2014 Monitoring Report

YELLOW RIVER RANCH

Santa Rosa County, Florida

ERC #: 14-196E

November 2014

Ecological Resource Consultants, Inc.

2014 Monitoring Report

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Santa Rosa County, Florida

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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 2014 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 2014 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 2014 monitoring event documents a landscape in full recovery. The prescribed fire of 2014 reduced the shrubs to coppice 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

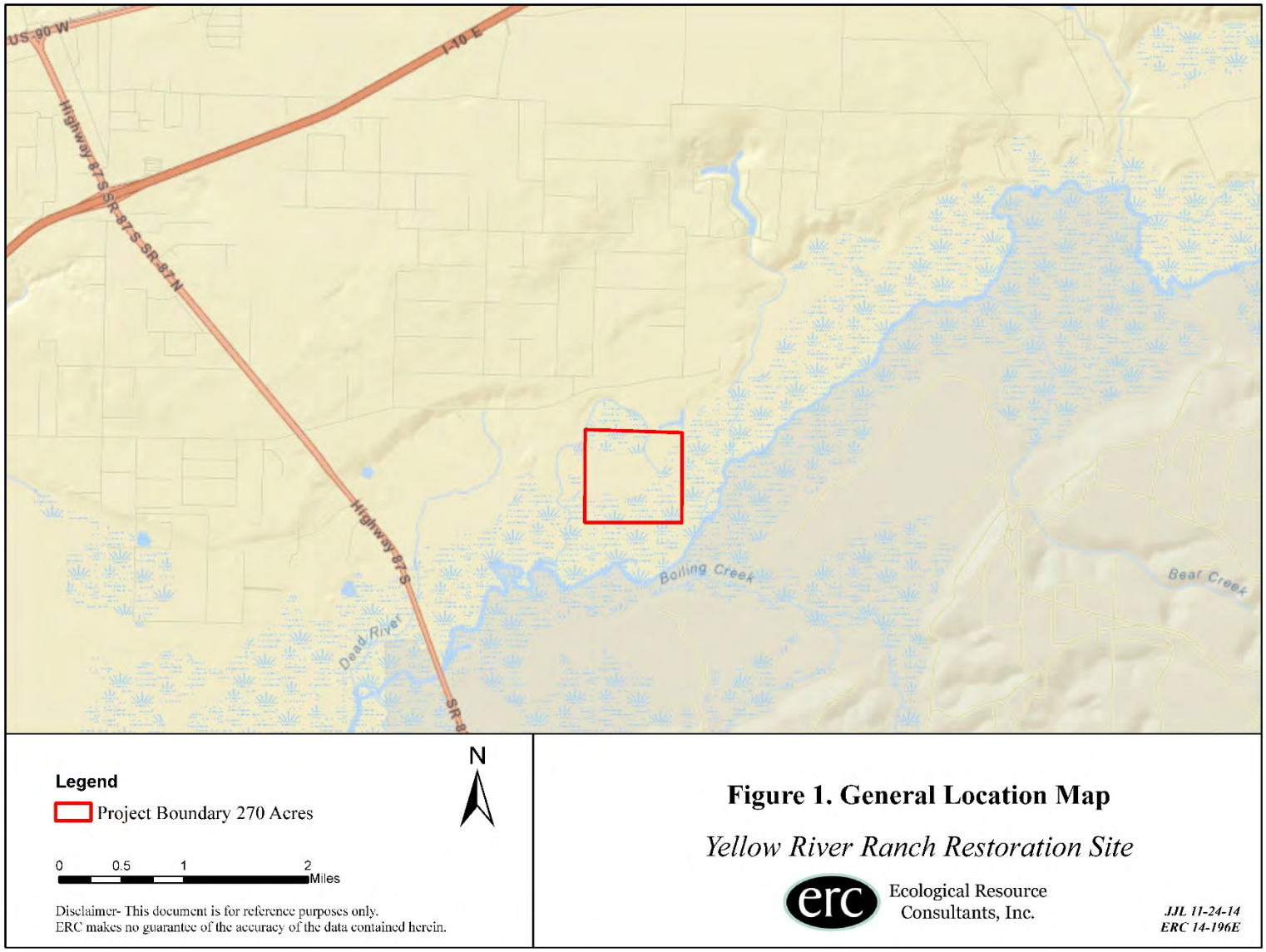
1.1. Purpose and Scope

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
Bear Creek
Dead River
SR-8
Legend
Project Boundary 270 Acres
N
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

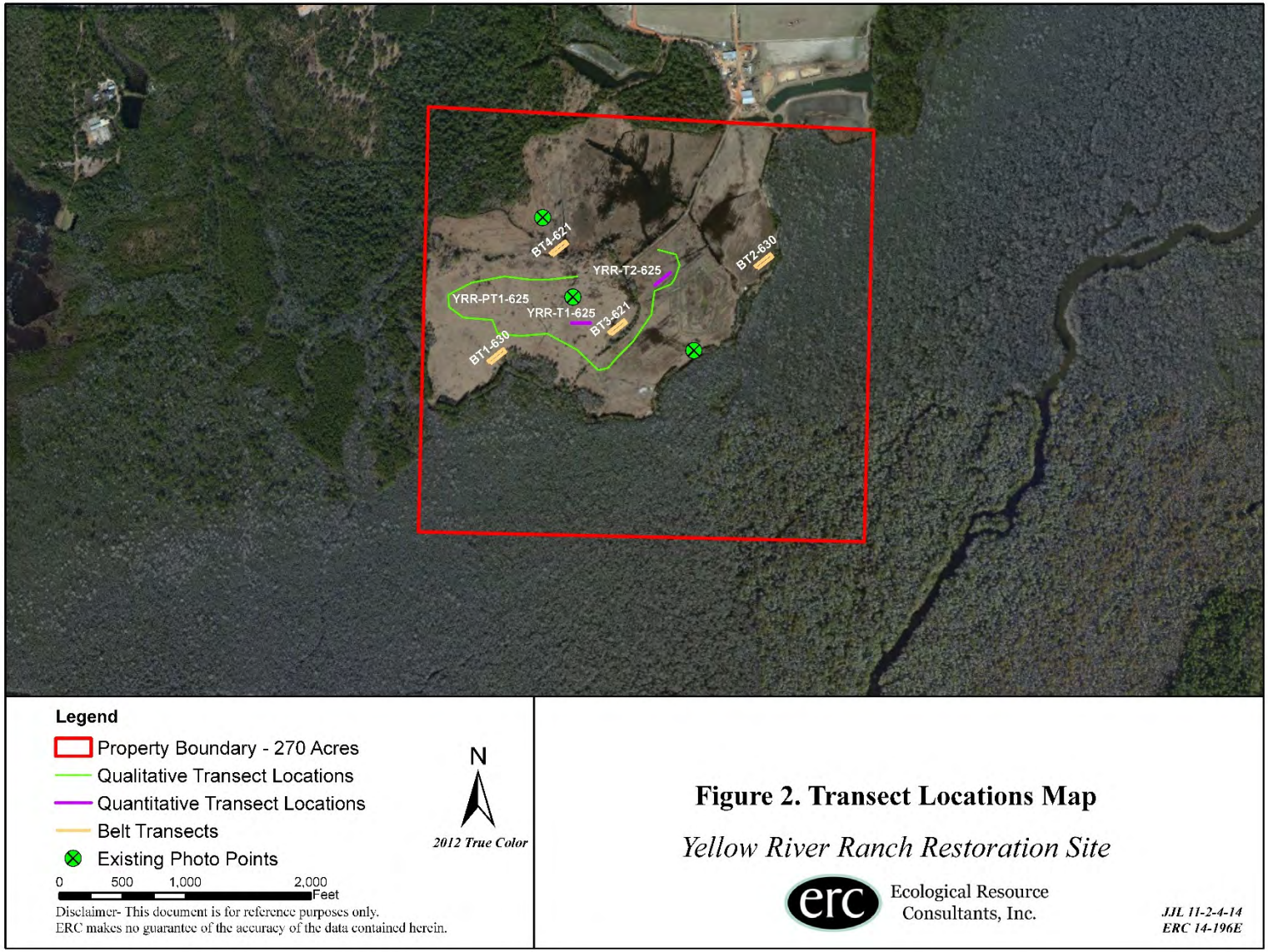
2.1 Field Methods

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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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.

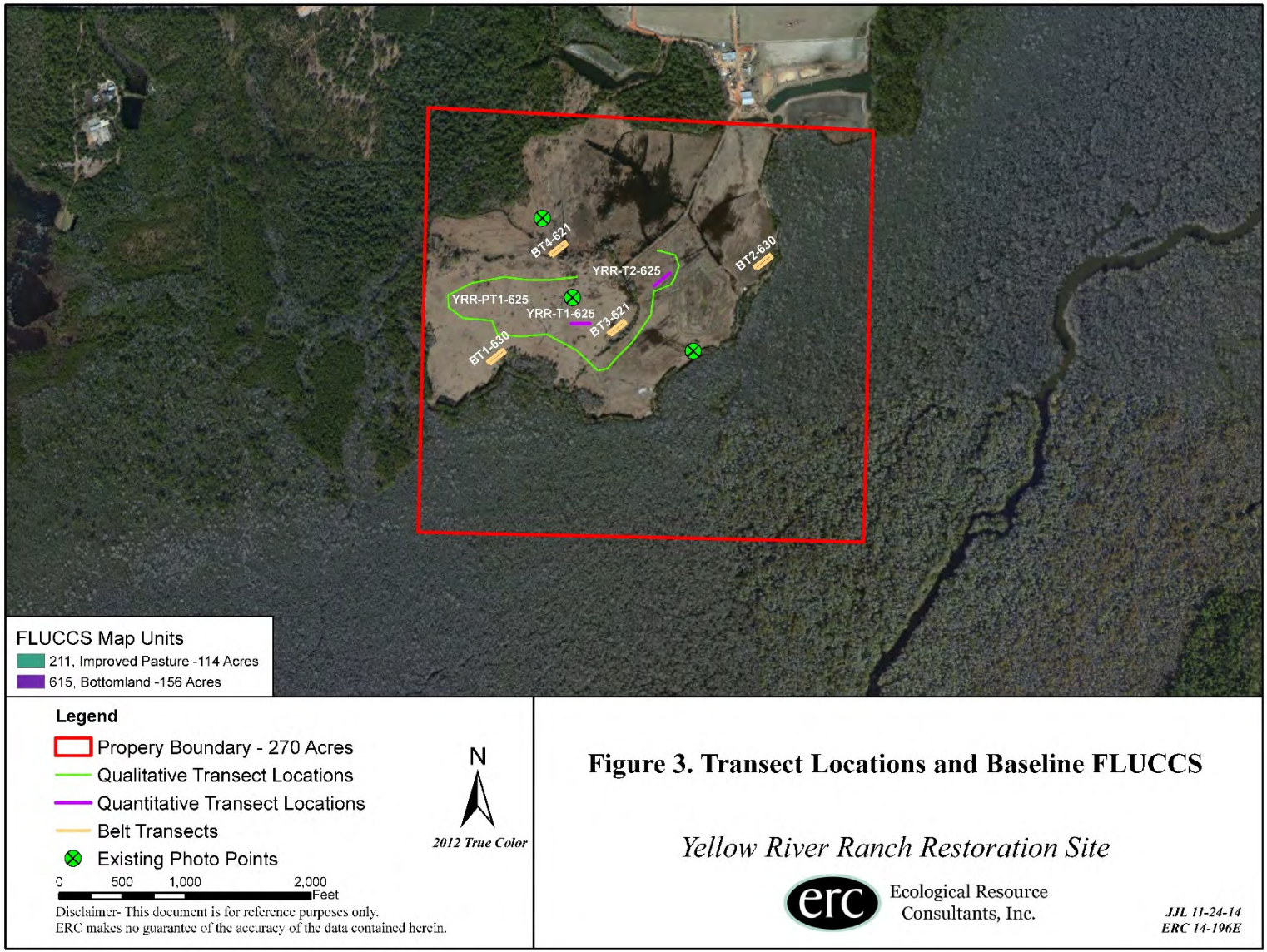

Figure 3. Transect Locations and Baseline FLUCCS

Yellow River Ranch Restoration Site

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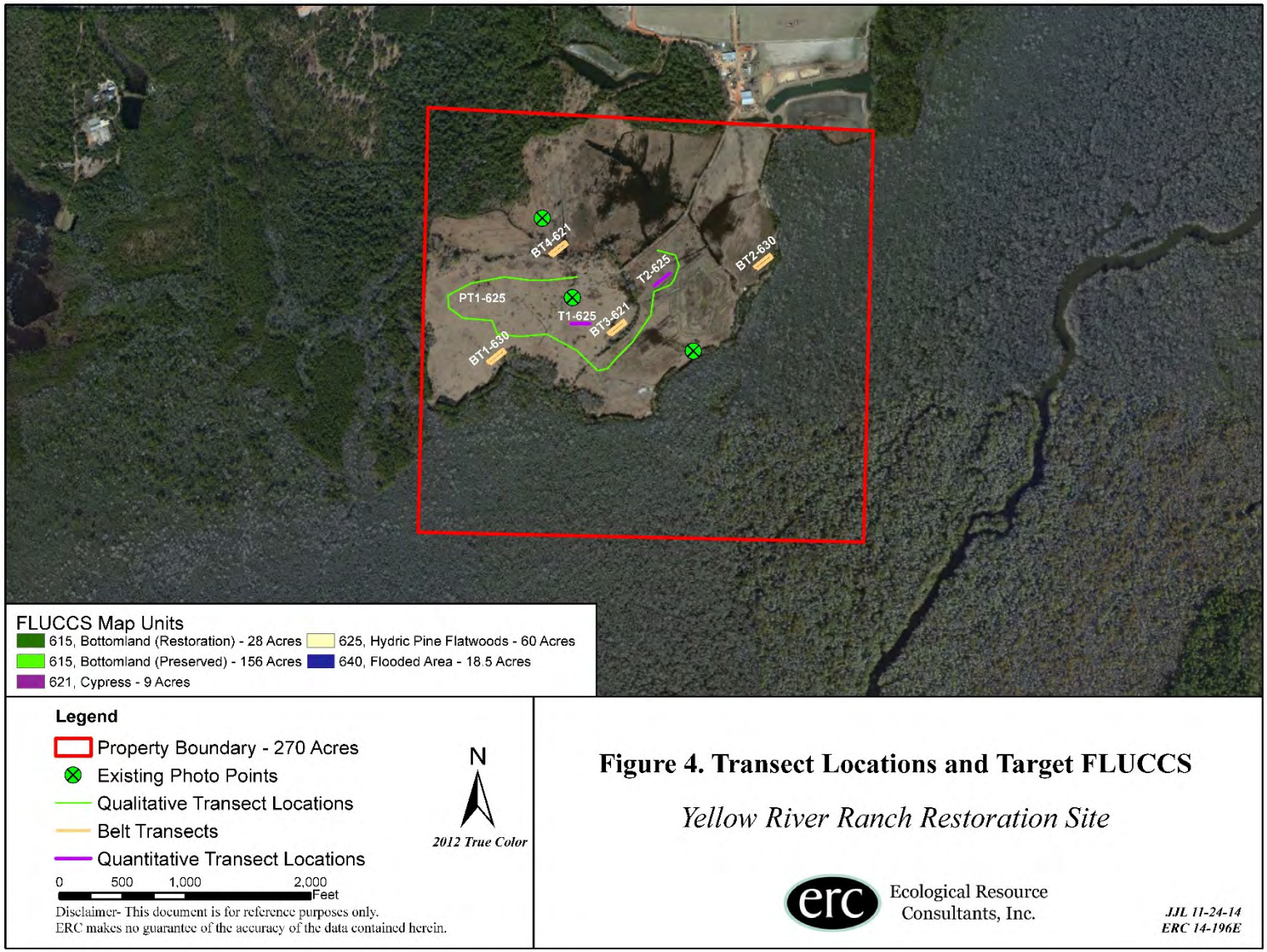

Figure 4. Transect Locations and Target FLUCCS

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				
Euthamia caroliniana	7.9	8.43	8.45	6.81
Symphyotrichum dumosum	5.62	7.76	3.98	5.11
Centella asiatica	5.17	4.88	7.66	2.98
Viola lanceolata	5.1	4.38	6.24	4.68
Eupatorium leptophyllum	4.66	5.65	5.35	2.98
Scoparia dulcis	4.54	4.1	5.26	4.26
Diodia virginiana	4.03	4.38	4.72	2.98
Agalinis fasciculata	3.09	4.43	2.7	2.13
Polypremum procumbens	2.91	1.77	3.98	2.98
Cuphea carthagenensis	2.62	2.72	3.0	2.13
Eupatorium capillifolium	2.26	2.16	2.06	2.55
Ludwigia linifolia	2.25	2.49	1.72	2.55
Hypericum cistifolium	2.22	1.61	2.06	2.98
Rubus trivialis	1.88	2.05	1.47	2.13
Rubus cuneifolius	1.83	2.11	1.67	1.7
Lobelia glandulosa	1.78	1.5	1.28	2.55
Verbena brasiliensis	1.57	0.94	2.06	1.7
Oldenlandia uniflora	1.56	0.89	1.67	2.13
Rubus argutus	1.53	1.61	1.28	1.7
Solidago rugosa subsp. aspera	1.38	2.16	1.13	0.85
Eupatorium leucolepsis	1.19	1.5	0.79	1.28
Ludwigia virgata	1.09	0.78	0.79	1.7

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

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Forbs				
Agalinis divaricata	1.03	1.16	0.64	1.28
Hypericum crux-andreae	1.03	1.16	0.64	1.28
Gratiola virginiana	0.96	1.16	0.44	1.28
Rhexia virginca	0.7	0.67	0.15	1.28
Solidago odora	0.57	0.78	0.49	0.43
Bidens mitis	0.51	0.39	0.29	0.85
Polygonum punctatum	0.5	0.39	0.25	0.85
Diodia teres	0.33	0.28	0.29	0.43
Hypericum hypericoides	0.33	0.28	0.29	0.43
Solidago canadensis var. scabra	0.29	0.28	0.15	0.43
Lachnanthes carolinana	0.29	0.28	0.15	0.43
Polygonum hydropiperoides	0.25	0.11	0.2	0.43
Rhexia mariana	0.25	0.28	0.05	0.43
Lycopus rubellus	0.25	0.28	0.05	0.43
Ludwigia pilosa	0.25	0.28	0.05	0.43
Hypericum gentianoides	0.25	0.11	0.2	0.43
Pluchea odorata	0.2	0.11	0.05	0.43
Graminoids				
Andropogon virginicus	5.29	6.43	4.76	4.68
Cyperus sp.	3.19	2.66	4.37	2.55
Rhynchospora nitens	2.3	1.83	3.78	1.28
Fuirena breviseta	1.77	1.83	0.93	2.55
Rhynchospora plumosa	1.77	1.44	2.16	1.7
Juncus marginatus	1.69	1.72	1.23	2.13
Rhynchospora pusilla	0.99	0.55	1.57	0.85
Rhynchospora filifolia	0.96	0.67	0.93	1.28
Juncus polycephalos	0.95	0.5	1.08	1.28
Paspalum notatum	0.83	0.67	0.54	1.28
Andropogon glomeratus	0.73	0.89	0.44	0.85
Sacciolepsis indica	0.59	0.22	0.69	0.85
Xyris stricta	0.39	0.22	0.1	0.85
Rhynchospora microcarpa	0.33	0.28	0.29	0.43
Juncus dichotomus	0.31	0.11	0.39	0.43
Woody Plants				
Baccharis halimifolia	2.86	2.16	2.6	3.83
Stillingia aquatica	0.5	0.78	0.29	0.43
Cyrilla racemiflora	0.45	0.78	0.15	0.43

Table 2b. Transect YRRT1-625 Hydric Pine Flatwoods

Groundcover Vegetation Relative Cover (%)			Average Cover (%)	Species Richness
Forbs	Graminoids	Woody Plants	Bare ground/ Standing water	
76.52%	19.8%	3.72%	10.67%	57
Shrub Height (meters)				0.32

Transect YRRT1-625 Hydric Pine Flatwoods

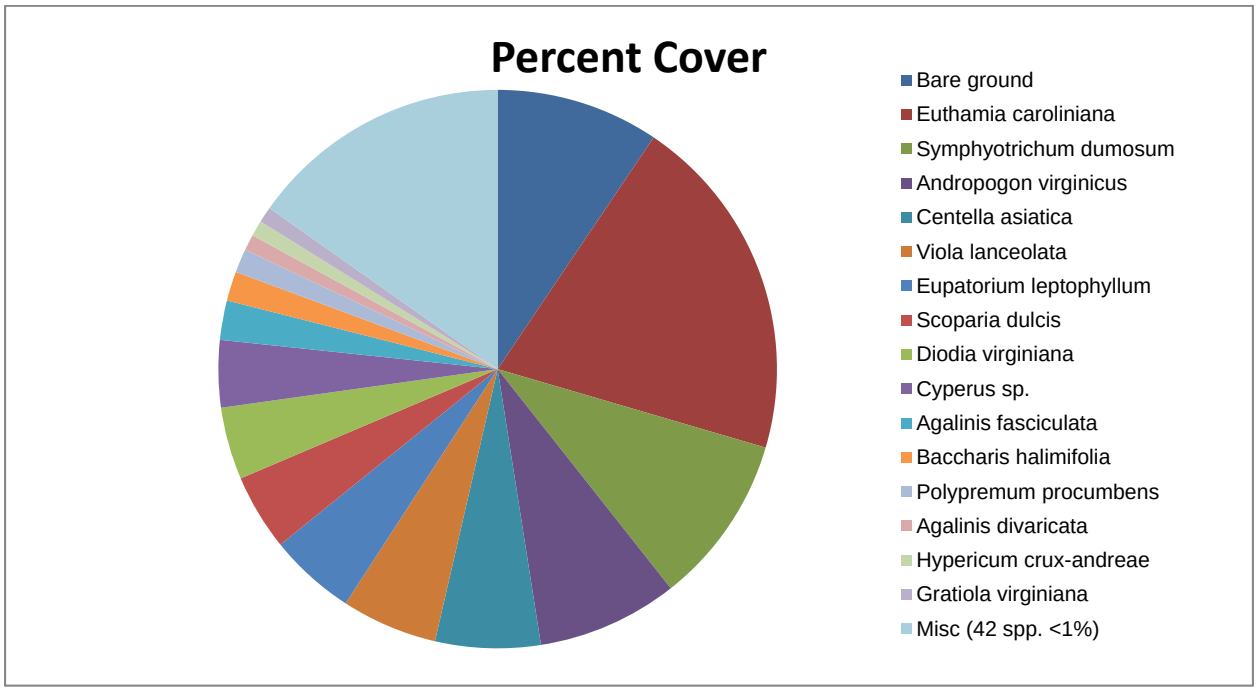

Table 3a. Transect YRRT2-625 Hydric Pine Flatwoods

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Forbs				
Diodia virginiana	9.91	9.04	14.65	6.03
Symphyotrichum dumosum	7.2	9.62	5.44	6.53
Viola lanceolata	6.3	4.84	8.53	5.53
Centella asiatica	4.93	3.35	6.92	4.52
Ludwigia linifolia	4.61	4.09	4.2	5.53
Cuphea carthagenensis	4.6	3.14	5.62	5.03
Euthamia caroliniana	2.78	2.55	2.78	3.02
Proserpinaca pectinata	2.01	0.74	3.28	2.01
Ludwigia pilosa	1.92	1.75	0.99	3.02
Lobelia glandulosa	1.52	1.01	0.99	2.51
Rubus cuneifolius	1.44	1.38	0.93	2.01
Bidens mitis	1.29	1.49	1.36	1.01
Rhexia virginica	1.11	0.58	0.74	2.01
Agalinis fasciculata	0.96	0.8	0.56	1.51
Euthamia graminifolia v. hirtipes	0.8	0.53	0.87	1.01
Solidago rugosa subsp. aspera	0.68	0.53	0.49	1.01
Eupatorium leptophyllum	0.58	0.53	0.19	1.01
Rhexia nutallii	0.45	0.11	0.74	0.5
Solidago fistulosa	0.38	0.27	0.37	0.5
Rhexia mariana	0.35	0.11	0.43	0.5
Eupatorium leucolepis	0.34	0.27	0.25	0.5
Scoparia dulcis	0.33	0.11	0.37	0.5
Pluchea odorata	0.28	0.27	0.06	0.5
Graminoids				
Axonopus furcatus	10.01	15.05	9.46	5.53
Rhynchospora plumosa	8.93	8.35	12.42	6.03
Andropogon virginicus	3.63	4.52	2.35	4.02
Panicum anceps	3.34	4.84	1.17	4.02
Fuirena breviseta	2.39	2.18	1.48	3.52
Dichanthelium scabriusculum	2.15	2.66	2.29	1.51
Rhynchospora filifolia	1.64	2.29	0.62	2.01
Cyperus sp.	1.36	0.53	2.53	1.01
Paspalum urvillei	1.14	1.28	0.62	1.51
Panicum verrucosum	1.05	0.85	1.3	1.01
Paspalum notatum	0.88	1.65	0.49	0.5
Rhynchospora pusilla	0.86	0.96	1.11	0.5

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

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Graminoids				
Xyris stricta	0.6	0.53	0.25	1.01
Rhynchospora microcarpa	0.55	0.53	0.12	1.10
Panicum hians	0.52	0.37	0.19	1.01
Rhynchospora fascicularis	0.52	0.74	0.31	0.5
Rhynchospora chapmanii	0.52	0.74	0.31	0.5
Rhynchospora nitens	0.31	0.11	0.31	0.5
Eragrostis virginica	0.28	0.27	0.06	0.5
Cyperus haspan	0.28	0.27	0.06	0.5
Juncus marginatus	0.24	0.11	0.12	0.5
Juncus dichotomus	0.22	0.11	0.06	0.5
Andropogon glomeratus	0.22	0.11	0.06	0.5
Juncus effusus subsp. solutus	0.22	0.11	0.06	0.5
Woody Plants				
Nyssa sylvatica v. biflora	1.94	2.76	0.56	2.51
Fraxinus caroliniana	0.44	0.27	0.56	0.5
Ilex glabra	0.32	0.27	0.19	0.5
Cephalanthus occidentalis	0.28	0.27	0.06	0.5
Ilex cassine v. myrtifolia	0.22	0.11	0.06	0.5
Hypericum fasciculatum	0.22	0.11	0.06	0.5

Table 3b. Transect YRRT2-625 Hydric Pine Flatwoods

Groundcover Vegetation Relative Cover (%)			Average Cover (%)	
Forbs	Graminoids	Woody Plants	Bare ground/ Standing water	Species Richness
47.64%	48.63%	3.79%	3.27%	53
Shrub Height (meters)				0.34

Transect YRRT2-625 Hydric Pine Flatwoods

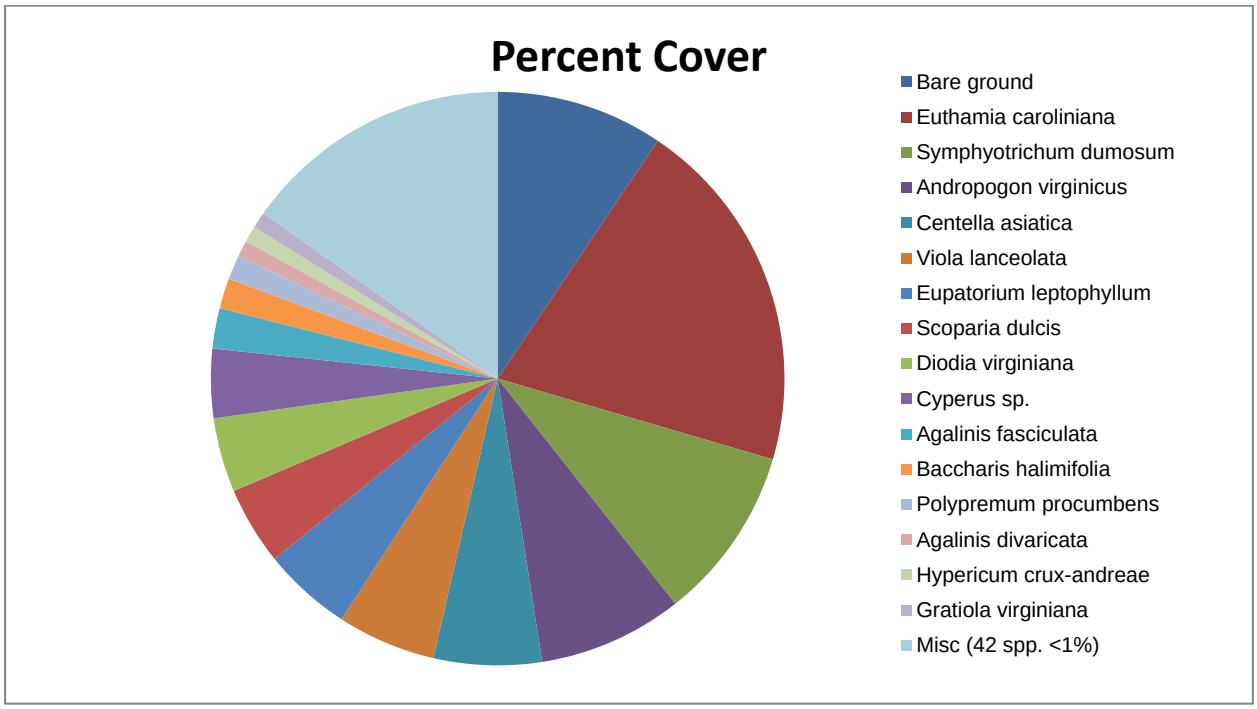

Table 4. Belt Transect Summary for YYR-BT1-630

Belt Transect Summaries for Transect YYR-BT1-630								
		Height Scale (feet)						
Species	**Total Number**	**0-1'**	**>1'-2'**	**>2' -3'**	**>3'-4'**	**>4'-5'**	**>5'-6'**	**Condition**
Acer rubrum	42	1	4	9	7	21	0	healthy/growing
Chamaecyparis thyoides	2	0	0	0	1	0	1	many saplings died from prolonged flooding
Ilex cassine	2	1	0	0	1	0	0	healthy/growing
Nyssa biflora	4	0	0	2	2	0	0	healthy/growing
Pinus elliottii	6	0	0	0	2	0	4	healthy/growing
Taxodium ascendens	77	0	3	44	12	18	0	healthy/growing
Total number of Saplings	133							
Number of Saplings/Acre	1,899.24							

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

Belt Transect Summaries for Transect YYR-BT2-630								
		Height Scale (feet)						
Species	**Total Number**	**0-1'**	**>1'-2'**	**>2' -3'**	**>3'-4'**	**>4'-5'**	**>5'-6'**	**Condition**
Chamaecyparis thyoides	14						14	healthy/growing
Juniperus virginiana	3				1		2	Healthy/growing
Pinus palustris	1						1	healthy/growing
Quercus laurifolia	2			2				healthy/growing
Total number of Saplings	20							
Number of Saplings/Acre	285.6							

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

Belt Transect Summaries for Transect YYR-BT3-621								
		Height Scale (feet)						
Species	**Total Number**	**0-1'**	**>1'-2'**	**>2' -3'**	**>3'-4'**	**>4'-5'**	**>5'-6'**	**Condition**
Chamaecyparis thyoides	2				2			healthy/growing
Pinus elliottii	2						2	healthy/growing
Taxodium ascendens	4	2	1	1				Healthy/growing
Total number of Saplings	8							
Number of Saplings/Acre	114.24							

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

Belt Transect Summaries for Transect YYR-BT4-621								
		Height Scale (feet)						
Species	**Total Number**	**0-1'**	**>1'-2'**	**>2' -3'**	**>3'-4'**	**>4'-5'**	**>5'-6'**	**Condition**
Pinus elliottii	2	1					1	healthy/growing
Nyssa biflora	1				1			healthy/growing
Taxodium ascendens	72			18	32	22		healthy/growing
Total number of Saplings	75							
Number of Saplings/Acre	1,071							

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 2014, reducing the shrubs to coppice. 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; less than one percent and the shrubs are in the 0-0.5m height class. The dominant shrub species are *Ilex glabra, Baccharis halimifolia* and *Cyrilla racemiflora*. The graminoid groundcover coverage class is 76-100% percent and the total groundcover cover class is 76-100% percent. The dominant groundcover species are *Euthamia caroliniana, Symphyotrichum dumosum, Andropogon virginicus, Agalinis divaricata, Axonopus furcatus, Centella asiatica, Viola lanceolata, Eupatorium leptophyllum, Scoparia dulcis, Diodia virginiana, Ludwigia linifolia, and Cuphea carthagenensis.* The site has relatively low bare ground coverage because fire stimulated abundant growth of groundcover species.

Groundcover diversity is good and the diversity is expected to increase with increased management of the site. Wildlife observations included northern mockingbird (*Mimus polyglottos*), turkey vulture (*Cathartes aura*), eastern bluebird (*Sialia sialis*), common crow (*Corvus brachyrhynchos*), barn swallow (*Hirundo rustica*), phoebe (*Sayornis phoebe*), cloudless sulfur (*Phoebis sennae*), gulf fritillary (*Agraulis vanillae*), buckeye butterfly (*Junonia coenia*), monarch (*Danaus plexippus*), common buckeye (*Junonia coenia*), grasshoppers, dragonflies, green lynx spider (*Peucetia viridans*), flower crab spider (*Misumenops celer*). Swallows were migrating across the landscape, wintering phoebe were hawking insects, migrating monarchs, cloudless sulfur, and gulf fritillary were also migrating and feeding on the thousands of false foxglove, goldenrod and aster flowers. Colombian waxweed flowers were also heavily visited by beneficial insects such as butterflies, bees and wasps. Common buckeye larvae were seen feeding on false foxglove.

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 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*) rutting the soils continue to be a management challenge. Feral hogs create conditions that permit persistence of ruderal species such as vaseygrass and Chinese tallow seedlings.

Natural regeneration of appropriate species is occurring. At least 57 plant species were observed in the quantitative transect and most of these are successional herbaceous species.

Overall, the landscape is trending toward recovery. 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
Aristida stricta	wiregrass
Axonopus furcatus	carpetgrass
Baccharis halimifolia	saltbush
Bidens mitis	beggarticks
Centella asiatica	coinwort
Ctenium aromaticum	toothache grass
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 leptophyllum	cutleaf thoroughwort
Euthamia spp.	flattop goldenrod
Fuirena breviseta	umbrella sedge
Hydrocotyle sp.	pennywort
Ilex vomitoria	yaupon
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 verrucosum	warty panicum
Paspalum dilatatum	Dallis grass
Paspalum notatum	Bahia grass
Rhexia mariana	Maryland meadow beauty
Rhexia virginica	Virginia meadow beauty

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

Scientific Name	Common Name
Rhynchospora fascicularis	fascicled beaksedge
Rhynchospora inundata	longbeak beaksedge
Rhynchospora plumosa	plumose beaksedge
Rubus argutus	sawtooth blackberry
Rubus cuneatus	blackberry
Rubus trivialis	dewberry
Sapium sebiferum	Chinese tallow tree
Scoparia dulcis	goats rue
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 is located on the lowest portion of the floodplain while the restoration area is located on low erosional terrace that is generally flooded less frequently. The erosional terrace also has soil, landform and vegetative signatures of a seepage slope. Significant anthropogenic alteration and drainage of the erosional terrace resulted in a cultural landscape of drained pasture lands managed by the cultivation and grazing of non-native forage grasses (primarily bahia grass). Restoration of the site involves hydrologic modification, installation of appropriate native species, control of invasive species, and prescribed fire in selected areas.

Approximately 155 acres of the Yellow River Ranch consists of existing forested Bottomland (615), with the remaining 120 acres converted to pasture from a previously forested landscape. Of the remaining 120 acres, 27 acres of Bottomland (615), 9 acres of Cypress (621) and 60 acres of Hydric Pine Flatwoods (625) are the focus of the quantitative monitoring. 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 53-57 species in the quantitative transects. All shrubs were reduced to coppice by recent fire.

In 2013, seedling swamp gum (*Nyssa sylvatica* var. *biflora*), white cedar (*Chameacyparis thyoides*), Chinese tallow tree (*Sapium sebiferum*) and slash pine (*Pinus elliottii*) were also observed throughout the landscape. Observations in 2014 indicate that many white cedar and Chinese tallow were killed by the prescribed fire. Most of the slash pine and 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 114 to 1,800 trees/acre in the sample area. YRR-BT3-621is located in an area of disturbed soils and would benefit from additional plantings of fire resistant slash and longleaf pine. Fire sensitive white cedar were greatly reduced throughout the landscape, which is appropriate. White cedar continue to regenerate along the lower and wetter edges of the landscape, adjacent to the floodplain. White cedar have wind dispersed seeds and are one of many species that naturally recruit from the adjacent, mature bottomland forest.

The landscape traversed during the pedestrian transect is entirely mapped as Hydric Pine Flatwoods (625). Herbaceous plant lifeform dominance throughout the landscape is consistent with the quantitative measures of groundcover. In the 2013 report, all wetland polygons were undergoing succession and trending toward a woody plant dominated landscape. After the prescribed fire the landscape can be described as dominated by herbaceous lifeforms, primarily graminoid species, with increasing groundcover species diversity, shrubs reduced to coppice and continued growth and vigor of fire resistant trees such as pond cypress. In addition, numerous animals and insects were seen feeding and otherwise using the previously burned landscape as important habitat.

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.

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 5% of the groundcover coverage; nuisance, non-native vegetation less than 5% 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 >50.

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 succession occurring, mostly slash pine, red maple and 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.
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 5% of the groundcover coverage; nuisance, non-native vegetation less than 5% 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 >50.
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 slash pine, red maple and 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.
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 5% cover.

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

Objectives	Performance Standards	Status
Belt Transect YYR-BT1-615 Bottomland		
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. 80% 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 native 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 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 5% 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. 80% 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 native 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 native species.

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

Objectives	Performance Standards	Status
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 5% 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. 80% 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 native 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 native 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 5% 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. 80% 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 native 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 groundcover vegetation.	Increase in appropriate herbaceous, shrub and /or tree species.	Site is recovering with increased diversity and coverage by native species.

5.0. CONCLUSIONS AND RECOMMENDATIONS

Notes on the current conditions at the Yellow River Ranch restoration site were obtained from ecological monitoring in 2014. Most of the site was burned in early 2014. This resulted in the rejuvenation of herbaceous species, all landscapes that were burned are now dominated by graminoids and a variety of native wildflowers. Overall there were many native animals and insects using all of the landscape that is undergoing restoration.

The bottomland (615) restoration area landscape was partially burned. Most of the invasive exotic Chinese tallow tree saplings were burned to the ground, others survive as coppice. Continued burning will help control the Chinese tallow tree seedlings and promote appropriate growth, coverage and selection of native groundcover species. Scattered pond cypress and slash pine are thriving, some have been coppiced by fire. Overall the prescribed fire was very beneficial. The groundcover vegetation is healthy and providing habit and hunting conditions for a variety of birds. With continued burning the bottomland (615) landscape will continue to trend toward the desired target.

The cypress (621) restoration landscape is dominated by graminoids with emergent pond cypress saplings, many of which survived the prescribed fire without damage. The area of cypress (621) at transect BT3-621 might be best planted in slash pine, longleaf pine and pond pine. The groundcover vegetation is healthy and providing habitat and hunting conditions for a variety of birds. With continued burning the cypress (621) landscape will continue to trend toward the desired target.

The hydric pine flatwoods (625) restoration areas appeared white from frost aster flowers and yellow from goldenrod flowers. No canopy has 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. Non-native bahia grass (*Paspalum notatum*) is present in the transects but is not a significant relative cover.

elective herbicide treatment of bahia grass is recommended. With continued burning the hydric pine flatwoods (625) landscape will continue to trend toward the desired target.

Fall flowering asters, goldenrod, false foxglove and Eupatorium were providing nectar for migrating monarch butterflies, gulf fritillaries, cloudless sulfurs, and many species of beneficial insects. Migrating barn, cliff and tree swallows were seen hawking insects over the bottomland (615), cypress (621), hydric pine flatwoods (625) restoration areas.

Threats to the inherent biodiversity of this site continue to include hydrologic modification, feral hog damage, and exotic invasive vegetation. Any expansion of non-native plants or animals should be monitored carefully. ERC recommends 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, continue burning the site whenever possible.

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