# 2016 Monitoring Report

## YELLOW RIVER RANCH

## Santa Rosa County, Florida

ERC #: 16-196A

October 2016

Ecological Resource Consultants, Inc.

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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 2016 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. Fifteen sample points in each of two quantitative transects, documented the coverage of each species, open water, and bare ground in a square meter. 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. All transects and photograph points are depicted on maps that accompany the monitoring report.

The results of the 2016 monitoring represent the current condition, which 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 11, 2016 monitoring event documents a landscape in full recovery. The prescribed fire of July 2015 reduced many of the shrubs and fire sensitive trees to coppice, eliminated some of the young slash pine and white cedar, and stimulated flowering and fruiting of herbaceous groundcover species. At the time of monitoring many of these coppiced saplings had grown from 3 to 6 feet. In addition, natural dispersal and regeneration of native trees and shrubs such as red maple, slash pine, white cedar, swamp laurel oak, styrax, buttonbush and pond cypress, is locally common. Numerous birds, reptiles, mammals, and insects were observed using the landscape as a source of food and shelter.

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# 1.0 INTRODUCTION

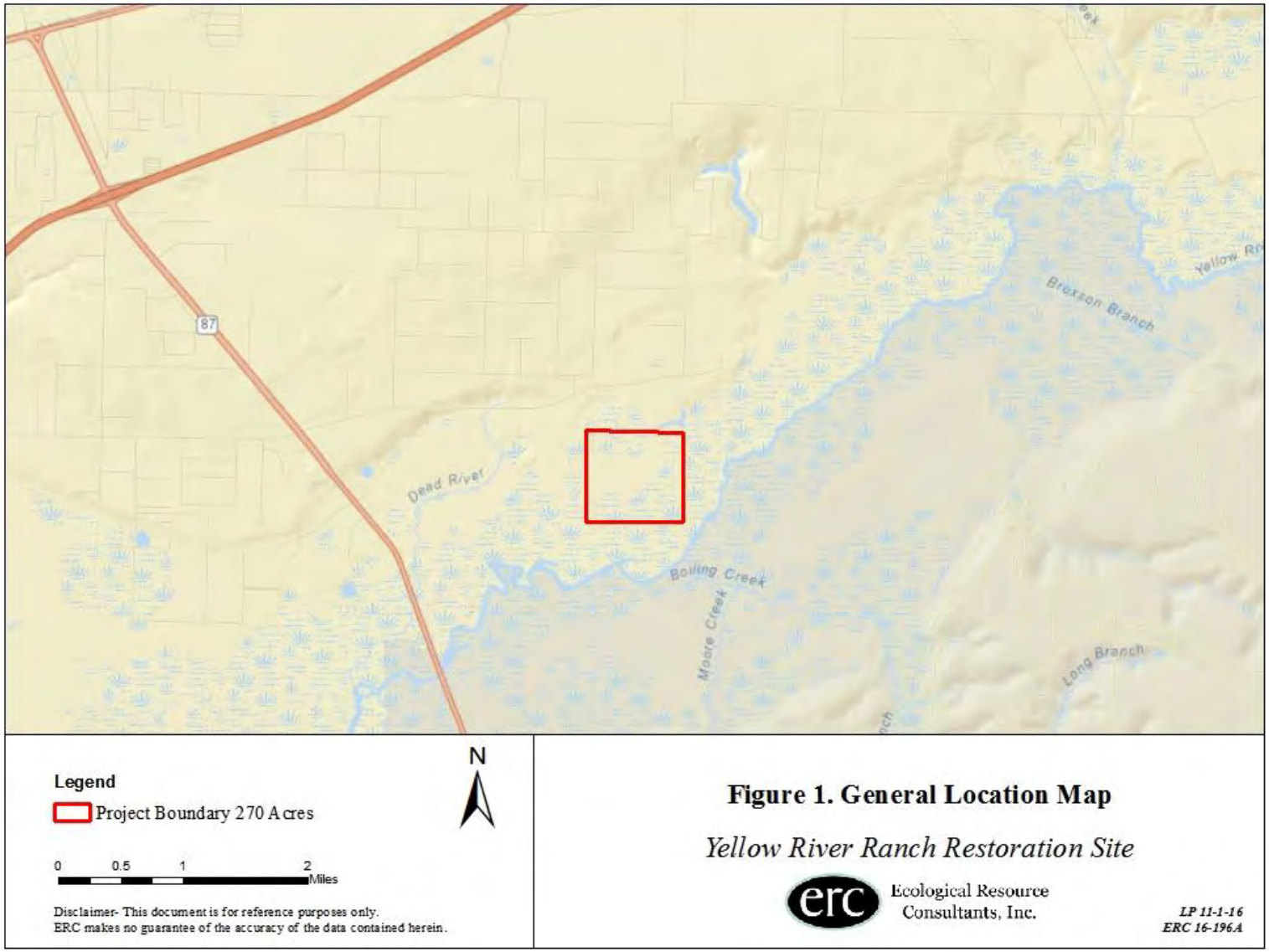
## 1.1. Purpose and Scope

### 1.1.1 Purpose

The Yellow River Ranch (YRR) 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 YRR is located on the floodplain of the Yellow River. 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.


87
Dead River
Boiling Creek
Moore Creek
Long Branch
Broxton Branch
Yellow Riv
N
Legend
Project Boundary 270 Acres
0 0.5 1 2
Miles
Disclaimer- This document is for reference purposes only.
ERC makes no guarantee of the accuracy of the data contained herein.
Figure 1. General Location Map
Yellow River Ranch Restoration Site
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# 2.0 METHODS

## 2.1 Field Methods

The location of all transects is depicted on Figure 2. A list of all the transect names appears in Table 1, Yellow River Ranch Transects, along with the target FLUCCS codes for each transect.

**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.


BT4-621
YRR-T2-625
BT2-630
YRR-PT1-625
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
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N
2012 True Color
Figure 2. Transect Locations Map
Yellow River Ranch Restoration Site
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### 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) 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.

b) 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.

c) 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%, and 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) 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.

b) 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 depends 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, specific parameters are observed and recorded at an observation point for all polygons. The specific parameters 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 3 and 4.

### 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.

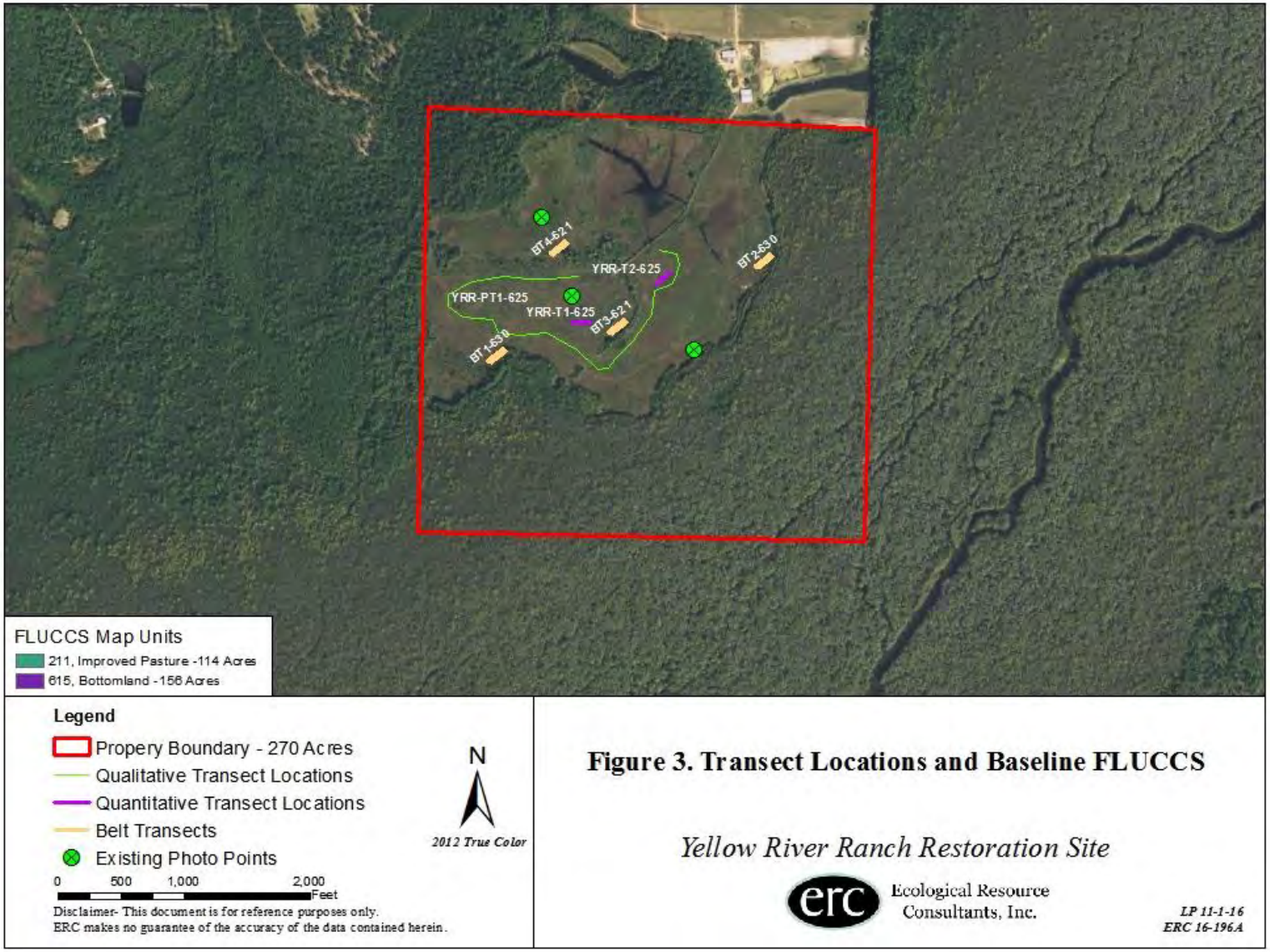


**Figure 3. Transect Locations and Baseline FLUCCS**

*Yellow River Ranch Restoration Site*

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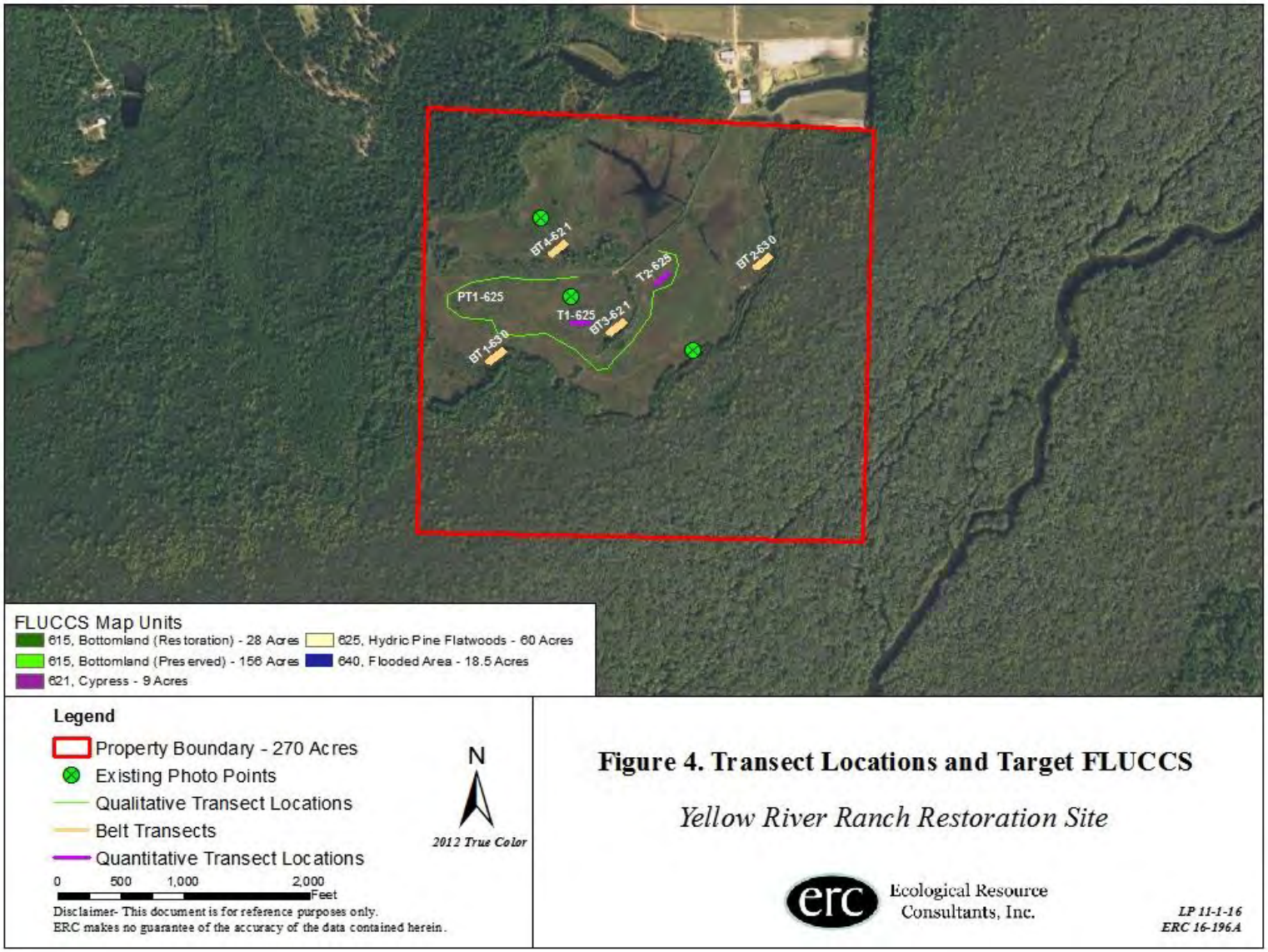
*ERC 16-196A*


BT4-621
BT2-630
T2-625
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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N
2012 True Color
Figure 4. Transect Locations and Target FLUCCS
Yellow River Ranch Restoration Site
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## 2.2 Analytical Methods

Biostatistical methods are employed to quantitatively describe and summarize the monitoring field data. The data collected in quadrats along 150' 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 2a and 3a). Quantitative summary data is reported for each transect and broken down by plant community (See Tables 2b and 3b). Summary data for the belt transects is provided in Tables 4, 5, 6 and 7.

**Table 2a. Transect YRRT1-625 Hydric Pine Flatwoods**

| Species | Importance Value (%) | Relative Cover (%) | Relative Density (%) | Relative Frequency (%) |
|---|---|---|---|---|
| **Forbs** | | | | |
| *Symphyotrichum dumosum* | 10.26 | 12.49 | 9.73 | 8.57 |
| *Euthamia caroliniana* | 7.47 | 4.81 | 9.03 | 8.57 |
| *Agalinis fasciculata* | 5.98 | 4.7 | 5.39 | 7.86 |
| *Rubus cuneifolius* | 5.18 | 6.59 | 5.39 | 3.57 |
| *Rubus argutus* | 5.17 | 4.52 | 5.98 | 5.0 |
| *Scoparia dulcis* | 3.33 | 1.6 | 4.81 | 3.57 |
| *Viola lanceolata* | 2.35 | 0.8 | 3.4 | 2.86 |
| *Lachnanthes caroliana* | 2.15 | 1.03 | 3.28 | 2.14 |
| *Balduina angustifolia* | 2.13 | 1.66 | 1.88 | 2.86 |
| *Eupatorium leptophyllum* | 1.96 | 1.26 | 1.06 | 3.57 |
| *Rhexia mariana* | 1.78 | 1.2 | 1.99 | 2.14 |
| *Ludwigia pilosa* | 1.26 | 1.78 | 1.29 | 0.71 |
| *Eupatorium mohrii* | 1.23 | 0.86 | 0.7 | 2.14 |
| *Polypremum procumbens* | 1.15 | 1.09 | 0.94 | 1.43 |
| *Rhexia virginica* | 1.1 | 0.57 | 1.29 | 1.43 |
| *Lobelia glandulosa* | 0.96 | 0.29 | 1.88 | 0.71 |
| *Ambrosia artemisiifolia* | 0.73 | 0.4 | 0.35 | 1.43 |
| *Hydrocotyle verticillata* | 0.65 | 0.29 | 0.94 | 0.71 |
| *Ludwigia virgata* | 0.62 | 0.8 | 0.35 | 0.71 |
| *Hypericum cistifolium* | 0.47 | 0.11 | 0.59 | 0.71 |
| *Centella asiatica* | 0.47 | 0.11 | 0.59 | 0.71 |

**Table 2a. Transect YRRT1-625 Hydric Pine Flatwoods (Continued)**

| Species | Importance Value (%) | Relative Cover (%) | Relative Density (%) | Relative Frequency (%) |
|---|---|---|---|---|
| **Forbs** | | | | |
| *Ludwigia linifolia* | 0.45 | 0.29 | 0.35 | 0.71 |
| *Cuphea carthagenensis* | 0.43 | 0.11 | 0.47 | 0.71 |
| *Solidago rugosa subsp. aspera* | 0.37 | 0.29 | 0.12 | 0.71 |
| *Oldenlandia uniflora* | 0.35 | 0.11 | 0.23 | 0.71 |
| *Liatris spicata* | 0.31 | 0.11 | 0.12 | 0.71 |
| *Bidens mitis* | 0.31 | 0.11 | 0.12 | 0.71 |
| *Hyptis alata* | 0.31 | 0.11 | 0.12 | 0.71 |
| *Verbena brasiliensis* | 0.31 | 0.11 | 0.12 | 0.71 |
| **Graminoids** | | | | |
| *Andropogon virginicus* | 21.58 | 35.62 | 18.41 | 10.71 |
| *Rhynchospora pusilla* | 3.63 | 2.18 | 6.57 | 2.14 |
| *Rhynchospora chapmanii* | 3.15 | 2.12 | 3.75 | 3.57 |
| *Juncus marginatus* | 1.76 | 1.49 | 0.94 | 2.86 |
| *Rhynchospora microcarpa* | 1.58 | 0.74 | 2.58 | 1.43 |
| *Fuirena breviseta* | 1.29 | 1.26 | 1.17 | 1.43 |
| *Axonopus furcatus* | 0.74 | 0.8 | 0.7 | 0.71 |
| *Eragrostis virginica* | 0.59 | 0.46 | 0.59 | 0.71 |
| *Juncus effusus subsp. solutus* | 0.45 | 0.29 | 0.35 | 0.71 |
| *Dichanthelium scabriusculum* | 0.37 | 0.29 | 0.12 | 0.71 |
| *Rhynchospora colorata* | 0.35 | 0.11 | 0.23 | 0.71 |
| *Paspalum urvillei* | 0.31 | 0.11 | 0.12 | 0.71 |
| **Woody Plants** | | | | |
| *Myrica cerifera* | 2.57 | 4.75 | 0.82 | 2.14 |
| *Pinus elliottii* | 0.74 | 0.57 | 0.23 | 1.43 |
| *Ilex cassine v. myrtifolia* | 0.45 | 0.29 | 0.35 | 0.71 |
| *Nyssa sylvatica v. biflora* | 0.45 | 0.29 | 0.35 | 0.71 |
| *Baccharis halimifolia* | 0.37 | 0.29 | 0.12 | 0.71 |
| *Sapium sebiferum* * | 0.31 | 0.11 | 0.12 | 0.71 |

**Table 2b. Transect YRRT1-625 Hydric Pine Flatwoods**

| Groundcover Vegetation Relative Cover (%) | | | Average Cover (%) | |
|---|---|---|---|---|
| Forbs | Graminoids | Woody Plants | Bare ground/ Standing water | Species Richness |
| 45.72 | 48.2 | 6.1 | 12.53 | 47 |
| Shrub Height (meters) | | | | 0.39 |

**Transect YRRT1-625 Hydric Pine Flatwoods**

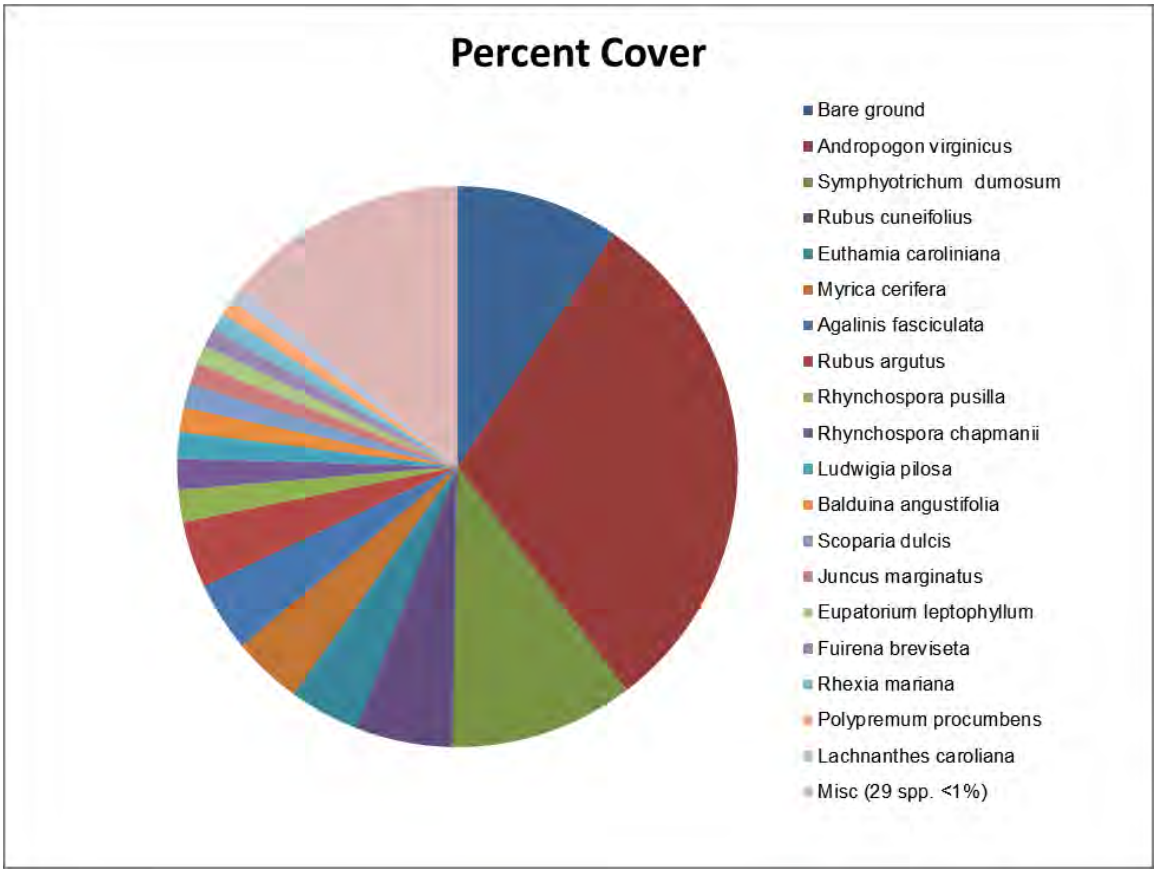



**Table 3a. Transect YRRT2-625 Hydric Pine Flatwoods**

| Species | Importance Value (%) | Relative Cover (%) | Relative Density (%) | Relative Frequency (%) |
|---|---|---|---|---|
| **Forbs** | | | | |
| *Symphyotrichum dumosum* | 10.5 | 12.2 | 9.1 | 10.1 |
| *Ludwigia pilosa* | 8.1 | 10.1 | 8.7 | 5.4 |
| *Viola lanceolata* | 3.3 | 1.3 | 5.2 | 3.4 |
| *Euthamia caroliniana* | 2.9 | 3.3 | 2.7 | 2.7 |
| *Bidens mitis* | 1.6 | 1.3 | 1.6 | 2.0 |
| *Cuphea carthagenensis* | 1.4 | 0.7 | 1.4 | 2.0 |
| *Xyris brevifolia* | 1.3 | 0.2 | 2.2 | 1.4 |
| *Ludwigia linifolia* | 1.2 | 0.9 | 0.5 | 2.0 |
| *Rubus argutus* | 1.1 | 1.1 | 0.9 | 1.4 |
| *Rhexia mariana* | 0.8 | 0.2 | 0.8 | 1.4 |
| *Agalinis fasciculata* | 0.7 | 0.8 | 0.6 | 0.7 |
| *Eupatorium mohrii* | 0.7 | 0.4 | 0.2 | 1.4 |
| *Eupatorium leptophyllum* | 0.5 | 0.8 | 0.1 | 0.7 |

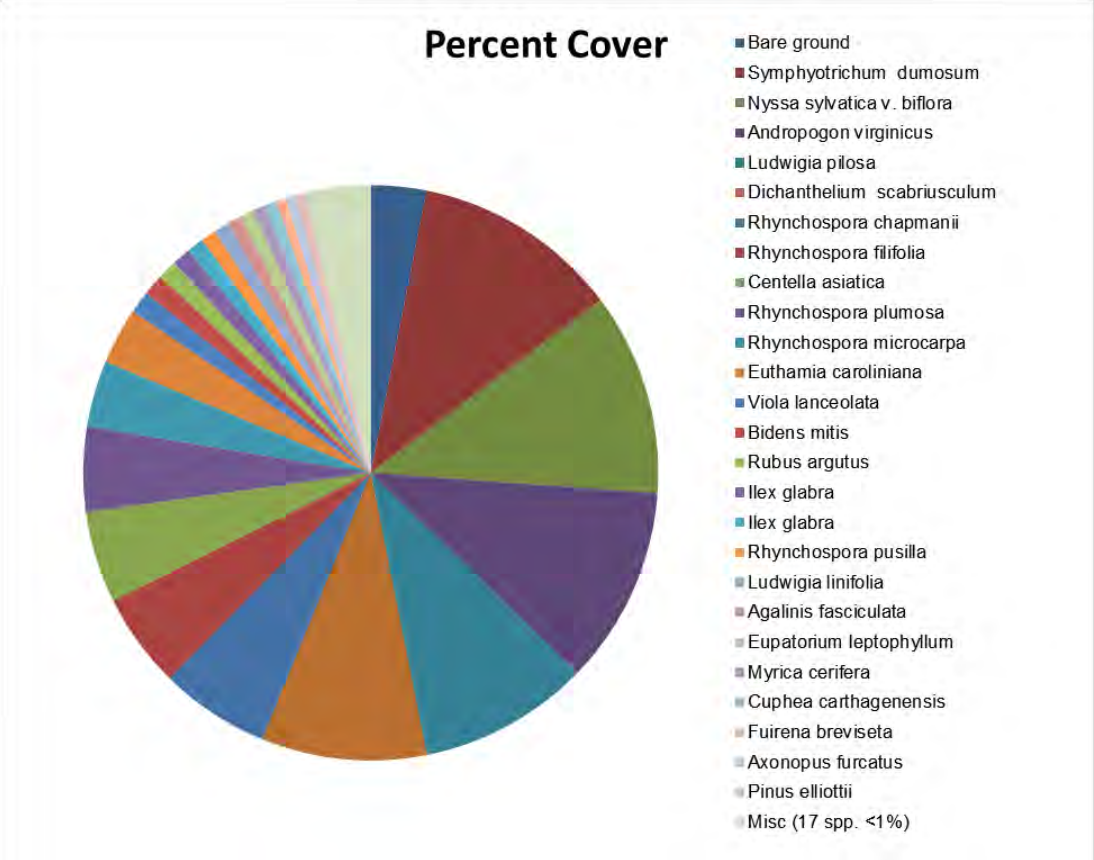
**Table 3a. Transect YRRT2-625 Hydric Pine Flatwoods (Continued)**

| Species | Importance Value (%) | Relative Cover (%) | Relative Density (%) | Relative Frequency (%) |
|---|---|---|---|---|
| **Forbs** | | | | |
| *Oldenlandia uniflora* | 0.48 | 0.12 | 0.63 | 0.68 |
| *Ludwigia virgata* | 0.41 | 0.12 | 0.42 | 0.68 |
| *Xyris elliottii* | 0.36 | 0.3 | 0.1 | 0.68 |
| *Solidago rugosa subsp. aspera* | 0.36 | 0.3 | 0.1 | 0.68 |
| *Scoparia dulcis* | 0.34 | 0.12 | 0.21 | 0.68 |
| *Lobelia glandulosa* | 0.3 | 0.12 | 0.1 | 0.68 |
| *Hyptis alata* | 0.3 | 0.12 | 0.1 | 0.68 |
| *Eriocaulon decangulare* | 0.3 | 0.12 | 0.1 | 0.68 |
| *Xyris serotina* | 0.3 | 0.12 | 0.1 | 0.68 |
| **Graminoids** | | | | |
| *Andropogon virginicus* | 9.43 | 11.66 | 7.84 | 8.78 |
| *Rhynchospora chapmanii* | 9.37 | 6.48 | 14.21 | 7.43 |
| *Centella asiatica* | 8.74 | 5.41 | 13.38 | 7.43 |
| *Dichanthelium scabriusculum* | 6.52 | 9.76 | 4.39 | 5.41 |
| *Rhynchospora plumosa* | 5.91 | 5.0 | 8.67 | 4.05 |
| *Rhynchospora filifolia* | 5.41 | 5.59 | 5.22 | 5.41 |
| *Rhynchospora microcarpa* | 3.91 | 3.93 | 3.76 | 4.05 |
| *Rhynchospora pusilla* | 1.57 | 0.89 | 1.78 | 2.03 |
| *Fuirena breviseta* | 0.75 | 0.59 | 0.31 | 1.35 |
| *Axonopus furcatus* | 0.75 | 0.59 | 0.31 | 1.35 |
| *Panicum hians* | 0.47 | 0.3 | 0.42 | 0.68 |
| *Juncus marginatus* | 0.36 | 0.3 | 0.1 | 0.68 |
| *Eragrostis virginica* | 0.36 | 0.3 | 0.1 | 0.68 |
| **Woody Plants** | | | | |
| *Nyssa sylvatica v. biflora* | 6.78 | 11.96 | 2.3 | 6.08 |
| *Ilex glabra* | 1.07 | 1.13 | 0.73 | 1.35 |
| *Pinus elliottii* | 0.72 | 0.59 | 0.21 | 1.35 |
| *Myrica cerifera* | 0.4 | 0.3 | 0.21 | 0.68 |
| *Ilex cassine v. myrtifolia* | 0.36 | 0.3 | 0.1 | 0.68 |

**Table 3b. Transect YRRT2-625 Hydric Pine Flatwoods**

| Groundcover Vegetation Relative Cover (%) | | | Average Cover (%) | |
|---|---|---|---|---|
| Forbs | Graminoids | Woody Plants | Bare ground/ Standing water | Species Richness |
| 38.44 | 55.58 | 5.97 | 4.67 | 40 |
| Shrub Height (meters) | | | | 0.52 |

**Transect YRRT2-625 Hydric Pine Flatwoods**



## Table 4. Belt Transect Summary for YYR-BT1-630

| Belt Transect Summaries for Transect YYR-BT1-630 (Wetland Forested Mix) | | | | | | |
|---|---|---|---|---|---|---|
| | | Height Scale (feet) | | | | |
| **Species** | **Total Number** | **0-1'** | **>1'-3'** | **>3'-5'** | **>5'** | **Condition** |
| *Acer rubrum* | | 34 | 3 | 17 | 20 | healthy/growing - many are from natural recruitment |
| *Cephlanthus occidentalis* | | | 2 | | | healthy/growing - natural recruitment |
| *Chamaecyparis thyoides* | | 1 | | | | healthy/growing |
| *Cliftonia monophylla* | | | | | | healthy/growing |
| *Ilex myrtifolia* | | | | 1 | | healthy/growing - natural recruitment |
| *Nyssa biflora* | | 7 | 1 | | | healthy/growing |
| *Pinus elliottii* | | 32 | 7 | | 15 | healthy/growing - many are from natural recruitment |
| *Styrax americana* | | | | | 2 | healthy/growing - natural recruitment |
| *Taxodium ascendens* | | 7 | | 6 | 16 | healthy/growing |
| **Total number of Saplings** | 171 | | | | | |
| **Number of Saplings/Acre** | 2441.88 | | | | | |

## Table 5. Belt Transect Summary for YYR-BT2-630

| Belt Transect Summaries for Transect YYR-BT2-630 (Wetland Forested Mix) | | | | | | |
|---|---|---|---|---|---|---|
| | | Height Scale (feet) | | | | |
| **Species** | **Total Number** | **0-1'** | **>1'-3'** | **>3'-5'** | **>5'** | **Condition** |
| *Acer rubrum* | | | | | 1 | healthy/growing |
| *Chamaecyparis thyoides* | | | | | 16 | healthy/growing |
| *Juniperus virginiana* | | | | | 1 | healthy/growing |
| *Magnolia virginiana* | | | | | 1 | healthy/growing |
| *Pinus palustris* | | | | | 1 | healthy/growing |
| *Quercus laurifolia* | | | | | 3 | healthy/growing |
| **Total number of Saplings** | 23 | | | | | |
| **Number of Saplings/Acre** | 328.44 | | | | | |

## Table 6. Belt Transect Summary for YYR-BT3-621

| Belt Transect Summaries for Transect YYR-BT3-621 (Cypress) | | | | | | |
|---|---|---|---|---|---|---|
| | | Height Scale (feet) | | | | |
| **Species** | **Total Number** | **0-1'** | **>1'-3'** | **>3'-5'** | **>5'** | **Condition** |
| *Chamaecyparis thyoides* | | | | 1 | 2 | healthy/growing |
| *Pinus elliottii* | | 12 | | | 2 | healthy/growing |
| *Taxodium ascendens* | | 1 | 3 | 1 | | healthy/growing |
| **Total number of Saplings** | 22 | | | | | |
| **Number of Saplings/Acre** | 314.16 | | | | | |

## Table 7. Belt Transect Summaries for Transect YYR-BT3-621

| Belt Transect Summaries for Transect YYR-BT4-621 (Cypress) | | | | | | |
|---|---|---|---|---|---|---|
| | | Height Scale (feet) | | | | |
| **Species** | **Total Number** | **0-1'** | **>1'-3'** | **>3'-5'** | **>5'** | **Condition** |
| *Pinus elliottii* | | | | 1 | | healthy/growing |
| *Nyssa biflora* | | | 14 | | | healthy/growing |
| *Taxodium ascendens* | | | | 49 | 37 | healthy/growing |
| **Total number of Saplings** | 101 | | | | | |
| **Number of Saplings/Acre** | 1442.28 | | | | | |

### 3.2. Qualitative Transect Data

A summary of the qualitative data and a plant list (Table 8) 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 wet flatwoods using the FNAI classification. This is an area of former pasture land in the process of being restored. Fire burned across this landscape in July 2015, reducing the shrubs to coppice. Some fire resistant trees such as slash pine and pond cypress survived the fire. There is no mature canopy. A young canopy near this point has become established, which consists of slash pine and planted and naturally recruiting pond cypress, red maple, swamp tupelo, and white cedar. Shrub coverage has increased since the last fire. The dominant shrub species is *Baccharis halimifolia,* followed by *Myrica cerifera*. The graminoid groundcover coverage class is 76-100% percent and the total groundcover cover class is 76-100% percent. The dominant groundcover species are *Andropogon virginicus, Symphyotrichum dumosum, Viola lanceolata, Agalinis divaricata, Axonopus furcatus, Centella asiatica, Ctenium aromaticum. Cuphea carthagenensis, Diodia virginiana, Eupatorium leptophyllum, Eupatorium leptophyllum, Euthamia caroliniana, Ludwigia linifolia, Ludwigia pilosa, Panicum verrucosum*, and *Scoparia dulcis.* The groundcover contains a diversity of groundcover species.

Wildlife observations included bald eagle (*Haliaeetus leucocephalus*), cooper's hawk (*Accipiter cooperii*), sharp shinned hawk (*Accipiter striatus*), sedge wren (*Cistothorus platensis*), yellowthroat (*Geothlypis trichas*), northern mockingbird (*Mimus polyglottos*), turkey vulture (*Cathartes aura*), eastern bluebird (*Sialia sialis*), common crow (*Corvus brachyrhynchos*), eastern phoebe (*Sayornis phoebe*), cloudless sulphur (*Phoebis sennae*), gulf fritillary (*Agraulis vanillae*), buckeye butterfly (*Junonia coenia*), tiger swallowtail (*Papilio glaucus*), pipevine swallowtail (*Battus philenor*), monarch (*Danaus plexippus*), grasshoppers, crickets, beetles, dragonflies, green lynx spider (*Peucetia viridans*), and flower crab spider (*Misumenops celer*). Wintering phoebe were hawking insects, cloudless Sulphur were migrating, and gulf fritillary were also migrating and feeding on the flowers of goldenrod and aster. White tailed deer (*Odocoileus virginianus*) were observed during monitoring. Alligators, sunfish, large mouth bass and gambusia were observed in the ditches along the roads and in pools found along the east side of the site.

Exotic species were observed, including the Chinese tallow (*Sapium sebiferum*), vaseygrass (*Paspalum urvillei*), Colombian waxweed (*Cuphea carthagenensis*), cogon grass (*Imperata cylindrica*), and bahia grass (*Paspalum notatum*). None of these species are dominant plants (although waxweed is very common) and all of these species are currently controlled by prescribed fire. Vaseygrass and Columbian waxweed are short-lived successional species that probably do not warrant chemical control. A decline in the coverage of rutting by feral hogs (*Sus scrofa*) was observed. The disturbed soils favor primarily native, successional species.

Natural regeneration of appropriate species is occurring. At least 47 native plant species were observed in the quantitative transect and many of these are graminoid species that are good for carrying fire across the landscape. The overall impression of the landscape is one of dominance by *Andropogon virginicus* with a few shrubs and tree samplings rising above the approximately 4 feet growth of *Androgopon*. Overall, the landscape is trending toward a variety of recovered wetland ecosystems. The fire in 2015 stimulated flowering and fruiting of primarily native plants at the landscape scale. This disturbance and the recent flooding have been beneficial to the native wildlife and creation of a resilient and recovering landscape.

**Table 8. Plant List for YRR-PT1 625 Hydric Pine Flatwoods**

| Scientific Name | Common Name |
|---|---|
| *Agalinus fasciculata* | false foxglove |
| *Ambrosia artemisiifolia* | annual ragweed |
| *Andropogon virginicus* | broomsedge bluestem |
| *Axonopus furcatus* | carpetgrass |
| *Baccharis halimifolia* | saltbush |
| *Balduina angustifolia* | coastal plain honeycombhead |
| *Bidens mitis* | beggarticks |
| *Centella asiatica* | coinwort |
| *Cuphea carthagenensis* | Colombian waxweed |
| *Dichanthelium scabriusculum* | woolly rosette grass |
| *Eragrostis virginica* | tender lovegrass |
| *Eupatorium lepophyllum* | cutleaf thoroughwort |
| *Eupatorium mohrii* | Mohr's thoroughwort |
| *Euthamia caroliniana* | flattop goldenrod |
| *Fuirena breviseta* | umbrella sedge |
| *Hydrocotyle verticillata* | whorled marshpennywort |
| *Hypericum cistifolium* | St John's wort |
| *Hyptis alata* | clustered bushmint |
| *Ilex cassine v. myrtifolia* | myrtle dahoon |
| *Juncus effusus subsp. solutus* | lamp rush |
| *Juncus marginatus* | rush |
| *Lachnanthes caroliana* | redroot |
| *Liatris spicata* | dense blazing star |
| *Lobelia glandulosa* | globe lobelia |
| *Ludwigia linifolia* | primrose willow |
| *Ludwigia pilosa* | hairy primrose willow |
| *Ludwigia virgata* | savannah primrose willow |
| *Myrica cerifera* | wax myrtle |
| *Nyssa sylvatica v. biflora* | swamp tupelo |
| *Oldenlandia uniflora* | clustered mille graines |
| *Paspalum urvillei* | Vasey's grass |
| *Pinus elliottii* | slash pine |
| *Polypremum procumbens* | rustweed |
| *Rhexia mariana* | Maryland meadow beauty |

**Table 8. Plant List for YRR-PT1 625 Hydric Pine Flatwoods (Continued)**

| Scientific Name | Common Name |
|---|---|
| *Rhexia virginica* | Virginia meadow beauty |
| *Rhynchospora chapmanii* | Chapman's beaksedge |
| *Rhynchospora colorata* | starsedge |
| *Rhynchospora microcarpa* | southern beaksedge |
| *Rhynchospora pusilla* | beaksedge |
| *Rubus argutus* | sawtooth blackberry |
| *Rubus cuneifolius* | blackberry |
| *Sapium sebiferum* | Chinese tallow tree |
| *Scoparia dulcis* | goatweed |
| *Solidago rugose subsp. aspera* | goldenrod |
| *Symphyotrichum dumosum* | rice button aster |
| *Verbena brasiliensis* | Brazilian vervain |
| *Viola lanceolata* | lance-leaf 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 restoration site is located within the floodplain of the Yellow River. Intact native bottomland forest 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 historic 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 (primarily bahia grass). Restoration of the site involves hydrologic modification, installation of appropriate native species, control of invasive species, and prescribed fire.

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. Table 9 summarizes the performance standards for each of the sampled plant communities.

The results of quantitative monitoring within the polygon identified as Hydric Pine Flatwoods (625) indicate that this is a landscape dominated by successional graminoids and forbs. The presence of successional, herbaceous, native species is indicative of a landscape that is in the process of recovery. Species richness ranges from approximately 40-47 species in the quantitative transects. All shrubs were reduced to coppice by the 2015 prescribed fire.

In October 2016 a few scattered Chinese tallow were found. The Chines tallow had been burned and coppiced from the 2015 fire. Bahai grass and Vasey grass coverage was minimal. Cogongrass was found near the site of the original infestation.

The quantitative summary results for the tree saplings in the target FLUCCS communities identified as forested/cypress wetlands (615 and 621) indicate that there are at least 300 to 2,400 trees/acre in the sample area. The white cedar density has been substantially reduced in 2016, as compared with previous monitoring years. This is due to their sensitivity to fire and long term inundation. Pond cypress, slash pine, red maple, swamp tupelo have all displayed a marked increase in overall woody growth. There is evidence of large numbers of natural dispersal of tree seedlings across the site. Plants with winged seeds such as slash pine, red maple, and pond cypress are locally common. Sapling swamp tupelo were also observed throughout the site. Many of these are probably dispersed by birds.

The landscape traversed during the pedestrian transect is entirely mapped as Hydric Pine Flatwoods (625). Herbaceous plant lifeform dominance is primarily herbaceous and graminoid throughout the landscape and this is consistent with and corroborated by the quantitative measures of groundcover. In addition, numerous animals and insects were seen feeding and otherwise using the open, grassy landscape. Notable animals observed during the monitoring included white tailed deer, alligators, Cooper's hawk, sharp shinned hawk, bald eagle, migrating monarch butterflies, and a high diversity of insects feeding on flowering frost aster and false foxglove.

**Table 9. Objectives, Performance Standards, and Current Status by Habitat Type.**

| Objectives | Performance Standards | Status |
|---|---|---|
| 150' Linear Transect YRRT1-625 Hydric Pine Flatwoods | | |
| Reduce and/or eliminate invasive, exotic and nuisance vegetation. | Invasive exotic vegetation less than 1% cover over the site and nuisance/non-invasive exotic vegetation less than 5% cover. | Invasive exotics less than 1% of the groundcover coverage; nuisance, non-native vegetation less than 1% cover. |
| Increase coverage and diversity of native, appropriate vegetation. | Kind and total coverage of species appropriate for management goals and target natural community. 80% coverage by desirable species. | At least 80% coverage by native species. Species richness of native plants is 47. |

**Table 9. Objectives, Performance Standards, and Current Status by Habitat Type (Continued).**

| Objectives | Performance Standards | Status |
|---|---|---|
| 150' Linear Transect YRRT1-625 Hydric Pine Flatwoods | | |
| Increase coverage and diversity of native, appropriate tree vegetation. | Kind and total coverage of tree species appropriate for management goals and target natural community. | Tree species are appropriate for wet pinelands. |
| Increase coverage and diversity of native, appropriate groundcover vegetation. | Increase in appropriate herbaceous, shrub and /or tree species. | Site is recovering with increased diversity and coverage by native species. |
| 150' Linear Transect YRRT2-625 Hydric Pine Flatwoods | | |
| Reduce and/or eliminate invasive, exotic and nuisance vegetation. | Invasive exotic vegetation less than 1% cover over the site and nuisance/non-invasive exotic vegetation less than 5% cover. | Invasive exotics less than 1% of the groundcover coverage; nuisance, non-native vegetation less than 1% cover. |
| Increase coverage and diversity of native, appropriate vegetation. | Kind and total coverage of species appropriate for management goals and target natural community. 80% coverage by desirable species. | At least 80% coverage by native species. Species richness of native plants is 40. |
| Increase coverage and diversity of native, appropriate tree vegetation. | Kind and total coverage of tree species appropriate for management goals and target natural community. | Tree succession occurring, mostly swamp tupelo. |
| Increase coverage and diversity of native, appropriate groundcover vegetation. | Increase in appropriate herbaceous, shrub and /or tree species. | Site is recovering with increased diversity and coverage by native species. |

**Table 9. Objectives, Performance Standards, and Current Status by Habitat Type (Continued).**

| Objectives | Performance Standards | Status |
|---|---|---|
| Belt Transect YYR-BT1-615 Bottomland | | |
| Reduce and/or eliminate invasive, exotic and nuisance vegetation. | Invasive exotic vegetation less than 1% cover over the site and nuisance/non-invasive exotic vegetation less than 5% cover. | Invasive exotics less than 1% of the groundcover coverage; nuisance, non-native vegetation less than 1% cover. |
| Increase coverage and diversity of native, appropriate vegetation. | Kind and total coverage of species appropriate for management goals and target natural community. 80% coverage by native species. | Site is recovering with increased diversity and coverage by native species. 100% coverage by native species. |
| Increase coverage and diversity of native, appropriate tree vegetation. | Kind and total coverage of tree species appropriate for management goals and target natural community. | Site is recovering with increased diversity and coverage by native species. |
| Increase coverage and diversity of native, appropriate groundcover vegetation. | Increase in appropriate herbaceous, shrub and /or tree species. | Site is recovering with appropriate diversity and coverage by native species. |
| Belt Transect YYR-BT2-615 Bottomland | | |
| Reduce and/or eliminate invasive, exotic and nuisance vegetation. | Invasive exotic vegetation less than 1% cover over the site and nuisance/non-invasive exotic vegetation less than 5% cover. | Invasive exotics less than 1% of the groundcover coverage; nuisance, non-native vegetation less than 1% cover. |
| Increase coverage and diversity of native, appropriate vegetation. | Kind and total coverage of species appropriate for management goals and target natural community. 80% coverage by native species. | Site is recovering with increased diversity and coverage by native species. 100% coverage by native species. |

**Table 9. Objectives, Performance Standards, and Current Status by Habitat Type (Continued).**

| Objectives | Performance Standards | Status |
|---|---|---|
| Belt Transect YYR-BT2-615 Bottomland | | |
| Increase coverage and diversity of native, appropriate tree vegetation. | Kind and total coverage of tree species appropriate for management goals and target natural community. | Site is recovering with appropriate diversity and coverage by native species. |
| Increase coverage and diversity of native, appropriate groundcover vegetation. | Increase in appropriate herbaceous, shrub and /or tree species. | Site is recovering with appropriate diversity and coverage by native species. |
| Belt Transect YYR-BT3-621 Cypress | | |
| Reduce and/or eliminate invasive, exotic and nuisance vegetation. | Invasive exotic vegetation less than 1% cover over the site and nuisance/non-invasive exotic vegetation less than 5% cover. | Invasive exotics less than 1% of the groundcover coverage; nuisance, non-native vegetation less than 1% cover. |
| Increase coverage and diversity of native, appropriate vegetation. | Kind and total coverage of species appropriate for management goals and target natural community. 80% coverage by desirable species. | Site is recovering with increased diversity and coverage by native species. 100% coverage by desirable species. |
| Increase coverage and diversity of native, appropriate tree vegetation. | Kind and total coverage of tree species appropriate for management goals and target natural community. | Site is recovering with increased diversity and coverage by appropriate species. |
| Increase coverage and diversity of native, appropriate groundcover vegetation. | Increase in appropriate herbaceous, shrub and /or tree species. | Site is recovering with increased diversity and coverage by appropriate species. |

**Table 9. Objectives, Performance Standards, and Current Status by Habitat Type (Continued).**

| Objectives | Performance Standards | Status |
|---|---|---|
| Belt Transect YYR-BT4-621 Cypress | | |
| Reduce and/or eliminate invasive, exotic and nuisance vegetation. | Invasive exotic vegetation less than 1% cover over the site and nuisance/non-invasive exotic vegetation less than 5% cover. | Invasive exotics less than 1% of the groundcover coverage; nuisance, non-native vegetation less than 1% cover. |
| Increase coverage and diversity of native, appropriate vegetation. | Kind and total coverage of species appropriate for management goals and target natural community. 80% coverage by appropriate species. | Site is recovering with increased diversity and coverage by native species. 100% coverage by appropriate species. |
| Increase coverage and diversity of native, appropriate tree vegetation. | Kind and total coverage of tree species appropriate for management goals and target natural community. | Site is recovering with increased diversity and coverage by appropriate species. |
| Increase coverage and diversity of native, appropriate groundcover vegetation. | Increase in appropriate herbaceous, shrub and /or tree species. | Site is recovering with increased diversity and coverage by appropriate species. |

## 5.0. CONCLUSIONS AND RECOMMENDATIONS

Notes on the current conditions at the Yellow River Ranch restoration site were obtained from ecological monitoring in 2016. Most of the site was burned in July 2015. This resulted in the rejuvenation of herbaceous species, woody sensitive species eliminated or reduced to coppice, and all landscapes that were burned are now dominated by graminoids and a variety of native wildflowers. Much of the site was flooded in 2016. Results of the monitoring demonstrate that the seepage slope and floodplain wetland are healthy and functioning ecosystems.

The bottomland (615) restoration area landscape was burned in 2015. Continued burning will help control the Chinese tallow tree seedlings, promote appropriate growth, and increase coverage of native groundcover species. Scattered pond cypress, swamp tupelo, red maple, and slash pine are thriving. Some of the cypress have been coppiced by fire. Overall use of

landscape scale prescribed fire is very beneficial for maintaining appropriate native species and lifeforms. The groundcover vegetation is healthy and providing habit and feeding sites for a variety of mammals, birds, reptiles, amphibians, and insects. The soil disturbance from feral hogs has decreased compared to observations in 2015.

The cypress (621) restoration landscape is dominated by graminoids with a scattered landscape of pond cypress saplings, many of which survived the 2015 prescribed fire without damage and have continued to grow larger in 2016. The groundcover vegetation is healthy and providing habitat and hunting conditions for a variety of birds. The soil disturbance from feral hogs has decreased compared to observations made in 2015.

The hydric pine flatwoods (625) is open and park-like with a layer of chest high broomgrass (*Andropogon virginicus*). Slash pine and wax myrtle are obvious where they have grown taller than the broomgrass. The open aspect of this landscape provides excellent foraging conditions for a variety of birds, white tailed deer, and feral hogs. The soil disturbance from feral hogs has decreased compared to observations made in 2015. These areas were colonized by early successional native grasses and sedges. The bahia grass has decreased. Non-native plants occupy less than 1% of the landscape. Selective herbicide treatment of Chinese tallow is recommended. With continued burning, the hydric pine flatwoods (625) landscape will continue to trend toward the desired target and become a self-sustaining ecosystem with increased ecological processes.

ERC recommends frequent, prescribed fire as the best management tool for ecosystem recovery at this site. In addition, the vegetation will continue to recover as the feral hogs are removed and with targeted herbicide of non-native plants. No significant expansion of non-native plants or animals was observed. The trapping of hogs has resulted in an observable reduction of the coverage of rutting as seen from pedestrian and quantitative transects. Selective herbicide treatment of the non-native Chinese tallow in the hydric pine flatwoods is recommended. Prescribed fire should be continued whenever possible, as fire is the best management for this site. Prescribed fire may be deferred until a later date in areas of planted pond cypress and slash pine seedlings to allow for continued growth and development of fire resistance.

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