

#### 4.0 WITHLACOOCHEE AND HILLSBOROUGH WATERSHEDS – BOARSHEAD RANCH

##### 4.1 Introduction

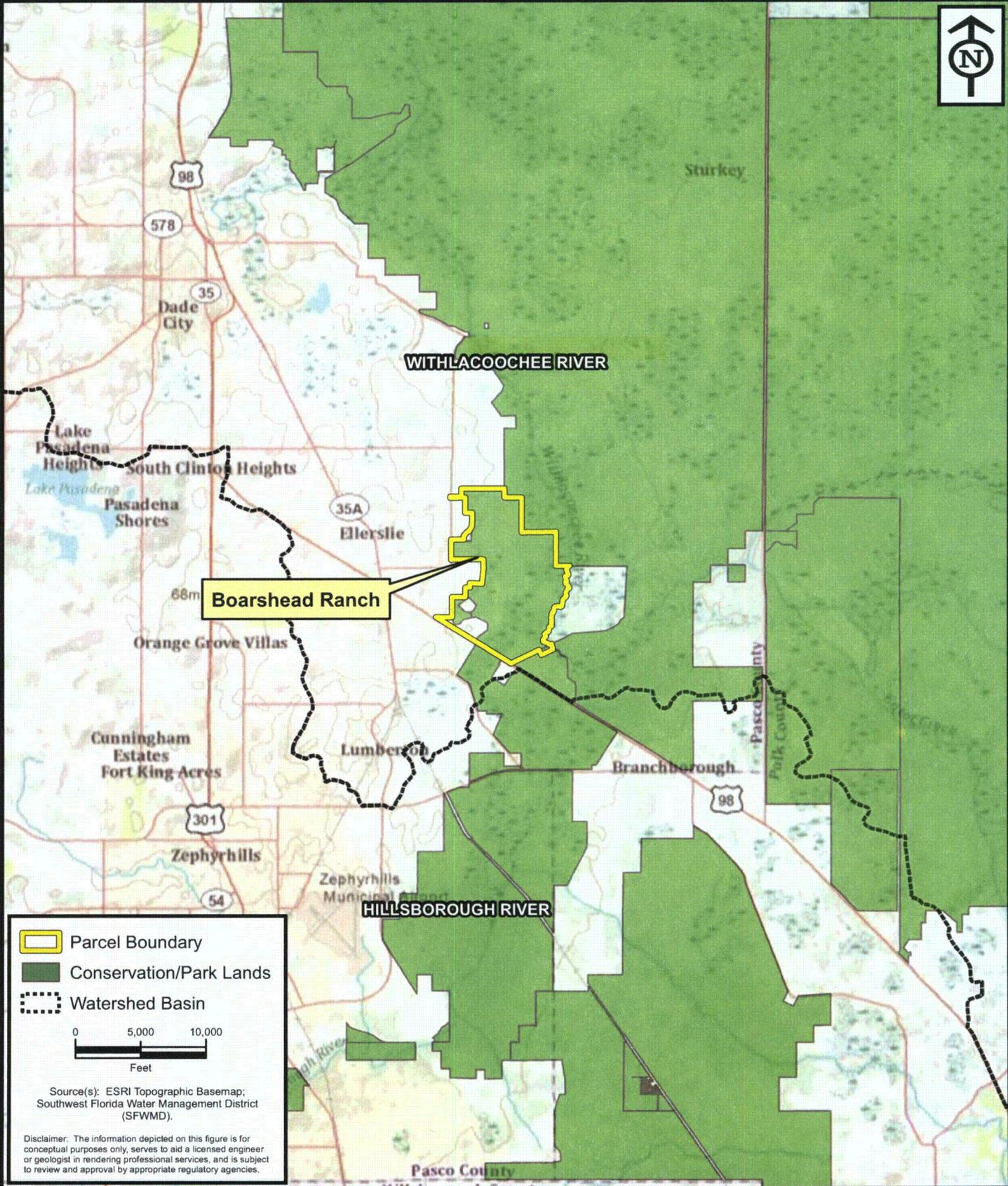
The mitigation plan for the 64.5 acres of impact from off-site transmission line impacts within the Withlacoochee and Hillsborough Watersheds (-35.6 total UMAM units; -25.5 herbaceous units and -10.0 forested units) is contained in this section. The proposed wetland impacts for LNP are summarized in Table 1-1. Mitigation for the impacts within the Withlacoochee Watershed and Hillsborough River Watershed (Figure 4-1) for off-site transmission line impacts will occur on Boarshead Ranch (BHR) (Figure 4-2). The detailed mitigation plan for on-site impacts to the LPN site within the Withlacoochee Watershed is provided in Section 3.0. BHR will produce 40.6 UMAM credits (11.0 wetland herbaceous, 9.6 wetland forested within the Withlacoochee Watershed and 19.0 wetland herbaceous, 1.0 wetland forested within the Hillsborough Watershed). This section of the overall mitigation plan provides the details for BHR.

The BHR mitigation site is located on a privately-owned parcel in Pasco County, Florida. This parcel is part of a corridor that is situated where the Hillsborough and Withlacoochee rivers diverge, and is adjacent to approximately 9 square miles of SWFWMD-owned Green Swamp property and other conservation lands located to the north, east and south (Figure 4-1). The enhancement/restoration activities proposed at BHR will improve wetland and ecosystem functions in the floodplains of the aforementioned rivers and will ultimately result in the removal of disturbances to native communities while creating habitat by enhancing the largest area of natural forest remaining in the upper Withlacoochee and Hillsborough Watersheds which allows for an ecologically improved and protected corridor between these two large systems. The enhancement will therefore have greater benefits than the site specific scores described herein.

##### 4.2 Impact Summary

The wetland impacts within the Withlacoochee Watershed for LPN off-site transmission line impacts south of the Cross Florida Barge Canal total approximately 41.0 acres. These impacts will generate a total loss of 19.0 functional units (-9.8 herbaceous and -9.2 forested). The wetland impacts within the Hillsborough River Watershed total approximately 23.5 acres. These impacts will generate a total loss of 16.6 functional units (-15.7 herbaceous and -0.9 forested). The impact summary is provided on Table 4-1 (below). The majority of these impacts will be the result of permanently clearing and/or filling existing herbaceous and forested wetlands. The proposed mitigation plan will provide for 40.6 functional units of lift within the Withlacoochee and Hillsborough Watersheds, of which 20.6 functional lift units will be in the Withlacoochee Watershed and 20.0 functional lift units will be within the Hillsborough Watershed. Furthermore, within the Withlacoochee Watershed, 11.0 functional units of lift will be provided to

offset the herbaceous and open water impacts, while 9.60 functional units of lift will offset the forested wetland impacts. Within the Hillsborough Watershed 19.0 functional lift units will be provided to offset the herbaceous and open water impacts, while 1.0 functional lift units will offset forested wetland impacts within this watershed (Section 4.6 provides details of the UMAM scores).



 Parcel Boundary

 Conservation/Park Lands

 Watershed Basin

0 5,000 10,000  
Feet

Source(s): ESRI Topographic Basemap;  
Southwest Florida Water Management District (SFWMD).

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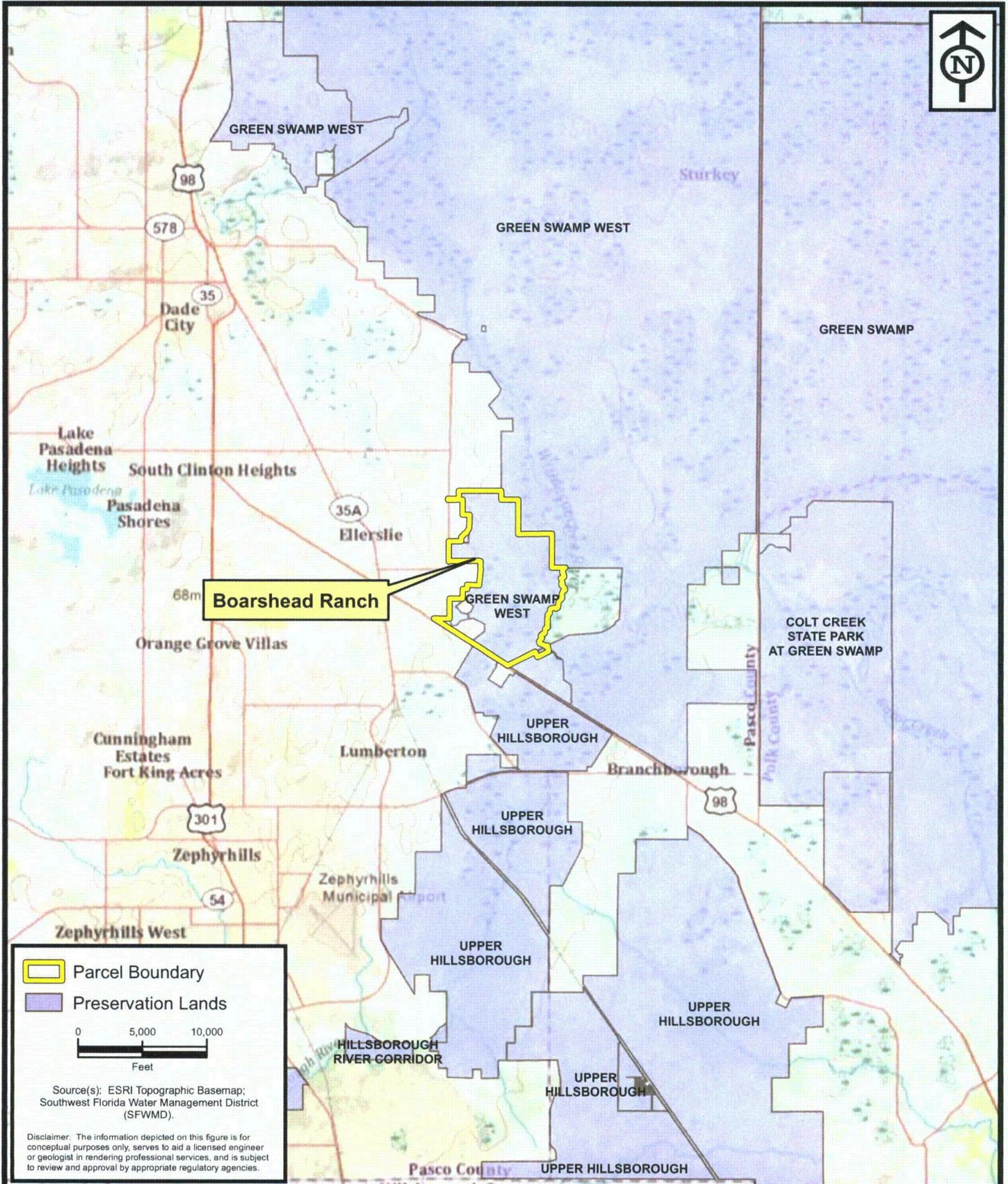
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7220 Financial Way, Suite 100  
Jacksonville, Florida 32256  
(904) 470-2200  
(904) 470-2112 Fax  
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Withlacoochee River and Hillsborough River Watersheds

**Boarshead Ranch**

Pasco County, Florida

Project:	EJ11021.00
Date:	June 2011
Drwn/Chkd:	JGB/JRN
Figure:	4-1



**Parcel Boundary**

**Preservation Lands**

0 5,000 10,000  
Feet

Source(s): ESRI Topographic Basemap;  
Southwest Florida Water Management District (SFWMD).

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Regional Preservation Land  
**Boarshead Ranch**  
Pasco County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JGB/JRN
Figure:	4-2

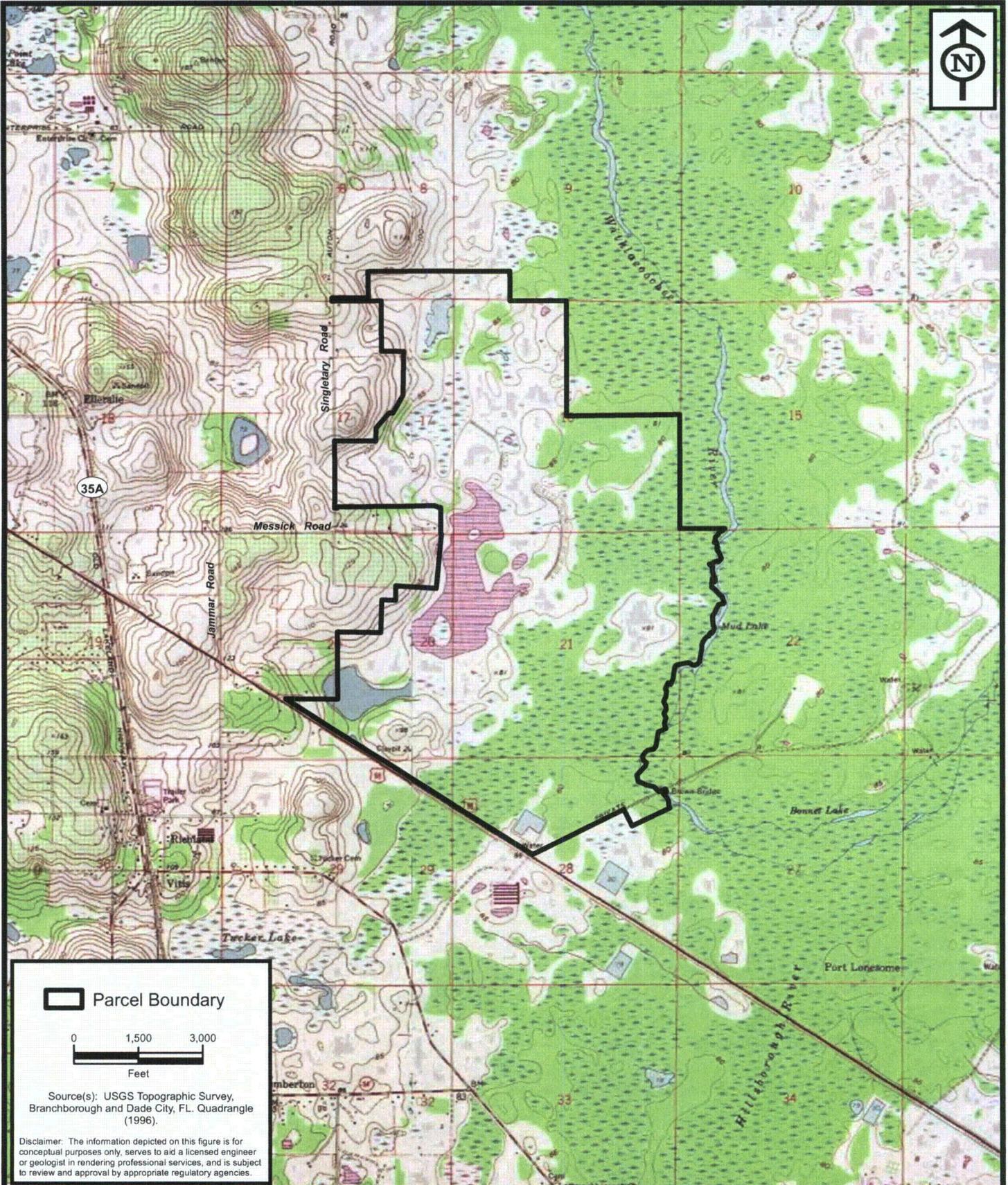
**Withlacoochee and Hillsborough Watersheds – Boarshead Ranch**

**Table 4-1. Withlacoochee and Hillsborough Watersheds (Boarshead Ranch) wetland impacts by UMAM functional loss/gain and acreage**

Area	Herbaceous Wetland Acreage (including open water)	Herbaceous Wetland Functional Loss/Gain	Forested Wetland Acreage	Forested Wetland Functional Loss/Gain	Total Acres	Total Functional Loss/Gain
<b>Withlacoochee Watershed</b>						
Permanent Fill	13.8 acres	-9.8 units	1.9 acres	-1.4 units	15.7	-11.2
Permanent Clearing	None	None	25.3 acres	-7.8 units	25.3	-7.8
<b>Total Impacts</b>					<b>41.0</b>	<b>-19.0</b>
<b>Hillsborough Watershed</b>						
Permanent Fill	22.4 acres	-15.7 units	1.1 acres	-0.9 units	23.4	-16.6
Permanent Clearing	None	None	0	0	0	0
<b>Total Impacts</b>					<b>23.4</b>	<b>-16.6</b>
<b>Combined Watershed Impacts</b>					<b>64.4</b>	<b>-35.6</b>

**4.3 Site Description**

The BHR site is located in Sections 8, 9, 15, 16, 17, 20, 21, 22, 27, 28, and 29, Township 25S and Range 22E and is north and adjacent to U.S. Highway 98, west of S.R. 35A and east of S.R. 471 in Pasco County, FL (Figure 4-3). The total area of the BHR parcel is approximately 2,096.8 acres, yet the proposed enhancement/restoration activities for this project are scattered throughout the property limits and include approximately 236.7 acres. Water flows within BHR from the east as the two watersheds diverge, and from sheet flow associated with ridges to the west. The headwaters of the Hillsborough River flow southwestward through a natural channel of the Withlacoochee River, and the Withlacoochee River flows to the northwest. These two drainage basins interconnect in several locations by swamp channels and gaps in surrounding ridges. Based on an existing USGS Station (02311000), the Withlacoochee must stage to 2.9 feet before measurable discharge at an overflow feature near the southwest corner of BHR will measure the discharge from the Withlacoochee to the Upper Hillsborough Basin. Prior to reaching the 2.9 feet of staging at the overflow feature, the Withlacoochee may overflow and follow low areas throughout BHR. Under extreme rain events, portions of BHR have been flooded. A portion of the water leaves the site with slight flows to the southwest, with the remaining majority of the water left to naturally infiltrate the surface or recede with the rivers' water elevations.



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 7220 Financial Way, Suite 100  
 Jacksonville, Florida 32256  
 (904) 470-2200  
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Project Location  
**Boarshead Ranch**  
 Pasco County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JGB/JRN
Figure:	<b>4-3</b>

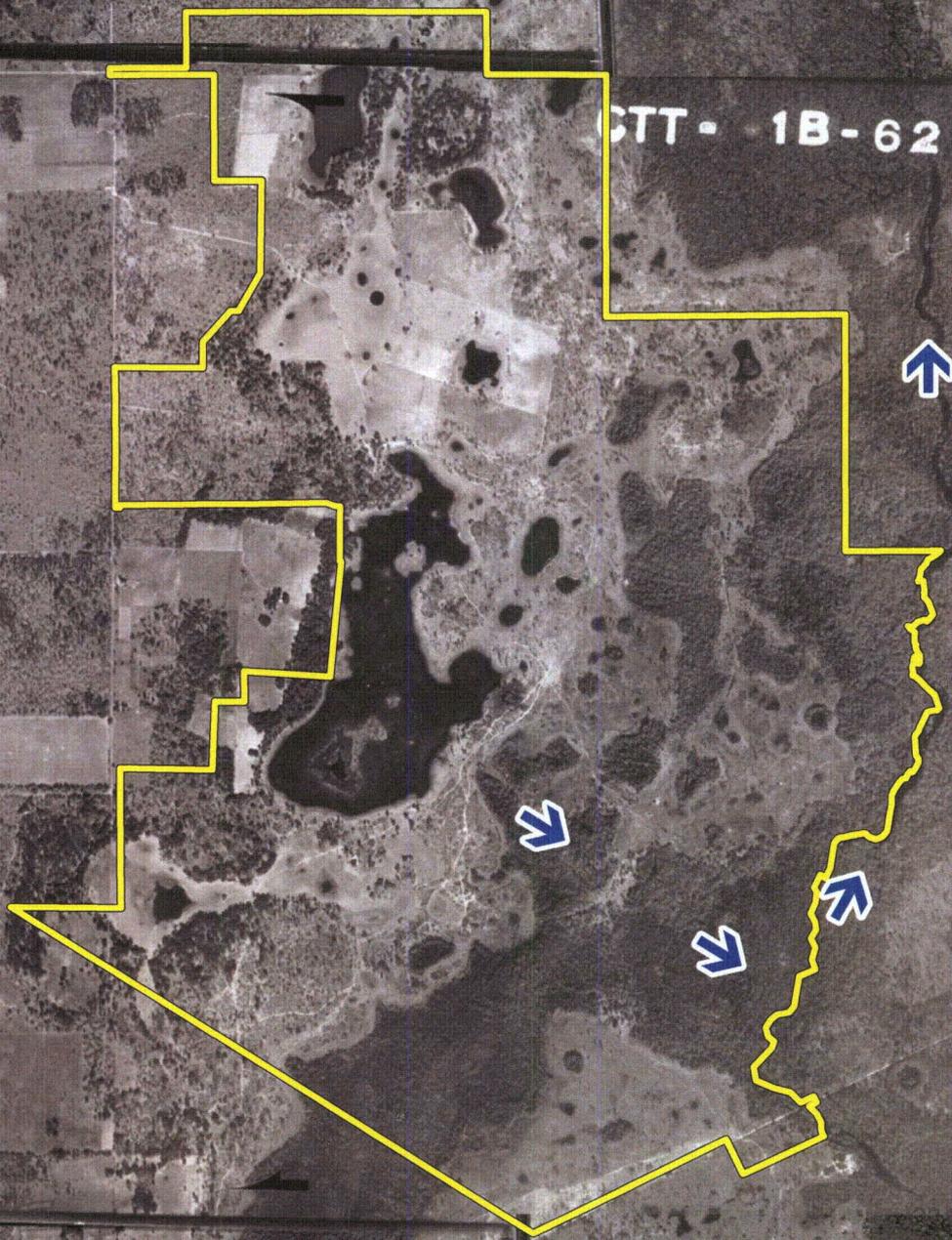
### 4.3.1 Historic Conditions

Historically, the BHR property was an extension of the Withlacoochee and Hillsborough River floodplains and consisted of a mosaic of forested wetlands and herbaceous marshes that sloped into flatwoods communities and open water systems. Sandhills were located to the west and various small broad ridges were scattered throughout the central portion of the site. The general footprint of the original floodplain system has been altered with the addition of agricultural areas and trail roads, and borrow areas that were developed to drain the land and improve access. The general hydrology of the floodplain has been altered to some extent, as floodwater historically entered the system from the north and east and generally moved toward the west and southwest direction (Figure 4-4).

Prior to 1941, northern portions of the site were converted to agricultural uses such as row crop and sod farming, and timber harvesting. The property was eventually used for borrow areas for constructing nearby roadways and harvesting clay, additional agricultural uses such as silviculture and cattle ranching, low density residential, and recreational hunting and fishing. Three large borrow pits were dug along U.S. Highway 98 and numerous marshes were excavated and converted to deep open water habitat or cattle ponds which significantly altered the hydrology of the north and western portion of BHR. Spoil piles and remnant uplands were colonized with invasive/exotic herbaceous species that have been managed and maintained. However, the aquatic invasive species, water hyacinth (*Eichhornia crassipes*) has invaded the northeastern-most pond, and no recent maintenance has been completed.

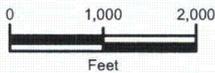


CTT - 1B-62



ALTA 88 88 88 88

 Parcel Boundary



Source(s): University of Florida PALMM Imagery, (1941).

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1941 Historic Aerial Imagery

**Boarshead Ranch**

Pasco County, Florida

Project: EJ11021.00

Date: Aug 2011

Drwn/Chkd: JGB/JRN

Figure: 4-4

### 4.3.2 Current Conditions

Various habitat types are present at the BHR site including the footprint of the Withlacoochee River. In addition, community types consist of low density residential areas, agricultural land, pine flatwoods, temperate hardwoods, hardwood conifer mixed, planted pine plantations, lakes and artificial waterbodies, stream and lake swamp, cypress domes, freshwater marshes, wet prairies, and improved trail roads (Figure 4-5). Most of the improved, non-natural habitats are highly degraded from historic land disturbances. Invasive/exotic species, such as water hyacinth and primrose-willow (*Ludwigia* spp.) have invaded the southern marsh areas and fringe areas of the open water ponds, and cogon grass (*Imperata cylindrica*) has invaded agricultural and altered upland areas, but is being maintained. Plant diversity and wildlife utilization appear to be high in undisturbed areas, but is low in areas that have been altered. The site has a variety of wildlife species and those observed include the protected gopher tortoise, American alligator, cottonmouth, slider/pond turtle, wild turkey, osprey, cormorant, red-tailed hawk, and protected sandhill crane were observed. Other known protected species that utilize BHR that were not observed include Sherman's fox squirrel, black bear, Florida panther, and various wading birds.

For the purposes of this project, all references to invasive/exotic species refer to those listed as Category I and II invasive exotic species, as defined by the Florida Exotic Pest Council.

FLUCFCS was used to determine the different community types on site. All habitat types located within the BHR property will be described. Please see Figure 4-6, for details of the specific community types associated with the mitigation/activity areas.

#### Uplands

1. Residential, Low Density, < 2 Dwellings/acre (FLUCFCS 110). There are two areas within BHR that contain single family residential dwellings. These upland community types are located southwestern portion of the ranch, adjacent to U.S. Highway 98 and the other is located in the northeastern section, just north of the crescent shaped pond. The residence in the southeast is dominated by bahia grass (*Paspalum notatum*), with a few live oaks (*Quercus virginiana*) and slash pine scattered throughout. The northeastern area is dominated by bahia grass, a live oak canopy, and various landscape species, most of which surround the perimeter of the dwellings.

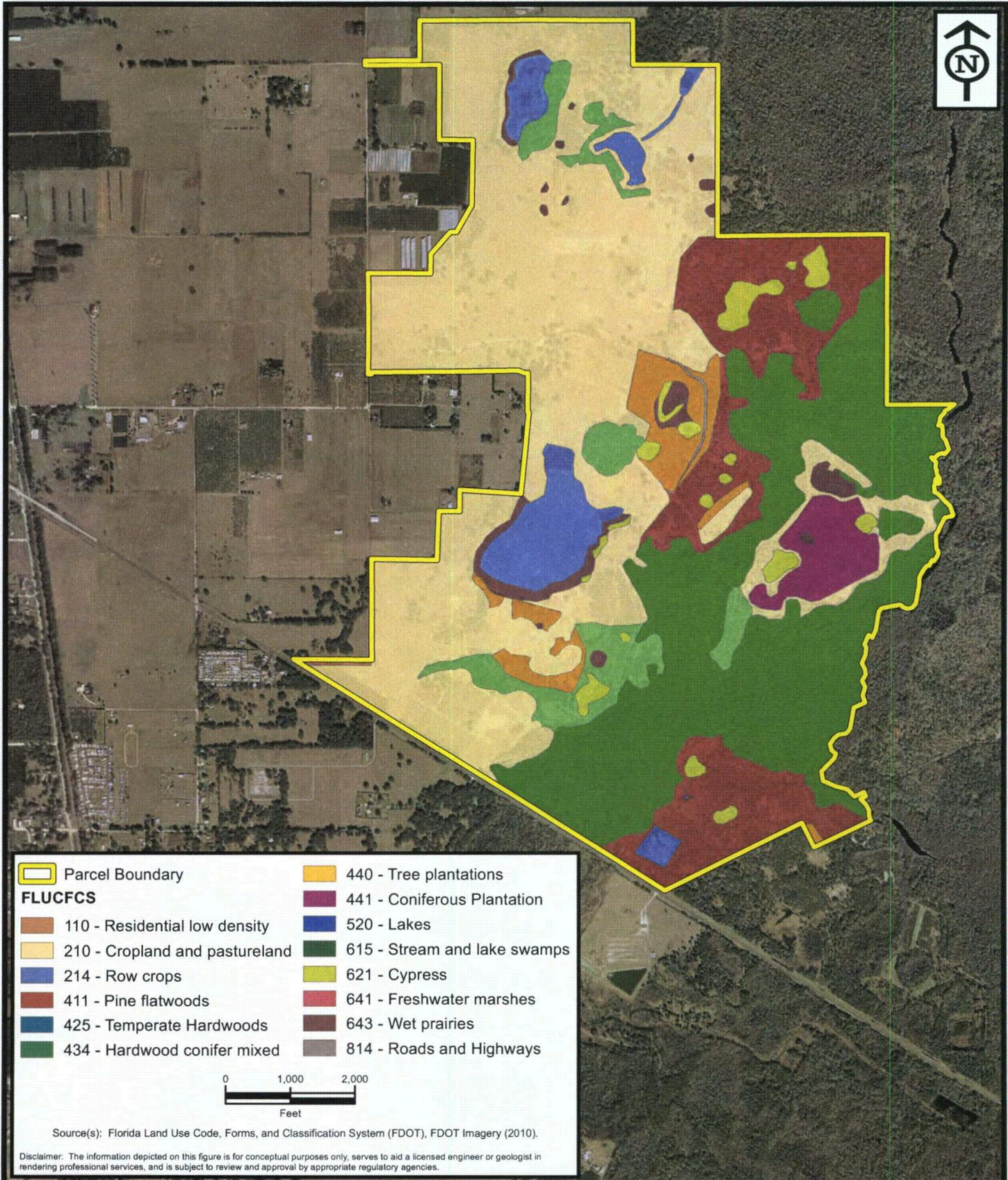
2. Cropland and Pastureland and Row Crops (FLUCFCS 210 and 214). This habitat type is composed of bahia grass, with scattered live oak, broomsedge, sour weed/sorrel (*Rumex acetosella*), and cogon grass. Historically, this area was used as improved pasture for cattle grazing; however it is now managed for the production of field crops grown in rotation.

3. Pine Flatwoods (FLUCFCS 411). The predominant species in this upland forest community is slash pine. Other common species in the community type include laurel oak (*Quercus laurifolia*), saw palmetto, broomsedge, bushy bluestem (*Andropogon glomeratus*), and blackberry (*Rubus* spp.). This habitat type is scattered throughout the BHR property on very slightly higher ridges and knolls adjacent to wetland areas, temperate hardwoods and hardwood conifer mixed communities.

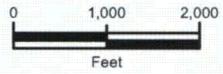
4. Temperate Hardwoods (FLUCFCS 425). The upland forested community is dominated by various oak species, red bay (*Persea borbonia*), pignut hickory (*Carya glabra*), cabbage palm (*Sabal palmetto*), and southern red cedar (*Juniperus virginiana*). Understory vegetation is composed of saw palmetto, shiny blueberry, and yaupon holly (*Ilex vomitoria*). These community types are scattered on slightly higher broad ridges adjacent to pine flatwoods and wetland marsh and prairie communities.

5. Hardwood Conifer Mixed (FLUCFCS 434). This upland forested community type is dominated by live and laurel oak in conjunction with slash pine. The understory is dominated by saw palmetto, wiregrass, shiny blueberry, beggar's lice (*Desmodium* spp.), and milk pea (*Galactia* spp.). This community type is typically adjacent to freshwater marsh and wet prairie communities and sit higher in elevation on broad knolls.

6. Tree and Coniferous Plantations (FLUCFCS 440 and 441). These upland communities have been cleared and planted with cypress, oaks or slash pine. Due to a dense canopy and a heavy duff layer, few species other than minor, scattered grass species occur in the understory, the most prevalent being wiregrass.



- |                                |                              |
|--------------------------------|------------------------------|
| Parcel Boundary                | 440 - Tree plantations       |
| <b>FLUCFCS</b>                 | 441 - Coniferous Plantation  |
| 110 - Residential low density  | 520 - Lakes                  |
| 210 - Cropland and pastureland | 615 - Stream and lake swamps |
| 214 - Row crops                | 621 - Cypress                |
| 411 - Pine flatwoods           | 641 - Freshwater marshes     |
| 425 - Temperate Hardwoods      | 643 - Wet prairies           |
| 434 - Hardwood conifer mixed   | 814 - Roads and Highways     |



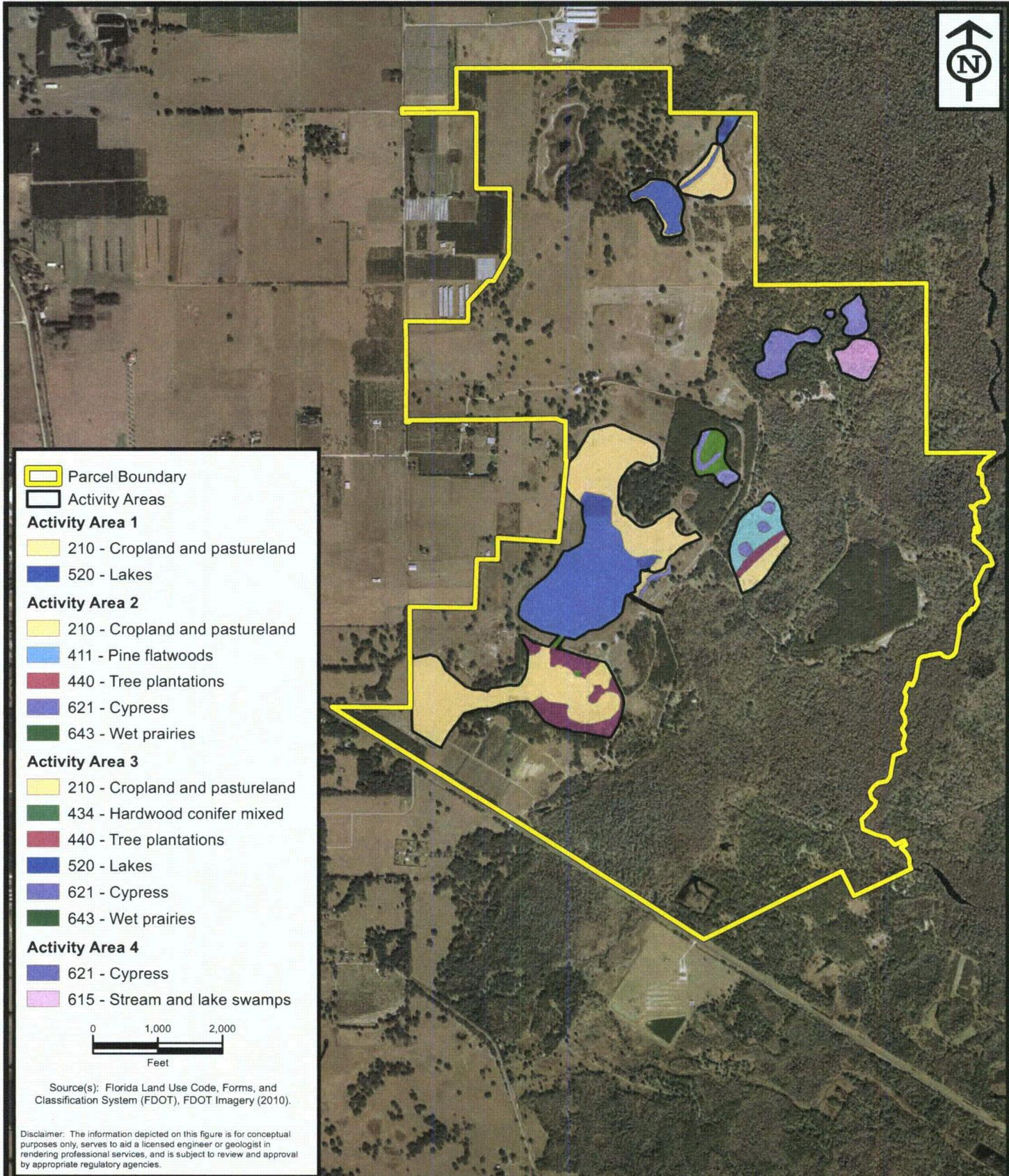
Source(s): Florida Land Use Code, Forms, and Classification System (FDOT), FDOT Imagery (2010).

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Jacksonville, Florida 32256  
(904) 470-2200  
(904) 470-2112 Fax  
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Existing Community Map  
**Boarshead Ranch**  
Pasco County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JGB/JRN
Figure:	4-5



**Parcel Boundary**  
Activity Areas

**Activity Area 1**

- 210 - Cropland and pastureland
- 520 - Lakes

**Activity Area 2**

- 210 - Cropland and pastureland
- 411 - Pine flatwoods
- 440 - Tree plantations
- 621 - Cypress
- 643 - Wet prairies

**Activity Area 3**

- 210 - Cropland and pastureland
- 434 - Hardwood conifer mixed
- 440 - Tree plantations
- 520 - Lakes
- 621 - Cypress
- 643 - Wet prairies

**Activity Area 4**

- 621 - Cypress
- 615 - Stream and lake swamps

0 1,000 2,000  
Feet

Source(s): Florida Land Use Code, Forms, and Classification System (FDOT), FDOT Imagery (2010).

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(904) 470-2200  
(904) 470-2112 Fax  
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Mitigation Activity Area - Existing Community Map

## Boarshead Ranch

Pasco County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JGB/JRN
Figure:	4-6

7. Roads and Highways (FLUCFCS 814). This community type consists of rural, primitive yet graded, unimproved roads and trails that allow access throughout the property. Some of the trails are elevated and drained and act as a berm severing hydrologic connections. Certain roads will have culverts added and/or lowered to restore or enhance hydrologic connections. The only category shown on the existing community map is the elevated and drained trail road that contains the major improvements. However, it must be noted that numerous trails exist within the property boundary.

### Wetlands

1. Lakes (FLUCFCS 520). Several areas within the property contain open water areas associated with existing borrow areas, farm ponds, historic depressions that were excavated, and connective ditching. The majority of the open water areas are hydrologically connected to the Withlacoochee River floodplain, and include water control structures to prevent flooding or enhance recreational fishing and birding. Emergent aquatic vegetation is present at the upper limits of the water bodies, with some shrub components in elevated islands within the interior of these areas. General open water species include Carolina willow (*Salix caroliniana*), young cypress, pickerelweed, pennywort (*Hydrocotyle umbellata*), smartweed (*Polygonum hydropiperoides*), needle rush, duck potato (*Sagittaria latifolia*), primrose willow, cattails, water lily (*Nymphaea* spp.) and marsh elder (*Iva* spp). Mitigation activities will include the creation of larger littoral shelves in some area to increase density of plant species, general flora and fauna biodiversity, and enhance water quality and restore hydrological conditions.

2. Stream and Lake Swamps (Bottomlands) (FLUCFCS 615). This wetland community type is represented by a dense canopy of hardwood tree species tolerant of hydric conditions. Dominant canopy species include sweetbay, red maple, pignut hickory, cabbage palm, and sweetgum. The shrub layer consists of gallberry, fetterbush, wax myrtle, and dahoon holly. This habitat type borders the Withlacoochee River.

3. Cypress (FLUCFCS 641). This wetland community type is dominated by cypress and is located in the central northeast and southern portions of the property. These areas are slightly lower in the landscape than the stream and lake swamps and are typically small depressions that are inundated with water. Swamp fern (*Blechnum serrulatum*), lizard's tail (*Saururus cernuus*), and chain fern (*Woodwardia* spp.) are present within

the understory. Given current drought conditions, several young slash pine were also present in the understory in Activity Area 4.

4. Freshwater Marshes (FLUCFCS 641). These wetland communities are currently minor components of the site as most have been altered by agricultural uses. These herbaceous systems contain smartweed, Paspalum, and various sedges. Lesser components include sesban (*Sesbania* spp.), carpetgrass (*Axonopus* spp.), and Bermuda grass (*Cynodon dactylon*).

5. Wet Prairie (FLUCFCS 643). These shallow marshes differ from freshwater marshes in that they are composed predominately of grassy vegetation with shorter hydroperiods and shorter herbage. These wetland communities are small isolated systems that are found throughout the property and may or may not have been altered by human activity. Dominant species in these systems is composed of maidencane, spikerush (*Eleocharis* spp.), yellow-eyed grass (*Xyris* spp.), beakrush (*Rhynchospora* spp.), and witchgrass (*Dicanthelium* spp.). Activity area 2 and 3 will expand these communities by re-establishing or enhancing historic wet prairies.

**4.3.3 Soils**

According to the NRCS soil map for Pasco County, 22 soil types and 1 water category are present within the BHR (Table 4-2). Figure 4-7 depicts all soil types within the BHR property. The NRCS soil map was produced prior to some of the depressions that were excavated into open water conditions, as some soil types are shown where there is currently open water. However, the remaining portions still reflect accurate soil conditions.

**Table 4-2. Boarshead Ranch Soil Types**

NRCS Soil Type	Hydric	Acreage
2 Pomona Fine Sand	No	34.0
5 Myakka Fine Sand	No	29.0
6 Tavares Sand, 0 to 5% slopes	No	136.4
7 Sparr Fine Sand, 0 to 5% slopes	No	105.9
8 Sellers Mucky Loamy Fine Sand	Yes	23.6
9 Ona Fine Sand	No	125.4
11 Adamsville Fine Sand	No	117.2
16 Zephyr Muck	Yes	5.1
17 Immokalee Fine Sand	No	28.9
21 Smyrna Fine Sand	No	45.5
23 Basinger Fine Sand, depressional	Yes	141.3
26 Narcoossee Fine Sand	No	55.3
28 Pits	N/A	23.1
32 Lake Fine Sand, 0 to 5% slopes	No	252.2

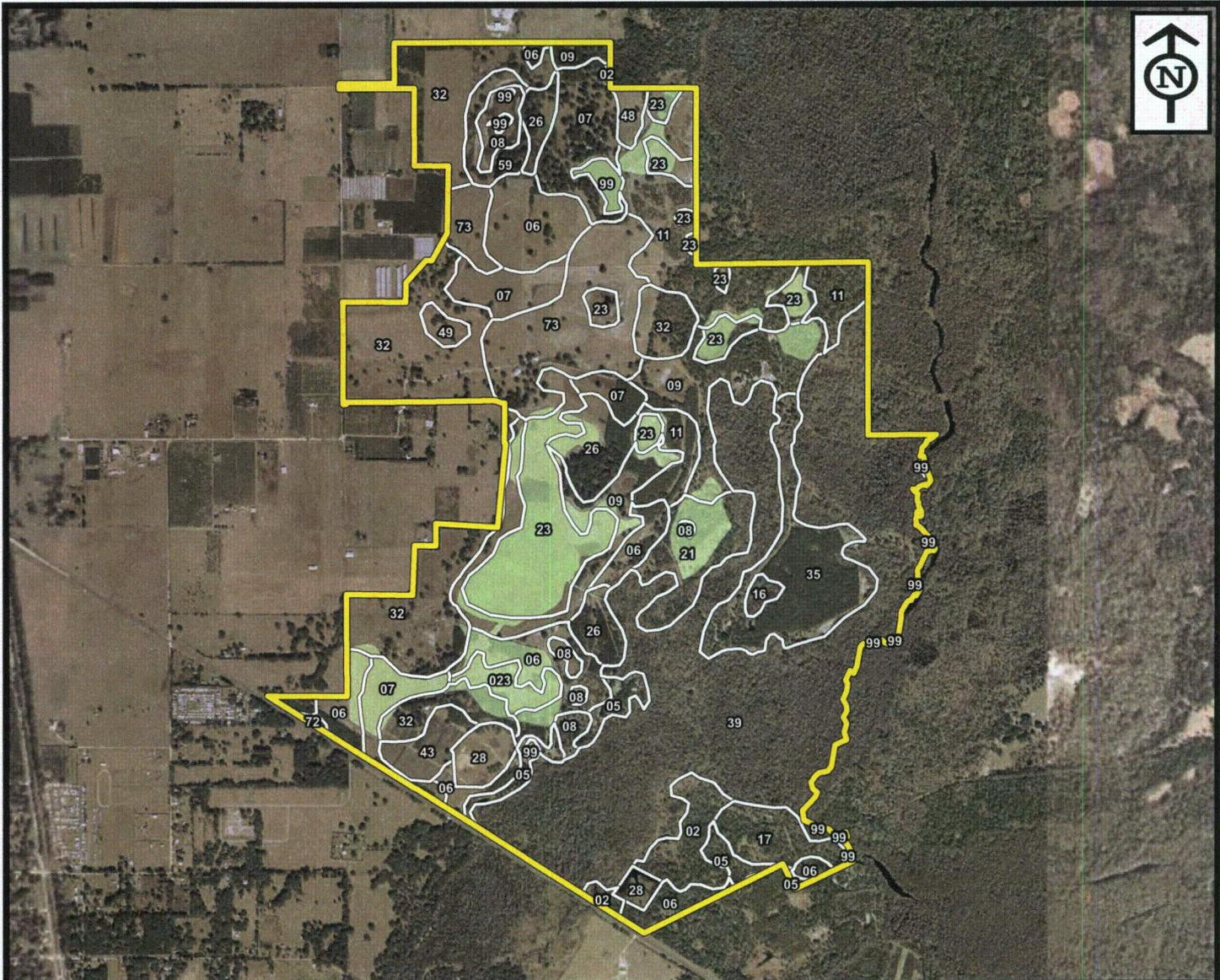
Withlacoochee and Hillsborough Watersheds – Boarshead Ranch

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**Table 4-2. Boarshead Ranch Soil Types cont.**

<b>NRCS Soil Type</b>	<b>Hydric</b>	<b>Acreage</b>
35 Eugallie Fine Sand	Yes	83.9
39 Chobee Soils, frequently flooded	Yes	489.0
43 Arredondo Fine Sand, 0 to 5% slopes	No	20.3
48 Lochloosa Fine Sand, 0 to 5% slopes	No	7.9
49 Blichton Fine Sand, 0 to 2% slopes	No	6.8
59 Newnan Fine Sand, 0 to 5% slopes	No	18.2
72 Orlando Fine Sand, 0 to 5% slopes	No	1.3
73 Zolfo Fine Sand	No	109.8
99 Water	N/A	11.4

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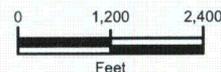


- Parcel Boundary
- Proposed Activity Areas
- Soils

- 02 - POMONA FINE SAND (34.0 ac.±)
- 05 - MYAKKA FINE SAND (29.0 ac.±)
- 06 - TAVARES SAND, 0 TO 5 PERCENT SLOPES (136.4 ac.±)
- 07 - SPARR FINE SAND, 0 TO 5 PERCENT SLOPES (105.9 ac.±)
- 08 - SELLERS MUCKY LOAMY FINE SAND (23.6 ac.±)
- 09 - ONA FINE SAND (125.4 ac.±)
- 11 - ADAMSVILLE FINE SAND (117.2 ac.±)
- 16 - ZEPHYR MUCK (5.1 ac.±)
- 17 - IMMOKALEE FINE SAND (28.9 ac.±)
- 21 - SMYRNA FINE SAND (45.5 ac.±)

- 23 - BASINGER FINE SAND, DEPRESSIONAL (141.3 ac.±)
- 26 - NARCOOSSEE FINE SAND (55.3 ac.±)
- 28 - PITS (23.1 ac.±)
- 32 - LAKE FINE SAND, 0 TO 5 PERCENT SLOPES (252.2 ac.±)
- 35 - EAUGALLIE FINE SAND (83.9 ac.±)
- 39 - CHOBEE SOILS, FREQUENTLY FLOODED (489.0 ac.±)
- 43 - ARREDONDO FINE SAND, 0 TO 5 PERCENT SLOPES (20.3 ac.±)
- 48 - LOCHLOOSA FINE SAND, 0 TO 5 PERCENT SLOPES (7.9 ac.±)
- 49 - BLIGHTON FINE SAND, 0 TO 2 PERCENT SLOPES (6.8 ac.±)
- 59 - NEWNAN FINE SAND, 0 TO 5 PERCENT SLOPES (18.2 ac.±)
- 72 - ORLANDO FINE SAND, 0 TO 5 PERCENT SLOPES (1.3 ac.±)
- 73 - ZOLFO FINE SAND (109.8 ac.±)
- 99 - WATER (11.4 ac.±)

Source(s): FDOT Imagery (2010). USDA Soil Survey of Pasco County.



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 (904) 470-2200  
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NRCS Soils  
**Boarshead Ranch**  
 Pasco County, Florida

Project:	EJ11021.00
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Drwn/Chkd:	JGB/JRN
Figure:	4-7

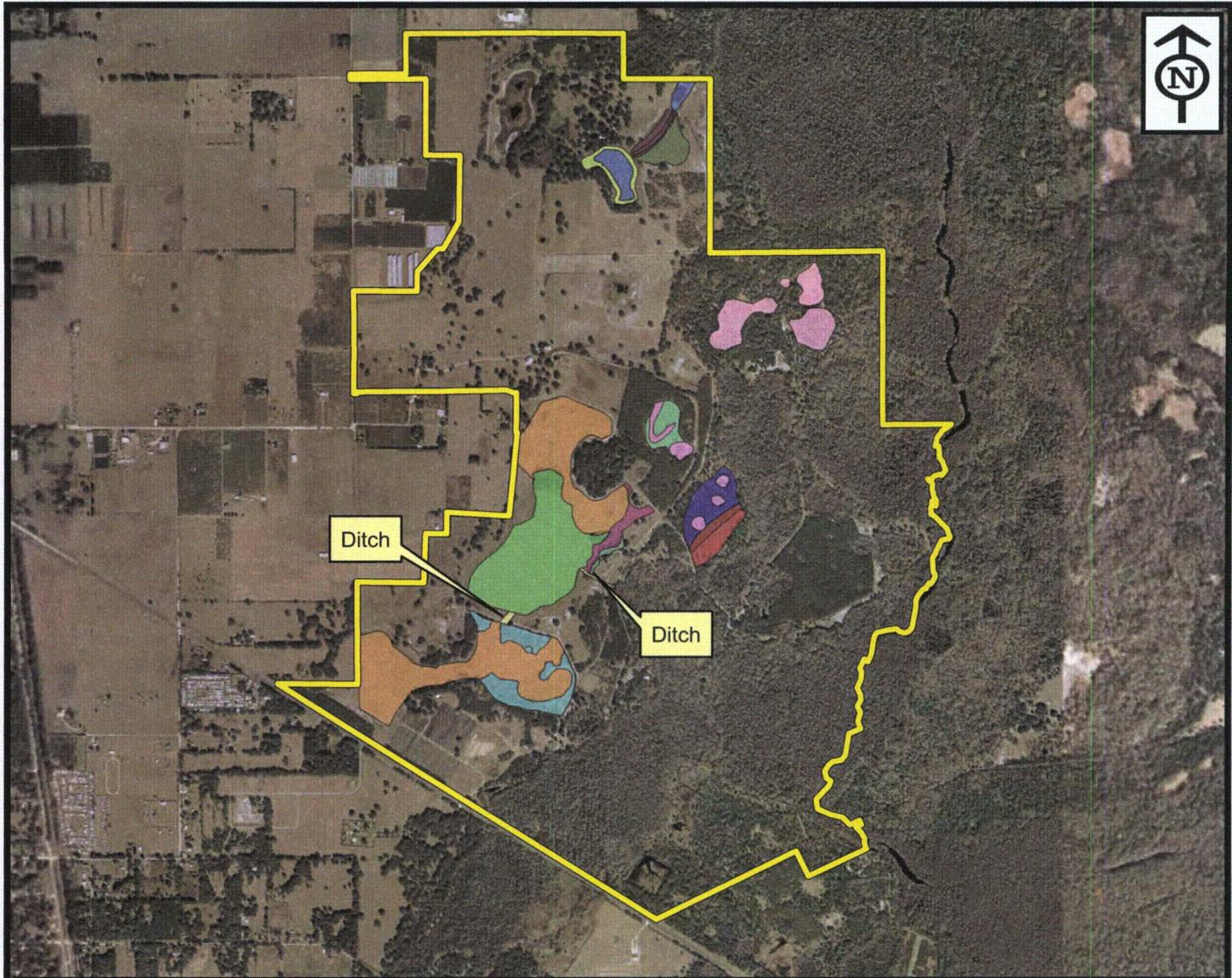
#### 4.4 Mitigation Plan

The overall goal of the mitigation plan for BHR is to preserve, restore and enhance the condition of existing wetlands and lakes (open water systems) that have been impacted by ongoing agricultural activities, and to create additional wetlands from uplands that have been previously converted to silvicultural uses or pastureland. Proposed mitigation activities at BHR total 236.7 acres and include the following target communities: mixed wetland hardwoods/dome swamp hardwoods, cypress domes, stream and lake swamps/bottomlands, lakes, hydric pine flatwoods, and wet prairies with association to hydrological enhancements (Figure 4-8). For details of all proposed activity areas described below (with the exception of straight preservation), please see the proposed planting plan for BHR found within Section 4.11 Engineering and Planting Detail Drawings.

##### 4.4.1 Activity Area 1

Activity Area 1 is located in the northeastern portion of the BHR property (Figure 4-6 and 4-8a). The current land uses in this area include Crop and Pastureland (6.8 acres) and Lakes (15.7 acres). Target Communities include mixed wetland hardwoods (6.8 acres), lakes (7.9 acres), one of which contains littoral shelves to mimic a fringe of wet prairie (4.2 acres), and freshwater marsh (3.6 acres). Primary mitigation in this area is forested and herbaceous wetland creation and enhancement, in addition to littoral shelf creation and planting. Water control structures will be altered to restore hydrological conditions to ensure mitigation success. For more detail on planting plans and water control structures, refer to Section 4.7 Engineering and Section 4.11 Engineering and Planting Detail Drawings.

1. Mixed Wetland Hardwood Creation. The proposed forested wetland creation (6.8 acres) is located along the southern edge of the BHR linear ditch/lake/open water system that connects the two larger lake systems. These lake/pond areas convey water from a wetland located directly off-site. The elevation of the agricultural area will be graded down approximately 8 to 10 feet to an elevation of 72 feet to establish a hydrological connection; therefore, creating a hardwood forested wetland system once planted. The area will be hydrated by the fluctuating level of flowing water in between the lakes and through the enhanced freshwater marsh area. During times of high flow, the water will meander through the adjacent ditch graded into a freshwater marsh, stage, and hydrate the lowered area. This will serve as an attenuation area for water by slowing the channelized flow between water control structures. This forested area will create a floodplain habitat that creates shallow wading bird habitat as well increased biodiversity and wildlife cover.



 Parcel Boundary

**Activity Area 1**

-  Regrade Side Slopes to Create Littoral Zone (4.2 ac.±)
-  Grade Area down to Create Forested Wetland (6.8 ac.±)
-  Lake Preservation (7.9 ac.±)
-  Regrade Side Slopes to Create Marsh (3.6 ac.±)

**Activity Area 2**

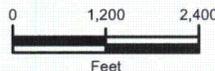
-  Cypress Hydrologic Enhancement (5.9 ac.±)
-  Cypress Enhancement (5.6 ac.±)
-  Wet Prairie Creation (8.5 ac.±)
-  Create Wet Flatwoods (10.0 ac.±)

**Activity Area 3**

-  Cypress Restoration (5.5 ac.±)
-  Cypress Preservation (1.1 ac.±)
-  Remove Pine and Create Herbaceous Wetland (15.6 ac.±)
-  Ditch Hydrologic Enhancement (1.1 ac.±)
-  Wet Prairie Restoration (87.1 ac.±)
-  Lake Preservation/Berms to be Removed (52.1 ac.±)

**Activity Area 4**

-  Forested Wetland Preservation (21.7 ac.±)



Source(s): FDOT Imagery (2010); Taylor Engineering.

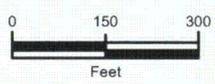
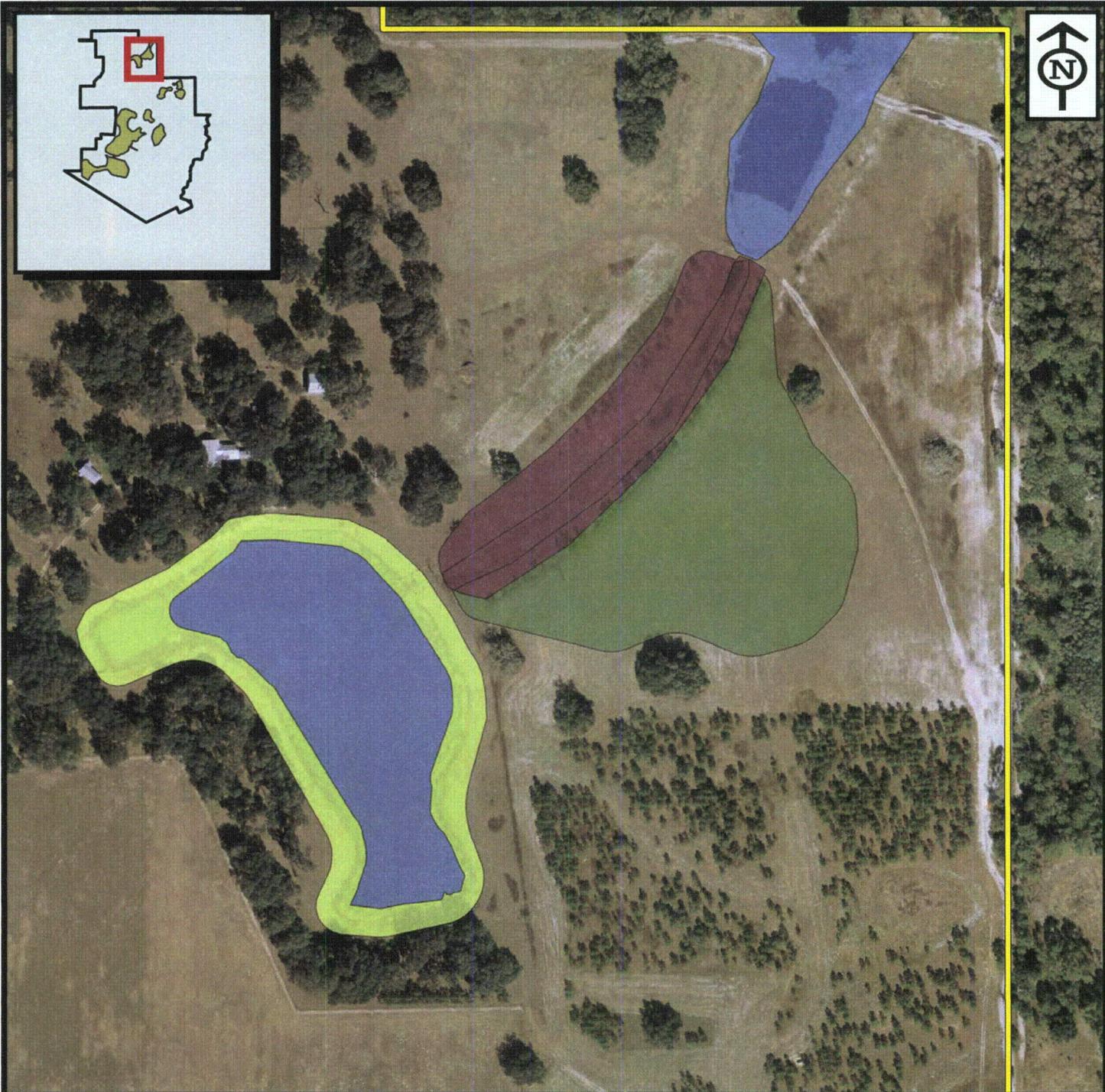
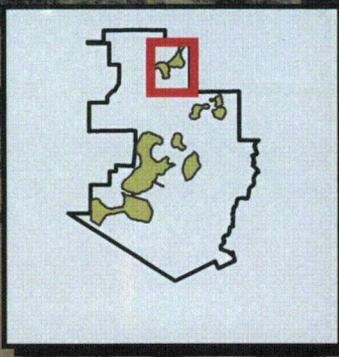
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 (904) 470-2200  
 (904) 470-2112 Fax  
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Mitigation Activity  
**Boarshead Ranch**  
 Pasco County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JGB/JRN
Figure:	4-8



Source(s): FDOT Imagery (2010); Taylor Engineering.

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Parcel Boundary

**Activity Area 1**

- Regrade Side Slopes to Create Littoral Zone (4.2 ac.±)
- Grade Area Down to Create Forested Wetland (6.8 ac.±)
- Lake Preservation (7.9 ac.±)
- Regrade Side Slopes to Create Marsh (3.6 ac.±)

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 7220 Financial Way, Suite 100  
 Jacksonville, Florida 32256  
 (904) 470-2200  
 (904) 470-2112 Fax  
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Mitigation Activity Area 1  
**Boarshead Ranch**  
 Pasco County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JGB/JRN
Figure:	<b>4-8a</b>

## Withlacoochee and Hillsborough Watersheds – Boarshead Ranch

---

The mixed wetland hardwood area will be planted on ten-foot centers at a density of 440 stems/acre with 3-gallon size Florida native trees including:

- Red maple
- Water oak
- Carolina ash

2. Lake Preservation and Enhancement. The proposed lake preservation encompasses the northernmost lake (2.4 acres) which includes existing wet prairie fringe. This lake is dominated with water hyacinth, and therefore, some enhancement will be needed to remove these exotic/invasive species to prevent spreading. The southern lake in Activity Area 1 will have 5.4 acres of open water, while the remaining outer limits (4.2 acres) will be graded to create a contiguous littoral zone. The existing littoral shelf will be regraded and extended out further into the water to create additional wading bird and forage habitat. The area will be graded to an elevation of 72 feet NVGD and planted with aquatic herbaceous vegetation.

The central lake region that resembles a linear ditch will be graded along the outer limits that are currently agricultural areas or large berms and the existing lake side slopes graded to a 4:1 to create varying depths for wetland plants that will be consistent with freshwater marsh systems. This area will total 3.6 acres and the area will be replanted to create additional wading bird and forage habitat.

The wetland herbaceous enhancement area and littoral zone will be planted on three-foot centers at a density of 4,840 stems/acre with bare-root size Florida native aquatic plants including:

- Pickerelweed
- Arrowhead
- Bulrush
- Maidencane
- Fire flag (*Thalia geniculata*)

#### 4.4.2 Activity Area 2

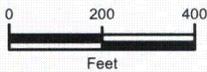
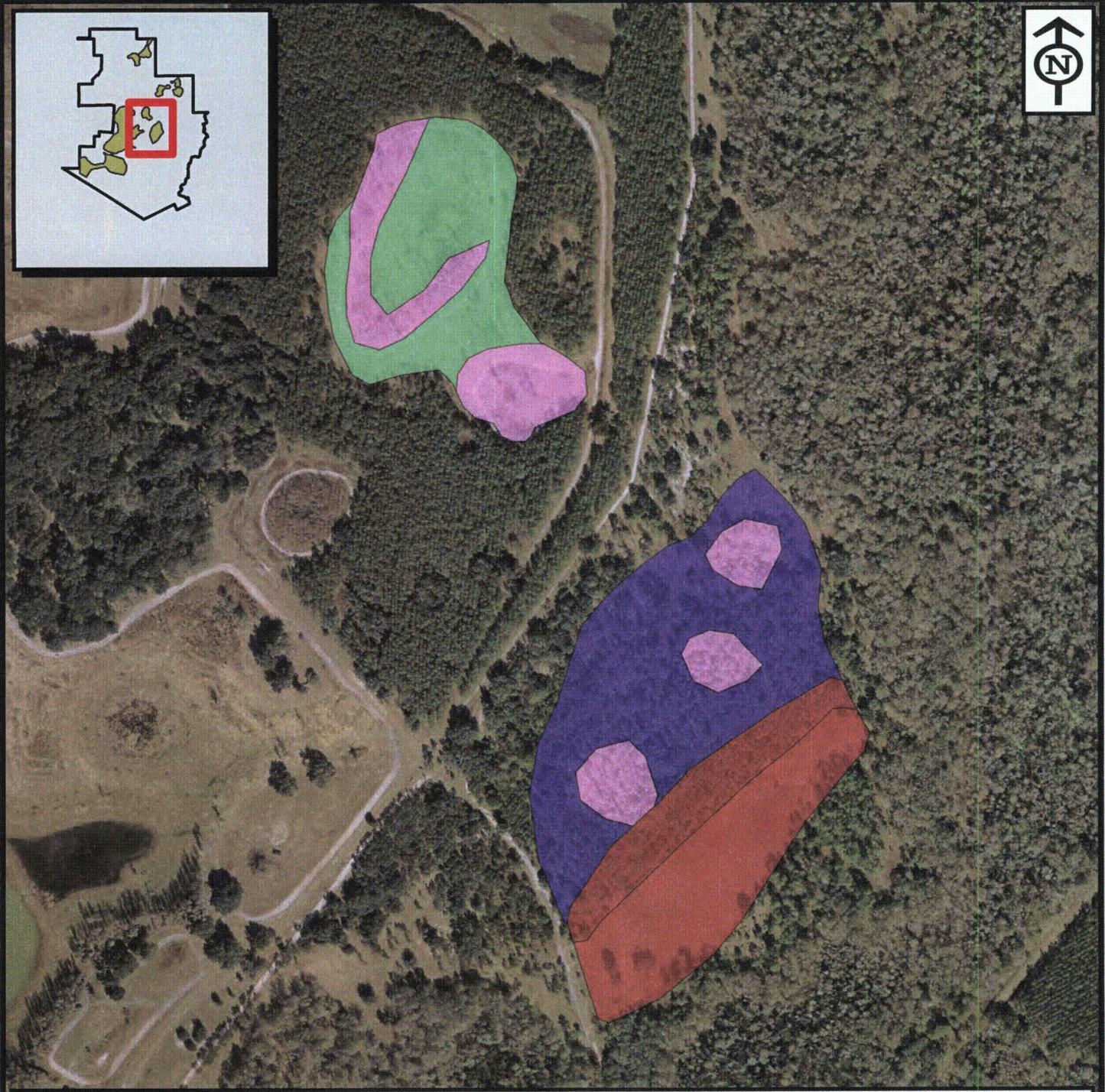
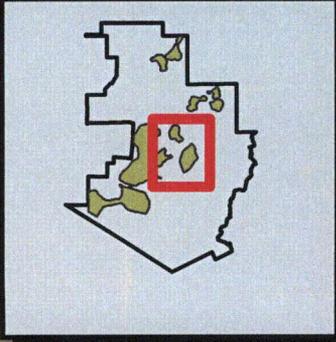
Activity Area 2 is located in the east central portion of BHR and consists of two areas that total 30.0 acres (Figure 4-6 and 4-8b). The current land use in these two areas consists of 5.7 acres of cropland and pastureland, 10.0 acres of pine flatwoods, 2.8 acres of pine plantation (planted), 5.9 acres of cypress, and 5.6 acres of wet prairie. The proposed work within Activity Area 2 consists of herbaceous wetland creation (8.5 acres) and forested wetland enhancement (21.5 acres) via hydrologic improvements, pine thinning, and reforestation.

1. Wet Prairie Creation. The herbaceous wetland creation area consists of two adjacent areas that total 8.5 acres; one area is currently planted pines and the other is a maintained pasture. Both areas will be cleared of existing vegetation and excavated to 75 feet NGVD and planted with aquatic herbaceous vegetation.

The wetland herbaceous areas will be planted on three-foot centers at a density of 4,840 stems/acre with bare-root size Florida native aquatic plants including:

Maidencane  
Cordgrass (*Spartina bakeri*)  
St. Johns wort (*Hypericum* spp.)  
Sawgrass (*Cladium jamaicensis*)

2. Wet Flatwoods Enhancement and Cypress Hydrological Enhancement. Immediately adjacent to the proposed herbaceous wetland creation area is an existing pine flatwoods area that totals approximately 10.0 acres. Within the interior of this flatwoods area are three small cypress domes totaling 2.2 acres (from north to south each cypress dome is 0.7, 0.6, and 0.9 acre respectively). The flatwoods area will be thinned of existing pine trees to a density of 50 stems/acre. This will provide both hydrologic and vegetative enhancement, as the machinery used to thin the pines will aid in flattening existing knolls and pine removal will result in less water being drawn from the ground. The result should promote an elevated water table and additional sheet flow throughout the area. It will also thin the existing canopy and allow for more sunlight penetration to understory vegetation and reduce the duff layer present. This hydrologic and vegetative enhancement will help to improve the hydrology within the cypress domes and should allow for the existing seed source to better populate the surrounding area. In addition, the second area to the west includes cypress enhancement (5.6 acres) and cypress hydrological enhancement (3.7 acres). This enhancement will



Parcel Boundary

**Activity Area 2**

- Cypress Hydrologic Enhancement (5.9 ac.±)
- Cypress Enhancement (5.6 ac.±)
- Wet Prairie Creation (8.5 ac.±)
- Create Wet Flatwoods (10.0 ac.±)

Source(s): FDOT Imagery (2010); Taylor Engineering.

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 (904) 470-2200  
 (904) 470-2112 Fax  
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Mitigation Activity Area 2  
**Boarshead Ranch**  
 Pasco County, Florida

Project:	EJ11021.00
Date:	June 2011
Drwn/Chkd:	JGB/JRN
Figure:	4-8b

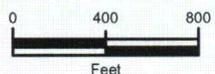
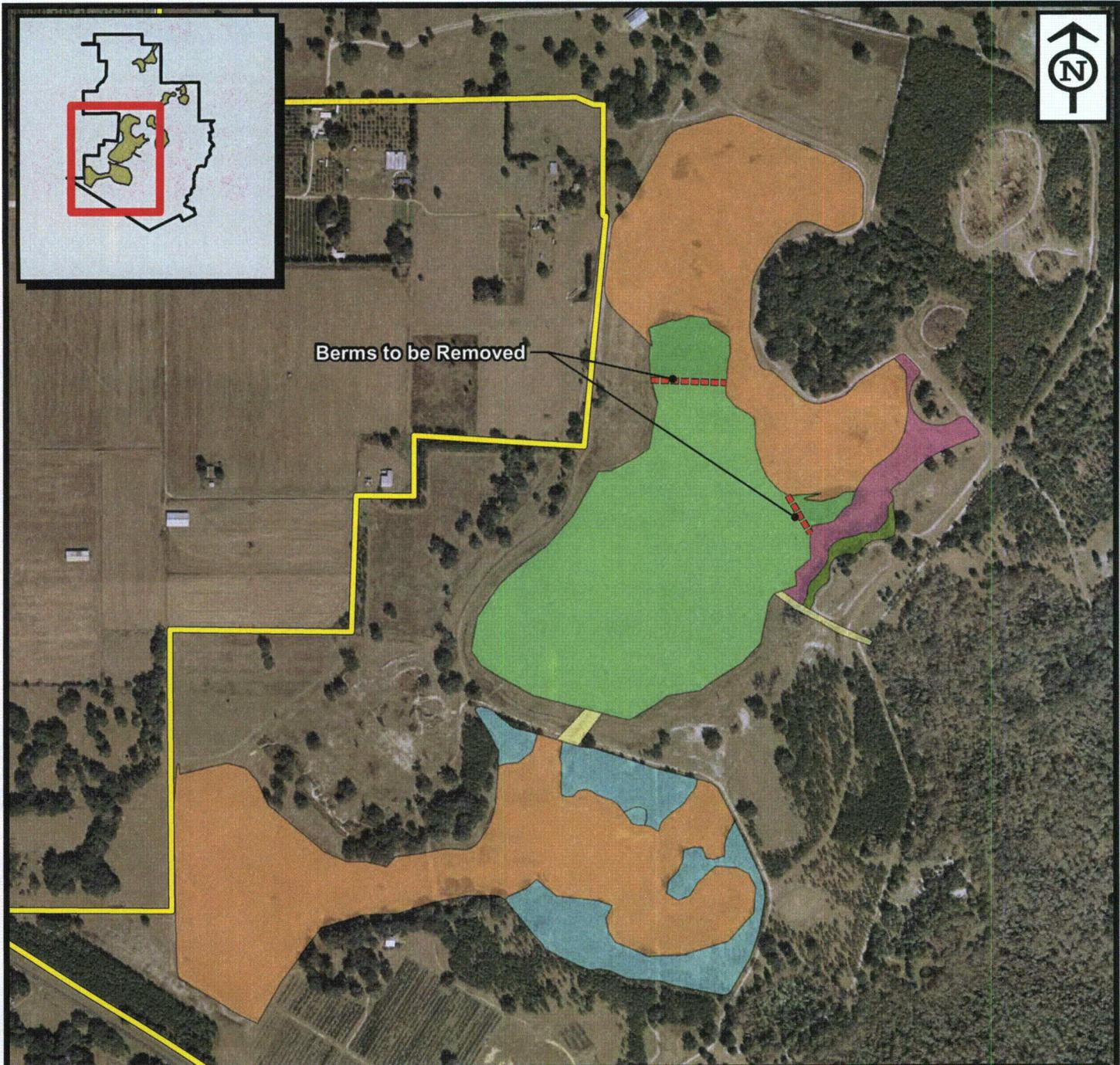
occur by altering an existing culvert to the south, just north of the northernmost creation area within Activity Area 2. The existing 24 inch culvert will be lowered to an elevation of 74 feet to improve the hydrological connection and flow into this area and restore historic conditions. Existing cypress occur in both areas, and therefore, improvements to hydroperiods will allow for improved growing conditions for both canopy and understory species.

The western cypress area (5.6 acres) will be planted on ten-foot centers at a density of 440 stems/acre with 3-gallon size Florida native trees including:

Cypress

#### **4.4.3. Activity Area 3**

Activity Area 3 represents a large portion of the mitigation provided at BHR and consists entirely of herbaceous wetland creation, hydrologic enhancement, and lake preservation (Figure 4-6 and 4-8c). This area is located in the southwest portion of BHR and is approximately 162.5 acres. A man-made lake exists in this area and was excavated in historic wetland areas (52.2 acres of lake and 1.1 acres of connected ditch to total 53.2 acres). This lake acts as additional storage for peak flows from the Withlacoochee River and associated floodplain. The existing lake appears to be groundwater driven, yet water normally flows south. Under high volume circumstance, the water stages up in the river and floodplain, and is forced west into a ditch containing water control structures that convey the water further into the lake. This lake was designed at different elevations and contains deep water portions as well as shallower, freshwater marsh habitat. The water is then further conveyed through another ditch and control structure along the southern edge of the lake. Both ditch systems will have alterations to control structures to enhance hydrology. In addition, two berms will be removed from the pond to permanently hydrologically connect isolated areas. These enhancement acreages are included in the lake preservation total. Any excess water flows through the southern ditch structure into a large, low-lying pasture (49.8 acres), planted pine areas (15.7 acres), and a small wet prairie (0.2 acre). Water may also stage to a level that also forces water north into existing agricultural areas which are already relatively low lying (41.1 acres) that will become herbaceous wetlands.



Source(s): FDOT Imagery (2010); Taylor Engineering.

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- Parcel Boundary
- Activity Area 3**
- Cypress Restoration (5.5 ac.±)
- Cypress Preservation (1.1 ac.±)
- Remove Pine and Create Herbaceous Wetland (15.6 ac.±)
- Ditch Hydrologic Enhancement (1.1 ac.±)
- Wet Prairie Restoration (87.1 ac.±)
- Lake Preservation/Berms to be Removed (52.1 ac.±)



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 7220 Financial Way, Suite 100  
 Jacksonville, Florida 32256  
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Mitigation Activity Area 3  
**Boarshead Ranch**  
 Pasco County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JGB/JRN
Figure:	4-8c

1. Wet Prairie Restoration. The proposed herbaceous restoration totals 87.1 acres and consists of lowering current elevations to 73 feet to encroach upon the water table to ensure hydric conditions. Additional hydration will occur from lake overflow during peak staging events to further the restoration of historical hydrological conditions. All vegetation will be removed, the area excavated and planted with aquatic herbaceous vegetation to mimic wet prairie and marsh conditions. Please see the engineering and planting detail drawings in Section 4.11 for details of this proposed excavation and planting. In the southwestern most restoration area, a berm will be created to an elevation of 80 feet, and will tie into an existing 80 foot contour elevation line to ensure that restoration activities do not have negative flooding effects on adjacent property owners. This berm will be sodded to prevent erosion. The details of this berm can be found in Section 4.11 Engineering and Planting Detail Drawings.

The wetland herbaceous areas will be planted on three-foot centers at a density of 4,840 stems/acre with bare-root size Florida native aquatic plants including:

- Maidencane
- Cordgrass
- St. Johns wort
- Sawgrass

2. Cypress Restoration. A small area of cypress restoration is located in the eastern portion of Area 3 and adjacent to the proposed wet prairie restoration. This area historically contained additional cypress trees that were impacted during the construction of the adjacent lake. This area will be restored back to more natural conditions by planting additional cypress trees to achieve a cypress dome habitat.

The cypress restoration area will be planted on twenty-foot centers at a density of 440 stems/acre with 3-gallon size Florida native trees including:

- Cypress

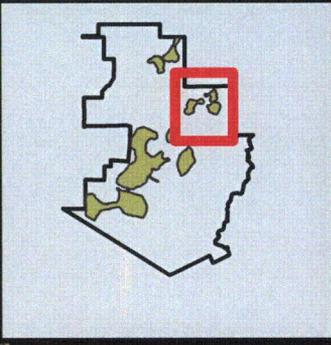
3. Cypress Preservation. A small area of cypress preservation is located in the eastern portion of Area 3 and adjacent to the proposed wet prairie and cypress restoration. The existing cypress trees will be preserved, along with the restoration planting, to achieve a cypress dome habitat.

4. Hydrological Enhancement. The proposed hydrologic enhancement (1.0 acre) consists of lowering the level of the existing inflow and outflow structures associated with the lake. The eastern inlet/control structure will be set at an elevation of 75 feet. The outflow/control structure to the south will be set at an elevation of 73.5 feet in order to maintain lake conditions, while allowing for additional flow into herbaceous restoration areas to the south and southwest. In addition, two berms within the northeastern lake area will be removed to further enhance hydrology to the north and east. Finally, an existing culvert under a trail road that bisects the southern pasture area will also be lowered to an elevation of 73 feet to promote hydrologic flow between the two areas.

5. Lake Preservation. Approximately 52.1 acres of the open water (lake) amid the proposed mitigation activities will be preserved. This acreage includes the lake ditch /hydrologic enhancements that will occur after retrofitting control structures. The open water area will be enhanced by the addition of proposed herbaceous wetland enhancement which will improve forage areas, primary productivity, and habitat for small fish, invertebrates, reptiles, and amphibians. The existing lake was designed with deep water portions and shallow marsh areas to mimic more natural conditions and provide for greater biodiversity. Therefore, preservation of this area will ensure continued flood attenuation, while aiding in the success of surrounding creation and enhancement areas. Water quality is also expected to improve as a result of the complete wetland mitigation plan in this activity area.

#### **4.4.4 Activity Area 4**

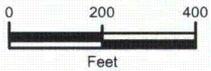
Activity Area 4 consists entirely of preserving wetlands within the floodplain of the Withlacoochee River (Figure 4-8d). These preservation areas include 14.3 acres of cypress and 7.5 acres of stream and lake swamp/bottomlands located within the northeastern corner of BHR that is dominated by existing forested habitats and bottomlands associated with the floodplain. Preservation of these areas will help ensure that they remain functioning and continue to provide diverse wetland habitat within the floodplain.



 Parcel Boundary

**Activity Area 4**

 Forested Wetland Preservation (21.7 ac.±)



Source(s): FDOT Imagery (2010); Taylor Engineering.

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Mitigation Activity Area 4  
**Boarshead Ranch**  
 Pasco County, Florida

Project:	EJ11021.00
Date:	Aug 2011
Drwn/Chkd:	JGB/JRN
Figure:	<b>4-8d</b>

## 4.5 Hydrology & Hydraulics

### 4.5.1 Objective

BHR is adjacent to the Withlacoochee River near the confluence with the Hillsborough River. The primary source of flooding on the BHR site is overflow from the Withlacoochee River. The primary objective of the hydraulic modeling is to determine the extent of on-site flooding due to overflow of the riverine system. To meet this objective two flood events were modeled, August 2003 and September 2009, with historic USGS data.

### 4.5.2 Model Setup

Modeling was done with the ICPR model Version 3.10 with service pack 3, 2002, to simulate the flooding conditions in the Withlacoochee River and subsequent inundation of the BHR site. This section describes the calculation of ICPR input parameters including basin areas, interconnectivity, stage-storage relationships, and boundary forcing conditions.

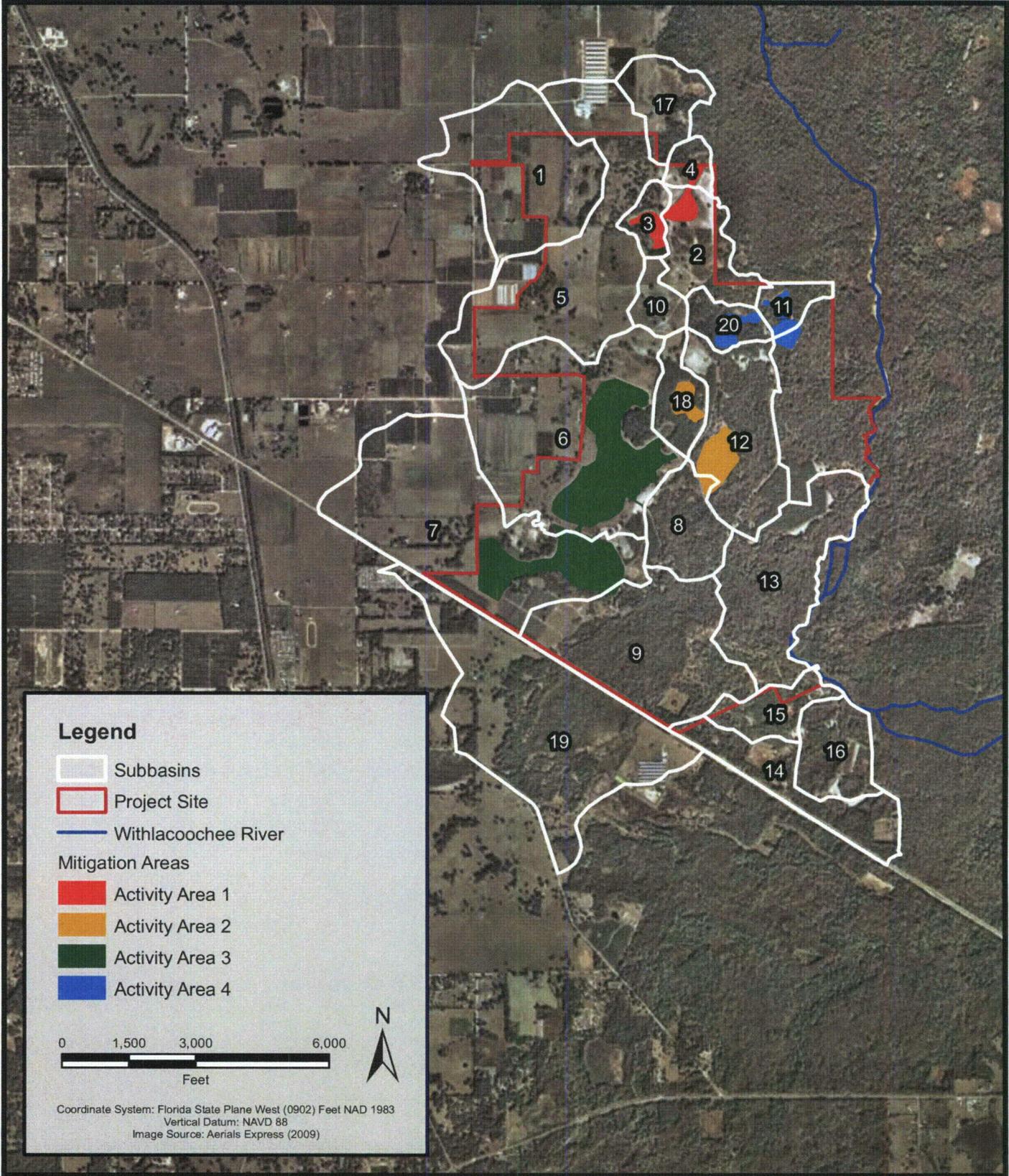
#### Basin Areas

Contributing basin boundaries were determined from a combination of a SWFWMD GIS basin coverage and LiDAR data. The 20 subbasins, defined following the SWFWMD's watershed management program guidelines and specifications, are presented in Figure 4-9.

#### Connectivity

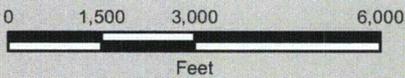
The ICPR model reflected the natural movement of water in the system by linking the subbasins through existing flow channels, swales, and culverts. High topographic elevations and roads can block flow paths.

Notably, the Hillsborough and Withlacoochee River basins connect at the interface between subbasins 9 and 19. At that interface, inter-basin communication occurs through a culvert under Hwy 98 and, during major storm events, over the road. Both of these communication mechanisms are included in the model.



**Legend**

-  Subbasins
  -  Project Site
  -  Withlacoochee River
- Mitigation Areas
-  Activity Area 1
  -  Activity Area 2
  -  Activity Area 3
  -  Activity Area 4



Coordinate System: Florida State Plane West (0902) Feet NAD 1983  
 Vertical Datum: NAVD 88  
 Image Source: Aerials Express (2009)

TAYLOR ENGINEERING, INC.



**Hydrologic Subbasins  
 Boarshead Ranch  
 Pasco County, Florida**

PROJECT	C2011-025
FIGURE	4-9
DRAWN BY	JK
DATE	JUNE 2011

The connectivity in the ICPR model, set at existing conditions, shows flooding without improvements to culverts, channels, and graded areas. For example, the culvert inverts and channels for mitigation Activity Area 1 show limited flooding in the area between the ponds. This area will be scraped and graded and, therefore, will flood more area after mitigation areas are complete.

### Stage-Storage Relationships

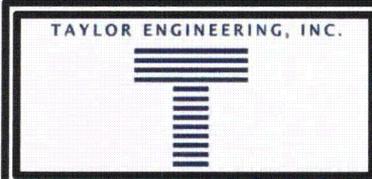
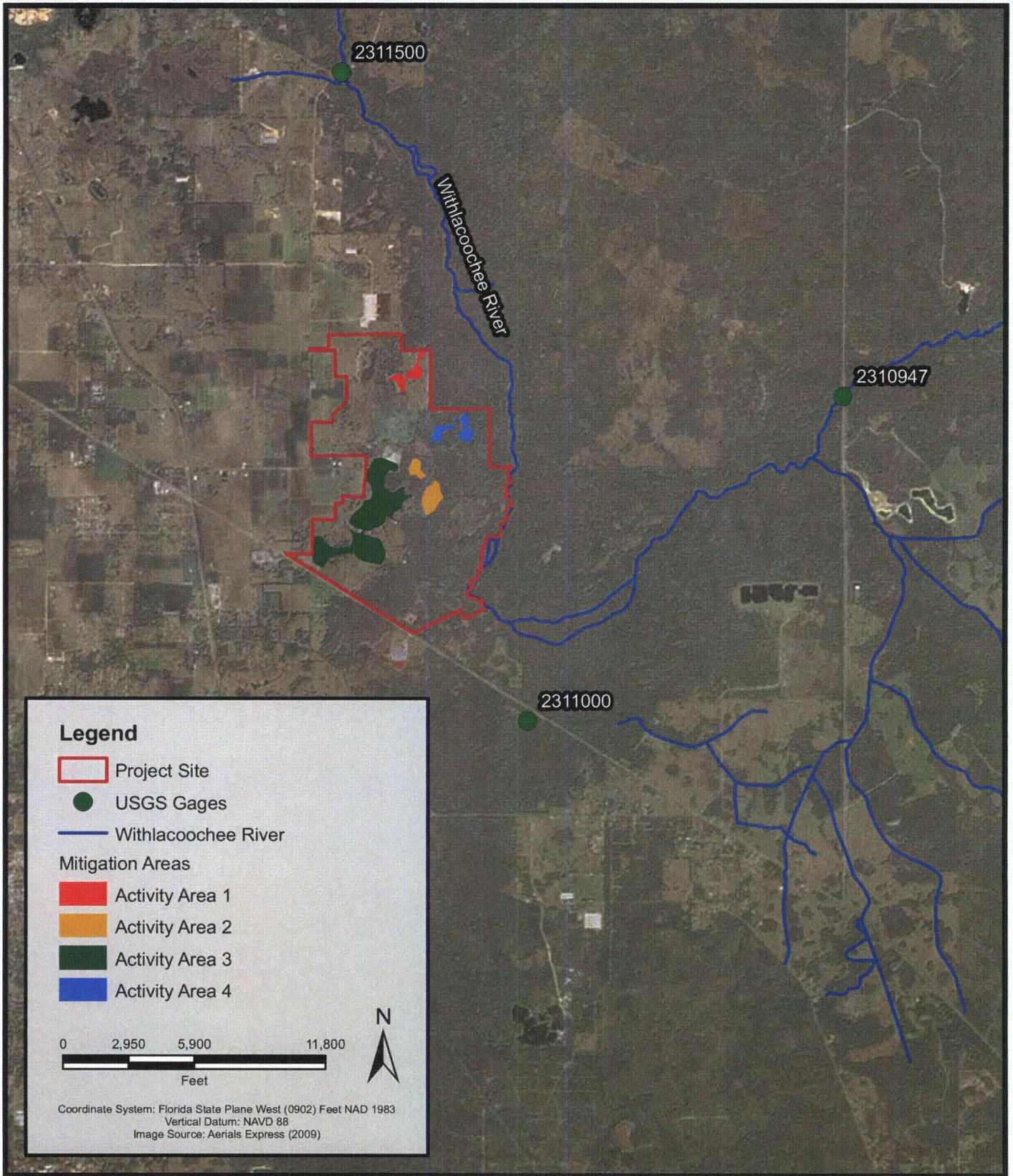
The ICPR model applies stage/storage relationships, calculated at 1 foot vertical intervals, at each node. These nodes, which represent each subbasin, simulate the rate of inundation from the Withlacoochee River. Model results identify the peak water surface elevations at each node.

### Boundary Conditions

The BHR site is located near three USGS gages, identified by site ID's 02311500, 02310947 and 02311000, shown in Figure 4-10. Gage 02311000 is southeast of the project site, under the bridge at US 98.

The model boundary conditions applied flood stages measured on the Withlacoochee River at basins 4, 11, 12, 13, and 15/16. Using straight-line interpolation, gage data from 02310947 and 02311500 provided the time vs. stage input for model runs. Comparison of these interpolated data to the gage under HWY 98 (02311000) show good agreement. It is not possible to make a direct application of the gage under HWY 98 to the model since there is a loss of hydraulic head under the HWY 98 Bridge. A report by the USGS (Lewelling 2004) showed the upstream side of the bridge had water surface elevations about 0.75 ft. higher than downstream of the bridge. The interpolated data applied in this study peaked at approximately 0.70 ft. higher than under the HWY 98 Bridge (at the 02311000 gage). Therefore, it is reasonable to expect water surface elevations at the BHR to be about  $\frac{3}{4}$  of a foot higher than the data collected at 02311000.

As detailed by the Wetland Mitigation Plan (April 2010), the Withlacoochee River reaches stage overflow threshold at about 77.46 ft. NGVD88, as measured at 02311000. This means when the USGS gage measures a stage above 77.46 ft. NAVD88, the Withlacoochee drainage divide is overtopped and the system begins to flood into the Hillsborough River (detailed in a January 22, 2010 memo from ENTRIX).



**USGS Gage Locations**  
**Boarshead Ranch**  
**Pasco County, Florida**

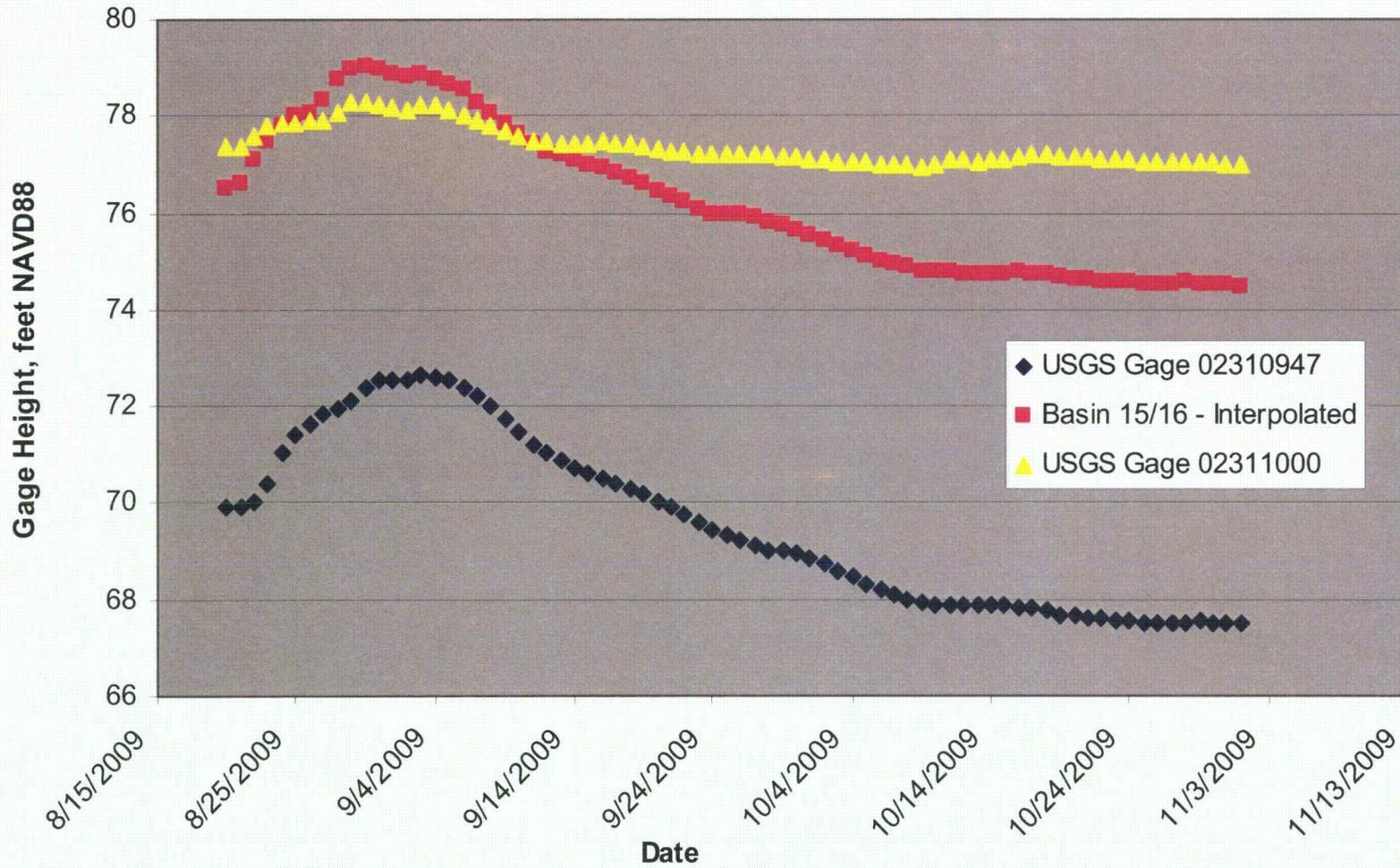
PROJECT	C2011-025
FIGURE	4-10
DRAWN BY	JK
DATE	JUNE 2011

Model Runs

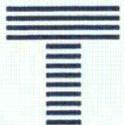
To examine the flooding of the BHR, the ICPR model simulated two events: 1) a 2009 event that occurred between August 20 to November 1 that reached a moderate peak elevation, and 2) a 2003 event that occurred in August and reached a high peak elevation.

The stage data applied for 2009, shown in Figure 4-11, represent a storm that would occur over 8% of the time, or 30 days a year. USGS 02311000 under Hwy 98 is shown to compare the stages used in model runs to interpolated data from upstream and downstream gages. The stage data applied for 2003, shown in Figure 4-12, represents a storm that would occur only 1.8% of the time, or 6 - 7 days a year.

Withlacoochee 2009 Stage Data



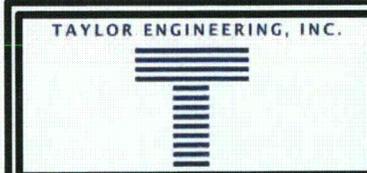
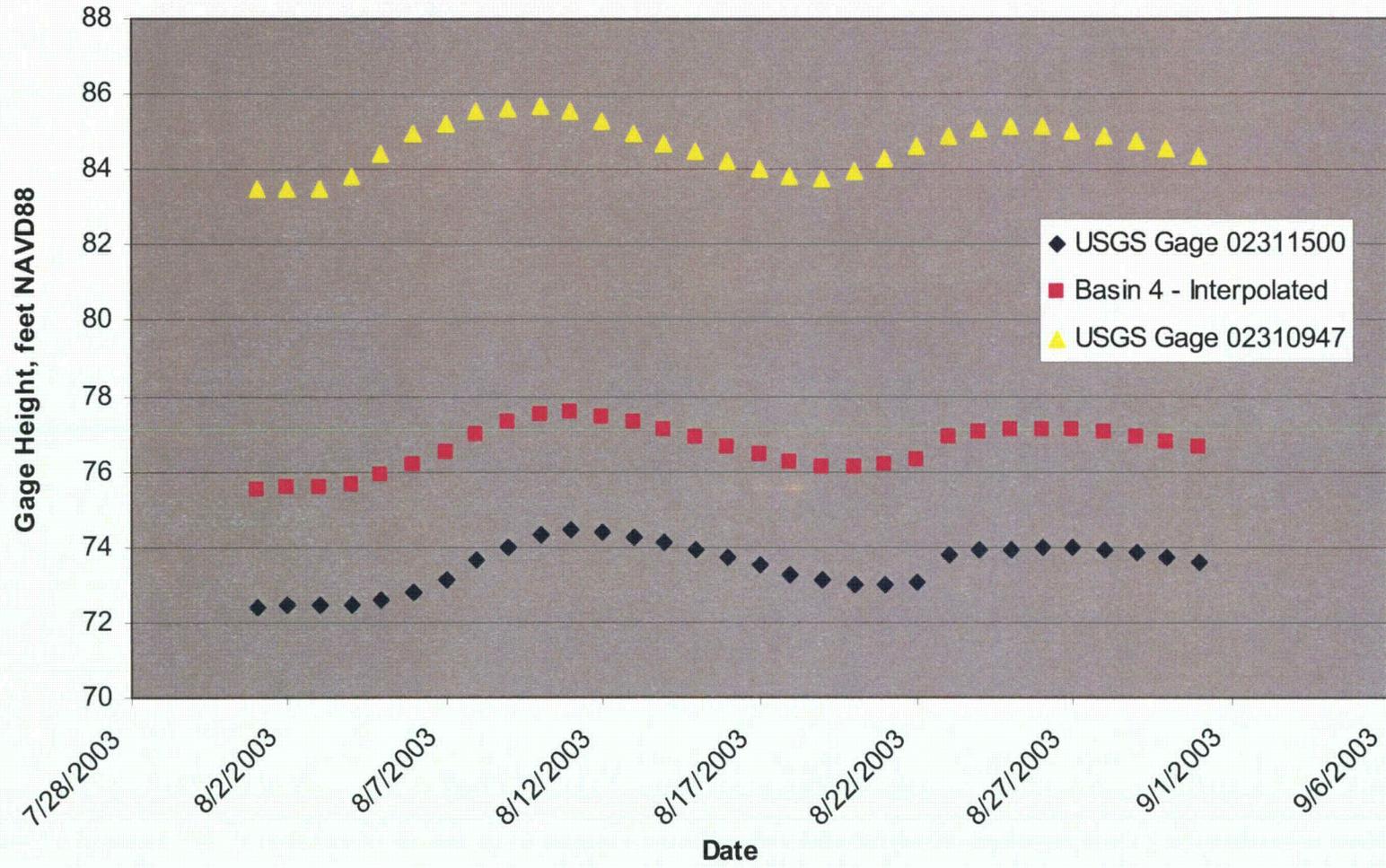
TAYLOR ENGINEERING, INC.



Withlacoochee 2009 Stage Data Used for Model Simulation  
 (USGS Gage 02311000 at Hwy 98 Shown for Comparison)  
 Boarshead Ranch  
 Pasco County, Florida

PROJECT	C2011-025
FIGURE	4-11
DRAWN BY	JK
DATE	JUNE 2011

Withlacoochee 2003 Stage Data

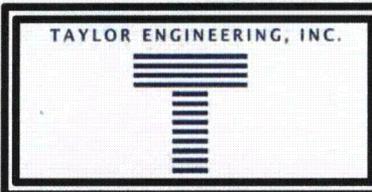
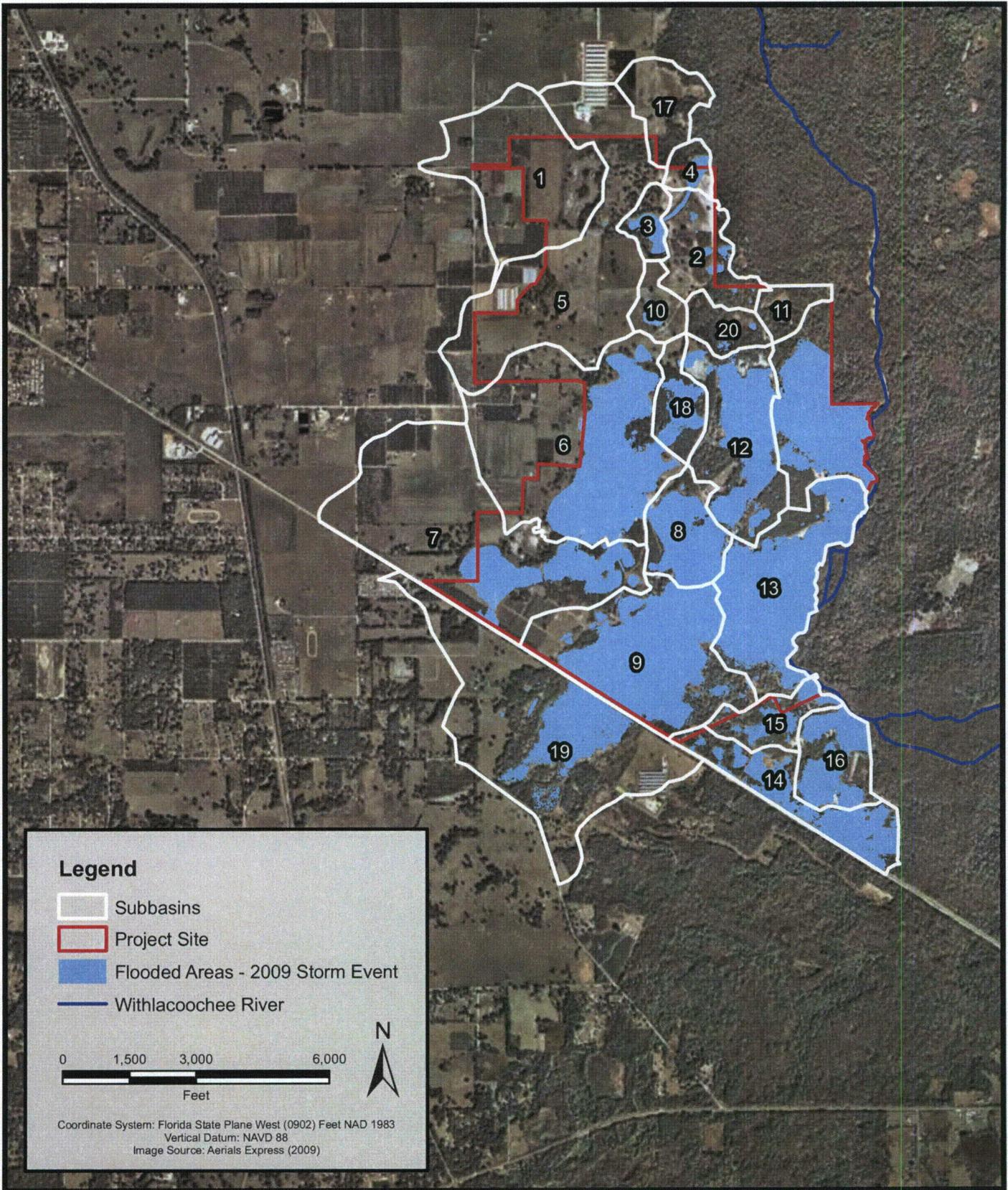


Withlacoochee 2003 Stage Data Used for Model Simulation  
 Boarshead Ranch  
 Pasco County, Florida

PROJECT	C2011-025
FIGURE	4-12
DRAWN BY	JK
DATE	JUNE 2011

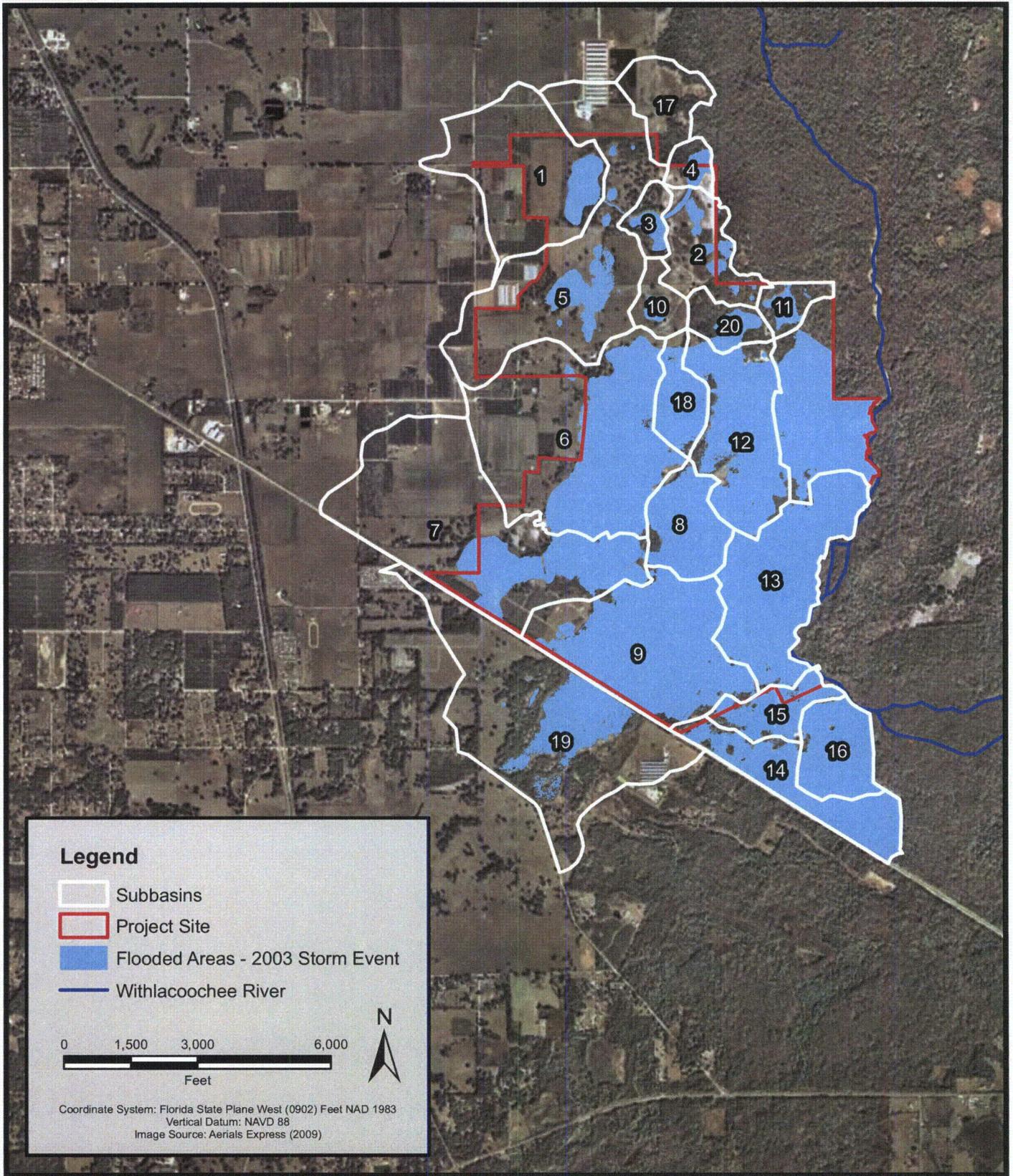
#### 4.5.3 Results

Model results, shown in the figures below (Figures 4-13 and 4-14), indicate the flooding for both moderate and large events (2009 and 2003, respectively) cover the majority of the subbasins in the lower end of the basin (6, 8, 9, 12, 13, 14, 15, 16, and 18). Flooding in subbasins 4 and 3 – which include mitigation Activity Area 1 – is contained to the channels and ponds. The model results for the 2009 event show the Withlacoochee just beginning to fill Activity Area 1 while the 2003 event shows the flooding from Activity Area 1 up into the intermittently connected pond in subbasin 1.



**Flooded Areas - 2009 Storm Event  
Boarshead Ranch  
Pasco County, Florida**

PROJECT	C2011-025
FIGURE	4-13
DRAWN BY	JK
DATE	JUNE 2011

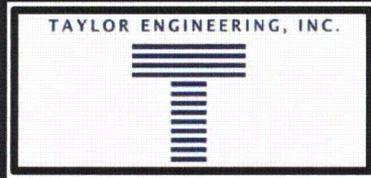


**Legend**

-  Subbasins
-  Project Site
-  Flooded Areas - 2003 Storm Event
-  Withlacoochee River

0    1,500    3,000    6,000  
 Feet

Coordinate System: Florida State Plane West (0902) Feet NAD 1983  
 Vertical Datum: NAVD 88  
 Image Source: Aerials Express (2009)



**Flooded Areas - 2003 Storm Event**  
**Boarshead Ranch**  
**Pasco County, Florida**

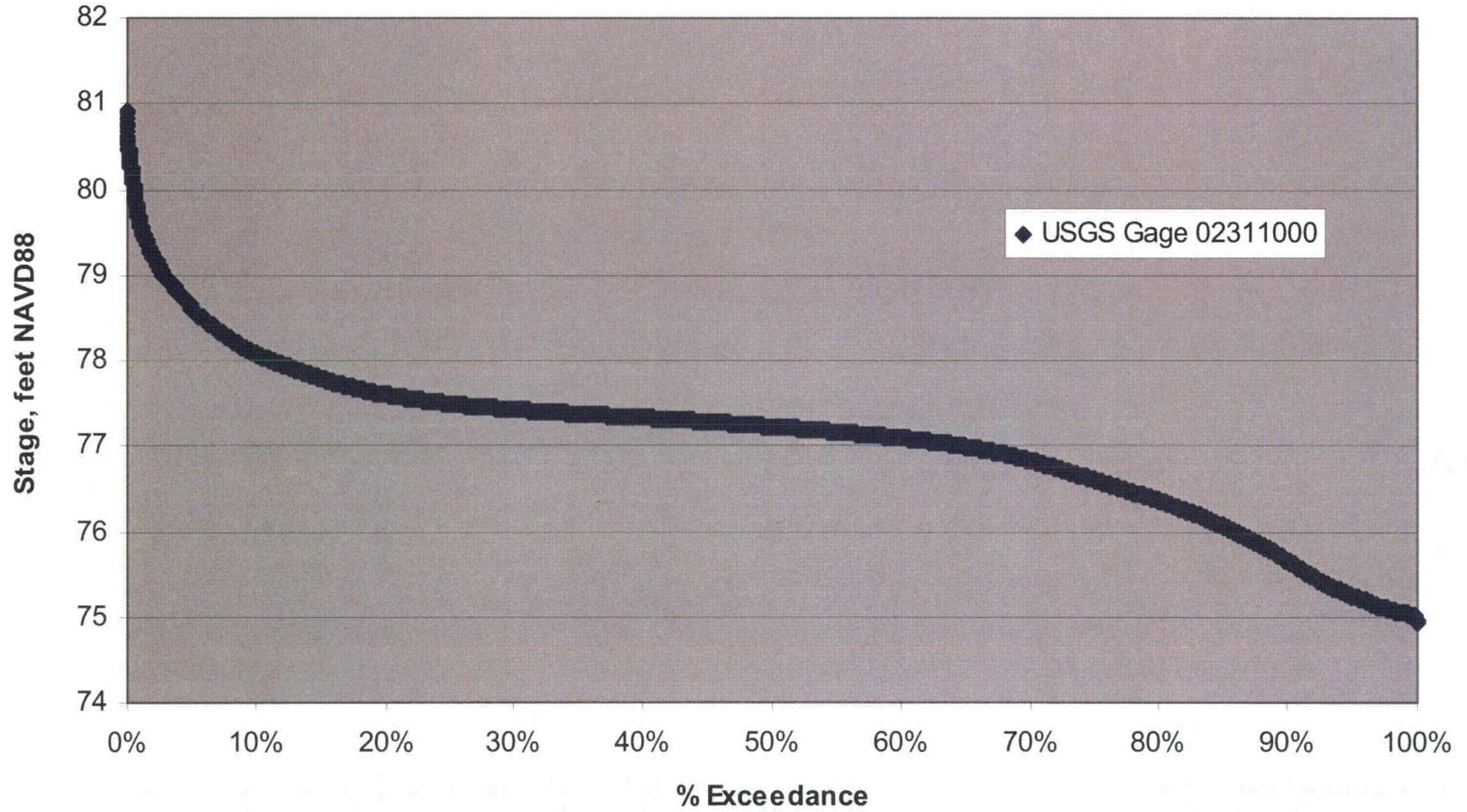
PROJECT	C2011-025
FIGURE	4-14
DRAWN BY	JK
DATE	JUNE 2011

Additional Comments

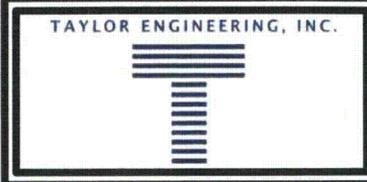
In order to understand the frequency of flooding for the BHR area, the daily stage data for the USGS Gage #02311000 for the period of April 25, 1960 to June 14, 2011 were examined. The Wetland Mitigation Plan (April 2010) presented the data in a time series, discussed the interconnected system, and presented a gage elevation (for station #02311000) at which the BHR property would flood. The stage overflow threshold is at about 77.46 ft. NGVD88. This means when the USGS gage measures a stage above 77.46 ft. NAVD88, the Hillsborough – Withlacoochee drainage divide is overtopped and the system begins to flood (detailed in a January 22, 2010 memo from ENTRIX).

To examine the frequency of this occurrence the daily stage data were used (gage #02311000) to create a stage-exceedance curve. This curve (shown in Figure 4-15 below) shows that the overflow threshold is exceeded about 25% of the time. However, as presented in the Wetland Mitigation Plan (April 2010) there are periods of months and years where the threshold elevation is not exceeded and the only water on the BHR site will be from small rainfall events and ground water.

### Exceedance Probability



◆ USGS Gage 02311000



Exceedance of Stage Data for Gage 0231100 Near Hwy 98  
Boarshead Ranch  
Pasco County, Florida

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