3.0 WACCASASSA AND WITHLACOOCHEE WATERSHEDS – LEVY NUCLEAR PLANT SITE

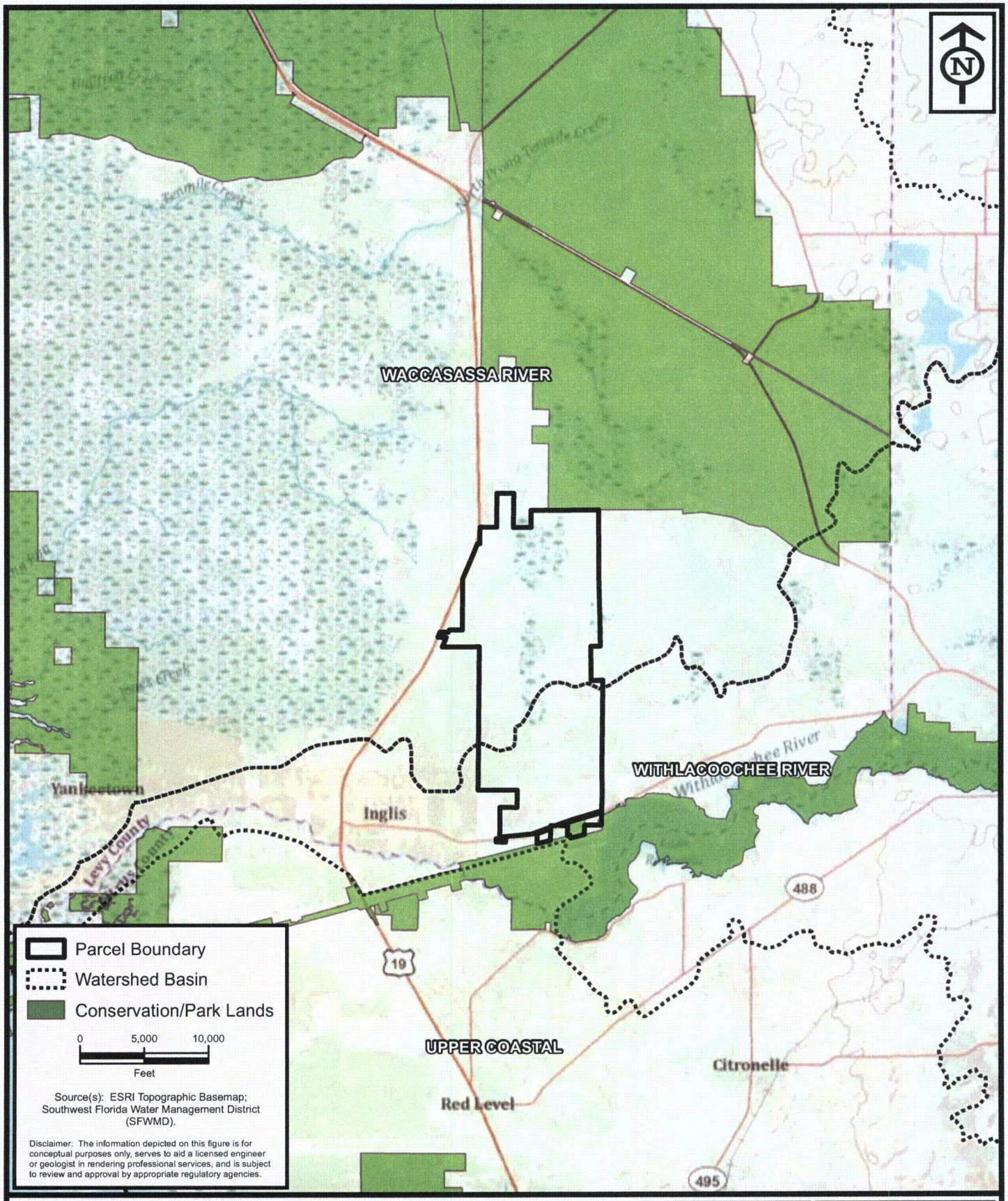
3.1 Introduction

The proposed wetland impacts for LNP are summarized in Table 1-1 and the mitigation plan for the 556.2 acres of impact (-231.6 UMAM units; -11.5 herbaceous units and -220.1 forested units) in the Waccasassa and Withlacoochee Basin are partially contained in this section. The LNP on-site mitigation will produce 372.9 UMAM credits. This section of the overall mitigation plan provides the details for the LNP on-site mitigation.

The LNP mitigation site is located on a PEF-owned parcel in Levy County, Florida (Figure 3-1). This parcel abuts the southwestern portion of the Goethe State Forest parcel to the north and a portion of the 110 mile Cross Florida Greenway (Inglis Island) to the south (Figure 3-2). The enhancement/restoration activities proposed at LNP will improve the link between these two regionally significant preserves and will ultimately result in an ecologically improved and protected corridor between these two large systems.

3.2 Impact Summary

The wetland impacts within the Waccasassa and Withlacoochee Watersheds for LNP site development and associated transmission line impact total approximately 556.2 acres. These impacts will generate a total loss of 231.6 functional units (-11.5 herbaceous and -220.1 forested). The impact summary is provided on Table 3.1 (below). The majority of these impacts will be the result of permanently clearing and filling existing forested wetlands, with a smaller portion coming from clearing and filling of herbaceous and open water wetlands. The proposed mitigation plan for LNP on-site will provide for 372.9 functional units of lift within the Waccasassa and Withlacoochee Watersheds, of which 317.1 functional lift units will be in the Waccasassa Watershed and 55.8 functional gain units will be in the Withlacoochee Watershed. Furthermore, within the Waccasassa Watershed, 16.5 functional units of lift will be provided to offset herbaceous and open water impacts, while 300.6 functional units of lift will offset the forested wetland impacts. Within the Withlacoochee Watershed, 2.4 functional units of lift will be provided to offset herbaceous and open water impacts, while 53.4 functional units of lift will offset the forested wetland impacts. (Section 3.6 provides details of the UMAM scores).



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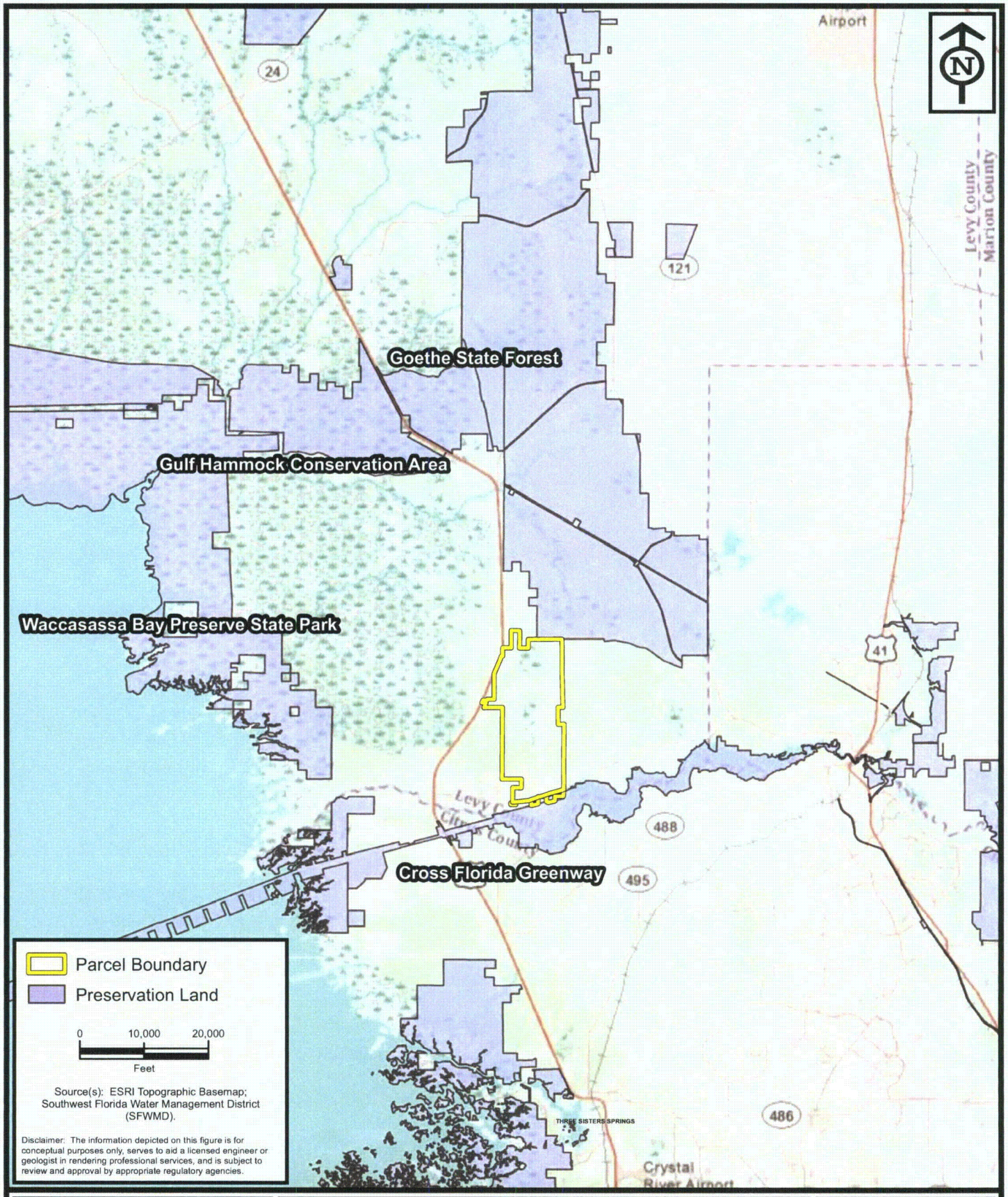
Waccasassa River and Withlacoochee River Watersheds

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	July 2011
Drwn/Chkd:	JRN/JGB
Figure:	3-1

Path: Q:_Projects\EJ\2011\021\00\fig\LNP_Plant\Report\Pro_basin.mxd Date: 7/25/2011 9:19:53 AM



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Regional Preservation Land

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	July 2011
Drwn/Chkd:	JGB/JRN
Figure:	3-2

Path: Q:_Projects\EJ\2011\021\00\fig\LNP_Plant\Report\Pro_location.mxd Date: 7/7/2011 11:28:37 AM

Table 3-1. Waccasassa and Withlacoochee Watershed wetland impacts by UMAM functional loss and acreage

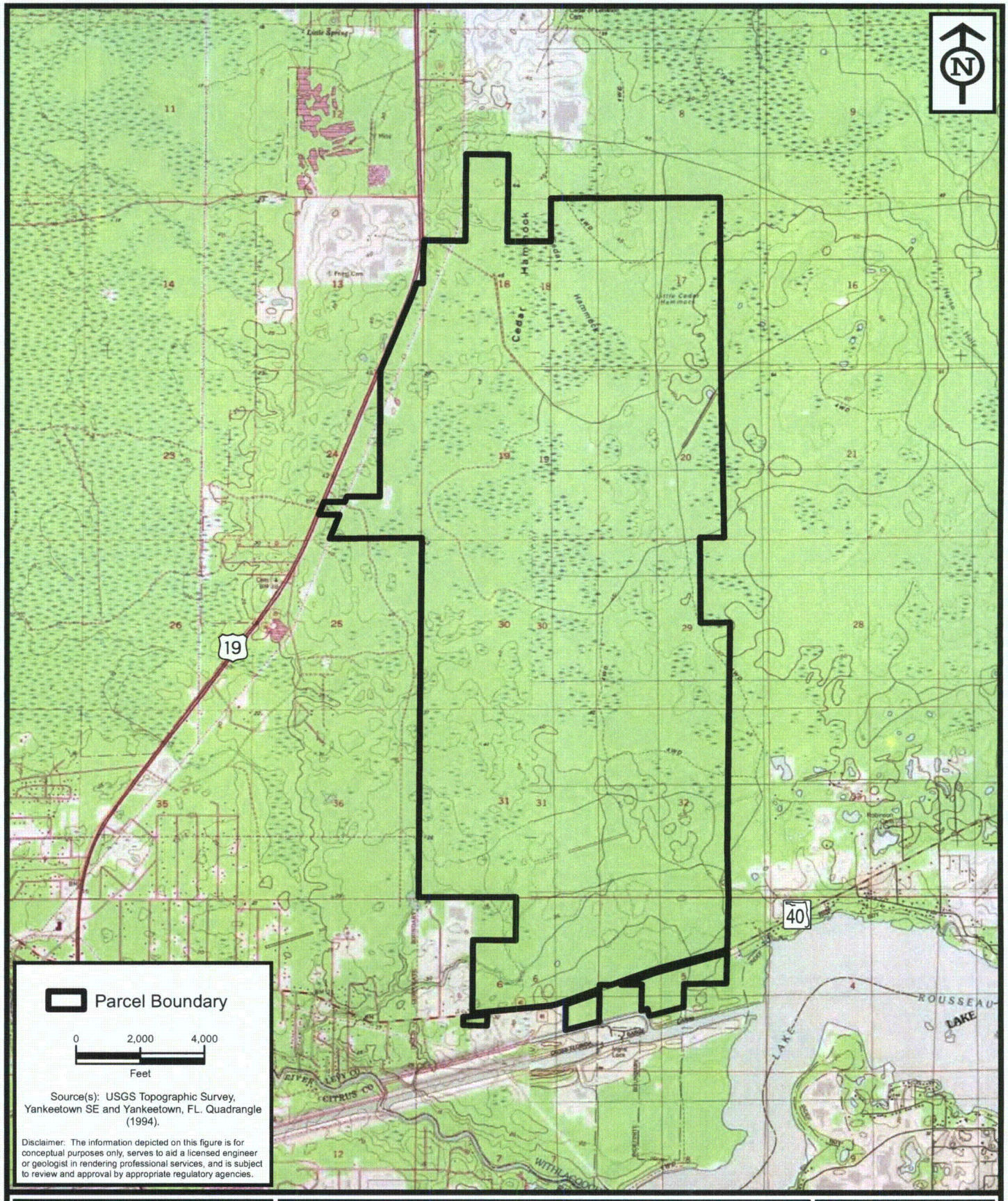
Watershed	Herbaceous Wetland Functional Loss Units	Herbaceous Wetland Acreage	Forested Wetland Functional Loss Units	Forested Wetland Acreage	Total Functional Loss Units	Total Acreage Impacted
Waccasassa	-1.3	2.6	-181.7	385.5	-183.0	388.1
Withlacoochee (plant site)	-0.4	2.4	-29.2	124.7	-29.6	127.1
Withlacoochee (trans. lines)	-9.8	13.8	-9.2	27.2	-19.0	41.0
Total	**-11.5**	**18.8**	**-220.1**	**537.4**	**-231.6**	**556.2**

3.3 Site Description

The LNP site is located in Sections 17-20 and 29-32, Township 16 South, Range 17 East; and Sections 5 and 6, Township 17 South, Range 17 East in Levy County, FL (Figure 3-3). The total area of the LNP parcel is approximately 5,200 acres, but the proposed enhancement/restoration activities for this project are located primarily in the four mitigation zones, comprised of 1,548.7 acres. Water in the northern portion of the site (Waccasassa watershed) flows north through the Goethe State Forest site and water in the southern portion of the project area (Withlacoochee watershed) flows west and south (Figure 3-4). As noted above, the LNP on-site mitigation is divided along two separate watersheds, the Waccasassa and the Withlacoochee. The majority of the on-site mitigation lies within the Withlacoochee watershed.

3.3.1 Historic Conditions

Historically, the property consisted primarily of pine plantation and is currently being used for silvicultural practices. On-site hardwood wetlands have been avoided to the greatest extent practicable. Traditional silvicultural practices have resulted in ditching, trail roads, and bedding rows.



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Project Location

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	July 2011
Drwn/Chkd:	JRN/JGB
Figure:	3-3

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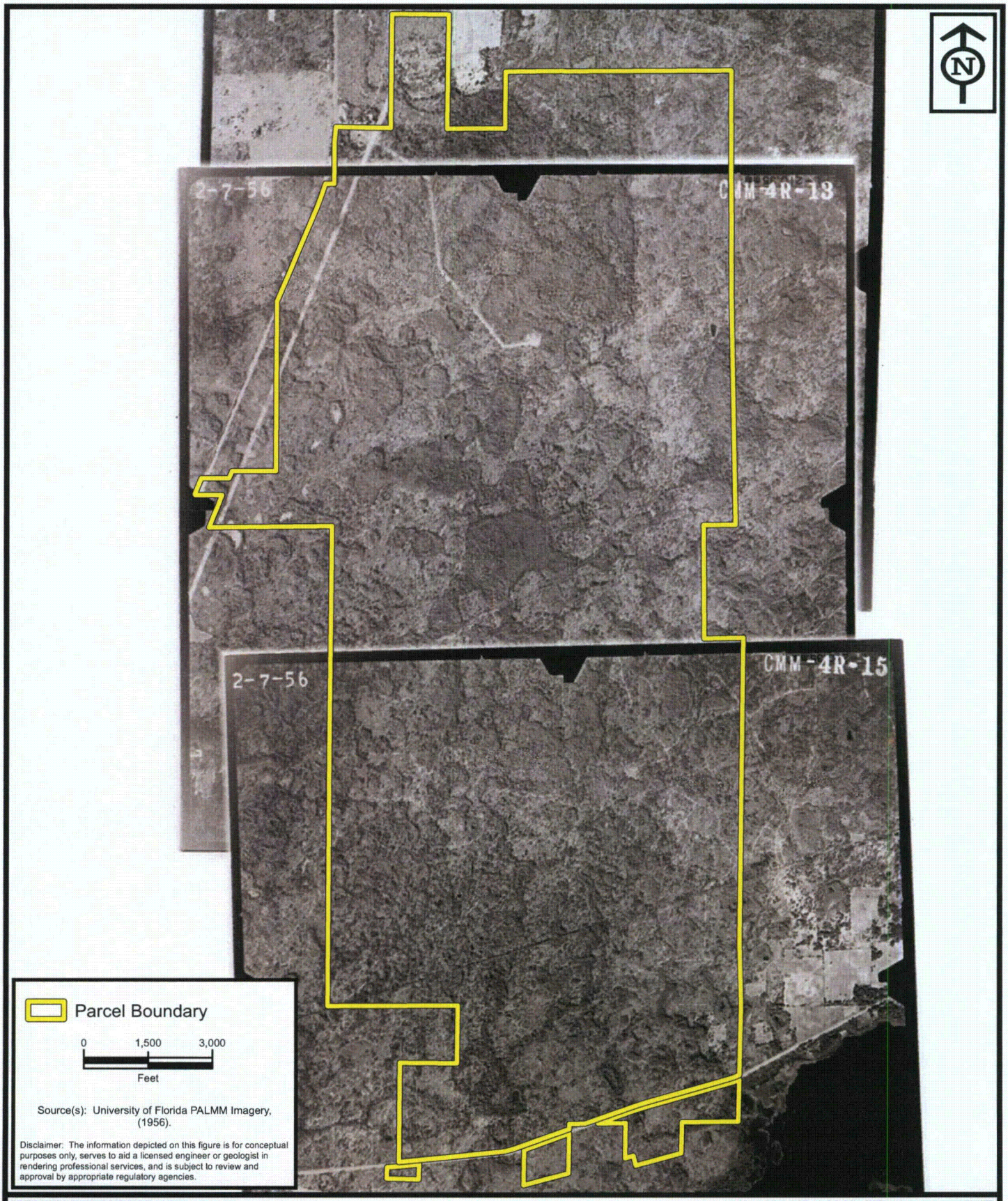

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1956 Historic Aerial Imagery

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	Junly2011
Drwn/Chkd:	JRN/JGB
Figure:	3-4

Path: Q:_Projects\EJ\2011\021\00\fig\LNP_Plant\Report\Pro_historic.mxd Date: 7/8/2011 3:40:53 PM

3.3.2 Current Conditions

Various habitat types are present at the LNP site including pine plantation, surrounding forested and herbaceous wetlands, and several areas cleared of vegetation. Many of the existing habitats are highly degraded from historic land disturbances.

FLUCFCS was used to determine the different community types on site. Please see the LNP Community Map (Figure 3-5) for details of the specific community locations.

Uplands

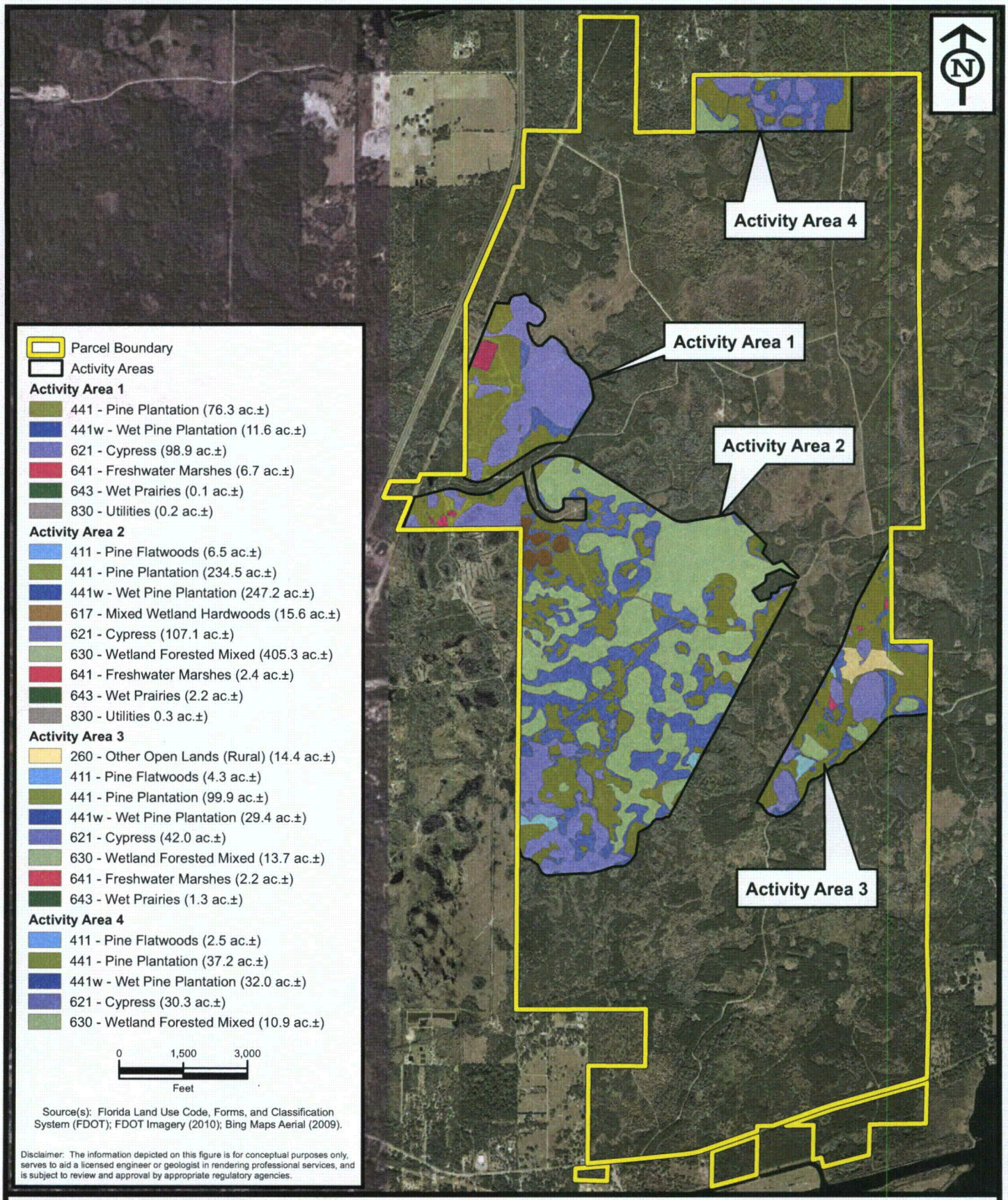
1. Open Rural Lands (FLUCFCS 260). Several acres within the mitigation activity areas have been previously cleared and are not currently planned for any specific use. The vegetation growing there is a mix of opportunistic pioneer species.

2. Pine Flatwoods (FLUCFCS 411). On-site uplands not in silvicultural rotation are dominated by a mixture of mesic and slightly xeric pine flatwoods. The canopy consists of predominantly longleaf pine and some slash pine. The subcanopy and shrub layer includes saw palmetto, gallberry, and shiny blueberry. The groundcover is predominantly grasses, including wiregrass, panicgrasses, and broomsedges.

3. Pine Plantation (FLUCFCS 441). A majority of on-site uplands are in silvicultural rotation as pine plantation. The canopy consists of predominantly slash pine. The subcanopy and shrub layer includes saw palmetto, gallberry, and shiny blueberry. The groundcover is predominantly grasses, including wiregrass, panicgrasses, and broomsedges.

Wetlands

1. Mixed Wetland Hardwoods (FLUCFCS 617). This community type is dominated by bald cypress and swamp tupelo. Other canopy or subcanopy species include red maple, dahoon, swamp bay, slash pine, sweetbay, loblolly bay. Shrubs include fetterbush, common buttonbush, wax myrtle, titi, and St. John's wort. Herbaceous species include Virginia chain fern, royal fern, cinnamon fern, maidencane, sawgrass, various species of beaksedge, lizard's tail, Carolina redroot, and sphagnum moss.



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Mitigation Activity Area - Existing Community Map

Levy Nuclear Plant Site

Levy County, Florida

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Date:	Aug 2011
Drwn/Chkd:	JRN/JGB
Figure:	3-5

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2. Cypress (FLUCFCS 621). This community type is dominated by bald cypress. Other canopy or subcanopy species include swamp bay, slash pine, and loblolly bay. Shrubs include fetterbush, common buttonbush, and St. John's wort. Herbaceous species include Virginia chain fern, cinnamon fern, maidencane, sawgrass, various species of beaksedge, and sphagnum moss.

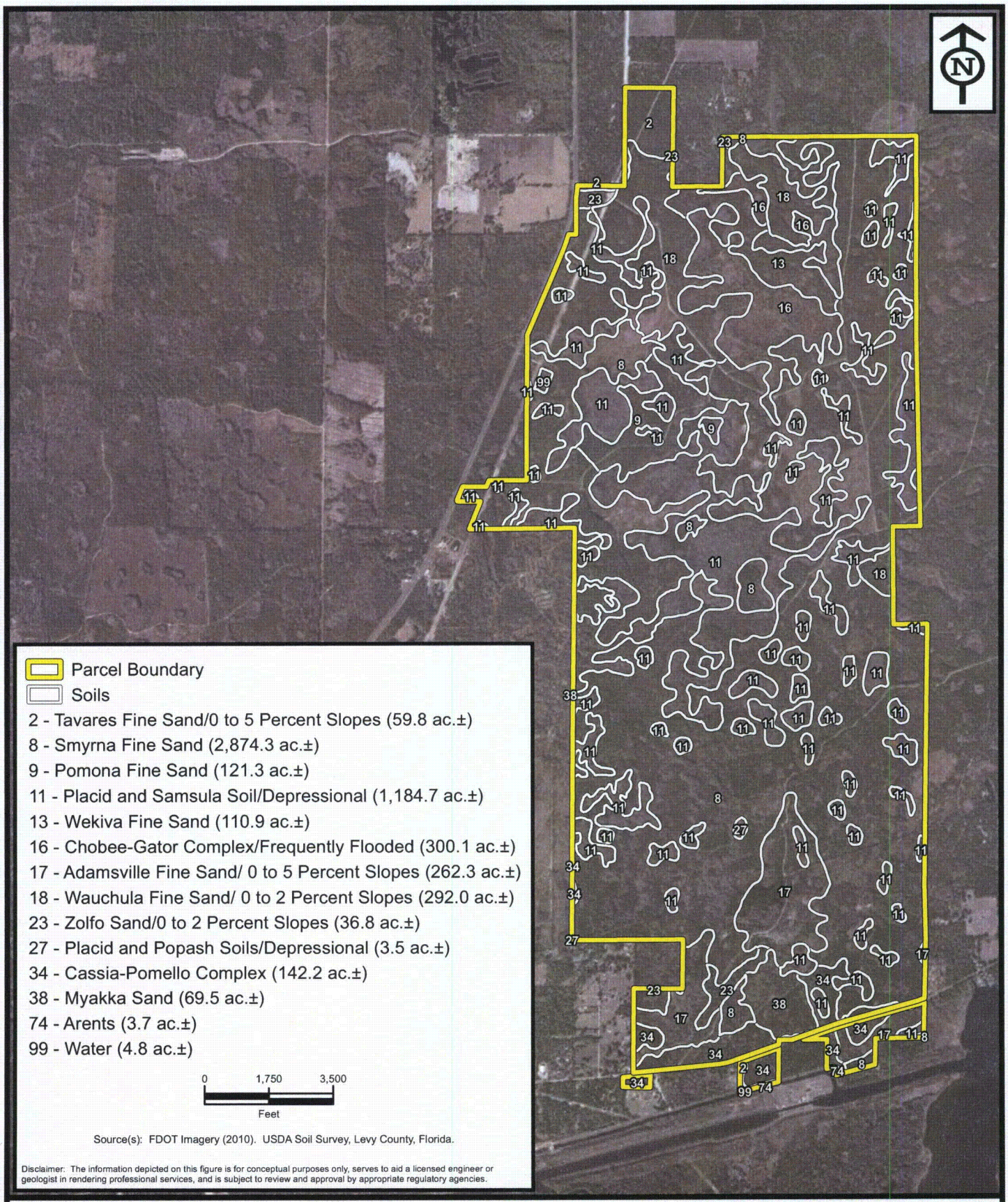
3. Wetland Forested Mixed (FLUCFCS 630). This community type is an even mixture of bald cypress, loblolly bay, and slash pine. Shrubs include fetterbush, common buttonbush, and St. John's wort. Herbaceous species include Virginia chain fern, cinnamon fern, maidencane, sawgrass, various species of beaksedge, and sphagnum moss.

4. Freshwater Marshes (FLUCFCS 641). This community is composed of a mixture of sawgrass, arrowhead (*Sagittaria* spp.), maidencane, needlerush (*Juncus effuses*), and cattail (*Typha* spp.).

5. Wet prairies (FLUCFCS 643). This community is composed of a mixture of sawgrass, maidencane, needlerush, St. Johns wort, yellow-eyed grass (*Xyris* spp.), and whitetop sedge (*Dichromena colorata*).

3.3.3 Soils

According to the NRCS soil map for Levy County, thirteen soil types are present on the LNP site along with open water (Figure 3-6). The NRCS soils are listed in Table 3-2.



Source(s): FDOT Imagery (2010). USDA Soil Survey, Levy County, Florida.

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NRCS Soils

Levy Nuclear Plant Site

Levy County, Florida

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Date:	July 2011
Drwn/Chkd:	JRN/JGB
Figure:	3-6

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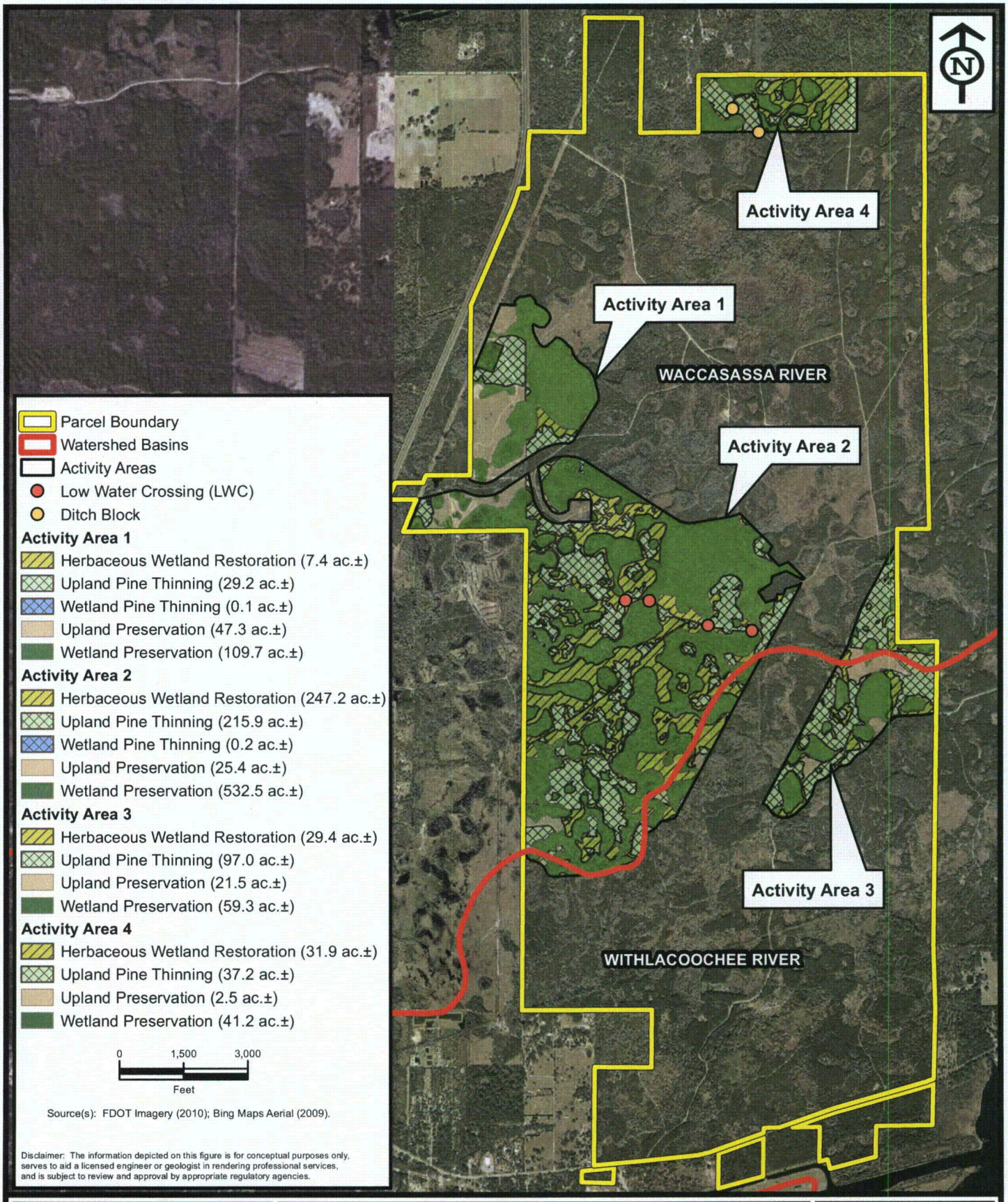
Table 3-2. LNP on-site soil types

NRCS Soil Type	Hydric	Acreage
2 Tavares Fine Sand	No	59.8
8 Smyrna Fine Sand	No	2,874.3
9 Pomona Fine Sand	No	121.3
11 Placid and Samsula Soils, depressional	Yes	1,184.7
13 Wekiva Fine Sands	Yes	110.9
16 Chobee-Gator Complex, frequently flooded	Yes	300.1
17 Adamsville Fine Sand; 0-5% slopes	No	262.3
18 Wauchula Fine Sand	No	292.0
23 Zolfo Sand	No	36.8
27 Placid and Popash Soils, depressional	Yes	3.5
34 Cassia-Pomello Complex	No	142.2
38 Myakka Sand	No	69.5
74 Arents, 0-5% slopes	No	3.7
99 Water	Yes	4.8

3.4 Mitigation Plan

The mitigation plan for LNP is a mixture of hydrologic enhancement to restore natural flow patterns and targeted pine thinning and clearing in silvicultural areas to restore normal pine community densities with embedded depressional hardwood forested and cypress swamps and herbaceous wetland habitat (Figure 3-7 through 3-7d).



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Mitigation Activity Areas

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JRN/JGB
Figure:	3-7

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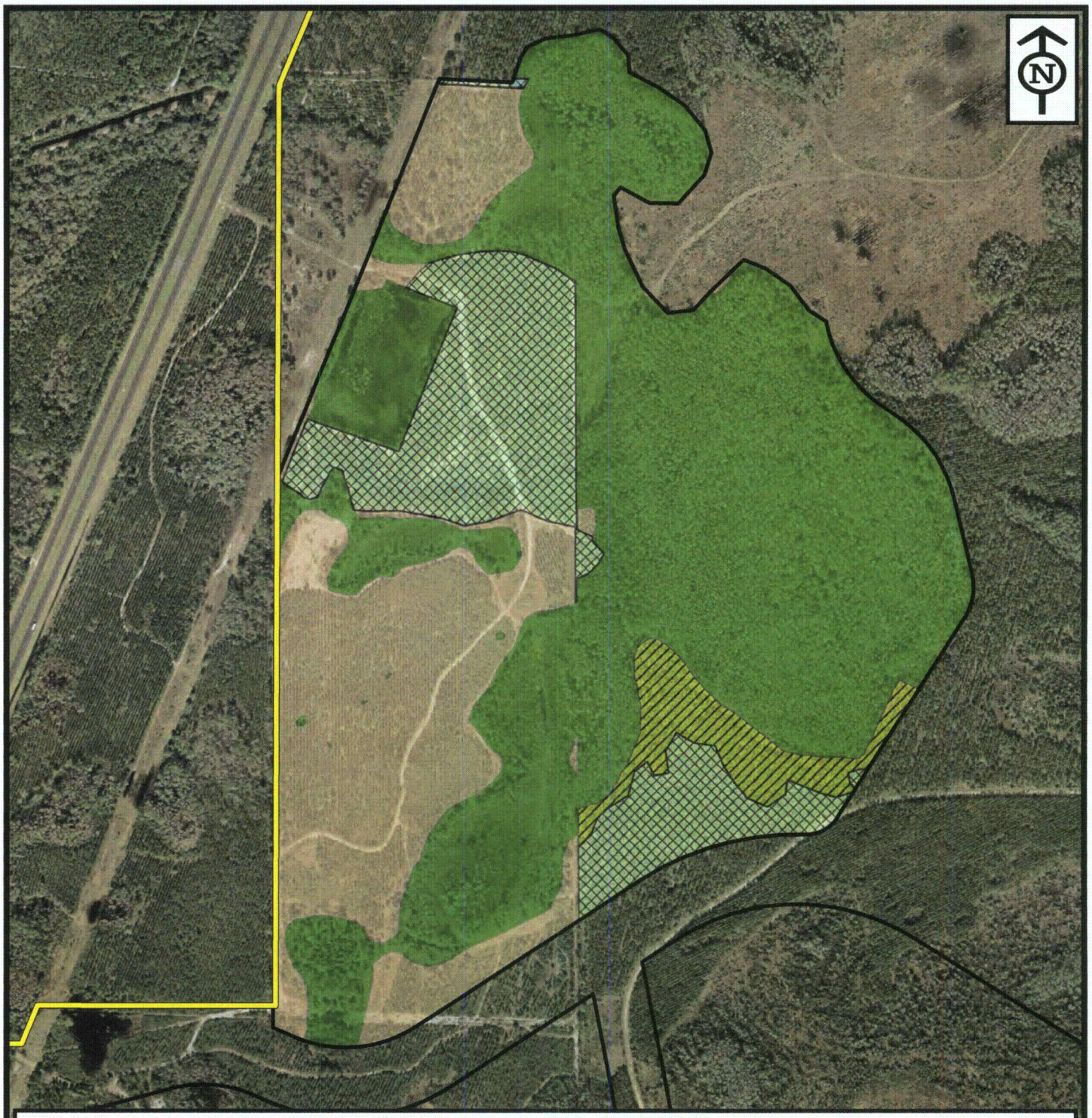

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Feet

Source(s): FDOT Imagery (2010); Bing Maps Aerial (2009).

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Parcel Boundary
Activity Areas
Low Water Crossing (LWC)
Ditch Block

Activity Area 1
Herbaceous Wetland Restoration (7.4 ac.±)
Upland Pine Thinning (29.2 ac.±)
Wetland Pine Thinning (0.1 ac.±)
Upland Preservation (47.3 ac.±)
Wetland Preservation (109.7 ac.±)

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Mitigation Activity Area 1

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JRN/JGB
Figure:	**3-7a**

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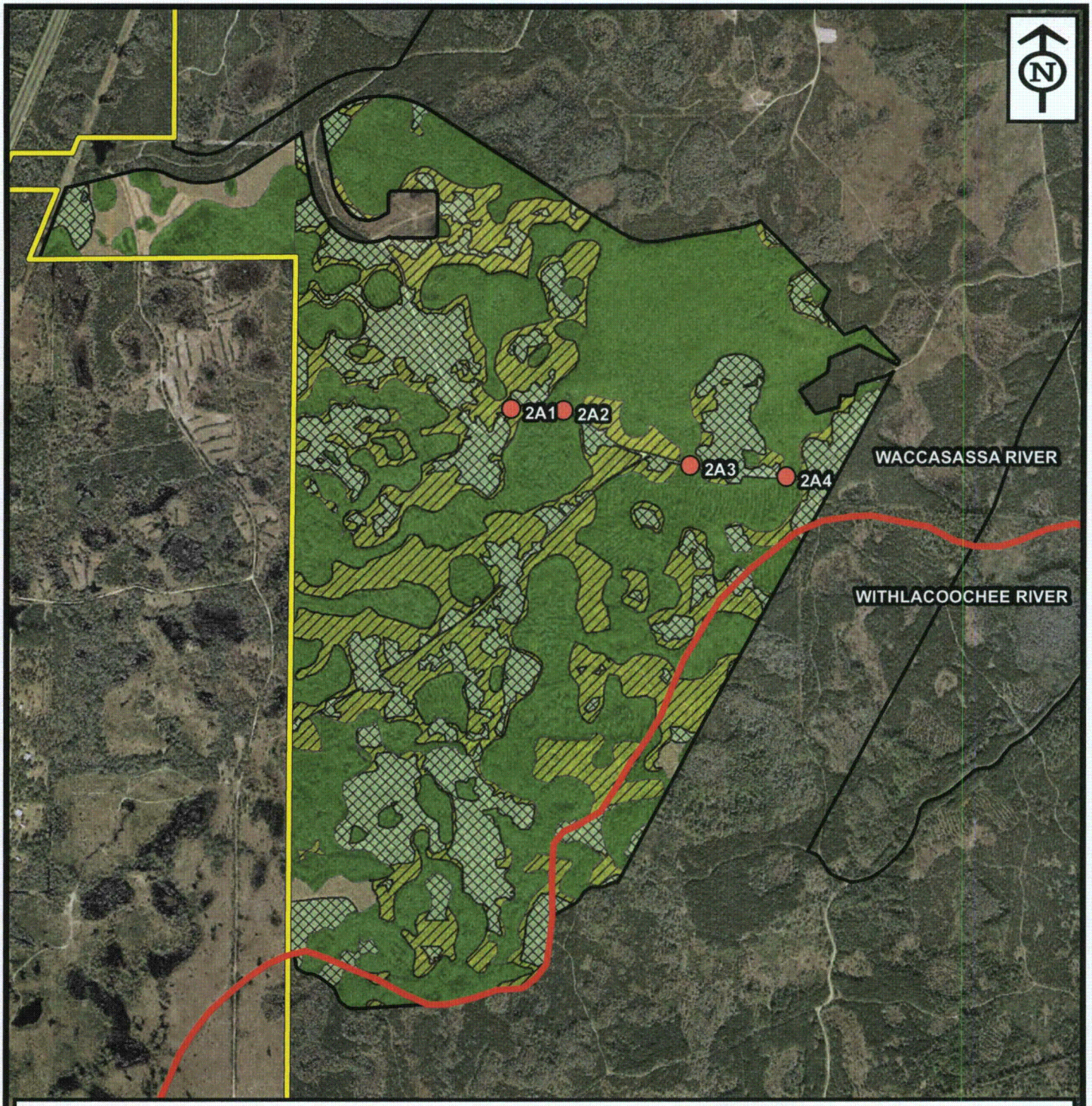

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Source(s): FDOT Imagery (2010); Bing Maps Aerial (2009).

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- Parcel Boundary
- Watershed Basins
- Activity Areas
- Low Water Crossing (LWC)
- Ditch Block

Activity Area 2

- Herbaceous Wetland Restoration (247.2 ac.±)
- Upland Pine Thinning (215.9 ac.±)
- Wetland Pine Thinning (0.2 ac.±)
- Upland Preservation (25.4 ac.±)
- Wetland Preservation (532.5 ac.±)

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Mitigation Activity Area 2

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JRN/JGB
Figure:	**3-7b**

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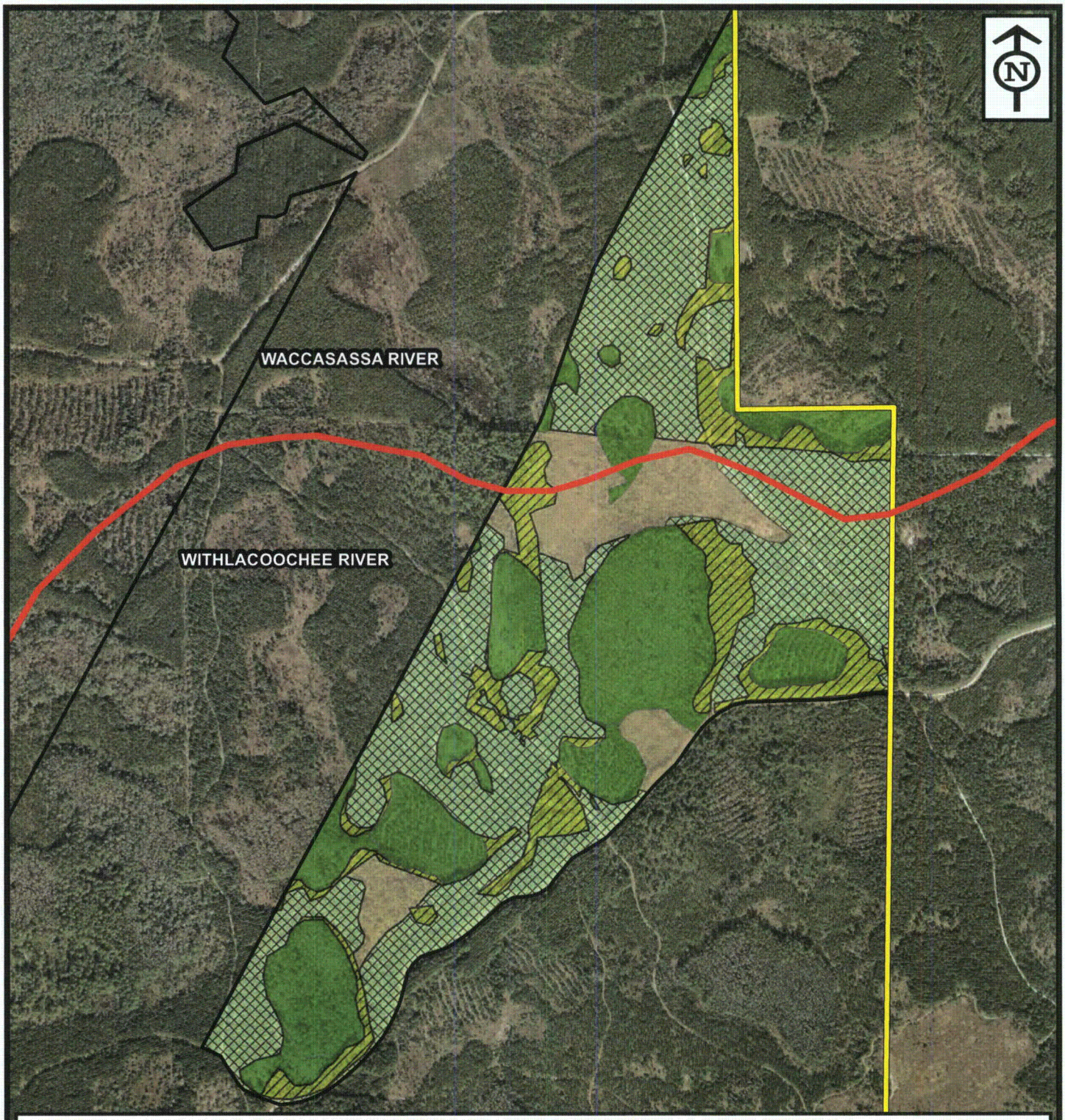

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Feet

Source(s): FDOT Imagery (2010); Bing Maps Aerial (2009).

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- Parcel Boundary
- Watershed Basins
- Activity Areas
- Low Water Crossing (LWC)
- Ditch Block

Activity Area 3

- Herbaceous Wetland Restoration (29.4 ac.±)
- Upland Pine Thinning (97.0 ac.±)
- Upland Preservation (21.5 ac.±)
- Wetland Preservation (59.3 ac.±)

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Mitigation Activity Area 3

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JRN/JGB
Figure:	**3-7c**

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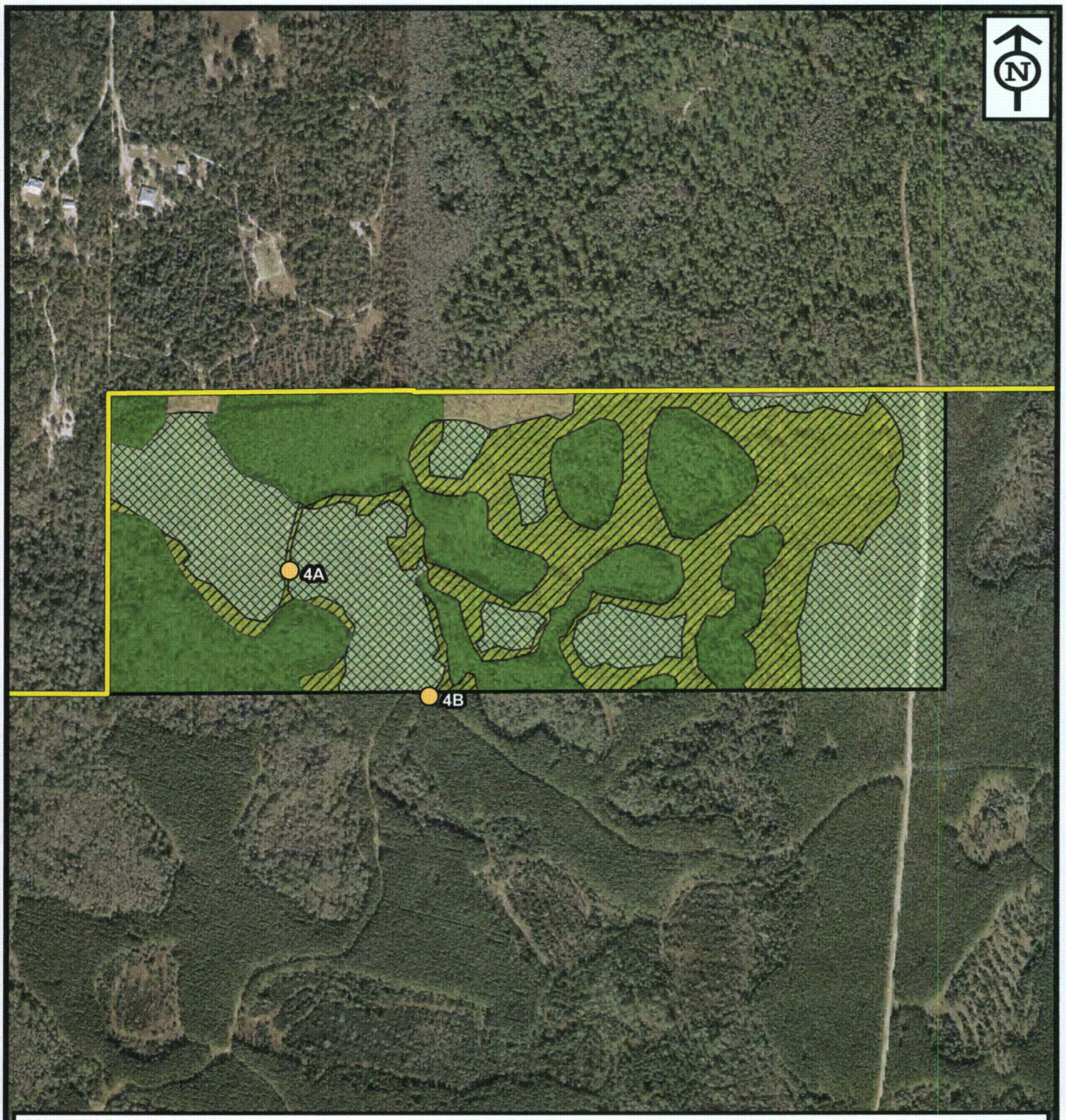

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Source(s): FDOT Imagery (2010); Bing Maps Aerial (2009).

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- Parcel Boundary
- Activity Areas
- Low Water Crossing (LWC)
- Ditch Block

Activity Area 4

- Herbaceous Wetland Restoration (31.9 ac.±)
- Upland Pine Thinning (37.2 ac.±)
- Upland Preservation (2.5 ac.±)
- Wetland Preservation (41.2 ac.±)

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Mitigation Activity Area 4

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JRN/JGB
Figure:	**3-7d**

Path: Q:_Projects\EJ\2011\021\00\fig\LNP_Plant\Report\Pro_MitAct_AA4.mxd Date: 8/9/2011 4:54:58 PM

1. Wetland and Upland Preservation. All uplands and wetlands within the four established mitigation activity areas will be preserved under the protection of a conservation easement. This preservation will allow these communities to continue to grow and mature while eliminating most, if not all, non-natural disturbances. One of the primary benefits of the conservation easements will be the cessation of selected silvicultural activities, including; non-selective broadcast herbicide application, planting in rows, bedding, plowing, disking, and any other intensive management or site disturbing activity. However, beneficial habitat management activities such as prescribed burning and selected thinning could still be conducted to ensure continued success of the enhancement activities. Additionally, the conservation easements will prevent additional development from occurring on the protected areas.

2. Wetland Hydrologic Enhancement. The proposed hydrologic enhancement is located within Activity Areas 2 and 4. Enhancement activities within Activity Area 2 (large mitigation activity area in the southwestern portion of the project area) will consist of modifying the existing grade of multiple road sections to enhance and restore historic sheet flow during storm events.

Enhancement activities within activity area 4 (small mitigation activity area located at the northern extent of the property) will consist of multiple ditch blocks and raised road segments. Both of these activities will be used to restrict the flow of water across sub-basin boundaries where artificial ditching allows the exchange of water during flood events. For details of the proposed hydrologic enhancement, please see Section 3.11 for Engineering Detail Drawings.

3. Wetland Pine Thinning. Along with the cessation of selected silvicultural activities, high density pine plantations across the mitigation activity areas will be thinned to levels appropriate for wet pine flatwoods and hardwood forested and cypress swamp communities. Specifically, 0.1 acre of Activity Area 1 and 0.2 acre of Activity Area 2 will be thinned using the following method.

The slash pine plantations will be thinned to a density between 50 and 200 trees per acre. During the thinning it will be important to try and remove as much of the bedding to enable more natural sheet flow to the restored area. The mature pine stands will be thinned and most of the debris removed. Desired species of hardwoods and cypress will be avoided during the operation. The thinning should also open up the ground to help facilitate recruitment of target species from seed sources within and along the edges of the stand. In the event that the pine canopy becomes too dense (over ±90 sq. ft. of basal area per acre) these stands may require additional thinning (to ±60 sq. ft. of basal area per acre) to maintain their health.

Initially the plan proposes thinning to densities at or below 200 stems per acre. Mature pine flatwoods have fewer trees per acre, but have significantly individual larger trees, resulting in comparable basal areas. Thus, the densities proposed are focused on achieving the target basal area. Additionally, these higher densities are designed to create a healthy, sustainable population that is less susceptible to catastrophic mortality due to natural disasters (storms, fires, disease, etc.). Fully mature wet pine flatwoods will have significantly lower tree densities, but significantly larger basal area trees. This differential is being compensated by cutting the trees to a target basal area (90 sq. ft. per acre) and thinning when necessary. If at any point in the future, the density of the basal area in the planted pine areas exceeds ±90 sq. ft. per acre, thinning will occur to a density of ±60 sq. ft. per acre. Therefore, the goal is to achieve the final density through a top-down method of thinning and natural reduction to the target instead of over-thinning or suffering catastrophic mortality and having to rely on new growth.

4. Herbaceous Wetland Restoration. Along with the cessation of silvicultural activities, high density pine plantations across the mitigation activity areas will be cleared and converted to herbaceous wetland systems. Specifically, 7.4 acres of Activity Area 1, 245.2 acres of Activity Area 2, 29.4 acres of Activity Area 3, and 31.9 acres of Activity Area 4 will be cleared using the following method.

The slash pine plantations will be cleared and removed prior to establishing a herbaceous wetland system. Once the trees have been removed, the land will be graded to match adjacent wetland elevations and left to naturally regenerate. The locations of the proposed herbaceous restoration areas were selected so that surrounding, established herbaceous communities would provide a significant seed source for the recruitment of desirable species. The goal of this activity is to keep disturbance to a minimum after the clearing operation. The maintenance and monitoring, along with an adaptive management plan, will ensure successful repopulation of desirable herbaceous species.

5. Upland Pine Thinning. Along with the cessation of silvicultural activities, high density pine plantations across the mitigation activity areas will be thinned to levels appropriate for pine flatwoods. Specifically, 29.2 acres of Activity Area 1, 215.9 acres of Activity Area 2, 97.0 acres of Activity Area 3, and 37.2 acres of Activity Area 4 will be thinned using the following method.

The slash pine plantations will be thinned to a density between 50 and 200 trees per acre. During the thinning it will be important to try and remove as much of the bedding to enable more natural sheet flow to the restored area. The mature pine stands will be thinned and most of the debris removed. Desired species of hardwoods will be avoided during the operation. The thinning should also open up the ground to help facilitate recruitment of target species from seed sources

within and along the edges of the stand. In the event that the pine canopy becomes too dense (over ±90 sq. ft. of basal area per acre) these stands may require additional thinning (to ±60 sq. ft. of basal area per acre) to maintain their health.

Initially the plan proposes thinning to densities at or below 200 stems per acre. Mature pine flatwoods have fewer trees per acre, but have significantly individual larger trees, resulting in comparable basal areas. Thus, the densities proposed are focused on achieving the target basal area. Additionally, these higher densities are designed to create a healthy, sustainable population that is less susceptible to catastrophic mortality due to natural disasters (storms, fires, disease, etc.). Fully mature pine flatwoods will have significantly lower tree densities, but significantly larger basal area trees. This differential is being compensated by cutting the trees to a target basal area (±90 sq. ft. per acre) and thinning when necessary. If at any point in the future the density of the basal area in the planted pine areas exceeds ±90 sq. ft. per acre, thinning will occur to a density of ±60 sq. ft. per acre. Therefore, our goal is to achieve the final density through a top-down method of thinning and natural reduction to the target instead of over-thinning or suffering catastrophic mortality and having to rely on new growth.

3.5 Hydrology & Hydraulics

3.5.1 Objective

A hydrologic and hydraulic engineering analysis for the LNP watershed was performed to analyze the effects of proposed mitigation modifications - including low water crossings and ditch plugging at several sites within LNP. The analysis was used to demonstrate benefits of the proposed mitigation modifications in terms of rainfall runoff conveyance and flow pattern improvements that correlate more closely with historic, unaltered conditions. To make comparisons between existing conditions and proposed conditions two model scenarios were considered. The LNP site does not currently have the nuclear power plant constructed, however for model comparison purposes it is assumed that the nuclear power plant is fully constructed in the existing condition model.

3.5.2 Model Setup

The ICPR Version 3.10 with service pack 3, 2002, was used to simulate rainfall runoff, conveyance, and flooding conditions in the LNP watershed. The modeled watershed includes more than 4,800 acres – encompassing areas beyond the actual LNP project site boundary.

This section describes the calculation of ICPR input parameters including basin area, time of concentration, curve number, interconnectivity, stage-storage relationships, and boundary forcing conditions.

Sub-basin Area

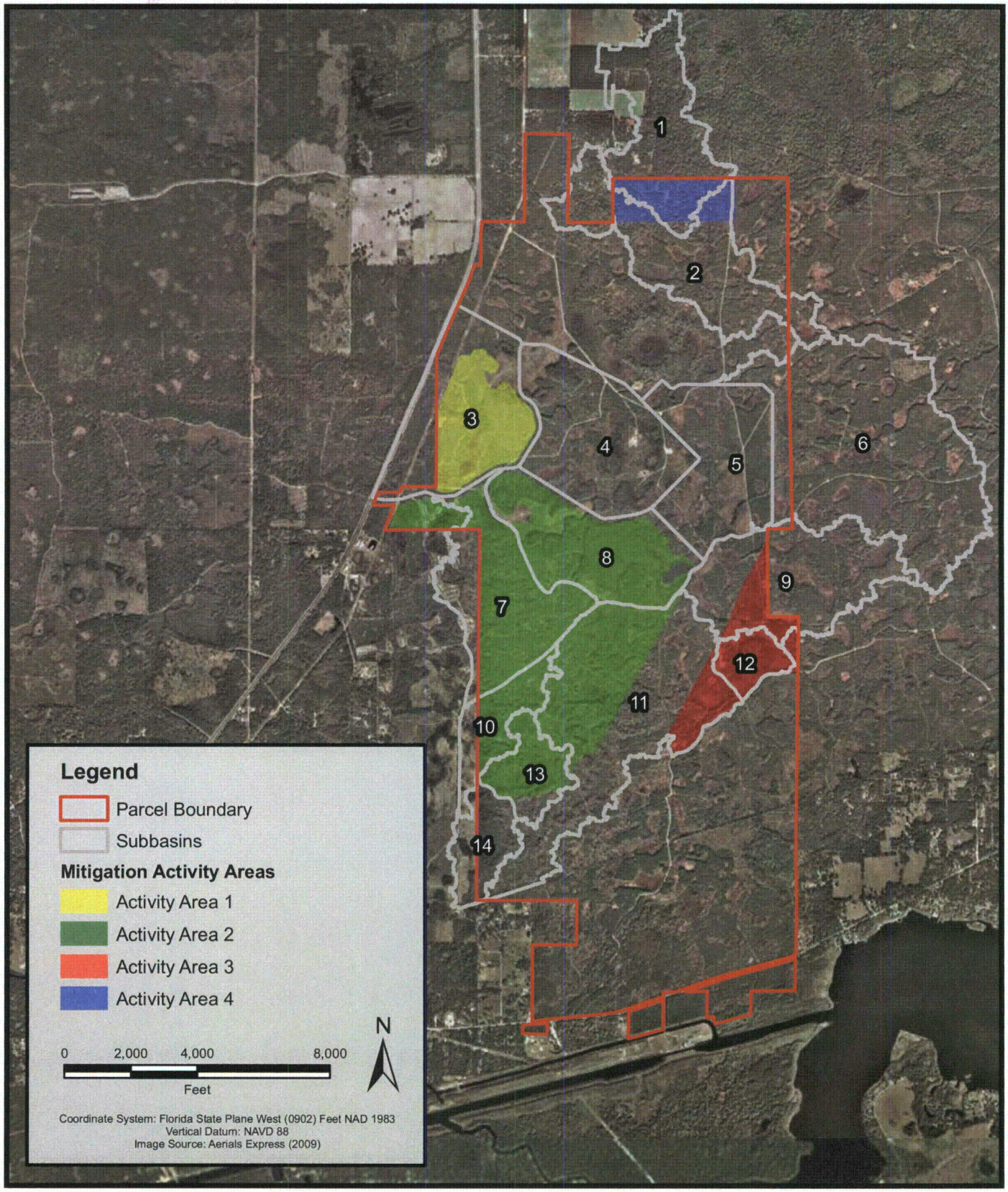
Sub-basin boundaries and areas were defined using a combination of SWFWMD GIS basin coverage, USGS DEMs, FDEM LiDAR data (2006) and LNP site plan. The overall watershed included 14 sub-basins as shown in Figure 3-8. Notably, sub-basin boundaries coincide with locations of mitigation sites and LNP infrastructure to facilitate analyses of modifications to improve basin flow.

Curve Number

The U.S. Soil Conservation Service Curve Number (CN) generally represents a sub-basin's rainfall runoff characteristics – its ability to store or shed rainfall – and is a function of the soil properties and land cover/use. GIS tools were applied to SWFWMD digital soil and land use coverages to determine the CNs. CN calculation assumes an antecedent rainfall condition corresponding to SCS Type II – or typical, mean conditions.

Time of Concentration

Time of concentration is a characteristic of the response of a watershed to a rainfall event and represents the time required for a drop of water to travel from the most hydraulically remote location within a sub-basin. It is a function of the sub-basin slope, length, and CN. For each sub-basin, average slope was calculated based on LiDAR and DEM topographic data. Time of concentration was calculated using these properties following the SCS lag method. Table 3-3 summarizes the calculated drainage area, curve number and time of concentration for each sub-basin.



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Hydrologic Subbasins
Levy Nuclear Plant Site
Levy County, Florida

PROJECT	C2011-025
FIGURE	3-8
DRAWN BY	JK
DATE	JULY 2011

Table 3-3. LNP ICPR model hydrologic input parameters

Sub-basin	Area (acres)	Curve Number	Time of Concentration (mins.)
1	317	76	623
2	381	83	310
3	400	84	269
4	402	94	287
5	334	90	417
6	810	83	679
7	344	85	326
8	346	87	366
9	388	82	1,023
10	127	81	926
11	654	83	304
12	70	84	138
13	120	83	254
14	119	80	271

Sub-basin Interconnectivity

Sub-basins were linked in the ICPR model to reflect the natural movement of water in the system. Sub-basin linkages included weirs and ditches. Weirs include natural sections such as sub-basin divides and man-made sections such as roadways.

Stage-Storage Relationships

Volumetric capacity of each sub-basin was determined using LiDAR and USGS DEM topographic data. ICPR accounts for this storage capacity by means of a user input stage-area curve for each sub-basin. These stage-area curves allow ICPR to simulate the rate at which each sub-basin will be inundated from rainfall runoff.

Boundary Conditions

Two types of boundary conditions were applied within the model. One boundary condition was applied to the most downstream outlet of the watershed (the outlet of sub-basin 14). Sub-basin 14 is located far enough downstream from the proposed mitigation sites such that its boundary condition has little influence on upstream stages. The outlet from sub-basin 14 is defined by a roadway weir section in ICPR. Downstream of this weir a static water level boundary was set based on a limited sensitivity analysis. Table 3-4 summarizes water level results from the limited sensitivity analysis. As shown by the results, a static water level

above 31ft-NGVD at the boundary begins producing a back-water effect on sub-basin 14. Therefore, a water level equal to 31 ft-NGVD was determined as the limit to which upstream water levels were affected and a good candidate for the boundary condition.

Table 3-4. Limited sensitivity analysis: water level at sub-basin 14

	Boundary Condition			
Event	**32 ft. NGVD**	**31ft. NGVD**	**30 ft. NGVD**	**29 ft. NGVD**
2.33	32.07	31.28	31.12	31.12
10	32.20	31.83	31.83	31.83
25	32.39	32.24	32.24	32.24
50	32.52	32.44	32.44	32.44
100	32.74	32.72	32.72	32.72

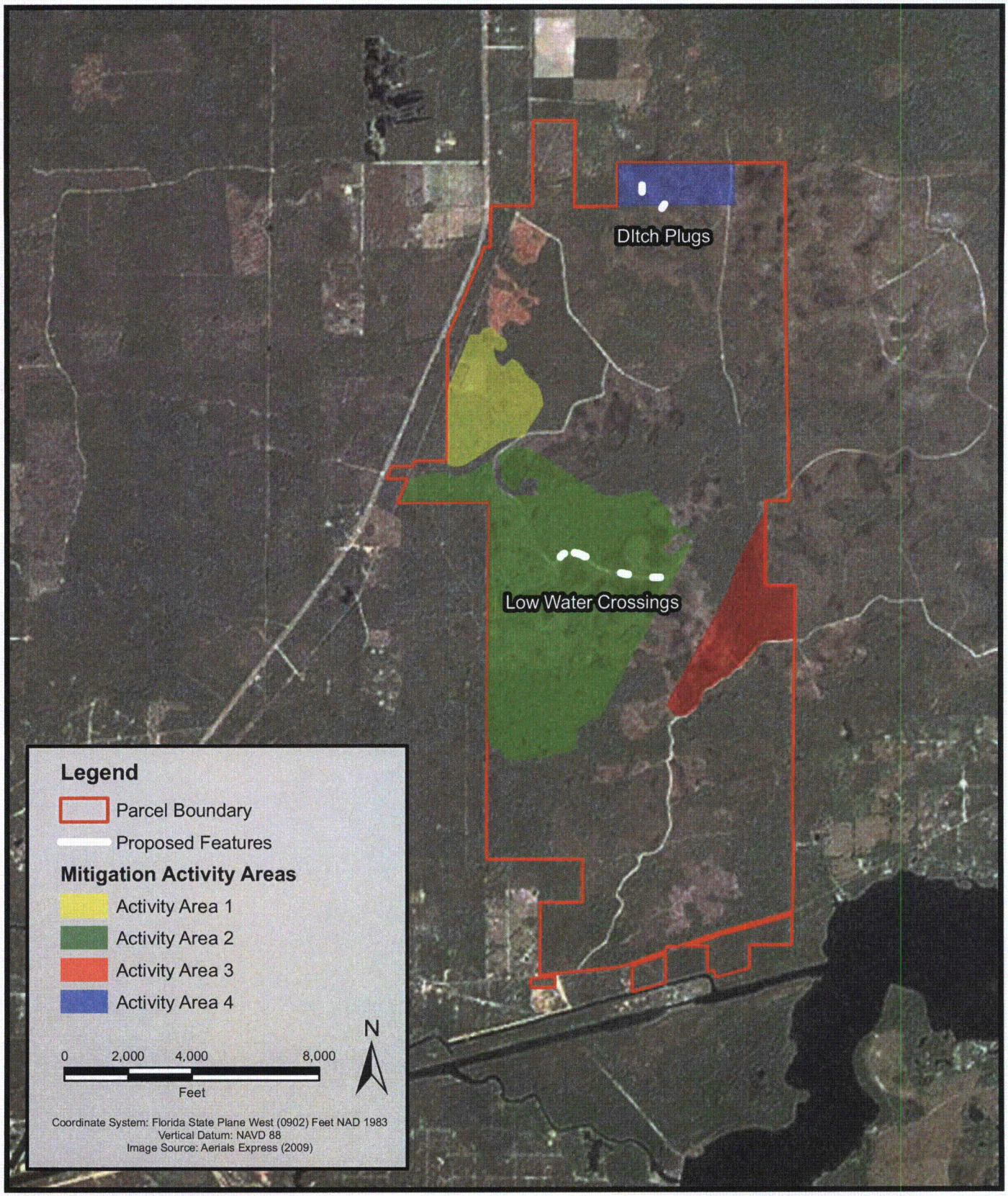
The second boundary condition was rainfall (volume and temporal distribution) applied at each sub-basin. The SCS Type II, Florida Modified, 24-hour distribution was applied with the 24 hour rainfall depths shown in Table 3-5 for the five rainfall events simulated (according to the Southwest Florida Water Management District Environmental Resource Permitting Information Manual - Part D Project Design Aids - July 1996).

Table 3-5. LNP ICPR model 24-hour rainfall depths

Recurrence Interval (years)	Rainfall Depth (inches)
2.33	4.8
10	6.7
25	8.5
50	9.5
100	11.2

3.5.3 Model Application Results

The ICPR model setup described above was applied to the system for five rainfall events representing the 2.33-, 10-, 25-, 50-, and 100-year return periods. The model was applied to existing and proposed conditions. The proposed conditions model includes the mitigation modifications at several candidate sites (shown in Figure 3-9) within the system (more details about the modifications are provided in the civil design section of this report). Comparison between the existing and proposed model results at each site demonstrate the improved flow conveyance gained from the cumulative effect of all modifications. These results are presented in Table 3-6 and described below for each site.



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Proposed Features
Levy Nuclear Plant Site
Levy County, Florida

PROJECT	C2011-025
FIGURE	3-9
DRAWN BY	JK
DATE	JULY 2011

Table 3-6. Existing and proposed peak flows at LNP site of interest

(Upstream – Downstream)	2.33-YR			
	Existing Flow (cfs)	Proposed Flow (cfs)	Difference (cfs)	Percent Change
2-1	0	0	0	0%
8-7	136	116	-20	-15%
8-11	37	128	91	244%
13-14	15	15	0	1%

(Upstream – Downstream)	25-YR			
	Existing Flow (cfs)	Proposed Flow (cfs)	Difference (cfs)	Percent Change
2-1	4	0	-4	-100%
8-7	416	249	-167	-40%
8-11	77	274	198	257%
13-14	63	59	-3	-5%

(Upstream – Downstream)	50-YR			
	Existing Flow (cfs)	Proposed Flow (cfs)	Difference (cfs)	Percent Change
2-1	6	0	-6	-100%
8-7	492	286	-206	-42%
8-11	85	386	301	354%
13-14	80	74	-6	-7%

(Upstream – Downstream)	100-YR			
	Existing Flow (cfs)	Proposed Flow (cfs)	Difference (cfs)	Percent Change
2-1	9	0	-9	-100%
8-7	621	350	-271	-44%
8-11	98	386	288	292%
13-14	111	100	-11	-10%

Ditch Plugging

Modifications between sub-basin 1 and sub-basin 2 include plugging two drainage ditches that serve as artificial hydrologic connections. Historically a ridge of relatively higher topographic elevations restricted inter-basin flow. The two ditches allow water to flow from sub-basin 2 into sub-basin 1 for rainfall events larger than the 2.33 year recurrence interval. Model results show a maximum inter-basin flow of 9 cfs for the 100 year rainfall event for existing conditions and 0 cfs after the proposed ditch plugging – thereby restoring the unaltered hydrologic flow regime.

Low Water Crossings

Sub-basin 8 is confined on its boundary by roads that are built along the naturally higher topographic ridge. Before human influence (road construction), water would flow out of sub-basin 8 through various topographically low wetland sloughs into sub-basins 7 and 11. The roads confining sub-basin 8 are blocking these natural flow paths – causing water levels to rise higher than historic conditions within sub-basin 8. The model results show that these higher water levels allow for a larger fraction of water to flow from sub-basin 8 to sub-basin 7 than historically. Also, model results show that by reopening these natural flow paths the fraction of water flow from sub-basin 8 to 7 reduces while the fraction of water flowing into sub-basin 11 increases substantially. By grading the road elevations at the key flow path locations, a more natural hydro-pattern is restored to sub-basins 7, 8, 10, 11, 13, and 14. A reduction in flow fraction from sub-basin 8 to 7 to 13 to 14 is shown by model results. By reopening the wetland slough flow paths, a greater flow fraction is conveyed from sub-basin 8 to 11 to 14 – thereby reducing the total amount of flow into sub-basin 13. In General, by implementing the flow path openings, flows are increased into sub-basins 11 and 14 while flows are decreased into sub-basins 7, 10, and 13.

3.6 UMAM Score

The proposed mitigation plan for LNP will provide for 372.9 units of functional lift to offset the herbaceous and forested impacts within the Waccasassa and Withlacoochee Watersheds (Table 3-7), while the balance of the impacts will be mitigated for at the Goethe site. The scoring system utilized during the UMAM process is outlined in the UMAM handbook and its scoring requirements.

Scores for existing communities that were assessed ranged from 4 to 7, pursuant to the UMAM process described above. Target UMAM scores presented in Table 3-7 ranged from 7 to 9 in accordance with the UMAM scoring parameters based on the target results of each of the mitigation activities outlined in this plan. A score of 0 was assigned to upland areas under the "Water" category that will not receive any water related enhancement.

Table 3-7. LNP mitigation plan proposed UMAM score summary

Area	Location		Water		Community		Acreage	Risk	Time Lag	RFG[1]	FG[2]
	Current	With	Current	With	Current	With					
Waccasassa Watershed											
Activity Area 1											
Wetland Preservation	7	7	5	5	7	8	109.7	1	1	0.02	2.2
Wetland Hydrologic Enhancement	7	7	5	9	7	7	117.2	1.25	1.14	0.09	10.5
Wetland Pine Thinning	7	8	5	5	6	9	0.1	1.25	1.25	0.09	0.1
Herbaceous Wetland Restoration	6	7	5	5	6	9	7.4	1.25	1.92	0.06	0.4
Upland Preservation	0	7	0	0	0	7	47.3	1	1	0.42	19.9
Upland Pine Thinning	0	8	0	0	0	8	29.2	1.25	1.25	0.51	14.9
Activity Area 2											
Wetland Preservation	7	7	5	5	7	8	532.5	1	1	0.02	10.7
Wetland Hydrologic Enhancement	7	7	5	9	7	7	779.9	1.25	1.14	0.09	73.0
Wetland Pine Thinning	7	8	5	5	6	9	0.2	1.25	1.25	0.09	0.1
Herbaceous Wetland Restoration	6	7	5	5	6	9	247.2	1.25	1.92	0.06	13.7
Upland Preservation	0	7	0	0	0	7	25.4	1	1	0.42	10.7
Upland Pine Thinning	0	8	0	0	0	8	215.9	1.25	1.25	0.51	110.5

Table 3-7. LNP mitigation plan proposed UMAM score summary cont.

Area	Location		Water		Community		Acreage	Risk	Time Lag	RFG[1]	FG[2]
	Current	With	Current	With	Current	With					
Activity Area 3											
Wetland Preservation	7	7	5	5	7	8	9.9	1	1	0.02	0.2
Wetland Hydrologic Enhancement	7	7	5	9	7	7	18.0	1.25	1.14	0.09	1.6
Herbaceous Wetland Restoration	6	7	5	5	6	9	8.1	1.25	1.92	0.06	0.5
Upland Preservation	0	7	0	0	0	7	3.1	1	1	0.42	1.3
Upland Pine Thinning	0	8	0	0	0	8	34.3	1.25	1.25	0.51	17.5
Activity Area 4											
Wetland Preservation	7	7	5	5	7	8	41.2	1	1	0.02	0.8
Wetland Hydrologic Enhancement	7	7	5	9	7	7	73.1	1.25	1.14	0.09	6.6
Herbaceous Wetland Restoration	6	7	5	5	6	9	31.9	1.25	1.92	0.06	1.9
Upland Preservation	0	7	0	0	0	7	2.5	1	1	0.42	1.1
Upland Pine Thinning	0	8	0	0	0	8	37.2	1.25	1.25	0.51	18.9
Subtotal	**Herbaceous**						**294.6**				**16.5**
Subtotal	**Forested**						**1088.5**				**300.6**
Waccasassa Totals							**1383.1**				**317.1**
Withlacoochee Watershed											
Activity Area 2											
Wetland Preservation	7	7	5	5	7	8	30.2	1	1	0.02	0.6

Table 3-7. LNP mitigation plan proposed UMAM score summary cont.

Area	Location		Water		Community		Acreage	Risk	Time Lag	RFG[1]	FG[2]
	Current	With	Current	With	Current	With					
Wetland Hydrologic Enhancement	7	7	5	9	7	7	48.9	1.25	1.14	0.09	4.4
Herbaceous Wetland Restoration	6	7	5	5	6	9	18.7	1.25	1.92	0.06	1.1
Upland Preservation	0	7	0	0	0	7	1.8	1	1	0.42	0.8
Upland Pine Thinning	0	8	0	0	0	8	396.5	8.7	1.25	0.51	4.4
Activity Area 3											
Wetland Preservation	7	7	5	5	7	8	49.5	1	1	0.02	1.0
Wetland Hydrologic Enhancement	7	7	5	9	7	7	70.8	1.25	1.14	0.09	6.4
Herbaceous Wetland Restoration	6	7	5	5	6	9	21.3	1.25	1.92	0.06	1.3
Upland Preservation	0	7	0	0	0	7	18.4	1	1	0.42	7.8
Upland Pine Thinning	0	8	0	0	0	8	62.7	1.25	1.25	0.51	32.0
Subtotal	**Herbaceous**						**40.0**				**2.4**
Subtotal	**Forested**						**171.3**				**53.4**
Withlacoochee Totals							**211.3**				**55.8**
LNP Total							**1594.4**				**372.9**

[1]Relative Functional Gain
[2]Functional Gain

For Location and Landscape Support, the proposed scores range from 7 to 8 based on the UMAM scoring methodology. These scores were derived by assessing the existing communities on site and identifying the main characteristics that these habitats were deficient in, such as habitat availability, wildlife access barriers, land use impacts and several others. This information was then used to incorporate those criteria into the proposed mitigation activities. By introducing increased habitat availability and the other criteria mentioned above, the proposed mitigation plan will "increase" the value of the existing on-site habitats and site functionality as defined in the methodology. The scores of 7 and 8 were assigned after reviewing the UMAM scoring requirements and the description of each scoring tier where a 7 is defined as having appropriate habitat diversity, but not a high overall diversity and still may contain some invasive/exotic species; provides some support for fish and wildlife, but is not quite optimal and there is a generally effective land management plan in place. An 8 score was defined as providing slightly higher habitat diversity than the areas that were scored as a 8 with most the majority of plants native and desirable, but still not as diverse as habitats scored as a 10; increased support for fish and wildlife and a land management plan that is more specified to address such issues as invasive/exotic species management.

For the Water category, proposed scores for hydrologic enhancement go from 5 to 9, expect for the upland berm area, as mentioned above. A score of 9 represents that the assessment area will provide adequate habitat for both aquatic vegetation and wildlife, will aid in the hydroperiod of the area and assist in storage capacity and attenuation, will increase water flow through the area resulting in better water quality and that the area will remain inundated under normal circumstances so that the other improvements will function as designed. In addition, the proposed mitigation project directly to the north of the LNP site (Goethe State Forest) will restore natural hydrology to Ten Mile Creek and associated wetlands and significantly increase water flow through that system. The PEF plan has incorporated the details of that project into its project design and will provide the same benefits as it relates to the water community.

For Community Structure, the scores go from 6 to 9 in areas where pine trees are being thinned or cleared to represent the conversion of an artificial community (pine plantation) to a natural community (pine flatwood or herbaceous wetland). The community structure score within the wetland preservation areas goes from 7 to 8 to represent the maturing of the forested areas, natural recruitment, and natural succession of the plant community. The community structure score within the upland preservation areas goes from 0 to 7 to represent the benefit gained by preserving an area that is currently susceptible to development. The community structure will be improved in all habitat types as plant diversity will be significantly increased, in addition to removing a well-established population of invasive/exotic species. The proposed pine thinning methodology is designed to support a healthy and age-diverse stand of pine flatwoods. The PEF plan will provide for additional habitat for aquatic vegetation and wildlife and will represent significant improvement over existing conditions.

Risk and Time Lag were the other parameters assessed during the UMAM scoring of the LNP project. The Risk parameter is examined to assess the potential risk the proposed activity has of not fully maturing and developing into the proposed habitat. Factors such as the project's location in proximity to other existing structures such as housing developments or major roadways, access to the site (both public and private), general environmental conditions compared to the proposed activity, and the amount of effort required to build and maintain a functioning habitat are all considered when assessing the Risk for a particular project. Due to the limited access to the LNP site, the score of 1.25 was assigned to all proposed activities at LNP. All of the proposed work is enhancement or restoration in nature and will not significantly alter the existing habitat in regard to hydrology, wildlife usage, etc.; it will only improve or restore existing wetland communities, so the 1.25 score represents a conservative but realistic expectation of the proposed work.

Time Lag is examined to determine an appropriate time frame that can be expected for a given activity to reach its full potential and provide the functions and values of a mature system. Forested communities typically take longer to establish, given the complex structure of a hardwood wetland community. Conversely, herbaceous systems typically become well established in a shorter time frame due to the limited complexity of habitat structure and the general hardiness of the plants found within. Scores for the LNP site ranged from 1.14 for the hydrologic restoration to 1.92 for the proposed herbaceous wetland restoration. The 1.14 score for the hydrologic enhancement represents a low time lag, because once the construction is complete, the water should return to historic flow patterns within the first rainy season. Some of the proposed mitigation plan will enhance or restore already existing pine habitat, indicating that the proper conditions currently exist to support such a community. The proposed pine flatwood habitats received time lag scores of 1.25 to represent the time it will take to after initial clearing to generate new subcanopy growth. Finally, the areas proposed to be cleared of pines and restored to herbaceous wetlands received a time lag of 1.92 to represent the amount of time necessary to fully establish a desirable and sustainable herbaceous community.

3.7 Engineering

The mitigation plan described in Section 3.4 and the modeling described in Section 3.5 form the basis of the engineering design. In general, the proposed LNP engineering plan consists of modifying the existing roads or ditches. The paragraphs below summarize the engineering design by mitigation activity area.

Activity Area 2 – In Area 2A1, the contractor will grade the area shown on Sheet 11 and 12 of 22 in Section 3.11 to 40.7 ft. NAVD, which is approximately 1 ft. below the existing grade. The Area 2A2, 2A3, and 2A4 proposed plans call for excavating the existing grades to 40 ft. NAVD (Section 3.11, Sheets 13-20 of 22). For the above areas, the

contractor will slope the fill material at 10H:1V on the road and 4H:1V along the edges of the road. The contractor will remove approximately 1547 cy of fill from the area. If geotechnical testing shows this material is suitable as fill, the contractor could use the excavated material as fill for Activity Area 4.

Activity Area 4 – The Area 4 proposed plan requires the contractor to fill areas along the existing ditch or road. In Area 4A (Section 3.11, Sheet 28 of 22), the contractor will construct a ditch block by placing and compacting approximately 5 cy of fill, with 4H:1V side slopes, in a 25-ft section of the existing ditch. As shown in Section 3.11, Sheet 19 and 20 of 22, the Area 4B proposed plan calls for approximately 11 cy of compacted fill, with 4H:1V side slopes, along an 80-ft section of the existing road. The contractor may use the excavated material from Activity Area 2 if geotechnical borings during final design show the material is suitable for construction fill and is free of muck, roots, and other large debris.

3.8 Implementation Schedule

The construction on the LNP site will begin within 90 days of commencement of construction and wetland impacts of the plant and associated transmission lines for the LNP project. The mitigation plan will be implemented in phases, as some activities, such as the pine thinning, are dependent on other factors and can only be completed under appropriate favorable conditions. The restoration of on-site hydrology has the highest priority, with the pine plantation thinning having the lowest priority. The construction sequencing will follow the above priorities. However, in Activity Areas 2 and 4 the thinning will be conducted prior to the hydrologic improvements to ensure that the thinning activities do not damage the ditch plugs or LWCs.

As with any construction project, natural conditions and weather patterns will be observed and activities will be planned to best coincide with suitable weather conditions. Prior to any land disturbance, appropriate erosion and sedimentation control measures will be installed, including silt fence around all disturbed areas and sediment curtains in the channel (LNP Engineering Detail Drawings show erosion control plans). Excavation will occur during the dry season (October-March) and pine thinning will occur once excavation is complete and the area has been constructed properly and approved. Maintenance for invasive/exotic species will be conducted year-round, with manual, mechanical and/or chemical removal methodologies to be utilized throughout the year to ensure the best results (Section 3.9).

Based on the above-referenced priorities, an implementation schedule of the mitigation activities is listed below:

Activity Area 1	Timeframe
Mobilization of contractor and equipment	Week 1
Establish all turbidity/erosion control measures	Week 2
Thin pine plantation areas	Weeks 2-4
Begin 5 year monitoring and maintenance period	Week 5

Activity Area 2	Timeframe
Mobilization of contractor and equipment	Week 1
Establish all turbidity/erosion control measures	Week 2
Thin pine plantation areas	Weeks 2-19
Clear and excavate ditch block and regrading areas and begin construction	Weeks 19-21
Generate and review as-built surveys	Week 22
Begin 5 year monitoring and maintenance period	Week 23

Activity Area 3	Timeframe
Mobilization of contractor and equipment	Week 1
Establish all turbidity/erosion control measures	Week 2
Thin pine plantation areas	Weeks 2-5
Begin 5 year monitoring and maintenance period	Week 6

Activity Area 4	Timeframe
Mobilization of contractor and equipment	Week 1
Establish all turbidity/erosion control measures	Week 2
Thin pine plantation areas	Weeks 2-4
Clear and excavate ditch block and regrading areas and begin construction	Weeks 4-5
Generate and review as-built surveys	Week 5
Begin 5 year monitoring and maintenance period	Week 6

The above is a general timeline of the basic implementation of the proposed mitigation activities. Additional planning and specifics may need to be established once the transmission line construction schedule is finalized.

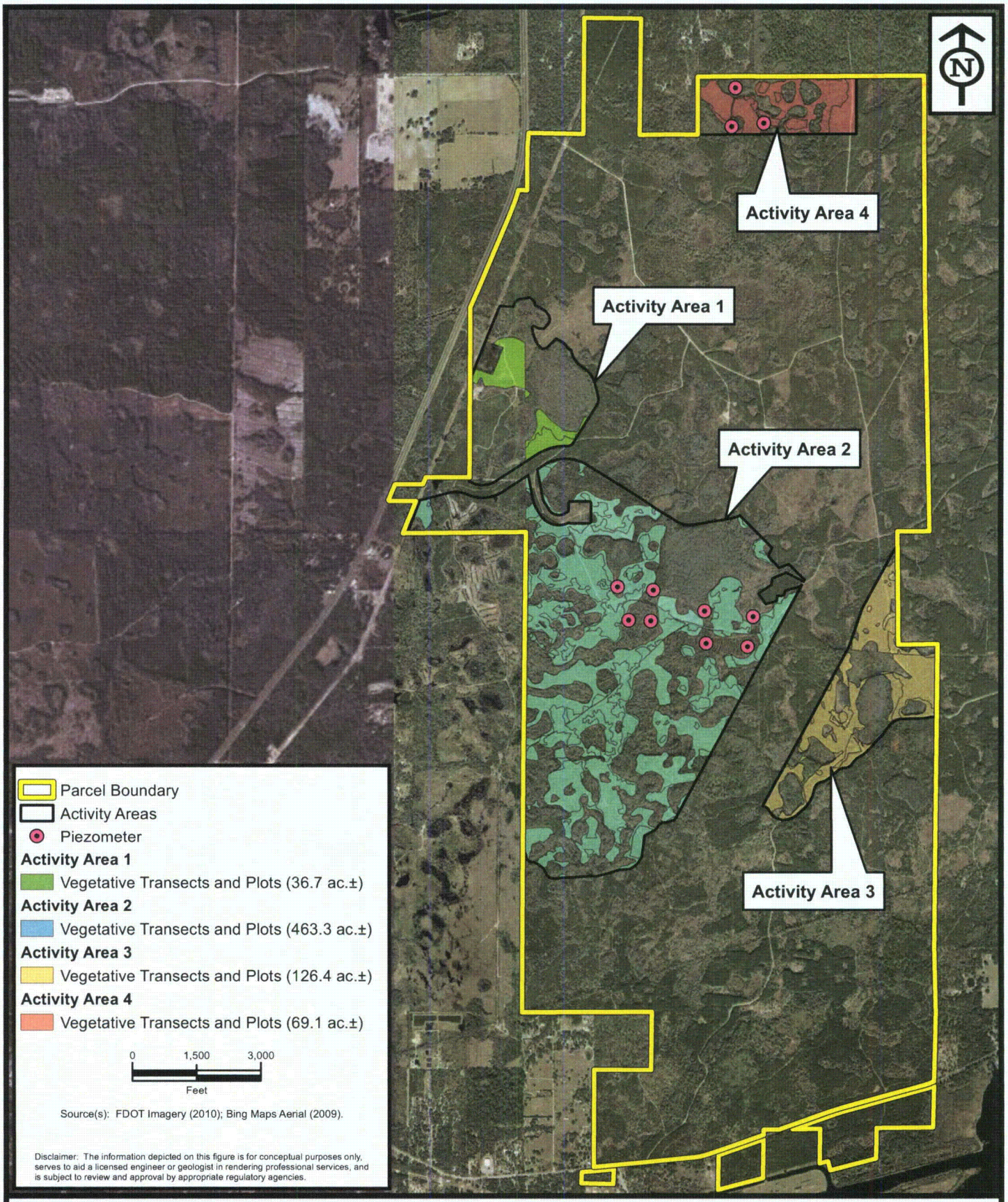
3.9 Monitoring and Maintenance Requirements

The wetland enhancement/restoration areas will be monitored on an annual basis and maintained quarterly to ensure their success. Monitoring will document that each habitat type is naturally progressing to resemble its intended target community in regard to plant species and composition. In addition, wildlife utilization, hydrologic conditions, presence of invasive/exotic species and any other management issues will be noted and addressed.

The quantitative monitoring of the herbaceous and forested wetland mitigation activity areas will consist of establishing fixed linear transects covering approximately 1.0 acre in area. For some of the smaller community types, 0.1 acre plots may be established instead of transects. The transects will be 25 ft. wide and will average 900 ft. long. Hydrology will be observed through the use of continuously recording piezometers installed strategically throughout the site (Figure 3-10 through 3-10d). The data that will be observed and recorded within each transect/plot will include:

- total coverage and survivorship of desirable planted species and any other dominant species;
- for the 0.1 acre plot, the presence of naturally recruited trees present within each stratum;
- the presence and overall coverage of any listed invasive/exotic species;
- success of any previously recommended treatment methods and any future methods proposed;
- any areas of mortality of natural species;
- current hydrologic conditions, water depths, and hydric soils observed;
- any evidence of wildlife presence or utilization;
- any maintenance needs in regard to stabilization, erosion, vandalism etc. and suggested corrective actions.

A baseline monitoring event will be conducted at the LNP no less than 60 days after the completion of the initial thinning event. The baseline event will help to establish the initial conditions after construction and will be used as a reference to assess progression during future monitoring events. The annual monitoring will commence after the baseline event and will be submitted to FDEP and ACOE in the fall (September/October) of each year. The report will consist of a narrative describing the site conditions, the management activities that have occurred, photographs taken from fixed location points and maps depicting the mitigation activity area. The forested enhancement area will be monitored for five years. The monitoring period may be adjusted based upon the performance of the vegetation.



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Monitoring Stations

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JRN/JGB
Figure:	3-10

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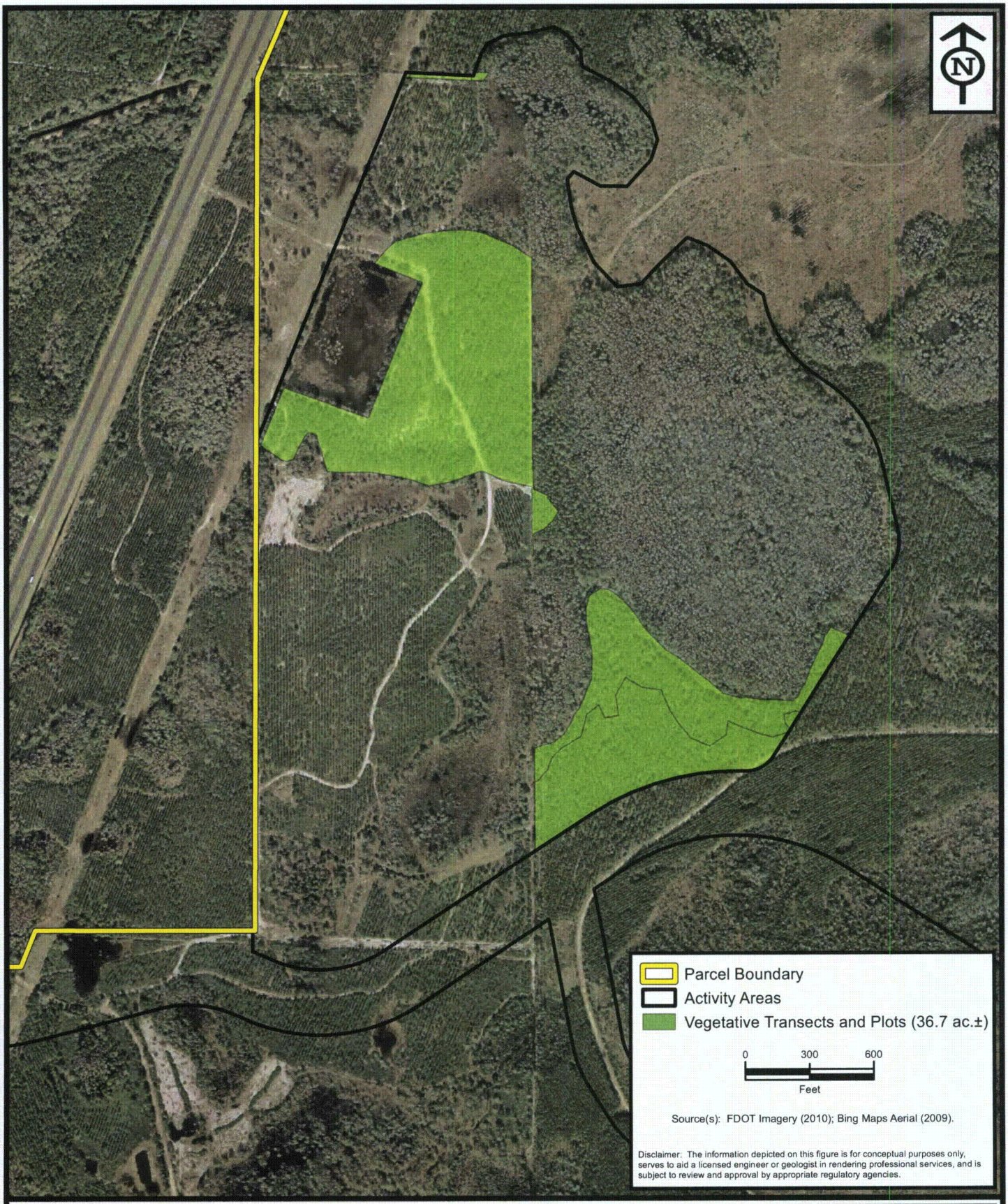

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Monitoring Stations - Activity Area 1

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JRN/JGB
Figure:	**3-10a**

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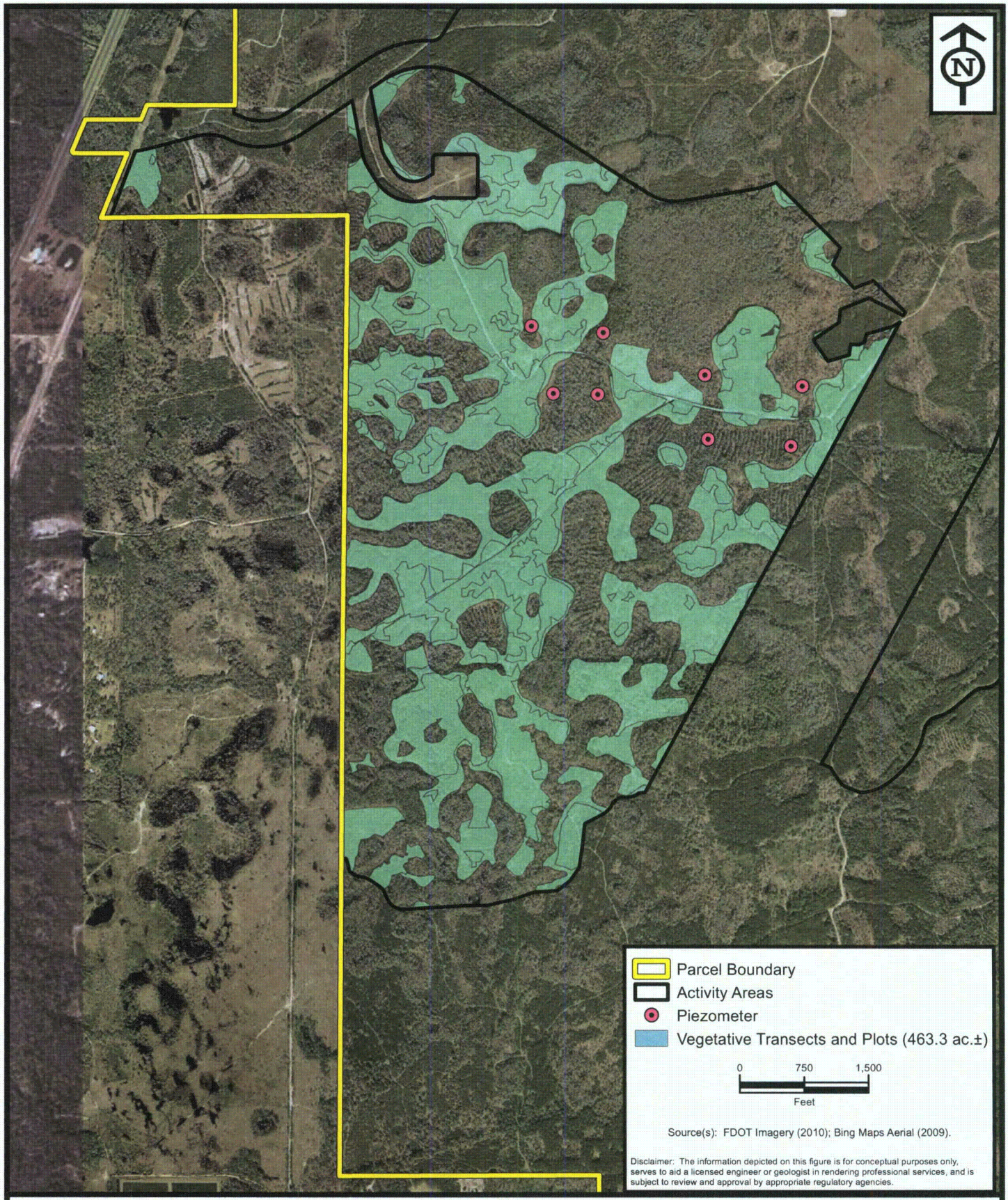

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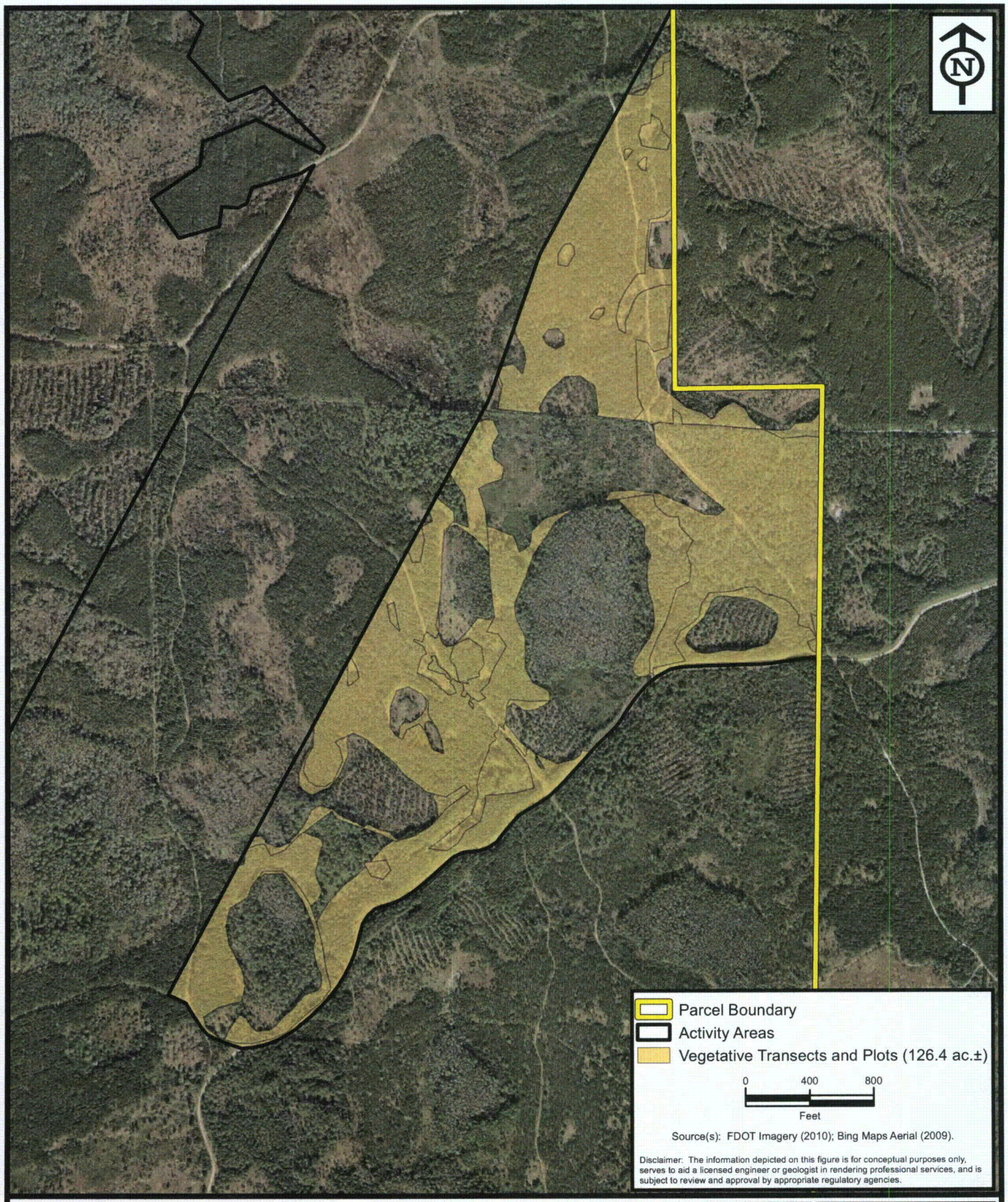
Monitoring Stations - Activity Area 2

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JRN/JGB
Figure:	**3-10b**

Path: Q:_Projects\EJ\2011\021\00\fig\LNP_Plant\Report\Pro_MonAct_AA2.mxd Date: 8/9/2011 6:13:24 PM



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Monitoring Stations - Activity Area 3

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JRN/JGB
Figure:	**3-10c**

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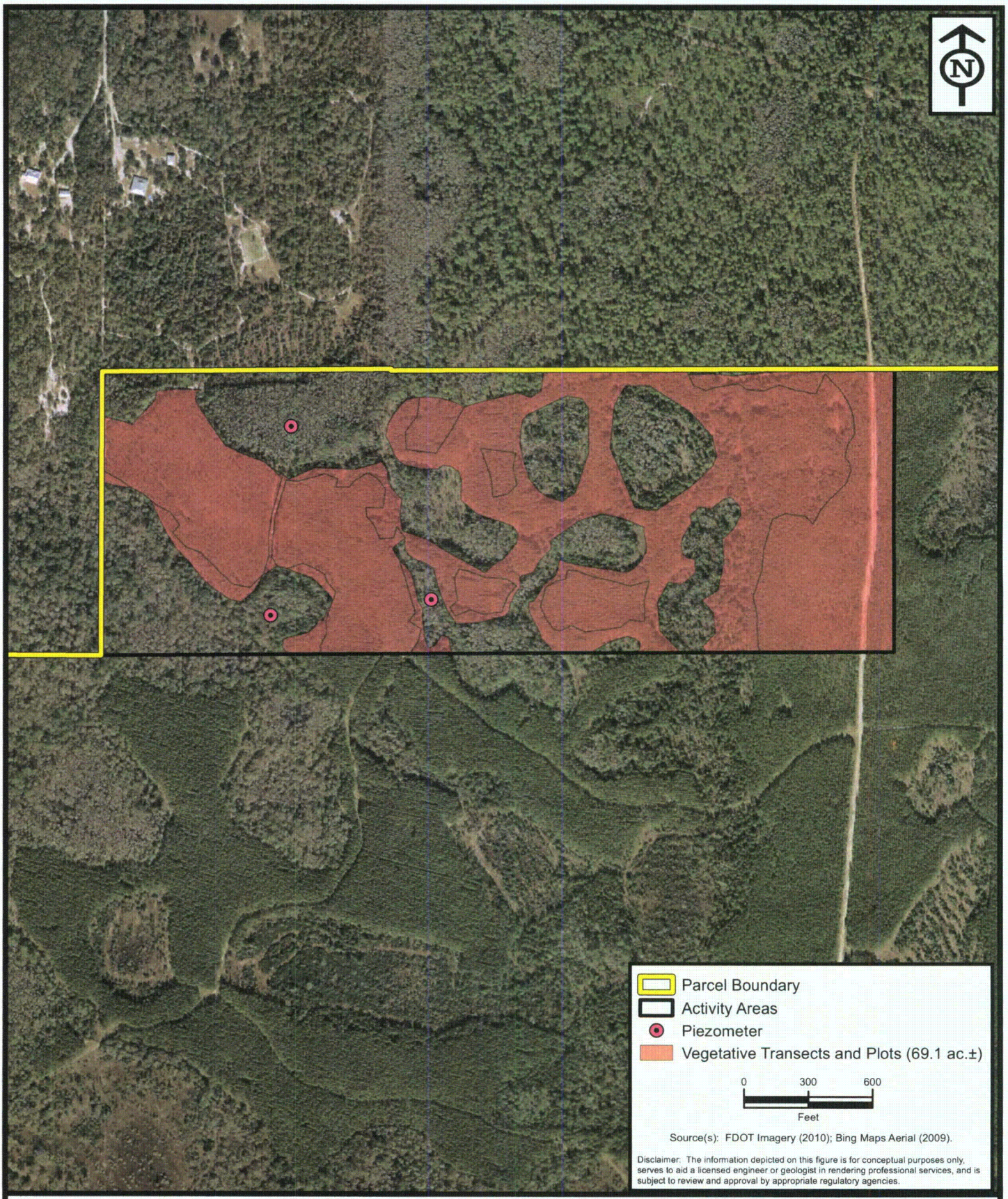

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Monitoring Stations - Activity Area 4

Levy Nuclear Plant Site

Levy County, Florida

Project:	EJ11021.00
Date:	July 2011
Drwn/Chkd:	JRN/JGB
Figure:	**3-10d**

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3.10 Success Criteria

Specific success criteria outlined below will ensure that the proposed mitigation activities achieve their intended design and function. The main focus of the success criteria for LNP will emphasize the establishment of historic hydrology and the restoration of natural pine densities. Regular monitoring as described above and maintenance implementation is important to ensuring success at the LNP site. The mitigation activity area will be considered successful when the following criteria have been met within the required monitoring time frame:

Wetland Hydrologic Enhancement Areas:

- 75% coverage of native/desirable wetland vegetation;
- 5% or less total coverage of any invasive/exotic species;
- hydrology is well established and visibly apparent based on the hydrologic indicators as defined by Rule 62-340 F.A.C.;
- the above criteria must be met within the five years of annual monitoring.

Upland and Wetland Pine Thinning Area:

- 75% coverage of native/desirable species for the vegetative community;
- the appropriate slash pine density for the vegetative community has been reached;
- 5% or less total coverage of any invasive/exotic species;
- hydrology is well established and visibly apparent based on the hydrologic indicators as defined by Rule 62-340, Florida Administrative Code (F.A.C.);
- the above criteria must be met within the five years of annual monitoring.

Herbaceous Wetland Restoration Area:

- 75% coverage of native/desirable herbaceous wetland vegetation;
- 5% or less total coverage of any invasive/exotic species;
- hydrology is well established and visibly apparent based on the hydrologic indicators as defined by Rule 62-340, Florida Administrative Code (F.A.C.);
- the above criteria must be met within the three years of annual monitoring.

The progress of the mitigation activity area towards reaching success will be tracked through the monitoring reports that will be submitted annually to FDEP and ACOE for review and approval. In the event that the above criteria are not met at the end of the monitoring period, or it is becoming obvious during annual monitoring that an area will not meet the established success criteria, then PEF will work closely with FDEP and ACOE staff in order to identify and correct any problems. Once the success criteria outlined above are met, the mitigation effort will be deemed a success and the monitoring of the mitigation activity area will be terminated.