

**Section 3**  
**Withlacoochee and Hillsborough**  
**River Watersheds**

---

S E C T I O N 3

# Withlacoochee and Hillsborough River Watersheds

---

Boarshead Ranch (BHR), in Pasco County, Florida, will provide all mitigation for wetland impacts in the Hillsborough River Watershed and the Withlacoochee River Watershed south of the CFBC (**Exhibit 3-4-1**). All of these impacts are associated with transmission projects. The Withlacoochee watershed impacts at the LNP Site (north of the CFBC) will be mitigated on-site.

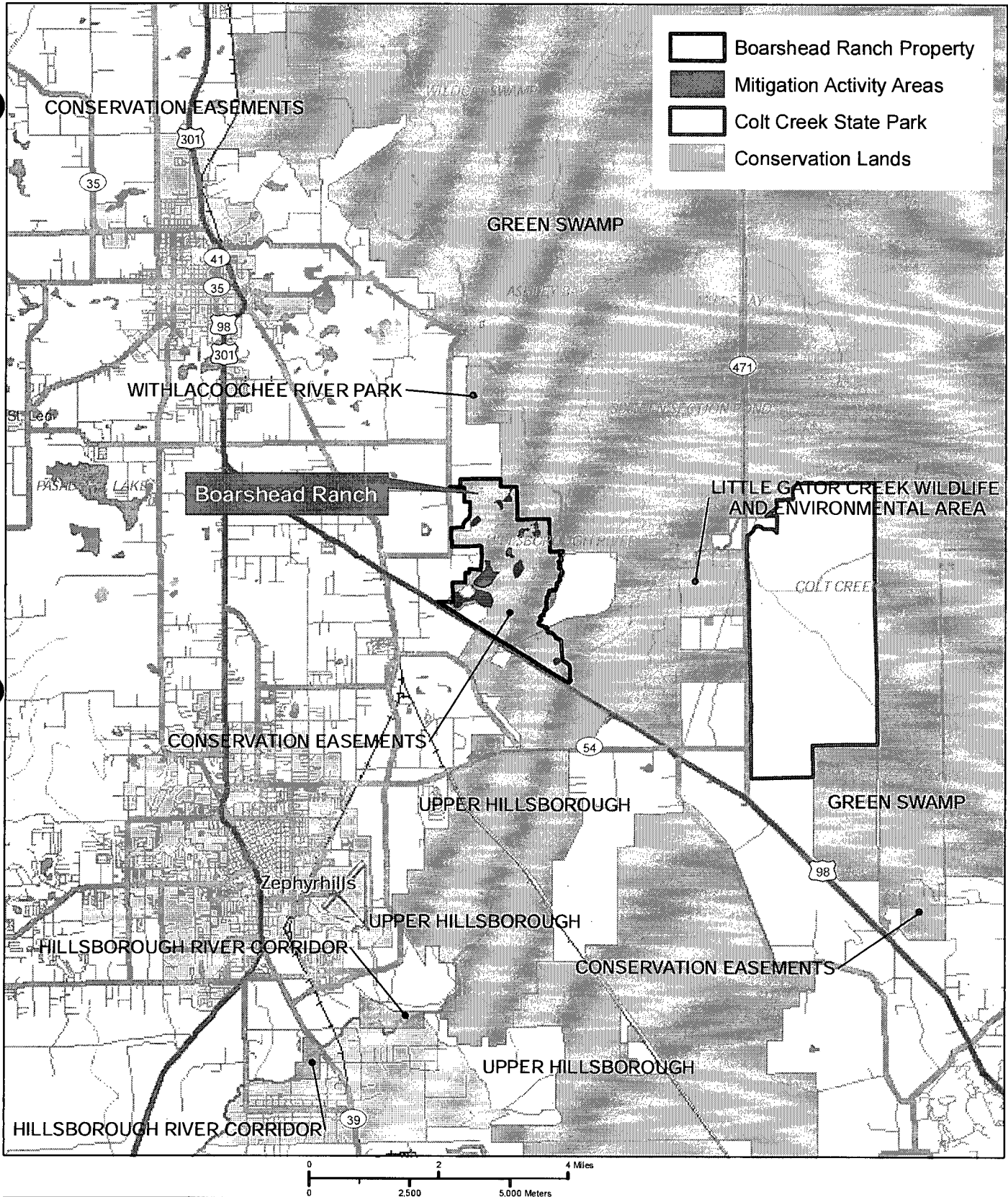
## 3.1 INTRODUCTION

The mitigation detailed here is designed to be regionally significant and sustainable. It is focused on the enhancement of wetland and ecosystem functions in the floodplains of the Withlacoochee River and the headwaters of the Hillsborough River. This mitigation provides greater benefits to the ecosystem than it would if the mitigation were distributed in small areas near the actual impact sites. It removes disturbances to native communities and creates habitat by enhancing the largest area of natural forest remaining in the upper Withlacoochee and Hillsborough Watersheds.

Five major drainage systems originate in or near the Green Swamp, including the Upper Hillsborough and Withlacoochee watersheds. The Green Swamp is one of four designated Areas of Critical State Concern per Chapter 380.05, FS. It covers approximately 900 square miles of swampy flatlands and sandy ridges in central Florida. The headwaters of the Hillsborough River flow southwestward through a natural diversionary channel of the Withlacoochee River; and the Withlacoochee River flows to the northwest (Pride et al. 1961). The drainage basins of the Green Swamp are interconnected in several locations by swamp channels and gaps in surrounding ridges. Water may flow through these gaps from one basin to another depending on relative elevation of the water levels. One such gap is a naturally-occurring diversionary overflow channel from the Withlacoochee River to the Hillsborough River, located in eastern Pasco County on the southwestern boundary of the Green Swamp in the immediate vicinity of the Boarshead Ranch. This channel connects the Withlacoochee and Hillsborough River basins during periods of high flow (Ashby and Kelly 2010); see **Section 3.8.4**.

A literature review and an analysis of historic and recent U.S. Geological Survey (USGS) stage and discharge data (Ashby and Kelly, 2010) indicate the following:

- The Upper Hillsborough and Withlacoochee River watersheds are seasonally interconnected along a natural overflow/diversion feature that bisects the drainage divide between the two basins near Highway 98 in eastern Pasco County. This overflow typically occurs during periods of high flow. While there may be other interconnections between the watersheds within the Green Swamp, the overflow feature near Highway 98 appears to transmit the most significant volume of water from the Withlacoochee basin to the Hillsborough basin.
- USGS Station 02311000, the Withlacoochee-Hillsborough Overflow near Richland, FL, is located at the overflow feature and measures stage and discharge over the divide. The stage must reach approximately 2.91 feet before measurable discharge occurs from the Withlacoochee to the Upper Hillsborough basin.
- As measured at USGS Station 02311000, the watersheds appear to communicate on approximately 99 days (27% of the time) in an average year.



This map and all data contained within are supplied as is with no warranty. ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

**Exhibit 3-4-1  
Boarshead Ranch Mitigation Site  
Location Map**



3905 Crescent Park Drive Riverview, FL 33578-3625	ph. (813) 664-4500 fx (813) 664-0440
<a href="http://www.entrix.com">www.entrix.com</a>	

Coordinate System:  
Florida Albers

### 3.2 IMPACT SUMMARY

Project wetland impacts in the Withlacoochee (south of the CFBC) and Hillsborough River Watersheds consist of 25.5 herbaceous wetlands and 10.1 forested wetlands UMAM loss units due to expansion of existing transmission lines and related facilities. In most cases, these wetland impacts will be required for right-of-way clearing and establishment of pads for the transmission towers, although access roads and substations will create some wetland fill impacts. The wetland impacts are categorized by watershed in **Tables 3-1** and **3-2** below.

#### 3.2.1 Withlacoochee River Watershed

Project impacts in the Withlacoochee River Watershed, both on and off of the LNP site, consist of 13.0 UMAM loss units for herbaceous wetlands and 37.1 UMAM loss units for forested wetlands (50.1 UMAM loss units total). The on-site portion of the impacts for the Withlacoochee watershed include 3.2 and 27.9 herbaceous and forested loss units due to on-site construction, including the plant facility, transmission lines and supporting infrastructure. These on-site impacts will be mitigated in conjunction with the on-site mitigation that is described in Section 2.0.

The improvements at BHR will provide mitigation for wetland impacts incurred in the Withlacoochee Watershed south of the CFBC (not on the LNP Site) which total 19.0 UMAM loss units. **Table 3-1** provides a detailed breakdown of the Withlacoochee Watershed wetland impacts resulting from wetland fill and clearing activities south of the CFBC.

**Table 3-1. Wetland Impacts by UMAM Functional Loss and Acreage (Withlacoochee Watershed – Offsite).**

Area	Herbaceous (including Open Water)		Forested		Total Acres	Total Functional Loss
	Acres	Functional Loss	Acres	Functional Loss		
<b>Impacts</b>						
Permanent Fill	13.8	-9.8	1.9	-1.4	15.7	-11.2
Permanent Clearing	NA	NA	25.3	-7.8	25.3	-7.8
<b>Total Impacts</b>	<b>13.8</b>	<b>-9.8</b>	<b>27.2</b>	<b>-9.2</b>	<b>41.0</b>	<b>-19.0</b>

#### 3.2.2 Hillsborough River Watershed

Wetland impacts in the Hillsborough River Watershed consist of 15.7 UMAM loss units for herbaceous wetlands and 0.9 UMAM loss units for forested wetlands (16.6 UMAM loss units total). All of the Hillsborough River Watershed mitigation will be provided on the Boarshead Ranch property. **Table 3-2** provides a detailed breakdown of the Hillsborough River Watershed wetland impacts resulting from wetland fill and clearing activities.

**Table 3-2. Wetland Impacts by UMAM Functional Loss and Acreage (Hillsborough Watershed)**

Area	Herbaceous (including Open Water)		Forested		Total Acres	Total Functional Loss
	Acres	Functional Loss	Acres	Functional Loss		
<b>Impacts</b>						
Permanent Fill	22.4	-15.7	1.1	-0.9	23.5	-16.6
Permanent Clearing	NA	NA	0	0	0	0
<b>Total Impacts</b>	<b>22.4</b>	<b>-15.7</b>	<b>1.1</b>	<b>-0.9</b>	<b>23.5</b>	<b>-16.6</b>

### 3.3 MITIGATION PROGRAM

There were a number of challenges to finding suitable mitigation areas for the project in these two watersheds. Large areas within the Hillsborough River Watershed were deemed unsuitable due to wellfield drawdown wetland impacts. A strong emphasis was placed on co-locating sites with public conservation landholdings,



and PEF explored the adjacent private landholdings and public lands for mitigation opportunities, including lands on public agencies' acquisition lists. Most private landholdings were not large enough to consider. Some private lands also had no potential long-term manager or ability to restore hydrologic or ecologic processes, due to location. Most public landholdings had nonexistent or insufficient mitigation opportunities or were already committed for restoration by others (such as the Florida Department of Transportation). Only one permitted mitigation bank exists in the affected watersheds, North Tampa Mitigation Bank, and it has very few available credits relative to PEF's needs in this watershed. Finally, if an option provided enough, or nearly enough herbaceous lift units, it did not provide many forested lift units and vice versa.

In our investigations, we learned that the owners of the BHR were interested in partnering with PEF on a wetland enhancement- and restoration-based mitigation project. The BHR is in an ideal location in the headwaters of both the Withlacoochee and Hillsborough River watersheds to enjoy frequent inter-basin communication (Ashby and Kelly 2010), and so is a suitable site for both watersheds. The entire BHR property lies within the Green Swamp. It is on Southwest Florida Water Management District (SWFWMD) land acquisition list for expansion of its Green Swamp landholdings, but the owners are not willing to sell the land. SWFWMD has secured a limitation on developments rights through an easement on the BHR. This easement is not very restrictive and allows continued agricultural and silvicultural operations, as well as peat mining. The existing easement allows third party wetland mitigation to be performed at BHR and a gopher tortoise mitigation area has been established in this area and is included with this plan. BHR's owners are willing to place a more restrictive Conservation Easement (CE) over the mitigation areas, implement the mitigation activities and convey a new easement to the FDEP or SWFWMD.

Implementation of this mitigation plan, in conjunction with the gopher tortoise project, will be the next step toward the eventual restoration of native communities throughout the property.

### 3.4 MITIGATION PLAN OBJECTIVE – BOARSHEAD RANCH

The objective of the mitigation program is to enhance the existing natural wetlands and areas that have been altered by agricultural activities, and create additional wetlands from disturbed upland areas.

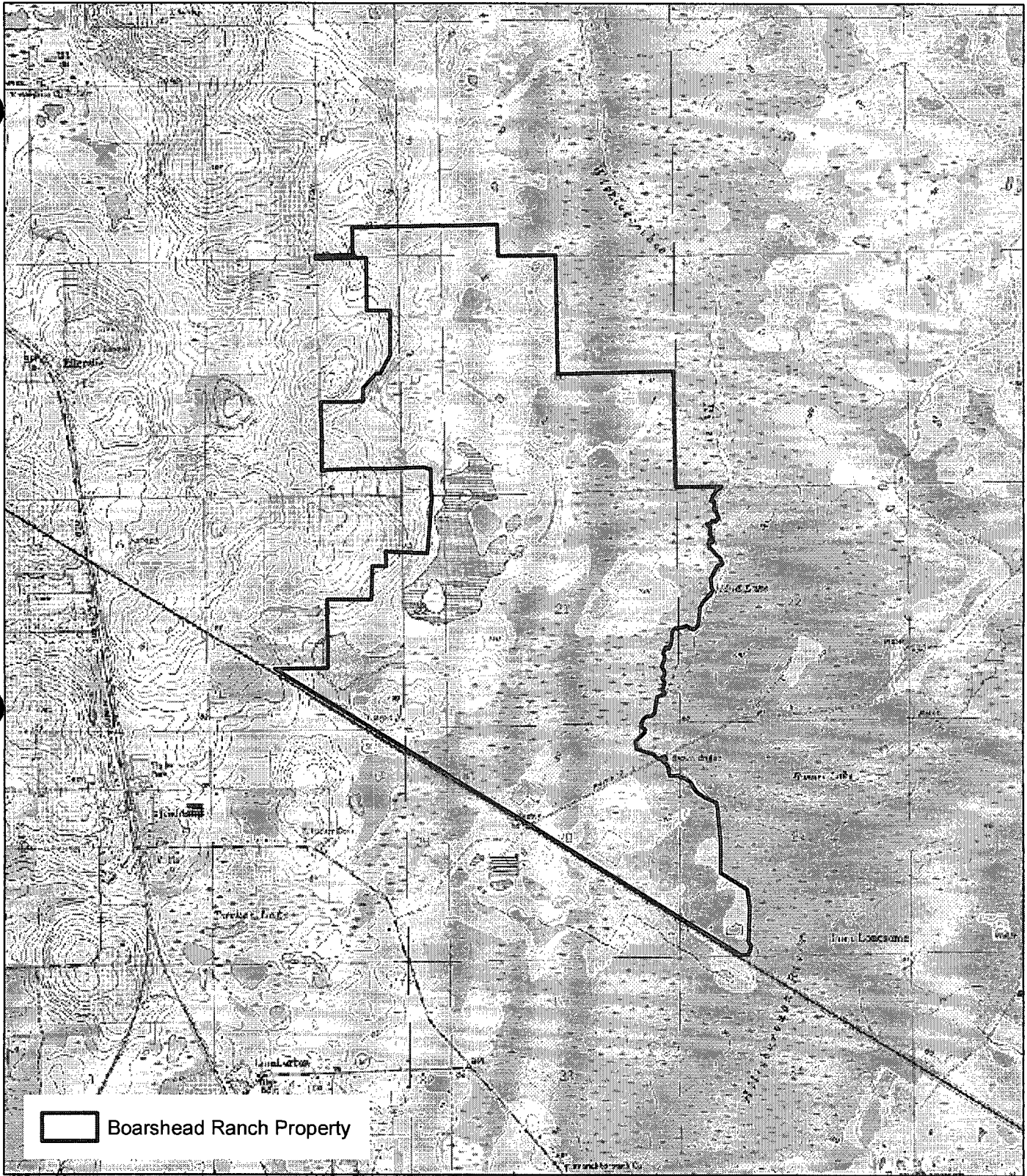
#### 3.4.1 Site Description

The BHR property totals 2,096.8 acres, of which 207.7 are included in the mitigation plan. The BHR is a privately-owned, actively-managed ranch located in Sections 8, 9, 15, 16, 17, 21, 22, 27, 28 and 29, Township 25S, Range 22E in Pasco County, Florida, near the southwest corner of central Florida's Green Swamp. The eastern edge of BHR abuts the Withlacoochee River and state-preserved lands, and the southern portion of the site includes the headwaters of the Hillsborough River.

The property lies on the southwestern side of the Green Swamp. It varies in topography from about 80 ft. in elevation in the swamp to 120 ft. in elevation at the western edges (**Exhibit 3-4-2**). Green Swamp is a forested complex of wetland and upland, and the land to its west is in a mix of agricultural, silvicultural, and native forest land units.

This mitigation plan focuses on five Activity Areas (AAs) identified as possessing the greatest lift potential and the plan describes these areas on the BHR. The AAs limits were established using historic and current vegetative community limits and topographic data. As these AAs were selected in part to be consistent with land management areas previously identified by the owner for this site, the AA numbers are not consecutive. Topographic data was used to approximate the likely extent of hydrologic influence subsequent to hydrologic improvements.

**Table 3-3** provides a list of the soil types in the AAs. Locations of soil units within the BHR property are shown in **Exhibit 3-4-3**. The table below also lists the type of plant community that typically occupies each soil type in the undisturbed condition, as well as the percent of the mapped unit that is expected to have hydric soil inclusions (USDA 1989, FAESS 2007). NRCS-identified typical plant community types, aerial interpretation of historic aerial signatures and field analysis of relict vegetation was utilized to establish target site conditions within selected AA's.

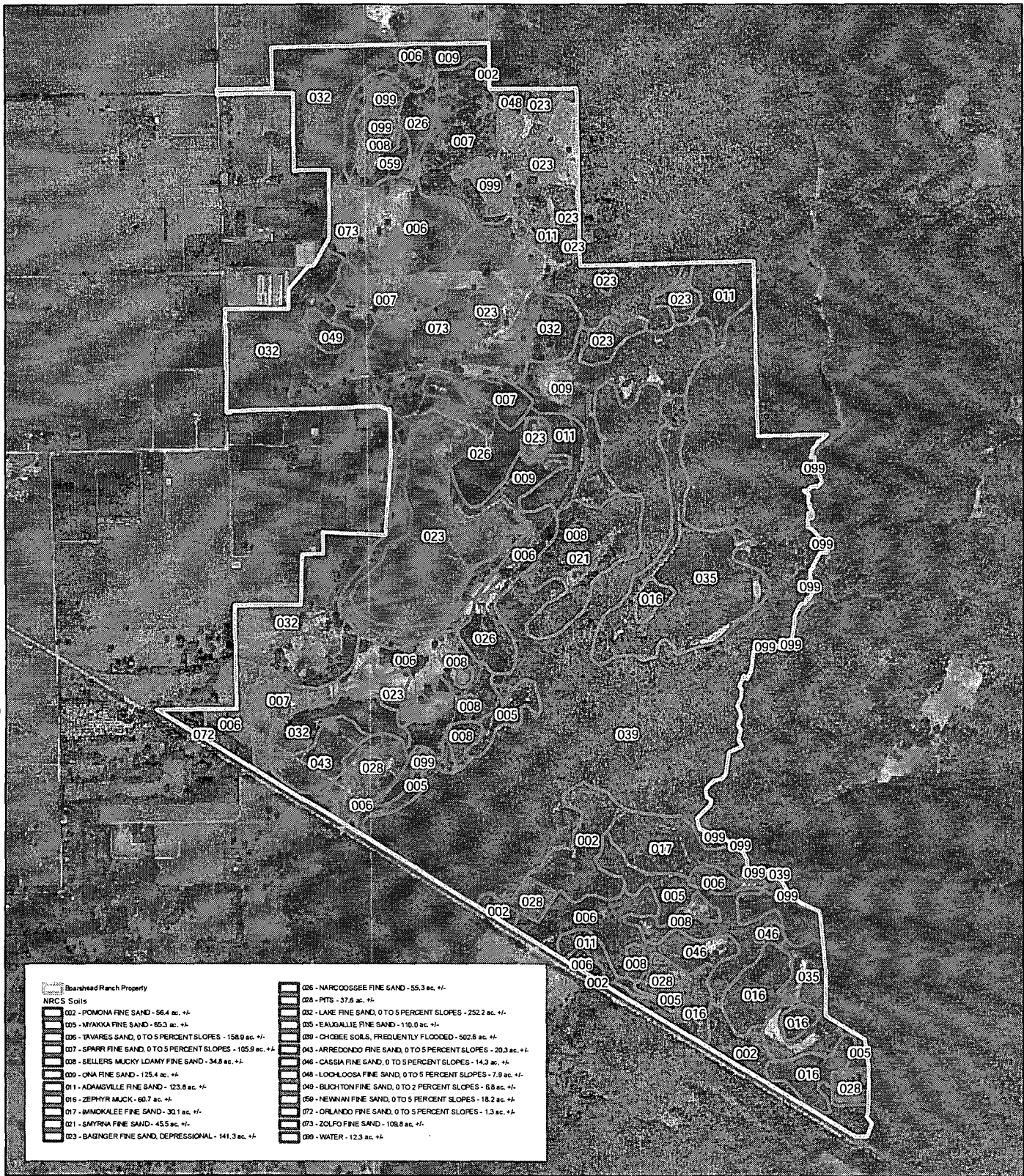


This map and all data contained within are supplied as is with no warranty. ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

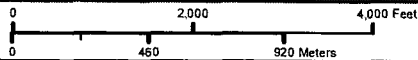
**Exhibit 3-4-2**  
**Boarshead Ranch Mitigation Site**  
**USGS Quadrangle Map**



3905 Crescent Park Drive Riverview, FL 33578-3625	ph. (813) 664-4500 fx (813) 664-0440
<a href="http://www.entrix.com">www.entrix.com</a>	
Coordinate System: Florida Albers	



Boarshead Ranch Property	
NRCS Soils	
002 - POMONA FINE SAND - 56.4 ac. +/-	026 - NARCOOSSEE FINE SAND - 55.3 ac. +/-
005 - MYAKKA FINE SAND - 65.3 ac. +/-	028 - PITS - 37.6 ac. +/-
006 - TAVARES SAND, 0 TO 5 PERCENT SLOPES - 158.9 ac. +/-	032 - LAKE FINE SAND, 0 TO 5 PERCENT SLOPES - 252.2 ac. +/-
007 - SPARR FINE SAND, 0 TO 5 PERCENT SLOPES - 105.9 ac. +/-	035 - EALGALLIE FINE SAND - 110.0 ac. +/-
008 - BELLERS MUCKY LOAMY FINE SAND - 34.8 ac. +/-	039 - CHOCOE SOILS, FREQUENTLY FLOODED - 502.6 ac. +/-
009 - ONA FINE SAND - 125.4 ac. +/-	043 - ARREDONDO FINE SAND, 0 TO 5 PERCENT SLOPES - 203.8 ac. +/-
011 - ADAMSVILLE FINE SAND - 123.6 ac. +/-	046 - CASSIA FINE SAND, 0 TO 5 PERCENT SLOPES - 14.3 ac. +/-
016 - ZEPHYR MUCK - 60.7 ac. +/-	048 - LOCHLOOSA FINE SAND, 0 TO 5 PERCENT SLOPES - 7.9 ac. +/-
017 - MINOKALEE FINE SAND - 30.1 ac. +/-	049 - BLIGHTON FINE SAND, 0 TO 2 PERCENT SLOPES - 6.8 ac. +/-
021 - SMYRNA FINE SAND - 45.5 ac. +/-	059 - NEWMAN FINE SAND, 0 TO 5 PERCENT SLOPES - 18.2 ac. +/-
023 - BASINGER FINE SAND, DEPRESSIONAL - 141.3 ac. +/-	072 - ORLANDO FINE SAND, 0 TO 5 PERCENT SLOPES - 1.3 ac. +/-
	073 - ZOLFPO FINE SAND - 1.3 ac. +/-
	099 - WATER - 12.5 ac. +/-



This map and all data contained within are supplied as is with no warranty. ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

### Exhibit 3-4-3 Boarshead Ranch Mitigation Site NRCS Soils Map



Image: 2009



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

Coordinate System:  
Florida Albers



**Table 3-3. USDA NRCS-Mapped Soil Mapping Units within the Mitigation Site.**

Soil Map Unit	Soil Type	Hydric*	Percent Hydric	NRCS Ecological Community Type
6	Tavares Sand, 0 to 5 percent slopes	No	0%	Longleaf Pine-Turkey Oak, Oak Hammocks
7	Sparr Fine Sand, 0 to 5 percent slopes	No	0%	Upland Hardwood Hammocks
8	Sellers Mucky Loamy Fine Sand	Yes	100%	Cypress Swamp, Freshwater Marsh & Ponds
9	Ona Fine Sand	Typically no; needs to be field verified	15%	Flatwoods
11	Adamsville Fine Sand	No	0%	Flatwoods, Upland Hardwood Hammocks, Oak Hammocks
16	Zephyr Muck	Yes	100%	Cypress Swamp, Freshwater Marsh & Ponds
21	Smyrna Fine Sand	Typically no; needs to be field verified	20%	Flatwoods
23	Basinger Fine Sand, depositional	Yes	100%	Cypress Swamp, Freshwater Marsh & Ponds, Swamp Hardwoods
73	Zolfo Fine Sand	No	0%	Upland Hardwood Hammocks, Oak Hammocks
99	Water	NA	NA	Lake

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

### 3.4.2 Historic Conditions

Much of BHR was historically an extension of the Withlacoochee and Hillsborough River floodplains and consisted of a mosaic of forested wetlands and herbaceous marshes that graded into a flatwoods landscape setting. This lowland area was bordered by sandhills to the west. Potential mitigation areas were identified on the BHR. Of these, a combination of several mitigation opportunities will provide the mitigation needed for the project wetland impacts. For purposes of this plan the site is divided into five Activity Areas, which are described below and depicted on **Exhibit 3-4-8**. The vegetative communities historically present on the site are listed in **Table 3-4**, using the FNAI nomenclature (FNAI 2009).

**Table 3-4. Historic Site Conditions.**

FNAI Community Type	Wetland (Y/N)
Basin Swamp	Y
Depression Marsh	Y
Dome Swamp	Y
Floodplain Forest	Y
Strand Swamp	Y
Mesic Flatwoods	N
Mesic Hammock	N
Dry Prairie	N

#### ACTIVITY AREA 1

Activity Area 1 is located in the northeastern portion of Boarshead Ranch, adjacent to the Withlacoochee River Basin. Historical aeriels (1951 and 1957) reveal that the major habitat types in this area were comprised of floodplain forest, depression marsh, basin marsh and mesic flatwoods. By 1970 aerial photographs indicate that the marshes had been excavated into open water pits, and the mesic flatwoods was converted to pastureland. Also during this time period a ditch was constructed connecting the two excavated areas.

#### ACTIVITY AREA 2

Activity Area 2 includes the large lake adjoining the western property boundary of the site. Historically, it was surrounded by wet prairie, floodplain forest, and cypress dominated basin swamp. The 1951 aerial reveals the full extent of the lake to the north, beginning south of the east/west road in the central portion

of the ranch. In 1951 the large lake displays a connection to the small lake along the southwestern border (adjacent to U.S. 98) via a ditch, but wet prairie habitats almost certainly facilitated sheet flow to the southwest portion of the site as well. In addition, the lake is connected to the marshes and prairies in the north (Activity Area 8) via a ditch. The lake is also hydrologically connected to the bottomland in the east in two locations- one via a culvert to the northeast, through cypress (and under the north/south road), and the second via a culvert to the southeast, through cypress (also under the north/south road). Three of these connections remain today, although, decreased water levels limit the amount of overflow to the small southwestern lake. The ditch that connected Activity Area 8 to the northern tip of the lake in Activity Area 2 is no longer present, and is assumed to have been filled to surrounding grade after 1970.

Between 1951 and 1957, the cypress and hardwood species buffering the southwest- southeastern portion of the lake were thinned. From 1957-1970, additional cypress were logged from within the dome swamps to the northeast of the lake. After 1970 this area (cypress domes to the northeast of the lake; within the hardwood conifer mixed habitat) was planted with pine. A jeep trail was also established between the newly planted pine and the hardwood conifer mixed habitat to the northeast of the lake.

#### ACTIVITY AREA 5

Prior to 1970 Activity Area 5 and its immediately surrounding area were comprised of pastureland, wet prairie, cypress, and hardwood conifer mixed habitats. A large portion of land surrounding Activity Area 5 was planted with pine at some time between 1970 and the present. As observed in the 1951 aerial, wet prairies were scattered throughout, and likely connected via sheet flow. This connection may still remain through the hydric pine plantation.

#### ACTIVITY AREA 6

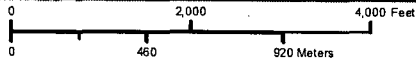
Activity Area 6 is bordered by the Withlacoochee River floodplain to the north and east. In the historic condition, this area was comprised of one cypress dome, a few wet prairies, bottomland, and a minimal amount of pastureland. Pine flatwoods surrounded these habitats. At some time after 1970 pine was planted in pastures and in locations buffering the isolated wet prairie habitats. It also appears that supplemental tree planting occurred within the pine flatwoods. The jeep trails were installed sometime between 1951 and 1970.

#### ACTIVITY AREA 8

Activity Area 8 is located in the center of the ranch, just north of the large lake system on the property. It was predominantly comprised of pastureland, with wet prairie and freshwater marsh systems abundant within the interior. The 1951 aerial (**Exhibit 3-4-4a**) clearly displays connectivity among the wet prairie and freshwater marsh systems in the northwestern portion of this area. In addition, a freshwater marsh, located along the eastern portion of this area, was connected to the northern wetlands via a ditch. In turn, this freshwater marsh was drained by a ditch to the southern lake system. The 1957 aerial (**Exhibit 3-4-4b**) displays the same connections, although, the water levels within the prairie and marsh system in the northwestern portion of this area appear to have decreased. It is unclear from the 1970 aerial (**Exhibit 3-4-4c**) whether or not this drainage connection is still in place. At one point after 1957, the wet prairie and marsh system in the northwestern portion of this area was cleared for production of crops (rows are observed in the 1970 aerial). Rough jeep trails were also created between 1957 and 1970 on the eastern and western side of the cleared area.

### **3.4.3** Current Conditions

Beginning in the early 1950s native communities on the BHR property were converted to agricultural uses such as row crop farming, timber harvesting and sod farming. Additionally, basin swamps and depression marshes were exploited for peat mining.



This map and all data contained within are supplied as is with no warranty. ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

**Exhibit 3-4-4a**  
**1951 Historic Aerial**  
**Boarshead Ranch Mitigation Site**

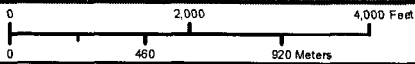
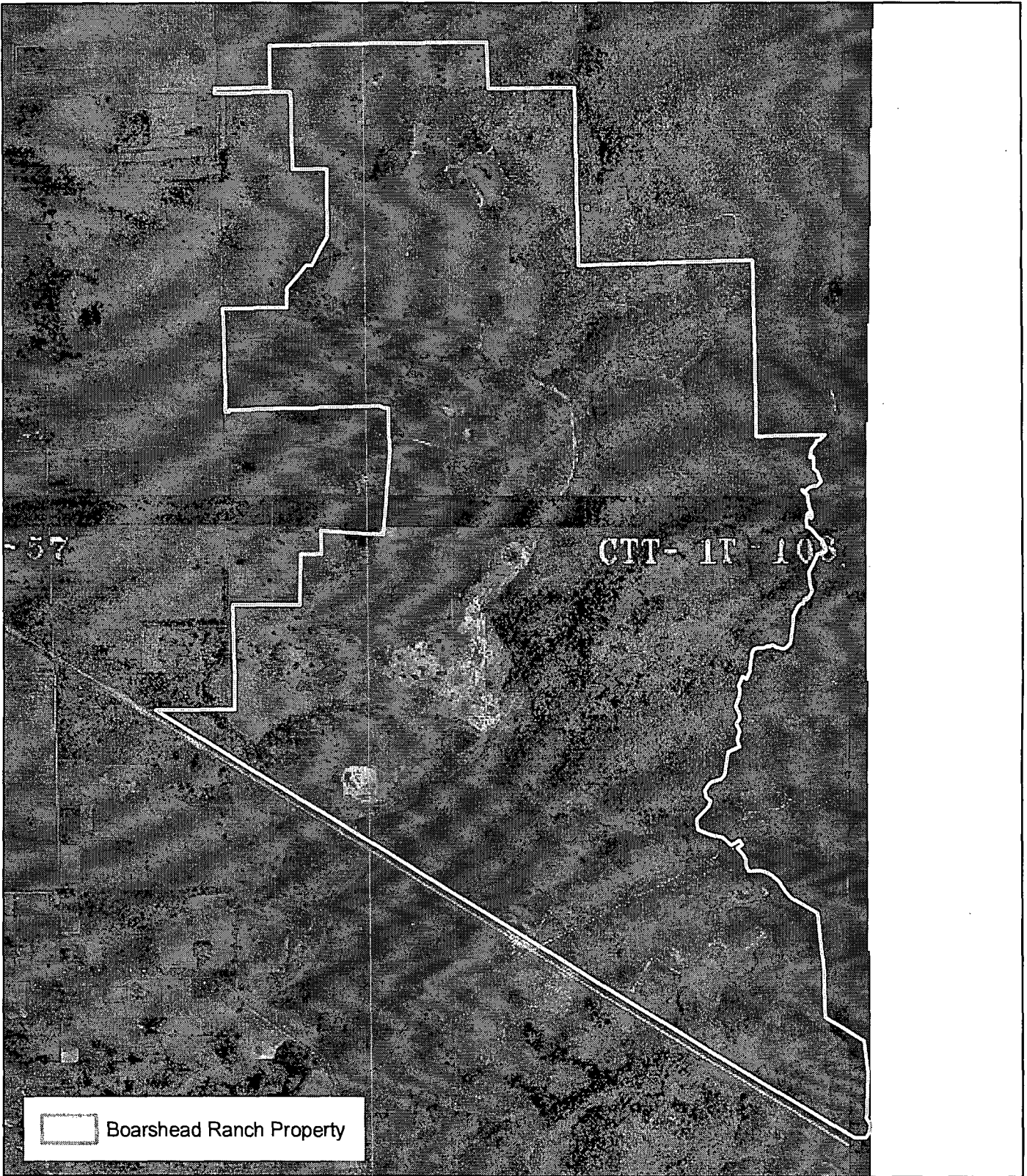


Image: 1951

 <b>ENTRIX</b>	
3905 Crescent Park Drive Riverview, FL 33578-3625	ph. (813) 664-4500 fx (813) 664-0440
<a href="http://www.entrix.com">www.entrix.com</a>	

Coordinate System:  
Florida Albers






This map and all data contained within are supplied as is with no warranty. ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

**Exhibit 3-4-4b  
1957 Historic Aerial  
Boarshead Ranch Mitigation Site**



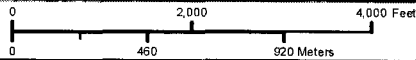
Image: 1957

 <b>ENTRIX</b>	
3905 Crescent Park Drive Riverview, FL 33578-3625	ph. (813) 664-4500 fx (813) 664-0440
<a href="http://www.entrix.com">www.entrix.com</a>	
Coordinate System: Florida Albers	





 Boarshead Ranch Property



This map and all data contained within are supplied as is with no warranty. ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

**Exhibit 3-4-4c**  
**1970 Historic Aerial**  
**Boarshead Ranch Mitigation Site**



Image: 1970

 <b>ENTRIX</b>	
3905 Crescent Park Drive Riverview, FL 33578-3625	ph. (813) 664-4500 fx (813) 664-0440
<a href="http://www.entrix.com">www.entrix.com</a>	
Coordinate System: Florida Albers	

A 2009 Aerial Map is provided as **Figure 3-4-5**. Existing land cover types are depicted on **Exhibit 3-4-6** and listed in **Table 3-5**. Florida Natural Areas Inventory (FNAI 2009) descriptions are provided in parenthesis after each FLUCFCS code to which they correspond.

**Table 3-5. Existing Land Use within Mitigation Site, FLUCFCS Communities (FNAI Community).**

Existing Communities	Mitigation Activity Areas (acres)	Boarshead Ranch (acres)
110 Residential Low Density (Developed)	0.0	2.3
210 Cropland and Pastureland (Agriculture)	72.7	754.5
214 Row Crops (Agriculture)	0.0	2.7
411 Pine Flatwoods (Mesic Flatwoods)	10.0	305.7
425 Temperate Hardwoods	0.0	0.8
434 Hardwood Conifer Mixed	0.0	111.8
440 Tree Plantations (Pine Plantation)	19.8	88.1
441 Coniferous Plantation (Pine Plantation)	0.0	43.4
520 Lakes (Impoundment/Artificial Pond)	65.0	117.2
615 Stream and Lake Swamp (Bottomland)	7.5	523.0
621 Cypress (Basin and Dome Swamp)	26.4	62.8
641 Freshwater Marsh (Depression Marsh)	0.5	5.3
643 Wet Prairies (Depression Marsh)	5.8	77.0
814 Roads and Highways	0.0	2.2
<b>Total</b>	<b>207.7</b>	<b>2096.8</b>

### 3.4.3.1 Boarshead Ranch Upland Land Use Types

#### **RESIDENTIAL LOW DENSITY <2 DWELLING UNITS (FLUCFCS 110)**

This habitat type is located in the southwestern portion of the ranch, adjacent to U.S. 98, and is dominated by bahia grass (*Paspalum notatum*), with a few live oaks (*Quercus virginiana*) and slash pine (*Pinus elliottii*) scattered throughout.

#### **CROPLAND AND PASTURELAND (FLUCFCS 210)**

This habitat type is composed of bahia grass (*Paspalum notatum*), with varying amounts of live oaks, bluestem grasses (*Andropogon* sp.) and saw palmetto (*Serenoa repens*). The cropland and pastureland on the ranch is managed for the production of field crops, grown in rotation.

#### **ROW CROPS (FLUCFCS 214)**

This area, located in the northeast portion of the site, is adjacent to citrus groves and dominated by bahia grass.

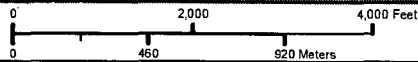
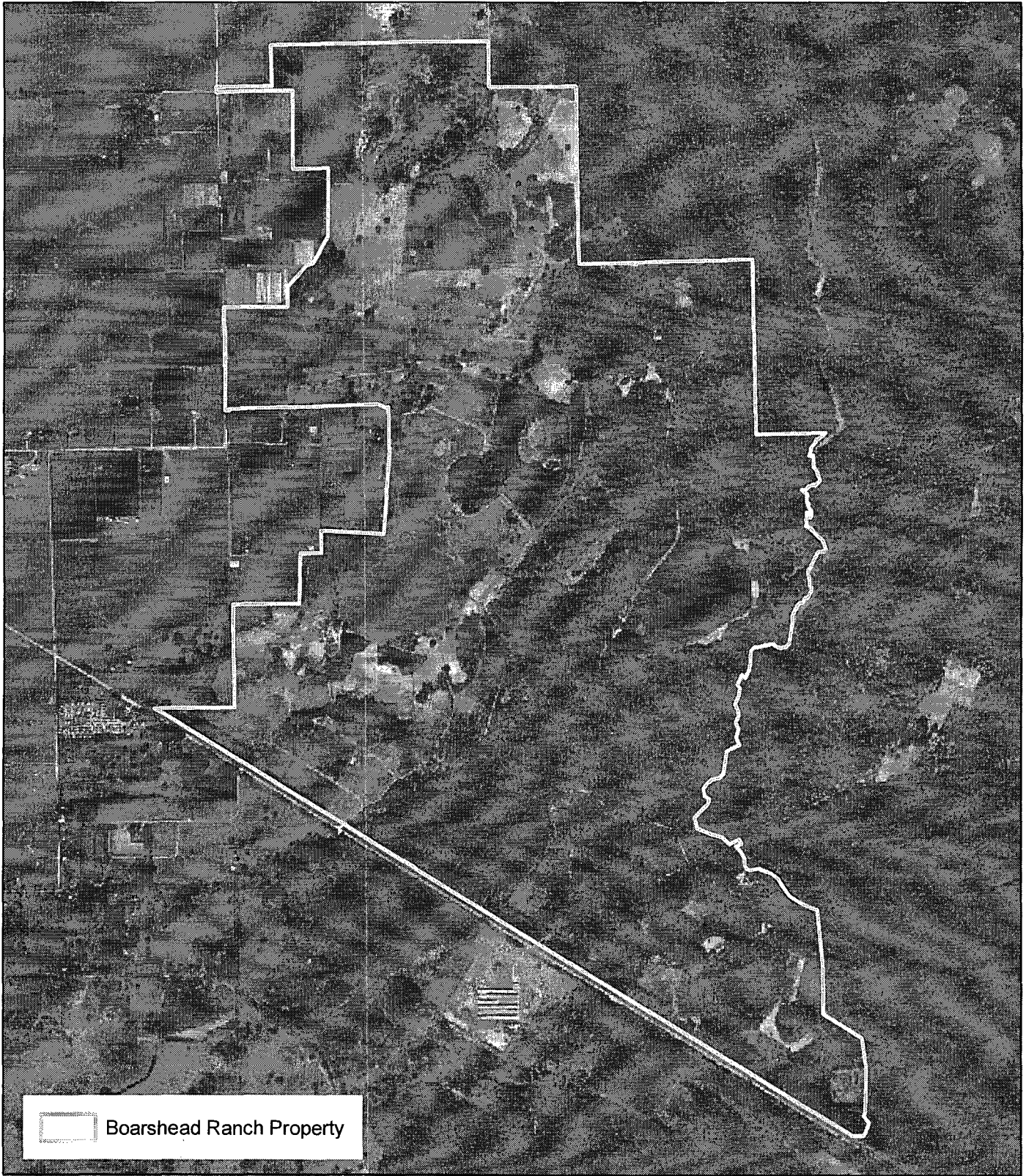
#### **PINE FLATWOODS (FLUCFCS 411)**

The predominant species in this forest community is slash pine. Other associates include laurel oak (*Quercus laurifolia*), saw palmetto, maidencane (*Panicum hemitomon*), broomsedge bluestem (*Andropogon virginicus*), bushy bluestem (*Andropogon glomeratus*), dog fennel (*Eupatorium* sp.) and blackberry (*Rubus* sp.) within the understory. This habitat type can be located in the northeastern portion of the site within Activity Area 6, adjacent to the Withlacoochee River Basin, as well as the southern portion of the site, within Activity Areas 3 and 5.

#### **TEMPERATE HARDWOODS (FLUCFCS 425)**

This cover type is characterized by an overstory of oaks, bays, hickories, cabbage palm, hollies and cedar. It comprises a very small portion of the BHR and is not present in any of the activity areas.





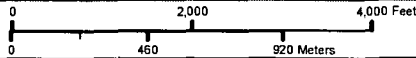
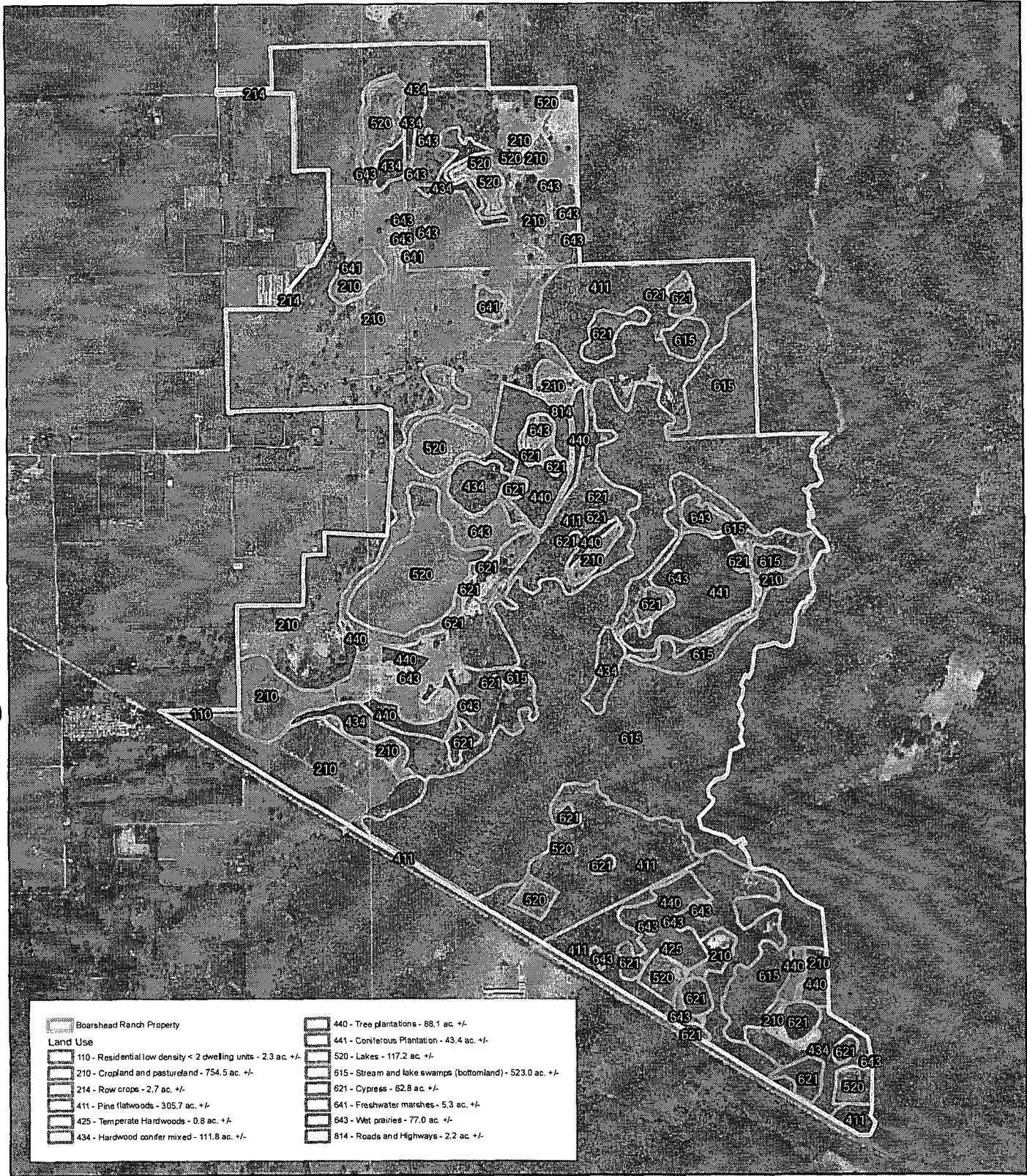
This map and all data contained within are supplied as is with no warranty. ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

**Exhibit 3-4-5**  
**Boarshead Ranch Mitigation Site**  
**2009 Aerial Map**



 <b>ENTRIX</b>	
3905 Crescent Park Drive Riverview, FL 33578-3625	ph. (813) 664-4500 fx (813) 664-0440
<a href="http://www.entrix.com">www.entrix.com</a>	
Coordinate System: Florida Albers	





This map and all data contained within are supplied as is with no warranty. ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

### Exhibit 3-4-6 Boarshead Ranch Mitigation Site Existing Land Use and Land Cover Map



Image:2009



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

www.entrix.com

Coordinate System:  
Florida Albers

#### ***HARDWOOD CONIFER MIXED (FLUCFCS 434)***

This cover type is characterized by an overstory of live oak, laurel oak and slash pine. Turkey oak (*Quercus laevis*) is a representative species in certain areas. The understory is dominated by saw palmetto, wiregrass (*Aristida stricta* var. *beyrichiana*), Bahiagrass, beggar's lice (*Desmodium* sp.), and milk pea (*Galactia* sp.). Hardwood and conifer tree species surround the freshwater marsh and wet prairies on the property.

#### ***TREE PLANTATIONS (FLUCFCS 440)***

This cover type, located in the southeastern portion of the site, within Activity Area 4, is characterized by an overstory of slash pine, with various amounts of grasses in the understory.

#### ***ROADS AND HIGHWAYS (FLUCFCS 814)***

This cover type describes a rural, unimproved road that acts as a berm between wetland systems. The bermed road severing the hydrologic connection between wetlands within Activity Area 2 North will be removed as part of this plan.

### **3.4.3.2 Boarshead Ranch Wetland Land Use Types**

#### ***LAKES (FLUCFCS 520)***

There are several reservoirs located on the property, some utilized for the irrigation of the surrounding agricultural fields. The majority of the lakes on the ranch are hydrologically connected to the Withlacoochee River floodplain, and include water control structures to prevent flooding. Emergent aquatic vegetation is present at the upper limits of the large central lake and includes the following species: pickerelweed (*Pontederia cordata*), manyflower marsh pennywort (*Hydrocotyle umbellata*), and swamp smartweed (*Polygonum hydropiperoides*).

#### ***STREAMS AND LAKE SWAMPS (BOTTOMLANDS) (FLUCFCS 615)***

Bottomlands, also referred to as stream hardwoods, include a dense canopy of hardwood tree species tolerant to hydric conditions. Dominant hardwood species include sweetbay (*Magnolia virginiana*), pignut hickory (*Carya glabra*), cabbage palm (*Sabal palmetto*), and sweetgum (*Liquidambar styraciflua*). The shrub layer consists largely of gallberry, fetterbush (*Lyonia lucida*) and wax myrtle (*Myrica cerifera*). A strip of this cover type bisects the ranch, running from the upper limits of the Withlacoochee River basin to the southeastern property boundary.

#### ***CYPRESS (FLUCFCS 621)***

This land cover type encompasses communities of pond cypress (*Taxodium ascendens*) dominated coniferous forests located in areas that are inundated with water and contain hydric soils. Swamp fern (*Blechnum serrulatum*), lizard's tail (*Saururus cernuus*), and swamp smartweed are present within the understory. Cypress domes are present throughout the majority of the property. A call from a southern chorus frog (*Pseudacris nigrita*) was heard near a cypress dome within Activity Area 3.

#### ***FRESHWATER MARSHES (FLUCFCS 641)***

These wetlands are dominated by herbaceous vegetation, including swamp smartweed, paspalum (*Paspalum* sp.), and various sedges (*Carex* sp.). Lesser amounts of many species including dog fennel, sesban (*Sesbania* sp.), carpetgrass (*Axonopus* sp.), and Bermuda grass (*Cynodon dactylon*) are also present.

#### ***WET PRAIRIE (FLUCFCS 643)***

These shallow marshes are dominated by herbaceous vegetative species such as maidencane and blue maidencane (*Amphicarpum muhlenbergianum*), with lesser amounts of many grassy species including Baldwin's spikerush (*Eleocharis baldwinii*), yellow-eyed-grass (*Xyris* sp.), beakrush (*Rhynchospora* sp.), witchgrass (*Dicanthelium* sp.), and dog fennel. Pines and oaks are also encroaching into the shrub and

canopy strata. Sandhill cranes (*Grus canadensis*) and snowy egrets (*Egretta thula*) were observed foraging in a depressional area adjacent to a wet prairie within Activity Area 1.

### 3.4.4 Target Conditions

The goal of mitigation at BHR is to restore and enhance the condition of the existing wetlands that have been impacted by ongoing agricultural management activities and to create additional wetlands from uplands that have previously been converted to pine plantation or pastureland; see Exhibits 3-4-7, 3-4-8, and 3-4-9a through 3-4-9f. Adjacent wetlands will be enhanced via removal of the timber management disturbances and nuisance species threat and/or by correction of hydrological alterations.

The mitigation target is to create herbaceous and forested wetland areas appropriate to the region and consistent with the natural community types present in the adjacent state-owned lands along the Withlacoochee and Hillsborough Rivers. The target types of these systems fall within the Palustrine wetland descriptions in FNAI. The target communities are listed in Table 3-6. They are described in Section 6.4.

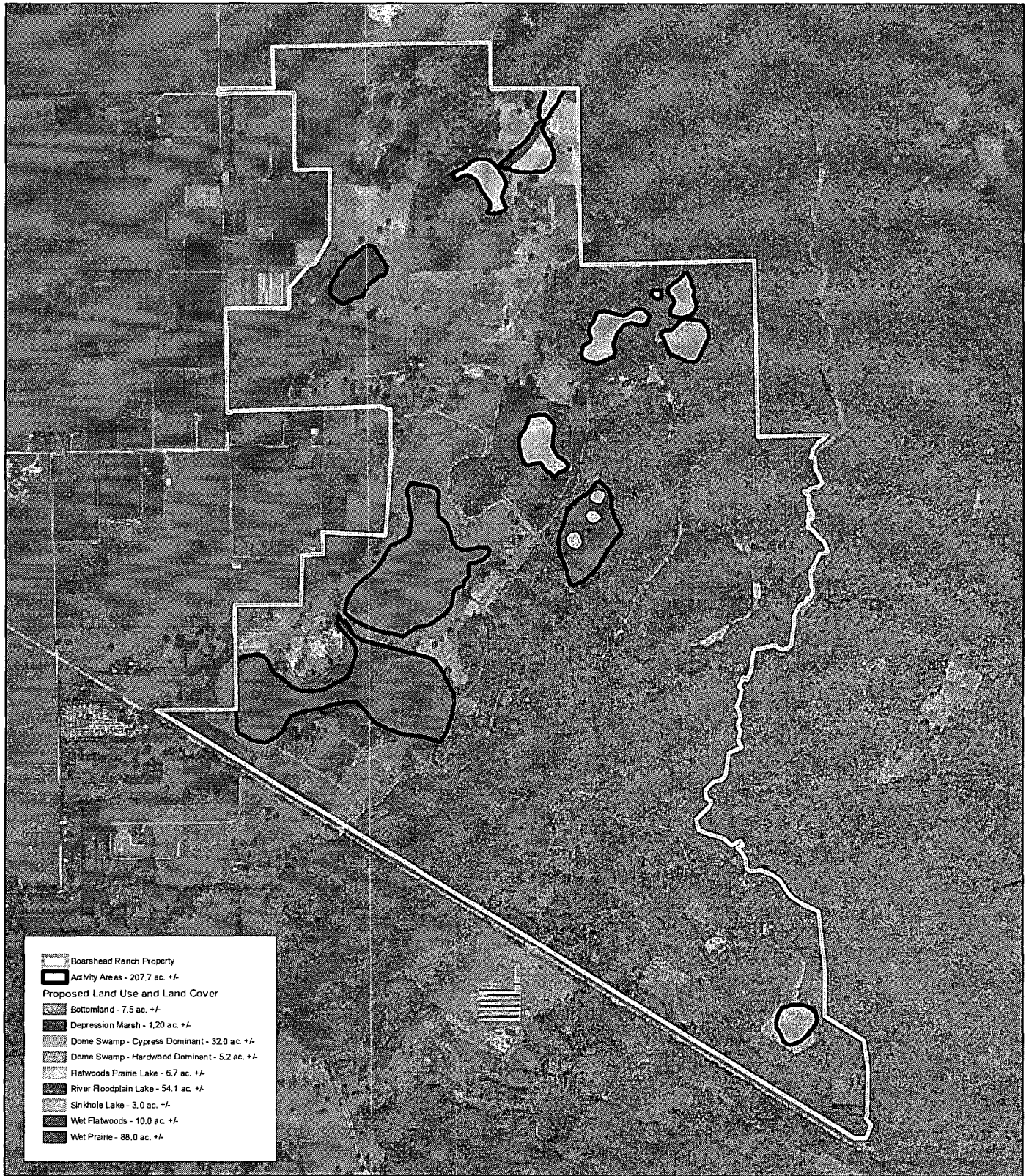
Target Communities	Acreage
Bottomland	7.5
Depression Marsh	1.2
Dome Swamp – Cypress Dominant	32.0
Dome Swamp – Hardwood Dominant	5.2
Flatwoods Prairie Lake	6.7
River Floodplain Lake	54.1
Sinkhole Lake	3.0
Wet Flatwoods	10.0
Wet Prairie	88.0
<b>Total</b>	<b>207.7</b>

### 3.4.5 Mitigation Activities

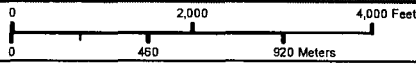
In the mitigation activity areas depicted on Exhibits 3-4-8 and 3-4-9 mitigation will generally be implemented according to field conditions when the mitigation is initiated.

Current Community (FLUCFCS)	FNAI Target Wetland Community Type (acres)									
	Dome Swamp Hardwood	Dome Swamp Cypress	Bottomland	Depression Marsh	Wet Flatwoods	Wet Prairie	Flatwoods Prairie Lake	Sinkhole Lake	River Floodplain Lake	Totals
210 Crop and Pastureland	5.2					67.5				72.7
411 Pine Flatwoods					10.0					10.0
440 Tree Plantations						19.8				19.8
520 Lakes				1.2			6.7	3.0	54.1	65.0
615 Stream and Lake Swamp			7.5							7.5
621 Cypress		26.4								26.4
641 Freshwater Marsh						0.5				0.5
643 Wet Prairie		5.6				0.2				5.8
<b>Totals</b>	<b>5.2</b>	<b>32.0</b>	<b>7.5</b>	<b>1.2</b>	<b>10.0</b>	<b>88.0</b>	<b>6.7</b>	<b>3.0</b>	<b>54.1</b>	<b>207.7</b>





- Boarshead Ranch Property
- Activity Areas - 207.7 ac. +/-
- Proposed Land Use and Land Cover**
- Bottomland - 7.5 ac. +/-
- Depression Marsh - 1.20 ac. +/-
- Dome Swamp - Cypress Dominant - 32.0 ac. +/-
- Dome Swamp - Hardwood Dominant - 5.2 ac. +/-
- Flatwoods Prairie Lake - 6.7 ac. +/-
- River Floodplain Lake - 54.1 ac. +/-
- Sinkhole Lake - 3.0 ac. +/-
- Wet Flatwoods - 10.0 ac. +/-
- Wet Prairie - 88.0 ac. +/-



This map and all data contained within are supplied as is with no warranty. ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

**Exhibit 3-4-7**  
**Boarshead Ranch Mitigation Site**  
**Proposed Land Use and Land Cover Map**



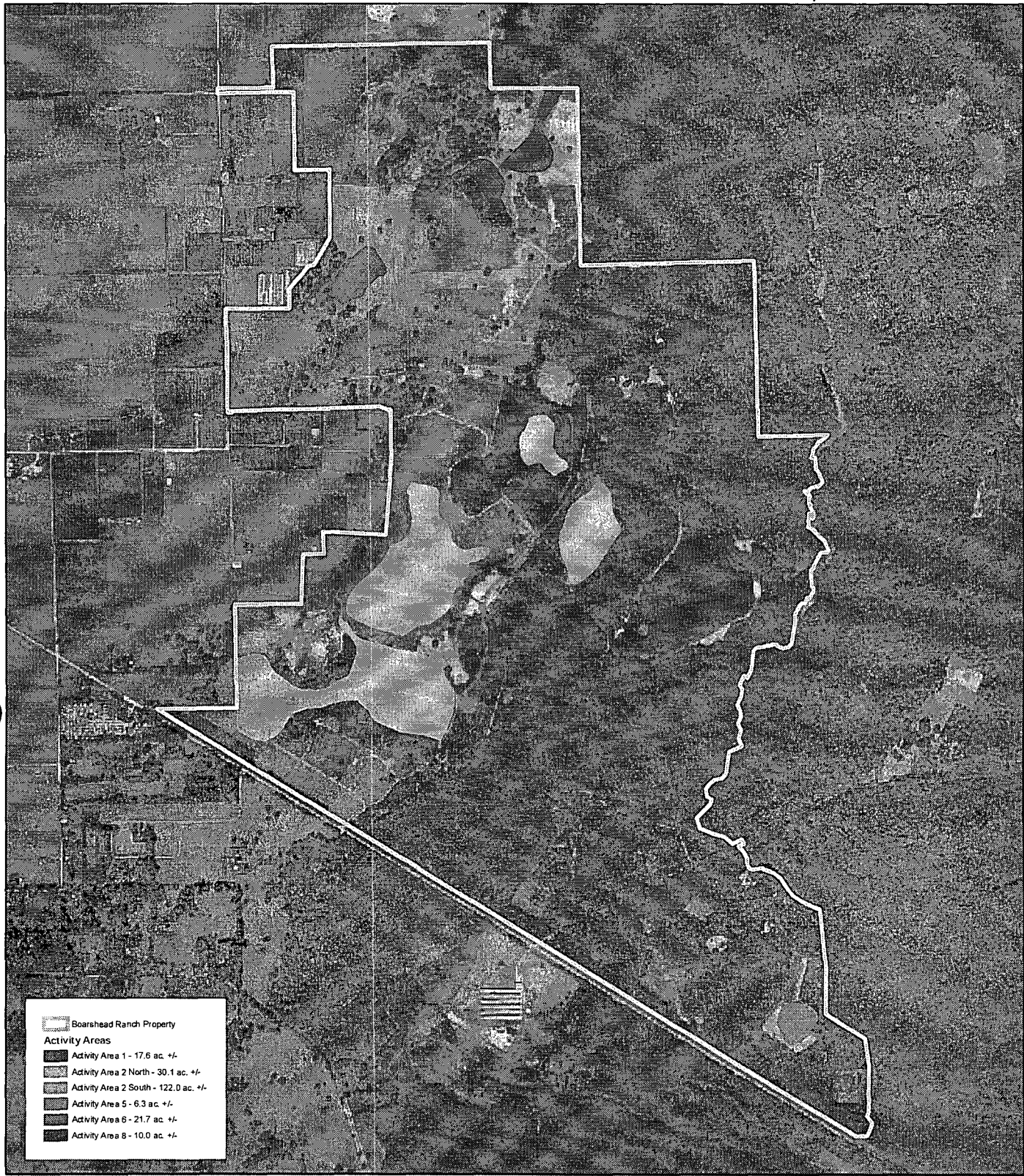
Image: 2009



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

Coordinate System:  
Florida Albers

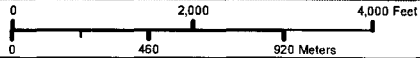




**Boarshead Ranch Property**

**Activity Areas**

- Activity Area 1 - 17.6 ac +/-
- Activity Area 2 North - 30.1 ac +/-
- Activity Area 2 South - 122.0 ac +/-
- Activity Area 5 - 6.3 ac +/-
- Activity Area 6 - 21.7 ac +/-
- Activity Area 8 - 10.0 ac +/-



This map and all data contained within are supplied as is with no warranty. ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

**Exhibit 3-4-8**  
**Boarshead Ranch Mitigation Site**  
**Mitigation Activities - Overall Map**



3905 Crescent Park Drive Riverview, FL 33578-3625	ph. (813) 664-4500 fx (813) 664-0440 <a href="http://www.entrix.com">www.entrix.com</a>
Coordinate System: Florida Albers	





The map and all data contained within are supplied as is with no warranty. Entrix, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of the map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, when required by law.

**Exhibit 3-4-9a  
Boarshead Ranch Mitigation Site  
Mitigation Activity Area 1**



**ENTRIX**  
 3195 Celestial Park Drive    ph. (813) 694-4500  
 Broward County, FL 33315-3813    fax. (813) 694-0440  
 www.entrxi.com  
 Copyright © 2005  
 Entrix Systems  
 Florida, USA





Boarshead Ranch Property - 2,066.8 ac +/-

Activity Area 2 North

Activity Area - 2.2 ac +/-

Activity Area and Conservation Easement - 30.1 ac +/-

Activity Area 2 North - Current Land Use

- 210 - Cropland and pastureland - 5.8 ac +/-
- 411 - Pine flatwoods - 10.0 ac +/-
- 440 - Tree plantations - 2.8 ac +/-
- 421 - Cypress - 5.9 ac +/-
- 643 - Wet prairies - 5.6 ac +/-
- 814 - Roads and Highways - 2.2 ac +/-

This map and all data contained within are provided as is with no warranty. Entrix, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data prepared by a licensed surveyor, where required by law.

**Exhibit 3-4-9b**  
**Boarshead Ranch Mitigation Activity Area 2 North**

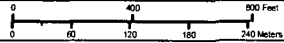
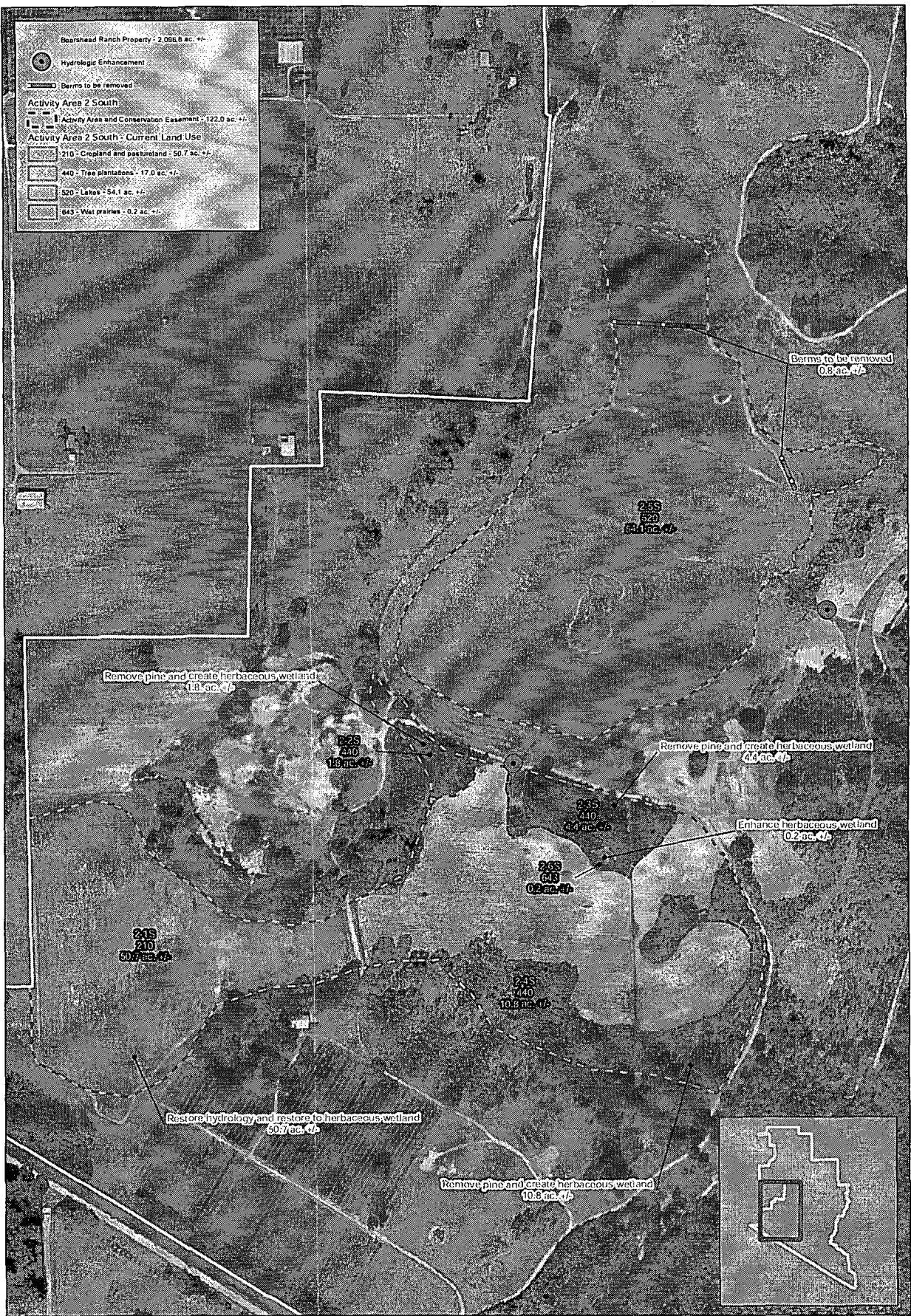


**ENTRIX**

3905 Crescent Park Drive | Ph: (813) 684-4500  
 Riverview, FL 33578-3635 | Fx: (813) 684-0400  
[www.entrinx.com](http://www.entrinx.com)

Coordinate Systems:  
 Florida Albers





The map and all data contained within are supplied as is with no warranty. Entrix, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data prepared by a licensed surveyor, where required by law.

**Exhibit 3-4-9c**  
**Boarshead Ranch Mitigation Site**  
**Mitigation Activity Area 2 South**

	<b>ENTRIX</b>	
	3905 Crescent Park Drive Tomball, TX 77375-3023 www.entrif.com	ph: (281) 464-4300 fx: (281) 654-0440
	CompuShare Systems Florida, Atlanta	

Preparation Date: 03/04/2010 10:19 AM; File Path: \\snp\proj\342\03\42010\Map\342\_03\342\_03\_04\_03\_01\342\_03\_04\_03\_01\_01.dwg; Plotter: HP DesignJet 2400; Scale: 1:1; Color: Color; Printer: HP DesignJet 2400; Plot Size: 34.25 x 44.75; Plot Range: All; Plot Orientation: Portrait; Plot Date: 03/04/2010 10:19 AM.





The map and all data contained herein are provided as is with no warranty. Entrix, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if this data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

Exhibit 3-4-9d  
Boarshead Ranch Mitigation Site  
Mitigation Activity Area 5



**ENTRIX**

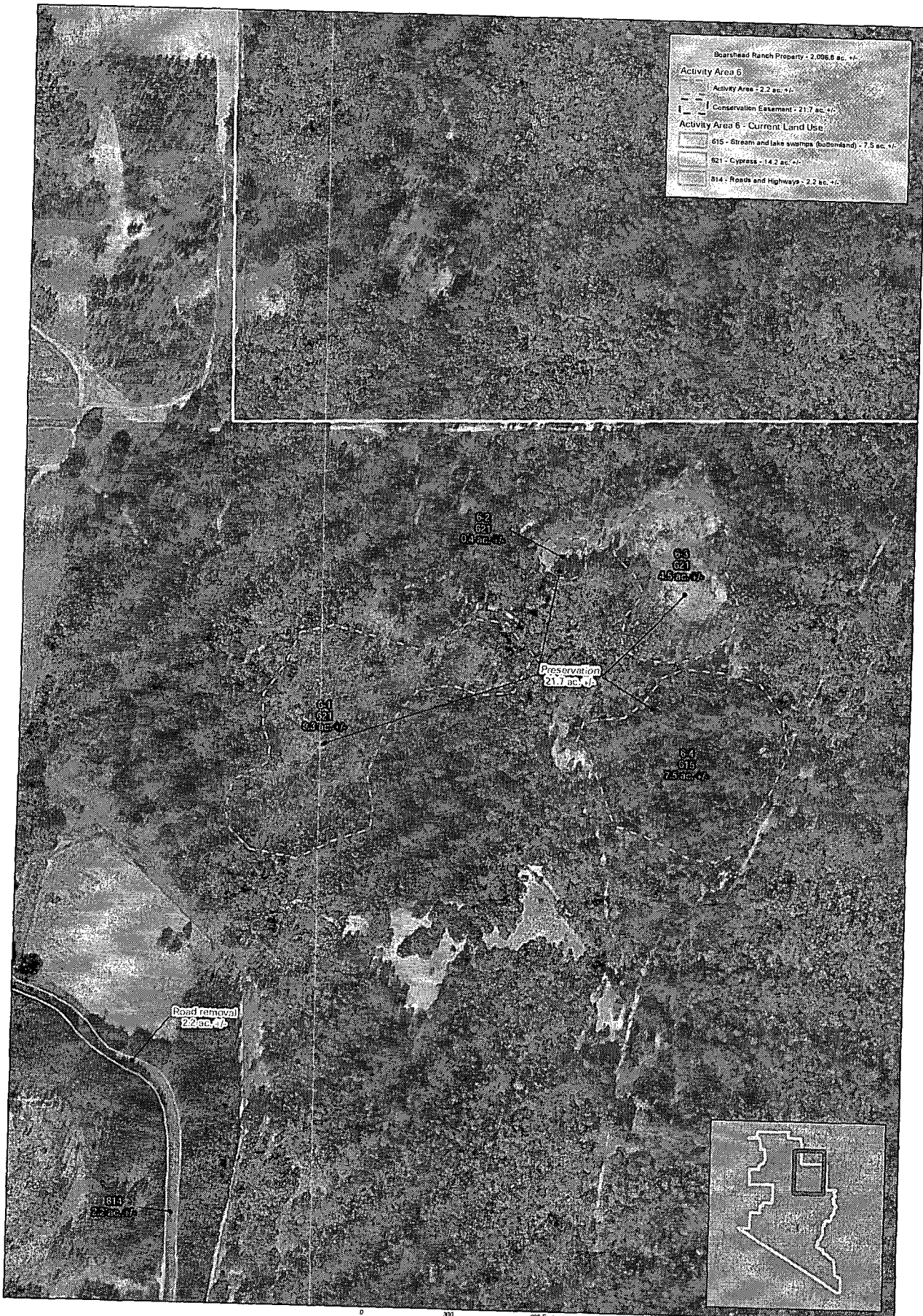
3105 Crescent Park Drive  
Riverview, FL 33528-3625  
www.entriv.com

ph: (813) 674-4500  
fx: (813) 674-0443

Image 335

Coordinate System:  
Florida Albers





Boarshead Ranch Property - 2,096.6 ac +/-

Activity Area 6

Activity Area - 2.2 ac +/-

Conservation Easement - 21.7 ac +/-

Activity Area 6 - Current Land Use


615 - Stream and lake swamps (bottomland) - 7.5 ac +/-

621 - Cypress - 14.2 ac +/-

614 - Roads and Highways - 2.2 ac +/-

The map and all data contained within are provided as is with no warranty. EntriX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use of this map. It is the sole responsibility of the user to determine if the data on this map meets their needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

Exhibit 3-4-9e  
Boarshead Ranch Mitigation Site  
Mitigation Activity Area 6

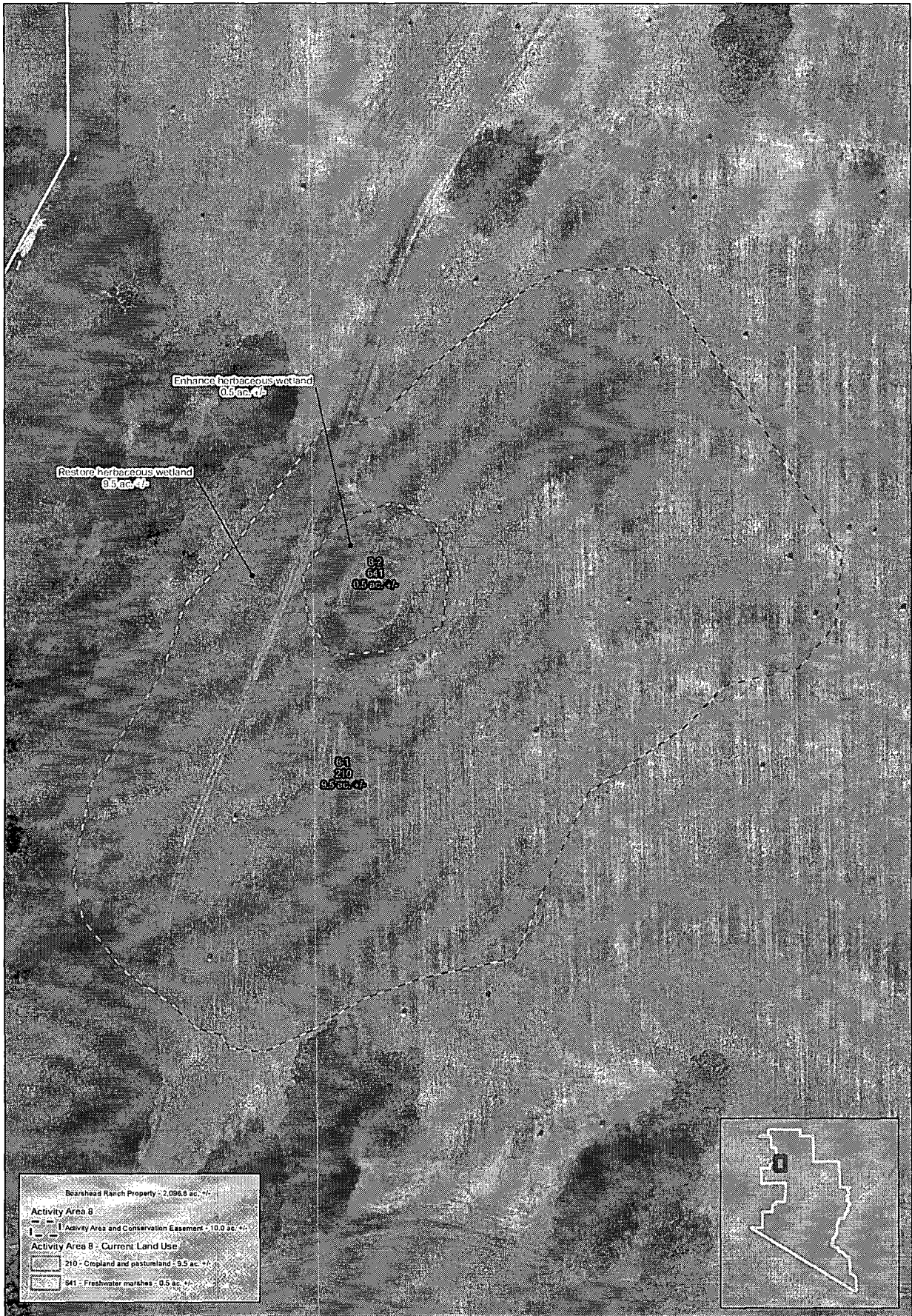


3705 Crescent Park Drive  
Borlough, FL 33478-3625  
www.entrix.com

ph: (813) 654-4500  
te: (813) 654-0440

Copyright Systems  
Florida A&M





The map and all data contained within are supplied as is, with no warranty. Entrix, Inc. expressly disclaims responsibility for consequences or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data prepared by a licensed surveyor, where required by law.

Exhibit 3-4-9f  
Boarshead Ranch Mitigation Site  
Mitigation Activity Area 8



**ENTRIX**

3306 Crescent Park Drive  
Riverview, FL 33578-3920  
www.entrinx.com

ph: (813) 684-4500  
fx: (813) 684-0440

Geonote Systems  
Florida Division



A series of wetland enhancement, restoration, creation and preservation activities will occur on the BHR in five AAs (Exhibits 3-4-8 to 3-4-9f). A preliminary engineering evaluation was conducted to assess the suitability of the BHR for wetland mitigation (Stuedemann 2010). This evaluation found a series of opportunities on BHR. This plan has selected the most efficient set of AAs in which to develop the mitigation. The mitigation techniques for use on the AAs are listed in Table 3-8.

**Table 3-8. Proposed Mitigation Technique by Community Conversion Type.**

Current Communities	Target Communities	Restoration Technique			
		Hydrologic Enhancement	Wetland Creation	Wetland Restoration	Wetland Enhancement
Improved Pasture	Dome Swamp, Hardwood-dominant		X		
Improved Pasture	Wet Prairie	X	X	X	
Mesic Flatwoods	Wet Flatwoods		X		
Planted Pine	Wet Prairie		X		
Depression Marsh	Wet Prairie				X
Flatwoods/Prairie Lake	Flatwoods/Prairie Lake	X			
Lake	Depression Marsh				X
Sinkhole Lake	Sinkhole Lake				X
River Floodplain Lake	River Floodplain Lake	X			
Bottomland	Bottomland				X
Dome Swamp, Cypress	Dome Swamp, Cypress				X
Wet Prairie	Wet Prairie				X
Wet Prairie	Dome Swamp, Cypress	X			X
Road	Mesic Flatwoods	X			

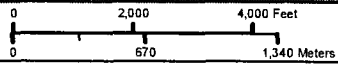
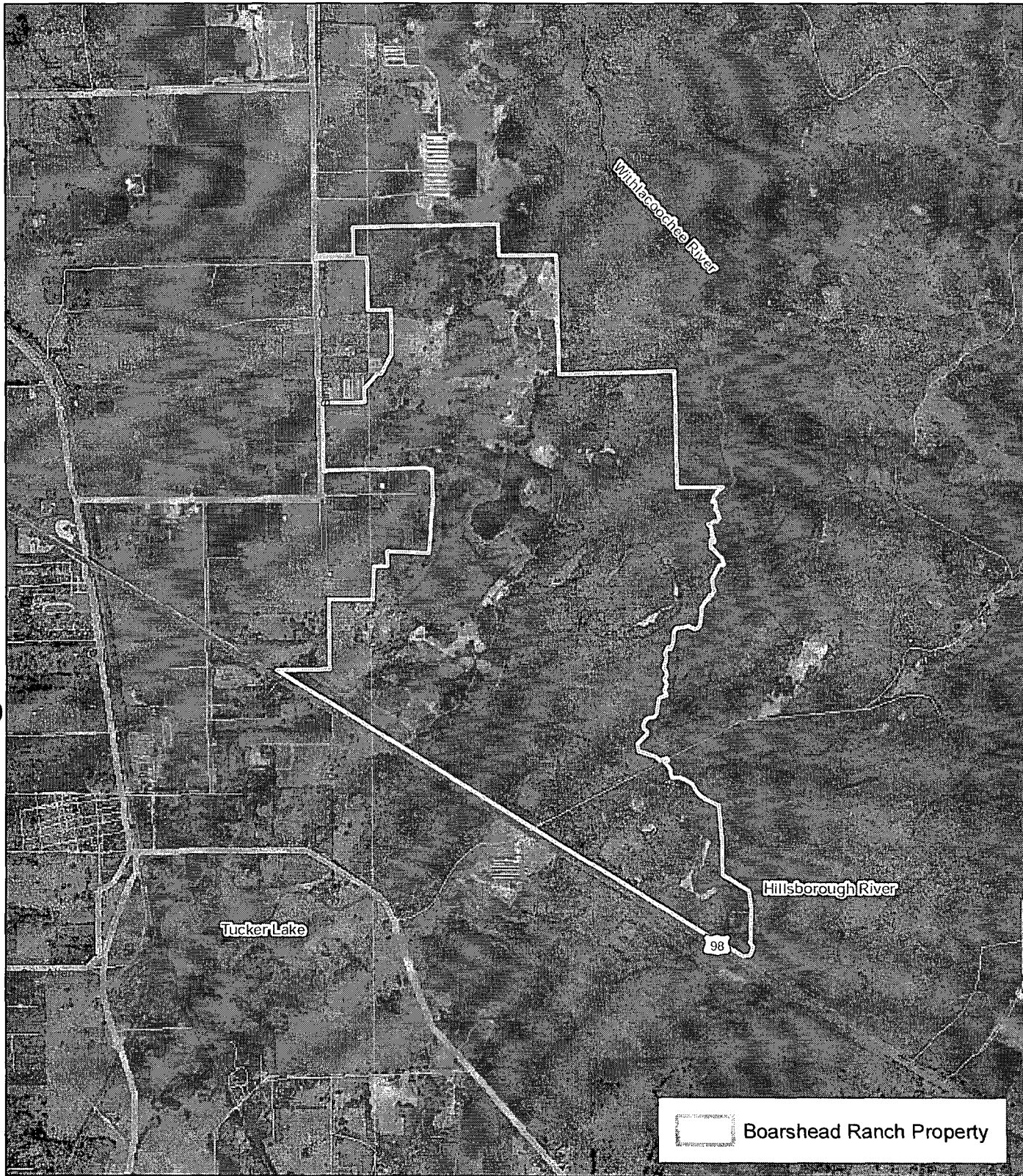
### 3.4.6 Hydrologic Restoration

Historic hydrologic connectivity will be restored to the greatest extent possible through the installation of culverts, removal of berms, and the removal of a large elevated road. Re-establishment of historic hydroperiods will help facilitate appropriate restoration of historic vegetative distributions and community structure.

Although hydrologic improvements will restore historic site conditions, field engineering is needed to refine the specific placements and elevations so that these activities will not affect site access and adjacent non-target lands. Specific modeling of the sites current or future hydrologic conditions resulting from mitigation activities have not yet been conducted (Exhibit 3-4-10). Site specific topographic and hydrologic surveys will be conducted and the hydrologic response to mitigation actions analyzed prior to commencing earth works. Survey and modeling results will be shared with and approved by BHR and other review agencies as appropriate prior to implementing restoration activities. Adjustments to this restoration plan may be warranted following these investigations.

#### WETLAND CREATION

Current uplands will be graded down to an appropriate elevation and replanted with species suitable to the target habitat type. Wetland creation has been designed to occur in areas where soils, elevations, drainage, proximity to wetlands, and historic conditions lend themselves to the development of a successful wetland system. Because of the site specific planning for wetland creation, those areas designated to be graded will not require significant alterations of elevations. Additionally, nearby intact wetland systems will supply support by providing seed source and benchmarks for hydrology. Creation will be in the form of both forested and herbaceous wetlands and plantings will mimic the vegetation of similar nearby/on-site intact systems. If necessary, nuisance and exotic plants will be treated with herbicide prior to planting.



This map and all data contained within are supplied as is with no warranty. ENTRIX, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

**Exhibit 3-4-10  
Boarshead Ranch Mitigation Site  
USGS Hydrology Map**



3905 Crescent Park Drive Riverview, FL 33578-3625	ph. (813) 664-4500 fx (813) 664-0440
<a href="http://www.entrix.com">www.entrix.com</a>	

Image: 2005  
Coordinate System:  
Florida Albers

**WETLAND RESTORATION**

Wetland restoration will occur in areas where current agricultural uses have altered the natural form and function of the landscape. The removal of agricultural activities, introduction of historical hydroperiods, grading of elevations where necessary, and replanting of species appropriate to target communities will restore these areas to their historical, pre-agriculture conditions. Hydroperiods restoration will occur as detailed above by the installation of culverts where water flow has been withheld from running its historical course. Regrading will occur only where necessary due to alteration of existing elevations by roads, agriculture, or other man-made features. Replanting will only occur where the existing seed bank and residual vegetation prove to be inadequate to re-establish the target community type. If necessary, nuisance and exotic plants will be treated with herbicide prior to replanting.

**WETLAND ENHANCEMENT**

The majority of wetland enhancement will occur by way of hydrologic enhancement (see above). The restoration of historical hydroperiods will enhance wetlands whose systems have been degraded due to altered hydrologic flows. Native and desirable species are still present within these systems and the reintroduction of historical hydroperiods should encourage growth of desirable wetland species, support reproduction, and eliminate undesirable upland species. If necessary, nuisance and exotic plants will be treated with herbicide prior to replanting.

**3.4.7 Mitigation Schedule**

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

All grading, planting, and maintenance activities will be conducted in accordance with best management practices as detailed in Section 6.5.

Table 3-9 provides a summary of this mitigation schedule.

**Table 3-9: Schedule for Implementation of Restoration and Monitoring Activities.**

	Year 1	Year 2	Year 3	Year 4
Wetland creation and enhancement earthwork	To be completed no later than two weeks prior to planting			
Monitoring to determine degree of nuisance species occurrence and distribution	Early (May) and late (September) growing season	Early (May) and late (September) growing season	Early (May) and late (September) growing season	Late growing season (September)
Nuisance species control	Early (May) and late (September) growing season	Early (May) and late (September) growing season	Early (May) and late (September) growing season	Late growing season (September)
Creation and enhancement plantings	Late growing season at least two weeks after nuisance species control	Additional planting if inadequate cover exists	Additional planting if inadequate cover exists	

**3.5 UMAM EVALUATION**

A UMAM analysis was conducted and shows that the mitigation activities will result in creation of 27.9 and 25.0 functional lift units for Withlacoochee and Hillsborough Watersheds, respectively, which will be more than adequate to compensate for the -19.0 and -16.6 units of loss in these basins, respectively. Herbaceous and forested wetland mitigation lift totaling 40.7 and 12.2 lift units, respectively, will result from implementation of this plan. This yields 15.2 herbaceous and 2.1 forested lift units beyond the amount required to offset otherwise unpermissible wetland impacts. In this case the "excess" credits are due to the fact that mitigation occurs in large

wetland systems and modifying their size to cover the exact amount of functional loss is not feasible. These "excess" lift units are proposed to be reserved and applicable to additional project impacts, if that need is established by an appropriate regulatory agency, or applied to future impacts within the watershed, if proven unnecessary for this project. **Table 3-10** summarizes Withlacoochee off-site and Hillsborough River watershed loss/lift impacts.

<b>Table 3-10. Withlacoochee Off-site and Hillsborough River Watershed Impact and Mitigation Summary.</b>						
Area	Herbaceous (including Open Water)		Forested		Total Acres	Total Functional Loss/Lift
	Acres	Functional Loss/Lift	Acres	Functional Loss/Lift		
<b>Withlacoochee Watershed</b>						
Permanent Fill	13.8	-9.8	1.9	-1.4	15.7	-11.2
Permanent Clearing	NA	NA	25.3	-7.8	25.3	-7.8
<b>Total Impacts</b>	<b>13.8</b>	<b>-9.8</b>	<b>27.2</b>	<b>-9.2</b>	<b>41.0</b>	<b>-19.0</b>
<b>Hillsborough Watershed</b>						
Permanent Fill	22.4	-15.7	1.1	-0.9	23.4	-16.6
Permanent Clearing	NA	NA	0	0	0	0
<b>Total Impacts</b>	<b>22.4</b>	<b>-15.7</b>	<b>1.1</b>	<b>-0.9</b>	<b>23.4</b>	<b>-16.6</b>
<b>Combined Impacts</b>	<b>36.2</b>	<b>-25.5</b>	<b>28.3</b>	<b>-10.1</b>	<b>64.4</b>	<b>-35.6</b>
<b>Mitigation at Boarshead Ranch</b>						
Withlacoochee Watershed	85.1	+17.0	48.4	+10.9	133.5	27.9
Hillsborough Watershed	67.9	+23.7	6.3	+1.3	74.2	25.0
<b>Total Lift</b>	<b>153.0</b>	<b>+40.7</b>	<b>54.7</b>	<b>+12.2</b>	<b>207.7</b>	<b>52.9</b>

### MONITORING AND MAINTENANCE

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

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

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

### 3.6 SUCCESS CRITERIA

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

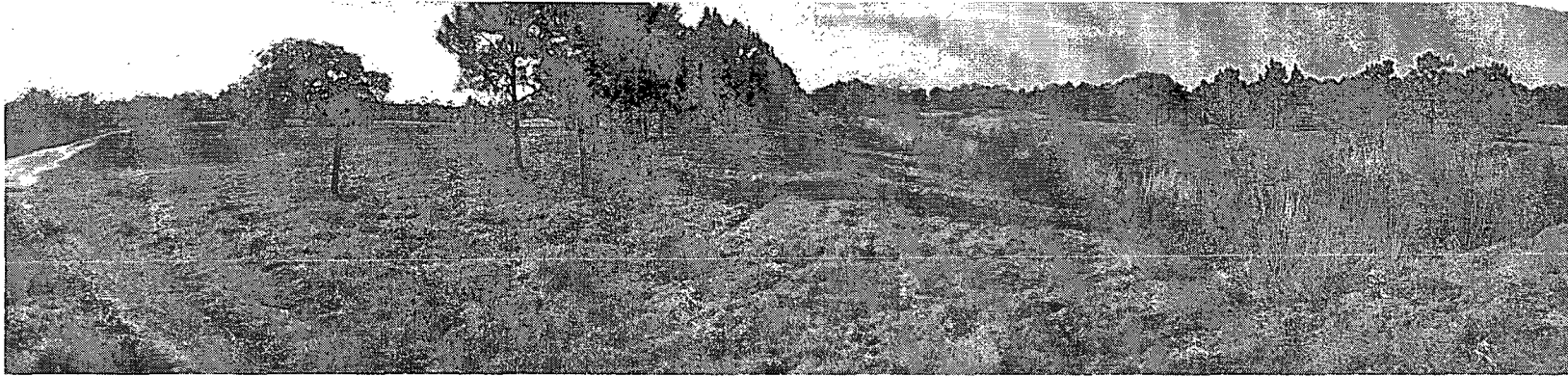
### 3.7 PUBLIC INTEREST

The mitigation to be conducted at BHR will augment and extend a series of conservation, mitigation and restoration projects that will ultimately result in the conversion of this agricultural landholding to native, sustainably managed communities on the edge of the Green Swamp system. The project is strategically located to provide perpetual, regionally-significant benefits to the Hillsborough and Withlacoochee Watersheds and the Green Swamp. These efforts will complement SWFWMD's Green Swamp Initiative and directly further its goals.



### 3.8 WITHLACOOCHEE/HILLSBOROUGH APPENDICES

#### 3.8.1 Site Photographs



Activity Area 1 facing southeast



Ditch in Activity Area 1



Culvert in Activity Area

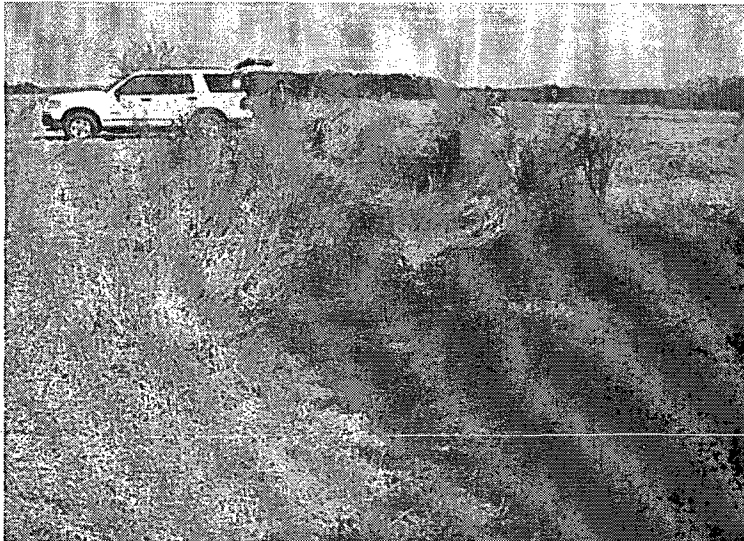


Ditch in Activity Area 1



Activity Area 2 South





Activity Area 2 South



Activity Area 2 South





Activity Area 2 (N) (West)



Activity Area 2 (N) (West)





Activity Area 2 (N) (East)



Activity Area 2 (N) (East)





Activity Area 2 (N) (East)



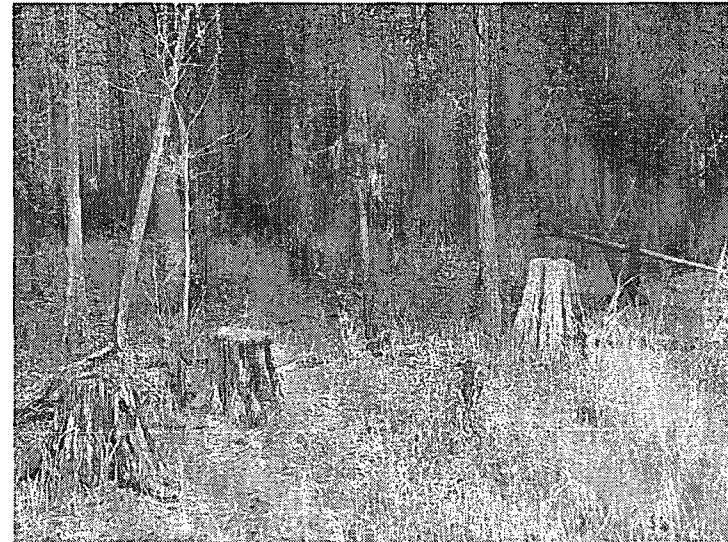
Typical wetland creation area - pine plantation and/or pasture  
upland adjacent to existing wetlands



Activity Area 5



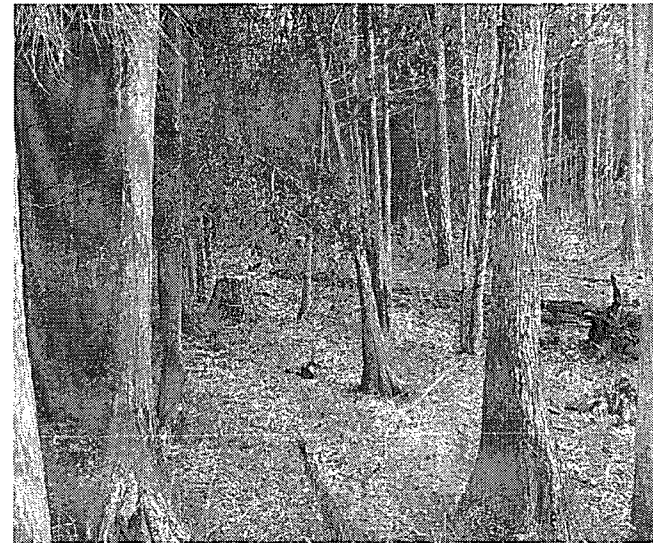




Activity Area 6 (West)



Activity Area 6 (West)



Activity Area 6 (West)



Activity Area 6 (East)



Activity Area 6 (East)



Typical berm removal area



3.8.2 UMAM scores - Boarshead Ranch

**Table 3-11. UMAM Scores**

Assessment Area Name	Location		Water		Community		Area Size (acres)	Time Lag	Risk	PAF	RFG	FG	
	Current	With	Current	With	Current	With							
<b>Hillsborough Basin-Forested</b>													
Cypress 5-1	6	8	6	7	4	9	6.3			0.8	0.21	1.3	
							Subtotal	6.3				1.3	
<b>Hillsborough Basin-Herbaceous</b>													
Cropland/Pastureland 2-1S	6	8	3	8	4	9	50.7	1.03	1.25		0.31	15.7	
Tree Plantation 2-2S	0	8	0	8	0	8	1.8	1.14	1.50		0.47	0.8	
Tree Plantation 2-3S	0	8	0	8	0	8	4.4	1.14	1.50		0.47	2.1	
Tree Plantation 2-4S	0	8	0	8	0	8	10.8	1.14	1.50		0.47	5.1	
Wet Prairies 2-6S	6	8	5	8	6	8	0.2			0.8	0.19	0.04	
							Subtotal	67.9				23.7	
<b>Withlacoochee Basin-Forested</b>													
Cropland and Pastureland 1-2	0	8	0	8	0	8	5.2	1.14	2.00		0.35	1.8	
Pine Flatwoods 2-11N	0	8	0	8	0	8	10.0	1.46	1.75		0.31	3.1	
Stream & Lake Swamps 6-4	8	8	7	7	4	9	7.5			0.8	0.13	1.0	
Cypress 2-10N	6	8	5	8	6	8	2.0	1.03	1.00		0.23	0.5	
Cypress 2-3N	6	8	6	8	6	8	1.7	1.03	1.25		0.16	0.3	
Cypress 2-4N	7	8	5	8	6	8	0.7	1.14	1.50		0.12	0.1	
Cypress 2-5N	7	8	5	8	6	8	0.6	1.14	1.50		0.12	0.1	
Cypress 2-6N	7	8	5	7	6	8	0.9	1.14	1.50		0.10	0.1	
Cypress 6-1	7	8	5	6	4	9	9.3			0.8	0.19	1.7	
Cypress 6-2	7	8	5	6	4	9	0.4			0.8	0.19	0.1	
Cypress 6-3	7	8	5	6	4	9	4.5			0.8	0.19	0.9	
Wet Prairies 2-1N	6	8	5	8	5	8	5.6	1.03	1.25		0.21	1.2	
							Subtotal	48.4				10.9	
<b>Withlacoochee Basin-Herbaceous</b>													
Cropland and Pastureland 1-3	0	8	0	8	0	8	1.6	1.14	1.75		0.40	0.7	
Cropland and Pastureland 2-9N	0	8	0	8	0	8	5.8	1.14	1.50		0.47	2.7	
Cropland and Pastureland 8-1	6	8	4	8	4	9	9.5	1.14	1.50		0.21	2.0	
Tree Plantation 2-8N	0	8	0	8	0	8	2.8	1.14	1.50		0.47	1.3	
Lakes 1-1	7	8	6	7	6	8	2.4	1.07	0.25		0.50	1.2	
Lakes 1-4a	7	8	5	8	5	8	4.2	1.07	1.50		0.15	0.6	
Lakes 1-4b	7	8	5	6	5	5	3.0	1.07	1.00		0.06	0.2	
Lakes 1-8	7	8	6	8	7	8	1.2	1.07	1.50		0.08	0.1	
Lakes 2-5S	7	8	5	8	5	7	54.1	1.07	1.25		0.15	8.1	
Freshwater Marshes 8-2	6	8	6	8	6	8	0.5	1.07	1.25		0.15	0.1	
							Subtotal	85.1				17.0	
							<b>Total</b>	<b>207.7</b>					<b>52.9</b>

See Exhibit 3-4-8 for Assessment Area locations. AAs are identified by the first digit in the AA name; e.g., Cypress 5-1 is in AA 5.

3.8.3 Hillsborough and Withlacoochee Rivers Watershed Boundary

Following this page is a memorandum titled *Drainage Divide Between Upper Hillsborough and Withlacoochee River Basins*.



ENTRIX, Inc.  
3905 Crescent Park Drive  
Riverview, FL 33578  
813.664.4500 | Fax 813.664.0440  
www.entrix.com

## Memorandum

**Date:** January 22, 2010

**To:** Doug Durbin (ENTRIX) and Ann Redmond (ENTRIX)

**cc:** Anne Benolkin (ENTRIX)

**From:** Brandon Ashby, PG (ENTRIX) and Dave Kelly (ENTRIX)

**Project No.:** 06691020.00 T710

**Project Name:** PEF Off-site Mitigation Potential – Boar’s Head Ranch

**RE:** **Drainage Divide between Upper Hillsborough and Withlacoochee River Basins**

---

### Introduction

The Upper Hillsborough and Withlacoochee watersheds originate in the Green Swamp. The Green Swamp covers approximately 900 square miles of swampy flatlands and sandy ridges in central Florida. Five major drainage systems originate in or near the Green Swamp. The headwaters of the Oklawaha River drain northward into the St. Johns River; headwaters of Peace River and Kissimmee originate in the southern boundary of the swamp and generally flow southward; headwaters of the Hillsborough River flow southwestward through a natural diversionary channel of the Withlacoochee River; and the Withlacoochee River flows to the northwest, draining approximately 720 square miles of the Green Swamp (Pride et al. 1961). Please refer to Figure 1 – *Regional Drainage Area and Site Features Map* for additional details of the region.

The drainage basins of the Green Swamp are interconnected in several locations by swamp channels and gaps in surrounding ridges. Water may flow through these gaps from one basin to another depending on relative elevation of the water levels. One such gap is a naturally-occurring diversionary overflow channel from the Withlacoochee River to the Hillsborough River, located in eastern Pasco County on the southwestern boundary of the Green Swamp. This channel connects the Withlacoochee and Hillsborough River basins during periods of high flow.

### Hydrologic Data Analysis

The United States Geological Survey (USGS) monitors the overflow between the Withlacoochee to the Hillsborough basins near U.S. Highway 98, 2.9 miles east of Richland, at station No.02311000. (Please refer to Figure 1. and References for exact location). Data from this station was evaluated to determine stage and discharge duration and frequency from the Withlacoochee to the Hillsborough watershed over this uncontrolled natural diversion.

Stage and Discharge records from the past 50 years (1960 – present) were acquired and plotted on a dual Y-axis graph to compare the relationship and examine the correlation between the two parameters (refer to Table 1 for statistics related to the discharge and stage). The data indicates that the relative overflow elevation is approximately 2.91 feet (which relates to a gage datum of 75.42 ft NGVD), as measured on the nearby stage gage. Once the threshold of 2.91 feet of measured stage is reached, quantifiable overbank flow begins to register across the Hillsborough – Withlacoochee drainage divide. Historically, this overflow has occurred mainly during periods of heavy precipitation within the wet season, during the summer months. On average, over the period of record, discharge (overflow) was recorded from the Withlacoochee to the Hillsborough basin 99 days a year (approximately 27% of the time). The average running discharge throughout the period of record was 22.84 cubic feet per second (cfs), however, it should be noted that many days in which no flow was recorded are included in this average. The average recorded discharge event over the period of record was approximately 82.65 cfs. Refer to Figure 2 for graphs of the data used in this analysis.

<b>Table 1. USGS 02311000 - WITHLACOOCHEE-HILLSBOROUGH OVERFLOW NEAR RICHLAND, FL</b>	
Period of Record Analyzed	4/25/1960 - 1/21/10
Discharge (Running average, cubic feet per second)	22.84
Discharge (Average Flow event, cfs)	82.65
Maximum recorded Discharge from 1960 to present (cfs)	1270
Average number of days per year with measurable discharge from Withlacoochee to Hillsborough watershed	99
Percentage of days per year with measureable flow from Withlacoochee to Hillsborough watershed	27%
Average Stage (feet)	2.53
Overflow discharge as a % of the total flow volume as measured at the Hillsborough River Gage above Crystal Springs (running average, 10/1/83 - present)	7%
Overflow discharge as a % of the total flow volume as measured at the Hillsborough River Gage below Crystal Springs (running average, 10/1/83 - present)	2.9%

### Summary

A literature review and an analysis of historic and recent USGS stage and discharge data indicate the following:

- The Upper Hillsborough and Withlacoochee River watersheds are seasonally interconnected along a natural overflow/diversion feature which bisects the drainage divide between the two basins near Highway 98 in eastern Pasco County. This overflow typically occurs during periods of high flow. While there may be other interconnections between the watersheds within the Green Swamp, the overflow feature near Highway 98 appears to transmit the most significant volume of water from the Withlacoochee basin to the Hillsborough basin.
- USGS Station 02311000, the *Withlacoochee-Hillsborough Overflow near Richland, FL*, is located at the overflow feature and measures stage and discharge over the divide. The stage must reach approximately 2.91 feet before measurable discharge occurs from the Withlacoochee to the Upper Hillsborough basin.





- As measured at USGS Station 02311000, the watersheds appear to communicate on approximately 99 days (27% of the time) in an average year.
- The average daily running discharge from 1960 to present is approximately 22.84 cfs, while the average discharge event is 82.65 cfs.
- While existing data shows that an interconnection between the basins exists, the amount inter-basin flow only accounts for a running average of 7 % of the total flow of the Hillsborough River as measured at Zephyrhills above Crystal Springs and 2.9% of the total flow as measured at Zephyrhills below Crystal Springs. It should be noted that this statistic was only calculated for 1983 to the present.



### References

Kelly, M. H., A. B. Munson, J. Morales, and D. L. Leeper. 2006. Proposed Minimum Flows and Levels for the Upper Segment of the Hillsborough River, from Crystal Springs to Morris Bridge, and Crystal Springs. Draft report. Ecological Evaluation Section. Southwest Florida Water Management District. Brooksville, Fl. 138p

Pride, R. W., F. W. Meyer, and R. N. Cherry. 1961. Interim Report on the Hydrologic Features of The Green Swamp Area in Central Florida. Information Circular No. 26. Florida Geological Survey. 106p.


Trommer, J. T., D. K. Yobbi, and W. S. McBride. 2009. Surface-Water and Groundwater Interactions along the Withlacochee River, West Central Florida. U.S. Geological Survey Scientific Investigations Report 2009-5124, 47p.

USGS Gaging Station #02311000, Withlacochee-Hillsborough Overflow near Richland, FL, [http://waterdata.usgs.gov/fl/nwis/uv/?site\\_no=02311000&PARAMeter\\_cd=00065,00060](http://waterdata.usgs.gov/fl/nwis/uv/?site_no=02311000&PARAMeter_cd=00065,00060).



Figure 1 - Regional Drainage and Site Details Map  
 LNP Mitigation Potential Assessment  
 Hillsborough and Withlacoochee River Basins, Florida

This map and all data contained within are supplied as is with no warranty. Entrix, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map

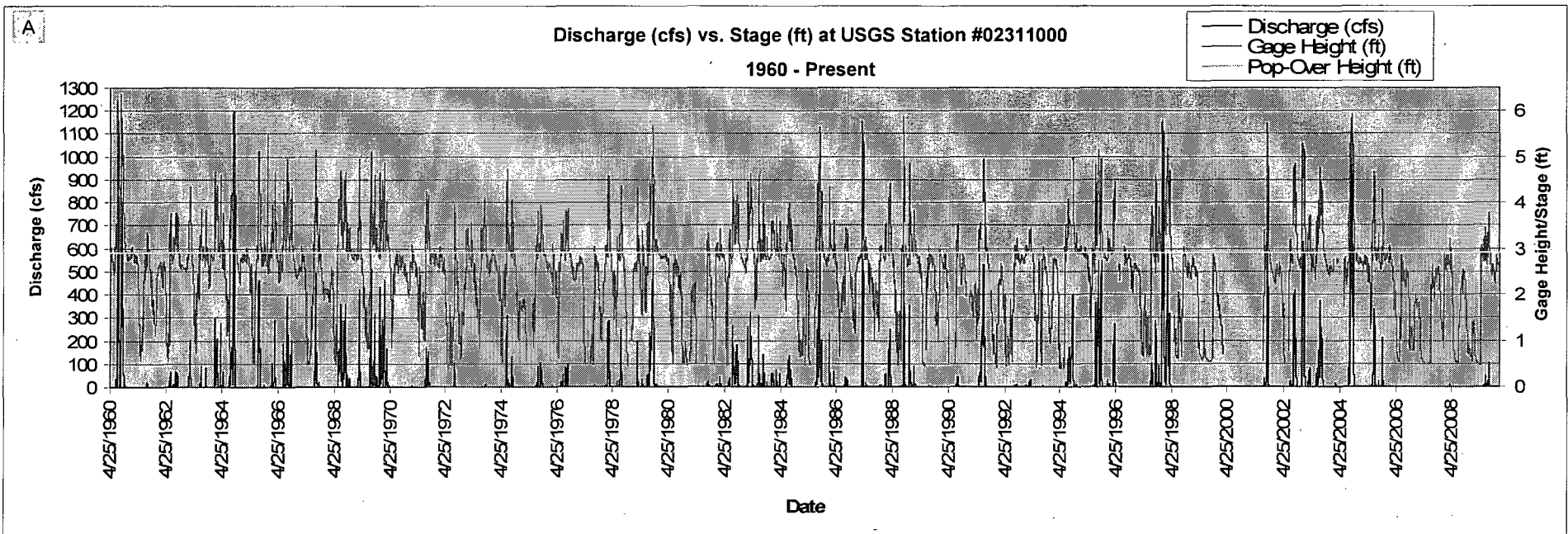
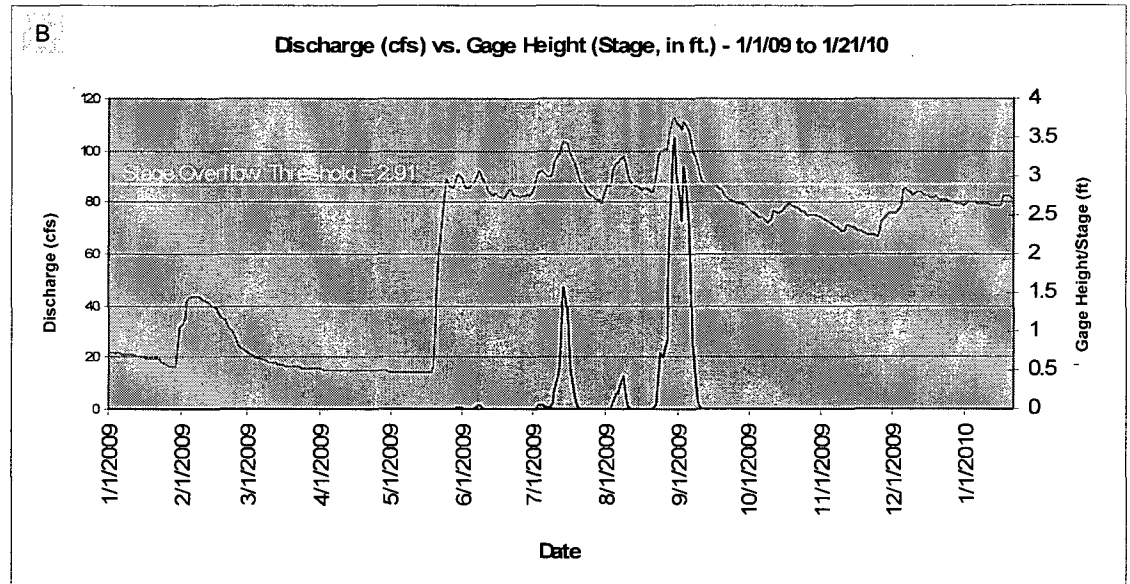
	<b>ENTRIX</b> Down to Earth. Down to Business.™	
	3905 Crescent Park Drive Riverview, FL 33578-3625	ph. (813) 664-4500 fx. (813) 664-0440



**Figure 2 – Graphs of Stage and Discharge Data from USGS #02311000**

**NOTES**

- Discharge is plotted on the left Y-axis and stage is plotted on the right Y-axis. Additionally, the stage at which overflow occurs (2.91) corresponds to the right Y-axis.
- Graph A contains data for the period of record 1960 to present (1/21/10). Graph B depicts data from 1/1/09 to present (1/21/10).
- In Graph B, note that whenever Stage (shown in pink) rises above the overflow height (shown in yellow) discharge (shown in blue) across the basin divide occurs.



#### 3.8.4 Preliminary Engineering Assessment

Following this page is the memorandum titled *Preliminary Engineering Evaluation of Mitigation Potential on Boarshead Ranch*.



ENTRIX, Inc.  
3905 Crescent Park Drive  
Riverview, Florida 33578  
(813) 664-4500 | Fax (813) 664-0440  
www.entrix.com

## Technical Memorandum

**Date:** March 10, 2010

**To:** PROGRESS ENERGY FLORIDA      **Project Number:** 06691020.00 T710

**cc:**      **Project Name:** Boarshead Levy Nuclear Plant

**From:** Barry Stuedemann, PE, PWS  
(ENTRIX)      **RE:** *Executive Summary:  
Preliminary Engineering  
Evaluation of Mitigation  
Potential on Boarshead Ranch*

---

ENTRIX prepared the Preliminary Engineering Evaluation of Mitigation Potential on Boarshead Ranch Technical Memorandum dated March 1, 2010 (Engineering Memo). The purpose of that memorandum was to provide a preliminary engineering evaluation of hydrologic and engineering suitability for potential wetland restoration, creation, and enhancement on Boarshead Ranch.

Boarshead Ranch is located in Pasco County, Florida, is approximately 2,000 acres in size, and is located near the southwest corner of central Florida's Green Swamp. Headwaters for two relevant water systems are located in the Green Swamp, the Withlacoochee River and the Hillsborough River. It is anticipated that construction and implementation of Progress Energy Florida's proposed Levy County Nuclear Power Plant to the north will require significant wetland mitigation resources. Potential mitigation credits exist on Boarshead Ranch in both watersheds. The objective of the Boarshead Ranch Project is to maximize wetland restoration, creation, and enhancement on Boarshead Ranch and to meet or exceed required wetland mitigation credits for the proposed Levy County Nuclear Power Plant.

On January 22, 2010, ENTRIX prepared a memorandum titled *Drainage Divide Between Upper Hillsborough and Withlacoochee River Basins* that presented findings from an analysis of the Withlacoochee and Hillsborough watershed interconnect during increased flow periods. This analysis identified watershed interconnect occurrence on Boarshead Ranch.

On February 8, 2010, ENTRIX conducted a site visit for engineering evaluation to identify the hydrologic potential of eight Activity Areas on Boarshead Ranch. ENTRIX observed evidence that significant backwater flooding events from the Withlacoochee River periodically inundate Boarshead Ranch. Below is a summary of the existing hydrologic evaluation and proposed wetland potential for the eight Activity Areas presented in the Engineering Memo. All eight Activity Areas are anticipated to be viable options, in terms of hydrologic and engineering suitability, for wetland restoration, creation, or enhancement. See Figure 3-4-9-a through Figure 3-4-9-f for Activity Area locations and proposed features.

*Activity Area 1* is located in the north end of Boarshead Ranch and includes an upper reservoir, lower reservoir, two ditches, and a lake. Concentrated flows are received from the Withlacoochee River bottomlands to the northeast. Adjacent natural ridges provide surface water sheet flows and hydrologic



control. Shoreline re-grading around the existing water bodies and significant mass grading in the historic wetland area to the southeast provide additional hydrology to support freshwater marshes, emergent aquatic vegetation, and wet prairies. Mass grading and culvert modifications to mimic historical hydrology could re-expose and rehydrate relic hydric soils. The implementation of these improvements would utilize the adjacent sheet flow, Withlacoochee River backwater, and high groundwater table.

**Activity Area 2** is located in the central portion of Boarshead Ranch and includes the central lake, ditch, and west lake. Concentrated flows are received from the Withlacoochee River bottomlands to the southeast. Adjacent natural ridges provide surface water sheet flows and hydrologic control. Modifications to the southeast hydrologic connection point, the east perimeter roadway, the central lake earthen berms, and the central lake and the west lake outfall points provide additional hydrology to support cypress communities, freshwater marshes, emergent aquatic vegetation, and wet prairies. Minor grading and culvert modifications that mimic historical hydrology conditions could rehydrate existing relic hydric soils and promote hydric soil development. The implementation of these improvements would utilize the adjacent Withlacoochee River backwater and the high groundwater table.

**Activity Area 3** is located in the south-central portion of Boarshead Ranch and includes the west borrow pit. Backwater flow from the Withlacoochee River is the main surface water source. Adjacent manmade and natural ridges provide hydrologic control. Re-grading through pine flatwoods to the west improves hydrologic connectivity from the borrow pit to the Withlacoochee River bottomlands and provides additional hydrology to support freshwater marshes and emergent aquatic vegetation. Adjacent existing hydric soils, located on the west portion of this area, could be utilized for development of these proposed wetland communities. The implementation of these improvements would utilize the Withlacoochee River backwater.

**Activity Area 4** is located in the south-central portion of Boarshead Ranch and includes the center borrow pit. This area is located in the cross-basin seasonal flow area of the Withlacoochee River and the Hillsborough River. Backwater flow from the Withlacoochee River, through existing cypress and pine flatwood communities, is the surface water source. Adjacent manmade and natural ridges provide hydrologic control. Re-grading through the pine flatwoods to improve hydrologic connectivity from the borrow pit to the Withlacoochee River bottomlands provides additional hydrology to support cypress communities, freshwater marshes, emergent aquatic vegetation, and wet prairies. Appropriate design elements could rehydrate existing hydric soils located on the east and west portions of this area. The implementation of these improvements would utilize the Withlacoochee River backwater.

**Activity Area 5** is located at the south tip of Boarshead Ranch and includes the east borrow pit and the adjacent cropland, pastureland, and cypress communities to the northwest. This area is located in the cross-basin seasonal flow area of the Withlacoochee River and the Hillsborough River. Backwater flow from the Withlacoochee River is the surface water source. Adjacent manmade and natural ridges provide hydrologic control. Culvert modifications and minor re-grading to improve hydrologic connectivity from the borrow pit and the pastureland to the Withlacoochee River bottomlands, and significant re-grading in the northwest portion of the pastureland provide additional hydrology to support cypress communities, freshwater marshes, emergent aquatic vegetation, and wet prairies. Appropriate design elements could rehydrate existing hydric soils located in the pastureland. The implementation of these improvements would utilize the Withlacoochee River backwater and high groundwater table.

**Activity Area 6** is located in northeast portion of Boarshead Ranch and to the southeast of Activity Area 1. This area consists of cypress and pine flatwoods. Surface water sources include the Withlacoochee River backwater from the east and Activity Area 2 overflow from the southwest. Adjacent manmade and natural ridges provide hydrologic control. No grade modifications are proposed in this area. Modifications to culverts to the west improves hydrologic connectivity between Activity Areas 2 and 6, and provides

additional hydrology to support cypress communities, freshwater marshes, emergent aquatic vegetation, and wet prairies. Adjacent existing hydric soils, located on the west portion of this area, are available for these proposed wetland communities. The implementation of these improvements would utilize the Withlacoochee River backwater.

*Activity Area 7* is located in the east portion of Boarshead Ranch and to the east of Activity Area 2. This area consists of planted pine and cypress. Surface water source includes Withlacoochee River backwater from the north, south, east, and west. Minor grade modifications are proposed in this area to mimic adjacent depressional areas and to provide additional hydrology to support cypress communities, freshwater marshes, emergent aquatic vegetation, and wet prairies. Adjacent existing hydric soils, located on the center portion of this area, are available for these proposed wetland communities. The implementation of these improvements would utilize the Withlacoochee River backwater.

*Activity Area 8* is located in the west-central portion of Boarshead Ranch and includes wet prairie and historical wetlands. This area consists of cropland, pastureland, and wet prairies. Surface water source includes concentrated flows from Activity Area 1 to the north and sheet flow from adjacent areas to the west. Grade modifications to lower elevations and mimic historical hydrology provide additional hydrology to support emergent aquatic vegetation and wet prairies. There are no relic hydric soils in this area; however, sufficient hydrology could promote inundation for durations sufficient for hydric soil development. The implementation of these improvements would utilize the Withlacoochee River backwater.

Specific engineering design considerations for further evaluation of the hydrologic potential at Boarshead Ranch include: historical hydrologic regime; surface water drainage patterns; rainfall event data; release rates; floodplain storage; habitat functions; soil erodability and permeability; land use; and passive design mechanisms.

To effectively implement the wetland restoration, creation, and enhancement engineering design at Boarshead Ranch, the following proposed sequence is presented in the Engineering Memo:

- Preliminary Engineering Design;
- Final Engineering Design and Plan Preparation;
- Construction Oversight; and
- Maintenance, Monitoring, and Adaptive Management.