and September, shrubs and pines can be added to the restored groundcover. Appropriate shrubs and longleaf pine will be installed as detailed in planting plan. Plants must be watered as they are planted unless there is adequate rain to maintain high soil moisture until the plants are established.

4.4.6 Mitigation Schedule

The mitigation will be initiated to coordinate with the PEF transmission line construction schedule. Once implemented, the work schedule will be as depicted in **Table 4-8**. The earthwork should be conducted in March and April when rainfall is typically low. All planting must be done when adequate moisture is present for establishment, typically, late in the growing season (July and August).

Table 4-8. Schedule for Implementation of Restoration and Monitoring Activities on the Homosassa Tract.

Activity	Year 1	Year 2	Year 3	Year 4	Year 5
LWC	Install	Monitor for function and bank stabilization	Continue monitoring	Continue monitoring	Continue monitoring
Pine Thinning	Dry season*				
Gyrotrac/Mowing	Dry season*				
Herbicide	Pasture, planted pine and proposed depression marshes				
Disk/Roll	Pasture, planted pine and proposed depression marshes				
Seed Collection	Collect from local donor site in fall following growing season burn				
Direct Seeding	Seed target areas in late November-mid December	Monitor vegetation to determine success	Continue monitoring	Continue monitoring	Continue monitoring
Planting	Plant non-direct seeding areas in late November-mid December	Monitor vegetation to determine success of planting	Plant direct seeding areas in late November-mid December	Monitor vegetation to determine success of planting	Continue monitoring
Prescribed Burn		Conduct site review to determine availability of fuel	All historic wet flatwoods, mesic flatwoods and sandhill	Monitor vegetative communities burned the previous year for response to fire	All historic wet flatwoods, mesic flatwoods and sandhill

*November-April

4.5 MITIGATION PLAN OBJECTIVE - FIVE MILE CREEK

The objective of this mitigation plan is to compensate for the loss of herbaceous wetland functions within the Upper Coastal Watershed that are associated with the LNP Project. This project may result in the permanent loss of up to 6.9 acres of herbaceous jurisdictional wetlands and other surface waters. The proposed wetland impacts to herbaceous wetlands in this watershed are to freshwater marsh, wet prairie, and shrub wetlands. The remainder of the wetland impacts are to open water bodies and ditches.

The mitigation plan is consistent with the established goals and objectives of the Pasco County Environmental Lands Program. This plan has been designed to restore and/or enhance wetland habitats on this highly disturbed piece of property in order to increase its suitability for use by wildlife as foraging, nesting and denning habitat and as an avenue for movement across landscape. This plan will also result in flood storage and attenuation restoration and increased water quality to downstream receiving waters.

4.5.1 Site Description

The Five-Mile Creek mitigation site is located in the Upper Coastal Watershed, on a parcel of land owned by Pasco County, in Section 21, Township 25S, Range 18E in Pasco County, FL. The parcel is located west of U.S. 41 and adjacent to the CSX Railroad line to the west, approximately two miles south of S. R. 52 (**Exhibit 4-5-1**). This parcel is strategically located to improve a link in a corridor of lands that is in relatively undeveloped condition between a approximately 500-acre SWFWMD preserve (Connor Preserve) to the east and the approximately 19,000-acre SWFWMD Starkey Wilderness Preserve located to the west (**Exhibit 4-5-1B**).

Five-Mile Creek flows under U.S. 41 through a triple box culvert and then eastward to cross a conservation easement dedicated to the county and enter the county property approximately one (1) mile west of U.S. 41. A wildlife crossing is currently under construction as part of the widening of U.S. 41. This crossing will facilitate the movement of wildlife through this natural corridor by allowing wildlife to avoid the traffic hazard of crossing over U.S. 41. The creek has been ditched throughout most of its length on the county easement and county-owned parcels. As a result of the ditching, the current hydrologic regime of the contiguous wetlands is very "flashy," staging up quickly after a rainfall event, and then dropping again. Thus the hydroperiod of the contiguous wetland systems has been reduced.

The total area of the parcel is approximately 81.6 acres. The natural topography of the site is generally flat but falls slightly in elevation from east to west (**Exhibit 4-5-2**).

According to the NRCS soil survey for Pasco County, Florida (USDA 1996) 5 soil units are present on the property (**Table 4-9**). Locations of soil units are shown in **Exhibit 4-5-3**. Because most of the site has been excavated for fill, the soils map clearly does not reflect the current condition. However, in the unexcavated portions of the site, the soil profiles appear to be relatively intact. Of the unexcavated portions of the site, the most prevalent soil type is Smyrna fine sand. The table below also lists the type of plant community that typically occupies each soil type in the undisturbed condition. This would be the most appropriate target community if one were seeking to restore a site to its historic condition.

Table 4-9 USDA NRCS Soil Types on the Five Mile Creek Project Site.

Soil Number	Soil Type	Hydric	Ac.	Typical Plant Community Type
190	Smyrna Fine Sand	No	47.7	Flatwoods
195	Narcoossee Fine Sand	No	2.3	Flatwoods or oak hammock
216	Cassia Sellers Fine Sand	No	4.9	Sand pine or scrubby flatwoods
250	Sellers Mucky Loamy Fine Sand	Yes	4.8	Cypress swamp or marsh
252	Water	NA	21.9	Aquatic

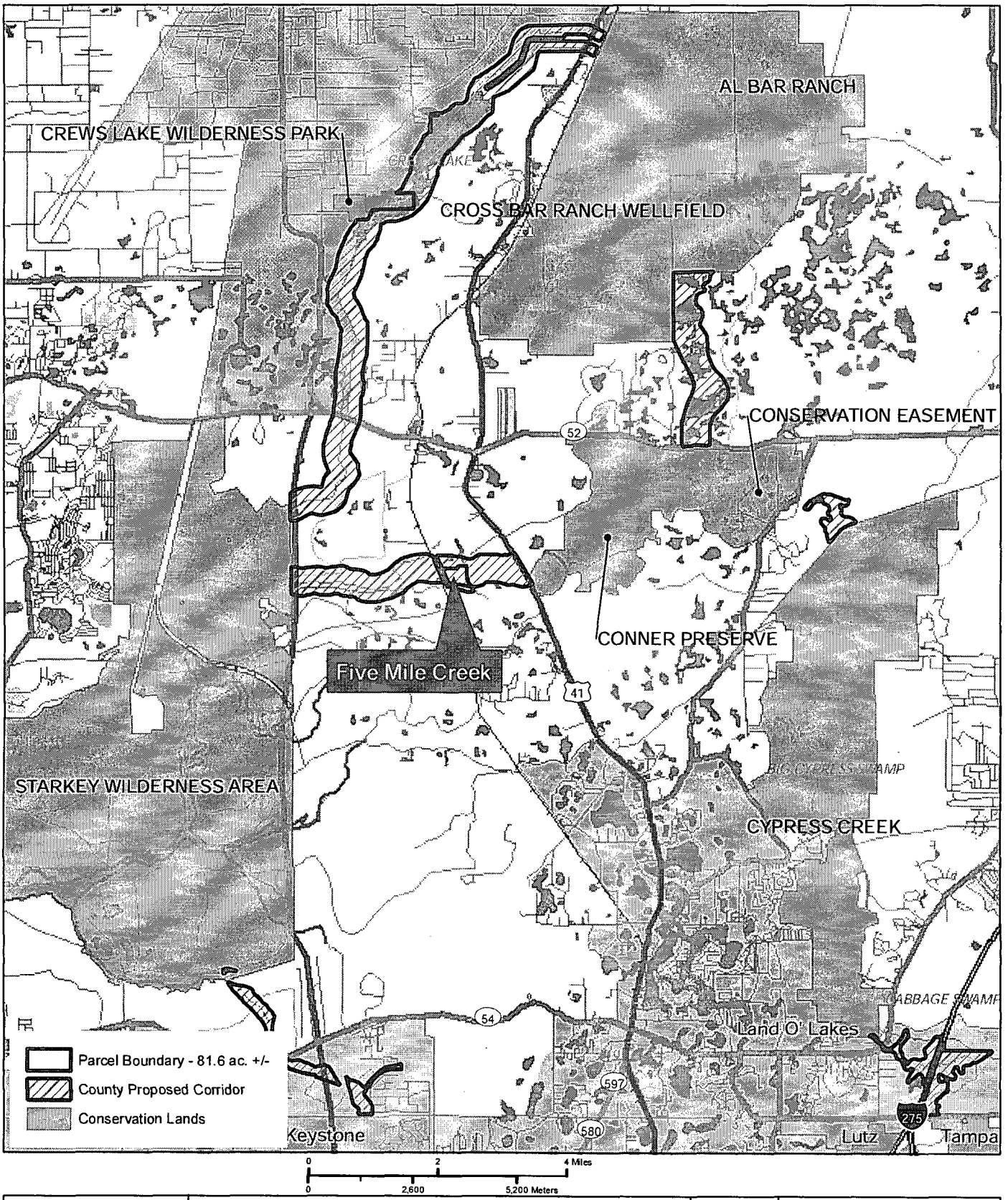

Exhibit 4-5-1
Five Mile Creek Mitigation Site
Location Map

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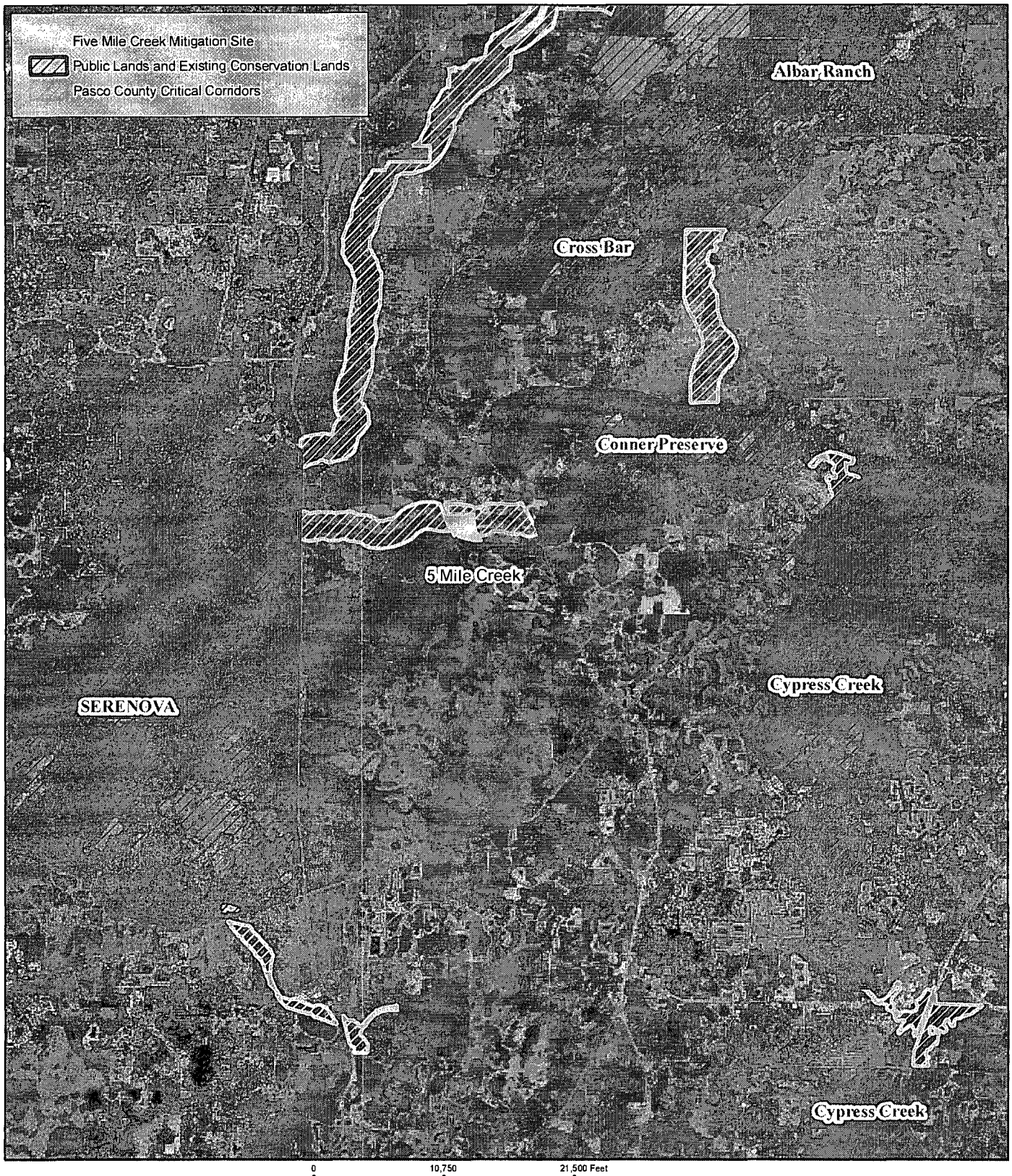

Exhibit 4-5-1B
Five Mile Creek Mitigation Site in Relation to Wildlife Corridors

Progress Energy
Pasco County, Florida

Image:2009

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NAD 1983 UTM Zone 17N feet

Date: 03/17/2010 Rev. Date: n/a PM: JJB GIS Analyst: GdA Map Document: FMCMS_wildlife_corridors_A_gda_20100317.mxd Project Number: 5691-029 PDF Document: FMCMS_wildlife_corridors_A_gda_20100317.pdf Plot Size: 8.5 x 11

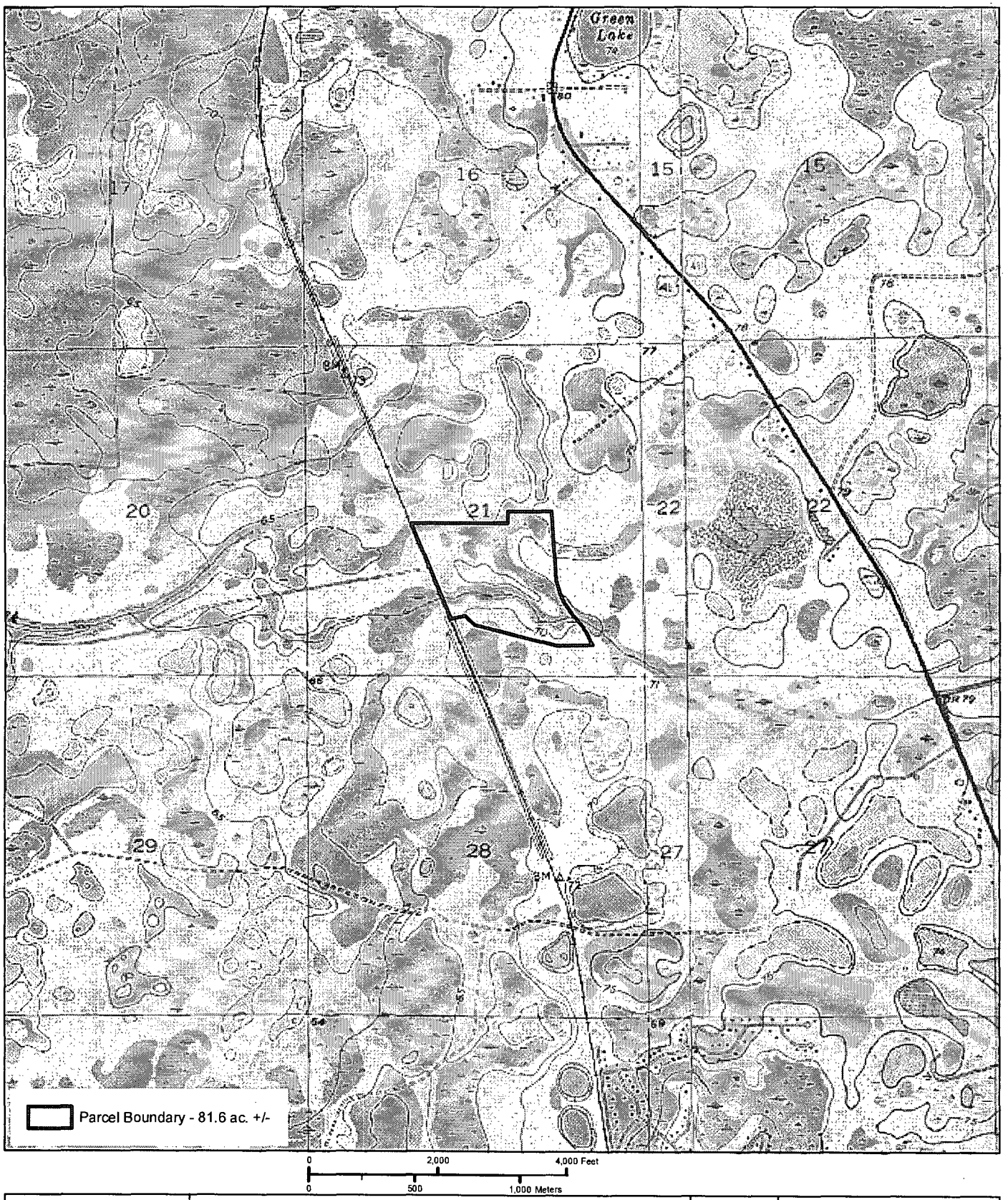

Exhibit 4-5-2
Five Mile Creek Mitigation Site
USGS Quadrangle Map

Image:USGS Quad
Fivay Junction

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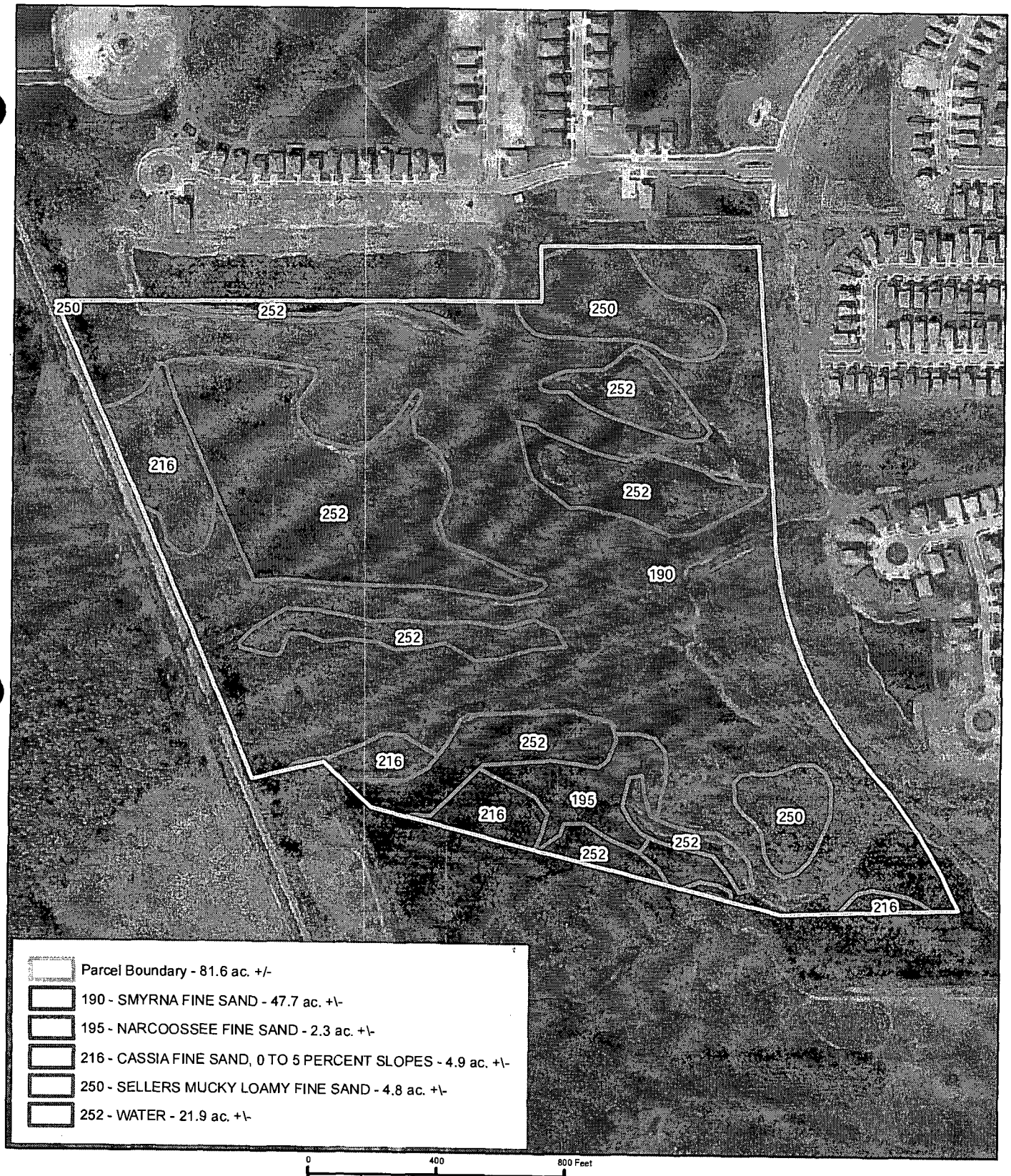

Parcel Boundary - 81.6 ac. +/-

190 - SMYRNA FINE SAND - 47.7 ac. +\-

195 - NARCOOSSEE FINE SAND - 2.3 ac. +\-

216 - CASSIA FINE SAND, 0 TO 5 PERCENT SLOPES - 4.9 ac. +\-

250 - SELLERS MUCKY LOAMY FINE SAND - 4.8 ac. +\-

252 - WATER - 21.9 ac. +\-

0 400 800 Feet

0 100 200 Meters

Exhibit 4-5-3
Five Mile Creek Mitigation Site
NRCS Soils Map

Image: 2009

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4.5.2 Historic Conditions

Historically the Five Mile Creek site was dominated by the Five Mile Creek slough system (**Exhibit 4-5-4**). The slough system consisted of a forested "spine" that meandered across the property connecting a series of pond cypress-dominated (*Taxodium ascendens*) depressions. The deeper cypress dominated areas were surrounded by marsh and wet prairie. Based on historical aerial photographs, the slough forked soon after entering the current project area with the main flow going generally westward and a smaller channel flowing to the northwest. The northern channel eventually flowed into the Pithlachascotee River and then to the Gulf of Mexico. The southern channel flowed into the Anclote River. At high water, there was likely an interconnection downstream of the mitigation site. Uplands on the property appear to have consisted of pine flatwoods. Typically these areas have a sparse canopy of slash pine (*Pinus elliottii*) and/or longleaf pine (*Pinus palustris*) with an understory dominated by grasses and saw palmetto (*Serenoa repens*).

4.5.3 Current Conditions

The Five Mile Creek site is currently in a highly degraded ecological condition as a result of fill excavation and lack of management. Current conditions site photographs are in **Section 4.11.5**. The site is dominated by several large borrow lakes that are surrounded by large berms, and a mixture of disturbed upland and wetland habitats. Except during high water, all flow is via the southern channel.

An aerial showing the current condition of the property is shown in **Exhibit 4-5-5**. **Exhibit 4-5-6** is a land use map based on the FLUCFCS that shows the limits of existing wetland and other habitats on the Five Mile Creek site. The wetland boundaries shown in **Exhibit 4-5-6** are based on aerial interpretation of current aerial imagery in combination with on the ground observations of vegetation, soils and hydrologic indicators.

4.5.3.1 Wetlands and Other Surface Waters

Because of the contiguous nature of the wetlands on the property, all wetlands would fall under the jurisdiction of both USACE and SWFWMD. The other surface waters (lakes) present would be considered "adjacent" to the natural wetland and would thus also fall within both state and federal wetland regulatory jurisdiction. The following is a brief description of all the aquatic habitats on the Five Mile Creek site.

RESERVOIRS (FLUCFCS CODE 520)

The property is dominated by several large artificial water bodies that are the result of mining activities. A distinctive feature of these lakes is that they are surrounded by a large berm that is approximately 6 feet above the elevation of the surrounding upland grade. The berms were constructed in order to facilitate the dewatering of the other pits. During construction of the pits, water was pumped into the nearby already constructed lakes and the berms allowed the water to be staged up several feet above the natural water level without spilling out across the property. The berms are vegetated primarily by blackberry (*Rubus argutus*), cogon grass (*Imperata cylindrica*), bahia grass (*Paspalum notatum*), wax myrtle (*Myrica cerifera*) and groundsel bush (*Baccharis halimifolia* and *B. glomerilifolia*).

The water bodies themselves have very steep side slopes, appear to be very deep, and are largely unvegetated with the exception of a narrow vegetated fringe as well as some shallow areas in the northern two lakes. The lake fringe vegetation zone is dominated by cattail, torpedo grass (*Panicum repens*) and wax myrtle.

WETLAND SHRUB (FLUCFCS CODE 631)

Wetlands on the property are essentially all dominated by an assemblage of weedy shrubs including Peruvian primrose-willow (*Ludwigia peruviana*), coastal plain willow (*Salix caroliniana*), wax myrtle and groundsel bush. Herbaceous species present include soft rush (*Juncus effusus*), torpedo grass, pickerelweed (*Pontederia cordata*), alligator weed (*Alternanthera philoxeroides*), smartweed (*Polygonum hydropiperoides*), cattail (*Typha* spp.) and bahia grass. There are large areas dominated by a monoculture of Peruvian primrose-willow. The water depth in most areas is relatively shallow during the growing season, with little of the area exceeding 2 feet in depth.

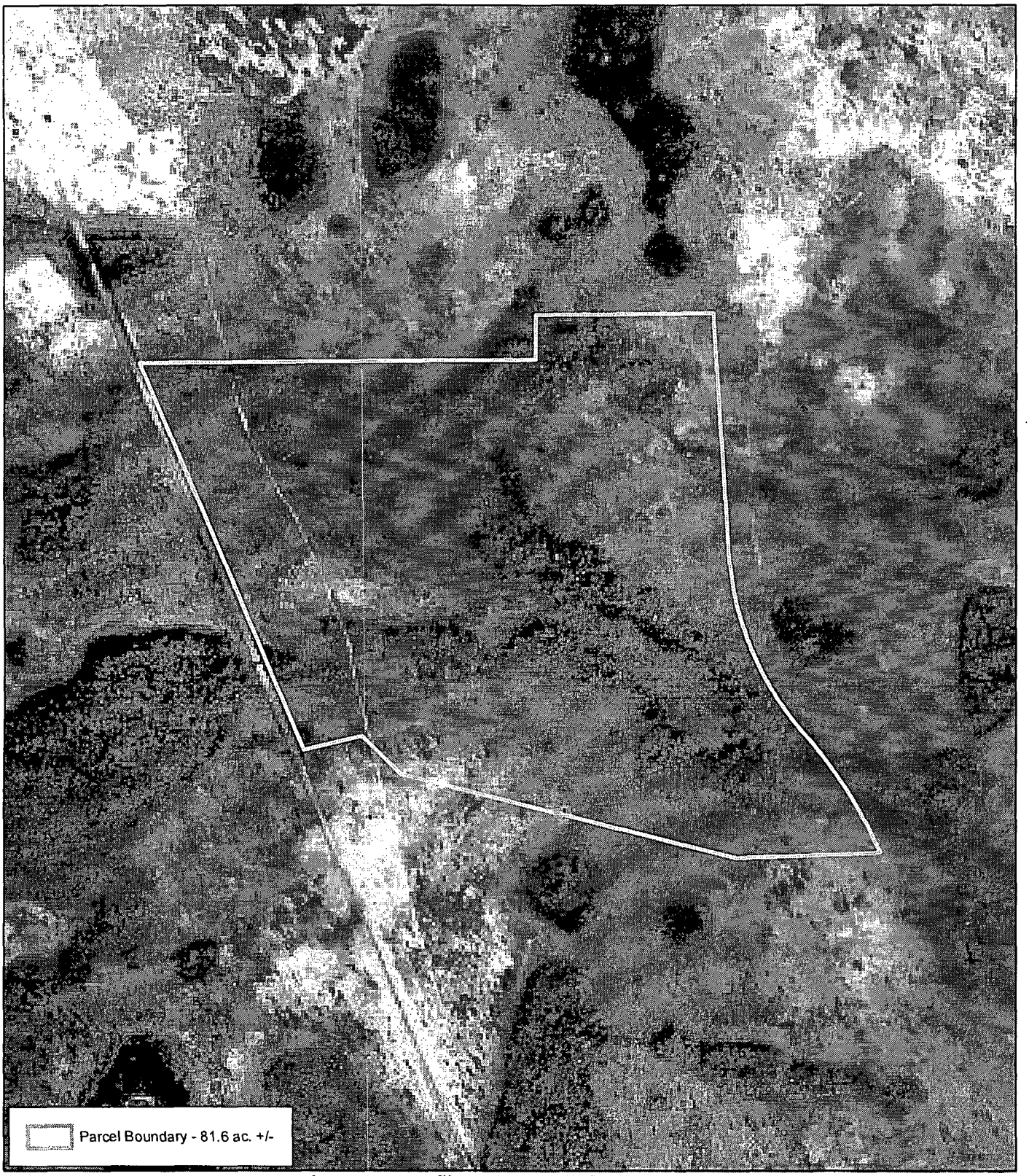

Exhibit 4-5-4
Five Mile Creek Mitigation Site
1941 Historic Aerial

Image 1941

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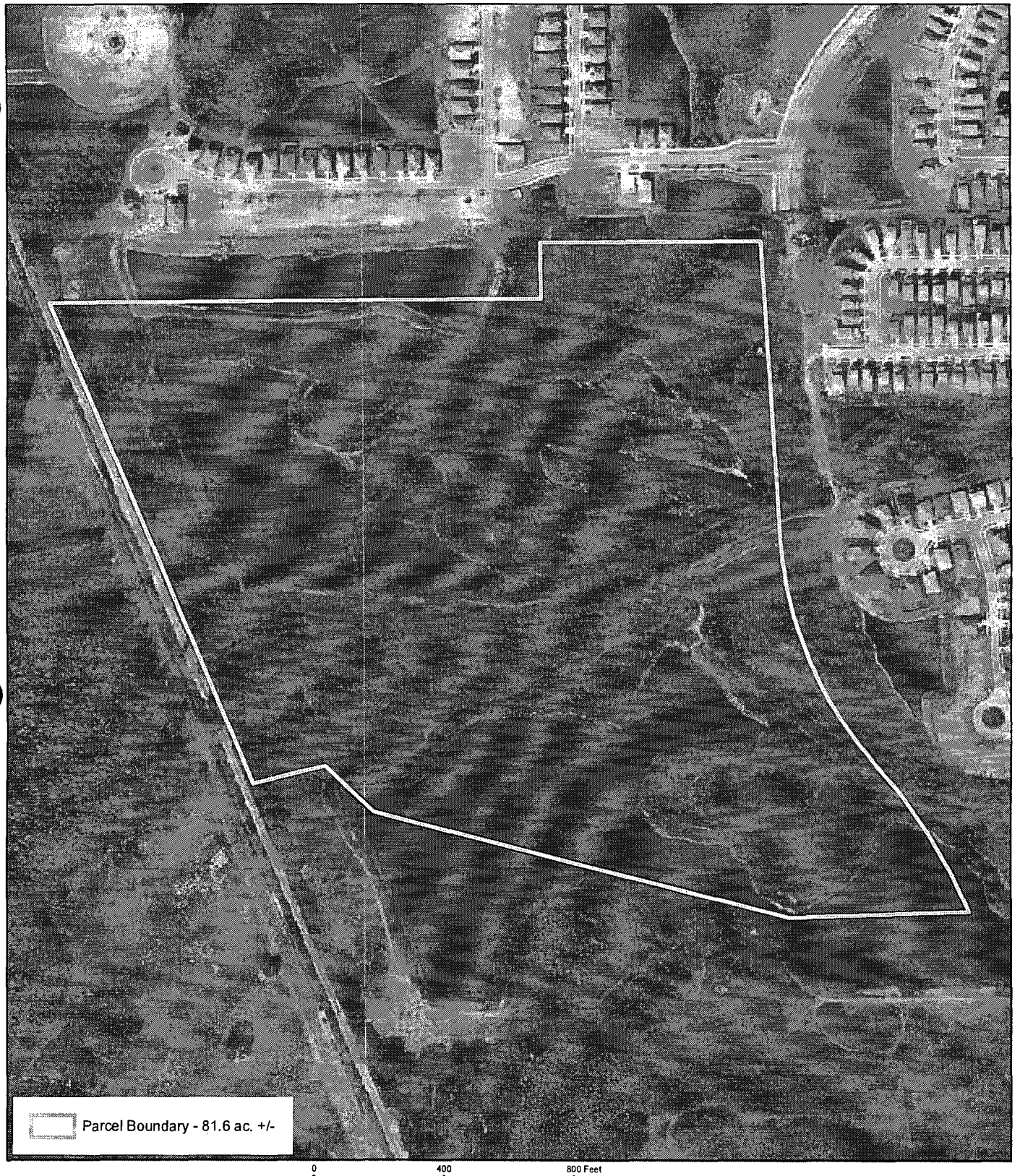

Exhibit 4-5-5
Five Mile Creek Mitigation Site
2009 Aerial Map

Image:2009

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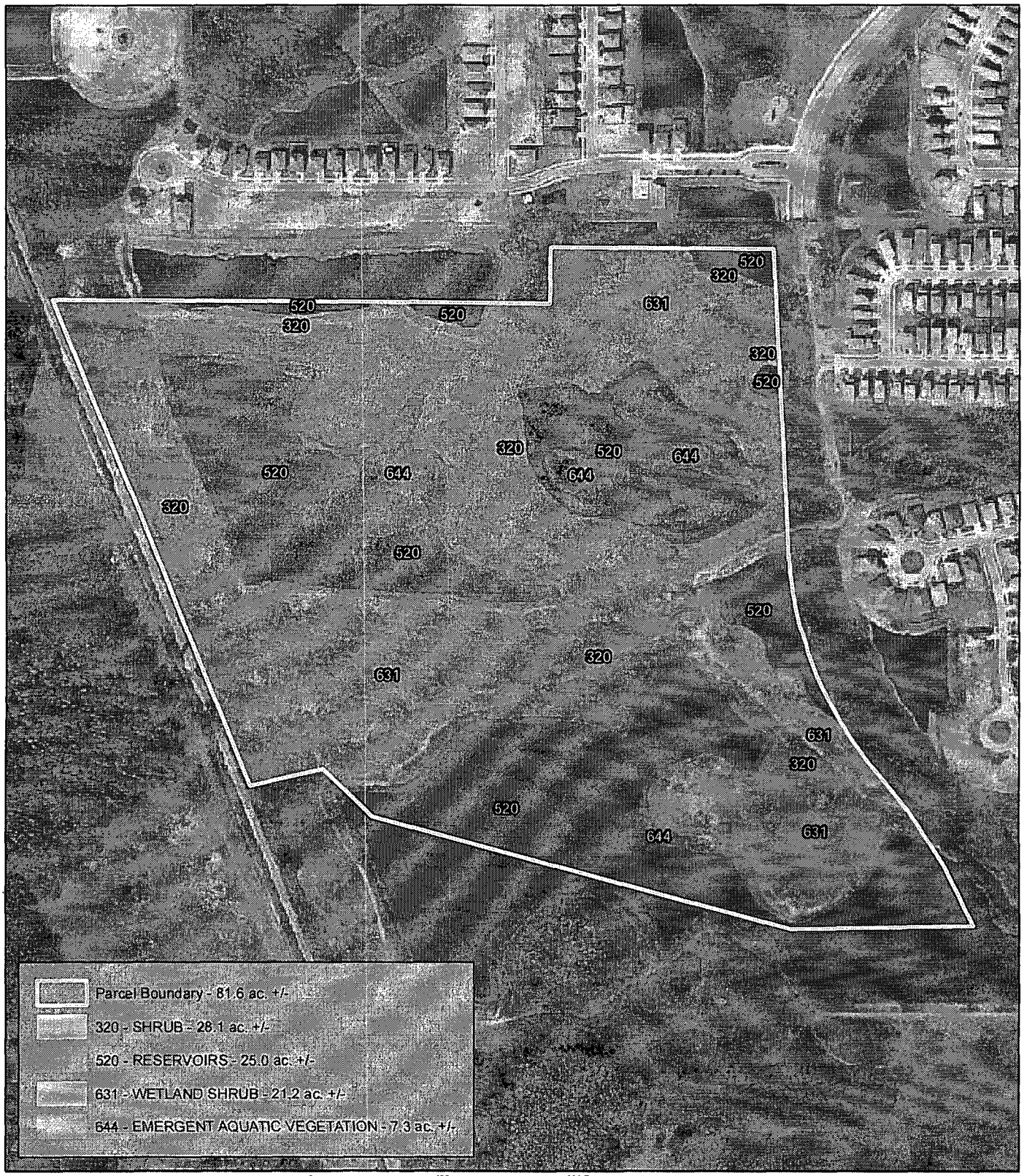

Exhibit 4-5-6
Five Mile Creek Mitigation Site
Existing Land Use and Land Cover

Image:2009

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Coordinate System:
Florida Albers

Date: 03/08/2010 Rev. Date: 04/07/2010 PM: JJB GIS Analyst: ACW Map Document: FMCMS_existing_landuse_A_20100329.mxd Project Number: 6691-020 PDF Document: FMCMS_existing_landuse_A_20100329.pdf Plot Size: 8.5 x 11

EMERGENT AQUATIC VEGETATION (FLUCFCS CODE 644)

These are relatively shallow portion of the lakes that appear to not have been fully excavated. They are dominated by a monoculture of cattail.

4.5.3.2 Uplands

SHRUB AND BRUSHLAND (FLUCFCS CODE 320)

All uplands on the property are in an overgrown and unmanaged condition and are vegetated with a mixture of weedy ruderal species. The dominant species are blackberry, groundsel bush, smut grass (*Sporobolus indicus*), bahia grass, dog fennel (*Eupatorium capillifolium*), cogon grass and broomsedge (*Andropogon* spp.).

4.5.4 Target Conditions

The mitigation plan seeks to enhance existing wetlands and restore areas of wetland that are no longer functional as a result of lake excavation and stream channelization. The overall goals are to: 1) restore the Five Mile Creek floodplain to a condition approximating the historic condition to the greatest extent practicable, and 2) increase the wildlife habitat value of the excavated lakes by creating a broad littoral shelf marsh. The post-restoration communities are best described as basin marsh, depression marsh dome swamp and mesic hammock. Within the overall boundary of the mitigation zone, some areas will remain as open water. A map showing the target plant communities that will result from the plan based on the FNAI classification system is provided as **Exhibit 4-5-7**. Please note that the 15.3 acres of cypress strand that are shown in **Exhibit 4-5-7** will be created by another project. Each of the communities shown in **Exhibit 4-5-7** are described in **Section 6.4**.

4.5.5 Mitigation Activities

Exhibit 4-5-8 shows the mitigation plan. **Table 4-10** depicts a matrix of the conversion from current to target conditions. The plan consists of a combination of wetland restoration and enhancement of freshwater herbaceous wetlands as well as some minor upland enhancement. Enhancement and restoration of the forested core of the cypress slough has already been proposed by others. The plan described consists of 3 main components.

1. Complete the enhancement and restoration of the core Five Mile Creek area (wetland Enhancement Area 2C and Restoration Area 2). Local wetland regulatory agency staff have made it clear that this is to be given the highest priority as to the possible restoration activities that could be implemented on the property.
2. Restore wetlands on the peninsula in the lake to the south (Wetland Restoration Areas 1 and 5 and Wetland Enhancement Area 2D).
3. Using the excavated material generated in the other two areas, create a littoral shelf/herbaceous basin marsh in the northeast corner of the southernmost lake (Wetland Enhancement Area 5).

This plan was developed based on input from the Tampa USACE office and Pasco County Environmental Lands staff. Both entities expressed a primary concern with the enhancement and restoration of the central core of the creek/historic slough system. The forested portion of the slough is already targeted for enhancement by others, therefore completion of the central core enhancement was the next logical step, although PEF has some concerns about the ongoing threat from proximate invasive species. Implementation of the enhancement of the central area will produce fill material. That material logically will go into one of the existing deep lakes to create a littoral shelf. The two options for the fill that were evaluated were the eastern end of the lake immediately to the north and the lake immediately to the south. Access to the east end of the lake to the north would be difficult. In addition, this area is immediately adjacent to areas infested with cattail. The lake to the south is easier to access, has far less nuisance species present and is also located between the central enhancement area and the peninsula area to the south. Therefore it appears that logistically it would be more efficient to deposit the fill material into that lake to create littoral shelf.

The details of how the plan will be implemented are described below.

Exhibit 4-5-7
Five Mile Creek Mitigation Site
Proposed Land Use & Land Cover

Image: 2009

ENTRIX
3905 Crescent Park Drive
Riverview, FL 33578-3625
ph. (813) 664-4500
fx (813) 664-0440
www.entrix.com

Coordinate System:
Florida Albers

Date: 03/09/2010 Rev. Date: 04/07/2010 PM: JJB GIS Analyst: ACW Map Document: FMCMS_proposed_LU_fnai_A_20100329.mxd Project Number: 6691-020 PDF Document: FMCMS_proposed_LU_fnai_A_20100329.pdf Plot Size: 8.5 x 11

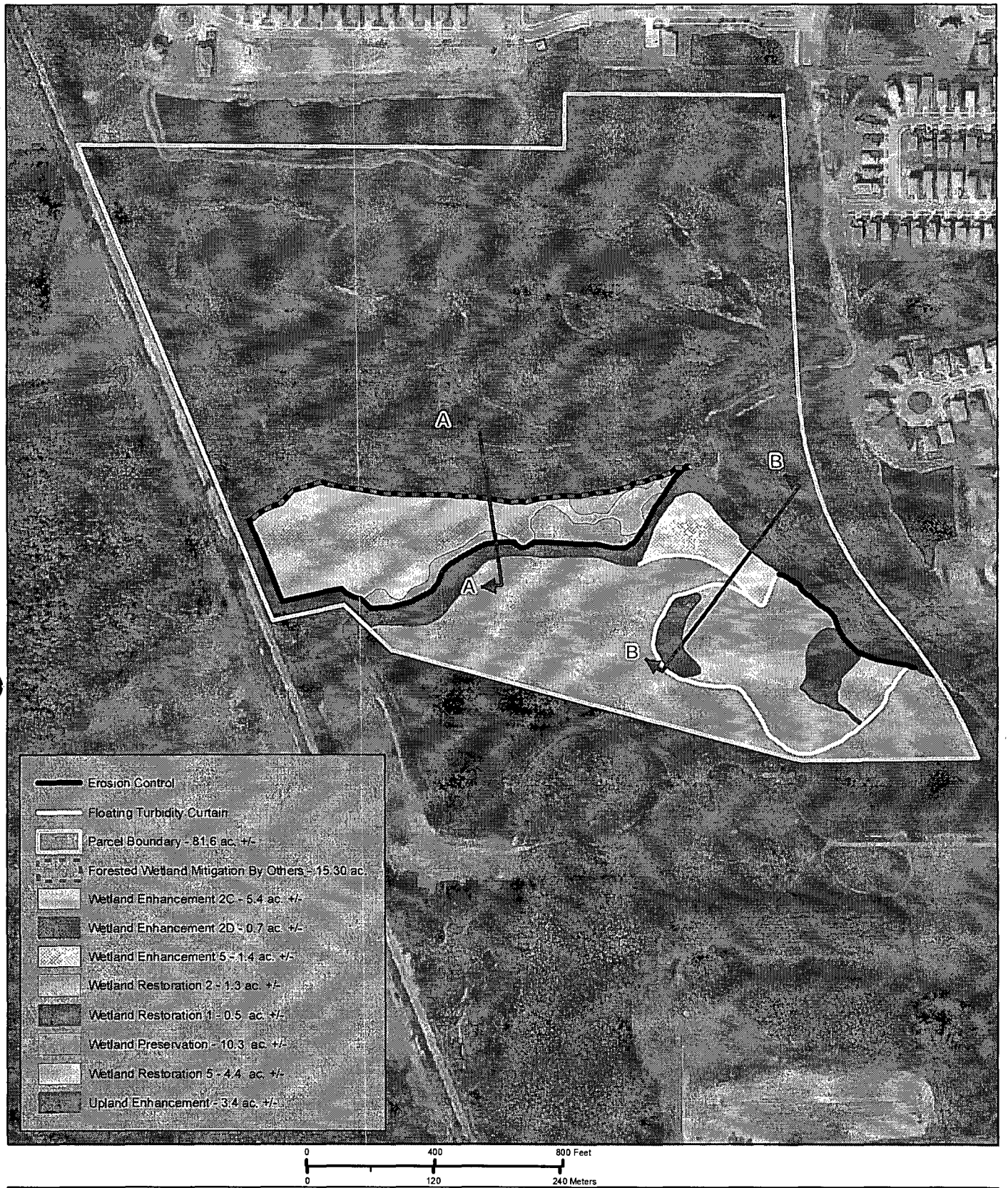


Exhibit 4-5-8
Five Mile Creek Mitigation Site
Mitigation Activities Plan

Image: 2009

ENTRIX
3905 Crescent Park Drive
Riverview, FL 33578-3625
ph. (813) 664-4500
fx (813) 664-0440
www.entrix.com

Coordinate System:
Florida Albers

Date: 03/09/2010 Rev. Date: 04/07/2010 PM: JJB GIS Analyst: ACWB Map Document: FMCMS_mit_plan_A_20100326.mxd Project Number: 6691-020 PDF Document: FMCMS_mit_plan_A_20100326.pdf Plot Size: 8.5 x 11

Table 4-10. Matrix of Existing to Target Land Uses and Acreages.

Current Communities	Basin Marsh	Freshwater Marsh	Dome Swamp	Impoundment / Artificial Pond	Mesic Hammock	Total (Ac.)
Shrub Bog	5.4	0.7				6.1
Impoundment/Artificial Pond		1.4		10.3		11.7
Abandoned Field	1.3	4.4	0.5		3.4	9.6
Total	6.7	6.5	0.5	10.3	3.4	27.4

4.5.5.1 Enhancement and Restoration of the Five Mile Creek Floodplain

Historically Five Mile Creek consisted of a forested core with surrounding freshwater marsh habitat. The forested core has already been proposed for restoration by others. The PEF plan calls for the restoration and enhancement of approximately 6.7 acres of herbaceous wetlands in historic floodplain of Five-Mile Creek (**Exhibit 4-5-8**). This will result in increased flood storage capacity as well as increased value of this area as habitat for wading birds and other wetland species. In order to increase the hydroperiod of the area and to remove the existing seedbank of undesirable plant species, the ground surface in this area will be lowered to approximately 0.5 to 1.5 feet below the seasonal high water (SHW) elevation of the wetland (**Exhibit 4-5-9A**). The area will then be replanted with desirable herbaceous wetland plant species (**Figure 4-5-9B**). The material from the excavation will be placed in a portion of the lake located immediately to the south in order to raise the elevation of that area (see details of littoral shelf expansion below).

4.5.5.2 Expansion of Lake Littoral Shelf

The existing artificial lakes on the property were dug as sand mines. They appear to be deep with steep side slopes and a very narrow vegetated fringe. In order to enhance the wildlife habitat value of the southern lake for wading birds and aquatic species including fish, PEF proposes to establish approximately 6.5 acres of shallow freshwater marsh/littoral shelf on the edge of the lake by scraping down the existing upland peninsula (that was historically wetland) and using the excavated material to raise the bottom elevation of a portion of the north lobe of the lake.

The ground surface of Wetland Restoration Area 5 and Wetland Enhancement Area 2D (**Exhibit 4-5-8**) will be lowered to approximately 0.5 to 1.5 feet below the SHW elevation of the adjacent lake. The material removed from this area will be placed on top of the material removed from the floodplain enhancement in order to raise the ground elevation in the north lobe of the lake (Wetland Enhancement Area 5, approximately 1.4 acres) to within 1.0 to 1.5 feet of the SHW level of the lake, thus creating one contiguous herbaceous littoral zone. The herbaceous area will surround an approximately 0.5-acre cypress island that will be established to provide a potential wading bird nesting area.

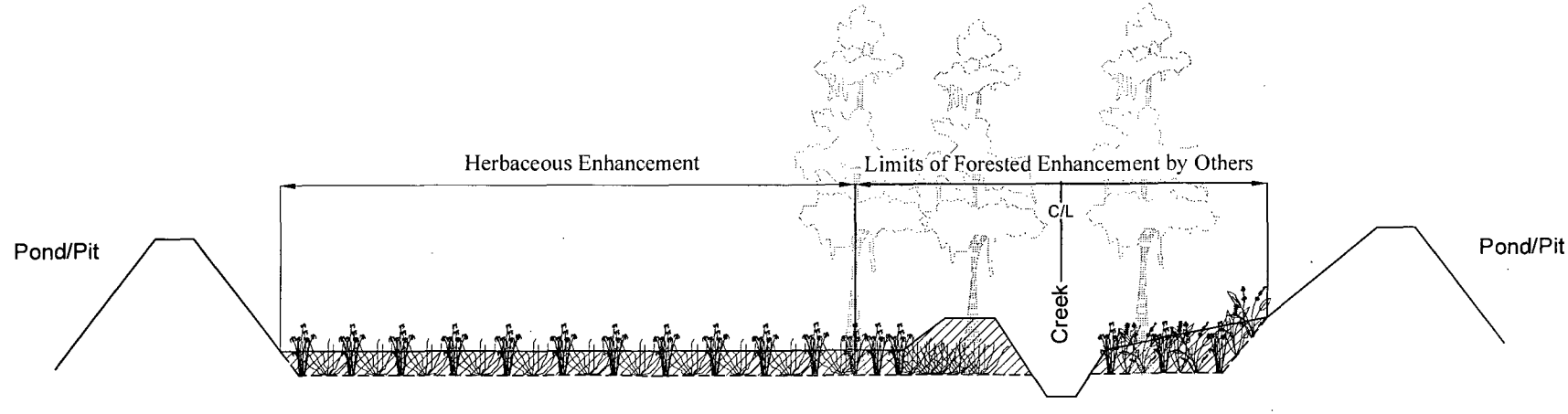
4.5.6 Mitigation Schedule

The mitigation will be initiated to coordinate with the PEF transmission line construction schedule. Once implemented, the work schedule will be as depicted in **Table 4-11**. The earthwork should be conducted in March and April when rainfall is typically low. All planting must be done when adequate moisture is present for establishment, typically, late in the growing season (July and August).

Table 4-11. Schedule for Implementation of Restoration and Monitoring Activities.

Month 1	Month 2	Months 3 and 4	Month 5	Month 9 through Year 5
Establish erosion and turbidity control. Begin dewatering lake.	Grade Five Mile Creek floodplain area and place fill in dewatered lake.	Grade expanded littoral shelf and finish grade wetland Enhancement Area 5 with the excavated material.	Plant all wetland mitigation	Monitoring and maintenance

Five Mile Creek Mitigation		
Common Name	**Size**	**Spacing**
Pickerelweed	1-quart eq.	3' o.c.
Duck Potato		
Bulrush		
Maidencane		
Fire flag		



Remove 6 to 12 inches for nuisance removal
Replant with cypress along Creek with Native
Desirable Herbs in Understory.

Typical Creek Cross Section A-A
N.T.S.

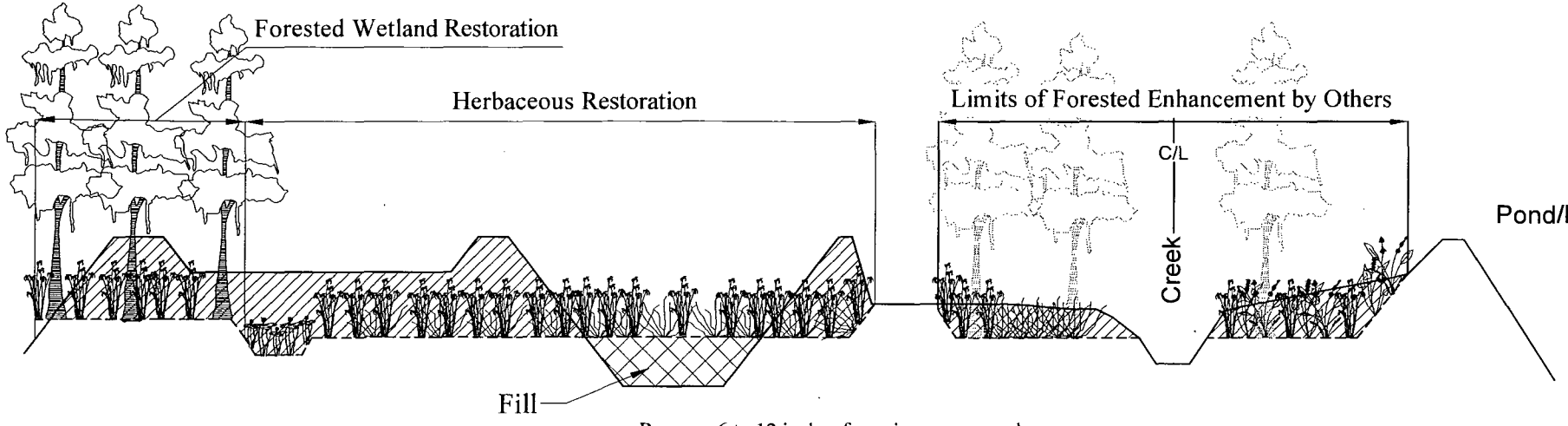
Exhibit 4-5-9A
Five Mile Creek Mitigation Site
Cross Section/Planting Plan

ENTRIX
3905 Crescent Park Drive
Riverview, FL 33578-3625
ph. (813) 664-4500
fx (813) 664-0440
www.entrix.com

Coordinate System:
N/A

Date: 04/05/10 Rev. Date. PM: TLN CAD Operator: JMB Project #: 5741-004-T700 File Location: Q:\UnitedStates\Florida\Tampa\6691\020working\cad\Typical_Cross_Section_20100305.dwg

Five Mile Creek Mitigation		
Common Name	**Size**	**Spacing**
Cypress	3 gal	10' o.c.
Pickerelweed	1-quart eq.	3' o.c.
Duck Potato		
Bulrush		
Maidencane		
Fire flag		
Spatterdock		



Remove 6 to 12 inches for nuisance removal
Replant with cypress along Creek with Native
Desirable Herbs in Understory.

Typical Creek Cross Section B-B

N.T.S.

Exhibit 4-5-9B
Five Mile Creek Mitigation Site
Cross Section/Planting Plan

ENTRIX
3905 Crescent Park Drive
Riverview, FL 33578-3625
ph. (813) 664-4500
fx (813) 664-0440
www.entrix.com

Coordinate System:
N/A

Date: 04/05/10 Rev. Date: PM: TLN CAD Operator: MAB Project #: 6691-020 File Location: Q:\UnitedStates\Florida\Tampa\6691\020\working\cad\Typical_Cross_Section_20100305.dwg

4.6 UMAM EVALUATION

In the Upper Coastal Watershed, construction of the proposed project will result in wetland impacts to approximately 76.8 acres of wetlands, most of which are due to clearing. Based on the results of the UMAM analysis these wetland impacts result in approximately 33.6 functional loss units as indicated in **Table 4-12**. A type-for-type comparison of functional loss to lift results in an excess of herbaceous and forested mitigation units, resulting in an "excess" of 7.8 units of lift beyond what is required to offset otherwise unpermittable wetland impacts. The "excess" and Upland-derived LNP and GSF UMAM credits are proposed to be reserved and applicable to additional project impacts, if that need is established by an appropriate regulatory agency, or applied to future impacts within the watershed, if proven unnecessary for this project.

4.6.1 Homosassa Tract

The assessment area targeted for restoration/enhancement at HT was analyzed to determine the potential lift available following implementation of the proposed mitigation activities. To accomplish this mitigation program in logical ecological and hydrological units, 34.3 functional wetland units and 1.8 functional upland units of lift will be created.

4.6.2 Five Mile Creek

A UMAM analysis was conducted on the plan (**Appendix 4.11.6**). A summary of the results of the UMAM analysis is presented in **Table 4-12** below, including acreages and functional loss or lift resulting from the activities within each site. The UMAM analysis indicates that the herbaceous wetland enhancement and restoration will result in the creation of 4.7 functional units. In order to provide the most ecologically effective mitigation, both the upland and wetland communities will be restored under this plan.

The results of the UMAM analysis indicate that the wetland enhancement and restoration at the Homosassa Tract and Five Mile Creek Mitigation Sites will provide more than sufficient compensation to offset the loss in wetland functions. An excess of 7.8 units of lift (2.4 of which are generated from upland restoration) beyond what is needed to offset the wetland impacts will be created. The "excess" and upland-derived LNP and Goethe UMAM credits are proposed to be reserved and applicable to additional project impacts, if that need is established by an appropriate regulatory agency, or applied to future impacts within the watershed should they be proven uncessary for this project.

Table 4-12. Upper Coastal Watershed Acreage and UMAM Summary.

Area	Herbaceous (including Open Water)		Forested		Total Acres	Total Functional Loss/Lift
	Acres	Functional Loss/Lift	Acres	Functional Loss/Lift		
Impacts						
Permanent Fill	6.9	-4.7	11.6	-7.7	18.5	-12.4
Permanent Clearing			58.3	-21.2	58.3	-21.2
TOTAL IMPACTS	**6.9**	**-4.7**	**69.9**	**-28.9**	**76.8**	**-33.6**
Mitigation						
Homosassa Tract	5.8	+0.8	234.9	+33.5	240.7	+34.3
Five Mile Creek	23.5	+4.5	0.5	+0.2	24.0	+4.7
Combined Wetlands and Other Surface Waters Total	**29.3**	**+3.6**	**235.4**	**+33.7**	**264.7**	**+39.0**
Homosassa Tract Uplands					19.9	1.8
Five Mile Creek Uplands					3.4	0.6
Uplands total					**23.2**	**2.4**
Total Mitigation	**29.3**	**+3.6**	**235.4**	**+33.7**	**288.0**	**+41.4**

4.7 MONITORING AND MAINTENANCE

Upon project implementation of the mitigation plans, it will be necessary to monitor the project for compliance and performance. Performance will be measured in relation to the project's success criteria (**Section 4.8**). Initial baseline monitoring will address conditions upon implementation, with annual progress monitoring to chart the progression to success. Detailed monitoring methods and reports will be developed per the guidelines provided in **Section 6.7**.

An integrated maintenance program of chemical and manual methods will be used to control nuisance vegetation, while allowing for the growth of beneficial species. This management approach goes beyond the chemical treatment of problems by identifying possible causes and managing those factors to further minimize the problems. Target species will be those that could adversely affect the success of the mitigation effort.

Section 6.7 addresses monitoring protocols and **Section 6.8** addresses maintenance and management protocols in more detail.

4.8 SUCCESS CRITERIA

Success criteria for the types of communities detailed in this plan are provided in **Section 6.9**. To ensure that the performance standards are met, an adaptive management approach will be an integral part of project implementation. If the USACE/FDEP decides, based on the selected performance standards and the annual monitoring reports, that the mitigation project is not meeting its goals, PEF will coordinate with USACE/FDEP and professional ecologists to develop and implement remedial measures.

4.9 PUBLIC INTEREST

The mitigation at the Homosassa Tract of the WSF and at Five Mile Creek will both significantly augment the ecosystem values of existing conservation networks. These projects have been identified by their owners as desirable, but are neither funded nor planned for the foreseeable future. Working with the DOF, PEF will partner on a wetland rehabilitation and restoration project that will be to the regional benefit of wildlife species and vegetative communities by enhancing lands in the Homosassa Tract of the WSF. Working with Pasco County's Environmental Lands Department, PEF will partner on a wetland enhancement and restoration project that will be to the regional benefit of wildlife species by not only enhancing and creating suitable habitat, but also by enhancing a significant link in a corridor for movement across the landscape. The area will also benefit from the project because the project will also provide additional flood water storage treatment and attenuation.

4.10 UPPER COASTAL APPENDICES

4.10.1 Letter of Agreement from DOF – Homosassa

The above-referenced letter follows this page.

Florida Department of Agriculture and Consumer Services
CHARLES H. BRONSON, Commissioner
The Capitol • Tallahassee, FL 32399-0800
www.doacs.state.fl.us

Respond to:
Florida Division of Forestry
3125 Conner Boulevard
Tallahassee, Florida 32399-1650
Telephone: 850-488-4274

March 5, 2010

Mr. Jim Maher
Program Administrator
Submerged Lands and Environmental Resource Permitting
Florida Department of Environmental Protection
7825 Baymeadows Way, Suite B-200
Jacksonville, Florida 32256

Dear Mr. Maher:

This letter is in reference to the off-site mitigation proposed by Progress Energy Florida (PEF) for its Levy Nuclear Plant and associated facilities. The site certification order is PPSA No. PA08-51. This letter is intended to provide PEF with authority to evaluate mitigation options on the Goethe State Forest and the Homosassa Tract of the Withlacoochee State Forest, with the ultimate intention of granting conceptual approval to the work proposed by PEF on both State Forests.

The Division of Forestry (DOF) understands that this proposal is a continuing part of the mitigation post-certification process and that more detailed planning will be developed, pending approval of FDEP. Once a formal restoration plan has been developed for project work involving either or both properties under DOF responsibility the Division of Forestry intends to cooperate fully with PEF to bring the restoration projects to fruition according to the permit requirements.

The Division of Forestry, based on several communications with PEF and their representatives over the last few months, has determined that this project is consistent with the resource management plans for each Forest. As proposed, restoration activities will neither impede scheduled DOF resource management activities nor create any negative impacts to DOF resource units.

Additionally, the Division of Forestry does not currently have any plans or funding to complete work described in this proposal in the foreseeable future. It is understood that upon completion of the mitigation project and PEF satisfying all of the success criteria of the post-certification conditions and applicable state and federal permits that responsibility of maintaining and protecting the mitigation site will revert back to the Division of Forestry.

We look forward to working with PEF and the state and federal permitting agencies in this endeavor.

Sincerely,

CHARLES H. BRONSON
COMMISSIONER OF AGRICULTURE

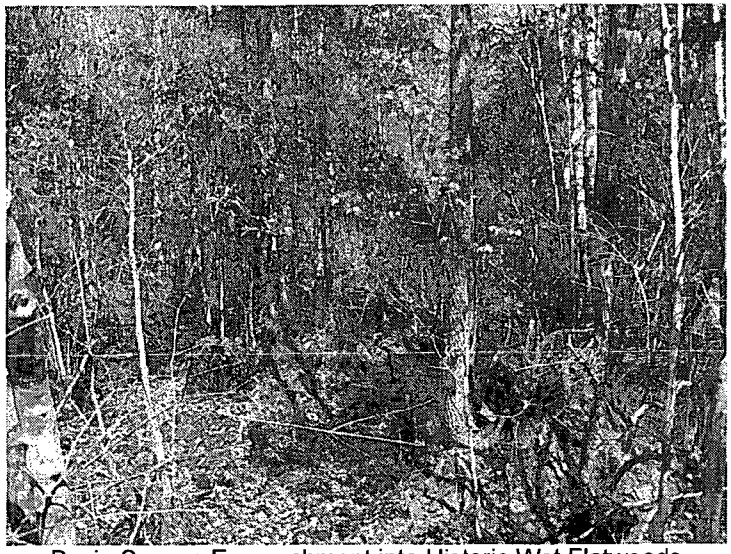
Jim Karels
Director, Division of Forestry

JRK/tg/vr

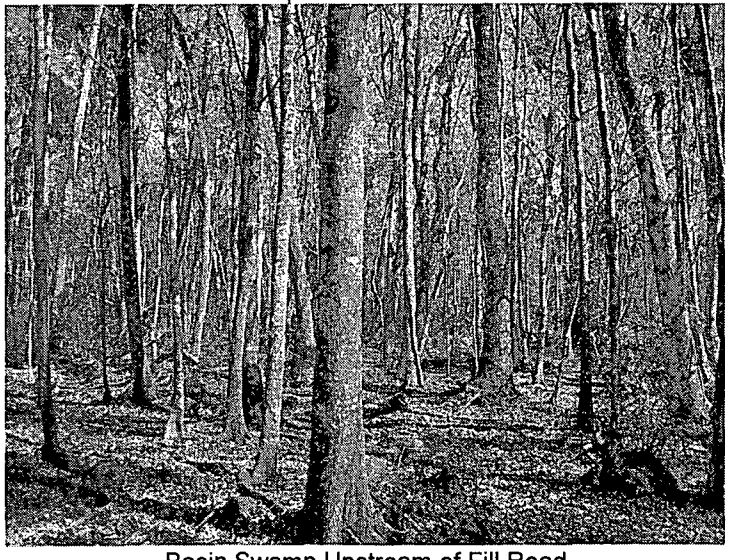
cc: Jeff Vowell, Chief, Field Operations
Steve Jennings, Chief, Forest Management
Winnie Schreiber, Manager, Withlacoochee Forest Center
Mike Penn, Resource Administrator, Withlacoochee Forest Center
Don West, Manager, Waccasassa Forest Center
Tom Gilpin, Wetland Restoration Specialist

4.10.2 Site Photographs – Homosassa

Basin Swamp Downstream of Fill Road



Basin Swamp Encroachment into Historic Wet Flatwoods

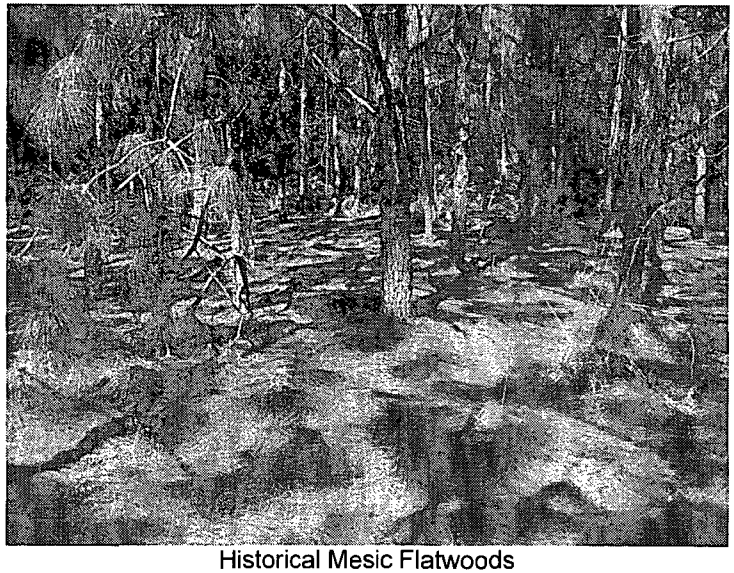


Basin Swamp Upstream of Fill Road

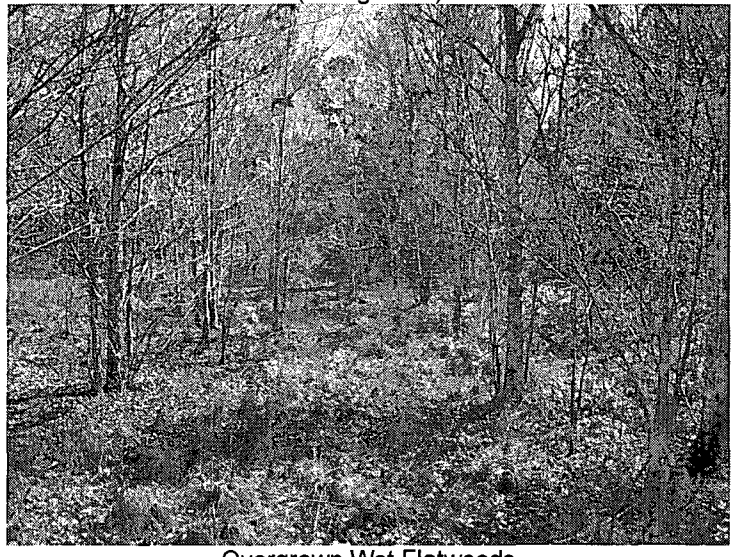
Fill Road Down and Upstream Changes in Vegetative Structure

Historic Wet Flatwoods Planted in Pine

Improved Pasture Foreground Basin Swamp-Pine Encroachment (background)



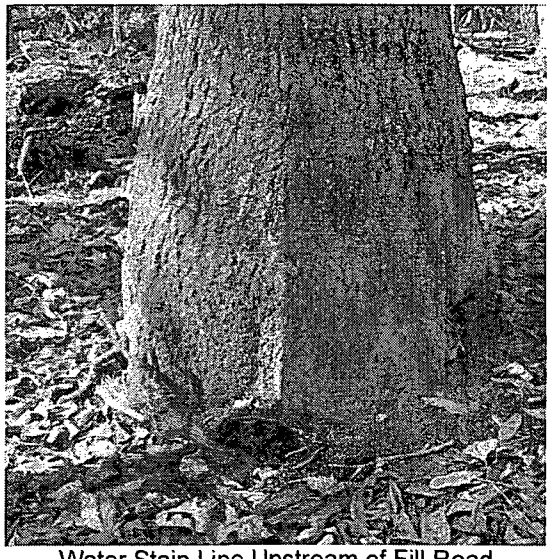
Historical Mesic Flatwoods



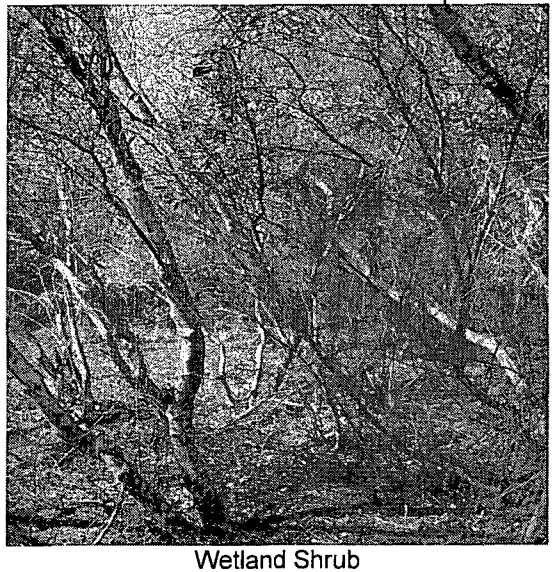
Overgrown Wet Flatwoods

Soil Oxidation

Thick Pine Duff in Basin Swamp



Water Stain Line Upstream of Fill Road



Wetland Shrub

4.10.3 UMAM Scores – Homosassa

FNAI Community		Location		Water		Community		Area Size (acres)	Time Lag	Risk	RFG	FG
Current	Proposed	Current	With	Current	With	Current	With					
BS	BS	7	8	6	8	7	9	78.85	1.07	1.00	0.16	12.28
BSPE	BS	7	8	6	8	6	9	54.45	1.07	1.25	0.15	8.14
DM	BS	7	8	6	8	4	9	0.96	1.46	1.25	0.15	0.14
DM	DM	7	8	6	8	7	9	2.13	1.07	1.25	0.12	0.27
DMPE	DM	7	8	6	8	6	9	3.68	1.07	1.25	0.15	0.55
BSPE	WF	7	8	6	8	5	9	58.31	1.25	1.50	0.12	7.26
IPW	WF	7	8	6	8	2	9	8.20	1.46	2.00	0.11	0.94
PPW	WF	7	8	6	8	3	9	4.42	1.25	1.75	0.14	0.61
WS	WF	7	8	6	8	3	9	26.89	1.46	1.50	0.14	3.68
DS	DS	7	8	6	8	8	9	1.18	1.03	1.00	0.13	0.15
DSPE	DS	7	8	6	8	6	9	1.64	1.07	1.00	0.19	0.31
IP	MF	7	8	*NA*	*NA*	2	9	13.79	1.46	2.00	0.09	1.26
PP	MF	7	8	*NA*	*NA*	3	9	4.42	1.25	1.75	0.11	0.47
SH	SH	7	8	*NA*	*NA*	7	9	1.64	4.07	1.00	0.02	0.04
Project Total:								**260.56**				**36.09**

BS=Basin Swamp; BSPE=Basin Swamp-Pine Encroachment; DM=Depression Marsh; DMPE= Depression Marsh-Pine Encroachment; IPW=Improved Pasture-Wet; PPW=Planted Pine-Wet; WS=Wetland Shrub; DS=Dome Swamp; DSPE= Dome Swamp-Pine Encroachment; IP=Improved Pasture; PP=Planted Pine; SH=Sandhill

4.10.4 Letter of Agreement from Pasco County – Five Mile Creek

The above-referenced letter follows this page.

PASCO COUNTY, FLORIDA

"Bringing Opportunities Home"

DADE CITY 352 521-4274
LAND O'LAKES 813 996-7341
WEST PASCO 727 847-8115
FAX 727 815-7010

COUNTY ADMINISTRATOR'S OFFICE
WEST PASCO GOVERNMENT CENTER
7530 LITTLE ROAD, SUITE 340
NEW PORT RICHEY, FL 34654
E-MAIL: pcadmin@pascocountyfl.net

April 10, 2010

Ms. Amy Dierolf, Lead Environmental Specialist
Nuclear Plant Development Progress Energy Florida
PO Box 14042
St. Petersburg, FL 33733

Re: Mitigation Sites in Pasco County

Dear Ms. Dierolf:

Please accept this letter as confirmation of Pasco County's intent to allow Progress Energy to perform mitigation on a county-owned site for Progress Energy's Levy County nuclear power plant and power line corridors project (PPSA No. PA08-51). In the event that Progress Energy determines that the Five Mile Creek Preservation site, which has been the focus of recent conversations, is not suitable, Pasco County is willing to work with Progress Energy and its consultants in the identification of other locations.

In order to identify a suitable location, Pasco County will provide available GIS and survey data, site descriptions and site access to Progress Energy and its consultants. Upon the identification of a mutually-suitable location, Pasco County will enter into an agreement, subject to the Board of County Commissioners approval with Progress Energy, identifying the location of the site, and specifying the work to be performed by Progress Energy. All design work, permitting and construction will be performed and paid for by Progress Energy. Pasco County will necessarily require the right to review, comment and approve the proposed mitigation project.

This notice of intent is subject to Board of County Commissioners' approval after the site has been finalized and the agreement finalized. We look forward to working with Progress Energy and the state and federal permitting agencies in this endeavor.

Sincerely,

John J. Gallagher
County Administrator

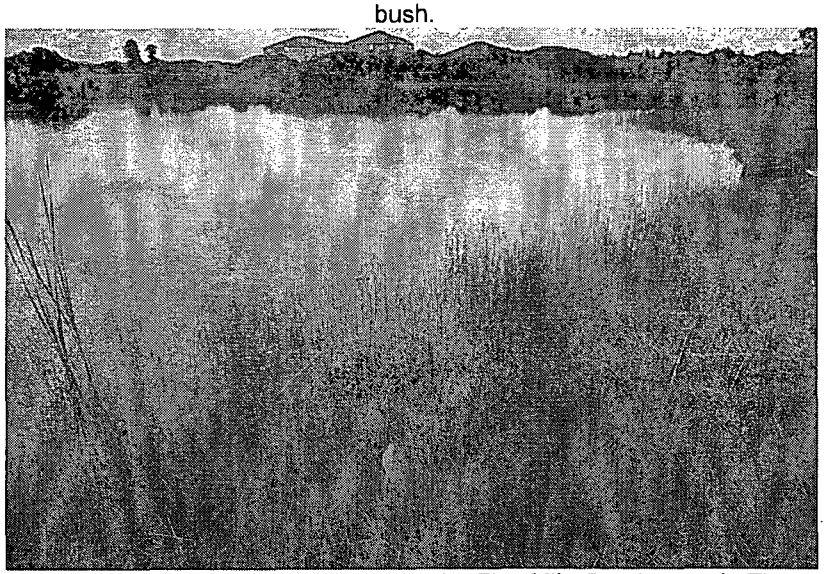
BT/MLB/RJT/pp

cc: Michele L. Baker, Chief Assistant County Administrator
Ronald Daniel, Acting Program Manager, Environmental Lands Division
Robert Tietz, Biologist, Environmental Lands Division

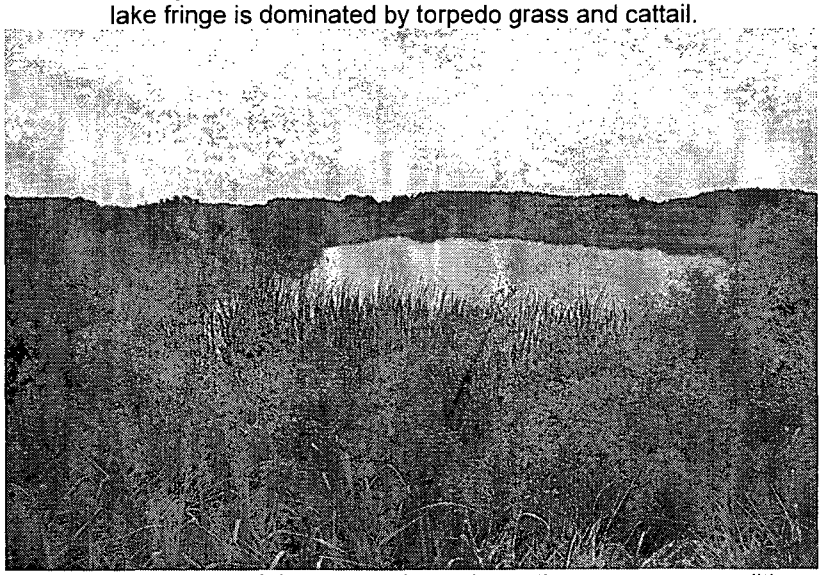
4.10.5 Site Photographs – Five Mile Creek

Five Mile Creek upland area overgrown with blackberry and groundsel bush.

One of the large man-made lakes on the Five Mile Creek parcel. The lake fringe is dominated by torpedo grass and cattail.

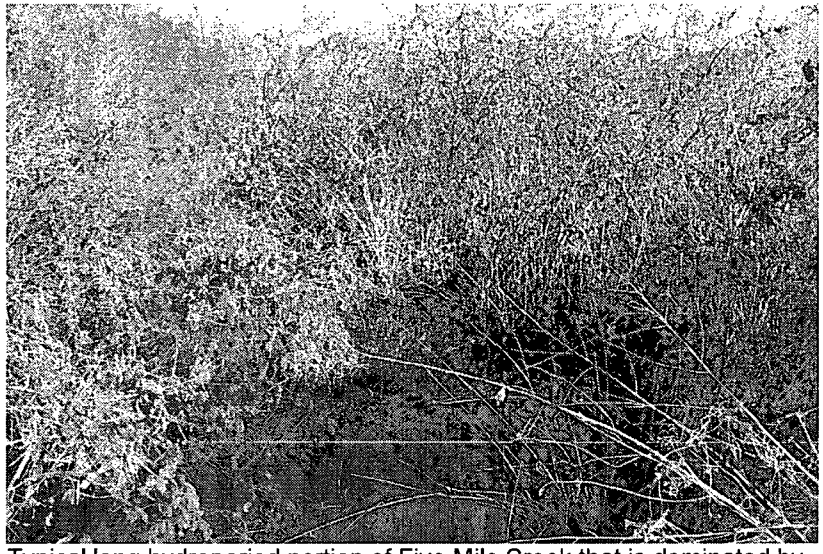


One of the large man-made lakes on the Five Mile Creek parcel. The very narrow vegetated fringe is dominated by torpedo grass.



One of the man-made lakes. The photo shows the overgrown condition of the uplands and dominance by cattails of the lake fringe.

Primrose-willow and groundsel bush dominated area.



Typical long hydroperiod portion of Five Mile Creek that is dominated by primrose willow.

Typical upland area on the Five Mile Creek parcel. The area is heavily overgrown with blackberry and dogfennel.

Typical view of one of the lake perimeter berms. The dominant plant is cogon grass; blackberry and bahia grass are also common.

4.10.6 UMAM Scores – Five Mile Creek

Assessment Area Name	Location		Water		Community		Area Size (Acres)	Risk	Time Lag	RFG	FG
	Current	With	Current	With	Current	With					
Upland Enhancement	4	7	0	0	3	7	3.4	1.5	1.25	0.19	0.63
Wetland Enhancement 2C (herbaceous enhancement)	4	7	6	8	3	7	5.4	1.5	1.14	0.18	0.95
Wetland Enhancement 2D (herbaceous enhancement)	4	7	6	8	3	7	0.7	1.5	1.14	0.18	0.12
Wetland Enhancement 5 (open water restored to marsh)	4	7	2	8	2	7	1.4	1.5	1.14	0.27	0.38
Wetland Preservation (lakes)	4	7	7	8	3	3	10.3	1.5	1.00	0.05	0.55
Wetland Restoration 2 (herbaceous, slough)	0	7	0	8	0	7	1.3	1.5	1.14	0.43	0.56
Wetland Restoration 3 (forested, cypress island)	0	7	0	8	0	7	0.5	1.5	1.25	0.39	0.20
Wetland Restoration 5 (south littoral shelf expansion)	0	7	0	8	0	7	4.4	1.5	1.14	0.43	1.89
Project Total:							**27.4**				**5.30**

Section 5
Tampa Bay Watershed

SECTION 5

Tampa Bay Watershed

All mitigation in the Tampa Bay Watershed will be accomplished at one site, the existing PEF transmission line ROW within and adjacent to the Brooker Creek Preserve in Pinellas County (**Exhibit 5-4-1**).

5.1 INTRODUCTION

The mitigation detailed here is designed to be regionally significant and sustainable. It is focused on the enhancement of wetland and ecosystem functions along existing transmission line rights-of-way where they pass through or are adjacent to the Pinellas County Brooker Creek Preserve (Preserve). This mitigation provides greater benefits to the ecosystem than it would if the mitigation were distributed in small areas near the actual impact sites. In particular, it provides conslidated mitigation by removing disturbances to the Brooker Creek Preserve and enhancing the largest area of natural forest remaining in Pinellas County. It also directly responds to a request by Brooker Creek Preserve management that PEF to enhance the natural water flow across its existing transmission line ROW and eliminate nuisance species.

The plan addresses the state's requirements for assuring the long term viability of the mitigation and provides greater ecological value than would a conventional on-site mitigation proposal.

5.2 IMPACT SUMMARY

Project wetland impacts in the Tampa Bay Watershed consist of 6.3 UMAM loss units for herbaceous wetlands and 0.3 UMAM loss units for forested wetlands (6.6 UMAM loss units total), all due to expansion of existing transmission lines. In most cases, these wetland impacts will be required for establishment of access road and pads for the transmission towers.

Table 5-1. Tampa Bay Watershed Acreage and UMAM Summary.

Area	Herbaceous (including Open Water)		Forested		Total Acres	Total Functional Loss
	Acres	Functional Loss	Acres	Functional Loss		
Impacts						
Permanent Fill	9.4	-6.3	0.3	-0.2	9.7	-6.5
Permanent Clearing	NA	NA	0.4	-0.1	0.4	-0.1
Total Impacts	**9.4**	**-6.3**	**0.7**	**-0.3**	**10.1**	**-6.6**

5.3 MITIGATION PROGRAM

Working closely with Pinellas County's Environmental Lands Department, PEF will partner on a wetland enhancement and restoration project that will be to the regional benefit of wildlife species by enhancing wetlands in the Brooker Creek Preserve (Preserve). The existing transmission line ROW extends north-south along the eastern boundary of the Preserve. A narrower existing transmission line easement through Preserve land extends from the main north-south transmission line to the northwest. Active mitigation work is only planned for the main transmission line owned by PEF, and all references to "transmission line" hereafter refer to this north-south corridor. Enhancements to Pinellas County-owned lands in the Preserve will result from work in the existing transmission line ROW.

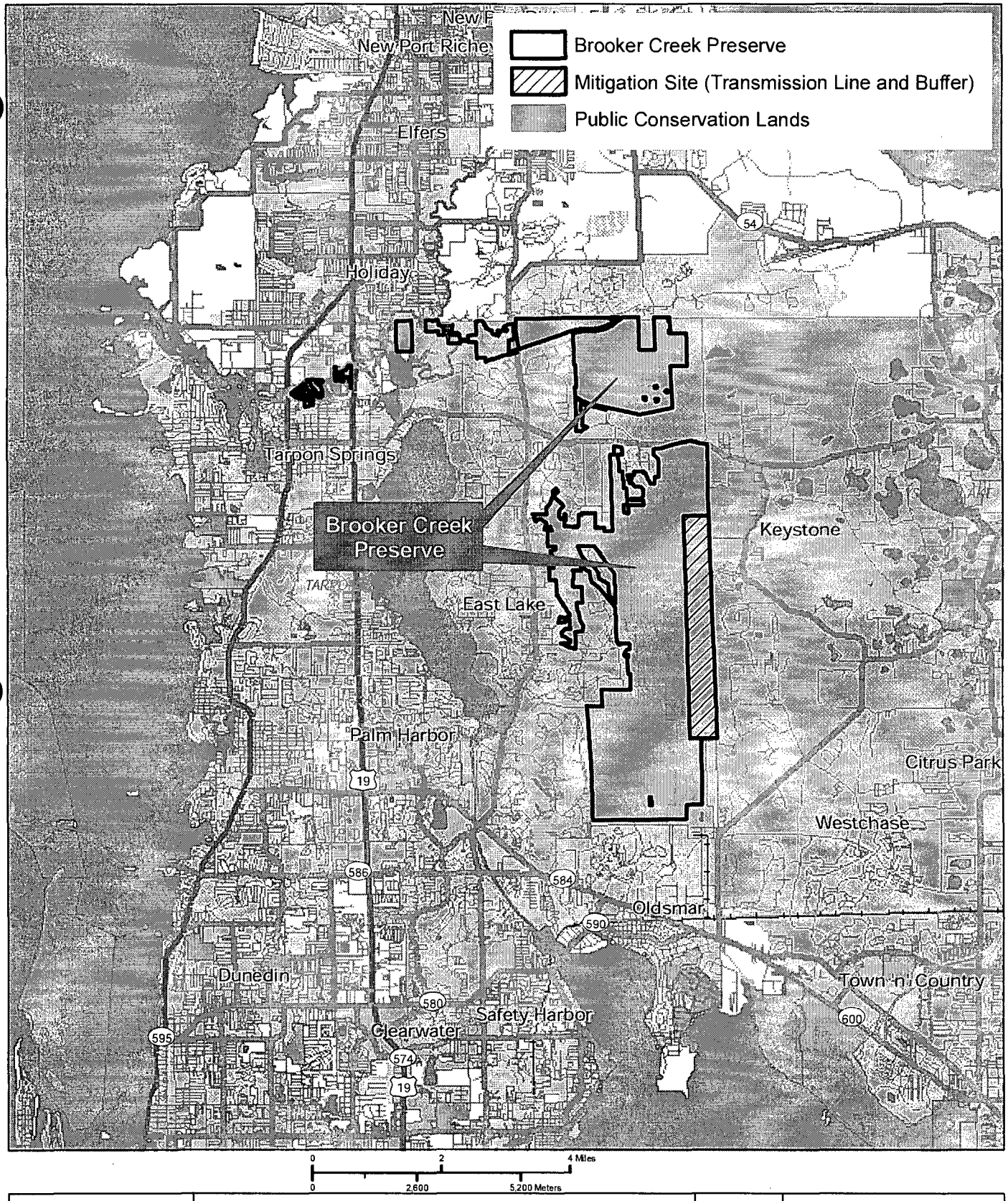


Exhibit 5-4-1
Brooker Creek Mitigation Site
Location Map

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The transmission line ROW are managed to facilitate maintenance of the power lines and structures. Trees have been removed and any saplings are herbicided. Nuisance species have colonized much of the ROW. Both the nuisance species and drainage changes have impacted the natural wetlands adjacent to the transmission line ROW. Those natural wetlands which have been impacted by the transmission line ROW and which can be improved by mitigation activities in the ROW are included in the mitigation program. Finally, there will be an improvement in the wetland contiguity across the ROW which will better connect the Preserve lands on either side.

5.4 MITIGATION PLAN OBJECTIVE – BROOKER CREEK

The objective of the mitigation program is to enhance the existing natural wetlands and previously impacted areas by removing impediments to natural flows, nuisance species, and enhancing the wetlands with desirable native wetland species. Because of the transmission lines, the wetlands within the ROW must remain herbaceous in character. The project's forested wetlands impacts will be mitigated by enhancement of the hydrology in preserve wetlands adjacent to the ROW and by removal of the threat of nuisance species invasion.

All figures in this plan include the transmission line ROW and a buffer within the Preserve in which enhancements due to mitigation activities in the transmission line ROW can reasonably be expected to result in improvements to adjacent wetlands. This resulting mitigation area extends 1000 ft west of the ROW and includes all wetlands in the Preserve east of the ROW(an area that varies slightly in width but which is approximately 1000 ft wide).

5.4.1 Site Description

The Brooker Creek Preserve is owned by Pinellas County and lies east of Lake Tarpon and immediately west of the Hillsborough County line. The Preserve includes the largest undeveloped parcel remaining in Pinellas County (**Exhibit 5-4-1**). The site includes multiple small channels of Brooker Creek, a stream that flows generally westward to empty into Lake Tarpon, which outfalls into Upper Tampa Bay. The mitigation site has been identified as the existing PEF transmission ROW through the Preserve and a 1000-ft buffer within the Preserve to either side of the ROW. The project lies in Sections 12, 13, 24, 25, and 36 Township 27S, Range 16E and Sections 01 and 12 Township 28S, Range 16E in Pinellas County, FL.

The Preserve is the focus of a number of conservation efforts which are seeking to maintain the water quality and quantity in this creek. These efforts include the John Chestnut Park (Pinellas County) at the mouth of the creek, the Brooker Creek Preserve (Pinellas County), and the Brooker Creek Buffer Preserve (Hillsborough County). The specific preserve enhancements described here are not planned for implementation by the any public entity, and indeed, they cannot be done effectively without the enhancement activities to be done on the lands owned by PEF.

PEF owns the north-south transmission ROW on or near the eastern edge of the preserve. It has an easement to an additional corridor that extends from the main transmission line ROW to the northwest through the approximate center of the preserve. Five of the named channels of the creek cross these transmission ROW.

Pinellas County, which owns and manages the Preserve, has expressed a desire that PEF minimize the effects of its transmission facilities within and adjacent to the preserve. These effects cannot be managed without action by PEF as PEF owns the north-south transmission line and holds the rights to manage the smaller line to the northwest. The land cover effects that the County has requested be addressed include nuisance species management and alterations to natural water flows by past construction practices. A letter from Pinellas County requesting assistance from PEF in managing and to the extent possible, eliminating, the effects of these alterations on county ownership is attached.

The total area of the mitigation site is approximately 1,296 acres of which 595.1 acres are wetlands and other surface waters and 701.4 acres are uplands. The natural topography of the site is generally flat, but falls somewhat in elevation from east to west (**Exhibit 5-4-2**).

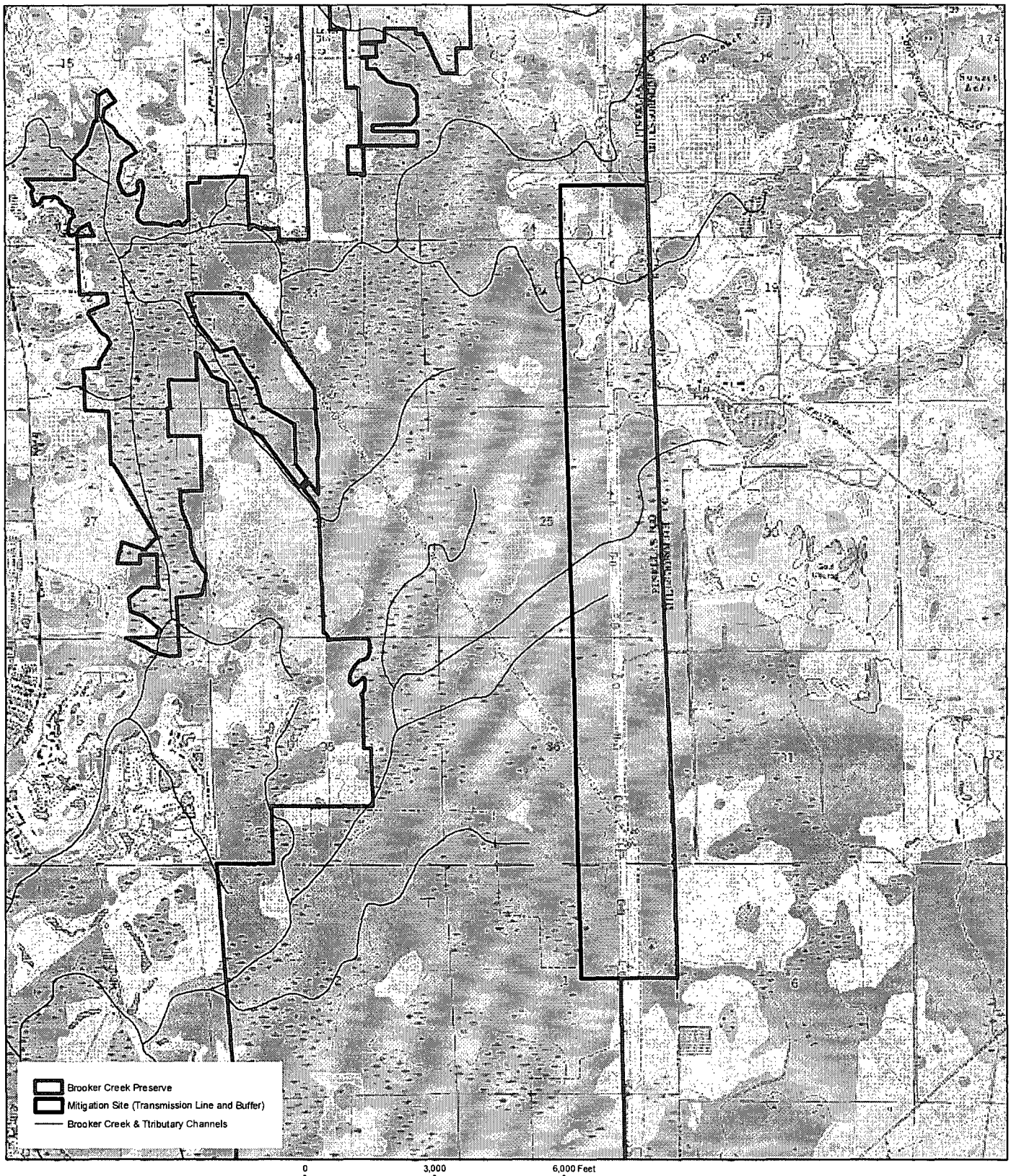

Exhibit 5-4-2
Brooker Creek Mitigation Site
USGS Quadrangle Map

Image:USGS Quad:Tarpon Springs, Elfers, and Oldsmar

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SOILS

The mitigation site and surrounding lands within the Preserve include eight soil mapping units (**Exhibit 5-4-3**). Of these, five are indicative of upland conditions. The remaining three are wetland soils. Given the precision of the mapping units, wetlands may be included within any of the mapped soils. The land clearing in the ROW has, in many cases, lowered the elevation of areas that once had upland soils so that those areas now have wetland hydrology and support wetland vegetation.

Table 5-2. USDA NRCS-Mapped Soil Mapping Units within the Mitigation Site.

Soil Map Unit	Soil Type	Hydric*
3	Anclote Fine Sand	Yes
6	Basinger	Typically no, but needs field verification
7	Basinger, depressional	Yes
10	Eau Gallie	No
12	Felda Fine Sand, depressional	Yes
17	Myakka Sand	No
29	Tavares Sand, 0 – 5 Percent Slopes	No
46	Wabasso	No

*included on the USDA Hydric Soils List/Per the USDA Hydric Soils List meets criteria as a hydric soils mapping unit

UPLAND SOILS

Tavares soils, NRCS Map Unit 29 (0 to 5 percent slopes) are moderately well-drained and have a high density of fine sand that allows for rapid permeability. The high water table averages approximately 5 feet below the surface from June to December. The landforms on this soil are knolls and low ridges. In the transmission rights-of-way, this soil type is ruderal. Adjacent areas on the preserve support sandhill and xeric hammock.

Basinger soils, NRCS Map Unit 6, are poorly drained and have a high density of fine sand that allows for rapid permeability. The high water table inundates the surface seasonally from June through February. The landforms on this soil type are sloughs. This soil type in general does not meet the definition of hydric soils; however, onsite verification is needed to determine if specific areas of this soil type should be classified as hydric. Basinger soil in Brooker Creek Preserve supports flatwoods with some inclusions of mixed wetland forests. In the transmission line ROW, the flatwoods have been cleared and some areas have been scraped down and function as wetlands.

Myakka soils, NRCS Map Unit 17, are poorly drained fine sand that exhibit moderately rapid to rapid permeability. The high water table averages approximately 1 foot below the surface from June through November. This soil naturally supports a flatwoods plant community. In the transmission line ROW, some areas of Myakka soils have been scraped down and function as wetlands. Elsewhere on the Preserve, the mapping unit includes small areas of wetlands.

HYDRIC SOILS

Anclote fine sand, depressional, NRCS Map Unit 3, is very poorly drained and has rapid permeability. The high water table can flood 2 feet above the soil surface seasonally from June to December. In the transmission line ROW, this soil supports residual marsh vegetation. Within the adjacent Preserve, the plant communities found on the Anclote fine sand are forested wetlands and freshwater marshes.

Basinger fine sand, depressional, NRCS Map Unit 7, is very poorly drained and has rapid permeability. The high water table can flood 2 feet above the soil surface seasonally from June through February. In the transmission line ROW, this soil supports residual marsh vegetation. Within the adjacent Preserve, the plant communities found on the Anclote fine sand are forested wetlands.

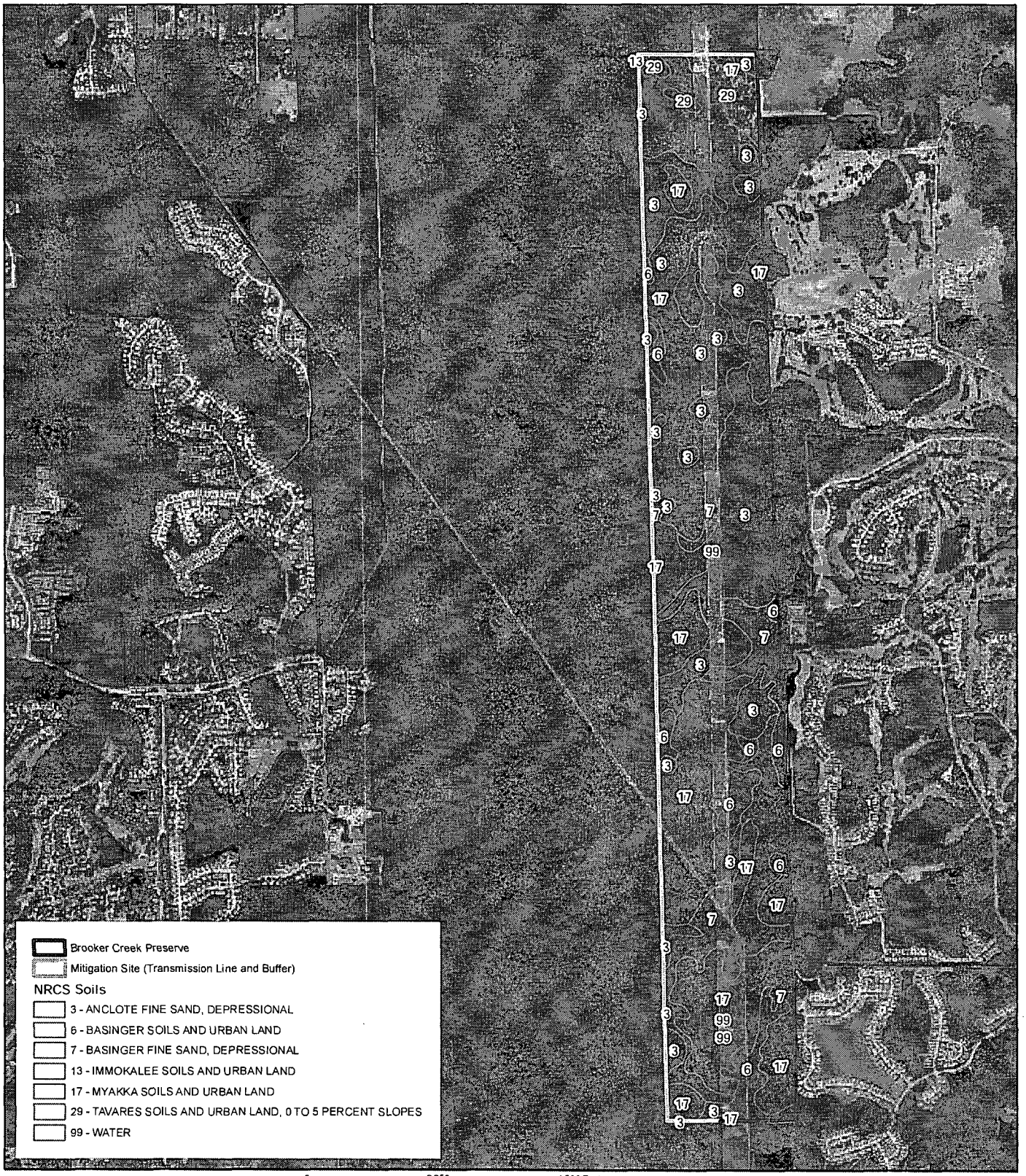

Exhibit 5-4-3
Brooker Creek Mitigation Site
NRCS Soils Map

Image: 2009

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5.4.2 Historic Conditions

The Preserve, including the area occupied by the transmission line ROW, was historically flatwoods with forested wetlands, both contiguous and isolated, occurring within the flatwoods (**Exhibit 5-4-4**). Most of the larger wetlands are connected by small high-water flowways that gradually coalesce to form the Brooker Creek system. The major flowways are indicated as an overlay on the topographic map (**Exhibit 5-4-2**) and are provided as drawn by Pinellas County.

Table 5-3. Historic Site Conditions.

FNAI Community Type	Wetland (Y/N)
Basin Swamp	Y
Depression Marsh	Y
Bottomland	Y
Strand Swamp	Y
Mesic Flatwoods	N
Sandhill	N

5.4.3 Current Conditions

As a result of regional growth, the Brooker Creek Preserve has become largely surrounded by residential and commercial development, and it remains as the last large natural area in Pinellas County. The Preserve itself is largely undeveloped, as shown on the aerial photograph in **Exhibit 5-4-5**.

Beginning in the early 1950's, much of what is now the Brooker Creek Preserve was acquired as a water production facility (East Lake Wellfield) by Pinellas County. A second facility (Eldridge-Wilde Wellfield) was leased by the county just north of Keystone Road. These facilities had early and ongoing wetland impacts on water availability to the natural systems of the area. The East Lake Wellfield was decommissioned and the Eldridge-Wilde wellfield has been incorporated into the regional Tampa Bay Water system and is now managed in accordance with current Water Use Permit regulations. The primary lasting effect of the East Lake Wellfield is that the property remains in public ownership and is not subject to development.

Existing land cover types are depicted on **Exhibit 5-4-6** and listed in **Table 5-4**. They are described in **Section 6.4**. Based on a review of current aerial photography and the Brooker Creek Management Plan Update (Pinellas County 2008), there is a direct correspondence on this site between FLUCFCS cover types and FNAI cover types.

Table 5-4. Existing Land Use within Mitigation Site, FLUCFCS Communities (FNAI Community).

Existing Communities	Transmission Line ROW	Adjacent Brooker Creek Preseve
621 and 630 Cypress and Wetland Forest Mixed (Basin Swamp)	0	232.1
615 Stream and Lake Swamp (Bottomland)	0	4.8
625 Hydric Pine Flatwoods (Wet Pine Flatwoods)	0	42.7
641 Marsh including 644 Emergent Vegetation (Depression Marsh)	49.0	0.5
643 Wet Prairie (Depression Marsh)	0	3.8
411 Pine Flatwoods (Mesic Pine Flatwoods)	0	403.6
434 Hardwood Conifer Mixed (Sandhill)	0	62.8
830 Utilities (Utility Corridor)	86.4	5.1
Total Acres	135.4	755.4

The mitigation area is the PEF transmission line ROW and natural lands adjacent to and within 1000 ft. of the transmission line. This ROW has been altered by the transmission line construction techniques standard at the time of development: all trees were cleared, a raised access road was constructed, and structure pads for the transmission towers were constructed. The access road and structure pads were developed using on-site materials resulting in scraped down areas and ditches along much of its length. Culverts provide some cross-corridor flows at selected points. This road has substantially altered the hydrology of wetlands both downstream and upstream of the ROW.

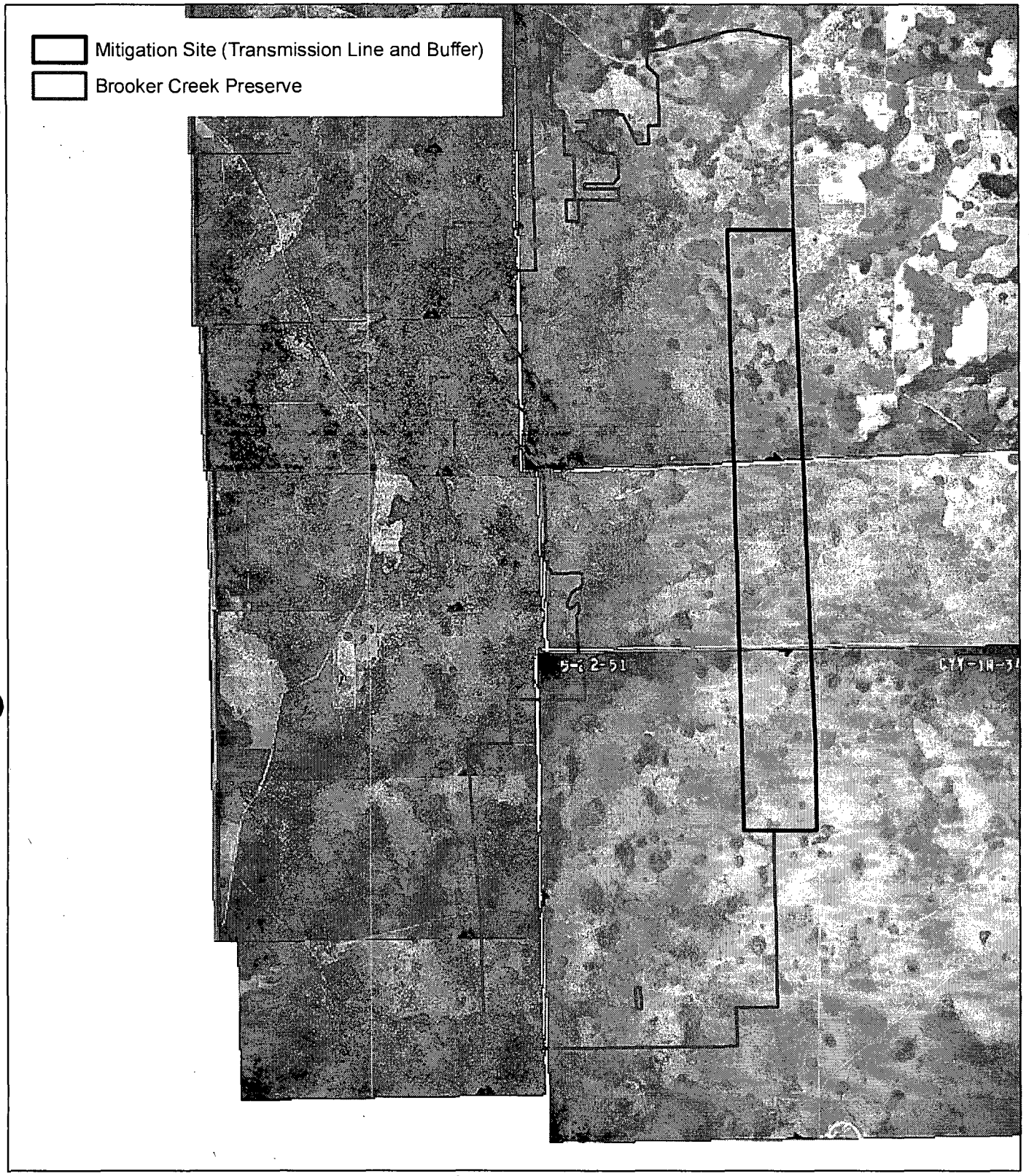

Exhibit 5-4-4
Brooker Creek Mitigation Site
1951/1952 Historical Aerial

Image:1951-1952

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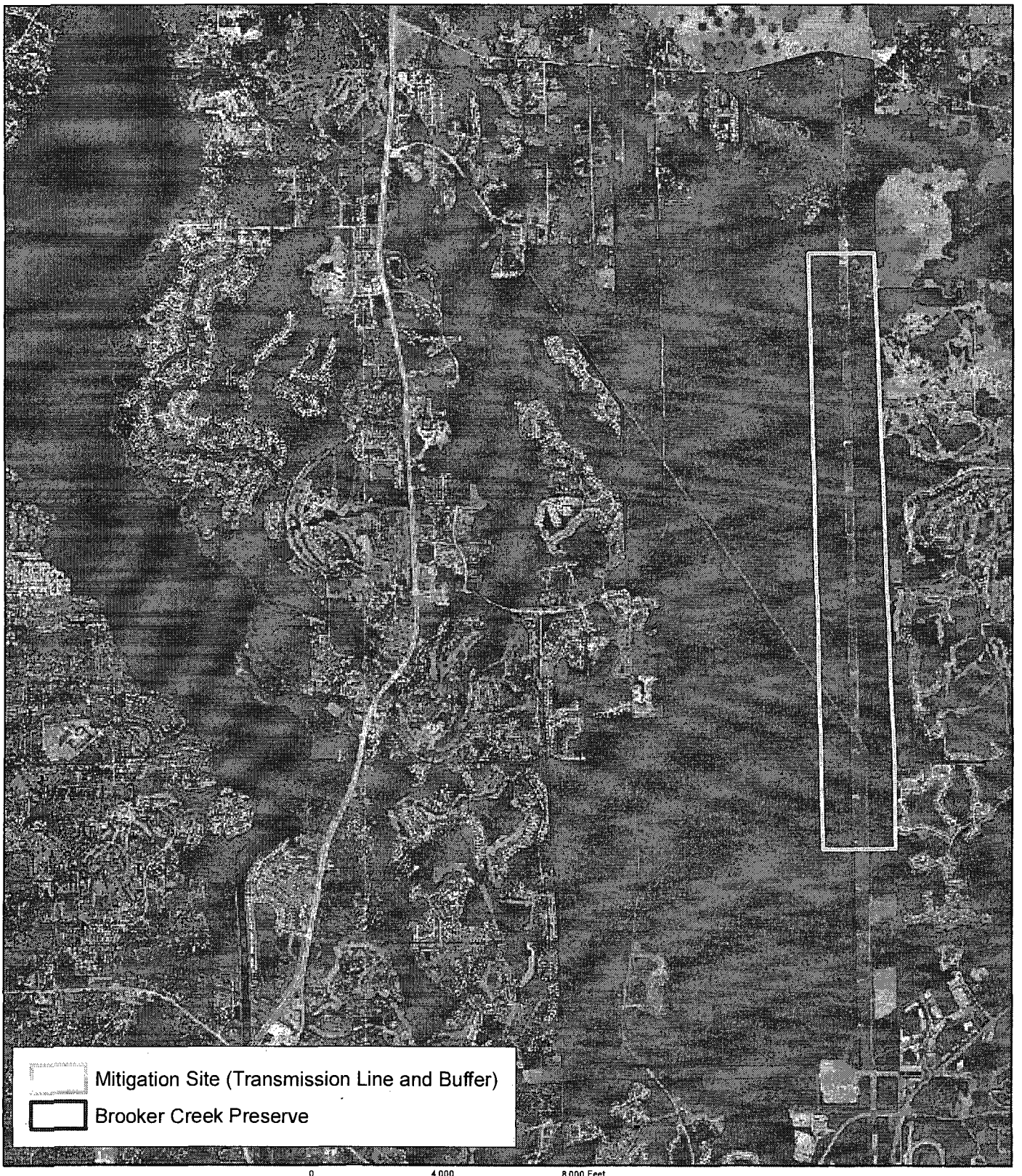

Exhibit 5-4-5
Brooker Creek Mitigation Site
2009 Aerial Map

Image:2009

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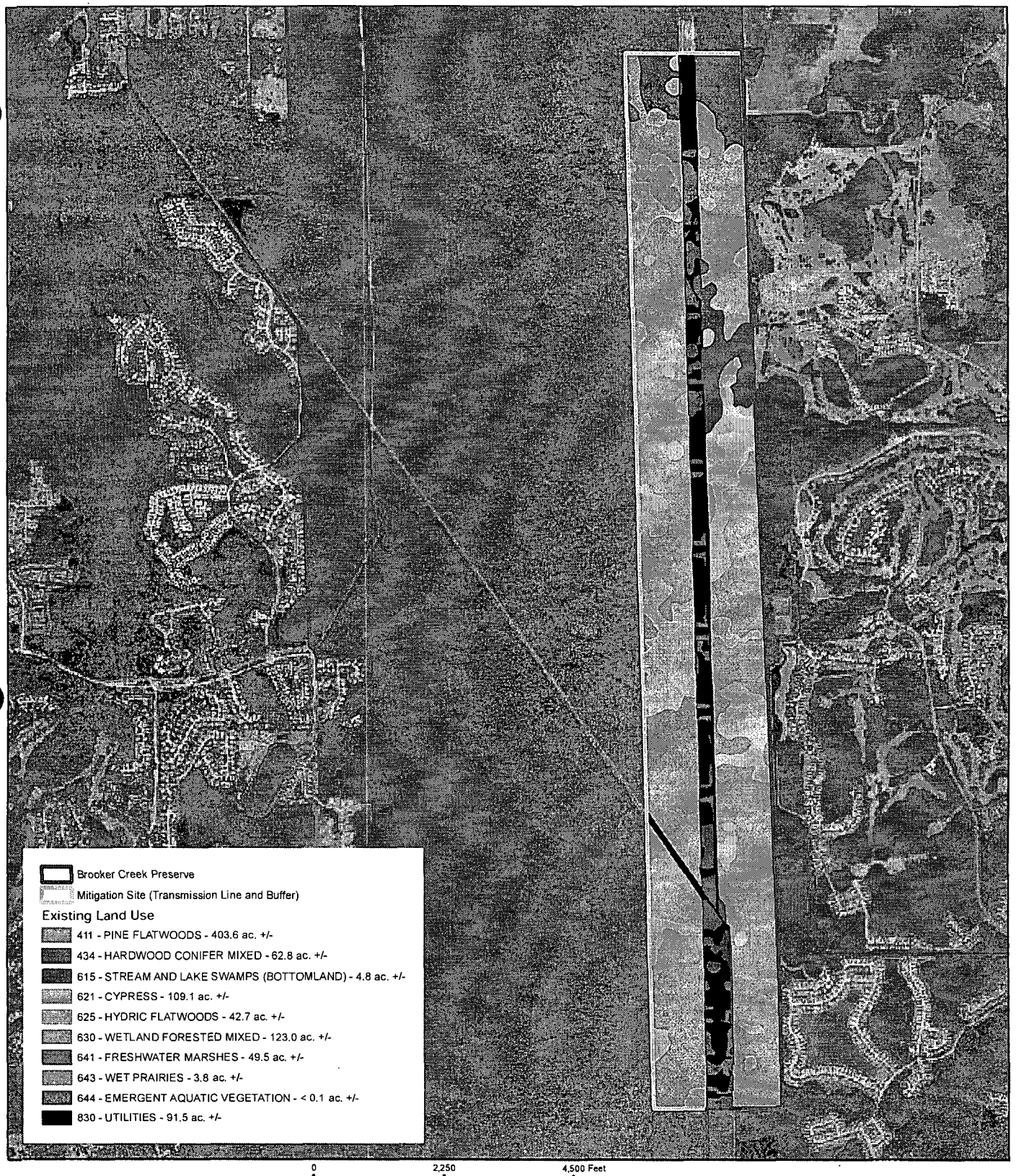

Exhibit 5-4-6
Brooker Creek Mitigation Site
Existing Land Use and Land Cover

Image:2009

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In addition, the transmission towers were constructed on raised pads which were made from materials dug from nearby. Almost all of the dug out areas have wetland hydrology. They were not planted or managed as wetlands, so most are now occupied by a combination of desirable native species and invasive species (both native and non-native). Natural wetlands within the transmission ROW were cleared and allowed to grow back to herbaceous cover, much of which is nuisance species. Presently, the typical vegetation found in these altered wetlands includes torpedo grass (*Panicum repens*), a non-native nuisance species), cattail (*Typha domingenensis*), a native nuisance species), Peruvian primrose-willow (*Ludwigia peruviana*), a non-native nuisance species), dog fennel (*Eupatorium capillifolium*), a ruderal native), all undesirable. Desirable species include St. John's wort (*Hypericum fasciculatum*), maidencane (*Panicum hemitomon*), pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria* spp.), and alligator flag (*Thalia geniculata*). Adjacent areas are typically ruderal, often dominated by wax myrtle (*Myrica cerifera*), groundsel bush (*Baccharis* spp.), and broomsedges (*Andropogon* spp.) but with some having a native cover of saw palmetto. Some adjacent areas have patches of cogon grass (*Imperata cylindrica*) which can be invasive both in uplands and wetland fringes.

Natural wetlands adjacent to the ROW retain their native vegetation but have been subject to hydrological alterations and nuisance species invasion as a result of their presence in the ROW. The typical forested wetland has a canopy of pond cypress (*Taxodium ascendens*) with a mixture of other species including dahoon holly (*Ilex cassine*), red maple (*Acer rubrum*), and swamp tupelo (*Nyssa sylvatica* var. *biflora*). A variety of shrubs, especially buttonbush (*Cephalanthus occidentalis*) and coastal plain willow (*Salix caroliniana),* was observed. Ferns such as midsorus fern (*Blechnum serrulatum*) and chain fern (*Woodwardia* spp.) are common. Some signs of hydrological alteration, depending on location either dewatering or excess inundation were observed. Small areas of invasion by nuisance species, especially cattail, were noted.

At the extreme south end of the Brooker Creek ROW site, and included within it, is a large borrow pond. This borrow pond outflows to the south and is quite deep. While not feasible to remove the pond, its littoral shelves are densely vegetated with nuisance species (cattails) which provide an additional risk factor for the native wetlands on the adjacent Brooker Creek Preserve.

Exhibit 5-4-6 shows current land uses in the ROW. As shown in that figure, there is substantial acreage of marsh with the remainder being appropriately described as ruderal (mapped as Utility).

The Brooker Creek Preserve has been the subject of multiple wildlife surveys. Species lists for the preserve (Pinellas County DEM 2008) include 276 species of vertebrates, excluding fish and including 18 state-listed species. The original Brooker Creek Preserve Management Plan (Pinellas County DEM 1993) notes that the majority of the listed species of birds recorded (predominantly wading birds) rely on the marsh systems and open water areas located in the PEF transmission ROWs. The American bald eagle has been observed foraging in the borrow pond at the south end of the mitigation site, and the County's 1993 management plan for the preserve recommended placing wood duck nest boxes in this pond.

5.4.4 Target Conditions

The goal of mitigation along the transmission ROW is to enhance the condition of the existing wetlands in the ROW, whether altered natural systems or systems created by scraping down low uplands to construct the roadway and tower pads; see **Exhibit 5-4-7**. Adjacent forested wetlands, predominantly cypress-dominated, will be enhanced via removal of the nuisance species threat and/or by correction of hydrological alterations that occurred in the transmission ROW. Only those wetlands shown on **Exhibit 5-4-8** will be targeted by mitigation activities.

The mitigation target is to create treeless marshy areas appropriate to the region in the ROW and to improve the condition of adjacent forested wetlands via removal of impediments to flow with the access roadway. The marshes will fit the FNAI description of depression marshes. The target communities are listed in **Table 5-5**. They are described in **Section 6.5**. Additional wetlands co-exist with the mitigation project area as defined by the 1000-foot buffer to the west and preserve ownership to the east but are not proposed for enhancement credit as they will not benefit directly from the mitigation activities.

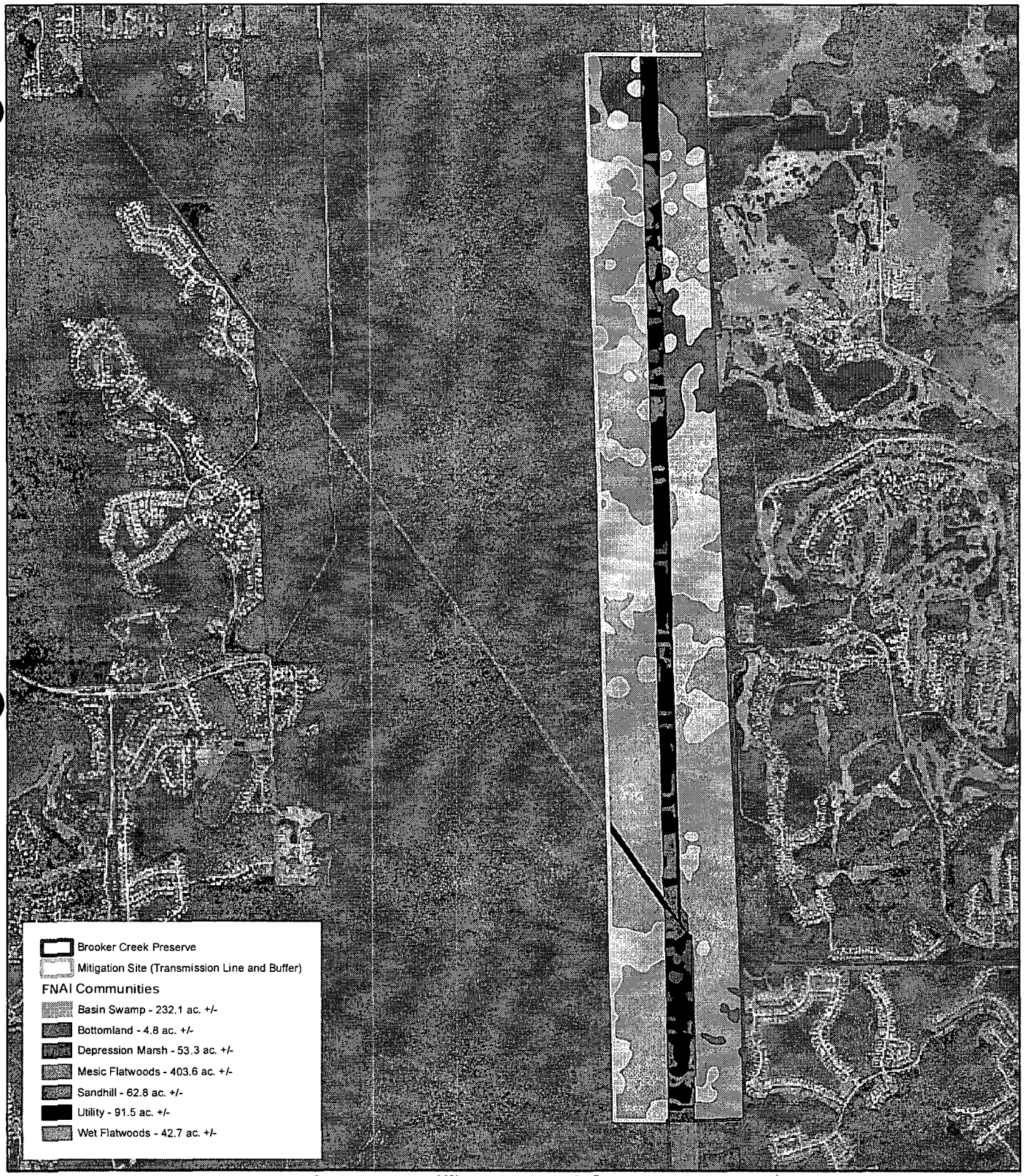

Exhibit 5-4-7
Brooker Creek Mitigation Site
Proposed Land Use and Land Cover

Image:2009

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Exhibit 5-4-8
Brooker Creek Mitigation Site
Mitigation Plan View

Image:2009

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Table 5-5. Acreage of Target Wetland Communities using FNAI Nomenclature.

Target Communities	Transmission Line	Adjacent Brooker Creek
Basin Swamp	0	96.4
Depression Marsh	40.1	0
Total Acres	**40.1**	**96.4**

Given the existing conditions and constraints imposed by continuing powerline ROW maintenance, the goal is to restore all wetlands in the ROW, except the impoundment, to small depression marshes dominated by maidencane, pickerelweed, blue maidencane, and other herbaceous species characteristic of small marshes in the Brooker Creek area. The extent to which limitations are imposed by the powerline ROWare reflected in the target UMAM scores and risk.

The wetlands on and adjacent to the powerline ROW are occupied by a variety of small animal species and may include several species that require breeding sites that are free of predatory fishes (Moler and Franz 1987). More than a dozen species of frogs and salamanders also breed regularly in depression marshes, and these constitute an important part of the food supply of wading birds and snakes, including the rare eastern indigo snake (*Drymarchon couperi*) and southern hognose snake (*Heterodon simus*; Moler and Franz 1987). Other species using this habitat include the Florida sandhill crane (*Grus canadensis pratensis*), and white-tailed deer.

Given the small amount of forested wetlands to be impacted, the mitigation will consist of removing existing barriers to natural water flows caused by the raised roadway in the powerline ROW and by removing nuisance species in the powerline ROW. The extent to which limitations are imposed by the ongoing operations and maintenance of the transmission lines is reflected in the target UMAM scores and risks. As a generality, habitat for wildlife will be improved, but there will be no attempt to attract bird species that could be placed at risk due to the transmission lines.

5.4.5 Mitigation Activities

The mitigation activities are depicted graphically on **Exhibit 5-4-8** and will generally be implemented according to field conditions at the time of mitigation implementation.

Table 5-6. Matrix of Existing to Target Wetland Community Types and Acreages.

Current Community	Basin Swamp	Depression Marsh
621 + 630 Cypress and Wetland Forest Mixed	96.4	
641 Marsh		40.1
Total Acres	96.4	40.1

The location of these wetlands in and adjacent to a transmission line ROW, and some selected site-specific constraints such as adjacent development, affects the way in which the mitigation will be implemented.

In areas where the transmission line access road is raised crossing through wetlands will be graded back to the natural grade elevation. Due to the requirement that the ROW be maintainable, these areas will be hardened so that vehicular traffic can continue. If there is a ditch beside the wetland in these areas, it will be backfilled using the material scraped from the roadway. This material came from the ditches to construct the road. The road bed will not be planted.

In areas where the roadway is raised but not adjacent to a wetland, it will be left as is, as the adjacent scraped areas are currently proving wetland functions.

Wetlands within the ROW will be enhanced by 1) removal of nuisance species and 2) planting with desirable native wetland species. Species to be planted are listed in **Exhibit 5-4-9e**. Due to the overhead transmission lines, any trees which recruit into these wetlands will be eliminated (manually cut or herbicided).

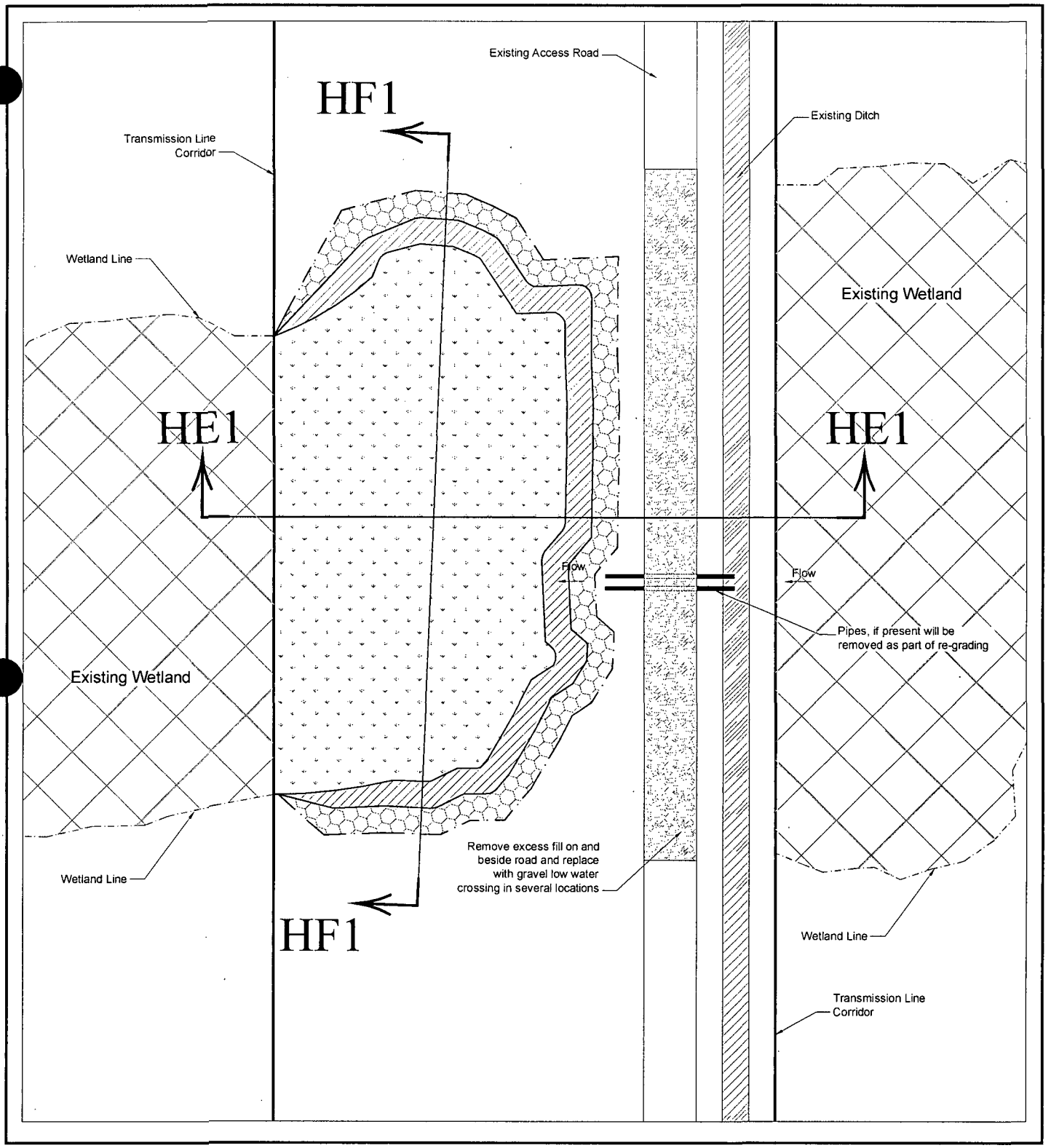

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Exhibit 5-4-9a
Typical Plan View of a Depression Marsh Proposed For Enhancement

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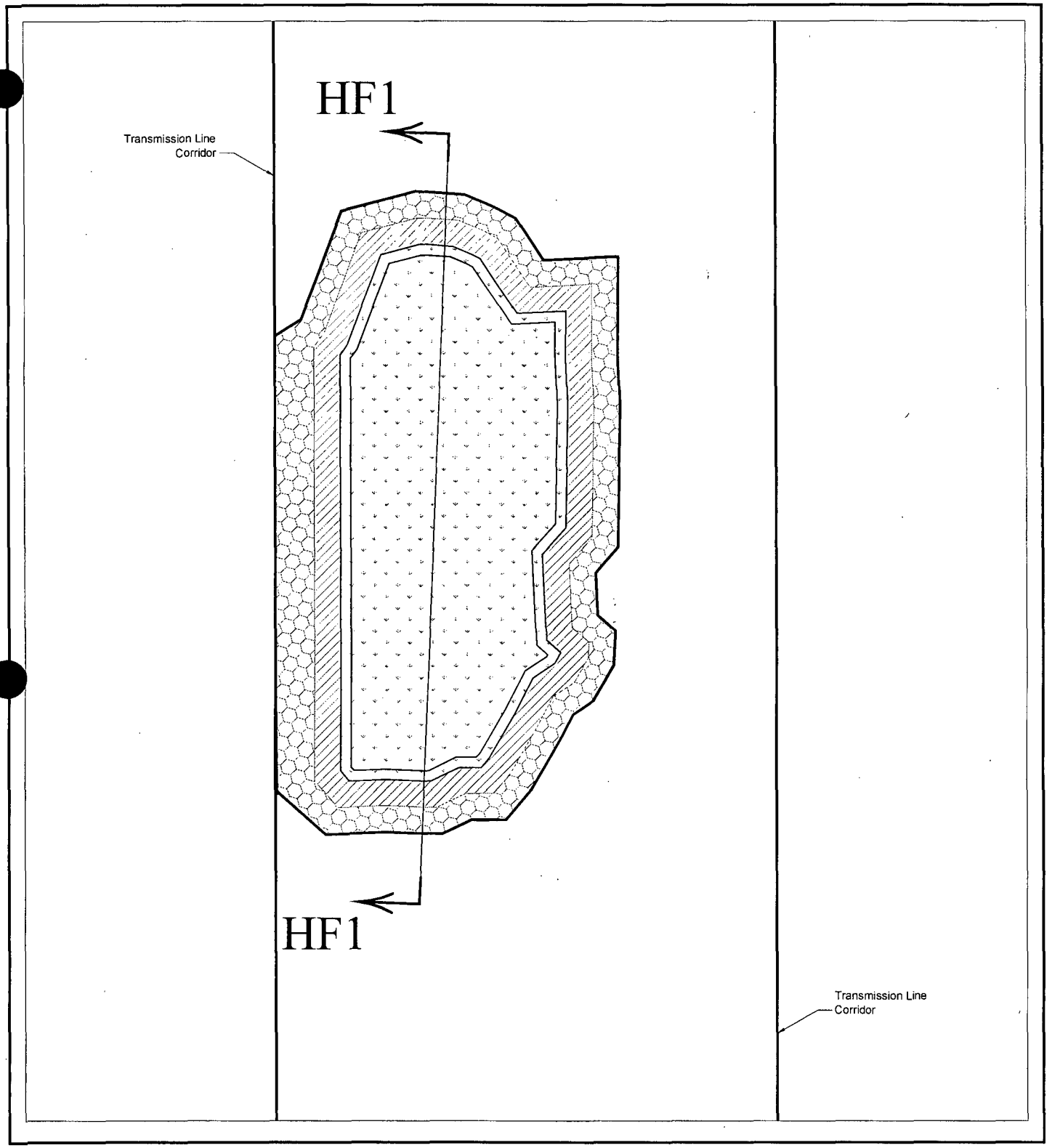

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Exhibit 5-4-9b
Typical Plan View of a Depression Marsh Proposed For Enhancement

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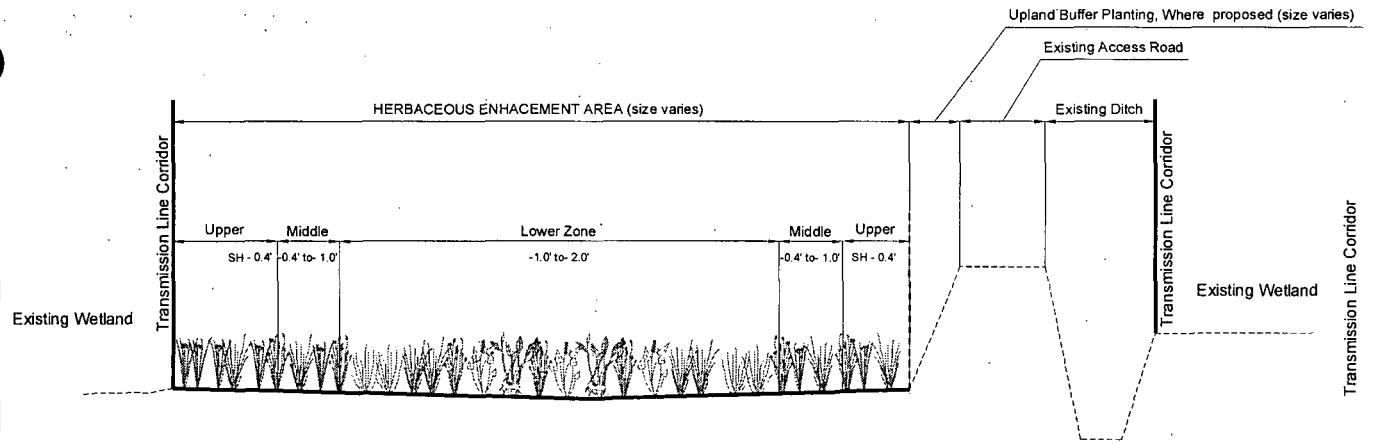
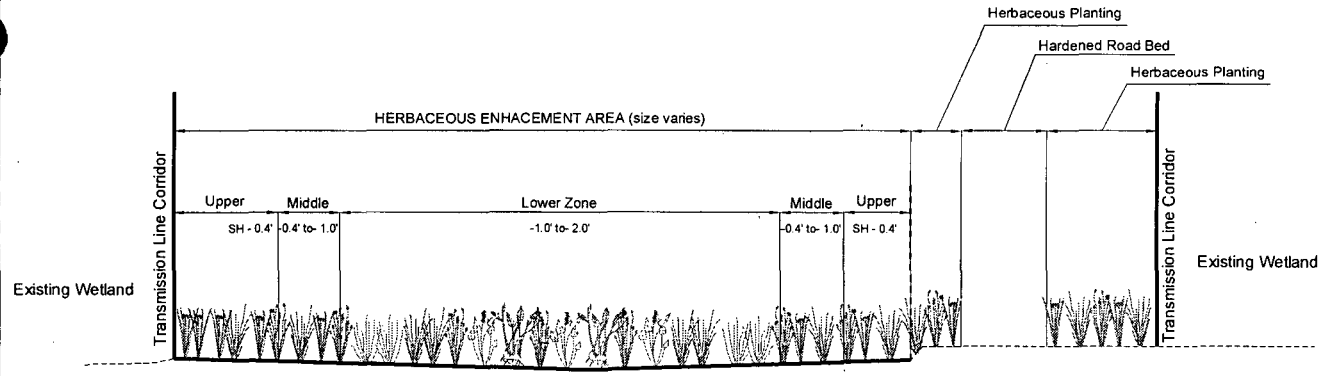


Typical Cross Section HE1-HE1 Existing Grade
NTS



Typical Cross Section HE1-HE1 Proposed Grade
NTS

Exhibit 5-4-9c
Typical Cross Section of a Depression Marsh Proposed For Enhancement

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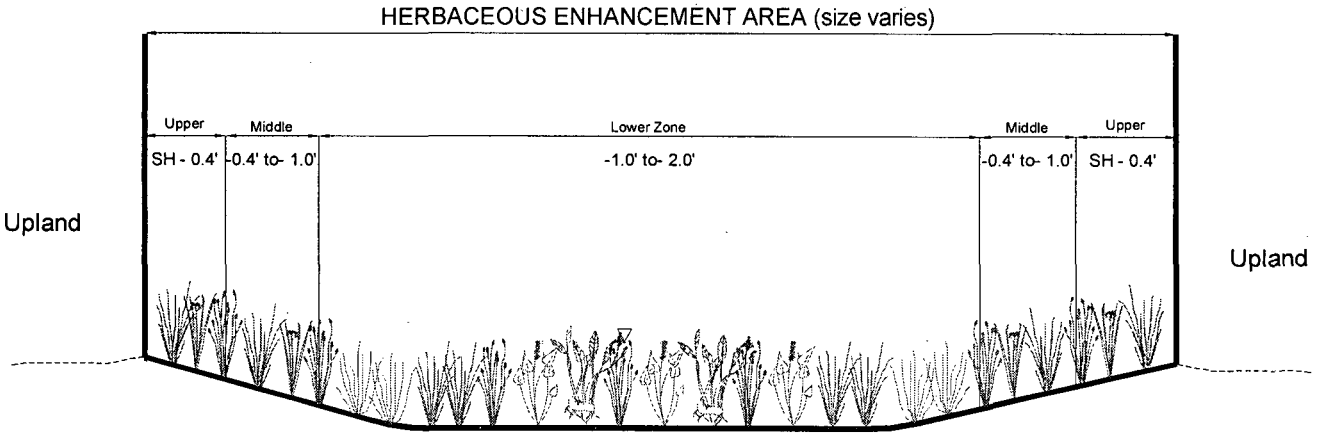
Date: 04/05/10 Rev Date: PM: JAG CAD Operator: JMB Project #: 6691-020 File Location: G:\UnitedStates\Florida\Tampa\6691\020\working\cad\Generic_Mitigation_Planting_Plans_20100405.dwg



Typical Cross Section HF1-HF1
NTS

Exhibit 5-4-9d
Typical Cross Section of a Depression Marsh Proposed For Enhancement

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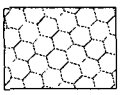
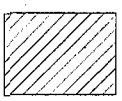
Date: 04/05/10 Rev Date: PM: JAG CAD Operator: JMB Project #: 6691-020 File Location: O:\UnitedStates\Florida\Tampa\6691\020\working\cad\Generic_Mitigation_Planting_Plans_no-road_20100310.dwg

Typical Planting Zone of a Depression Marsh Proposed For Enhancement							
Zone	**Elevation**	**Scientific Name**	**Common Name**	**Acres**	**Quantity**	**Size**	**Spacing**
UPPER RANGE 	Relative to Existing Seasonal High	*Pontederia cordata*	pickerelweed	Varies	10%	4" containerized stock or bare root equivatent	3' o.c.
		Eleocharis interstincta	knotted spikerush		10%		
	SH to 0.4'	*Panicum hemitomon*	maidencane		20%		
		Spartina bakeri	sand cordgrass		60%		
				Upper Range Plant Totals:	100%		
MIDDLE RANGE 	-0.4' to -1.0'	*Pontederia cordata*	pickerelweed	Varies	25%	4" containerized stock or bare root equivatent	3' o.c.
		Sagittaria lancifolia	lance-leaved arrowhead		25%		
		Eleocharis interstincta	knotted spikerush		25%		
		Panicum hemitomon	maidencane		25%		
				Middle Range Plant Totals:	100%		
LOWER RANGE 	-1.0' to -2.0'	*Nymphaea odorata*	white water-lily	Varies	2%	4" containerized stock or bare root equivatent	3' o.c.
		Pontederia cordata	pickerelweed		35%		
		Sagittaria lancifolia	lance-leaved arrowhead		33%		
		Eleocharis interstincta	knotted spikerush		15%		
		Panicum hemitomon	maidencane		15%		
				Lower Range Plant Totals:	100%		

* - Areas vary in water depth. The plant mix will be adjusted for variable water depths. Relative percentages are shown as suggestions only.

Exhibit 5-4-9e
Typical Planting Zone of a Depression Marsh Proposed for Enhancement

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Enhancement 1. Areas that will be given this treatment have varying degrees of nuisance species invasion, typically by cattail, but to some extent also by Peruvian primrose-willow and/or torpedo grass and/or various non-native *Cyperus* and *Scirpus* species. Field visits indicated nuisance species cover greater than 20%. These areas have wetland hydrology either because they are in areas where the natural ground surface was lowered to provide fill for transmission tower pads or for the access roadway, or because they are areas of natural wetlands that were cleared. While the areas vary in depth, typical depths range from 0.5 to 1.5 feet below seasonal high water.

The mitigation is to remove nuisance species by the most efficient means possible, typically herbiciding. Optionally, the areas may be scraped so that the seed bank is also removed. Following nuisance species removal, the wetlands will be replanted to native wetland species appropriate to depression marshes in the Tampa Bay Watershed (**Exhibit 5-4-9[b,d,e]**) for a typical plan view, cross section and planting plan. A detailed plan, based on the actual depth profile will be developed prior to planting. Where areas of desirable wetland species are present, the intent is to retain them.

Most areas are surrounded by acceptable vegetation, with the nature of that vegetation varying depending on the specific setting as basin swamp, flatwoods, or semi-ruderal uplands in the powerline. The latter will be inspected to ensure that any non-native nuisance species occurring within a 30-foot buffer, an uncommon occurrence, are herbicided.

Enhancement 2. These are basin swamps and strand swamps on lands in the Brooker Creek Preserve that are adjacent to the transmission line ROW. They are abutted in the ROW by areas identified for enhancement. These swamps are generally subject to some disturbance due to the presence of clearing along their boundaries (the enhancement areas in the transmission line ROW). They also have some invasion by nuisance species that originate via seed sources and/or vegetative propagules from those wetlands.

Mitigation activities will consist of a survey, at the time of mitigation implementation, for the presence of nuisance species within the wetland. Such species will be treated if necessary.

These enhancement wetlands will benefit from the Enhancement 1 activities which will remove nuisance species from the adjacent areas in the transmission line ROW.

In the UMAM analysis, lift has been computed on the basis of removal of nuisance species in the wetlands (improved community structure) and improved location score (due to Enhancement 1 activities).

Enhancement 3. Areas that will be given this treatment are similar in setting to those identified as Enhancement 1, but have 20% or less cover by nuisance species. The nuisance vegetation is typically by cattail, but to some extent also Peruvian primrose-willow and/or torpedo grass and/or various non-native *Cyperus* and *Scirpus* species. Field visits indicated nuisance species cover less than 20%. These areas have wetland hydrology either because they are in areas where the natural ground surface was lowered to provide fill for transmission tower pads or for the access roadway, or because they are areas of natural wetlands that were scraped to clear them. While the areas vary in depth, typical depths range from 0.5 to 1.5 ft below seasonal high water.

The mitigation is to remove nuisance species by the most efficient means possible, typically herbiciding. To the extent needed, the wetlands will be replanted to native wetland species appropriate to depression marshes in the Tampa Bay Watershed (**Exhibit 5-4-9[b,d,e]**) for a typical plan view, cross section, and planting plan. The species to be planted will largely be based largely on species present on-site and on the adjacent preserve lands. Any areas left unvegetated by nuisance species removal will also be planted with appropriate on-site vegetation that is selected to improve habitat diversity.

Most areas are surrounded by acceptable vegetation, with the nature of that vegetation varying depending on the specific setting as basin swamp, flatwoods, or semi-ruderal uplands in the powerline. The latter will be inspected to ensure that any non-native nuisance species occurring within a 30-foot buffer, an uncommon occurrence, are herbicided.

Enhancement 4. This enhancement activity will address the ditch along the eastern side of the transmission line access road. This ditch is currently open water but has patchy to dense concentrations of nuisance species, mostly cattail.

Enhancement will consist of removing the cattail. Ecologically, these areas provide a readily available water source for species, such as deer and raccoon. UMAM credits are being sought for elimination of invasive nuisance species.

Enhancement 5. This enhancement activity benefits not only the area mapped (**Exhibit 5-4-8**) but also adjacent areas (UMAM scores computed separately). These are wetlands in the transmission line ROW where the corridor severed a larger wetland, typically a basin swamp or in a few cases, a strand swamp or bottomland altering both the wetland within the ROW and the residual wetlands to the east and west. The wetland in the ROW was cleared and much of it scraped. The access road was constructed across it, usually on the east side, and there is a deep ditch on the immediate east side and shallower scraped area on the west. The material removed to create the ditch and scraped area now form the raised road. There is at least one culvert that allows water flow across the road. The wetland area itself has a combination of native and non-native species.

The mitigation activities are to remove the raised road replacing it with an at-grade, hardened road bed, as the road must remain open for transmission line maintenance. See **Exhibit 5-4-9 (a,c,d)** for a typical cross section of the road alteration. In addition, nuisance species will be controlled, and the wetland planted to species appropriate to depression marshes (See Exhibit 5-4-9e). A 30-ft wide upland buffer adjacent to the wetland will be evaluated for nuisance species, and any nuisance species will be herbicided. The buffer will be replanted to appropriate native non-woody species.

Enhancement 7. This enhancement area is characterized as shallow scraped areas and cleared natural wetlands in the transmission line ROW. It is occupied predominantly by ruderal species including dog fennel (*Eupatorium capillifolium*) and soft rush (*Juncus effusus*). There is little or no cover by nuisance species.

Mitigation will consist of planting additional, desirable wetland species appropriate to shallow wetlands (See Exhibit 5-4-9e).

UMAM credits are being sought for improved community structure.

Enhancement 10. This enhancement area is similar to Enhancement 6 except that the area to the east (upstream) has no known issues due to potential off-site wetland impacts as the wetland to the east is entirely within the Brooker Creek Preserve which would like to see the enhancement occur. The area is basin swamp that will benefit from Enhancement 10 activities including restoration of a more natural hydrological regime due to removal of the raised road, elimination of nuisance species, if any, and benefits provided by removing nuisance species from the wetland within the transmission line ROW.

UMAM credits are being sought for improved community structure due to elimination of nuisance species, improved location scores due to removal of nuisance species in the adjacent ROW, and improved hydrology due to changing the road.

5.4.6 Mitigation Schedule

The mitigation will be initiated to coordinate with the PEF transmission line construction schedule. Nuisance species control will be most effective if completed during periods of low water when all portions of the nuisance plants are actively growing but exposed to the herbicide, or when mechanical removal is possible. Both are typically best done early in the growing season (late dry season) when the wetlands are as dry as possible. All planting must be done when adequate moisture is present for establishment, typically, late in the growing season.

The mitigation to be conducted will vary by enhancement area, but the overall process will be the same for all:

- Each wetland area to be enhanced will be assessed in detail at the initiation of the program. This initial assessment will include a baseline monitoring event using the protocols described in **Section 6.7** and including photographs, lists of dominant plants and nuisance species, a map of areas needing nuisance species treatment and areas needing enhancement planting, data on water depths and an estimate of seasonal high water.

- Based on the existing conditions as determined above, a planting list will be made for each area. This list will be based on the information developed in the assessment. Numbers of plants will be based on the acreage and the amount of area that will need to be replanted.
- The intent is for the major nuisance species control to be conducted late in the first dry season following permit issuance. Targeted nuisance species will be treated using site-specific treatment (mechanical removal or herbiciding) appropriate to the wetland. Dead plant materials will be allowed to decay in place unless the biomass is excessive. Desirable native species will be avoided to the extent feasible.
- In areas where the access road was built across existing wetlands and it is to be removed, the roadway and associated ditch will be recontoured to match the adjacent wetland ground in accordance with **Exhibit 5-4-9c** and the access roadway will be "hardened" in accordance with **Section 6.5.** All earthwork will be completed prior to enhancement plantings. The road alteration to restore historic flows in the transmission ROW and adjacent wetlands will be restricted to areas where the landowner (Brooker Creek Preserve) has approved the changes.
- Supplemental planting of each area will occur in general accordance with the plant list in **Exhibit 5-4-9e** but refined during the assessment of baseline conditions. The major planting will occur near the end of the subsequent rainy season, typically September.
- Follow-up nuisance species control will occur in the enhanced wetlands semi-annually for the first two years and annually thereafter until the areas are deemed successful by the permitting agencies. Success criteria are provided in **Section 6.9**.
- Monitoring will be conducted annually until the wetlands are deemed successful by the permitting agencies. Monitoring and reporting will be done in accordance with the procedures specified in **Section 6.7**.

Table 5-7 provides a summary of this mitigation schedule.

Table 5-7. Schedule for Implementation of Restoration and Monitoring Activities.

Activity	Year 1	Year 2	Year 3	Year 4
Monitoring to determine degree of nuisance species occurrence and distribution	Early (May) and late (September) growing season	Early (May) and late (September) growing season	Early (May) and late (September) growing season	Late growing season (September)
Nuisance species control	Early (May) and late (September) growing season	Early (May) and late (September) growing season	Early (May) and late (September) growing season	Late growing season (September)
Enhancement plantings	Late growing season at least 2 weeks after nuisance species control	Additional planting if inadequate cover exists	Additional planting if inadequate cover exists	
Low water crossing construction	Install			

5.5 UMAM EVALUATION

A Unified Mitigation Assessment Methodology (UMAM) analysis was conducted and shows that the mitigation activities will result in creation of 9.2 functional lift units which will be more than adequate to compensate for the 6.6 units of loss in the basin. Details are included in **Section 5.8** to show that the activities described in this plan will result in an increase of 2.6 functional units beyond the amount required to offset otherwise unpermittable wetland impacts. These "extra" lift units are proposed to be reserved and applicable to additional project impacts, if that need is established by an appropriate regulatory agency, or applied to future impacts within the watershed, if proven unnecessary for this project.

Table 5-8. Tampa Bay Watershed Impact and Mitigation Summary.

Area	Herbaceous (including Open Water)		Forested		Total Acres	Total Functional Loss/Lift
	Acres	Functional Loss/Lift	Acres	Functional Loss/Lift		
Impacts						
Permanent Fill	9.4	-6.3	0.3	-0.2	9.7	-6.5
Permanent Clearing	NA	NA	0.4	-0.1	.0.4	-0.1
Total Impacts	**9.4**	**-6.3**	**0.7**	**-0.3**	**10.1**	**-6.6**
Mitigation						
Brooker Creek Wetlands	40.1	+2.5	96.4	+6.7	136.5	+9.2
Total Mitigation	**40.1**	**+2.5**	**96.4**	**+6.7**	**136.5**	**+9.2**

5.6 MONITORING AND MAINTENANCE

An adaptive management approach that uses monitoring to determine the required maintenance, and allows for varied responses to ongoing conditions will be used. The key is to use monitoring to determine current condition and maintenance needs, as well as the necessary schedule.

MONITORING

For the transmission ROW in the Brooker Creek area, two types of monitoring are needed: monitoring to determine maintenance needs, and progress toward attaining success criteria. Monitoring to determine maintenance needs will be based on limited site visits documented with photography. And will occur twice annual for the first three years and annually thereafter. Monitoring to determine progress toward attaining success criteria (**Section 6.9**) will include a quantitative assessment and reporting as described in **Section 6.7**.

MAINTENANCE

Based on the monitoring, a qualified environmental professional will determine which specific enhancement areas are in need of maintenance activities and what those activities will be. Some combination of chemical and manual methods will be used to control invasive vegetation. General maintenance procedures to be used throughout for this project are specified in **Section 6.8**.

5.7 SUCCESS CRITERIA

The mitigation at Brooker Creek will meet the success criteria defined in **Section 6.9**. To ensure that the performance standards are met, an adaptive management approach will be an integral part of project implementation. If the USACE/FDEP decides, based on the selected performance standards and the annual monitoring reports, that the mitigation project is not meeting its goals, PEF will coordinate with the USACE/FDEP and professional ecologists to develop and implement remedial measures.

5.8 PUBLIC INTEREST

Working closely with Pinellas County's Environmental Lands Department, PEF will partner on a wetland enhancement and restoration project that will be to the regional benefit of wildlife species by enhancing wetlands in the Brooker Creek Preserve. Based on the importance to Pinellas County and the hydrologic enhancements extending well beyond the boundaries of the work, the mitigation is designed to be regionally significant and sustainable. It is focused on the enhancement of wetland and ecosystem functions along an existing transmission line ROW where it passes through the Pinellas County Brooker Creek Preserve. This mitigation provides greater benefits to the ecosystem than it would if the mitigation were distributed in small areas near the actual impact sites as it removes disturbances to the Brooker

Creek Preserve and enhances the largest area of natural forest remaining in Pinellas County. It also directly responds to a request by Brooker Creek Preserve management that PEF remove, to the extent possible, barriers to natural water flow across its power line ROW and eliminate nuisance species.

5.9 TAMPA BAY APPENDICES

5.9.1 Letter of Agreement from Pinellas County

Following this page is the Letter of Agreement from Pinellas County.

Pinellas County
ENVIRONMENTAL MANAGEMENT

William M. Davis
Bureau Director

March 18, 2010

Jim Maher
Program Administrator
Submerged Lands and Environmental Resource Permitting
Florida Department of Environmental Protection
Northeast District Office
7825 Baymeadows Way, Suite B200
Jacksonville, FL 32256

Dear Mr. Maher:

This letter is in reference to the off-site mitigation proposed by Progress Energy Florida ("PEF") for its Levy Nuclear Plant and associated facilities. The site certification order is PPSA No. PA08-51. This letter is intended to provide PEF with authority to evaluate mitigation options on Pinellas County property and to give conceptual approval to the work proposed by PEF on the Brooker Creek Preserve located in Pinellas County.

Pinellas County understands that this proposal is a continuing part of the mitigation post-certification process and that more detailed planning may be developed, pending approval of FDEP. Based on PEF's description of the proposed activities, the County has determined that this project is consistent with the County's plans, and will not create any negative impacts to our management activities.

Additionally, the County does not currently have any funding to complete work described in this proposal in the foreseeable future. It is understood that PEF, upon completion of the mitigation project, will ensure that all success criteria of post-certification conditions and applicable federal permits are satisfied.

We look forward to working with PEF and the state and federal permitting agencies in this endeavor.

Sincerely,

William M. Davis, Bureau Director
Department of Environmental Management

cc: Dr. Steven J. Harper, Ph.D.
Gail Simpson
Melissa Seixas

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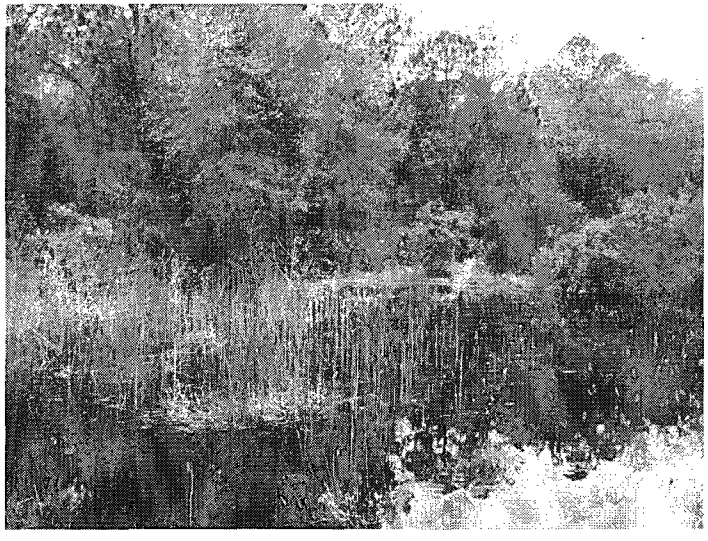
5.9.2 Site Photographs

Enhancement 1. Typical Enhancement 1 area dominated by cattail (nuisance species) with some wax myrtle. Wetland 45.

Enhancement 1. Typical scraped area (foreground) east of access road looking across residual saw palmetto dominated flatwoods toward a tower fill pad. Wetland 2.

Enhancement 2. Basin swamp adjacent to the transmission line and adjacent to and Enhancement 1 area. Note cattail invasion on the edge (foreground; Wetland 5).



Enhancement 3. Area with low coverage of nuisance species. This wetland at the base of a fill pad is mostly occupied by pickerelweed. Some sesban (*Sesbania herbacea*) and a small patch of cattail are visible.

Enhancement 4. View across the ditch on the east side of the road. This is one of the wider areas with dense cattail coverage. Mitigation activity will retain the ditch but eliminate the cattails. The photograph with Enhancement 6 shows the ditch at a location beside a wetland where there is no nuisance species cover.

Enhancement 5. Area under powerline affected by scraping and hydrological alterations due to the raised access roadway which is where the photographer is standing. Note the patch of cattails in the center. Photograph shows the view to the west (Wetland 58).

Enhancement 5. Area under powerline affected by scraping and hydrological alterations due to the raised access roadway which is where the photographer is standing. Photograph shows the view to the west. Wetland 29.

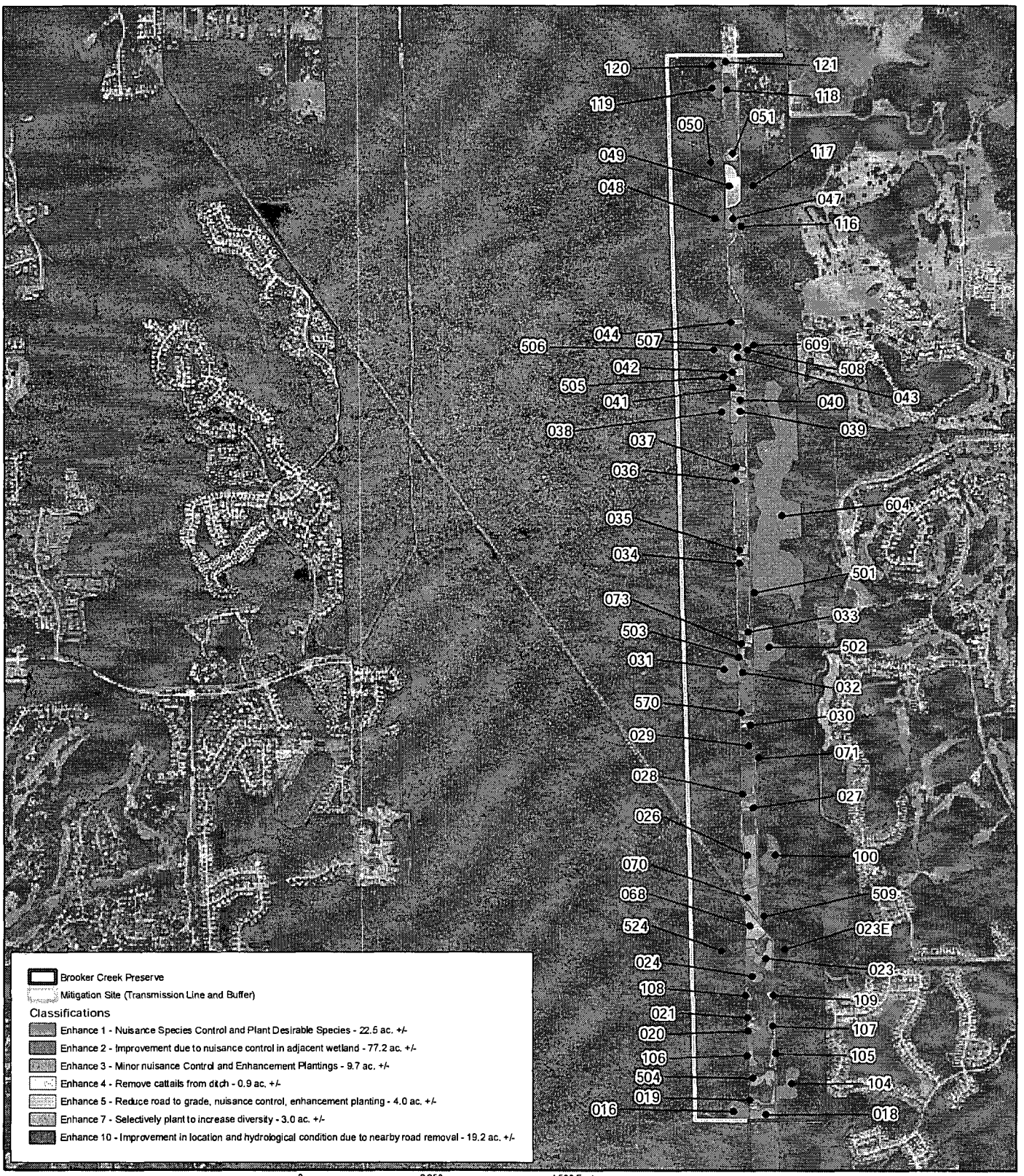
Enhancement 7. While lacking in diversity, this wetland is free of nuisance species. Wetland 20.

Enhancement 10. Area adjacent to roadway that will be enhanced hydrologically by scraping the roadway down to grade to restore natural flows. Wetland 50.

5.9.3 UMAM Scores - Brooker Creek

Following are the UMAM Score Summary and Wetland Assessment Areas map (UMAM Exhibit).

Assessment Area Name	Location		Water		Community		Area Size (Acres)	Time Lag	Risk	RFG	FG
	Current	With	Current	With	Current	With					
Enhancement 1 (nuisance control and plant)	5	5	7	7	4	8	22.50	1.07	2.00	0.06	1.40
Enhancement 2 (buffer nuisance control)	7	8	8	8	8	9	77.20	1.00	1.25	0.05	4.12
Enhancement 3 (minor nuisance control)	7	7	7	7	6	8	9.70	1.07	1.25	0.05	0.48
Enhancement 4 (ditch cattail removal)	7	7	7	7	5	8	0.90	1.07	1.50	0.06	0.06
Enhancement 5 (grade road, nuisance species control)	7	7	6	8	5	8	4.00	1.07	1.50	0.10	0.42
Enhancemetn 7 (plant desirable species)	7	7	8	8	6	8	3.00	1.07	1.50	0.04	0.12
Enhancement 10 (improved condition due to nearby road removal)	7	8	6	8	7	9	19.20	1.00	1.25	0.13	2.56
Project Total:							**136.50**				**9.16**



Wetland Assessment Areas
Brooker Creek Mitigation Site
Tampa Bay Basin

Image:2009

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Date: 03/31/2010 Rev. Date: n/a PM: SRD GIS Analyst: GdAMap Document: brooker_mit_chop_wet_assess_areas_A_20100331.mxd Project Number: 6691-026 PDF Document: brooker_mit_chop_wet_assess_areas_A_20100331.pdf Plot Size: 8.5 x 11

Section 6
Attachments

SECTION 6

Attachments

6.1 REFERENCES

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6.2 DEFINITIONS

ASSESSMENT AREA

From UMAM documentation (contained in Chapter 62-345, *Florida Administrative Code* [FAC]), an assessment area means all or part of a wetland or surface water impact site, or a mitigation site, that is sufficiently homogeneous in character, impact, or mitigation benefits to be assessed as a single unit.

BHR-BOARSHEAD RANCH

Mitigation site in Pasco County privately owned by a land owner willing to commit to a conservation easement and long term use of their land for mitigation. The site lies at a unique location where the Upper Hillsborough and Withlacoochee Rivers watersheds are seasonally interconnected along a natural overflow/diversion feature that bisects the drainage divide between the two basins near US 98 in eastern Pasco County. This overflow typically occurs during periods of high flow.

BLOWDOWN PIPELINE

The pipelines that will carry the LNP cooling tower blowdown water to the existing discharge structure located at PEF's Crystal River Energy Complex discharge canal.

BROOKER CREEK

Mitigation site in the Tampa Bay Watershed, owned by Pinellas County, and whose enhancement is desired by Pinellas County to improve wetland functions and values.

DOF

Division of Forestry of the Florida Department of Agriculture and Consumer Services, managing agency for the Homosassa Tract of the Withlacoochee State Forest and Daniels Island Tract of the Goethe State Forest mitigation areas.

FIVE MILE CREEK

Mitigation site in the Upper Coastal Watershed, owned by Pasco County, and whose enhancement is desired by Pasco County to improve wetland functions and values.

FG-FUNCTIONAL GAIN

From UMAM documentation (contained in Chapter 62-345, *Florida Administrative Code* [FAC]), when the acres of a proposed mitigation assessment area is known, the gain in functions provided by that mitigation assessment area is determined using the following formula: Functional gain (FG) = RFG x Mitigation Acres.

FUNCTIONAL LOSS

From UMAM documentation (contained in Chapter 62-345, *Florida Administrative Code* [FAC]), the loss of functions provided by impact assessment areas is determined using the following formula: Functional loss (FL) = Impact Delta x Impact Acres.

GOETHE STATE FOREST (GSF)

Daniels Tract of the Goethe State Forest. Located in the Waccasassa Watershed, this mitigation area consists of specific sites within the Goethe State Forest that the DOF would like to see improved by a combination of hydrological and forest management activities.

HT-HOMOSASSA TRACT

Homosassa Tract of the Withlacoochee State Forest. Located in the Upper Coastal Watershed, this mitigation area consists of specific sites within the Homosassa Tract that the DOF would like to see improved by a combination of hydrological and forest management activities.

IMPACT SITE

The impact sites refer to wetlands and other surface waters as delineated pursuant to Chapter 62-340, F.A.C., which would be impacted by the project. Uplands will not be included as impact sites.

INVASIVE SPECIES

Invasive species are those species not native to Florida that exhibit vigorous growth characteristics, to the extent that they have a negative effect on the establishment, growth, vigor and survival of the native species that are typical of the natural community in question.

LEVY NUCLEAR PLANT (LNP) SITE

The LNP site includes the 3,105 acres zoned for the power plant and certified by the state plus adjacent lands owned by PEF (approximately 5,200 acres in total). It is located in the Waccasassa and Withlacoochee watersheds

NUISANCE SPECIES

Nuisance species are those species native to Florida that exhibit overly vigorous growth characteristics, to the extent that they have that they have a negative effect on the establishment, growth, vigor and survival of the native species that are typical of the natural community in question. Examples are cattails (*Typha* spp.), climbing hemp vine (*Mikania scandens*) and primrose willow (*Ludwigia leptocarpa*).

PROJECT

Consolidated project components of the PEF nuclear power plant implementation including areas to be used for power generation, transmission and related facilities.

RFG-RELATIVE FUNCTIONAL GAIN

The change in wetland function, calculated according to the UMAM documentation (contained in Chapter 62-345, *Florida Administrative Code* [FAC]), for a unit area of mitigation wetland the value of that area with and without the proposed project. This area differs from the computation for relative functional loss as it is adjusted (decreased) based on risk of failure and the time lag anticipated between mitigation activity start and attainment of success. Per the documentation, relative functional gain (RFG) = Mitigation Delta (or adjusted mitigation delta for preservation)/(risk x t-factor).

RFL-RELATIVE FUNCTIONAL LOSS

The change in wetland function, calculated according to the UMAM documentation (contained in Chapter 62-345, *Florida Administrative Code* [FAC]), for a unit area of wetland that will be impacted based on the value of that area with and without the proposed project.

TRANSMISSION

Those portions of the project associated with power transmission. These areas include new transmission ROW, expansions of existing transmission rights-of-way, expasion of existing substations and the construction of new substations.

UMAM-FLORIDA UNIFIED MITIGATION ASSESSMENT METHODOLOGY

UMAM (contained in Chapter 62-345, *Florida Administrative Code* [FAC]) provides a standardized procedure for assessing the functions provided by wetlands and other surface waters, the amount that those functions are reduced by a proposed impact, and the amount of mitigation necessary to offset that loss. This method is used by both the state of Florida and USACE. Application of the UMAM process for this project is described in **Section 6.8** of this plan.

6.3 EXISTING VEGETATION ASSOCIATION DESCRIPTIONS

The following paragraphs provide descriptions of FLUCFCS (Florida Land Use Cover and Forms Classification System (FDOT 1999) codes. Conditions vary between sites and within sites, with any relevant differences discussed in the site-specific sections of this report.

The FLUCFCS system is based predominantly on overstory dominance. Substantial site-specific variation in lower strata may occur. This system is different in concept from the natural systems based

system used by most government land management agencies in Florida, the Florida Natural Areas Inventory (FNAI) classification.

For the LNP project and its mitigation, the existing land use is described in terms of FLUCFCS and the mitigation targets are given in terms of the FNAI classification which is more ecologically based. The HT and GSF classifications provided by the DOF for existing plant communities are in the FNAI system. The descriptions provided below are for the existing condition and use the best available classification, FLUCFCS for all except HT and GSF. Various maps of existing land cover were available for the LNP site and the mitigation sites. Because of the generality of the FLUCFCS system and its emphasis on the overstory, the FLUCFCS categories do not always map consistently into FNAI categories.

Table 6-1 includes the FLUCFCS categories identified and the most appropriate FNAI categories based on the specific landscape settings, species composition, and management identified during site review. The community descriptions which follow are listed alphabetically, not numerically, so that both the FLUCFCS and FNAI classifications can be accommodated.

Table 6-1. Existing Land Use Within Mitigation Sites. (Translation of FLUCFCS to FNAI Community Types.)

FLUCFCS	FNAI
2610 – Cropland & Pastureland	Agriculture
260 – Other Open Lands (Rural)	Agriculture
320 – Shrub & Brushland	Mesic Flatwoods
410 – Upland Coniferous Forest	Mesic Flatwoods
411 – Pine Flatwoods	Mesic Flatwoods
434 – Hardwood – Conifer Mixed	Varies by site: Mesic Hammock (LNP), Sandhill (Brooker Creek)
440 – Tree Plantations	Pine Plantation
441 – Pine Plantation	Pine Plantation
520/530 - Reservoir	Impoundment/Artificial Pond
615 – Bottomland, Stream and Lake Swamp	Bottomland Forest
617 - Mixed Wetland Hardwoods	Basin Swamp – Hardwood dominant (LNP)
617-1 – Mixed Wetland Hardwoods, Logged	Basin Swamp – Hardwood dominant (LNP)
620 – Wet flatwoods (see 625)	Wet Flatwoods
621 – Cypress	Basin Swamp – Cypress dominant (LNP), Dome Swamp (various sites)
621-1 – Cypress, Logged	Basin Swamp – Cypress dominant (LNP)
625 – Hydric Pine Flatwoods	Wet Flatwoods
629 – Wet Planted Pine	Wet Flatwoods
630 – Wetland Forested Mix	Basin Swamp – high percent hardwoods (LNP), Strand Swamp (Brooker Creek)
630-1 – Wetland Forested Mix, Logged	Basin Swamp – high percent hardwoods (LNP)
631 – Wetland Shrub	Shrubby Wetlands
641 – Freshwater Marshes	Depression Marsh
643 – Wet Prairies	Depression Marsh
830 – Utilities	Utility Corridor

BASIN SWAMP (GSF AND HT)

These forested wetlands were historically dominated by pond cypress (*Taxodium ascendens*), swamp tupelo (*Nyssa sylvatica* var. *biflora*) and other hydrophytic hardwoods. Based on comparison of historic and current aerials, approximately 46% of the historic limits of basin swamps within lands slated for restoration have been colonized by pine. Pine encroachment is typically present in all but the deepest portions of these systems and is most prevalent in historically ditched and drained wetlands. Drained wetlands also contain a dense shrub understory and signs of soil oxidation.

BOTTOMLAND, STREAM AND LAKE SWAMPS (FLUCFCS 615)

This community, often referred to as bottomland or stream hardwoods, is usually found on but not restricted to river, creek and lake floodplain or overflow areas. This category has a wide variety of

predominantly hardwood species of which some of the more common components include red maple (*Acer rubrum*), laurel oak (*Quercus laurifolia*), water oak (*Quercus nigra*), sweetgum (*Liquidambar styraciflua*), willows (*Salix* spp.), swamp tupelo (*Nyssa sylvatica* var. *biflora*), water hickory (*Carya aquatica*), bays (*Magnolia virginica*, *Persea palustris*), and water ash (*Fraxinus carolinianus*) and buttonbush (*Cephalanthus occidentalis*). As it was mapped on the Pinellas County-owned portion of the Brooker Creek mitigation site, this system corresponds to Bottomland Forest in the FNAI classification.

CROPLAND AND PASTURELAND (FLUCFCS 210)

This land use is typically dominated by crop production, pasture and semi-pasture areas characterized by Bahia grass (*Paspalum notatum*), with varying amounts of live oaks (*Quercus virginiana*), bluestem grasses (*Andropogon* spp.) and saw palmetto (*Serenoa repens*). This land use was mapped on Boarshead Ranch.

CYPRESS (FLUCFCS 621)

Cypress-dominated swamps are common both on the LNP site and most of the mitigation sites. These wetlands are characterized by a canopy cover of cypress. Pond cypress (*Taxodium ascendens*) is most abundant in dome swamps, narrower strand swamps, and near the edges of basin swamps.

The typical semi-isolated cypress swamp (FNAI dome swamp) is poorly drained with water at or above ground surface during much of the year. Some cypress swamps support small, semi-permanent pools of open water in deeper areas. Other cypress swamps form shallow slough systems or drainage-ways during wet weather periods, such as early spring (FNAI strand swamp).

Woody species, including slash pine, swamp bay (*Persea palustris*), swamp tupelo (*Nyssa sylvatica* var. *biflora*), red maple (*Acer rubrum*), buttonbush, fetterbush (*Lyonia lucida*), Virginia-willow (*Itea virginica*), and doghobble (*Leucothoe racemosa*) are associated with the pond cypress. Groundcover is generally sparse due to high water, but includes lizard's tail (*Saururus cernuus*), maidencane (*Panicum hemitomon*), and a variety of fern species that frequently grow in elevated tussocks, such as royal fern (*Osmunda regalis*), cinnamon fern (*Osmunda cinnamomea*), and Virginia chain fern (*Woodwardia virginica*). Under natural conditions, flooding restricts the encroachment of less inundation tolerant hardwoods, such as laurel oak (*Quercus laurifolia*) into cypress swamps.

On the LNP site, areas mapped as 621 have a canopy dominated by pond cypress (*Taxodium ascendens*) with lance-leaved arrowhead (*Sagittaria lancifolia*), maidencane (*Panicum hemitomon*), pickerelweed and sawgrass (*Cladium jamaicense*) dominating the understory and groundcover. Many of these systems have become, as a result of fire suppression, past timbering and hydrological alteration, impenetrable thickets of fetterbush. Slightly more than half of the isolated wetlands are dome swamps dominated by pond cypress in various stages of regeneration. These systems fit the FNAI definitions of dome swamps and basin swamps.

CYPRESS SWAMP – LOGGED (FLUCFCS 621-1)

This classification was applied specifically on the LNP site to describe cypress swamps (621) that have been heavily logged. They are similar to the 621-classified sites but with more disturbance as well as varying degrees of cypress and hardwood tree regeneration.

DEPRESSION MARSH (HT ONLY)

Depression marshes occur on several of the mitigation sites. Most areas identified as depression marsh are naturally occurring marsh lands are small, shallow, bluestem (*Andropogon* spp.) dominated depressions occurring with historic wet flatwoods. The HT also includes one man-made system and a linear cut through a basin swamp. The linear clear cut is dominated by broomsedge bluestem (*Andropogon virginicus*), coastalplain St. John's-wort (*Hypericum brachyphyllum*), tall yellow-eyed grass (*Xyris platylepis*) and occasionally recruiting bald cypress (*Taxodium distichum*). Higher elevations within these depressions have been planted with longleaf pine (*Pinus palustris*) or contain some pine recruitment. Depression marshes adjacent to pasturelands contain some bahia grass (*Paspalum notatum*) encroachment.

DOME SWAMP (GSF, HT)

These are smaller, more-or-less isolated wetlands in small landscape depressions. They are characterized by a canopy cover of cypress and/or swamp tupelo (*Nyssa sylvatica* var. *biflora*). Pond cypress (*Taxodium ascendens*) is most abundant. Please see Cypress (621) for additional description.)

FRESHWATER MARSHES (FLUCFCS CODE 641) AND WET PRAIRIE (FLUCFCS 643)

Freshwater marsh is broadly defined under the FLUCFCS system as freshwater wetlands with predominantly herbaceous emergent vegetation. Given the breadth of the definition, it is not surprising that there is considerable variation in hydrology and vegetative composition both on the LNP site and on the mitigation sites. Much of the variation is related to site history, with some marshes being natural landscape features and others being features that developed as a result of land management activities, predominantly logging, clearing for transmission lines, or mining. Most natural freshwater marshes found on either the LNP site or the mitigation sites meet the FNAI definition of depression marsh.

The FLUCFCS system identifies shallow marshes vegetation under the 643 code and references them as wet prairies. These systems, under the FNAI system are also depression marshes, merely shallow ones or the edges of larger ones whose centers are given the 641 code. These systems should not be confused with FNAI wet prairies which have a substantially different hydrology and vegetative composition.

Typical vegetation includes maidencane, blue maidencane (*Amphicarpum muhlenbergianum*), bushy bluestem (*Andropogon glomeratus)*, sand cordgrass (*Spartina bakeri*), sawgrass (*Cladium jamaicense*), yellow-eyed-grasses (*Xyris* spp.), redroot (*Lachnanthes caroliniana*), bogbuttons (*Lachnocaulon* spp.), spikerushes (*Eleocharis* spp.), red ludwigia (*Ludwigia repens*), sedges (*Carex* spp.), and beakrushes (*Rhynchospora* spp.). Scattered shrubs such as groundsel bush (*Baccharis halimifolia* and *B. glomerulifolia*), St. Andrew's cross (*Hypericum hypericoides*), sandweed (*Hypericum fasciculatum*) and buttonbush (*Cephalanthus occidentalis*) may be present.

Typical vegetation of shallow marshes and the shallow edges of larger systems includes maidencane, blue maidencane, bushy bluestem, sand cordgrass, sawgrass, yellow-eyed grasses (*Xyris* spp.), redroot, bogbuttons, spikerushes, and beakrushes. Scattered shrubs such as groundsel bush, St. Andrew's cross, sandweed, and buttonbush may be present.

On the LNP site, most areas classified as freshwater marsh are successional habitats that developed after cypress swamps or pine flatwoods were logged. Vegetative composition of these systems varies depending on several factors, including hydroperiod, the nature of the community prior to disturbance, and the length of time since the disturbance occurred.

The depression marshes on the LNP site are shallow, often circular basins deepening towards the center, with herbaceous and shrub vegetation in concentric bands. The central portion of these systems is vegetated by emergent plant species such as pickerelweed (*Pontedaria cordata*), firelag (*Thalia geniculata*), and cattail (*Typha* spp.), surrounded by shrubs such as buttonbush, St. Peter's wort (*Hypericum crux-andreae*), St. Andrew's cross, and wax myrtle (*Myrica cerifera*), as well as various graminoids and forbs including maidencane (*Panicum hemitomon*), rushes (*Juncus repens, J. marginatus, J. effusus)*, beakrushes, sedges (*Cyperus* spp., *Carex* spp., etc.), yellow-eyedgrass (*Xyris* spp.), and bogbutton. Where logging is very recent and the soil is exposed, early successional species associated with disturbance, like redroot, broomsedge, bushy bluestem, dog fennel, and annual ragweed *(Ambrosia artemisiifolia*), vegetate the area. Later colonizers include wax myrtle, blackberry (*Rubus* spp.), groundsel bush *(Baccharus* spp.), buttonbush, and persimmon (*Diospyros virginiana*). Some cypress stands are not completely clearcut; instead, a few widespread individual cypress trees are left for regeneration.

The depression marshes on the mitigation sites vary greatly depending on origin. Descriptions appropriate to the individual mitigation sites are included in Section 3.

HARDWOOD CONIFER MIXED (FLUCFCS 434)

The Hardwood Conifer Mixed land cover classification describes forests in which upland conifers and hardwoods share dominance in the crown canopy. For both the LNP and mitigation sites where this classification has been used, typical species include laurel oak (*Quercus laurifolia*), sweet-gum (*Liquidambar styraciflua*), slash pine (*Pinus elliottii*), loblolly pine (*P. taeda*), live oak (*Quercus virginiana*), and cabbage palm (*Sabal palmetto*). In most cases, these sites are artifacts of past lands management where fire was excluded from flatwoods allowing colonization by hardwoods. In other areas, these may be naturally fire protected sites adjacent to wetlands.

On Boarshead Ranch, this FLUCFCS classification was used for a drier cover type characterized by an overstory of live oak (*Q. virginiana*), laurel oak and slash pine. Turkey oak (*Q. laevis*) is a representative species in certain areas. The understory is dominated by saw palmetto, wiregrass (*Aristida stricta* var. *beyrichiana*), Bahiagrass (*Paspalum notatum*), beggar's lice (*Desmodium* spp.), and milk pea (*Galactia elliottii*). Hardwood and conifer tree species surround the freshwater marsh and wet prairies on the property.

HARDWOOD - CONIFER MIXED (FLUCFCS 434)

The FLUCFCS system provides this code for forested areas in which neither upland conifers nor hardwoods achieve a 66 percent crown canopy dominance. This is a very general class that is used to handle a number of natural communities that are hard to evaluate based on overstory cover alone.

On the LNP site, this code has been used to describe an early successional, mesic community. Canopy cover in these areas consists of an even distribution of mature hardwood species including live oak and laurel oak (*Quercus laurifolia*) as well as mature conifer species including slash pine (*Pinus elliottii*) and loblolly pine (*P. taeda*). Cabbage palm (*Sabal palmetto*) and eastern red cedar (*Juniperus virginiana*) are also common in these communities. The subcanopy is predominantly composed of cabbage palm and the shrub layer is dominated by saw palmetto (*Serenoa repens*). Herbs are prevalent where sufficient light reaches the ground and consist of ferns (*Thelypteris* spp.), torpedo grass (*Panicum repens*), and slender woodoats (*Chasmanthium laxum*). Density of palmetto and grassy forbs varies within each forested area. Common vines include saw greenbrier (*Smilax bona-nox*) and muscadine grape (*Vitis rotundifolia*). Hardwood-conifer mixed forests may all be transitional communities derived from the conversion of native plant communities that have been subjected to land use practices, such as timber harvest, fire suppression, and drainage.

This code was used on the Brooker Creek Preserve area just outside of the transmission line ROW (Tampa Bay Basin). The Preserve staff has classified these areas under the FNAI system as sandhill. They are uplands characterized by high, well-drained soils that are droughty, highly-leached soils and with poor nutrient content. The canopy of longleaf pines and turkey oaks is sparse and allows for a high diversity of herbaceous floral. Fire frequency was historically high. Some are disturbed areas that were used and altered to various extents for grazing. Typical species include longleaf pine (*Pinus palustris*), turkey oak (*Quercus laevis*), bluejack oak (*Quercus incana*), persimmon (*Diospyros virginiana*), gopher apple (*Licania michauxii*), wiregrass (*Aristida stricta* var. *beyrichiana*), and golden-aster (*Pityopsis graminifolia*). Fauna include white-tailed deer, turkey, gopher tortoise, spadefoot toad, and eastern diamondback rattlesnake (Pinellas County 2008).

HYDRIC PINE FLATWOODS (FLUCFCS 625)

These are forests with a sparse to moderate canopy of slash pine *(Pinus elliottii)*. The understory is composed of grasses, wiregrass (*Aristida stricta* var. *beyrichiana*), forbs, and at times with sparse saw palmetto (*Serenoa repens*). This mapping occurs on the Brooker Creek mitigation site.

MIXED WETLAND HARDWOODS (FLUCFCS 617/630)

The FLUCFCS system defines both these systems as having mixtures of conifers and hardwoods with no species having obvious dominance. Because these generic descriptions are very broad, the ecological plant community to which they correspond varies depending on location and past land management.

On the LNP site, wetlands given these FLUCFCS codes exhibit in an impacted hydrologic regime and are located within a landscape of planted pine plantations. This community is composed primarily of pond cypress (*Taxodium ascendens*) in the canopy, with some slash pines (*Pinus elliottii*) and swamp tupelo (*Nyssa sylvatica* var. *biflora*), red maple (*Acer rubrum*), bays (*Persea palustris* and *P. borbonia*), dahoon holly (*Ilex cassine*), and occasional individuals of sabal palm (*Sabal palmetto*), hackberry (*Celtis laevigata*), and loblolly-bay (*Gordonia lasianthus*). Shrubs include gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), wax myrtle (*Myrica cerifera*) and some titi (*Cyrilla racemiflora*). Ground cover species include a variety of sedges (eg., *Cyperus* spp., *Carex* spp., *Rhynchospora* spp.), sawgrass (*Cladium jamaisence*), cinnamon fern (*Osmunda cinnamomea*), Virginia chain fem (*Woodwardia virginica*), and broomsedges (*Andropogon* spp.). The shrub stratum in many of these areas can be very dense likely as a result of some combination of logging, hydrological alteration, and fire suppression. The dominant species is fetterbush (*Lyonia lucida*) with lesser amounts of buttonbush (*Cephalanthus occidentalis*) in the deeper areas and wax myrtle on the shallower areas. Shrub cover ranges up to nearly 100 percent cover in some of these areas severely limiting access to large mammals and excluding herbaceous species via competition for rooting space and shading. Laurel greenbriar (*Smilax laurifolia*), is often found growing in combination with the fetterbush further hampering access to the interiors of these systems. Groundcover in these areas is sparse to non-existent. On the LNP site, these communities were historically basin swamp.

MIXED WETLAND HARDWOODS – LOGGED (FLUCFCS 617-1/630-1)

This is a variant of the 617/630 code that has been applied on the LNP site to describe areas that had been 617/630 but which have been logged. They are similar in species composition to the 617/630 systems described above, but have a higher degree of disturbance. They were historically basin swamps.

OTHER OPEN LANDS, RURAL (FLUCFCS CODE 260)

This is a very general cover type generally used to describe agricultural lands of indeterminate nature.

On the LNP site, the clear-cut portions of the plant site were classified as Other Open Lands, vegetated by broomsedge, redroot, dog fennel, annual ragweed, red top panicum (*Panicum rigidulum*), bracken fern (*Pteridium aquilinum*), and slash pine saplings. Relative to other areas of the LNP site, this central portion shows the most conspicuous results of prolonged silvicultural operations with a heavily scarified ground surface, scattered piles of woody debris, and a network of existing and relict logging roads.

PINE FLATWOODS FLUCFCS 411 AND 410)

Pine flatwoods (411) are defined in the FLUCFCS system as having an overstory dominated by either slash pine (*Pinus elliottii*), longleaf pine (*P. palustris*) or both and less frequently pond pine (*P. serotina*). Common flatwoods understory species include saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*), gallberry (*Ilex glabra*) and a wide variety of herbs and brush. Originally, longleaf pines were common on drier sites while slash pines, which are less fire-resistant, were confined to moister sites; wildfire being the contributing factor in this distribution. However, fire control and artificial reforestation have extended the range of slash pine into former longleaf sites. The pine flatwoods class is dominated by either slash pine, longleaf pine or both and less frequently pond pine. The code 410 has been applied to some areas of pine flatwoods that have somewhat less characteristic understory and groundcover.

The Pine Flatwoods classification under FLUCFCS maps directly into the Mesic Flatwoods FNAI Designation.

This description applies broadly to both areas mapped as 411 on the LNP site and to areas mapped as flatwoods on the mitigation sites.

RESERVOIR (FLUCFCS 520 AND 530)

Reservoirs are artificial impoundments of water. The reservoir mapped on the Brooker Creek mitigation site was apparently constructed to assist in site drainage for the utility (830) area adjacent to it. Those on the Five-Mile Creek site are a result of mining.

RESIDENTIAL LOW DENSITY <2 DWELLING UNITS (FLUCFCS 110)

In these low-density residential areas the landscape is typically dominated by Bahia grass (*Paspalum notatum*), with a few live oaks (*Quercus virginiana*) and slash pine (*Pinus elliottii*) scattered throughout. This land use was mapped on Boarshead Ranch.

ROW CROPS (FLUCFCS 214)

These areas are used for intensive agriculture. Fallow areas may be dominated by Bahia grass (*Paspalum notatum*). This land use was mapped on Boarshead Ranch.

SHRUB AND BRUSHLAND FLUCFCS 320)

This code is often used in FLUCFCS mapping to describe areas that were historically flatwoods but from which much of the canopy has been removed by management, either logging overly hot fire. As the code is general, it may also be applied to areas that have been converted to pine plantation and cleared.

In most areas mapped as shrub and brushland, other than the lack of overstory, the species composition is typical of mesic flatwoods.

On the LNP site, the area given this classification was converted to pine plantation, and wildfire destroyed the planted pine; the area was not replanted due to its small size. The area is a fairly moist area with natural pine canopy and a diverse ground cover. Species observed in this area included longleaf pine (*Pinus palustris*) and slash pine (*P. elliottii*) in the canopy; rusty staggerbush (*Lyonia ferruginea*), gallberry (*Ilex glabra*), saw palmetto (*Serenoa repens*), shiny blueberry (*Vaccinium myrsinites*), fetterbush (*Lyonia lucida*), Florida dropseed (*Sporobolus floridanus*), wiregrass (*Aristida stricta* var. *beyrichiana*), goldenaster (*Chrysopsis* spp.), black senna (*Seymeria cassioides*), panic grasses (*Panicum* spp.), witch grasses (*Dichanthelium* spp.), meadowbeauty (*Rhexia* spp.), and deer mosses.

SHRUB BOG (GOETHE SF ONLY)

These communities are typified as shrub dominated wetland systems. Based on comparison of historic and current, approximately 34% of the historic limits of shrub bog within lands slated restoration have been colonized by pine. Pine encroachment is typically present in all but the deepest portions of this community and is most prevalent in historically ditched and drained wetlands. Drained wetlands also contain a dense shrub understory and signs of soil oxidation.

WETLAND SHRUB (FLUCFCS 631)

Wetlands on the property are essentially all dominated by an assemblage of weedy shrubs including Peruvian primrose-willow (*Ludwigia peruviana*), coastal plain willow (*Salix caroliniana*), wax myrtle and groundselbush (*Baccharus* spp.). Herbaceous species present include soft rush (*Juncus effusus*), torpedo grass (*Panicum repens*), pickerelweed (*Pontederia cordata*), alligator weed (*Alternanthera philoxeroides*), smartweed (*Polygonum hydropiperoides*), cattail (*Typha* spp.) and bahia grass (*Paspalum notatum*). There are large areas dominated by a monoculture of primrose-willow. The water depth in most areas is relatively shallow during the growing season, with little of the area exceeding 2 feet in depth.

STREAM AND LAKE SWAMPS (BOTTOMLAND) (FLUCFCS 615)

This bottomland cover type consists of low-lying forest with mostly hardwoods in the vegetative canopy, often associated with streams, lakes, floodplains, or overflow areas. Dominant canopy species are red maple (*Acer rubrum*), sweet-gum (*Liquidambar styraciflua*), swamp laurel oak (*Quercus laurifolia*), water ash (*Fraxinus caroliniana*), swamp tupelo (*Nyssa sylvatica* var. *biflora*), Florida elm (*Ulmus americana* var. *floridana*), swamp bay (*Persea palustris*), and sweetbay (*Magnolia virginiana*). Cypress stumps are also common suggesting that these areas once had a higher cypress dominance and that current canopy composition is at least in part a function of past logging practices. Associated subcanopy species include coastal plain willow (*Salix caroliniana*), stiff cornel (*Cornus foemina*), black haw (*Viburnum obovatum*), wax myrtle (*Myrica cerifera*), saw palmetto (*Serenoa repens*) and buttonbush (*Cephalanthus occidentalis*). Groundcover species include bristlegrass (*Setaria geniculata*), panic grasses (*Panicum spp.*), frog-fruit (*Phyla nodiflora*), poison ivy (*Toxicodendron radicans*), and musky mint (*Hyptis alata*).

On the LNP site this community type was mapped as occurring around cypress swamps and wetland forested mixed systems, and it is seasonally flooded. The bottomland cover type has also been used in FLUCFCS mapping on several of the mitigation parcels where it has its standard definition of wetlands that occur along streams and adjacent to lakes. In this context it is defined as having a canopy of predominantly hardwood species of which some of the more common components include red maple, water oak (*Quercus nigra*), sweet-gum, willows, tupelos, water hickory (*Carya aquatica*), bays, and water ash and buttonbush. Associated species include cypress, slash pine (*Pinus elliottii*), and loblolly pine (*L. taeda*).

TREE PLANTATIONS (FLUCFCS 440)

Tree plantations (FLUCFCS 440) occur on the LNP site and on two of the mitigation sites. Most of the pine plantations are mono-specific and even-aged. The overstory is generally slash pine (*Pinus elliottii*) although loblolly pine (*P. taeda*) and longleaf pine (*P. palustris*) plantations also occur. Silvicultural management varies in intensity, and the understory and groundcover generally reflect the degrees of management intensity, stand density (denser canopied stands generally have less understory and groundcover), and variations in site preparation. In many areas, especially the LNP site and Homosassa, grading has been used as a site preparation technique. After harvest the land is graded, bedded, and replanted with pine seedlings. Bedding is a common site preparation practice where specialized equipment has been used to create continuous mounds of soil alternating with furrows. The practice enhances local drainage and seedling survival.

On the LNP site, planted pine stands are monospecific and even-aged. Typical understory and groundcover strata are generally sparse, with common species including gallberry (*Ilex glabra*), saw palmetto (*Serenoa repens*), sand blackberry (*Rubus cuneifolis*), wax myrtle (*Myrica cerifera*), wiregrass (*Aristida stricta* var. *beyrichiana*), broomsedge (*Andropogon virginicus* and *A. glomeratus*), bristlegrass (*Setaria geniculata*), blue maidencane (*Amphicarpum muhlenbergium*), musky mint (*Hyptis alata*), muscadine grape (*Vitis rotundifolia*) and greenbrier (*Smilax* spp.). In wetter areas, understory and groundcover species may include buttonbush (*Cephalanthus occidentalis*), Virginia chain fern (*Woodwardia virginica*), maidencane (*Panicum hemitomon*), and soft rush (*Juncus effusus*).

On the GSF (Wacasassa Basin), pine plantation is found throughout the mitigation areas and consists of planted slash pines. Understory is typically under-represented due to shading and a thick layer of needle duff from the planted pines and disturbance due to bedding. Understory species include saw palmetto (*Serenoa repens*), gallberry and a mix of grasses and forbs. The age of the pine trees varies from 7 to 50 years. Most of the upland plantation areas are not bedded. Thinning and prescribed burning have not occurred in these areas for a number of years.

On the Homosassa Tract (Upper Coastal), the pine plantation consists of planted slash and longleaf pines; and due to intensive management and shade, there is typically little or no ground cover)

UTILITIES (FLUCFCS 830)

The utilities FLUCFCS code is used to categorize lands whose primary use is for some form of utility such as a gas line, transmission line, or support facility.

On the LNP site, a natural gas pipeline corridor exists in the northwest corner of the site, roughly parallel to US-19/US-98. Vegetative communities along the corridor are maintained in herbaceous to shrub strata, and are dominated by early successional species including dog fennel, bluestem, goldenrod (*Solidago* spp.), bracken fern, flat-topped goldenrod (*Euthamia minor*), winged sumac (*Rhus copallina*), groundsel bush, and blackberry. Wetter areas support hydrophytic grasses and forbs, including cattail, pickerelweed, maidencane, and blue maidencane.

The Brooker Creek (Tampa Bay Basin) mitigation site is dominated by a power transmission line and a supporting substation. This line has been variously mapped under FLUCFCS with the upland areas carrying the 830 code and wetlands being mapped as marshes.

WET FLATWOODS (GOETHE SF ONLY)

In the targeted restoration areas of the GSF, this community typically exists as a narrow ecotone band or more expansive flats between the upland mesic pine flatwoods and the adjacent forested wetlands. Canopy trees are dominated by slash pine and occasional longleaf pine and contain areas of dense, tall shrub and vine growth. The current fire return interval and timber management plant implemented by GSF DOF appears sufficient to maintain vegetative assemblages and structure appropriate for this type of system.

WET PLANTED PINE (FLUCFCS 629)

This FLUCFCS code was applied specifically on the LNP site to describe wet monocultures planted slash pine and loblolly pine. These are bedded plantations and the understory consists of very little herbaceous vegetation as a result of the bedding, shading and pine straw accumulation due to fire suppression. In some areas shrub cover may be as high as 25 to 40 percent and consists primarily of wax myrtle (*Myrica cerifera*), saltbush (*Baccharis halimifolia*) and in some cases fetterbush. The groundcover of these areas would generally be described as depauperate.

WETLAND FORESTED MIXED (FLUCFCS 630)

This classification is defined as forested wetlands in which hardwoods and conifers are co-dominant in the crown canopy composition.

On the LNP site these systems are frequently found as inclusions in, or on the periphery of, cypress swamps. Common species are similar to those found in cypress swamps, but with a higher prevalence of hardwood trees such as swamp bay (*Persea palustris*), sweetbay (*Magnolia virginiana*), swamp tupelo (*Nyssa sylvatica* var. *biflora*), red maple (*Acer rubrum*), and dahoon holly (*Ilex cassine*).

On the Brooker Creek mitigation area, this code was used for areas outside the transmission line corridor owned by the Preserve and mapped by preserve staff as FNAI strand swamp.

6.4 TARGET NATURAL COMMUNITY DESCRIPTIONS

The planned mitigation efforts involve restoring the mitigation sites to their historical communities. To the extent possible, the rehabilitated mitigation area will contain the indigenous vascular plant and wildlife species that are characteristic of these communities as they occur on the LNP site and on the proposed mitigation sites on similar soils and at similar elevations above sea level. To attain success, the rehabilitated communities will resemble representative natural communities with respect to life form distribution, vertical stratification, overall plant size, species abundance, and patterns of dominance, and will substantively conform to the descriptions provided in this plan. The rehabilitation will concentrate on three levels of diversity: (1) landscape mosaic, (2) plant community structure, and (3) plant species composition. General descriptions of the target communities, as defined by the FNAI (2009), are listed alphabetically below. With the exception of mesic flatwoods and mesic hammock, all are wetlands.

6.4.1 Basin Swamps

Basin swamps typically occur in large landscape depressions. Soils are generally acidic, nutrient-poor peats often overlying a clay lens or other impervious layer.

While mixed species canopies are common, the dominant trees are pond cypress (*Taxodium ascendens*) and swamp tupelo (*Nyssa sylvatica* var. *biflora*). The term "cypress dominant" has been used to refer to basin swamps where the overstory is predominantly pond cypress. The term "hardwood dominant" has been used where the overstory is predominantly swamp tupelo or where there is a high component of other hardwoods which are usually found in shallower parts of the system or on hummocks. Other typical canopy and subcanopy trees include slash pine (*Pinus elliottii*), red maple (*Acer rubrum*), dahoon (*Ilex cassine*), swamp bay (*Persea palustris*), sweetbay (*Magnolia virginiana*), loblolly bay (*Gordonia lasianthus*), swamp laurel oak (*Quercus laurifolia*), sweetgum (*Liquidambar styraciflua*), water oak (*Quercus nigra*), green ash (*Fraxinus pennsylvanica*), American hornbeam (*Carpinus caroliniana*), and American elm (*Ulmus americana*). Depending on the hydrology and fire history, shrubs may be found

throughout a basin swamp or they may be concentrated around the perimeter. Common species include Virginia willow (*Itea virginica*), swamp dogwood (*Cornus foemina*), swamp doghobble (*Leucothoe racemosa*), coastal sweetpepperbush (*Clethra alnifolia*), myrtle dahoon (*Ilex cassine* var. *myrtifolia*), fetterbush (*Lyonia lucida*), wax myrtle (*Myrica cerifera*), titi (*Cyrilla racemiflora*), and buttonbush (*Cephalanthus occidentalis*). The herbaceous layer is also variable and includes a wide array of species including maidencane (*Panicum hemitomon*), Virginia chain fern (*Woodwardia virginica*), arrowheads (*Sagittaria* spp.), lizard's tail (*Saururus cernuus*), false nettle (*Boehmeria cylindrica*), beaksedges (*Rhynchospora* spp.), bladderworts (*Utricularia* spp.), and royal fern (*Osmunda regalis* var. *spectabilis*).

6.4.2 Bottomland Forest

Bottomland forest is a deciduous or mixed deciduous/evergreen closed-canopy forest on terraces and levees within riverine floodplains and in shallow depressions. Found in situations intermediate between swamps (which are flooded most of the time) and uplands, the canopy may be quite diverse with both deciduous and evergreen hydrophytic to mesophytic trees. Dominant species include sweetgum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*), sweetbay (*Magnolia virginiana*), swamp laurel oak (*Quercus laurifolia*), water oak (*Q. nigra*), live oak (*Q. virginiana*), and sugarberry (*Celtis laevigata*). More flood tolerant species that are often present include American elm (*Ulmus americana*) and red maple (*Acer rubrum*), as well as occasional swamp tupelo (*Nyssa sylvatica* var. *biflora*) and bald cypress (*Taxodium distichum*). Smaller trees and shrubs often include American hornbeam (*Carpinus caroliniana*), swamp dogwood (*Cornus foemina*), possumhaw (*Ilex decidua*), dahoon holly (*I. cassine*), dwarf palmetto (*Sabal minor*), swamp bay (*Persea palustris*), wax myrtle (*Myrica cerifera*), and highbush blueberry (*Vaccinium corymbosum*). The understory may be dense shrubs with little ground cover, or open, with few shrubs and a groundcover of ferns, herbs, and grasses. Ground cover is also variable. Characteristic species include witchgrasses (*Dichanthelium* spp.), slender woodoats (*Chasmanthium laxum*), and sedges (*Carex* spp.).

Bottomland forest occurs along rivers and tributaries and in somewhat isolated depressions that do not flood frequently. Bottomland forests along smaller streams are prone to periodic flooding. In floodplains along larger rivers and tributaries, bottomland forests on higher terraces, ridges, and levees are subject to short seasonal floods due to either high relief or quickly drained sandy soils or both. Soils are a mixture of sand, clay, and organic materials. The water table is relatively low in alluvial floodplains during dry periods. Inundation occurs only during higher floods.

6.4.3 Depression Marsh

Most depression marshes form where the overlying sands have slumped into depressions dissolved in underlying limestone. These marshes also frequently form an outer rim around swamp communities such as dome swamps. Depression marshes often burn with the surrounding landscape and are seasonally inundated. The deepest zones may have a peat substrate while shallower zones have a sandy substrate.

Depression marshes typically occur in landscapes occupied by fire-maintained matrix communities such as mesic flatwoods, dry prairie, or sandhill. The concentric zones or bands of vegetation are related to length of the hydroperiod and depth of flooding.

The outer, or driest, zone is often occupied by sparse herbaceous vegetation consisting of longleaf threeawn (*Aristida palustris*), beaksedges (*Rhynchospora microcarpa*, *R. cephalantha*, *R. tracyi*, *R. filifolia*, etc.), Elliott's yellow-eyed grass (*Xyris elliottii*), myrtleleaf St. John's wort (*Hypericum myrtifolium*), and patches of blue maidencane (*Amphicarpum muhlenbergianum*) or sand cordgrass (*Spartina bakeri*). This sparse zone may be followed downslope by a sparse to dense zone of sandweed (*Hypericum fasciculatum*), water toothleaf (*Stillingia aquatica*) and scattered herbs, such as fringed yellow-eyed grass (*Xyris fimbriata*), pipeworts (*Eriocaulon compressum* and *E. decangulare*), narrowfruit horned beaksedge (*Rhynchospora inundata*), and Baldwin's spikerush (*Eleocharis baldwinii*). The innermost, deepest zone is occupied by maidencane (*Panicum hemitomon*), pickerelweed (*Pontederia cordata*), bulltongue arrowhead (*Sagittaria lancifolia*), or sawgrass (*Cladium jamaicense*). Floating-leaved plants, such as white waterlily (*Nymphaea odorata*), may be found in open water portions of the marsh. Depending on depth and configuration, depression marshes can have varying combinations of these zones and species within each zone.

6.4.4 Dome Swamps

Dome swamps are functionally isolated, forested, depressions occurring within a fire-maintained community such as mesic flatwoods. These swamps are generally small, but may also be large and shallow. Pond cypress (*Taxodium ascendens*) often dominates, but swamp tupelo (*Nyssa sylvatica* var. *biflora*), may also form pure stands or occur as a co-dominant. Other canopy or subcanopy species may include red maple (*Acer rubrum*), dahoon (*Ilex cassine*), swamp bay (*Persea palustris*), slash pine (*Pinus elliottii*), sweetbay (*Magnolia virginiana*), loblolly-bay (*Gordonia lasianthus*). Shrubs are typically sparse to moderate, but often are absent in dome swamps with a high fire frequency. Common shrubs include Virginia-willow (*Itea virginica*), buttonbush (*Cephalanthus occidentalis*), coastalplain willow (*Salix caroliniana*), wax myrtle (*Myrica cerifera*), titi (*Cyrilla racemiflora*) (GSF only), and St. John's worts (*Hypericum* spp.). Herbaceous species can be dense or absent and include a wide variety of ferns, graminoids, and herbs including Virginia chain fern (*Woodwardia virginica*), royal fern (*Osmunda regalis* var. *spectabilis*), cinnamon fern (*Osmunda cinnamomea*), toothed midsorus fern (*Blechnum serrulatum*), maidencane (*Panicum hemitomon*), sawgrass (*Cladium jamaicense*), various species of beaksedge (*Rhynchospora* spp.), lizard's tail (*Saururus cernuus*), Carolina redroot (*Lachnanthes caroliana*), taperleaf waterhorehound (*Lycopus rubellus*), false nettle (*Boehmeria cylindrica*), and knotweeds (*Polygonum* spp.).

6.4.5 Flatwoods/Prairie Lake

Flatwoods lakes are similar to depression marshes but generally the open water area is proportionately larger than the open water area (which may not be present) in a Depression Marsh. For the restoration proposed at Boarshead Ranch and Five Mile Creek, the flatwoods lake will be created from existing borrow ponds by developing a broad littoral shelf. The open water area will be surrounded by a zone of species characteristic of Depression Marsh. Typical plants include spikerushes, yellow-eyed-grasses, St. John's wort (Hypericum spp.), chain fern (*Woodwardia virginica*), coastal plain willow (*Salix caroliniana*), maidencane (*Panicum hemitomon*), wax myrtle (*Myrica cerifera*), water primrose (*Ludwigia* spp.), floating heart (*Nymphoides aquatica*), buttonbush (*Cephalanthus occidentalis*), fire flag, pickerelweed (*Pontederia cordata*), arrowheads (*Sagitaria* spp.), bladderworts (*Utricularia* spp.), threeawn grasses (*Aristida* spp.), sawgrass (*Cladium jamaisence*), beakrushes (*Rhynchospora* spp.) and nut sedge (*Scleria* spp.).

6.4.6 Floodplain Swamp

Floodplain swamp is a closed-canopy forest of hydrophytic trees occurring on frequently or permanently flooded hydric soils adjacent to stream and river channels and in depressions and oxbows within floodplains. Trees are often buttressed, and the understory and groundcover are sparse. The canopy is sometimes a pure stand of bald cypress (*Taxodium distichum*), but more commonly bald cypress shares dominance with swamp tupelo (*N. sylvatica* var. *biflora*). Other canopy trees capable of withstanding frequent inundation may be present but rarely dominant, including water hickory (*Carya aquatica*), red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), and swamp laurel oak (*Q. laurifolia*). Floodplain swamp can often occur within a complex mixture of communities including alluvial forest, bottomland forest, and baygall. This produces a variable assemblage of canopy and subcanopy species, with less flood tolerant trees and shrubs found on small hummocks and ridges within the swamp. Shrubs and smaller trees such as water ash (*Fraxinus caroliniana*), titi (*Cyrilla racemiflora*), Virginia-willow (*Itea virginica*), buttonbush (*Cephalanthus occidentalis*), cabbage palm (*Sabal palmetto*), and dahoon (*Ilex cassine*) may be present. A groundcover of flood tolerant ferns and herbs are found in some floodplain swamps, including lizard's tail (*Saururus cernuus*), false nettle (*Boehmeria cylindrica*), creeping primrosewillow (*Ludwigia repens*), royal fern (*Osmunda regalis* var. *spectabilis*), smartweeds (*Polygonum* spp.), climbing aster (*Symphyotrichum carolinianum*), and string lily (*Crinum americanum*). Poison ivy (*Toxicodendron radicans*) is a frequent vine.

6.4.7 Mesic Flatwoods

Mesic flatwoods are variable depending on the geographical location, climate, fire history, human disturbance and edaphic conditions. Mesic flatwoods are relatively flat and have moderately to poorly

drained soils, and are generally acidic overlying an organic hardpan or clay subsoil. As a result of the hardpan, vegetation is under stress of saturation and drought; periodically inundated during the rainy season, and competing for water in drought conditions.

North Central Florida Flatwoods are characterized by an open canopy of widely scattered longleaf and slash pines with a generally higher density than sandhill. In the more southern mitigation areas, the pines are predominantly longleaf.

Midstory trees with a sparse distribution include red maple, sweetgum, dahoon holly, loblolly bay, and water oak with most of these trees occurring in close to wetlands or otherwise sheltered from fire. The understory shrub layer includes saw palmetto, gallberry, fetterbush, staggerbush (*Lyonia ferruginea*), dwarf huckleberry (*Gaylussacia dumosa*), wax myrtle, runner oak (*Quercus pumila)*, tar flower (*Befaria racemosa*), low growing blueberries (*Vaccinium myrsinites*, *V. darowii*) and dwarf live oak (*Quercus minima*). The shrub layer varies from sparse to dense depending on fire, growth patterns of the canopy, and slight topographical changes, creating mosaics and having a distinct stratified appearance. Grasses and forbs are abundant and dense where the tree canopy and shrub layers are open, receding to a sparse, but diversified mosaic where the canopy and shrub layers are more dense but discontinuous. Preferred species are native grasses and herbs adapted to frequent fire such as wiregrass (*Aristida stricta*), lopsided Indian grass (*Sorghastrum secundum*), blazing star (*Liatris* spp.), white-topped aster (*Sericocarpus tortifolius*), black root (*Pterocaulon pycnostachyum*), yellow-eyed grass, and gopher apple (*Licania michauxii*) among others. Palmetto (*Serenoa repens*) and gallberry (*Ilex glabra*) are common but do not dominate the landscape. Palmetto occurs in varying densities and is often found in clumps of various sizes. Gallberry is found on the wetter sites within the flatwoods and is kept to a height of no more than six feet by recurring fire.

6.4.8 Mesic Hammock

Mesic hammock is a well developed evergreen hardwood and/or palm forest on soils that are rarely inundated. Mesic hammock may occur as "islands" of high ground within basin or floodplain wetlands, as patches of oak/palm forest in flatwoods communities or in ecotones between wetlands and upland communities. Mesic hammocks are restricted to naturally fire-protected areas and edges of depressional or basin wetlands. Soils of mesic hammock are sands with high organic content in the upper horizons and often with a thick layer of leaf litter.

The canopy is typically closed and dominated by live oak (*Quercus virginiana*), with cabbage palm (*Sabal palmetto*) generally common in the canopy and subcanopy. Southern magnolia (*Magnolia grandiflora*) and pignut hickory (*Carya glabra*) may be occasional in the subcanopy. Water oak (*Q. nigra*) and laurel oak (*Q. hemisphaerica*) may also be frequent in this community. Only a few deciduous species such as sweetgum (*Liquidambar styraciflua*) and sugarberry (*Celtis laevigata*) are found in the canopy and subcanopy layers. Pine trees, particularly slash pine (*Pinus elliottii*), may form a sparse emergent layer. The shrubby understory may be dense or open, tall or short, and is typically composed of a fairly sparse mix of saw palmetto (*Serenoa repens*), American beautyberry (*Callicarpa americana*), American holly (*Ilex opaca*), gallberry (*I. glabra*), sparkleberry (*Vaccinium arboreum*), highbush blueberry (*Vaccinium corymbosum*), Carolina laurelcherry (*Prunus caroliniana*), yaupon (*I. vomitoria*), wild olive (*Osmanthus americanus*), and/or wax myrtle (*Myrica cerifera*).

Abundant epiphytes on live oaks and cabbage palms are a characteristic feature of mesic hammocks. In addition to the Spanish moss (*Tillandsia usneoides*) and epiphytic ferns such as resurrection fern (*Pleopeltis polypodioides* var. *michauxiana*), golden polypody (*Phlebodium aureum*), and shoestring fern (*Vittaria lineata*) may be present in undisturbed stands.

6.4.9 River Floodplain Lake

River Floodplain Lakes are shallow open water zones, with or without floating and submerged aquatic plants that are surrounded by Basin Swamp or Floodplain Swamp. They are generally permanent water bodies, although water levels may fluctuate substantially and they may become completely dry during extreme droughts. They are typically pools; however, during floods or following heavy rains, they may flow and overflow into adjacent areas. Except for a fringe of flood-tolerant trees, shrubs, and emergent

herbs, these areas may be open water or covered with floating-leaved emergents and submergents. When present, typical plants include fragrant water lily (*Nymphaea odorata)*, spatterdock (*Nuphar lutea*), and pennywort (*Hydrocotyle* spp.), but these generally do not cover the majority of the surface.

6.4.10 Sinkhole Lake

Sinkhole Lakes are typically in deep, funnel-shaped depressions in a limestone base. Water levels may fluctuate dramatically. These lakes are characterized by clear, alkaline, hard water with high mineral content, including calcium, bicarbonate, and magnesium. The vegetation in Sinkhole Lakes may be conspicuously absent or limited to a narrow fringe of emergents such as maidencane (*Panicum hemitomon*) at the edge of the water, or the surface may be covered by floating plants. When they occur, typical plants include American cupscale (*Sacciolepis striata*), bog moss (*Mayaca fluviatilis*) , smartweed (*Polygonum* spp.), rushes (*Juncus* spp. and *Eleocharis* spp.), bladderwort (*Utricularia* spp.), duckweed (*Lemna* spp.), watermeal (*Wolfiella* sp.), and floating ferns (*Azolla caroliniana* and *Salvinia minima*).

6.4.11 Strand Swamp

Strand swamp was included as a classification specifically because it was used as a natural community descriptor by the Brooker Creek Preserve. As this classification is typically found in South Florida, and as the site in question lacks limestone near the surface, its application at Brooker Creek is questionable. Based on our understanding of the FNAI intended definition, we believe that the wetlands given this classification on the Brooker Creek Preserve are more appropriately called Basin Swamps and/or Floodplain Swamp depending on the setting. Since none of these systems will be modified except indirectly by correcting hydrological and nuisance species problems in the transmission line corridor, we have retained this classification to maintain compatibility with the Brooker Creek Management Plan.

6.4.12 Wet Flatwoods

Wet flatwoods have a relatively open canopy of scattered pine trees with patches of thick shrubby understory, and dense ground cover of hydrophytic herbs. They occur on fairly flat, poorly drained terrain where the hardpan substantially reduces the percolation of water.

Typical wet flatwoods are open pine forests with a sparse or absent midstory and a dense groundcover of hydrophytic grasses, herbs, and low shrubs. The pine canopy typically consists of slash pine (*Pinus elliottii*). Other pines may include longleaf pine (*P. palustris*) and/or loblolly pine (*P. taeda*). The subcanopy, if present, consists of scattered sweetbay (*Magnolia virginiana*), swamp bay (*Persea palustris*), loblolly bay (*Gordonia lasianthus*), pond cypress (*Taxodium ascendens*), dahoon (*Ilex cassine*), titi (*Cyrilla racemiflora*), and/or wax myrtle (*Myrica cerifera*). Shrubs include large gallberry (*Ilex coriacea*), fetterbush (*Lyonia lucida*), titi, red chokeberry (*Photinia pyrifolia*), and azaleas *(Rhododendrum viscosum*). Saw palmetto (*Serenoa repens*) and gallberry *(I. glabra*), species characteristic of mesic flatwoods sites, may be present but typically are in low abundance. Herbs include wiregrass (*Aristida stricta* var. *beyrichiana*), blue maidencane (*Amphicarpum muhlenbergianum*), and/or hydrophytic species such as toothache grass (*Ctenium* spp.), yellow-eyed grasses (*Xyris* spp.), Carolina redroot (*Lachnanthes caroliana*), and beaksedges (*Rhynchospora* spp.), among others.

Floodplain swamp is located within floodplains of permanently moving streams. It ranges from narrow strips of cypress along small streams to expansive stands along large rivers. Soils are variable mixtures of alluvial and organic materials, sometimes with layers of sand in the subsoil. Inundation is seasonal and usually prolonged, restricting the growth of most shrubs and herbs and leaving most of the ground surface open or thinly mantled with leaf litter.

6.4.13 Wet Prairie

Wet prairie is a herbaceous community found on continuously wet, but not inundated, soils and subjected to frequent fires. It is usually dominated by dense wiregrass (*Aristida stricta* var. *beyrichiana*), which in the wetter portions, may occur with or be replaced by beaksedges (*Rhynchospora* spp.), nutrushes (*Scleria* spp.),

hooded pitcherplant (*Sarracenia minor*), Curtiss' dropseed (*Sporobolus curtissii*), blue maidencane (*Amphicarpum muhlenbergianum*), longleaved threeawn (*Aristida palustris*), pineland rayless goldenrod (*Bigelowia nudata*), toothache grass (*Ctenium aromaticum*), pipeworts (*Eriocaulon compressum* and *E. decangulare*), water cowbane (*Oxypolis filifolia*), and coastalplain yellow-eyed grass (*Xyris ambigua*) are typical species. These communities can be highly diverse (Orzell and Bridges 2006). There may also be spatial differences in moisture conditions across a wet prairie that increase diversity, as well as temporal differences in fire and flooding regime from year to year, all of which are thought to enhance species richness and diversity.

6.5 RESTORATION ACTIVITY DESCRIPTIONS

Each of the mitigation areas is unique; and to some extent, the procedures, specific activities and timing of those activities must be unique. We have divided the activities into three main categories to facilitate description with details of activities specific to individual sites described in their specific sections. As a generality, the three main categories are:

1. Hydrological enhancement by correcting culverts, raised roads, etc.;
2. Reversing silvicultural alterations; and
3. Enhancement of wetland vegetation.

The planned mitigation efforts involve restoring the mitigation sites to their historical communities and details of mitigation activities common to multiple sites are provided below.

6.5.1 Hydrological Enhancement

CORRECTION OF RAISED ROADS

In some locations where roadways were built across existing wetlands, there are opportunities to remove some/all of the fill elevating the road to bring it to pre-development grades. Such areas will be assessed by a case-by-case basis. The excess fill will be removed and will be placed either in the adjacent ditches and excavated areas which had been previously been dredged in order to provide fill for the road. An appropriate gravel/low water road will be installed (**Exhibit 6-5-1**). It will generally be at the estimated grade of the pre-existing natural wetland based on the existing remnants of those wetlands adjacent to the roadway/ditch system. All earthwork will be completed prior to any plant installation (see enhancement section).

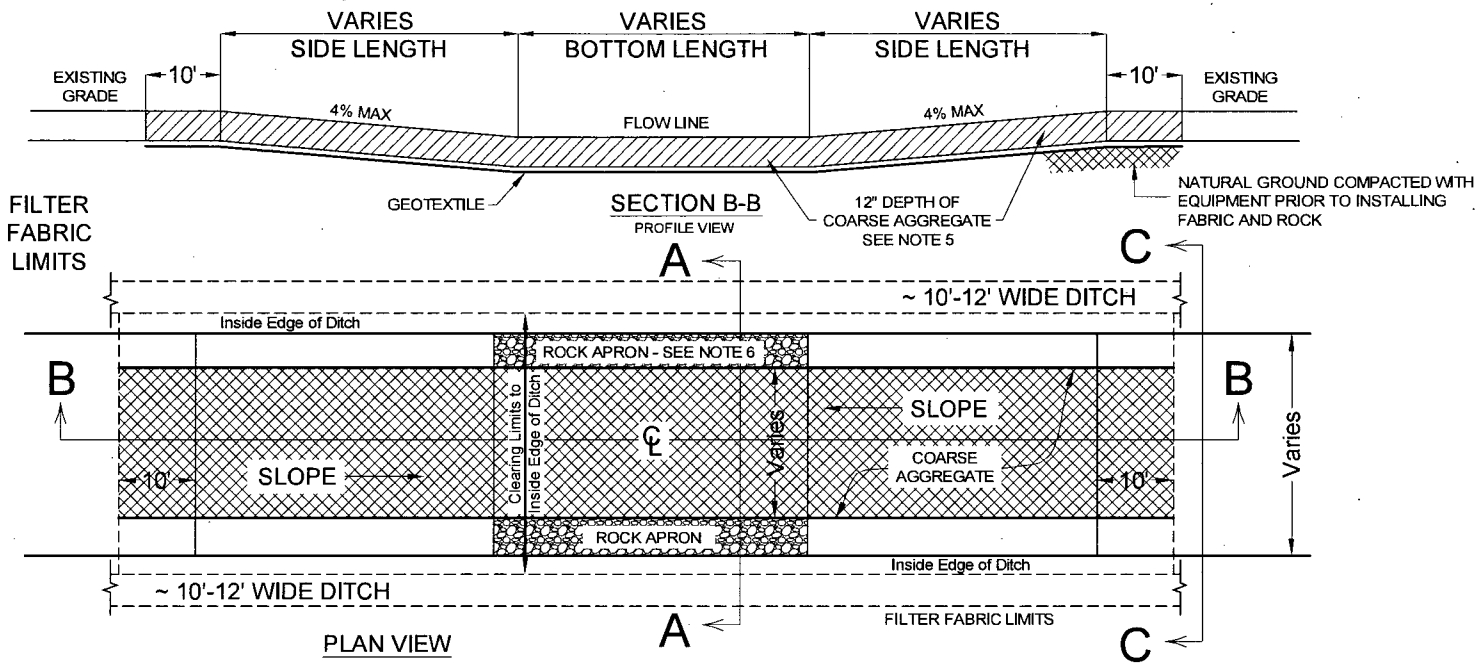
If any hydrological correction has the potential to impact off-site property without owner authorization, either authorization will be obtained or the crossing will be engineered to avoid hydrological changes to the off-site areas.

Exhibit 6-5-1 depicts a typical cross section of a raised roadway that has been redesigned to be an at-grade crossing.

IMPROVEMENT OF CULVERTS

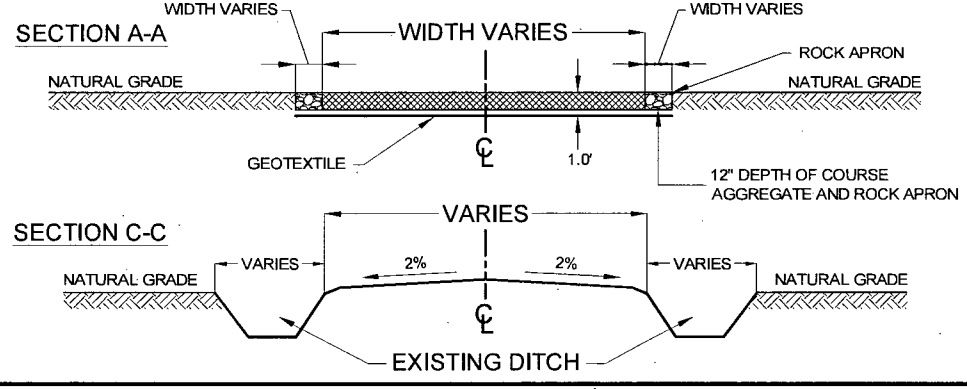
There are incidences on several sites where culverts are undersized or are associated with deeper than natural inflows and/or outfalls. These settings are individualistic in nature and are described in the relevant sections for the specific mitigation areas.

TYPICAL HARDENED LOW WATER CROSSING DETAIL



NOTES:

1. GEOTEXTILE SHALL BE A WOVEN FABRIC FOR STABILIZATION THAT CONFORMS TO FDOT DESIGN STANDARDS, INDEX 199, CLASS D-1 OF D-2
2. MINIMUM FABRIC OVERLAP SHALL BE 2 FT. ON EACH EDGE. ROCK SHALL BE PLACED ON LAP PRIOR TO PLACING ROCK ON SINGLE LAYERS OF FABRIC TO PREVENT LATERAL MOVEMENT.
3. LIMEROCK SHALL BE TRUCK DUMPED AND MACHINE SPREAD OVER THE FABRIC FOLLOWING PLACEMENT OF FABRIC.
4. COARSE AGGREGATE BASE SHALL BE 12" THICK AND CONSIST OF LIMESTONE OR GRANITE 2 TO 4 INCHES IN DIAMETER , (D_{50} = 3 INCH). WITH A MAXIMUM L. A. ABRASION LOSS OF 35%.
5. ROCK APRON SHALL CONSIST OF BEDDING STONE RUBBLE OF COBLES IN THE RANGE OF 6" - 10" WITH D_{50} OF 8 INCHES AND MAXIMUM L. A. ABRASION LOSS OF 35%. THE THICKNESS OF THE ROCK APRON SHALL BE A MINIMUM OF 12 INCHES.
6. ALL MATERIALS TO BE PROVIDED BY HE CONTRACTOR.



Exihibit 6-5-1
Typical Hardened Low Water Crossing Detail

ENTRIX
3905 Crescent Park Drive
Riverview, FL 33578-3625
ph. (813) 664-4500
fx (813) 664-0440
www.entrix.com

Coordinate System:
N/A

Date: 04/05/10 Rev. Date PM: TLB CAD Operator: JMB Project #:
File Location: Q:\UnitedStates\Florida\Tampa\6691\020working\cad\6691_020_Typical Hardened Low Water Crossing Detail_20100405.dwg

DITCH BLOCKS AND DITCH REMOVAL

Ditches that are deleteriously altering hydrology will be blocked or rendered inoperable by filling the ditch, typically with the spoil that was dredged from it, such that the surface elevation is restored to the historic land contour. If the ditch is in flat terrain and extensive and it is determined that filling the entire ditch will cause secondary impacts, a ditch block, in which only a short stretch of the ditch is filled, may be used in lieu of filling the entire ditch. **Exhibit 6-5-2** provides a typical cross section of a typical ditch removal/block.

RESTORATION OF NATURAL LAND CONTOURS

In several of the mitigation sites, the land no longer has its historic contours. The reasons vary but can generally be summarized as furrowing and bedding to establish pine plantations and mining. As the specifics are unique to sites, they are provided in the sections detailing the specific mitigation sites.

BEST MANAGEMENT PRACTICES

Best Management Practices (BMP) for the control of turbidity and erosion shall be implemented during all on-site work in accordance with the Florida Department of Environmental Protection (FDEP) Nonpoint Source Management Section inspector's manual (2008). Silt fences, staked hay bales, and/or floating turbidity curtain barriers shall be used to minimize turbid runoff into waters of the State. Erosion and turbidity control measures shall be inspected regularly. All installed turbidity control devices will remain, and be upgraded as necessary, until all grades are stabilized. Appropriately sized construction equipment will be used for each earth works activity. This will avoid or minimize incidental impacts to adjacent lands. Erosion and turbidity control measures shall be inspected regularly and turbidity monitored until work is complete. The graded areas shall be stabilized within 48 hours of attaining final grades to prevent erosion, siltation, and turbid discharges in violation of State water quality standards. In wetter areas, low-impact vehicles will be used to minimize soils disturbance. Earthworks will be prohibited following rain events to prevent rutting and turbid runoff.

6.5.2 Reversing Silvicultural Alterations

This will consist of enhancing large areas of land that have been severely graded and/or bedded and altered by silvicultural activities (LNP, Goethe SF, Homosassa Tract)

REMOVAL OF PLANTED PINES – UPLANDS AND WETLANDS

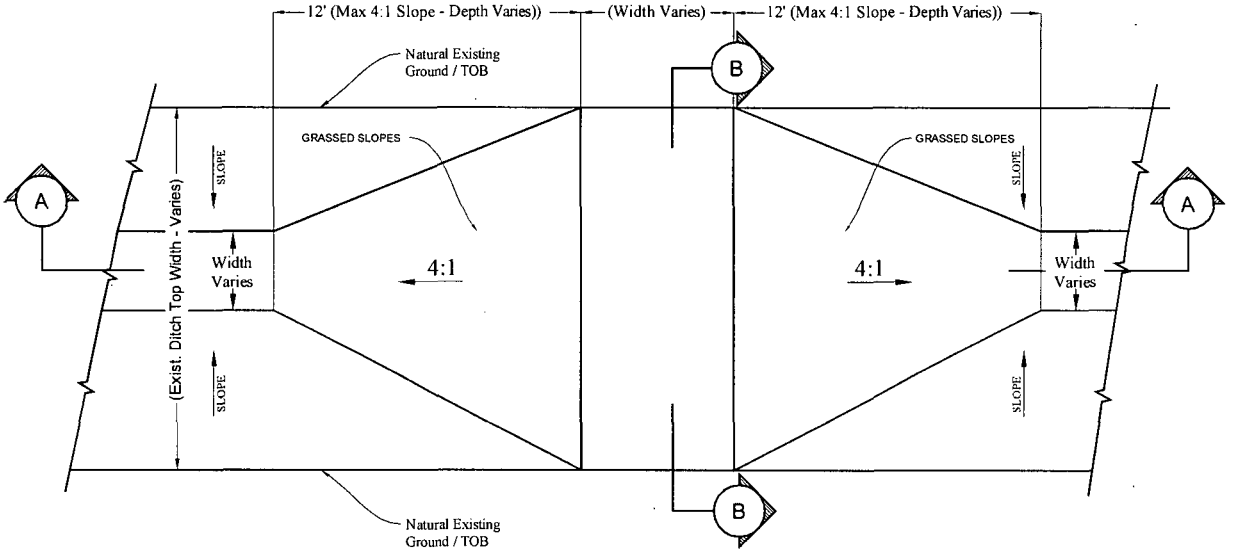
The pine plantations will be clearcut using a commercial clearcut method, although a few trees may remain as structure for wildlife. After removal of the slash pines, the sites will be burned and planted with native longleaf pine at densities ranging from 50 to 100 pines/acre.

All timber harvesting will adhere to the Florida Department of Agriculture and Consumer Services Division of Forestry BMP (FDOACS 1991). Pines will be logged using commercial timbering equipment and particular attention will be paid to the location of loading decks and limbing gates. No loading deck will be allowed in a wetland area. After a loading deck is no longer in use, the slash left on site will be spread, leaving no more than two inches of litter. No limbing gates will be allowed in a wetland area. Limbing gates will be moved to new upland locations every three to five days to preclude substantial build-up of slash.

REMOVAL OF PLANTED PINES – WETLANDS

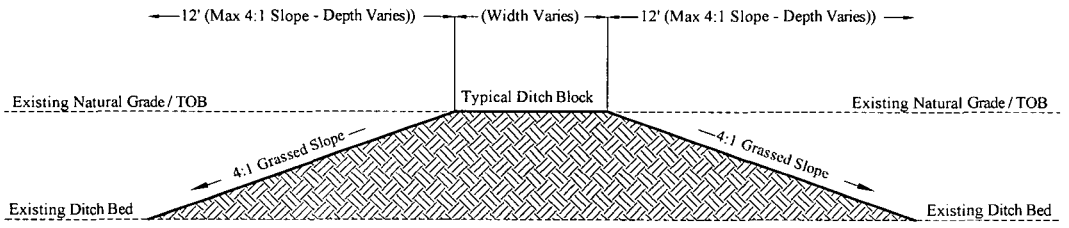
Procedures comparable to those described above will be used except that the target plant community will consist of slash pines and wetland appropriate hardwoods. Except areas that were historically wet flatwoods, pines will not be planted. Pines in areas that were historically deep water systems, such as in basin swamps and dome swamps, will be girdled or herbicided in place.

All pine removal activities will be consistent with Florida's Division of Forestry silvicultural best management practices (DOF 2009).



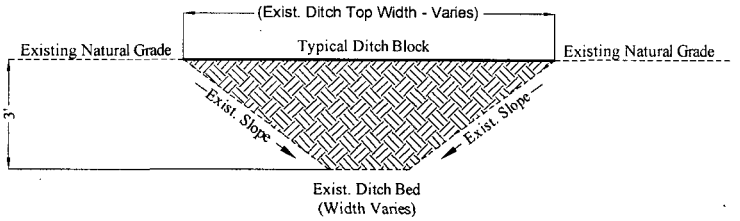
TYPICAL DITCH BLOCK

NTS



SECTION A-A

NTS



SECTION B-B

NTS

Exhibit 6-5-2
Typical Ditch Block

ENTRIX
3905 Crescent Park Drive
Riverview, FL 33578-3625
ph. (813) 664-4500
fx (813) 664-0440
www.entrix.com

Coordinate System:
N/A

Date: 04/05/10 Rev Date: PM: SRD CAD Operator: JMB Project #: 6691-020 File Location: Q:\UnitedStates\Florida\Tampa\6691\020\working\cad\Typical_Ditch_Block.dwg

RE-INTRODUCTION OF PRESCRIBED FIRE

Despite the presence of a fairly uniform canopy, most of the plantation areas have diverse ground cover, as evidenced in the area on the LNP that was burned by a wild fire in 2000. With the removal of the dense canopy the ground cover will reestablish through the seed bank, seeding from adjacent areas, and the invigoration from extended light. If, after monitoring for two years post fire, the groundcover is not sufficiently recovered, additional seeding of appropriate (mesic or wet flatwoods) species will be conducted.

Fire will be returned to the community through the application of prescribed fire. The first burn will occur during the dormant season after any canopy thinning operation has been completed. Future burns will be weighted toward the growing season. Fire will be as frequent as every two years and as infrequent as five years, on a random schedule. After the first winter burn the target will be to have a mosaic burn pattern where not all areas of a community burn during any particular fire event.

Priority burns orders are decided by the following criteria:

1. Potential for recruitment clusters for RCW;
2. Fuel reduction in unburned stands;
3. High quality habitat; and
4. Unburned, un-logged plantations.

The reduction of palmetto and other shrubs is needed to create a more diversified and contiguous layer of grasses, herbs, and forbs. In some plantations and natural pine forests, fire suppression has created saw palmetto density that is artificially high and which is suppressing what historically would have been a diverse, more open, graminoid-dominated groundcover. Fire will reduce palmetto and shrub cover allowing for groundcover recruitment. If fire is inadequate to reduce the palmetto cover, chopping (hydro-axe) or other form of mulching may be used followed six months later by a burn. Some plantations have almost no groundcover at all (fuels are present in needle drop). In these areas, fire will reduce the duff providing a suitable seed bed for appropriate groundcover species. Some plantations, after harvest, may require additional seeding of groundcover.

With numerous wetlands embedded within the mesic flatwoods, careful considerations need to be made when creating new fire lines, logging to remove the slash pine, and performing other management activities that could impair successful restoration within the landscape. If the wetland is greater than two acres and management must occur when the wetland is dry, the DOF's silvicultural best management practice (2009) of a 30'-66' buffer will be considered on a case-by-case basis. All timber harvesting will be performed in ways that will minimize disturbance to the ground cover vegetation, native fauna, or ecosystem values. Any fire lines will be restored with a rework harrow and allowed to revegetate.

NUISANCE SPECIES CONTROL

Some mitigation sites have patches of nuisance species both in wetlands and adjacent uplands. These include but are not limited to Peruvian primrose-willow (*Ludwigia peruviana*), torpedo grass (*Panicum repens*), cattail (*Typha* spp.), cogongrass (*Imperata cylindrica*), mimosa (*Albizia julibrissin*), chinaberry (*Melia azedarach*), camphor tree (*Cinnamomum camphora*), and Chinese tallow (*Sapium sebiferum* L.). Surveying will be continued for incidentals on road ways and boundaries.

In areas where fire is a management tool, it may be adequate to reduce nuisance species cover. In areas where fire is not appropriate, nuisance species will be control by the most appropriate combination of mechanical removal and herbiciding. All herbicides will be applied according to best management practices by appropriately licensed contractors. Follow-up monitoring will determine the need for additional controls on a site-specific basis.

ENHANCEMENT OF VEGETATION

Enhancement of vegetation will occur on a site-specific basis. Planting plans have been provided in the appropriate mitigation sites. Typical cross sections of the most common types of enhancement, planting of depression marshes and basin swamps are provided as Exhibits 6-5-3 and Exhibit 6-5-4. In all cases,

the palate of species to be planted will be based both on historical aerials and on the target FNAI communities.

6.6 UMAM ANALYSIS METHODOLOGY AND LOGIC

In Florida all wetland impact and mitigation areas must be assessed using the Uniform Mitigation Assessment Methodology (UMAM; Chapter 62-345, *Florida Administrative Code* [F.A.C.]). The Jacksonville District of USACE also uses this methodology for projects in Florida. The fundamental purpose of UMAM is to provide an objective assessment of the degree of wetland function being performed by the wetland(s) being assessed. In the assessment wetlands are "scored" using the rule criteria and those scores yield the relative loss of fish and wildlife and their habitat functions incurred by an impact project or the relative gain from a mitigation project.

Under UMAM each wetland, or group of similar wetlands, is considered as an Assessment Area (AA). Each AA is first described in Part I of the analysis, which sets forth the native condition of the AA and the functions it should exhibit in an optimal condition. Part II is then performed which scores the degree to which optimal functions are being performed by the AA in both the existing and proposed future conditions. For mitigation areas, the time lag until full mitigation functions are attained, as well as risk of success are accounted for and incorporated in to a final assessment of the amount of functional gain expected in each AA.

Part II is composed of three parameters that measure wetland function: Location and Landscape Support, Water Environment, and Community Structure. Each of these parameters is scored based on the level of benefits to fish and wildlife provided by the Assessment Area. Each category is assigned a numeric score ranging from 0 (inadequate conditions to provide wetland functions) to 10 (optimal condition that fully supports wetland functions and wildlife).

The methodology used for this project follows the guidelines set forth in 62-345 F.A.C. and was performed by dividing each site into separate Assessment Areas, generally on the basis of FLUCFCS. Wetlands occurring on all potential impact and mitigation sites were given a unique identifiers and were evaluated using UMAM. The assessment areas were visited by a team of ecologists to evaluate current conditions. The team was equipped with a Global Positioning System (GPS) unit, a current infrared aerial of the site and standardized data sheets. Data recorded at each site included vegetative cover and composition in all strata, presence and degree of disturbance observed, visible signs of hydrologic stress, soil characteristics, and surrounding land uses.

Upon completion of the field effort, observations were subject to quality assurance checks and refinement between teams to maintain consistency over the entire study area. A Microsoft Access database was created for the project and all information included in Part I and Part II of the UMAM analysis was entered. The current condition of each AA used as a surrogate for the "without project" condition and was compared with that projected under the proposed impact or mitigation scenarios, or "with project" condition and the Relative Functional Gain was calculated for the project.

The relative functional gain provided by the mitigation is summarized in the watershed-specific mitigation plan sections. The assumptions used for the UMAM analyses for the LNP project are provided below.

COMMUNITY STRUCTURE

Community Structure scores ranged from 4-8 on the LNP site. According to UMAM, each impact and mitigation assessment area is evaluated with regard to its characteristic community structure. According to UMAM:

> *The presence, abundance, health, condition, appropriateness, and distribution of plant communities in surface waters, functions of the community type identified are provided. Vegetation is the base of the food web in any community and provides many additional structural habitat benefits to fish and wildlife. In forested systems, for example, the vertical structure of trees, tree cavities, standing dead snag, and fallen logs provide forage, nesting, and cover habitat for wildlife. Topographic features, such as flats, deeper depressions, hummocks, or tidal creeks also provide important structure for fish and wildlife habitat. Overall condition of a plant*

community can often be evaluated by observing indicators such as dead or dying vegetation, regeneration and recruitment, size and age distribution of trees and shrubs, fruit production, chlorotic or spindly plant growth, structure of the vegetation strata, and the presence, coverage and distribution of inappropriate plant species. Human activities such as mowing, grazing, off-road vehicle activity, boat traffic, and fire suppression constitute more direct and easily observable impacts affecting the condition of plant communities. Although short-term environmental factors such as excessive rainfall, drought, and fire can have temporary impacts, human activities such as flooding, drainage via groundwater withdrawal and conveyance canals, or construction of permanent structures such as seawalls in an aquatic system can permanently damage these systems. The plant community should be evaluated to consider whether natural successional patterns for the community type are permanently altered. Inappropriate plants, including invasive exotic species, other invasive species, or other species atypical of the community type being evaluated, do not support the functions attributable to that community type and can out-compete and replace native species. Native upland and wetland vegetation, such as wax myrtle, pines and willow, which are not typically considered as invasive, can occur in numbers and coverage not appropriate for the community type and can serve as indicators of disturbance. The relative degree of coverage by inappropriate species, inappropriate vegetation strata, condition of vegetation, and both biotic and abiotic structure all provide an indication of the degree to which the functions anticipated for the community type identified are being provided.

Our scoring followed the following logic for Community Structure:

4-Hydric planted pine;

- Community structure varies throughout the hydric planted pine areas;
- Structure is limited or non-existent in many cases;
- In most cases, the structure is limited to wet prairie/marsh species;
- Pines are not naturally occurring; some areas are completely devoid of vegetation, while other areas have some herbaceous coverage (primarily limited to the furrows);
- Most areas occur within historic pine flatwoods (uplands) based on the historic aerials, or at best, the eco-tone along the edge of the forested wetlands.
- In their current condition, these areas cannot be used as habitat like a typical wet prairie/marsh would be. Bring them to areas with no structure vs. areas with some herbaceous coverage to show justification of low scores.
- Majority of plant cover is undesirable (pines),
- Minimal evidence of regeneration/recruitment,
- Age/size distribution atypical,
- Low quantity of good structure habitat,
- Minimal support for fish and wildlife;
- Land management practices resulted in alteration of natural structure and artificial features (i.e., creating wetlands as a result of bedding/furrowing).

5-Systems that are heavily logged.

- Some systems are logged in rows with significant ground disturbance and debris throughout the wetland.
- Historic community has been significantly impacted making it difficult to recruit back to the historic condition.
- In some cases, trees have been logged so severely that there are virtually no trees representative of the historic wetland, or minimal to no natural seed source to allow for recruitment of the historic condition.
- Several of these areas are transitioning to mixed hardwood communities and/or pine dominated systems;
- Heavy pine recruitment characterizes many of these wetlands. Pines can be considered invasive species on this particular site since they are not naturally occurring in the wetlands, and are acting more as opportunistic species given the surrounding seed source and the poor hydrology. Although pine is FACW for the COE, pines in many of these systems are found throughout the wetlands in the deeper zones as opposed to the periphery of the wetland.

- Some plant cover is undesirable (pines or other transitional species),
- Minimal evidence of regeneration/recruitment,
- Age/size distribution atypical,
- Low quantity of good structure habitat, but better than hydric planted pine,
- Land management practices resulted in significant alteration of natural structures,
- Minimal support for fish and wildlife.

For herbaceous, very limited structure-poor zonation and diversity, likely due to poor hydrology.

6-Step up from the 5 scores;

- These systems are also recently impacted from logging, but logging impacts are not as severe; more structure remains or has recruited back.
- There still remains a fair amount of coverage of the native trees representative of the historic condition allowing for recruitment;
- Evidence of natural recruitment;
- Pines still present, but the systems show recruitment of native species; however, in a lot of cases, these systems are not recruiting back to the historic condition (cypress domes), but rather transitioning to mixed hardwood communities;
- Some plant cover is undesirable (pines or other transitional species),
- Minimal evidence of regeneration/recruitment,
- Age/size distribution atypical but slightly better than a 5,
- Slightly higher quantity of good structure habitat,
- Land management practices resulted in significant alteration of natural structures,
- Provide some support for fish and wildlife, but less than optimal.

For herbaceous, very limited structure-poor zonation and diversity.

7-Better than a 6, but not quite an 8;

- Evidence of historic logging, but logging activity appears to be a while back allowing for recruitment of native trees;
- In many cases, there is extensive pine encroachment which has an impact on the community structure as it is not representative of the historic condition.
- Majority of plant cover is desirable, although a fair amount of pines present throughout (in lesser quantity than a 6),
- Evidence of near normal regeneration/recruitment,
- Age/size distribution typical,
- Slightly higher quantity of good structure,
- Provide some support for fish and wildlife, but less than optimal;
- Land management practices generally appropriate;

8-these systems are the highest quality for community structure onsite, although they are not ideal given the occurrence of pines throughout the wetland, which are considered to be invasive;

- Majority of plant cover is desirable,
- Cover by pines still present but lesser quantity,
- Evidence of near normal regeneration/recruitment,
- Age/size distribution typical,
- High quantity of good structure,
- Provide good support for fish and wildlife, but less than optimal;
- Land management practices generally appropriate.

WATER ENVIRONMENT

Water environment scores ranged from 3 to 7 on the LNP site. According to UMAM, each impact and mitigation assessment area is evaluated with regard to its characteristic Water Environment. According to UMAM:

The quantity of water in an assessment area, including the timing, frequency, depth and duration of inundation or saturation, flow characteristics, and the quality of that water, may facilitate or preclude its ability to perform certain functions and may benefit or adversely impact its capacity to support certain wildlife. Hydrologic requirements and tolerance to hydrologic alterations and water quality variations vary by ecosystem type and the wildlife utilizing the ecosystem. Hydrologic conditions within an assessment area, including water quantity and quality, must be evaluated to determine the effect of these conditions on the functions performed by area and the extent to which these conditions benefit or adversely affect wildlife. Water quality within wetlands and other surface waters is affected by inputs from surrounding and upstream areas and the ability of the wetland or surface water system to assimilate those inputs. Water quality within the assessment area can be directly observed or can be inferred based on available water quality data, on-site indicators, adjacent land uses and estimated pollutant removal efficiencies of contributing surface water management systems. Hydrologic conditions in the assessment area are a result of external hydrologic inputs and the water storage and discharge characteristics of the assessment area. Landscape features outside the assessment area, such as impervious surfaces, borrow pits, levees, berms, swales, ditches, canals, culverts, or control structures, may affect hydrologic conditions in the assessment area. Surrounding land uses may also affect hydrologic conditions in the assessment area if these land uses increase discharges to the assessment area, such as agricultural discharges of irrigation water, or decrease discharges, such as wellfields or mined areas.

Our scoring followed the following logic for Water Environment:

3-Highly disturbed hydroperiods, southern areas of the site

- No standing water or evidence of recent standing water
- In some cases, seasonal high water levels appears a foot or more below historic seasonal high;
- Heavy slash pine coverage recruiting throughout out the wetland, as well as other transitional species (i.e., *Lyonia*);
- Most systems are also directly surrounded by bedded pine with furrows that have intercepted the natural hydroperiod and redirected the watersheds, thereby lowering hydroperiods.
- Water level indicators not distinct; no standing water or evidence of recent standing water
- Water levels and flow not present, far less than appropriate for community type;
- Soils much drier than appropriate, soils altered from logging activity as a result of heavy equipment;
- Wetland canopy trees dead, dying, leaning or fallen;
- Plant community has some species tolerant of moderate inundation, in some case, has species tolerant of minimal inundation;
- Presence of water dependent animal species far less than appropriate relative to natural community, and upland species (ant lions) may be living in the AA;
- Transitional vegetation (pines, *Lyonia*) and dying, fallen trees shows signs of hydrologic stress.

4-Hydric planted pine

- In most cases, appears to have been pine flatwoods (uplands) historically, but hydrophytic vegetation has recruited in the furrows.
- No true hydroperiod or seasonal high water levels.
- Water level indicators not present;
- Water levels and flow less than appropriate for community type;
- Soils inappropriate;
- Plant community indicative of species tolerant of moderate inundation;
- Presence of water dependent animal species less than appropriate relative to natural community;
- Transitional vegetation shows signs of hydrologic stress.

5-Very disturbed hydroperiods, more toward the south side of the site

- No standing water or evidence of recent standing water

- In some cases, seasonal high water levels appears a foot or more below historic seasonal high;
- Heavy slash pine coverage recruiting throughout out the wetland, as well as other transitional species (i.e., *Lyonia*);
- Some of these wetland areas that have been directly bedded and furrowed or logged in rows, altering the wetland grade, thereby altering the hydroperiod.
- Most systems are also directly surrounded by bedded pine with furrows that have intercepted the natural hydroperiod and redirected the watersheds, thereby lowering hydroperiods.
- Water level indicators not distinct; no standing water or evidence of recent standing water
- Water levels and flow not present, far less than appropriate for community type;
- Soils drier than appropriate, soils altered from logging activity as a result of heavy equipment;
- Plant community has some species tolerant of moderate inundation, in some case, has species tolerant of minimal inundation;
- Presence of water dependent animal species less than appropriate relative to natural community;
- Transitional vegetation (pines, *Lyonia*) and dying, fallen trees shows signs of hydrologic stress.

6-A step up from 5 scores, some evidence of hydrologic stress and dying trees, also fair coverage of pines recruiting as a result of the altered hydroperiods;

- No standing water or evidence of recent standing water
- Most systems are also directly surrounded by bedded pine with furrows that have intercepted the natural hydroperiod and redirected the watersheds, thereby lowering hydroperiods.
- In some cases, seasonal high water levels appears a foot or more below historic seasonal high;
- Heavy slash pine coverage recruiting throughout out the wetland, as well as other transitional species (i.e., *Lyonia*);
- Water level indicators not distinct;
- Water levels and flow not present, far less than appropriate for community type;
- Soils drier than appropriate, soils altered from logging impacts as a result of heavy equipment;
- Plant community has some species tolerant of moderate inundation, in some case, has species tolerant of minimal inundation;
- Presence of water dependent animal species less than appropriate relative to natural community;
- Transitional vegetation (pines recruiting, *Lyonia*) and dying, fallen trees shows signs of hydrologic stress.

7- Best score considering the general conditions onsite; although there is no standing water, these systems appear to have the best hydrology based on the hydrologic indicators, soils and the community structure that persists. Pines still present, but generally show less coverage of pines than other systems onsite.

- No standing water or evidence of recent standing water
- Most systems are also directly surrounded by bedded pine with furrows that have intercepted the natural hydroperiod and redirected the watersheds, thereby lowering hydroperiods.
- In some cases, seasonal high water levels appears a foot or more below historic seasonal high;
- Water level indicators not as distinct as expected;
- Water levels and flow not present, far less than appropriate for community type;
- Soils drier than appropriate in most cases;
- Plant community has some species tolerant of moderate inundation, in some case, has species tolerant of minimal inundation;
- Presence of water dependent animal species less than appropriate relative to natural community;
- Transitional vegetation (pines recruiting, *Lyonia*) and dying, fallen trees shows signs of hydrologic stress.

For herbaceous systems, range from 5-7 based on community structure and vegetative coverage; very poor zonation and diversity shows evidence of poor hydrology; dog fennel recruiting in the cores where obligate species/open water previously existed.

LOCATION AND LANDSCAPE SUPPORT

USACE requested that a detailed justification be presented for the Location and Landscape scoring. As discussed with USACE we developed a list of species from a variety of trophic levels that would utilize the property in an optimal Part I condition. We scored the location and landscape criteria as described below. For the project impact AA's this resulted in scores ranging from 3-6.

We selected 5 wetland-dependent wildlife species groups or guilds and used these groups to assess the potential affects of surrounding habitat type and land use based on the assessment criteria outlined at Section 62.345.500(6)(a) F.A.C. We selected groups or guilds comprised of species whose geographic distribution included or historically included the project site and proposed mitigation areas. The species groups included common species, such as the southern leopard frog (*Lithobates* (=*Rana*) *sphenocephala*) and prothonotary warbler (*Protonotria citrea*), and uncommon or listed species, such as the swallow-tailed kite (*Elanoides forficatus*) and eastern indigo snake (*Drymarchon couperi*). We selected species for which basic life history information was available from the literature or our professional knowledge of the species biology, including reproductive biology, foraging ecology, and dispersal/movement characteristics. We selected the species guilds to reflect the habitat requirements of a variety of trophic levels likely to occupy wetlands on the LNP project area based on the habitat types present on the project site and proposed through the project's wetland mitigation plan. The following briefly summarizes the species groups selected for our analysis.

Anuran Group

We selected an Anuran Group comprised of three locally abundant frogs and toads: the southern leopard frog (*Lithobates* (=*Rana*) *sphenocephala*), southern toad (*Anaxyrus* (=*Bufo*) *terrestris*) and eastern narrowmouth toad (*Gastrophryne carolinensis*). Amphibians, including frogs and toads, are a conspicuous and significant component of wetland wildlife communities and can achieve remarkable biomass and abundance (Gibbons et al. 2006). In one 10-ha South Carolina isolated wetland, 24 species of amphibians produced more than 350,000 individual young weighing more than 1,400 kg in a single breeding season. A total of 232,095 southern leopard frogs comprised 95.9% of the amphibian biomass produced (Gibbons et al. 2006). Anurans are biphasic in their habitat use, requiring wetland habitats for reproduction and upland habitats for foraging, dispersal, and over wintering. As such, frogs may be exposed to anthropogenic perturbations that impact habitat values of either wetlands or uplands. In their wetland breeding habitats, amphibians are potentially susceptible to alterations in water quality and wetland hydroperiod timing and duration. After breeding, frogs have been documented to disperse over land for distances up to 1000 m and may spend portions of the year in suitable upland habitats. Therefore, the group may be exposed to primary, as well as secondary, affects of alterations to upland habitats. Frogs and toads are an important prey for a number of species, including snakes, wading birds, raptors, and small and medium sized mammals. Therefore, landscape-scale impacts on this group may have secondary impacts on predators of frogs and toads.

Large Snake Group

We selected the eastern indigo snake (*Drymarchon couperi*) to define a Generalist Large Snake group. The eastern indigo snake is a state and federally threatened species, whose primary threats include habitat destruction and degradation (U.S. Fish and Wildlife Service 1978, U.S. Fish and Wildlife Service 2008). The snake uses a variety of upland habitats, as well as wetland fringes, particularly during summer months for foraging on small vertebrate prey, which may include amphibians, other snakes, small mammals, and birds (Speake et al, 1981, Moler 1992). The eastern indigo snake may occupy large home ranges. In peninsula Florida, female home ranges varied from 4.75 to 375 acres and male home ranges varied from 4 to 818 acres (Moler 1985, Layne and Steiner 1996, Bolt 2006, Dodd and Barichivich 2007 in U.S. Fish and Wildlife Service 2008). Long distance movements of over one mile have also been documented for eastern indigo snakes (Moler 1985). Radio telemetry of eastern indigo snakes in Georgia suggests eastern indigo snakes avoid paved roads and urban areas (Hyslop 2007 in U.S. Fish and Wildlife Service 2008). Environmental planning for habitat generalists, such as the eastern indigo snake,

may be difficult because these species may be expected in a wide variety of habitats, but it is difficult to predict with certainty when or where they may be observed. The snake is potentially susceptible to activities that alter or fragment upland and wetland habitats or impact the production of prey species, such as amphibians. It is reasonable to assume that these species may occur in potentially suitable habitats and that they will respond positively or negatively to direct and secondary changes that result from site development or mitigation activities, including upland and wetland enhancement, restoration and creation.

Swamp Passerine Group

We selected three warblers to define the swamp passerine group: prothonotary warbler (*Protonotaria citrea*), yellow-throated warbler (*Dendroica dominica*), and northern parula (*Parula americana*). All three species have been documented to breed in the adjacent Goethe State Forest (Florida Department of Agriculture and Consumer Services undated). These warblers occupy forested habitats, including pine and hardwood-dominated uplands and swamp. Prothonotary warblers are particularly associated with forested wetlands. These birds inhabit tree canopies, where they forage on insects and seeds. The prothonotary warbler is unique among warblers in that it nests in tree cavities. The other species build nests in the tree canopy, frequently constructing the nest in or of Spanish moss. Prothonotary warblers have been well studied as a bird characteristic of bottomland swamps throughout the southeastern United States. Research has demonstrated that water depth at prothonotary warbler nesting sites and perturbation of water depth at nesting sites influences predation on prothonotary warbler nests, particularly by raccoons (*Procyon lotor*).

Swamp-nesting Raptor Group

We selected the swallow-tailed kite (*Elanoides forficatus*) to define a swamp-nesting raptor group. Swallow-tailed kites have been documented to nest in the adjacent Goethe State Forest (Florida Department of Agriculture and Consumer Services undated). Swallow-tailed kites are social and frequently occur in numbers. The birds spend a great deal of time in flight soaring effortlessly. Swallow-tailed kites prefer to nest in the highest trees emerging from a forest canopy. Nesting occurs in the spring, following return by the migrant swallow-tailed kites from their wintering grounds in Central and South America. Swallow-tail kites feed on a variety of prey. Adult prey heavily on invertebrates captured in flight or picked from vegetation without landing. Small vertebrates, such as frogs, lizards, small snakes, and birds (including nestlings) are also eaten and are important food of nestlings. Intact habitats may be important – only the largest swamp strands supported swallow-tailed kites. Alterations to wetland strand hydrology may have important secondary affects on swallow-tailed kites because impacts to community vegetation structure.

Mature Flatwoods Bird Group

In addition to the above wetland-dependent species groups, we also used Bachman's sparrow (*Aimophila aestivalis*) and the brown-headed nuthatch (*Sitta pusilla*) to define a Mature Pine Flatwoods species group. Where applicable in our analysis, this species group was used to consider potential landscape affects of the conversion and restoration of the historic pine flatwoods upland community, Bachman's sparrows inhabit open grass-dominated upland habitats. These include fire-maintained pine flatwoods and other open habitats, such as clear-cut areas, before the habitats become too overgrown. In the absence of frequent fire, potential suitable Bachman's sparrow habitat may become unsuitable in three to four years of forest regeneration or fire suppression. Bachman's sparrows nest in heavy grass cover. The birds occupy territories of 12.5 acres (Benson and Arnold 2001). Dispersal is facilitated by corridors of open habitats and may be restricted by expanses of unsuitable forested habitat and distance (SREL paper).

The brown-headed nuthatch is a bird characteristic of open pine lands. The birds forage for insects on tree bark and may move down trees head-first in a characteristic nuthatch fashion. Nesting typically takes place in cavities in snags. Cavity density may influence nuthatch density and so commercial pine plantations are typically unsuitable because of lack of nesting cavities and density of forest overstory.

Quantitative Analysis

Using the species groups outlined above, we calculated landscape/location scores for eight (8) pre-project and ten (10) post project habitat types representing 23 habitat or land use types. For scoring, natural communities of similar habitat characteristics; e.g., physical structure, hydrologic characteristics; were groups to reduce the number of habitats that had to be scored. The landscape/location score for each habitat was calculated by assigning scores of 0 to 10 for the following UMAM review criteria: Habitat Availability, Wildlife Access Barriers, Land Use Impacts, Hydrologic Impediments, and Hydrologic Impacts to Downstream Systems. A score of zero represented a particular habitat providing no habitat functions to a guild or species group. A score of 10 represented a particular habitat providing optimal habitat functions relative to an unaltered natural community. Guild Landscape Subscores were calculated as the arithmetic mean of the 5 scores assigned for the above review criteria. An Overall Habitat Landscape Score was then calculated as the arithmetic mean of the Guild Landscape Subscores.

The scores presented in **Table 6-6-1** are representative for generalized site conditions at the proposed project site and mitigation area(s). Where specific site conditions or habitat polygon characteristics warranted, these generalized landscape scores were modified (up or down) to best score the Landscape/Location characteristics of each Assessment Area.

Table 6-6-2. Summary Scores for Each Pre- and Post-project Habitat Type by Each Species Guild/Group.

FLUCFCS Code	FNAI Classification	Overall Score	Anurans	Snakes	Swamp Passerines	Raptors	Flatwoods Birds
Pre-project							
260 - Other Open Land - Pre/Post	Clearing	5.0	6.0	6.0	4.0	5.0	3.0
440 - Pine Plantation - Pre	Pine Plantation	4.0	4.0	4.0	4.0	4.0	1.0
615, 616, 617, 621, 630 - Forested Wetlands - Pre	Basin Swamp	7.0	7.0	7.0	8.0	8.0	
615-1, 616-1, 617-1, 621-1, 630-1 - Logged Forested Wetlands - Pre	Wet Clearcut Pine Plantation	5.0	6.0	7.0	4.0	4.0	
441 W, 629 - Wet Planted Pine - Pre	Wet Pine Plantation	4.0	5.0	4.0	4.0	4.0	0.0
641, 644- Marshes - Pre	Depression Marsh	8.0	7.0	7.0		8.0	
643, 646 - Wet Prairie - Pre	Wet Prairie	8.0	7.0	7.0		8.0	
831 - Power Generating Plants	Developed	1.0	1.0	1.0	2.0	3.0	1.0
832 - Electrical Distribution Line Rights-of-way	Utility corridor	4.0	5.0	5.0	4.0	4.0	3.0
814 - Roads	Road	2.0	2.0	2.0	3.0	3.0	2.0
Post-project							
	Mesic Flatwoods	10.0	10.0	10.0	10.0	10.0	10.0
	Basin Swamp	9.0	9.0	9.0	9.0	9.0	
	Depression Marsh	9.0	9.0	9.0		9.0	
	Wet Prairie	9.0	9.0	9.0		9.0	
	Developed	1.0	1.0	1.0	2.0	3.0	1.0

FLUCFCS Code	FNAI Classification	Overall Score	Anurans	Snakes	Swamp Passerines	Raptors	Flatwoods Birds
[redacted]	Utility corridor	4.0	5.0	5.0	4.0	4.0	3.0
[redacted]	Road	2.0	2.0	2.0	3.0	3.0	2.0

TIME LAG AND RISK

As part of the UMAM analysis, the following factors were taken into consideration to determine the appropriate time lag and risk factor for each mitigation area: quality of existing habitats and land uses, targeted communities (post-development), type of mitigation proposed, maintenance and management practices proposed, and the post-development scores proposed. A qualitative assessment was conducted for all habitats and land uses within each assessment area (and the surrounding landscape) to determine appropriate mitigation measures, target communities, and "with project" UMAM scores. Forested wetlands in general take far longer to become established than herbaceous systems due to the complex community structure. Therefore, any wetlands that were targeted as forested systems in the post-development condition, were naturally assigned higher time lag than herbaceous systems. The condition of these areas was also taken into consideration as much of the land targeted for mitigation has been subjected to intense silviculture and agriculture impacts. In some cases, areas with a higher level of disturbance (i.e., logged forested wetlands) were assigned higher risk scores and time lag factors where more intensive mitigation and maintenance efforts are needed to establish the desired natural community, particularly for those areas where canopy coverage and seed source was severely compromised from logging. The higher quality systems where the community structure and seed source was still intact and/or clearly regenerating, were assigned lower risk and time lag factors. The more disturbed areas (i.e., logged, overgrown with nuisance/exotic species) will require more effort and time to achieve the desired community structure and overall success. Therefore, higher risk and time lag was proposed for the poor quality forested systems where more intensive restoration/enhancement efforts and maintenance is needed to achieve success. Time lag was also determined based on the mitigation activities proposed. Those activities that were thought to result in an immediate improvement (i.e., hydrologic restoration) typically has less time lag than activities that will require time to achieve success (i.e., forested plantings).

Areas such as wetland planted pine, although highly disturbed, are expected to reach success in a shorter time period than forested wetlands as a result of the mitigation measures proposed and the herbaceous communities being targeted (wet prairie). Therefore, these areas were assigned lower risk and time lag scores. In general, the community structure for a herbaceous wetland is easier to achieve relative to forested wetlands. Therefore, herbaceous wetland communities that were targeted as a result of wetland enhancement and wetland creation were assigned lower risk and time lag factors. However, the existing condition of these areas were taken into consideration and areas with a higher level of disturbance in the pre-existing condition (i.e., croplands that are being targeted for wetland creation) were given higher risk scores relative to existing herbaceous wetlands where the vegetation and hydrology already exists. The more disturbed areas will likely require more restoration/enhancement efforts, as well as maintenance/management to achieve success. Therefore, risk and time lag was adjusted accordingly to ensure that success will be achieved for the targeted communities based on the proposed "with project" scores.

The condition of the surrounding landscape was also taken into consideration and the risk was adjusted accordingly. Areas surrounded by natural landscapes were typically considered to be of lower risk and areas surrounded by altered landscapes (agricultural, silviculture, roadways) are considered to be of higher risk. In some cases, where higher post-development scores were used (i.e. 9's & 10's), higher risk and time lag was used to ensure that success could be achieved relative to the proposed "with project" scores.

Time lag and risk factors are included in the UMAM Summary Tables (included in each watershed section).

6.7 MONITORING

The planned mitigation efforts involve restoring the site to the pre-pine plantation/historical communities. Target habitat types to be restored or enhanced as mitigation will be mixed hardwood forest, cypress dominated forest, mixed forested wetland, herbaceous marsh, and wet prairie. To the extent possible, the restored or enhanced mitigation areas will contain the plant and wildlife species that are characteristic of these communities. Monitoring methods will document that each target community will resemble representative communities with respect to plant community structure and species composition. Incidental observations of wildlife will be reported to document use by animal species that commonly occur in the target habitat. Hydrologic conditions will be noted and recorded. Also any problems or management needs will be noted and corrective work implemented or proposed will be reported.

To monitor the condition of the mitigation efforts, a series of transects will be established in each target habitat type. One transect in each 50 acres of habitat, with each individual mitigation site having at least one transect irrespective of site size For sites that are small enough to be seen in entirety from a single point, the transect may consist of that single point. Photostations will be permanently established at strategic locations on each transect. Transect locations will be shown on a plan view drawing of the relevant site. Photostation locations also will be shown. Along each transect sampling points will be established at which the following information will be recorded:

1. Date of planting and, if applicable, number of each species installed;
2. Total percent cover by desirable vegetation;
3. Percent cover by any specific species group as required to meet success criteria for any given mitigation area (see Section 6.8);
4. Percent cover of nuisance/exotic species;
5. Percent survival of each planted species, if applicable;
6. Water depths and/or a description of soil moisture;
7. Lists of dominant plant species and an estimate of the cover of each in each stratum;
8. For forested sites, growth and mortality rates of planted trees;
9. For sites with specific canopy, subcanopy, or shrub basal area or density requirements, the basal area or density as required for that mitigation area;
10. Observations of wildlife use;
11. Problems encountered and corrective actions implemented or proposed; and
12. Number of plants replanted, if necessary, and planting date.

These data will be summarized in a tabular style report for ease of review and comparisons from year to year. In addition to transect data, an overall description of each target habitat will be noted and reported. Included with this information will be notes regarding the condition of planted vegetation cover by nuisance and desirable vegetation, wildlife observations and any problems observed.

Water levels (in feet) or soil conditions will also be recorded at each sampling. Where no standing water is present, general moisture content of the soil will be noted.

Where target habitats are to be forested, either through recruitment or supplemental planting, growth of trees will be measured through comparison of photographs taken from permanent photostations.

Each photostation for this purpose will be located on a four by four-inch fence post buried in the ground with four feet above the ground. The camera will be placed on top and each photograph will be taken with the same camera settings so comparisons can be made from year to year.

6.8 MAINTENANCE AND MANAGEMENT

The key to a successful mitigation program is typically the effort used to ensure its success. PEF will use an adaptive management concept of management and maintenance to assure success. An adaptive management program is one where ongoing monitoring of current conditions is used to determine management needs, and where the management protocols can be modified if warranted by changes in

conditions (such as wildfire, hurricanes, off-site hydrological alterations, hogs, etc.). If new conditions warrant new maintenance and management, the needed maintenance and management are added to the management program.

PEF will retain a Qualified Environmental Professional (QEP) to oversee the adaptive management program and to see that all needed maintenance is performed. This person will be qualified to do more than spray herbicide, rather, it is someone who can identify possible causes of problems and manage them to eliminate the causes. The goal is to ongoingly identify any conditions that need to be remedied for the site to attain success in accordance with the time schedule used in the UMAM analysis.

The maintenance most likely to be needed is nuisance species control. This will entail the most appropriate combination of manual removal and herbicide treatment to control invasive nuisance vegetation, while allowing for the growth of beneficial native species. On sites, such as the transmission line corridor through Brooker Creek, PEF may also remove high growing woody species that would be considered desirable in other settings. All herbicide products will conform to all Environmental Protection Agency (EPA) and Department of Natural Resources (DNR) regulations, and will be applied by an experienced, State-licensed, aquatic herbicide applicator. Target species will be those that could adversely the success of the mitigation effort. Target species will primarily those species listed as category I and II invasive exotic plant species (pursuant to the list established by the Florida Exotic Pest Council at www.fleppc.org). However, weedy native species (specifically cattails) will also be controlled to facilitate the establishment of target communities.

In the event of weather patterns that lead to poor survival of planted species or where gaps were left due to nuisance species removal, replanting of desirable native vegetation may be needed. The specific species and numbers of plants will be determined by the QEP. Plants will be planted during periods when water levels and soils are appropriate to survival of the young plants.

In areas where hydrological alterations have been made to re-establish more natural conditions, the QEP will use the monitoring data and site observations to determine if the alterations are working as anticipated, and if appropriate wetland hydrology has not been achieved, the QEP may suggest alterations to further improve the hydrology of the site. These improvements will be made as soon as hydrological conditions allow.

Other conditions which could inhibit success, such as severe rooting by feral hogs, will be addressed if they should arise.

The frequency of maintenance will be specific to the site and will vary with time. More frequent maintenance is typically needed early in the mitigation sequence and will typically decrease in frequency and intensity with time. Depending on the site, maintenance will initially be conducted semiannually or quarterly depending on conditions at the site

6.9 SUCCESS CRITERIA

Success criteria for the types of communities proposed in this plan are provided in this section.

The mitigation shall be deemed successful when all of the following criteria have been met after a period of at least one full year without intervention in the form of artificial manipulation of water levels or replanting of desirable vegetation.

Each mitigation plan was developed using historical aerial photographs, soils maps, existing condition observations, and any constraints imposed by required site usage (such as consistency with a transmission main at Brooker Creek or forestry mandates at the Homosassa Tract or Goethe State Forest), major past land alterations (deep borrow ponds at Five Mile Creek). The ultimate goal of the plan is to restore natural processes to the site such that a self-sustaining, functioning ecosystem results.

6.9.1 Community Requirements

6.9.1.1 Basin Swamp and Dome Swamp

Basin swamps and dome swamps shall be restored or enhanced as described in Section 6.4.1 and 6.4.4. The following criteria shall be met:

1. Non-nuisance, native wetland ground and shrub species are healthy, reproducing naturally and exhibiting the cover and diversity typical of habitat as described in Section 6.4.1 or 6.4.4, as appropriate. This ground cover shall be 75% or greater (except in open water area) when canopy cover is less than 30% due to immature trees. As canopy matures, or in those cases where there is already canopy, lower percentage ground cover is appropriate due to shading, and this decrease will not preclude a success determination.
2. For the systems identified as logged at the time of permitting, the desirable canopy tree cover is increasing annually. Success will be considered achieved when at least 30% canopy cover has been achieved, not including shrub species. The plants are reproducing naturally, either by normal, healthy vegetative spread (in ways that would be normal for each wetland species) or though seedling establishment, growth and survival.
3. The plants are reproducing naturally, either by normal vegetative propagation or through seedling establishment, growth and survival.
4. Nuisance and exotic species cover is limited to 5% or less of total cover/acre.
5. Any residual layer of pine needs layer will be 2 inches or less in thickness, and the associated water regime will be such that decomposition and/or conversion to muck is in progress.

6.9.1.2 Depression Marsh

Depression marsh shall be restored or enhanced to jurisdictional depression marsh as described in Section 6.4.3. The following criteria shall be met:

1. Species composition shall consist of 75% or greater those listed in Section 6.4.4 unless a site-specific species list has been prepared in which case the site-specific list will supersede.
2. The collective cover of pioneer *Andropogon* spp. shall not exceed 25% of the total cover along any monitoring transect.
3. Total cover of woody shrub species shall not exceed 20% unless allowed in a site-specific list.
4. Total tree density shall not exceed 5 trees/acre unless allowed in a site-specific list.
5. Appropriate plants are reproducing naturally, either by normal vegetative propagation or through seedling establishment, growth and survival.
6. Nuisance and exotic species cover is limited to 5% or less of total cover/acre.

6.9.1.3 Mesic Flatwoods

Mesic flatwoods shall be restored or enhanced to uplands as described in Section 6.4.7. The following criteria shall be met:

1. Groundcover species composition of 30% or greater graminoids unless a site-specific species list has been prepared in which case the site-specific list will supersede. Each area of 5-acres or more shall contain at least 25 desirable species.
2. The collective cover of pioneer *Andropogon* spp. shall not exceed 25% of the total cover along any monitoring transect.
3. Gallberry, wax myrtle, fetterbush and other woody shrubs shall be no taller than the coppice sprouts that could arise from root crowns following the most recent fire.
4. Total basal area of trees trending toward an eventual 40-70 sq ft/ac, which should result in an average of 60-112 mature trees/acre.
5. Appropriate plants are reproducing naturally, either by normal vegetative propagation or through seedling establishment, growth and survival.
6. Nuisance and exotic species cover is limited to 5% or less of total cover/acre.

6.9.1.4 Mesic Hammock

Mesic hammock shall be restored or enhanced to uplands as described in Section 6.4.8. The following criteria shall be met:

1. Total basal area of trees trending toward an eventual 70 or more sq ft/ac, which should result in an average of at least 112 mature trees/acre. At least 5 appropriate tree species are present in any 5-acre area.
2. A subcanopy shall be present with an eventual density of 50 small trees or more per acre as described in Section 6.4.6. At least 3 species of subcanopy trees shall be present in any 5-acre area.
3. The collective cover of pioneer species shall not exceed 25% of the total cover along any monitoring transect. At least 10 species of appropriate shrubs and herbaceous plants shall be present in any 5-acre area.
4. Appropriate plants are reproducing naturally, either by normal vegetative propagation or through seedling establishment, growth and survival.
5. Nuisance and exotic species cover is limited to 5% or less of total cover/acre.

6.9.1.5 Flatwoods/Prairie Lake

Flatwoods/prairie Lake shall be restored or enhanced to as described in Section 6.4.5. The following criteria shall be met:

1. Species composition shall consist of 75% or greater those listed in Section 6.4.5 unless a site-specific species list has been prepared in which case the site-specific list will supersede.
2. The collective cover of pioneer *Andropogon* spp. shall not exceed 25% of the total cover along any monitoring transect.
3. Total cover of woody shrub species shall not exceed 20% unless allowed in a site-specific list.
4. Total tree density shall not exceed 5 trees/acre unless allowed in a site-specific list.
5. Appropriate plants are reproducing naturally, either by normal vegetative propagation or through seedling establishment, growth and survival.
6. Nuisance and exotic species cover is limited to 5% or less of total cover/acre.

6.9.1.6 Wet Flatwoods

Wet flatwoods shall be restored or enhanced to jurisdictional depression marsh as described in Section 6.4.12. The following criteria shall be met:

1. Groundcover species composition of 75% or greater graminoids unless a site-specific species list has been prepared in which case the site-specific list will supersede. Each area of 5-acres or more shall have at least 75 desirable species.
2. The collective cover of pioneer *Andropogon* spp. shall not exceed 25% of the total cover along any monitoring transect.
3. Gallberry, yaupon holly, wax myrtle, fetterbush, and other woody shrubs shall be no taller than the coppice sprouts that could arise from root crowns following the most recent fire.
4. Total basal area of pines (*P. elliottii*) trending toward an eventual 40-70 sq ft/ac, which should result in an average of 60-112 mature trees/acre.
5. Appropriate plants are reproducing naturally, either by normal vegetative propagation or through seedling establishment, growth and survival.
6. Nuisance and exotic species cover is limited to 5% or less of total cover/acre.

6.9.1.7 Wet Prairie

Wet prairie shall be restored or enhanced to jurisdictional wet prairie as described in Section 6.4.13. The following criteria shall be met:

1. Groundcover species composition of 75% or greater graminoids unless a site-specific species list has been prepared in which case the site-specific list will supersede. Each area of 5-acres or more shall have at least 75 desirable species.
2. The collective cover of pioneer *Andropogon* spp. shall not exceed 25% of the total cover along any monitoring transect.
3. Gallberry, yaupon holly, wax myrtle, fetterbush, and other woody shrubs shall be no taller than the coppice sprouts that could arise from root crowns following the most recent fire.
4. Overstory absent or consisting of pines (*P. elliottii*) and having no more than 10 trees/acre.
5. Appropriate plants are reproducing naturally, either by normal vegetative propagation or through seedling establishment, growth and survival.
6. Nuisance and exotic species cover is limited to 5% or less of total cover/acre.

6.9.2 Hydrologic Criteria

1. All low water crossings installations/removals, bridge and creek road crossing removals, and ditch fill areas have been completed to the satisfaction of the regulatory agencies, are stabilized showing no signs of erosion, and have operated as designed without repair for a period of two years;
2. There is no evidence of washouts, erosion, or other indications of unnatural channelized water flow;
3. Where installed, staff gauges indicated that surface water elevations have met design goals (hydroperiods and water depths) for the specific site for at least two years;
4. Each site shall demonstrate a trend toward having appropriate hydric soils per USDA-Natural Resource Conservation Service hydric soil identification criteria.