2012 Monitoring Report

YELLOW RIVER RANCH SITE

Santa Rosa County, Florida

ERC #: 12-196C

December 2012

Ecological Resource Consultants, Inc.

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Santa Rosa County, Florida

ERC #: 12-196C

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EXECUTIVE SUMMARY

Annual monitoring of the 275 acre Yellow River Ranch Site located in Santa Rosa County, Florida was conducted in October 2012 to assess the hydrologic, vegetative, and ecological condition of the site. Assessments were conducted at specific transect sites located within discrete mapped delineations of Florida Land Use and Cover Classification (FLUCCS) restoration target habitats. Newly selected transect locations were marked with metal stakes in the field and located with sub-meter precision using GPS receivers. Fifteen sample points in each of two quantitative transects documented the coverage of each species, open water, and bare ground in a meter square grid. The quantitative transects were conducted in two locations recently used for Improved Pasture (FLUCCS 211) that are being restored to Hydric Pine Flatwoods (FLUCCS 625). One qualitative transect documented estimated coverage of graminoids and total groundcover in modified Braun/Blanquet Scale classes and general notes regarding the natural history of the site. Biostatistical parameters were calculated and presented in the report in tabular and graphic formats. The qualitative transect was conducted in a location recently used for Improved Pasture (FLUCCS 211) that is being restored to Hydric Pine Flatwoods (FLUCCS 625). Four belt transects were conducted including two transects at two locations recently used for improved pasture (FLUCCS 211) that are being restored to Cypress Swamp (FLUCCS 621) and at two locations of preserved Bottomland (FLUCCS 615). Belt Transects documented the health and condition of planted tree saplings. Quantitative and qualitative transects were documented with a panoramic photograph at a location that was marked in the field. All transects and photograph points are depicted on maps that accompany the monitoring report.

The results of the 2012 monitoring represent a baseline condition that can be compared to future monitoring events to assess the progress of restoration efforts. The monitoring report also documents compliance with permit conditions for the Yellow River Ranch Site. Data obtained during the October 2012 monitoring event for the disturbed areas is typical of a site used as pastureland and consequently the groundcover is dominated by ruderal species. The dominant plant lifeforms are herbaceous. Implementation of active restoration activities observed include installation of appropriate native canopy species, supplemental planting of appropriate native groundcover species, and treatments to eliminate and control invasive exotics plants. The progress of specific practice implementation combined with assurances for perpetual maintenance indicates that the restoration potential of the site is very good.

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1.0 INTRODUCTION

1.1. Purpose and Scope

1.1.1 Purpose

The Yellow River Ranch Mitigation Area (YRR) is located on the floodplain of the Yellow River in Santa Rosa County, Florida. The 275 acre tract was acquired by the Northwest Florida Water Management District (NWFWMD) in December 2005 specifically for use as mitigation to offset current and future Florida Department of Transportation (FDOT) wetland impacts. The goal of the mitigation is to preserve and protect intact bottomland forest and restore disturbed portions of the site to natural conditions. Restoration activities include breaching of dikes and ditch plugging, prescribed fire, herbicide treatment, and planting native species. One hundred and fifty five acres of bottomland forest preservation and restoration of 55 acres are mitigation for a U.S. Army Corps of Engineers permit associated with State Road 87 wetland impacts. Additional mitigation credit is available from the restoration of an additional 65 acres of prior converted wetlands. The purpose of this study is to obtain data that reflect the current vegetative condition. The data is reported to document permit compliance and is used for a reference by which the success of future restoration efforts is assessed.

1.1.2 Scope

The scope of this study is ecological monitoring in specific habitats and preparation of a report that summarizes the results of the data obtained during the monitoring activity. Critical evaluation allows the determination of current landscape scale conditions as reflected in the dominant species, species richness, invasive exotic plants, and plant lifeforms (herbs, vines, shrubs, and strata in the canopy). The monitoring data is used in the selection of appropriate restoration and management strategies, measurement of the success of implemented restoration practices, evaluation of trends in landscape responses to management, selection of future adaptive management strategies, and adherence to and completion of regulatory permit conditions.

For this study, field maps are prepared that depict prior habitat mapping and other pertinent spatial data including the most recent aerial photographs (2010 and 2012) and spatial data intersections. A review is conducted to evaluate existing habitat mapping and data intersections to select locations of 2 quantitative linear/quadrat sampling transects, 4 quantitative belt transects, and 1 qualitative transect. The goal for choosing the habitat evaluation sites is to select areas for the linear/quadrat quantitative transects that are not within ecotones and that are likely to represent the most acceptable example of the central concept for the habitats that are monitored. The goal for locating the belt transects is to sample a representative area that was planted with native wetland tree saplings. Qualitative transect locations are selected based upon habitats depicted in the existing

FLUCCS maps and areas of interest with respect to restoration management activities. Specifications of habitat and transect types and numbers provided by the Water Management District are in Table 1 below.

Table 1: Yellow River Ranch Monitoring Scope by Activity

Project Name	Transect/Activity Type	Polygon Descriptor	Number of Transects
Yellow River Ranch	Pedestrian Transect/Qualitative	625 – Hydric Pine Flatwoods	1
Total			**1**
Yellow River Ranch	Quantitative Transect 150’	625- Hydric Pine Flatwoods	2
Total			**2**
Yellow River Ranch	Belt Transect 20’ X 150’	621 - Cypress	2
Yellow River Ranch	Belt Transect 20’ X 150’	615 - Bottomland	2
Total			**4**

The data in this table was provided by the Northwest Florida Water Management District.

The locations for each of the transects are depicted on maps and submitted to the Water Management District for approval. Following approval, each of the transect sites is assessed in the field. The transect locations and paths are adjusted slightly in the field to assure that each selection is appropriate for accomplishing the goals of monitoring. Each linear/quadrat transect is staked at either end with half inch, 5 foot galvanized stake. Each belt transect is staked at each corner. The location of each stake is recorded with a GPS.

For each quantitative transect, a metal stake was placed at the terminus of the linear/quadrat transect. At each sample point, a meter square grid or quadrat is placed on the ground to demarcate the sample area. Coverage for each species, bare ground, and open water is determined and recorded. Each tree sapling is identified and measured for height and the health of each tree is assessed in each belt transect. Each sample point is photographed with the quadrat in place. A representative point is selected and located with a GPS to obtain a 360 degree (panoramic) photograph of the landscape.

For each qualitative transect, a metal stake is placed at a representative observation point. The representative observation point is subjectively selected after traversing the entire route of the qualitative transect. At the observation point, a panoramic photograph and a

qualitative assessment of site conditions are obtained. The qualitative assessment includes wildlife observations, fuel load estimation, presence of threatened and endangered species and other ecological and/or management notes. A standard qualitative assessment form was utilized to record data at each observation point. During the pedestrian survey through the selected habitats, all plant species encountered in each mapped FLUCCS unit was recorded until no new species were encountered for a time interval that is not less than 3 minutes.

For each belt transect, two permanent 20' X 150 belts are positioned in each of two representative plant communities selected. All belt transects are marked at each corner with metal stakes and labeled. In each belt transect all living tree seedlings are identified, counted and height is measured. The health of each sapling is also determined by inspecting leaf condition and noting if the sampling had active growth in the current growing season.

Following completion of the field assessment, data was summarized and parameters were calculated. For the 150' linear/quadrat quantitative transects, the percent cover, frequency and density for each species, bare ground and open water coverage, and nuisance or invasive exotic species was determined. A summary of species richness was determined for all transects. For the 20' X 150' belt transects, the number of tree saplings per acre was determined.

This report includes observations, photographs, calculations and data summaries, maps, plant species lists, and completed qualitative data forms. Percent cover and occurrence is depicted graphically in pie charts. Additional pertinent information about the nature of the Yellow River Ranch Site is provided in Section 1.2 of this report. New spatial data created for the assessment, including GPS points, is provided as shapefiles in a digital addendum to the report.

1.2 Natural Setting of the Yellow River Ranch Site

1.2.1 Physiography

The Yellow River Ranch Restoration site is located in Santa Rosa County, approximately 1.5 miles east of SR 87 in Section 13, Township 1 North, Range 27 West (Figure 1). The matrix of the tract is intact bottomland forest that is contiguous with bottomland forest on the Yellow River alluvial plain. The former pastureland lies on a low erosional terrace that slopes gently to the south and west from the adjacent uplands to the north. Although the low terrace is on the floodplain and floods frequently, the origin of the parent material of terrace soils is not recent alluvium (Weeks et.al., 1980). North of the property boundary, the 100 Year Flood Zone extends to a line that corresponds approximately with

the 20 foot contour above which a river-parallel escarpment rises. The escarpment is abrupt at some points west and east of the tract but is broad and gradual near the restoration area.

When the Yellow River Ranch was acquired by the Water Management District, approximately 155 acres of the site remained in mostly undisturbed forested wetlands (Bottomland Forest, FLUCCS 615). Approximately 120 acres of floodplain habitat had previously been converted to Pasture (FLUCCS 211). Based upon an analysis of soil survey data, topographic maps and historic aerial photographs, the pasture land was likely a mosaic of less frequently flooded wetlands such as Hydric Pine Flatwoods (FLUCCS 625) prior to conversion. A summary of plant communities and habitat restoration goals is provided in Table 4.

Santa Rosa County averages approximately 65 inches of rain per year, with approximately 45 percent of the precipitation falling in the rainy season from June to September. October is typically the driest month of the year. The climate is humid-temperate, with average monthly temperatures ranging from 54°F in January to 81°F in August. (Weeks et.al. 1980)

The Yellow River Ranch Restoration site is located within the Pensacola Bay System watershed, on the floodplain of the Yellow River. The Yellow River has a basin that is approximately 1,334 square miles and extends from the site location in Santa Rosa County through Okaloosa and Walton Counties, Florida and into south Alabama. (NWFWMD, 2008) Many drainage ditches of varying size were constructed throughout the pasture land. Levees were constructed to prevent flooding of the pasture land between the bottomland and the low erosional terrace along the south and east boundaries of the pasture. Drainage ditches breach the levees at two locations.

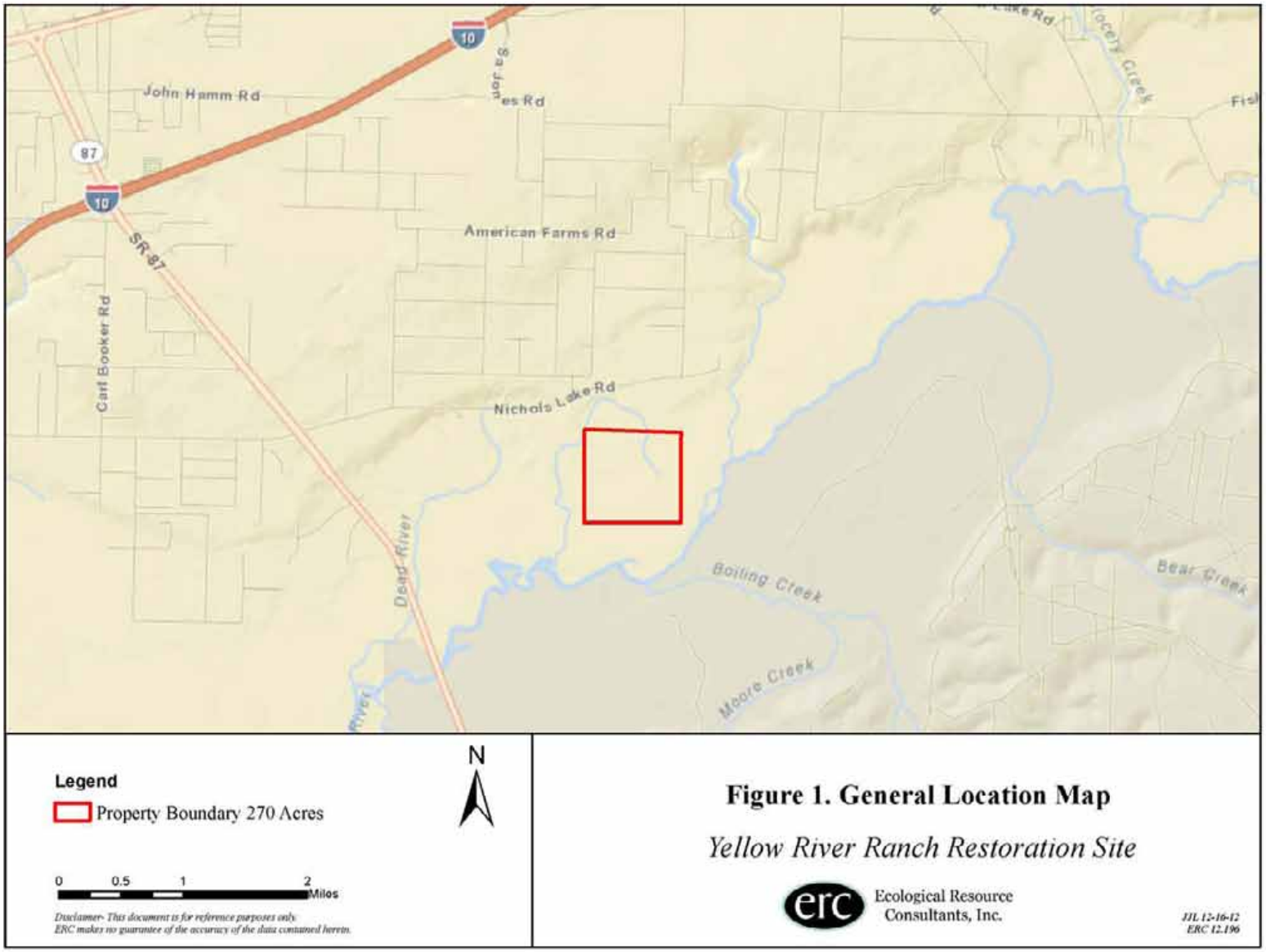
John Hamm Rd
10
87
SR 87
Carl Booker Rd
American Farms Rd
Nichols Lake Rd
Dead River
Boiling Creek
Moore Creek
Bear Creek
Legend
Property Boundary 270 Acres
N
0 0.5 1 2
Miles
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Figure 1. General Location Map
Yellow River Ranch Restoration Site
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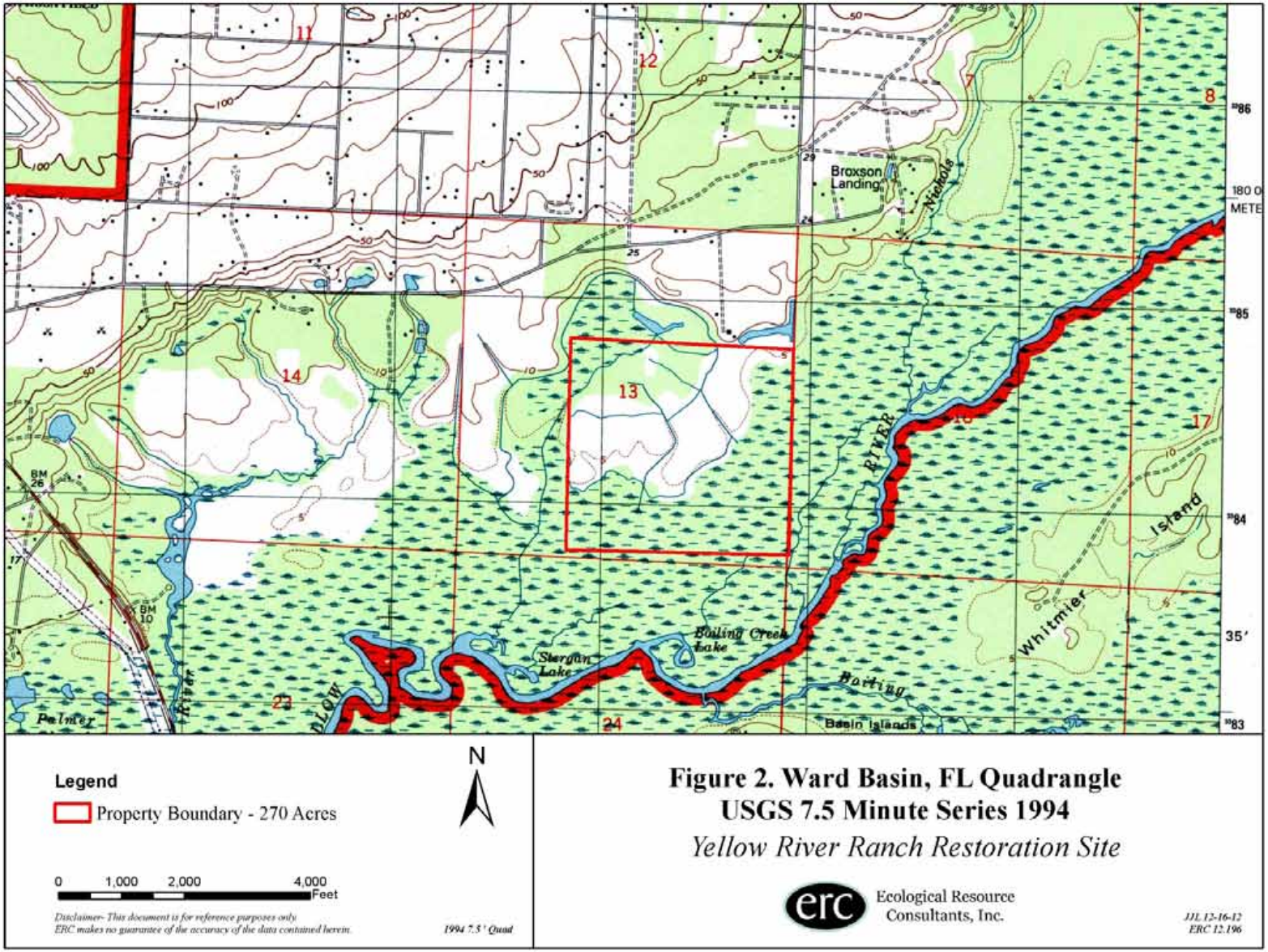
Legend
Property Boundary - 270 Acres
N
0 1,000 2,000 4,000 Feet
Disclaimer- This document is for reference purposes only.
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1994 7.5' Quad
Figure 2. Ward Basin, FL Quadrangle
USGS 7.5 Minute Series 1994
Yellow River Ranch Restoration Site
Ecological Resource Consultants, Inc.
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ERC 12.196
Broxson Landing
Nichols
Boiling Creek Lake
Sturgan Lake
Whitmier Island
Basin Islands
Palmer
BM 26
BM 10
11
12
13
14
17
23
24

1.2.2. Soils

This section describes soil conditions at the Yellow River Ranch Restoration Site and provides an update to soils information discussed in the Revised Mitigation Plan (NWFWMD, 2011). Soil, as used in this report, is defined as the uppermost layers of the surface of the earth to a depth of 6 feet or more. Soil is the most biologically active component of the planet's geology and thereby significantly affects the plant community that is supported at any given location. Soil Morphology refers to characteristics of the soil that formed from or were inherited from the parent material and that can easily be observed. The primary morphological units in soils are layers called horizons. Different types of soil horizons characterize soil conditions that can affect plant growth and other land uses.

All soils data and information in this report complies with the standards of the USDA-NRCS Soil Survey Program. Soil surveys have been produced by the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) for most counties in the United States. The Soil Survey of Santa Rosa County, Florida was published in 1980 at a map scale for detailed soil survey maps of 1:20,000 (Weeks et.al., 1980). The Survey data is updated by NRCS periodically and the most recent update indicated by the metadata for the digital soil survey data was performed in 2010. Soil survey map unit names have been changed since the original publication in 1980.

The entity that is delineated by soil scientists and is depicted on the soil survey maps is called the map unit. The map unit is typically comprised of one soil series (identified by geographic names such as Lynn Haven or Leon) but may contain several soils series or even components of non-soil such as urban land or water. Map units are identified by a numeric or alpha numeric symbols, the soil series name, the typical topsoil texture, and other information reflecting the geomorphic position where the soil is typically identified and mapped. In the map unit descriptions below, 29-Mulat loamy fine sand is an example of the map unit symbol and name.

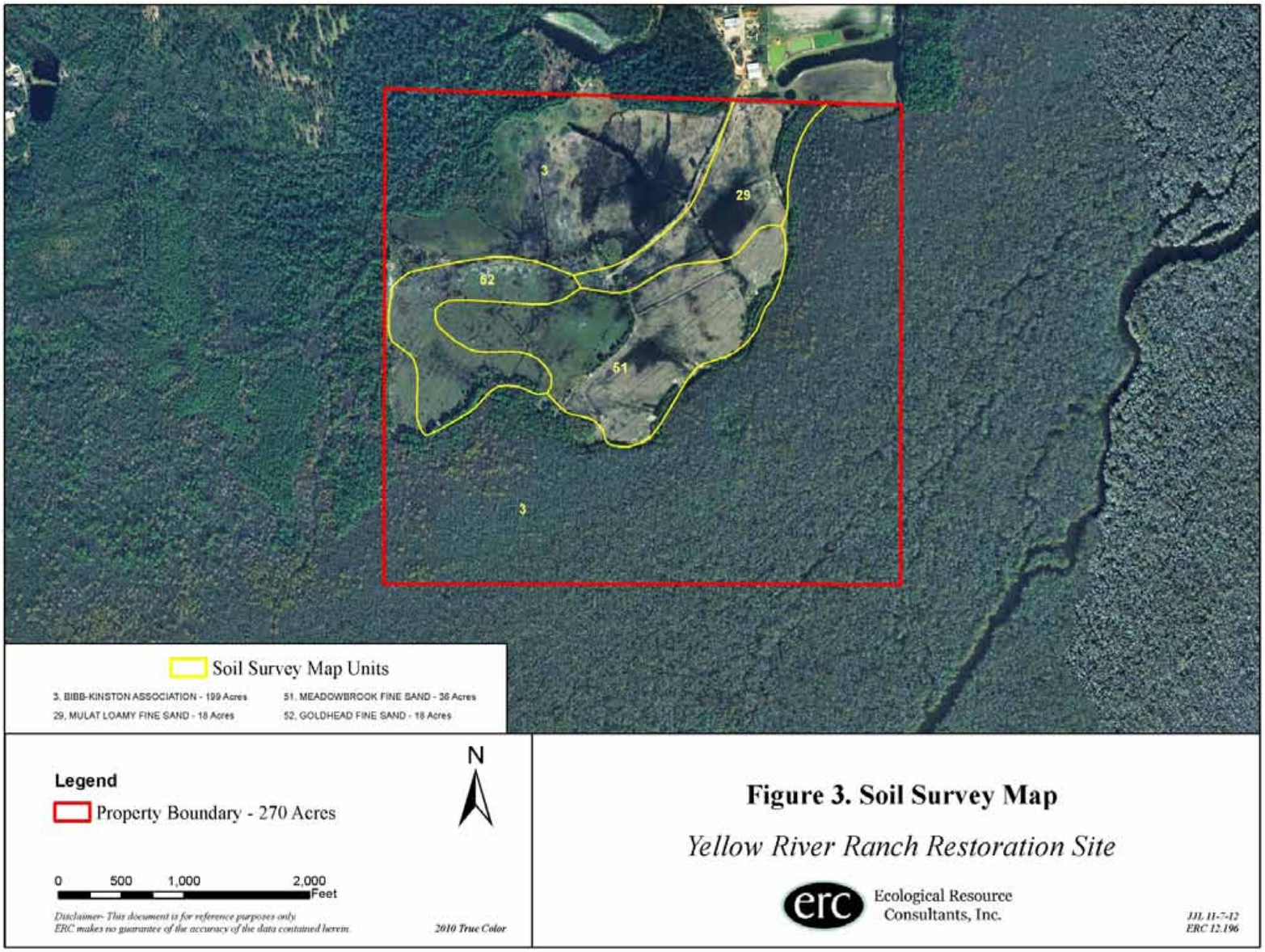
Soil series are distinguished from each other by their classification in Soil Taxonomy. Most of the soils at the Yellow River Ranch site vary primarily by the parent material, the thickness of sandy epipedons versus depth to fine texture subsoils or C horizons, and the degree of soil profile development. All of the soil survey map units at the Yellow River Ranch site are associated with wetlands hydrology and plants, and are described with 90 percent or greater hydric components.

The parent material of soils on the Yellow River Ranch site is recent alluvium on soils of the intact forested bottomlands and near shore deposits in the soils of the low erosional terrace occupied recently by pasture lands. Water tables in most soils fluctuate seasonally in response to rainfall, evaporation and transpiration (water used by photosynthesizing plants), and tides in coastal areas. The shallowest depth to sustained saturation is called the depth to seasonal high saturation/inundation or seasonal high water table (SHWT). In Santa Rosa County, the seasonal high water table is typically observed in the later winter months during years of normal precipitation amounts and

distribution. Water tables also rise during the summer thunderstorm season or at other times in response to prolonged heavy rains. Subaqueous water tables are present in shallow water bodies and represent permanent inundation. Subaqueous soils were not mapped nor distinguished from water in the Soil Survey of Santa Rosa County, Florida. Flooding is defined as the temporary inundation of an area caused by overflowing streams, runoff from adjacent slopes, or by tides. The depth of water during floods does not necessarily correlate with the depth of soil water tables and water tables can be above the soil surface even during periods when local rivers and streams are below flood stage.

The dominant soil types on the Yellow River Ranch site are poorly drained Fluvaquents and Fluvaquentic intergrades. (Weeks et.al.,1980). These are the stratified alluvial soils of the bottomland forest in map unit 3, Bibb-Kinston Association. Bibb soils are sandier Fluvaquents and lack pedogenic development while Kinston soils are Fluvaquentic Inceptisols and have a higher subsoil clay content and sufficient pedogenic development in the A and B horizons to indicate that they are on more stable landforms less affected by fluvial erosion and deposition.

Poorly drained Alfisols and Entisols are mapped in three different map units on the low erosional terrace. These soil map units are all poorly drained and have thick sandy surfaces underlain by loamy subsoils. The Meadowbrook and Goldhead soils are Alfisols indicating that the loamy subsoils have a relatively high base saturation. Mulat soils are Ultisols and have relatively low base saturation in the loamy subsoil. The thickness of the sandy surface in the Goldhead and Mulat soils is 20 to 40 inches while the sandy surface thickness is greater than 40 inches in the Meadowbrook soils. All of the soil map units mapped on the low erosional terrace have a flooding frequency of “None” assigned by the Soil Survey data; however, the associated landforms on the Yellow River Ranch site have at least an occasional flooding frequency. The apparent discrepancy is likely caused by limitations of the soil survey mapping scale. (Figure 3).


3
29
52
51
3
Soil Survey Map Units
3, BIBB-KINSTON ASSOCIATION - 199 Acres
51, MEADOWBROOK FINE SAND - 36 Acres
29, MULAT LOAMY FINE SAND - 18 Acres
52, GOLDHEAD FINE SAND - 18 Acres
Legend
Property Boundary - 270 Acres
N
0 500 1,000 2,000 Feet
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2010 True Color
Figure 3. Soil Survey Map
Yellow River Ranch Restoration Site
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Table 2. Soil Survey Map Unit Data for the Yellow River Ranch Restoration Site

Map Unit	Map Unit Name	Acres	Landforms	Percent of Site	Drainage Class	Ecological Community
3	Bibb-Kingston association	199	Floodplain	73	Poorly Drained	Bottomland Hardwoods
51	Meadowbrook fine sand	36	Flats on Marine Terraces	13.5	Poorly Drained	North Florida Flatwoods
29	Mulat loamy fine sand	18	Flats on Marine Terraces	6.75	Poorly Drained	North Florida Flatwoods
52	Goldhead fine sand	18	Flats on Marine Terraces	6.75	Poorly Drained	North Florida Flatwoods

1. 26 Ecological Communities of Florida. Soil Conservation Service, 198x.

2. Soil Survey data from Soil Survey of Santa Rosa County, Florida Update. NRCS. Accessed December, 2012.

1.2.3. Vegetation

Habitat mapping for the Yellow River Ranch Revised Mitigation Plan from April 22, 2011, was conducted using the Florida Land Use Cover Classification System (FLUCCS). Habitat descriptions and maps for existing conditions prior to commencement of restoration efforts and restoration goals were prepared using data from the Yellow River Ranch Revised Mitigation Plan (NWFWMD, 2011) and from spatial data obtained from the NWFWMD. (Figures 4 and 5)

Prior to commencement of restoration efforts, the FLUCCS wetland habitats mapped at the Yellow River Ranch Site were Bottomland (615) and Improved Pasture (211). Restoration targets for the pasture lands are Bottomland (615)/Mixed Forested Wetland (630), Cypress (621), Hydric Pine Flatwoods (625/626) and Non-Forested Wetlands (640). Bottomland habitat will also be preserved at Yellow River Ranch site.

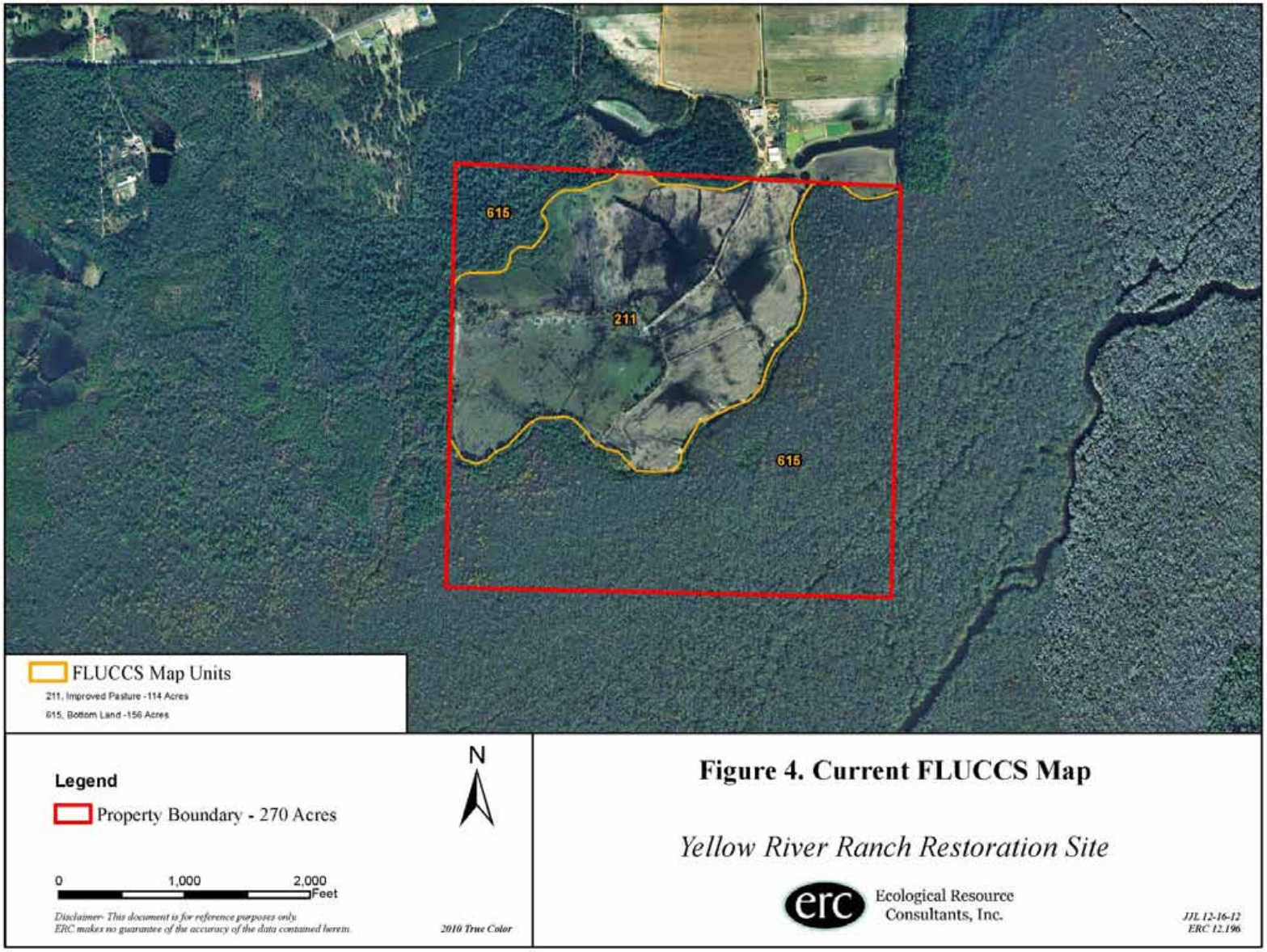
Numerous classification systems have been used in Florida to describe habitats often with a different focus and purpose. Habitats correlated with USDA-NRCS Soil Survey mapping for example are shown above in Table 3 for the Yellow River Ranch Restoration Site using the 26 Ecological Communities of Florida system. This classification system correlates soil conditions with vegetative communities (Figure 6).

The NRCS system evolved from a rangeland classification system that was modified to portray ecological conditions of various soil properties and landforms. The Florida Natural Areas Inventory (FNAI) classification system has been favored by some restoration ecologists; however, neither the FNAI system nor the NRCS system emphasize land use to the extent utilized by the FLUCCS system. In 2009, the Florida Fish and Wildlife Conservation Commission published the results of an effort to correlate several habitat classification systems used in the state including FLUCCS, FNAI, and other classification schemes creating the Florida Land Cover Classification System (FLCCS). FLCCS is hierarchical and based primarily upon FLUCCS and attempts to incorporate FNAI habitats that could not be correlated into existing FLUCCS habitats. The FLCCS system does not consider the NRCS classification system and neither FLUCCS, FLCCS, nor FNAI systems correlate soil survey data with habitat types.

FLUCCS was used to characterize habitats at the Yellow River Ranch Restoration Site during planning and implementation and is therefore utilized in this report for consistency. FNAI is referenced for some habitats when it is useful to convey site conditions or restoration goals. NRCS soil survey data and classification from the 26 Ecological Communities of Florida is also provided for additional reference.

Table 3: Existing FLUCCS Habitats

FLUCCS Habitat Descriptions and Acreages
Improved Pasture (FLUCCS 611), 120 Acres
This non-forested wetland landscape includes most of the site landward of the floodplain of the Yellow River. A variety of successional wetland tolerant plant species dominates the groundcover. Historically these areas were occupied by Bottomland (615) and Hydric Pine Flatwoods/Savanna (625). Use as a pasture for many years, fire exclusion and hydrologic impacts created by large ditches have impacted the native vegetation on this site. Currently this landscape is recovering from many years of use as a pasture. The dominant plants include the following broomgrass (*Andropogon virginicus*), carpetgrass (*Axonopus furcatus*), caric sedge (*Carex* spp.), coinwort (*Centella asiatica*), toothache grass (*Ctenium aromaticum*), nut sedge (*Cyperus* spp.), witch grass (*Dicanthelium* spp.), poor joe (*Diodia virginica*), thoroughwort (*Eupatorium* spp.), rush (*Juncus* spp.), blackberry (*Rubus* spp.), bushy goldenrod (*Euthamia* spp.), water primrose (*Ludwigia* spp.), panic grass (*Panicum* spp.), meadow beauty (*Rhexia* spp.), goldenrod (*Solidago* spp.), beaksedge (*Rhynchospora* spp.) and lance-leaf violet (*Viola lanceolata*). The target is a landscape with large, scattered mature pines with a species rich groundcover that will carry fire across this landscape.
Bottomland (FLUCCS 615), 155 Acres
This forested wetland community is mapped as the restoration target across a large portion of the property. Currently this landscape is recovering from many years of use as a pasture. The dominant plants include the following broomgrass (*Andropogon virginicus*), carpetgrass (*Axonopus furcatus*), caric sedge (*Carex* spp.), coinwort (*Centella asiatica*), toothache grass (*Ctenium aromaticum*), nut sedge (*Cyperus* spp.), witch grass (*Dicanthelium* spp.), poor joe (*Diodia virginica*), thoroughwort (*Eupatorium* spp.), rush (*Juncus* spp.), blackberry (*Rubus* spp.), bushy goldenrod (*Euthamia* spp.), water primrose (*Ludwigia* spp.), panic grass (*Panicum* spp.), meadow beauty (*Rhexia* spp.), goldenrod (*Solidago* spp.), beaksedge (*Rhynchospora* spp.) and lance-leaf violet (*Viola lanceolata*). The target is a landscape with large, scattered mature pines with a species rich groundcover that will carry fire across this landscape.


615
211
615
FLUCCS Map Units
211, Improved Pasture -114 Acres
615, Bottom Land -156 Acres
Legend
Property Boundary - 270 Acres
N
0
1,000
2,000
Feet
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2010 True Color
Figure 4. Current FLUCCS Map
Yellow River Ranch Restoration Site
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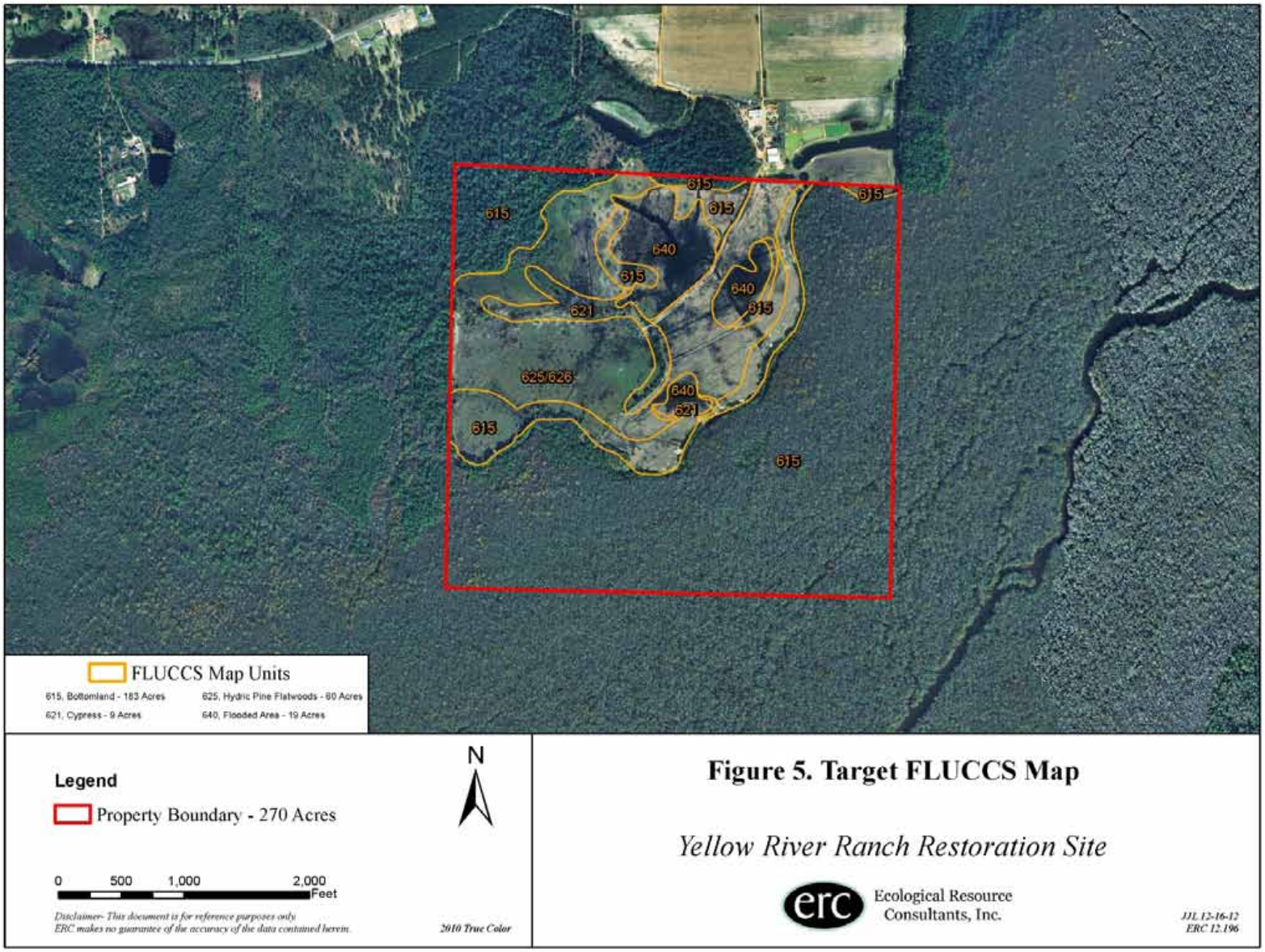
615
615
615
615
640
615
640
615
621
625/626
640
621
615
615
FLUCCS Map Units
615, Bottomland - 183 Acres
625, Hydric Pine Flatwoods - 60 Acres
621, Cypress - 9 Acres
640, Flooded Area - 19 Acres
Legend
Property Boundary - 270 Acres
N
0 500 1,000 2,000 Feet
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2010 True Color
Figure 5. Target FLUCCS Map
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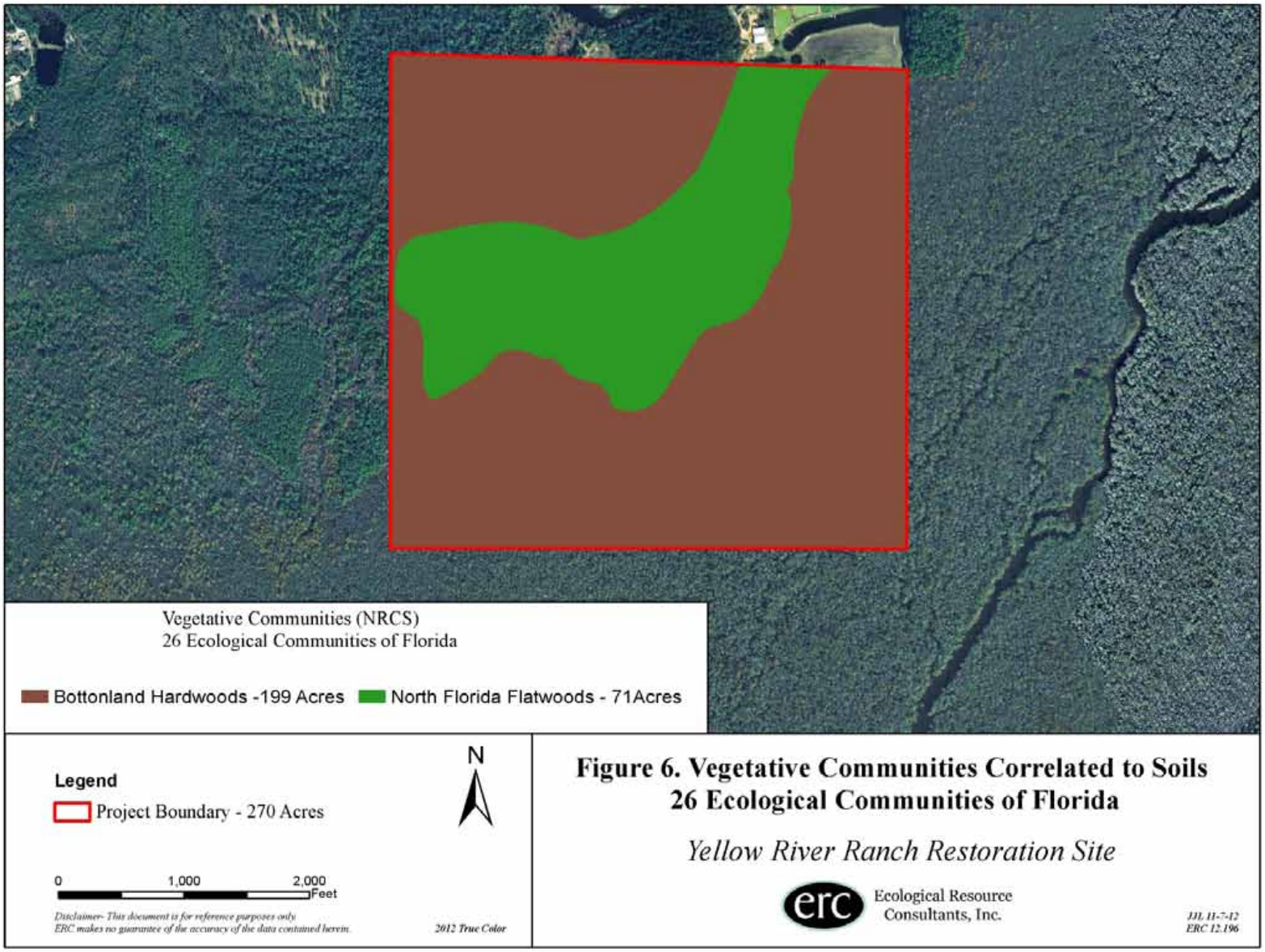
Vegetative Communities (NRCS)
26 Ecological Communities of Florida
Bottonland Hardwoods -199 Acres
North Florida Flatwoods - 71Acres
Legend
Project Boundary - 270 Acres
N
0
1,000
2,000
Feet
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2012 True Color
Figure 6. Vegetative Communities Correlated to Soils
26 Ecological Communities of Florida
Yellow River Ranch Restoration Site
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Ecological Resource
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ERC 12.196

The Florida Natural Area Inventory (FNAI) pre-restoration habitats at the Yellow River Ranch Site consist primarily of wetlands classified as Wet Flatwoods (FNAI 2010).

The focus for monitoring in this study is the pre-restoration habitat (land use) mapped as FLUCCS 211-Improved Pasture. Target restoration goals at the quantitative monitoring sites are FLUCCS 625-Hydric Pine Flatwoods, 615-Bottomland, 621-Cypress, and 640-Non-Forested Wetlands. The habitats are classified using FNAI descriptors as Wet Flatwoods. The landscapes that support these habitats are present on the majority of the site excluding the large area of intact Floodplain Forest.

Wet Flatwoods landscapes are typically forested lands with a canopy dominated by slash pine (*Pinus elliottii*). Pine density varies from 30 –60 trees/acre. The additional woody understory species are typically limited to low shrubby growth intermixed with a high diversity of herbaceous species. This low substrata and rich herbaceous layer is strongly influenced and maintained by a high frequency of natural fires which likely occurred over an area every 3-10 years historically and represents a fairly open landscape dominated by forbs and graminoids. The observed surviving constituents of the groundcover forbs and graminoids include: Toothache grass (*Ctenium aromaticum*), carpetgrass (*Axonopus furcatus*), coastal lovegrass (*Eragrostis virginica*), Flattop goldenrod (*Euthamia* spp.), beaksedge (*Rhynchospora* spp.), spadeleaf (*Centella asiatica*), lanceleaf violet (*Viola lanceolata*), meadow beauty (*Rhexia* spp.), partridgeberry (*Mitchella repens*), St Johns Wort (*Hypericum* spp.), and primrosewillow (*Ludwigia* spp). Additionally, there are a number of species commonly observed in wet flatwoods present in these areas which are also common in pastures, such as blackberries (*Rubus* spp.), broom grasses (*Andropogon* spp.), and thoroughworts (*Eupatorium* spp.)

1.2.4 Anthropogenic Impacts

The property comprising the Yellow River Ranch restoration areas is notably impacted by the past clearing of existing forest, construction of drainage ditches and levees, and conversion of the forested landscape to planted pasture as can be seen in historic aerial photographs.

The 1940, 1974, 1999 historic aerials depict an intensification of land use change throughout time. Drainage ditches were constructed before 1974. Portions of the site were converted to pasture prior to 1942 and the modern extent of improved pasture at the site was converted after 1974. The improved pasture was maintained until approximately 2005.

Landscape scale forest conversion to pasture lands, drainage ditch construction, grazing, maintenance of exotic pasture grass species such such as Bahia grass (*Paspalum notatum*), and fire exclusion are significant anthropogenic factors that have altered this site from historic conditions and trajectories.

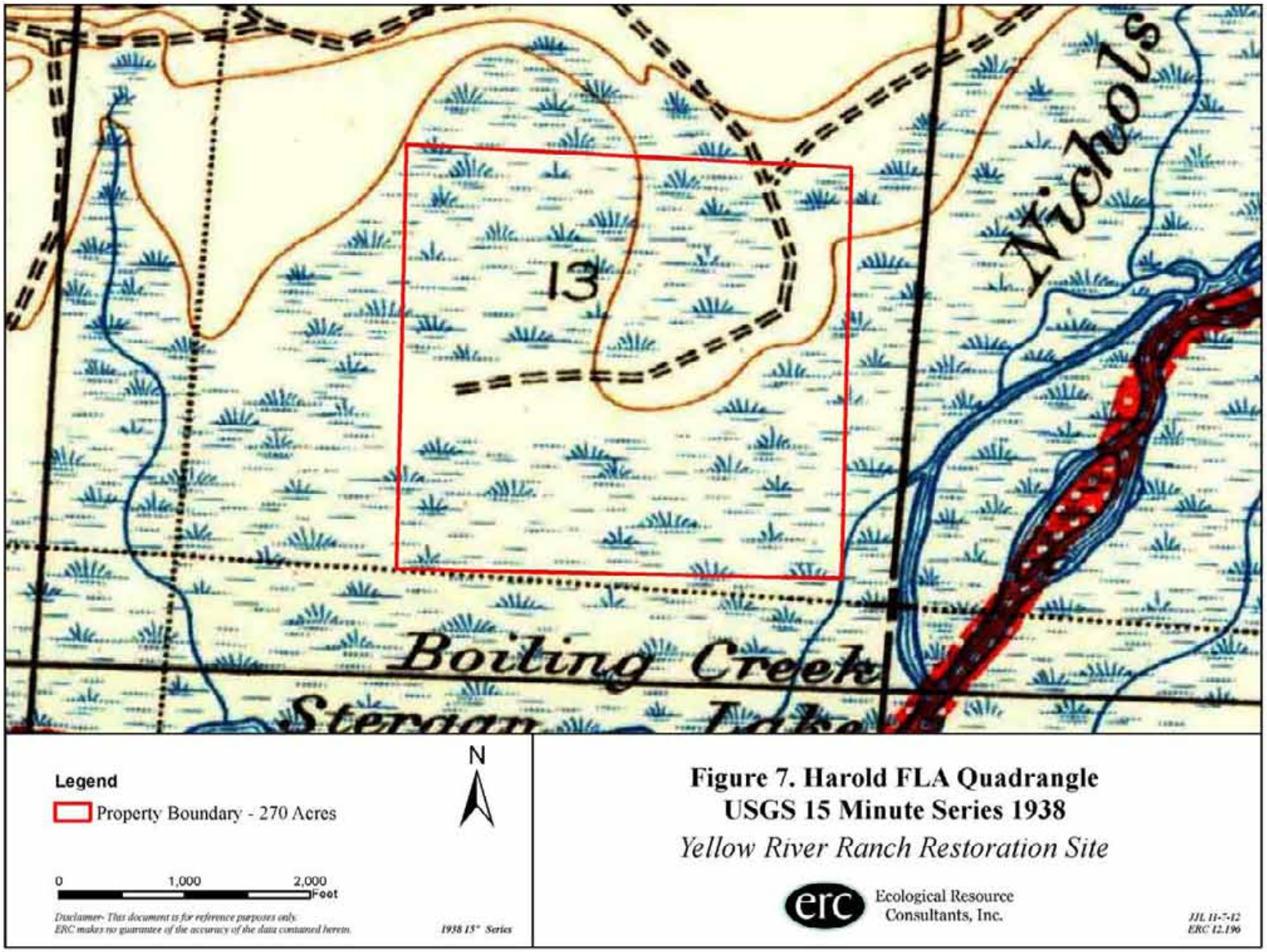
Functional lift for wetland mitigation at the Yellow River Ranch site is derived from 1) acquisition and perpetual preservation of the mitigation property, 2) cessation of cattle grazing, 3) filling and/or blocking drainage ditches, 4) breaching portions of the dike that impair hydrologic connection with the Yellow River floodplain, 5) eradication of non-native pasture grasses, 6) revegetation of former pastureland with bottomland hardwood forest and hydric pine flatwood species, 7) appropriate re-establishment of growing-season fire regime, and 8) long-term management including control of nuisance and exotic species. In areas of bottomland hardwood forest restoration, vegetation is planted that includes a mixture of Atlantic white cedar, possum haw, black gum, laurel oak, cypress and American elm. Areas that are to be restored as hydric pine flatwoods may be planted with a mixture of slash pine, cypress, myrtle leaf holly, wiregrass and other hydric flatwood species. Generally, areas at the Yellow River Ranch site with Bibb-Kinston Association soils will be restored as bottomland hardwood forest, whereas areas of Mulat Loamy Fine Sand soils will be restored as hydric pine flatwoods.

No structures appear on the Yellow River Ranch site in either aerial photographs or topographic maps (Figures 2 and 7) or historic photographs (Figures 11-15). An unimproved road traverses the pasture in the 1938 USGS Quadrangle.

2.0 METHODS

2.1 Field Methods

The location of all transects is depicted on Figure 8. A list of all the transect names appears in Table 4, Yellow River Ranch Transects, along with the current and target FLUCCS codes for each transect.


13
Nichols
Boiling Creek
Legend
Property Boundary - 270 Acres
N
0
1,000
2,000
Foot
Disclaimer- This document is for reference purposes only.
ERC makes no guarantee of the accuracy of the data contained herein.
1938 15' Series
Figure 7. Harold FLA Quadrangle
USGS 15 Minute Series 1938
Yellow River Ranch Restoration Site
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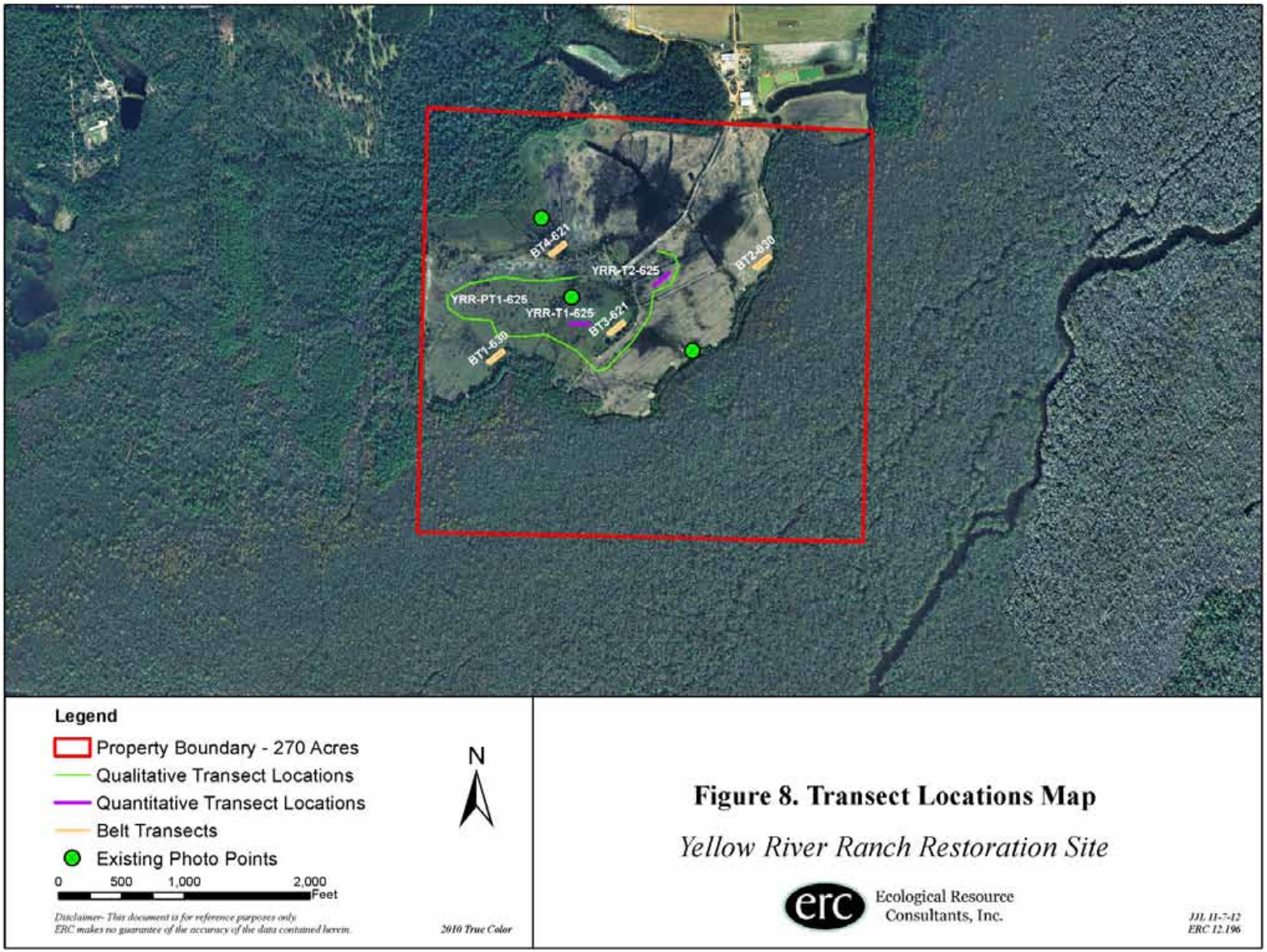
BT4-621
YRR-T2-625
BT2-630
YRR-PT1-626
YRR-T1-625
BT3-621
BT1-630
Legend
Property Boundary - 270 Acres
Qualitative Transect Locations
Quantitative Transect Locations
Belt Transects
Existing Photo Points
0 500 1,000 2,000
Feet
Disclaimer- This document is for reference purposes only.
ERC makes no guarantee of the accuracy of the data contained herein.
2010 True Color
N
Figure 8. Transect Locations Map
Yellow River Ranch Restoration Site
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ERC 12.196

Table 4: Yellow River Ranch Transects

Transect Location	Transect Type	Transect Name	Current Polygon Descriptor (FLUCCS)	Target Polygon Descriptor (FLUCCS)	Number of Transects
Yellow River Ranch	Pedestrian/Qualitative	YRRPT1-625	211- Improved Pasture	625 - Hydric Pine Flatwoods	1
Total Number of Transects					**1**
Yellow River Ranch	Quantitative Transect	YRRT1-625	211- Improved Pasture	625 - Hydric Pine Flatwoods	1
Yellow River Ranch	Quantitative Transect	YRRT2-625	211- Improved Pasture	625 - Hydric Pine Flatwoods	1
Total Number of Transects					**2**
Yellow River Ranch	Belt Transect	YRRBT1-630	211- Improved Pasture	621- Cypress	1
Yellow River Ranch	Belt Transect	YRRBT2-630	211- Improved Pasture	621- Cypress	1
Yellow River Ranch	Belt Transect	YRRBT3-621	211- Improved Pasture	615 – Bottomland (restoration)	1
Yellow River Ranch	Belt Transect	YRRBT4-621	211- Improved Pasture	615 – Bottomland (restoration)	1
Total Number of Transects					**4**

2.1.1 Quantitative Transects

Biological indicators are commonly used criteria for analyzing the value, health and restoration success of habitats. Indicators obtained from the monitoring methodology employed at the Yellow River Ranch Restoration Site include species diversity, relative cover, density and frequency for plant species. The sum of relative values (cover, density and frequency) is typically referred to as importance value. Ranking of plant species importance is used to describe the community structure, e.g. importance allows for discovery of dominant species, sensitive species and dominant lifeforms (i.e. herb, woody shrub, vine, or tree). Plant lifeform and community structure are typically measured in three plant strata: groundcover, shrub and canopy.

A summary of the measurements (importance, lifeform, diversity) for each plant community or habitat permits a critical evaluation of the landscape. The evaluation allows a determination of appropriate indicator species, species richness, invasive exotic plants and presence of appropriate lifeforms versus lifeforms indicative of a degraded landscape. Evaluations of the measurements are used to assist in the selection of the appropriate restoration and management strategies, determination of the successional landscape trending, the need for adaptive management strategies to enhance conditions for appropriate plant community structure, diversity and lifeforms; and successful adherence to and completion of regulatory permit conditions. The quantitative monitoring methodology includes the following steps:

For measuring the Groundcover, Shrubs, and Vines a 150' linear transect with fifteen 1m X 1m quadrats will be employed:

a) Consultant and District Staff select polygons that are representative for Hydric Pine Flatwoods (FLUCCS 625), Cypress (621) and Bottomland (615).

b) Establish two permanent 150' linear transects in each sampling polygon. Two 150' transects were established as representative sample areas within the polygon. All transects will be located and marked at each end with labeled metal stakes, and photographed for visual reference.

c) Establish sample points every 10' per 150' transect. For each transect, the first sampling point is located at 10' and the final point is located at 150'. The configuration establishes a total of 15 points along the 150' transect.

d) Measure and apply one 1m X 1m quadrat at each of the 15 points. Fifteen (15) quadrats are used to sample each transect. The methodology samples 15 square meters along each 150' transect.

e) Photograph each sample point with the grid in place. A representative point is selected and located with a GPS to obtain a 360 degree (panoramic) photograph of the landscape.

f) Identify and estimate coverage for each species. All groundcover, shrub, and vine species are identified. Data collected for each plot includes species name, percent cover by species, percent bare ground, and notes. The total coverage of each species within the plot was estimated using the following percentage classes: 100%, 75%, 50%, 25%, 12%, 6%, 3%. The coverage classes represent successive divisions of the square by one-half (after 75%), and are readily and consistently applied in the field. Bare ground and/or open water is also recorded using the same coverage classes listed above.

2.1.2. Belt Transects

Belt transects are used to measure the quantity and heath of tree saplings and for this study, specifically the quantity and health of planted trees.

a) Consultant and District Staff select polygons that are representative for Cypress (FLUCCS 621) and Bottomland (FLUCCS 615).

b) Establish two permanent 20' X 150' belt transects in each polygon that are representative for Cypress (FLUCCS 621) and Bottomland (FLUCCS 615) for a total of four transects. All transects are located and marked at each corner with metal stakes, with one of the metal stake being labeled.

d) Trees and saplings are located within the belt transect. Identify all trees and saplings, assign a height scale to all in the following increments: 0-1';>1-2'; >2'-3'; >3'-4'; >4'-5'; >5'-6. Note overall health of plants qualitatively as healthy, growing, stunted and/or limited mortality.

e) Tree species are recorded, along with a height class and the condition of the trees, for each belt transect.

2.1.3 Qualitative Transects

The initial qualitative monitoring is conducted prior to implementation of restoration activities in the late summer/fall and annually thereafter for the duration specified in the permit. The length of the transect is variable and dependent upon the nature and size of the FLUCCS delineation that is being evaluated.

The monitoring is conducted by recording observations along the designated transect called the "walking path". Each walking paths is designed to ensure maximal coverage of the selected plant community. The walking path is typically a loop for smaller ecosystem delineations and a line for larger ecosystem delineations. Approved transect locations are uploaded to a GPS unit to guide a walking traverse in the field. During the traverse, a record is maintained of species diversity and observations regarding overall ecosystem health and fecundity. Indications of wildlife usage and pertinent natural history notes are recorded. GPS locations are obtained for exotic invasive species and threatened and endangered species observed. Upon completion of the walking traverse, a

representative location is selected for monitoring. A permanent point is established at the selected monitoring location where data is collected annually. The permanent points are selected to represent the most typical condition of the specified habitat along the walking path. Each permanent point is marked with a 5 foot section of metal stakes.

The specific parameters observed and recorded at the observation point for all polygons include the following:

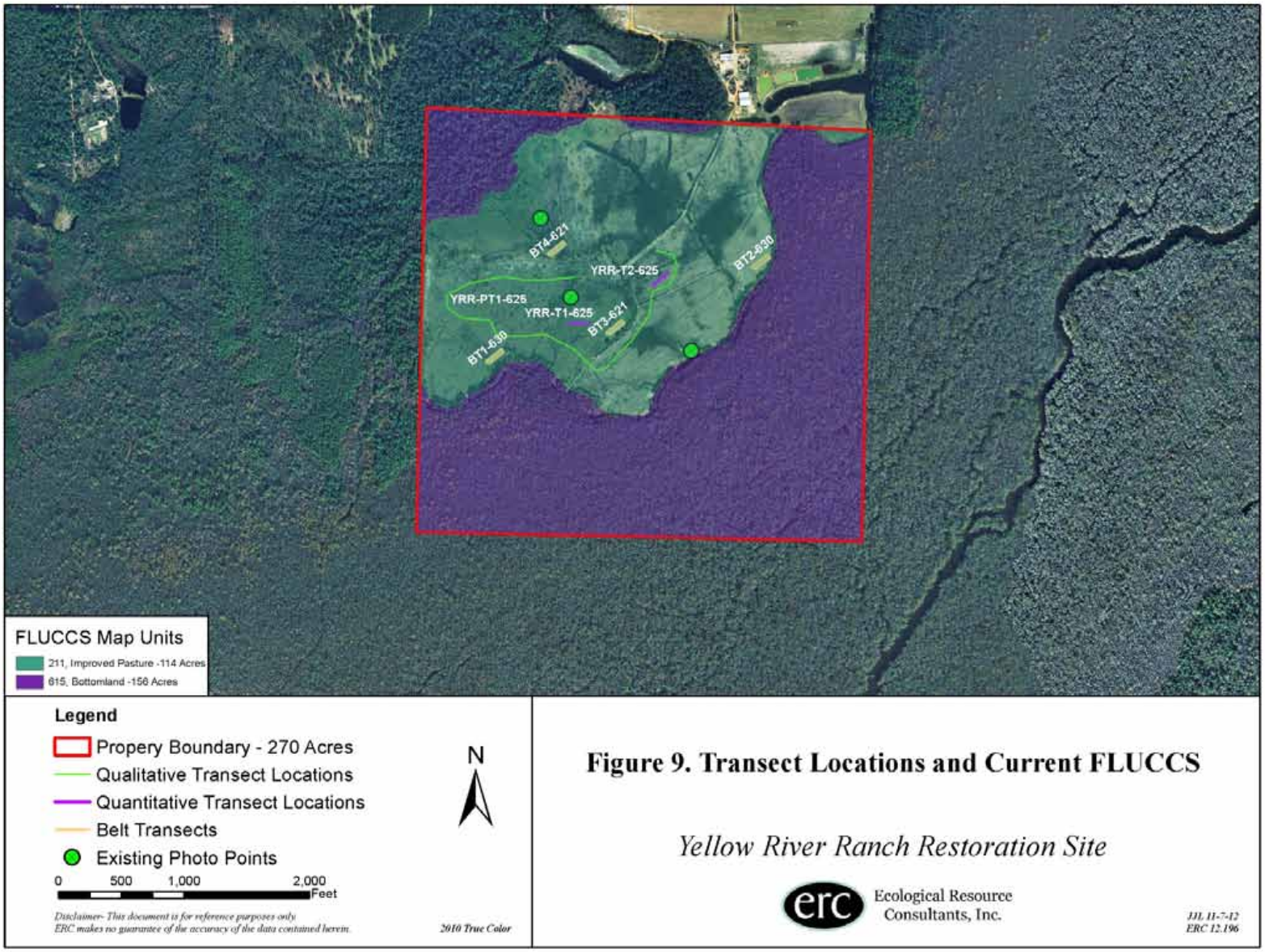
1. The type of plant community sampled.
2. The date, time and weather conditions.
3. An estimation of the aerial coverage of plants in the canopy, subcanopy and shrub strata and identification of the dominant species in the canopy, subcanopy and shrub strata.
4. An estimation of the coverage of graminoids (grasses, sedges and rushes) and total coverage of groundcover including graminoids and forbs, based on the following cover classes as per a modified Braun/Blanquet scale: 0-1%; 1-5%; 5-25%; 25-50%; 50-75%; 75-100%.
5. Identification of at least four dominant species in the groundcover.
6. Indications of wildlife usage and natural history including presence of any threatened or endangered species. Also note and obtain gps locations for threatened and endangered species observed at other points along the transect.
7. Identification of exotic species and estimated coverage of exotics as per Brower, et al., 1998. Also note and obtain gps locations for exotic invasive species observed at other points along the transect.
8. An estimation of the fuel load and aspects of the vegetative condition that might affect fire. Measure depth of litter and duff. Observe soil moisture conditions in upper 6 inches by inserting tiling spade into soil and using tactile method to determine moisture state.
9. A list of plant species encountered during the qualitative transect inspection.

2.1.4 Panoramic Photographs

Representative photographs are obtained at specific locations for each quantitative and qualitative transect. The photographic documentation is a 360 degree panorama of the landscape at one end of the quantitative transect and at the representative data point for the qualitative transects. Photographic locations are depicted on Figures 9W, 9E, 10W, and 10E.

2.1.5 Additional Observations

All incidental listed wildlife and botanical observations are recorded during site visits. Surveys are conducted concurrently with overall site assessments performed as part of quantitative and qualitative transect field work. No threatened or endangered species were observed during the site visit.


BT4-621
YRR-T2-625
BT2-630
YRR-PT1-625
YRR-T1-625
BT3-621
BT1-630
FLUCCS Map Units
211, Improved Pasture -114 Acres
615, Bottomland -156 Acres
Legend
Propery Boundary - 270 Acres
Qualitative Transect Locations
Quantitative Transect Locations
Belt Transects
Existing Photo Points
0 500 1,000 2,000 Feet
N
Disclaimer- This document is for reference purposes only.
ERC makes no guarantee of the accuracy of the data contained herein.
2010 True Color
Figure 9. Transect Locations and Current FLUCCS
Yellow River Ranch Restoration Site
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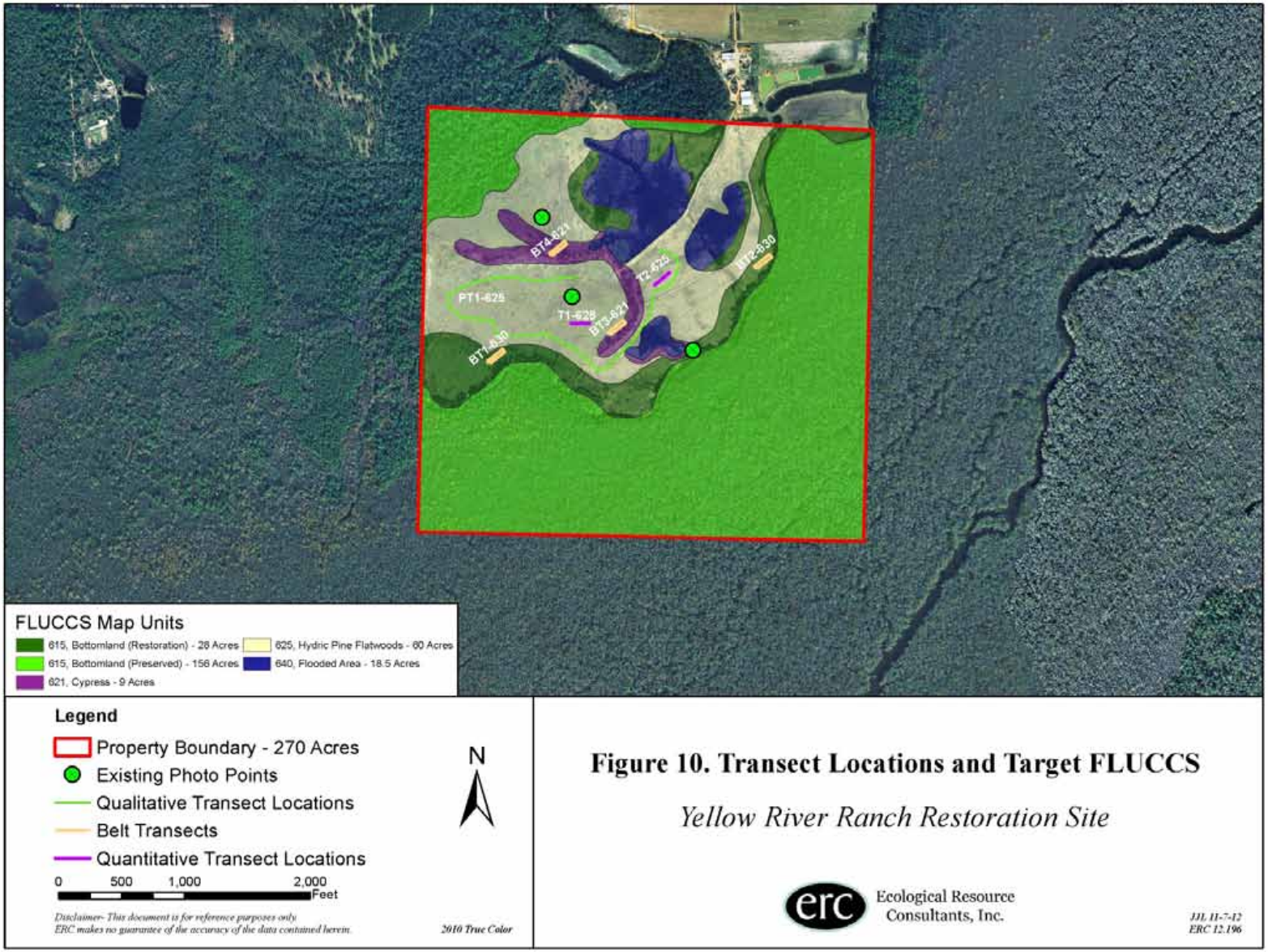
BT4-621
T2-625
BT2-630
PT1-625
T1-625
BT3-621
BT1-630
FLUCCS Map Units
615, Bottomland (Restoration) - 28 Acres
625, Hydric Pine Flatwoods - 60 Acres
615, Bottomland (Preserved) - 156 Acres
640, Flooded Area - 18.5 Acres
621, Cypress - 9 Acres
Legend
Property Boundary - 270 Acres
Existing Photo Points
Qualitative Transect Locations
Belt Transects
Quantitative Transect Locations
0 500 1,000 2,000
Feet
Disclaimer- This document is for reference purposes only.
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2010 True Color
N
Figure 10. Transect Locations and Target FLUCCS
Yellow River Ranch Restoration Site
erc
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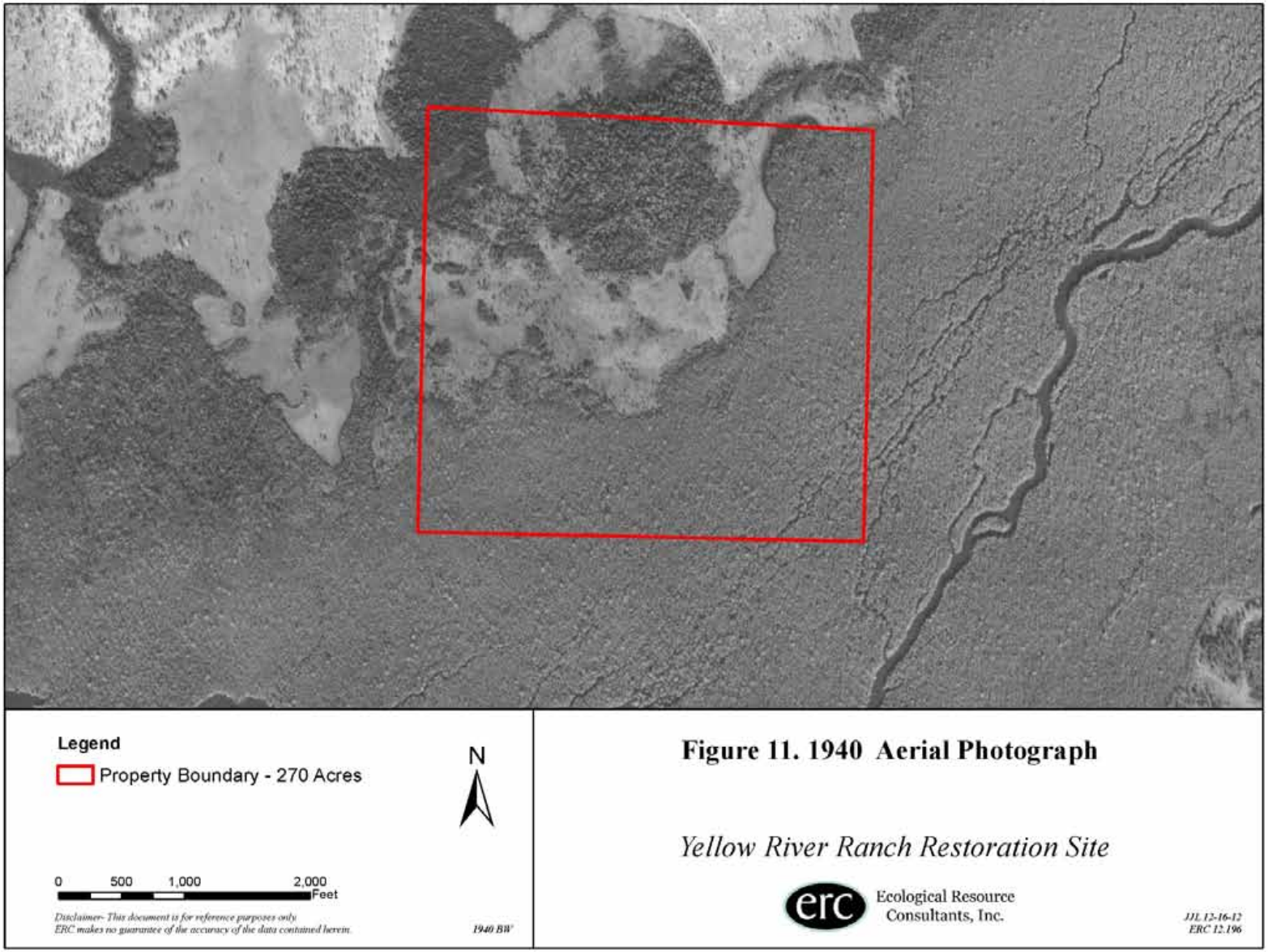
ERC 12.196


Legend
Property Boundary - 270 Acres
N
0 500 1,000 2,000
Feet
Disclaimer- This document is for reference purposes only.
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1940 BW
Figure 11. 1940 Aerial Photograph
Yellow River Ranch Restoration Site
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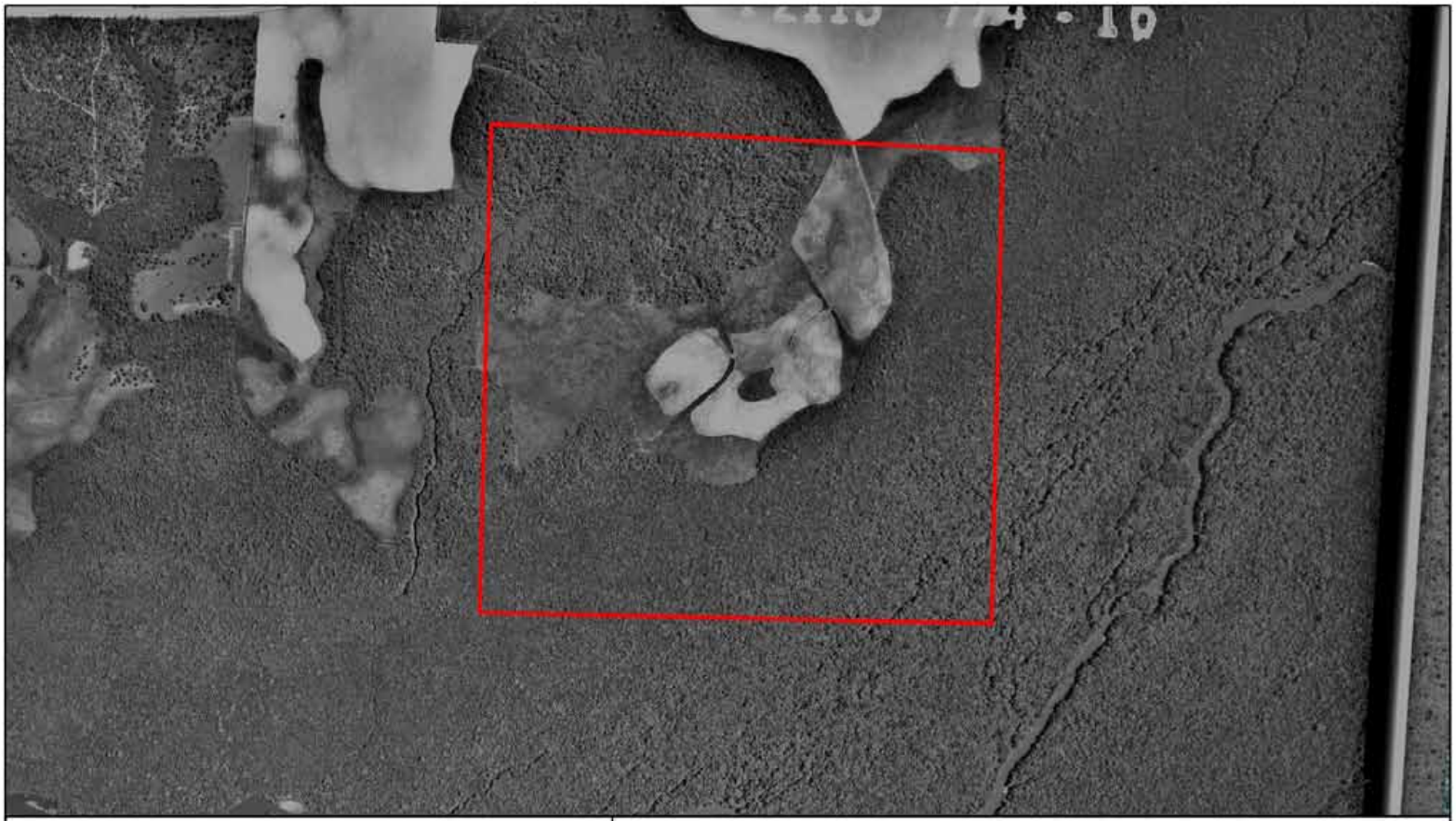
ERC 12.196


Legend
Property Boundary - 270 Acres
N
0 500 1,000 2,000
Feet
Disclaimer- This document is for reference purposes only.
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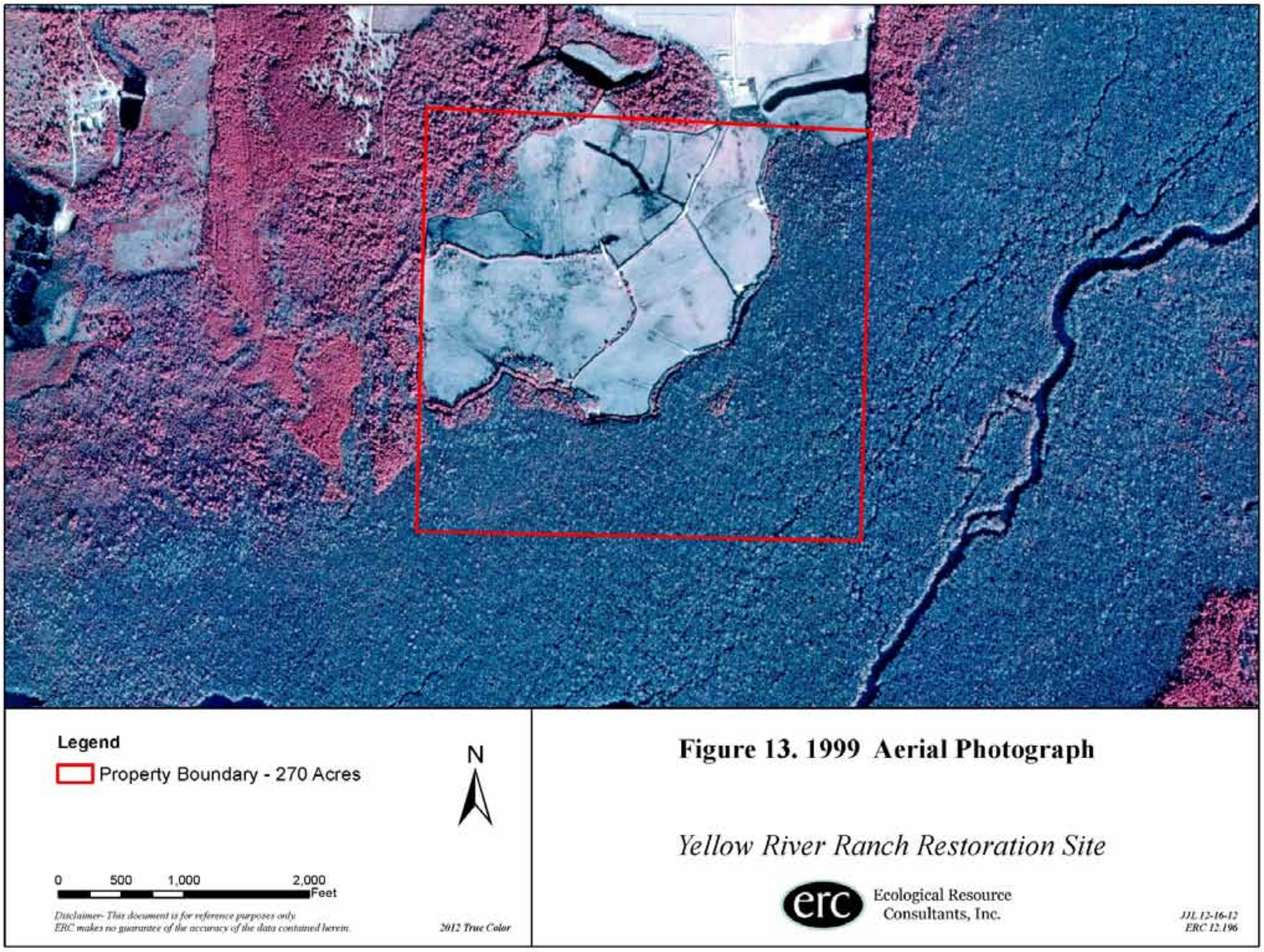
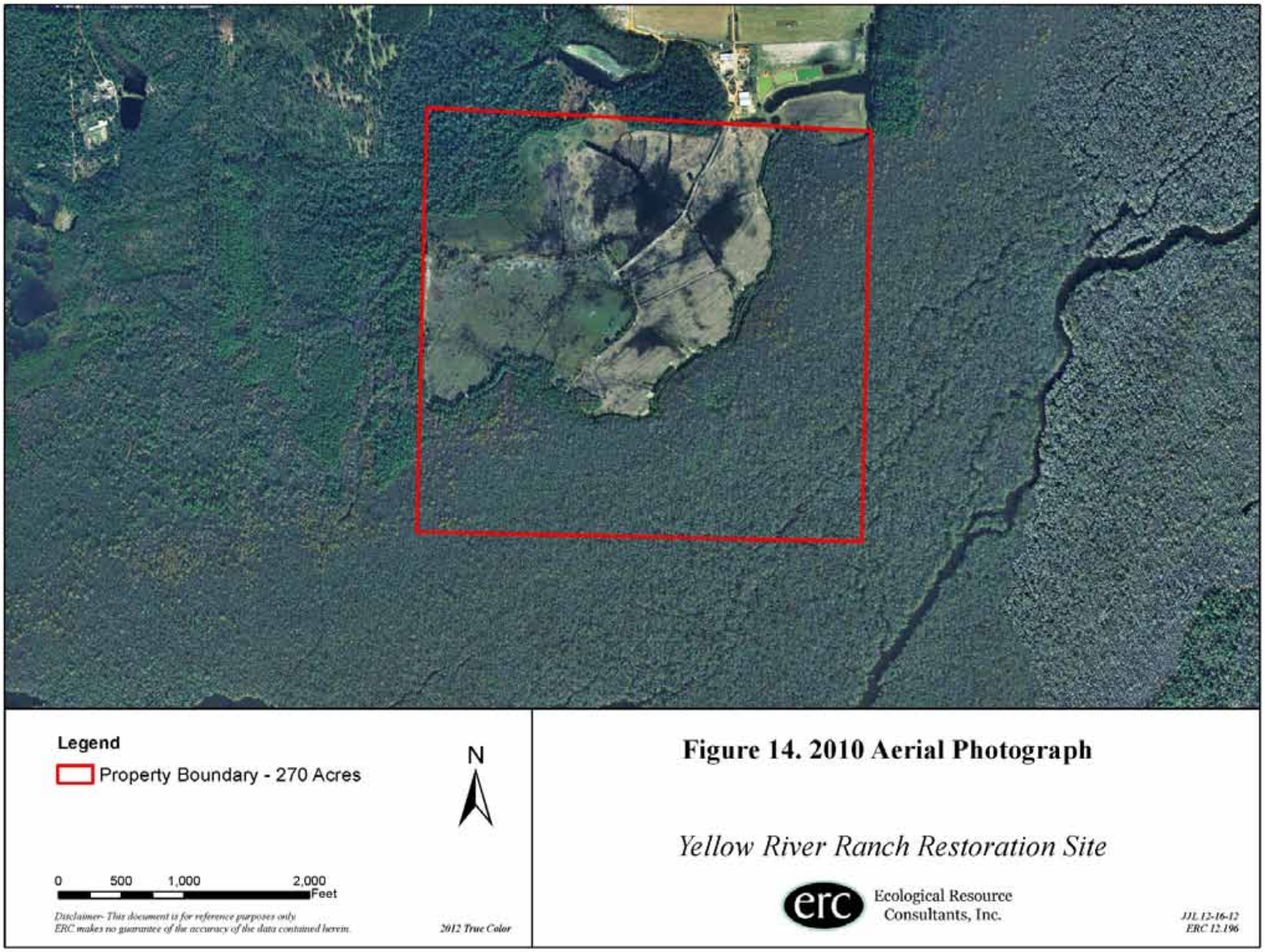
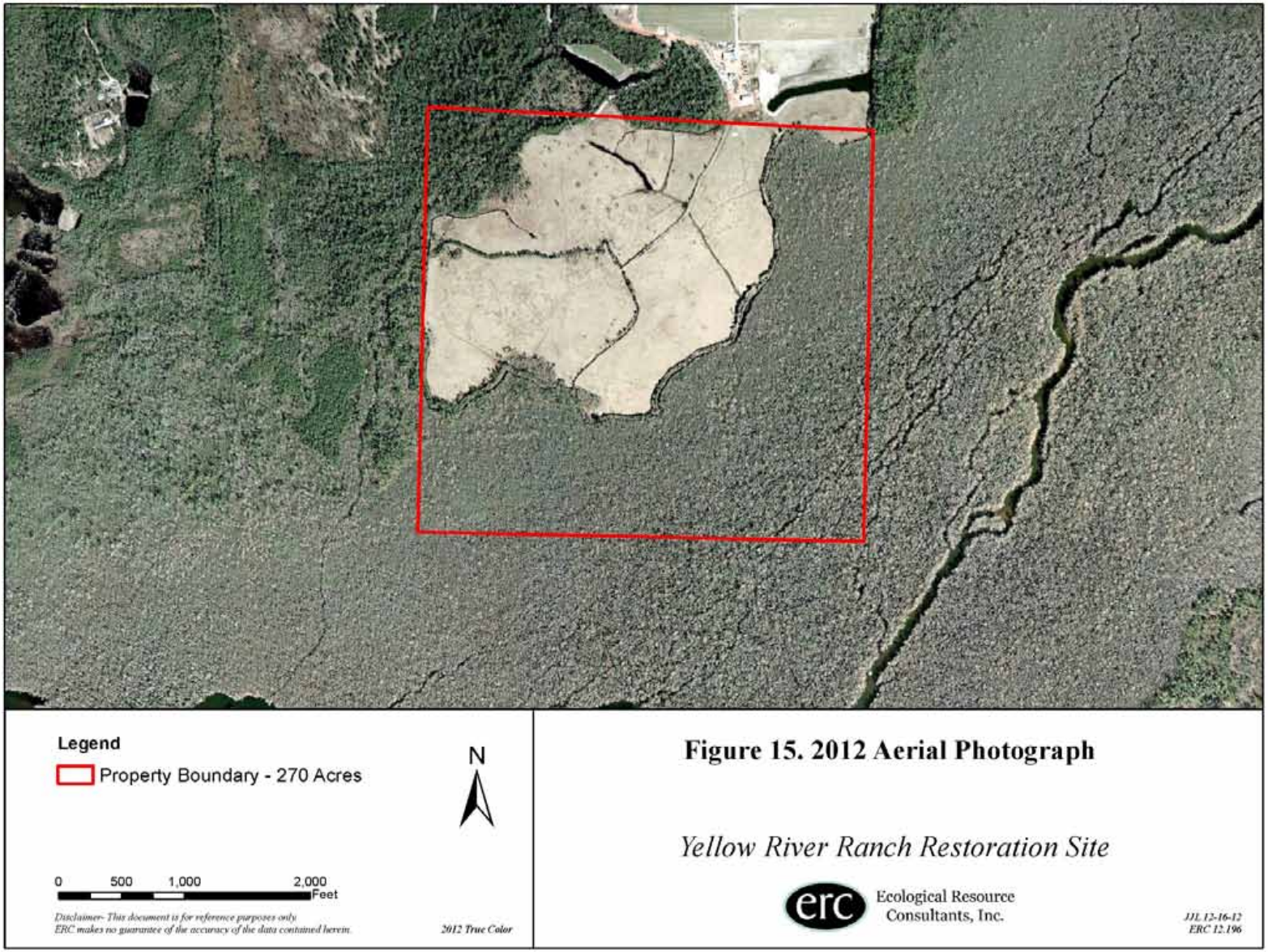
1974 BW
Figure 12. 1974 Aerial Photograph
Yellow River Ranch Restoration Site
erc
Ecological Resource
Consultants, Inc.
JJL 12-16-12
ERC 12.196


Legend
Property Boundary - 270 Acres
N
0 500 1,000 2,000
Feet
Disclaimer- This document is for reference purposes only.
ERC makes no guarantee of the accuracy of the data contained herein.
2012 True Color
Figure 13. 1999 Aerial Photograph
Yellow River Ranch Restoration Site
erc
Ecological Resource Consultants, Inc.
JJL 12-16-12
ERC 12.196


Legend
Property Boundary - 270 Acres
N
0 500 1,000 2,000
Feet
Disclaimer- This document is for reference purposes only.
ERC makes no guarantee of the accuracy of the data contained herein.
2012 True Color
Figure 14. 2010 Aerial Photograph
Yellow River Ranch Restoration Site
erc
Ecological Resource Consultants, Inc.
JJL 12-16-12
ERC 12.196


Legend
Property Boundary - 270 Acres
N
0 500 1,000 2,000
Feet
Disclaimer- This document is for reference purposes only.
ERC makes no guarantee of the accuracy of the data contained herein.
2012 True Color
Figure 15. 2012 Aerial Photograph
Yellow River Ranch Restoration Site
erc
Ecological Resource
Consultants, Inc.
JJL 12-16-12
ERC 12.196

2.2 Analytical Methods

Biostatistical methods are employed to quantitatively describe and summarize the monitoring field data. The data collected in quadrats along150' linear transects and within a 20' X 150' belt transects is analyzed by calculating the proportional distribution of all plants in the groundcover quadrats and recorded. The transect data is treated as representative samples of larger plant community polygons. The basic units for describing populations and communities are relative density, frequency and coverage. From these parameters, species importance and diversity are calculated. Formulas are provided below for several measures used to analyze the data.

2.2.1 Statistical Methods for Linear Transects

From the raw data, sum separately:

(1) the % coverage of each species from all plots
(2) the # of individuals of each species from all plots
(3) the % coverage of all species sampled in plots
(4) the #'s of individuals of all species sampled in plots

2.2.2 Relative Coverage

Calculate the Relative Coverage by dividing the total coverage of each species by the total coverage of all species.
RC= (1)/(3)

2.2.3 Relative Density

Calculate the Relative Density by dividing the total # of individuals of each species by the total #'s of individuals of all species.
RD= (2)/(4)

2.2.4 Relative Frequency

Calculate the Relative Frequency by initially calculating the frequency for each species (5). This is the total number of sample plots in which a species occurred in divided by the total number of plots sampled. Sum the frequencies of each species (6). The Relative Frequency is obtained by dividing the frequency of each species by the total frequencies of all species.
RF= (5)/(6)

2.2.5 Importance Value

The Importance Value is the sum of all Relative values for each species.
Importance Value = RC+RD+RF
The Importance Value Percentage is the Importance Value multiplied by 100
Importance Value Percentage = Importance Value * 100

2.2.6 Statistical Methods for Belt Transects

For the 20' X 150' belt transects the number of tree saplings per acre and total tree sapling diversity is calculated. From the raw data, sum separately:

(1) the individuals of each tree species with height measure/20' X 150' belt transects.

2.2.7 Number of Trees/Acre

Calculate the Number of Trees/Acre by multiplying the total number of tree species recorded in the 150' X 20' belt transect by 14.28.

Trees/Acre = (1)(14.28)

3.0 DATA AND OBSERVATIONS

3.1. Quantitative Transect Data

Four standard calculations of the relative abundance of each species are given for each quantitative transect: Importance Value, Relative Cover, Relative Density, and Relative Frequency (See Tables 5a and 6a). Quantitative summary data is reported for each transect and broken down by plant community (See Tables 5b and 6b). Summary data for the Belt transects is provided in Tables 7, 8, 9, and 10.

Table 5a. Transect YRRT1-625 Hydric Pine Flatwoods

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Forbs				
Rubus cunefolius	13.41	13.12	15.71	11.4
Centella asiatica	12.55	9.08	17.18	11.4
Euthamia caroliniana	8.2	5.41	13.05	6.14
Rubus trivialis	6.47	5.96	7.32	6.14
Diodia virginiana	5.42	2.84	6.39	7.02
Viola lanceolata	4.8	2.94	5.33	6.14
Symphyotrichum dumosum	3.11	2.48	1.6	5.26
Eupatorium leptophyllum	1.52	1.47	1.33	1.75
Rubus argutus	0.89	0.46	1.33	0.88
Solidago fistulosa	0.58	0.46	0.4	0.88
Pluchea baccharis	0.49	0.46	0.13	0.88
Erechtites hieraciifolius	0.44	0.18	0.27	0.88
Agalinis fasciculata	0.44	0.18	0.27	0.88
Hypericum cistifolium	0.4	0.18	0.13	0.88
Lobelia glandulosa	0.4	0.18	0.13	0.88
Graminoids				
Paspalum notatum	18.6	33.67	14.25	7.89
Andropogon virginicus	7.5	9.83	4.79	7.89
Axonopus furcatus	3.75	3.94	2.93	4.39
Rhynchospora plumosa	2.03	0.73	1.86	3.51
Eremochloa ophiuroides	1.42	0.64	1.86	1.75
Carex albolutescens	1.28	0.55	0.67	2.63
Ctenium aromaticum	1.16	0.92	0.8	1.75
Cyperus strigosus	0.94	1.28	0.67	0.88
Juncus marginatus	0.84	0.37	0.4	1.75
Sporobolus indicus	0.4	0.18	0.13	0.88
Woody Plants				
Ilex vomitoria	0.89	0.64	0.27	1.75
Nyssa sylvatica v. biflora	0.8	0.37	0.27	1.75
Myrica cerifera	0.76	1.28	0.13	0.88
Sapium sebiferum	0.49	0.18	0.4	0.88

Table 5b. Transect YRRT1-625 Hydric Pine Flatwoods

Groundcover Vegetation Relative Cover (%)			Average Cover (%)	Species Richness
Forbs	Graminoids	Woody Plants	Bare ground/ Standing water	
45%	52%	2.5%	31%	29
Shrub Height (meters)				0.25

Transect YRRT1-625 Hydric Pine Flatwoods

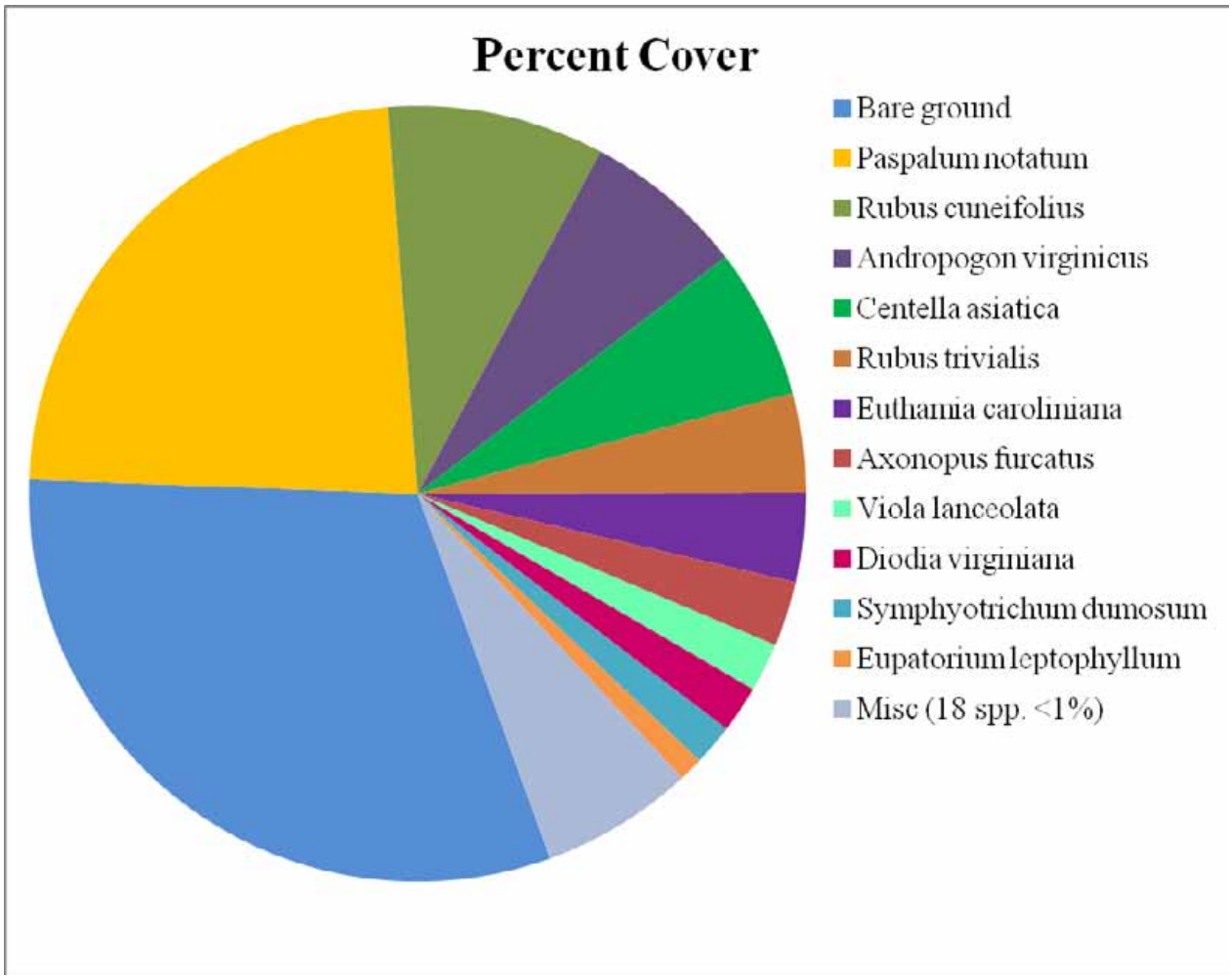


Table 6a. Transect YRRT2-625 Hydric Pine Flatwoods

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Forbs				
Centella asiatica	16.83	10.32	30.89	9.29
Diodia virginiana	11.02	7.72	16.05	9.29
Viola lanceolata	6.3	5.12	6.65	7.14
Euthamia caroliniana	5.56	5.59	5.37	5.71
Symphyotrichum dumosum	3.43	3.39	2.62	4.29
Rhexia virginica	2.32	2.29	1.81	2.86
Polypremum procumbens	2.19	0.95	1.34	4.29
Eupatorium leptophyllum	1.66	1.1	1.01	2.86
Cuphea carthagenensis	1.35	0.71	1.21	2.14
Rhexia mariana	1.31	0.71	1.07	2.14
Eupatoriumcapillifolium	0.63	0.32	0.13	1.43
Rubus cunefolius	0.5	0.39	0.4	0.71
Ludwigia pilosa	0.48	0.39	0.34	0.71
Lindernia dubia	0.46	0.39	0.27	0.71
Ludwigia linifolia	0.43	0.39	0.2	0.71
Hypericum cistifolium	0.4	0.16	0.34	0.71
Lobelia glandulosa	0.36	0.16	0.2	0.71
Graminoids				
Axonopus furcatus	20.02	32.31	16.32	11.43
Andropogon virginicus	7.13	12.06	1.48	7.86
Rhynchospora plumosa	6.5	6.3	8.19	5.0
Eragrostis virginica	1.54	1.1	0.67	2.86
Dichantheliumscabriusculum	1.12	1.58	0.34	1.43
Rhynchospora microcarpa	1.05	1.26	0.47	1.43
Panicum hians	0.92	0.79	0.54	1.43
Carex albolutescens	0.39	0.39	0.07	0.71
Panicum verrucosom	0.36	0.16	0.2	0.71
Rhynchospora fascicularis	0.31	0.16	0.07	0.71
Woody Plants				
Nyssa sylvatica v. biflora	3.47	2.05	1.21	7.14
Ilex glabra	0.67	0.32	0.27	1.43
Hypericum fasciculatum	0.63	1.1	0.07	0.71
Baccharis halimifolia	0.31	0.16	0.07	0.71

Table 6b. Transect YRRT2-625 Hydric Pine Flatwoods

Groundcover Vegetation Relative Cover (%)			Average Cover (%)	Species Richness
Forbs	Graminoids	Woody Plants	Bare ground/ Standing water	
40%	56%	4%	34%	32
Shrub Height (meters)				0.25

Transect YRRT2-625 Hydric Pine Flatwoods

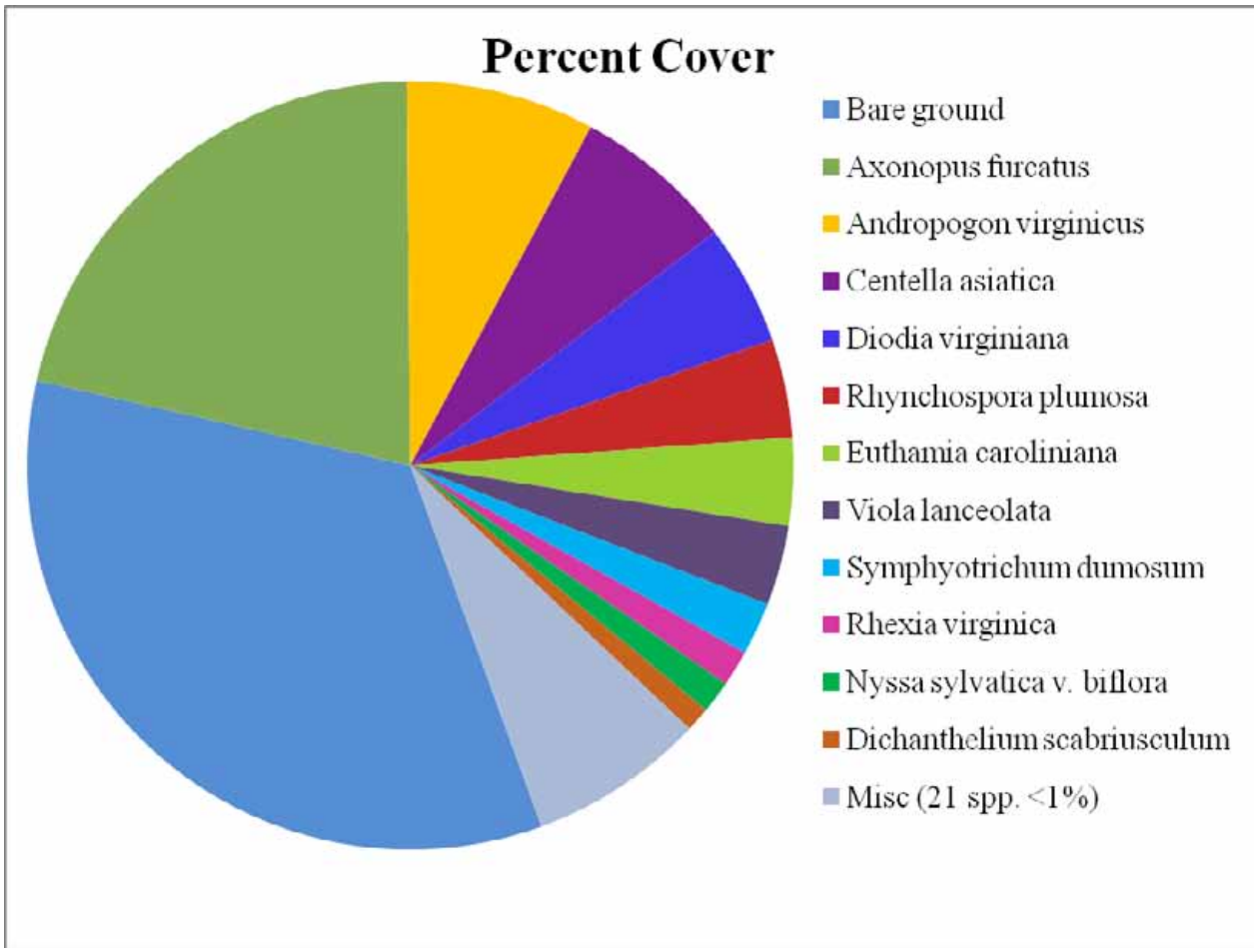


Table 9. Belt Transect Summary for YYR-BT1-630

Species	Total Number	Height Scale (feet)						Condition
		0-1'	>1'-2'	>2' -3'	>3'-4'	>4'-5'	>5'-6'	
Acer rubrum	34	1	2	31	0	0		healthy/growing
Chamaecyparis thyoides	14	0	0	4	3	0	7	healthy/growing
Nyssa biflora	1	0	1	0	0	0	0	healthy/growing
Pinus elliottii	14	0	2	3	3	3	3	healthy/growing
Sapium sebiferum	6	2	2	2	0	0	0	healthy/growing
Taxodium ascendens	28	1	7	12	5	1	2	healthy/growing
Total number of Saplings	97							
Number of Saplings/Acre	1,387.1							

Table 10. Belt Transect Summary for YYR-BT2-630

Species	Total Number	Height Scale (feet)						Condition
		0-1'	>1'-2'	>2' -3'	>3'-4'	>4'-5'	>5'-6'	
Chamaecyparis thyoides	24	0	1	3	6	3	11	healthy/growing
Pinus palustris	1	0	1	0	0	0	0	healthy/growing
Quercus laurifolia	2	1	1	0	0	0	0	healthy/growing
Total number of Saplings	27							
Number of Saplings/Acre	386.1							

Table 11. Belt Transect Summary for YYR-BT3-621

Species	Total Number	Height Scale (feet)						Condition
		0-1'	>1'-2'	>2' -3'	>3'-4'	>4'-5'	>5'-6'	
Chamaecyparis thyoides	12	1	2	2	4	2	1	limited mortality
Pinus elliottii	3	0	0	2	0	1	0	healthy/growing
Taxodium ascendens	17	0	3	7	7	0	0	plants are stunted
Total number of Saplings	32							
Number of Saplings/Acre	457.6							

Table 12. Belt Transect Summaries for Transect YYR-BT3-621

Species	Total Number	Height Scale (feet)						Condition
		0-1'	>1'-2'	>2' -3'	>3'-4'	>4'-5'	>5'-6'	
Chamaecyparis thyoides	5	0	1	4	0	0	0	healthy/growing
Cliftonia monophylla	2	0	0	2	0	0	0	healthy/growing
Pinus elliottii	3	1	1	0	1	0	0	healthy/growing
Taxodium ascendens	80	10	9	41	18	2	0	healthy/growing
Total number of Saplings	90							
Number of Saplings/Acre	1,287.0							

3.2. Qualitative Transect Data

A summary of the qualitative data and a plant list (Table 12) are provided below for Qualitative Transect YRR-PT1-625. The qualitative data sheet recorded for this transect is located in Appendix A.

Qualitative Transect YRR-PT1-625 Hydric Pine Flatwoods

The plant community is a wet flatwoods using the FNAI classification. The location where this transect was conducted, was managed for pasture and is currently in the process of being restored. There is no canopy, subcanopy or well developed shrub strata. Shrub coverage is 0-1 percent and the majority of shrubs are in the 0-0.5m height class. The dominant shrub species are *Ilex glabra* and *Baccharis halimifolia*. The graminoid groundcover coverage class is 51-75% percent and the total groundcover cover class is 76-100% percent. The dominant groundcover species are *Andropogon virginicus, Axonopus furcatus, Centella asiatica, Diodia virginiana, Eupatorium leptophyllum, Euthamia caroliniana, Paspalum notatum, Rhynchospora* spp., *Rubus* spp., and *Symphyotrichum dumosum*. The site has very little bare ground coverage because the area is open and abundant light and moisture are available to the herbaceous plant species.

Groundcover diversity was good, and diversity is expected to increase with increased management of the site. Wildlife observations included a northern harrier (*Circus cyaneus*), a sharp-shinned hawk (*Accipiter striatus*), a red-tailed hawk (*Buteo jamaicensis*), an eastern phoebe (*Sayornis phoebe*), a barn swallow (*Hirundo rustica*), a northern mockingbird (*Mimus polyglottos*), a monarch butterfly (*Danaus plexippus*), and a buckeye butterfly (*Junonia coenia*). Exotic species were observed, including the Chinese tallow (*Sapium sebiferum*), which is found in 1-5% coverage range, and evidence of feral hogs (*Sus scrofa*) rutting the soils. Natural regeneration of appropriate species is occurring. Thirty four species were observed and most of these are successional herbaceous species. Overall, the landscape is fire suppressed. The depth of duff is approximately 1 cm and there are many fine fuels in which to carry a fire across the landscape. The soil surface moisture class is moist.

Table 12. Plant List for YRR-PT1 625 Hydric Pine Flatwoods

Scientific Name	Common Name
Andropogon virginicus var. *virginicus*	Virginia broomgrass
Agalinis fasciculata	beach false foxglove
Axonopus furcatus	big carpetgrass
Baccharis halimifolia	sea myrtle
Bidens mitis	smallfruit beggarticks
Centella asiatica	spade leaf
Chamaecyparis thyoides	white cedar
Ctenium aromaticum	toothachegrass

Table 12. Plant List for YRR-PT1 625 Hydric Pine Flatwoods (Continued)

Scientific Name	Common Name
Dichanthelium sp.	witchgrass
Diodia virginiana	common persimmon
Erechtites hieraciifolius	American burnweed
Euthamia caroliniana	slender flattop goldenrod
Fuirena breviseta	umbrellasedge
Juncus marginatus	shore rush
Lachnanthes caroliana	redroot
Ludwigia linifolia	Southeastern primrosewillow
Ludwigia maritima	seaside primrosewillow
Ludwigia pilosa	hairy primrosewillow
Lycopus virginicus	Virginia bugleweed
Myrica cerifera	wax myrtle
Nyssa biflora	tupelo
Panicum hians	gaping panicum
Paspalum notatum	bahiagrass
Rhexia virginica	handsome Harry
Rhynchospora fascicularis	fascicled beaksedge
Rhynchospora plumosa	beaksedge
Rhynchospora inundata	horned beaksedge
Rubus argutus	blackberry
Sapium sebiferum	Chinese tallow tree
Solidago fistulosa	pinebarren goldenrod
Symphyotrichum dumosum	rice button aster
Viola lanceolata	bog white violet

3.3. Photographic Documentation

Panoramic photographs are located in Appendix B of the monitoring report. Quantitative monitoring plot photographs are located in Appendix C.

4.0 RESULTS AND DISCUSSION

The Yellow River Ranch Restoration site is located within the floodplain of the Yellow River. Intact native bottomland is located on the lowest portion of the floodplain while the restoration area is located on low erosional terrace that is generally flooded less frequently. The erosional terrace also has soil, landform and vegetative signatures of a seepage slope. Significant anthropogenic alteration and drainage of the erosional terrace resulted in a cultural landscape of drained pasture lands managed by the cultivation and grazing of non-native forage grasses. Restoration of the site involves hydrologic modification, installation the appropriate native species, control of invasive species, and prescribed fire in selected areas.

Approximately 155 acres of the Yellow River Ranch consists of existing forested Bottomland (615), with the remaining 120 acres converted to pasture from a previously forested landscape. Of the remaining 120 acres, 27 acres of Bottomland (615), 9 acres of Cypress (621) and 60 acres of Hydric Pine Flatwoods (625) are the focus of the quantitative monitoring.

The results of quantitative monitoring within the polygon identified as Hydric Pine Flatwoods (625) indicate that this is a landscape dominated by graminoids and forbs representing mostly herbaceous, perennial lifeforms. The presence of successional, herbaceous native species is indicative of a landscape that has been disturbed and is in the process of increasing species richness. Species richness ranges from 29 to 32 species in the quantitative transects. Specifically there are species such as beaksedge (*Rhynchospora plumosa*) and toothache grass (*Ctenium aromaticum*) that are associated with the historic landscape of Hydric Pine Flatwoods. Toothache grass, along with wiregrass (*Aristida stricta*), are species that require prescribed fire to flourish and spread. Wiregrass was not located within the transects; however, this species is one of the native groundcover species that has been planted in the Hydric Pine Flatwoods (625) polygon. As measured in transect YRR-T1-625, Bahia grass (*Paspalum notatum*) continues to be the most dominant groundcover species in this area of the Hydric Pine Flatwoods (625) polygon. Elsewhere on the site Bahia grass has mostly been erradicated by herbicide application.

Seedling swamp gum (*Nyssa sylvatica* var. *biflora*), white cedar (Chameacyparis thyoides), Chinese tallow tree (*Sapium sebiferum*) and slash pine (*Pinus elliottii*) were also observed within the Hydric Pine Flatwoods (625) polygon.

The quantitative summary results for the tree saplings in the target FLUCCS communities identified as forested, such as Cypress (621) and Bottomland (615), indicate that there are at least 386 to 1,387 trees/acre in the Bottomland polygon sample area and 4,57 to 1,287 in the Cypress polygon sample area. All saplings are growing and healthy except those in the Cypress polygon sample area near an existing ditch at transect YRR-BT3-621. Planted cypress mortality, may be resolved by allowing this portion of the landscape to trend toward more slash pine, atlantic white cedar, and other associated native species as they are dispersed into the site. As the entire site is hydrologically restored, wetland tree saplings will likely recruit naturally from the adjacent, mature bottomland forest and augment the species richness already present in the Cypress and Bottomland polygons.

The landscape traversed during the pedestrian transect is entirely mapped as Hydric Pine Flatwoods (625). Overall the dominance of herbaceous plant lifeforms in the Hydric Pine Flatwoods is consistent with the quantitative measures of groundcover species in the Hydric Pine Flatwoods (625), Cypress (621) and Bottomland (615). These wetland polygons all are undergoing similar successional phases. As the canopy matures in the planted polygons of Cypress (621) and Bottomland (615), the groundcover coverage is expected to decrease as the woody strata begin to shade and dominate the landscape.

5.0. CONCLUSIONS AND RECOMMENDATIONS

A snapshot of the current conditions at the Yellow River Ranch restoration site was obtained from ecological monitoring in the autumn of 2012. The data indicates a landscape that is trending towards the restoration goals and habitat target. The goal of the ecological monitoring is to qualitatively and quantitatively assess the mitigation progress and use the information to adapt modifications or continue the application of planned restoration activities to achieve ongoing and future restoration goals for the site.

The converted pasture is being restored to a mosaic of bottomland (615), cypress (621) and, hydric pine flatwoods (625)/hydric pine savanna (626) and non-forested (640) wetlands. In the bottomland (615) restoration area, the existing vegetation includes saplings of red maple (*Acer rubrum*), white cedar (*Chamaecyparis thyoides*), swamp gum (*Nyssa sylvatica* var. *biflora*), slash pine (*Pinus elliottii*) and pond cypress (*Taxodium ascendens*). This landscape is trending toward the desired target; however, invasive exotic Chinese tallow tree saplings should be monitored and treated.

In the cypress (621) restoration area, existing tree sapling diversity is lower than in the bottomland restoration area; however, potential species richness gains are likely from continued natural recruitment of native species. The landscape is trending toward the desired target of a pond cypress dominated landscape. Invasive exotic Chinese tallow tree saplings are also a concern in this area and should be monitored and treated. There are small areas of pond cypress that are not thriving in the cypress restoration area. The solution may be to allow the small landscape inclusions to become mixtures of trees where cypress is a component but not the dominant species. This strategy does not appreciably alter the restoration target but rather recognizes the complexity of the landscape and associated habitat.

The hydric pine flatwoods restoration areas have scattered slash pine, pond cypress, limited areas of myrtle leaf holly (*Ilex cassine* var. *myrtifolia*), gallberry (*Ilex glabra*), wax myrtle (*Myrica cerifera*) and swamp bay (*Persea palustris*) and a diverse herbaceous groundcover that could be augmented by additional native groundcover plantings that are typical in wet savanna or wet prairie.

The monitoring results corroborate a qualitative assessment of severe landscape impacts caused by many years of pasture use. Herbaceous plants continue to comprise the majority of the vegetation within all the polygons that are mapped in the improved pasture. The high coverage by herbaceous species is not unexpected because the site is open with virtually no canopy and receives full sunlight throughout the day. All of the proposed restoration techniques as mentioned in Section *1.1.1., Purpose,* of the report will result in a landscape trending toward restoration targets as listed in Table 4.

Threats to the inherent biodiversity of this site include fire suppression, hydrologic modification, non-native pasture grass and herbaceous weeds growth, exotic invasive vegetation, and climate change. The expansion of invasive exotic species incursions on the site will likely be a significant challenge to restoration. Chinese tallow (*Sapium sebiferum*), cogon grass (*Imperata*

cylindrica) and Japanese climbing fern (*Lygodium japonicum*) are significant invading species that should be monitored carefully. Seedlings of Chinese tallow were found throughout the areas of former pasture. In addition large areas of bare ground were noted during traverses across the site. Areas of bare soils are the result from the feeding practices of introduced feral hogs (*Sus scrofa*). ERC recommends removal of feral hogs from the site as soon as is feasible.

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