2015 Monitoring Report

YELLOW RIVER RANCH

Santa Rosa County, Florida

ERC #: 15-196C

November 2015

Ecological Resource Consultants, Inc.

2015 Monitoring Report

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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 November 2015 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 2015 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 November 2015 monitoring event documents a landscape in full recovery. The prescribed fire of July 16, 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. Numerous animals and insects were observed using the landscape for 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.

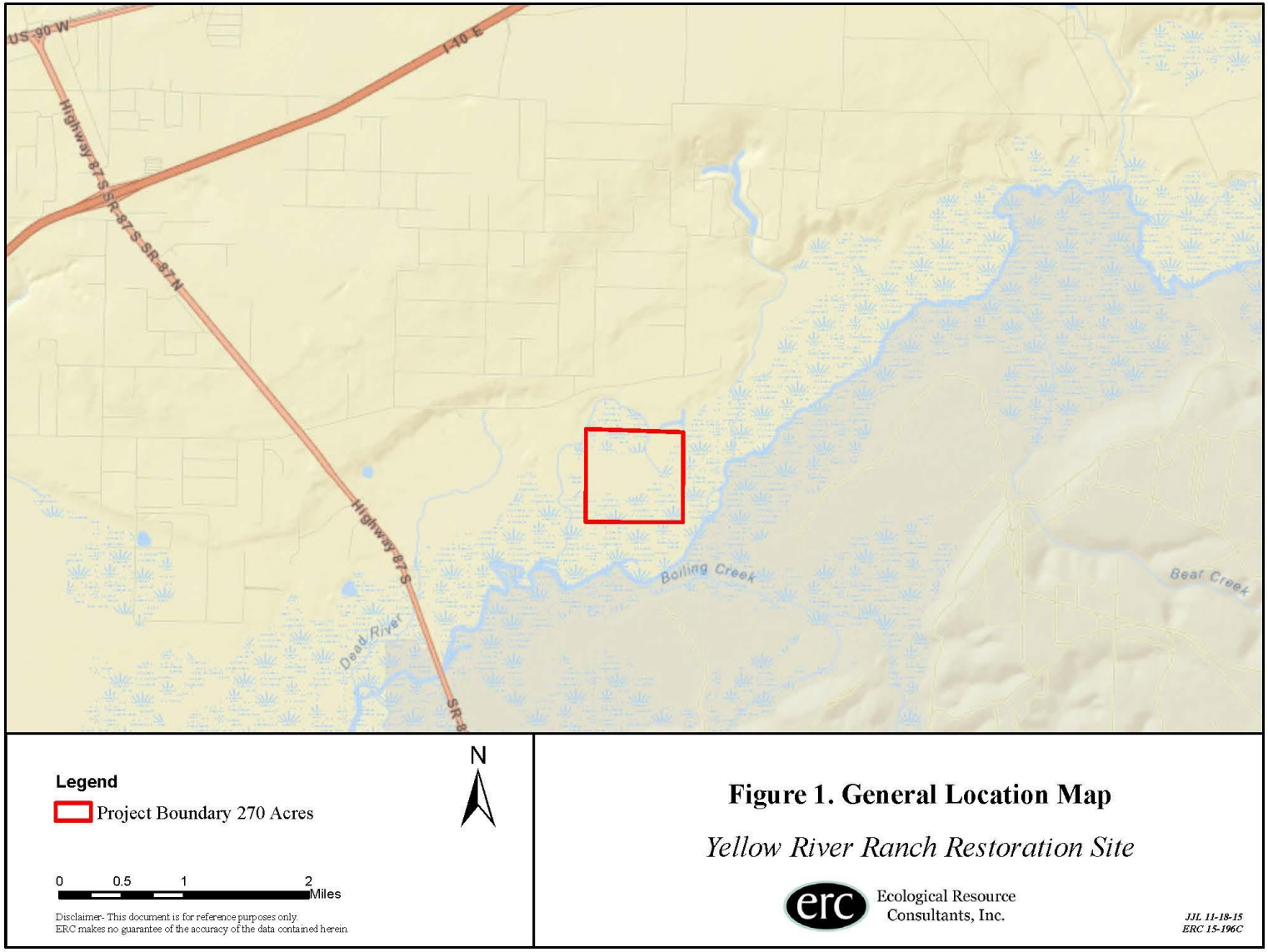
US-90-W
I-10-E
Highway-87-S-SR-87-S-SR-87-N
Highway-87-S
Boiling Creek
Beat Creek
Dead River
SR-8
Legend
Project Boundary 270 Acres
N
0 0.5 1 2
Miles
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Figure 1. General Location Map
Yellow River Ranch Restoration Site
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2.0 METHODS

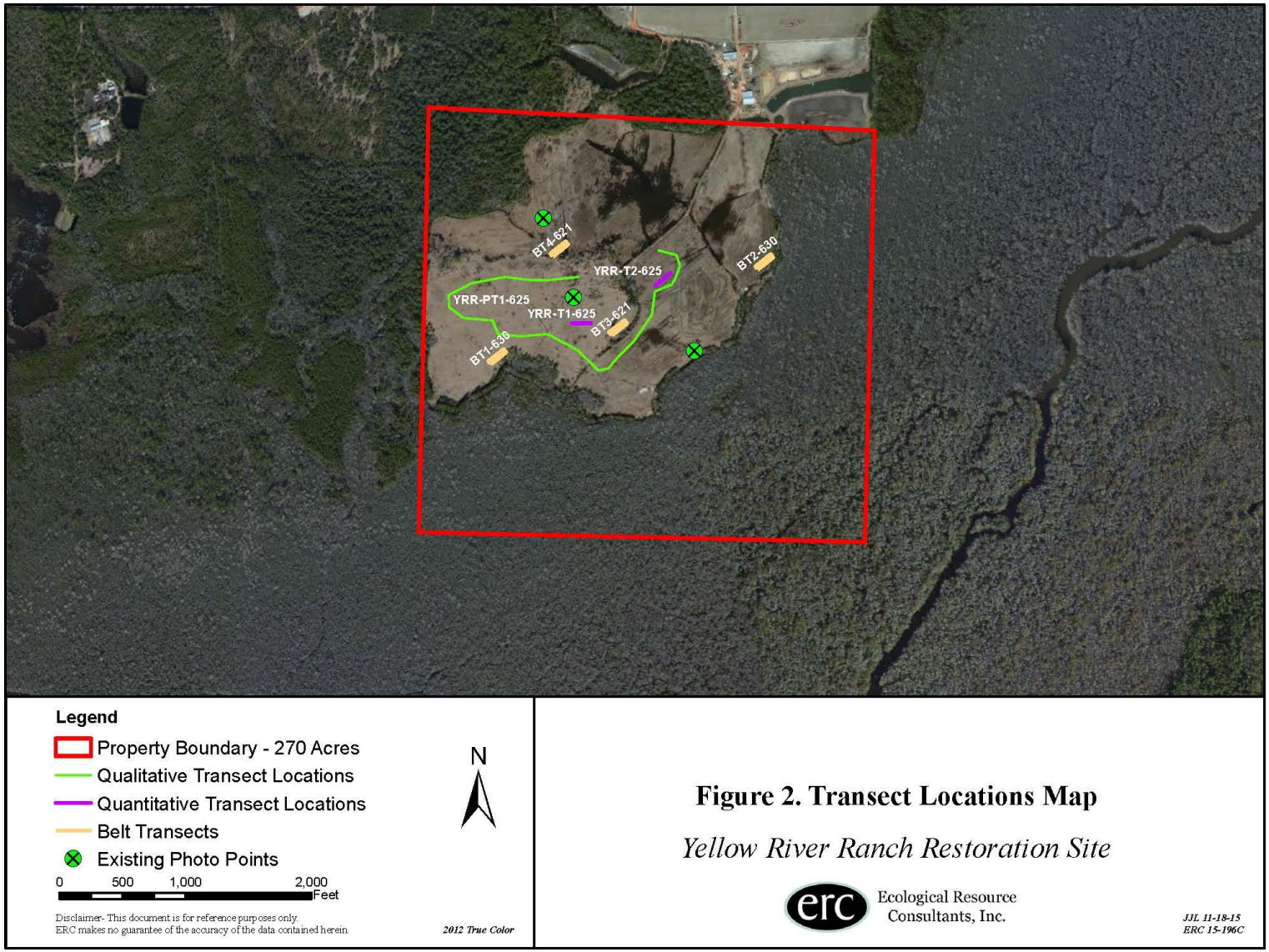
2.1 Field Methods

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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2012 True Color
N
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.

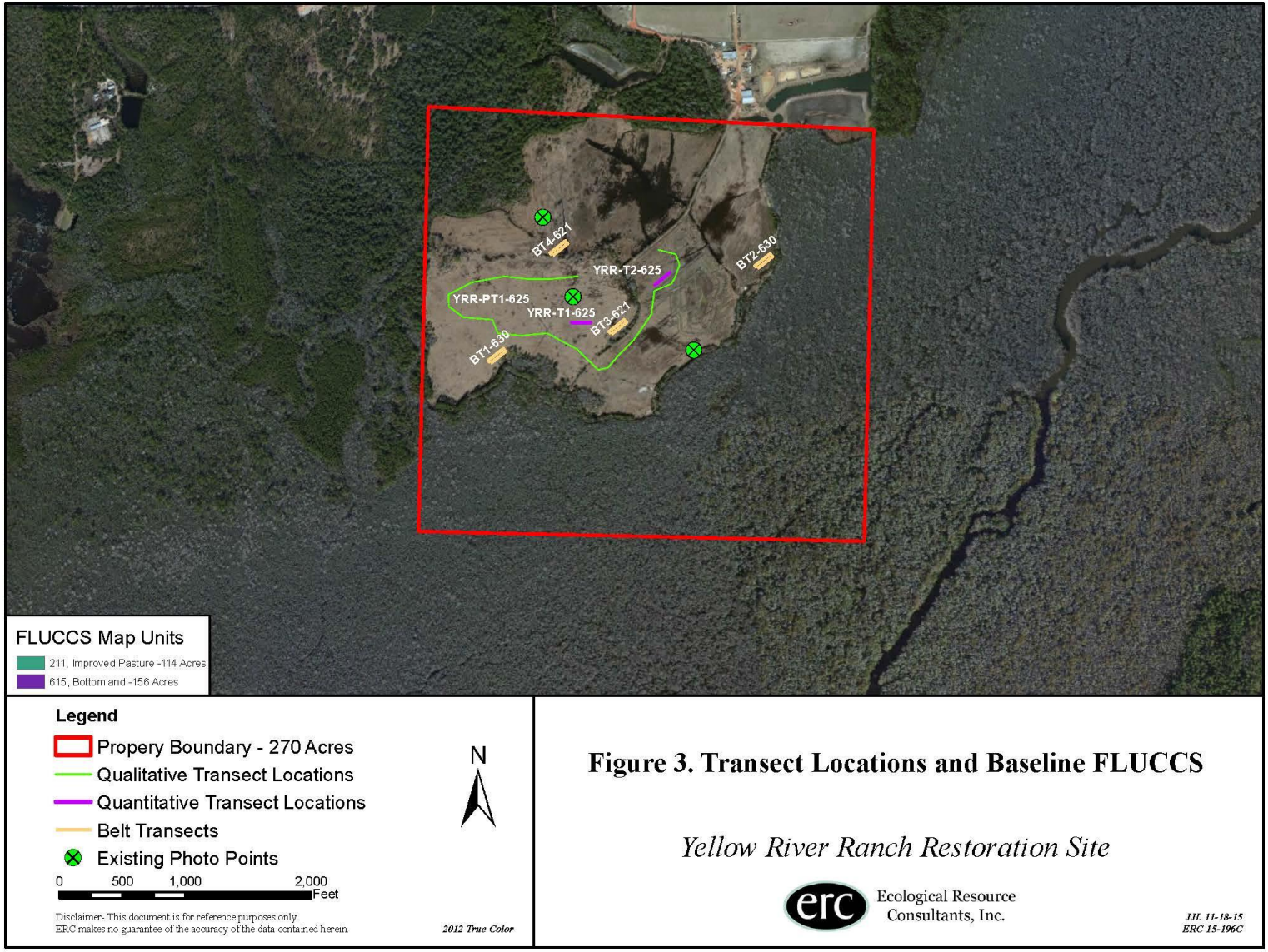
BT4-621
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Figure 3. Transect Locations and Baseline FLUCCS
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Figure 4. Transect Locations and Target FLUCCS

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	6.4	5.5	7.6	6.3
Viola lanceolata	6.2	3.8	9.7	5.0
Rubus argutus	6.0	5.3	5.8	6.9
Scoparia dulcis	5.9	4.3	6.5	6.9
Diodia virginiana	5.3	4.1	6.2	5.7
Hypericum cistifolium	4.1	3.8	4.8	3.8
Polypremum procumbens	3.5	1.9	4.7	3.8
Eupatorium capillifolium	3.4	3.0	2.7	4.4
Euthamia graminifolia	3.0	2.3	3.6	3.1
Eupatorium leptophyllum	2.7	3.1	1.9	3.1
Cuphea carthagenensis	1.9	1.5	2.4	1.9
Euthamia caroliniana	1.4	1.0	1.4	1.9
Rubus cuneifolius	0.9	0.8	1.3	0.6
Rubus trivialis	0.7	0.4	0.6	1.3
Solidago rugosa	0.6	0.8	0.4	0.6
Xyris drummondii	0.6	0.3	0.8	0.6
Dichondra carolinensis	0.5	0.3	0.7	0.6
Hypericum tetrapetalum	0.5	0.8	0.1	0.6
Eupatorium compositifolium	0.5	0.4	0.3	0.6
Lachnanthes caroliana	0.4	0.3	0.4	0.6
Solidago canadensis	0.4	0.3	0.3	0.6

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

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Forbs				
Rhexia mariana	0.4	0.4	0.1	0.6
Agalinis fasciculata	0.4	0.3	0.2	0.6
Ludwigia virgata	0.4	0.3	0.2	0.6
Graminoids				
Andropogon virginicus	15.5	29.6	8.8	8.2
Rhynchospora pusilla	4.1	3.8	5.8	2.5
Rhynchospora chapmanii	2.7	2.0	3.0	3.1
Axonopus furcatus	2.7	2.7	2.9	2.5
Centella asiatica	2.5	1.4	3.5	2.5
Juncus marginatus	2.2	1.0	2.3	3.1
Cyperus flavescens	1.3	0.4	2.9	0.6
Kyllinga odorata	1.6	0.8	2.1	1.9
Paspalum notatum	1.6	2.2	0.7	1.9
Rhynchospora plumosa	1.5	1.1	1.5	1.9
Rhynchospora microcarpa	0.9	0.7	0.6	1.3
Eragrostis virginica	0.8	0.9	0.3	1.3
Ctenium aromaticum	0.5	0.8	0.1	0.6
Rhynchospora cephalantha	0.5	0.4	0.4	0.6
Fuirena breviseta	0.5	0.8	0.1	0.6
Panicum anceps	0.4	0.3	0.4	0.6
Juncus scirpoides	0.4	0.4	0.1	0.6
Woody Plants				
Baccharis halimifolia	2.5	2.6	1.3	3.8
Myrica cerifera	1.9	3.5	0.8	1.3

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%	48.20%	6.10%	12.50%	43
Shrub Height (meters)				0.39

Transect YRRT1-625 Hydric Pine Flatwoods

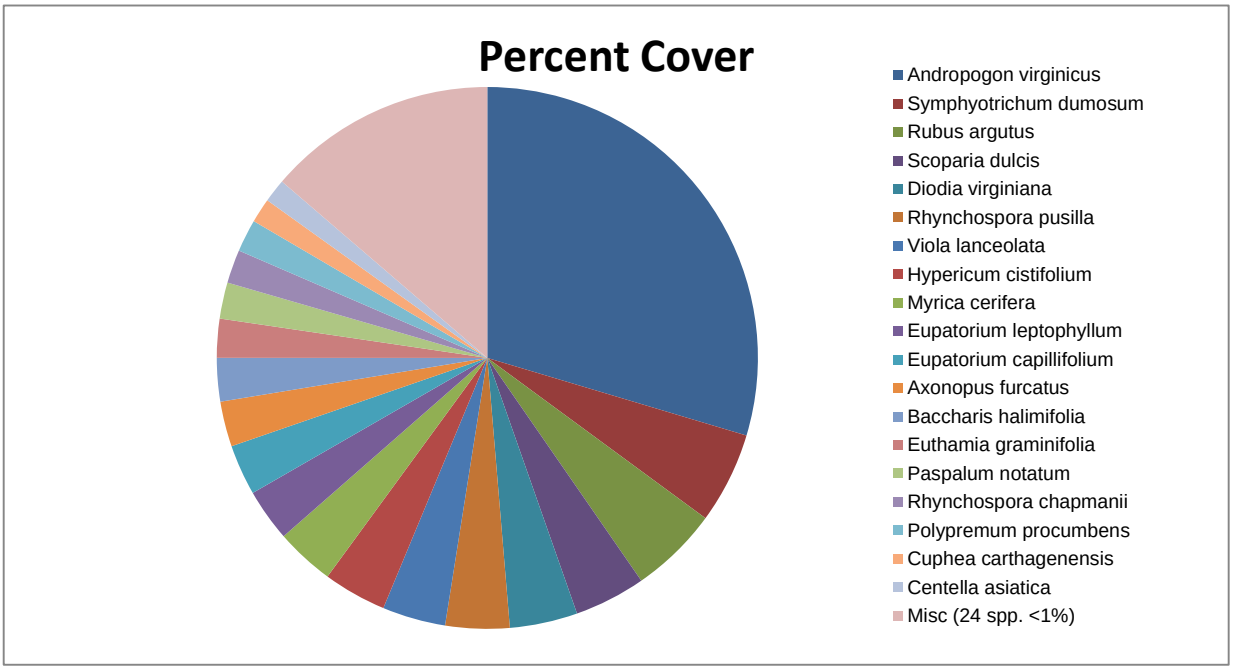

Table 3a. Transect YRRT2-625 Hydric Pine Flatwoods

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Forbs				
Viola lanceolata	12.5	6.7	22.7	8.0
Symphyotrichum dumosum	10.9	12.2	8.8	11.7
Centella asiatica	7.8	5.0	11.1	7.3
Ludwigia pilosa	3.8	3.8	3.1	4.4
Hypericum cistifolium	2.0	1.9	2.0	2.2
Eupatorium leptophyllum	2.0	2.1	1.0	2.9
Cuphea carthagenensis	1.6	1.1	2.2	1.5
Euthamia caroliniana	1.5	1.1	1.1	2.2
Solidago rugosa	1.0	1.0	1.4	0.7
Rubus cuneifolius	0.8	0.4	0.6	1.5
Rhexia virginica	0.7	0.7	0.7	0.7
Lachnanthes caroliana	0.5	0.3	0.6	0.7
Eupatorium mohrii	0.5	0.7	0.2	0.7
Solidago fistulosa	0.4	0.4	0.2	0.7
Pluchea foetida	0.4	0.4	0.1	0.7
Ludwigia linifolia	0.4	0.3	0.1	0.7
Hypericum brachyphyllum	0.4	0.3	0.1	0.7
Diodia virginiana	0.3	0.1	0.2	0.7
Xyris serotina	0.3	0.1	0.1	0.7

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

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Graminoids				
Axonopus furcatus	13.5	17.6	14.0	8.8
Andropogon virginicus	8.6	11.9	5.2	8.8
Rhynchospora chapmanii	5.7	4.2	6.9	5.8
Dichanthelium scabriusculum	3.8	6.4	1.3	3.6
Rhynchospora microcarpa	3.6	3.4	2.9	4.4
Rhynchospora plumosa	3.2	3.2	4.9	1.5
Panicum verrucosum	1.7	0.7	3.0	1.5
Panicum hians	1.6	2.3	1.0	1.5
Eragrostis virginica	1.2	1.3	0.8	1.5
Panicum anceps	1.0	1.1	0.3	1.5
Andropogon glomeratus	0.9	1.6	0.4	0.7
Rhynchospora fascicularis	0.6	0.4	0.6	0.7
Fuirena breviseta	0.5	0.7	0.1	0.7
Rhynchospora chalarocephala	0.4	0.4	0.1	0.7
Paspalum notatum	0.3	0.1	0.1	0.7
Ctenium aromaticum	0.3	0.1	0.1	0.7
Woody Plants				
Nyssa biflora	3.9	4.3	1.5	5.8
Ilex glabra	0.9	1.0	0.4	1.5
Myrica cerifera	0.5	0.7	0.1	0.7

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%	4.57%	38
Shrub Height (meters)				0.52

Transect YRRT2-625 Hydric Pine Flatwoods

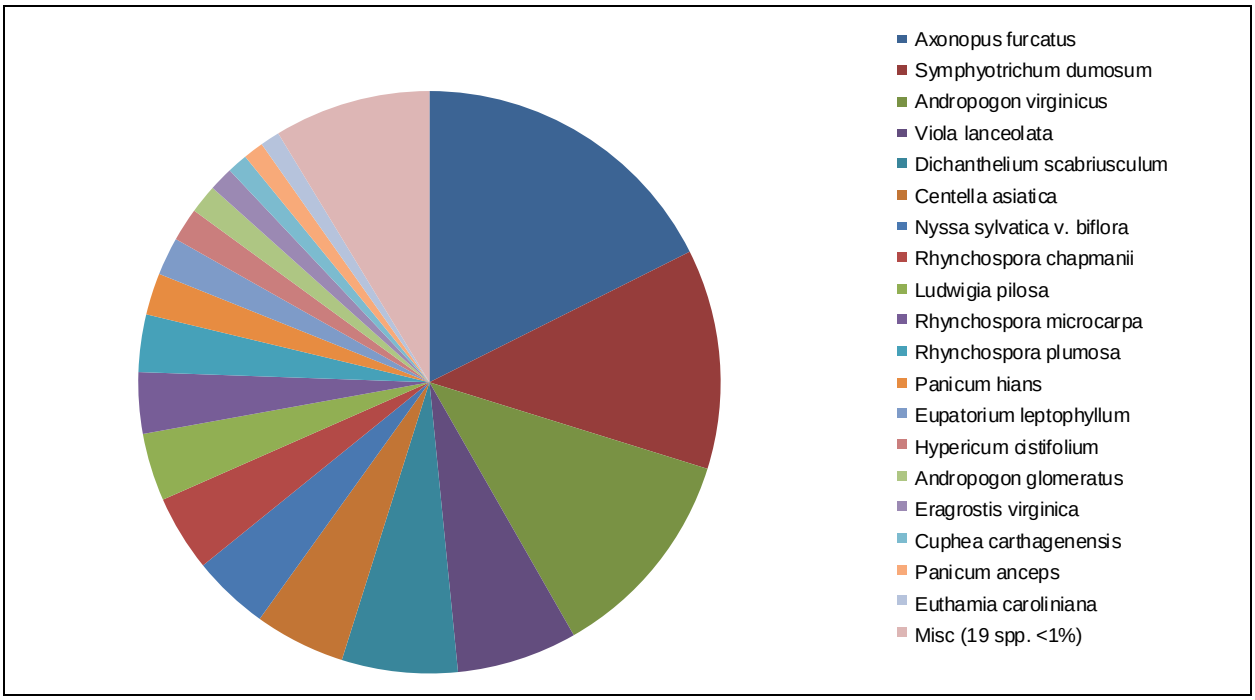

Table 4. Belt Transect Summary for YYR-BT1-630

Belt Transect Summaries for Transect YYR-BT1-630 (Wetland Forested Mix)								
		Height Scale (feet)						
Species	**Total Number**	**0-1'**	**>1'-2'**	**>2' -3'**	**>3'-4'**	**>4'-5'**	**>5'**	**Condition**
Acer rubrum			13	19			18	many are coppiced
Chamaecyparis thyoides				1				many saplings died from prolonged flooding
Ilex cassine			1					coppiced from 2015 fire
Nyssa biflora			1					coppiced from 2015 fire
Pinus elliottii				2		5	7	healthy/growing
Taxodium ascendens			3	4	14			healthy/growing
Total number of Saplings	88							
Number of Saplings/Acre	1256.64							

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'-2'**	**>2' -3'**	**>3'-4'**	**>4'-5'**	**>5'**	**Condition**
Chamaecyparis thyoides						4	11	healthy/growing
Juniperus virginiana								healthy/growing
Pinus palustris							1	healthy/growing
Quercus laurifolia						3		healthy/growing
Total number of Saplings	19							
Number of Saplings/Acre	271.32							

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'-2'**	**>2' -3'**	**>3'-4'**	**>4'-5'**	**>5'**	**Condition**
Chamaecyparis thyoides					2			healthy/growing
Pinus elliottii							2	healthy/growing
Taxodium ascendens		1	1	1				healthy/growing
Total number of Saplings	7							
Number of Saplings/Acre	99.96							

Table 7. Belt Transect Summaries for Transect YYR-BT4-621

Belt Transect Summaries for Transect YYR-BT4-621 (Cypress)								
		Height Scale (feet)						
Species	**Total Number**	**0-1'**	**>1'-2'**	**>2' -3'**	**>3'-4'**	**>4'-5'**	**>5'**	**Condition**
Pinus elliottii				1				healthy/growing
Nyssa biflora			14					coppiced from 2015 fire
Taxodium ascendens					49	19		healthy/growing
Total number of Saplings	83							
Number of Saplings/Acre	1185.24							

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 on July 16, 2015, reducing the shrubs to coppice. Some fire resistant trees such as slash pine and pond cypress survived the fire. There is no canopy nor subcanopy strata. Shrub coverage is very low. 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 site has relatively low bare ground coverage because the July 2015 fire, stimulated abundant growth and subsequent coverage by a diversity of groundcover species.

Wildlife observations included American kestrel (*Falco sparverius*), 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*), Wilson's snipe (*Gaillinago gallinago*), cloudless sulfur (*Phoebis sennae*), gulf fritillary (*Agraulis vanillae*), buckeye butterfly (*Junonia coenia*), grasshoppers, dragonflies, green lynx spider (*Peucetia viridans*), flower crab spider (*Misumenops celer*). Wintering phoebe were hawking insects, migrating cloudless sulfur, and gulf fritillary were also migrating and feeding on the flowers of goldenrod and aster. Cottonmouth (*Agkistrodon piscivorus*), ribbon snake (*Thamnophis sauritus*), leopard frog (*Rana sphenocephala*), cricket frog (*Acris gryllus*), narrowmouth toad (*Gastrophryne carolinensis*) and Carolina anole (*Anolis carolinensis*) were observed.

Exotic species were observed, including the Chinese tallow (*Sapium sebiferum*), vaseygrass (*Paspalum urvillei*), Colombian waxweed (*Cuphea carthagenensis*) and bahia grass (*Paspalum notatum*); however, none of these are dominant plants (although waxweed is very common) and all of these exotic species are currently controlled by prescribed fire. Vaseygrass and Columbian waxweed are short-lived successional species that probably do not warrant chemical control. Feral hogs (*Sus scrofa*) soil rutting continues to be a management challenge and their feeding activity creates soil disturbance that favors bahia grass and native successional species.

Natural regeneration of appropriate species is occurring. At least 50 native plant species were observed in the quantitative transect and most of these are graminoid species that are

good for carrying fire across the landscape. The amount of seed production of native grass species such as toothache grass, *Andropogon*, *Eragrostis*, *Panicum* and *Aristida* is impressive. Overall, the landscape is trending toward a variety of recovered wetland ecosystems. The recent fire stimulated flowering and fruiting of native plants at the landscape scale, benefiting the native wildlife.

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

Scientific Name	Common Name
Agalinus fasciculata	false foxglove
Andropogon glomeratus	big broomgrass
Andropogon glomeratus	broomgrass
Aristida palustris	three-awn grass
Aristida stricta	wiregrass
Axonopus furcatus	carpetgrass
Baccharis halimifolia	saltbush
Bidens mitis	beggarticks
Centella asiatica	coinwort
Ctenium aromaticum	toothache grass
Cyperus flavescens	flatsedge
Cyperus odoratus	flatsedge
Cuphea carthagenensis	Colombian waxweed
Dichanthelium acuminatum	tapered witchgrass
Dichondra carolinensis	ponyfoot
Dichanthelium ensifolium	witchgrass
Diodia virginiana	Virginia buttonweed
Erechtites hieracifolium	fireweed
Eupatorium capillifolium	dogfennel
Eupatorium leptophyllum	cutleaf thoroughwort
Euthamia spp.	flattop goldenrod
Fuirena breviseta	umbrella sedge
Hydrocotyle sp.	pennywort
Hypericum cistifolium	St Johns wort
Ilex vomitoria	yaupon
Kyllinga sp.	spikesedge
Juncus marginatus	rush
Juncus polycephalus	manyhead rush
Juncus scirpoides	rush
Lachnanthes caroliana	redroot
Ludwigia linifolia	primrose willow
Ludwigia maritima	seedbox primrose willow
Ludwigia pilosa	hairy primrose willow
Lycopus sp.	water horehound
Myrica cerifera	wax myrtle
Nyssa sylvatica v. *biflora*	swamp gum
Oldenlandia uniflora	clustered mille graines
Panicum anceps	Panicum

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

Scientific Name	Common Name
Panicum hians	Panicum
Panicum verrucosum	warty panicum
Paspalum dilatatum	Dallis grass
Paspalum floridanum	wetland paspalum
Paspalum notatum	Bahia grass
Polypremum procumbens	rustweed
Rhexia mariana	Maryland meadow beauty
Rhexia virginica	Virginia meadow beauty
Rhynchospora chapmanii	Chapman's beaksedge
Rhynchospora colorata	starsedge
Rhynchospora fascicularis	fascicled beaksedge
Rhynchospora inundata	longbeak beaksedge
Rhynchospora microcarpa	southern beaksedge
Rhynchospora plumosa	plumose beaksedge
Rhynchospora pusilla	beaksedge
Rubus argutus	sawtooth blackberry
Rubus cuneatus	blackberry
Rubus trivialis	dewberry
Sapium sebiferum	Chinese tallow tree
Schizachyrium sp.	bluestem
Scoparia dulcis	goatweed
Solidago rugosa	goldenrod
Symphyotrichum dumosa	frost aster
Viola primulifolia	primrose-leaf violet
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 50-60 species in the quantitative transects. All shrubs were reduced to coppice by recent fire.

In previous years of monitoring only a few Chinese tallow tree (*Sapium sebiferum*) and slash pine (*Pinus elliottii*) were observed throughout the landscape. Observations in November of 2015 indicate that many seedling white cedar and Chinese tallow were killed by the prescribed fire. Most of the pond cypress, which are fire resistant and appropriate to this landscape, survived the prescribed fire.

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 99 to 1,200 trees/acre in the sample area. White cedar density has been substantially reduced across the site primarily because they are sensitive to fire and long term inundation. Pond cypress have shown the greatest increase in overall woody growth. They are adapted to the use of periodic fire as a means to select for appropriate native plant species.

The landscape traversed during the pedestrian transect is entirely mapped as Hydric Pine Flatwoods (625). Herbaceous plant lifeform dominance in primarily herbaceous and graminoid throughout the landscape and this is consistent and corroborated by the quantitative measures of groundcover. In addition, numerous animals and insects were seen feeding and otherwise using the open, grassy landscape. The density of wintering birds using the landscape was reflected by the numerous calls from wrens, warblers and the flushing of Wilson's snipe.

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.

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 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 >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 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 >30.
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.
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.

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 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.
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.

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

Objectives	Performance Standards	Status
Belt Transect YYR-BT4-621 Cypress		
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 2015. Most of the site was burned in July of 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. Good diversity of native animals and insects were observed. Data and observations in 2015 indicate that the restoration site is a healthy, functioning ecosystem of seepage slope and floodplain wetlands.

The bottomland (615) restoration area landscape was burned in 2015. Future burning will help control the Chinese tallow tree seedlings and promote appropriate growth, coverage of native groundcover species. Scattered pond cypress and slash pine are thriving and some of the cypress have been coppiced by fire. Overall use of landscape scale prescribed fire is beneficial. The groundcover vegetation is healthy and providing habit and feeding sites for a variety of mammals, birds, reptiles, amphibians and insects. There is evidence of soil disturbance from feral hogs. Increased biological complexity of the bottomland (615) landscape was observed indicated progress towards a self-sustainable ecosystem.

The cypress (621) restoration area landscape is dominated by graminoids with a scattered pond cypress saplings, many of which survived the 2015 prescribed fire without damage. The groundcover vegetation is healthy and providing habitat conditions for a variety of birds. There is evidence of soil disturbance from feral hogs. Increased biological complexity of the cypress (615) landscape was observed indicated progress towards a self-sustainable ecosystem.

The hydric pine flatwoods (625) restoration areas appeared white and yellow from frost aster and goldenrod flowers during the monitoring period. No canopy species have been planted in this area. ERC recommends planting this area with an appropriate density of native hydric pine

flatwoods trees, such as slash and pond pines, and pond cypress. The groundcover vegetation was burned and is dominated by grasses and sedges. The open, park-like aspect of the landscape provides excellent foraging conditions for a variety of birds. There were large areas of soil disturbance from feral hogs. These areas were colonized by early successional native grasses and sedges, and bahia grass. Non-native bahia grass continues to persist in the area of the transect locations but is not a dominant groundcover and total coverage is less than 1% of the landscape. Selective herbicide treatment of bahia grass was conducted during the 2015 monitoring period and continued herbicide control of bahia grass 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.

Fall flowering asters and goldenrod were providing nectar for migrating gulf fritillaries, cloudless sulfurs, and many species of beneficial insects. American kestrel were observed hunting over the open landscape and using existing pond cypress as a perch. Cottonmouth and ribbon snakes were observed as were abundant frogs, a likely food source for water snakes. Narrowmouth toads were heard calling from shallow pools.

Threats to the inherent biodiversity of this site continue to feral hog damage and exotic invasive vegetation. Any expansion of non-native plants or animals should be monitored carefully. ERC recommends continued removal and/or control of feral hogs as is feasible. Selective herbicide treatment of the non-native bahia grass in the hydric pine flatwoods is recommended. Frequent prescribed fire is the best management for this site as often as weather and fuel conditions permit.

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