

2013 Monitoring Report

YELLOW RIVER RANCH SITE

Santa Rosa County, Florida

ERC #: 13-196D

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Ecological Resource
Consultants, Inc.

2013 Monitoring Report

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ERC #: 13-196D

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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 August 2013 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 2013 monitoring represent the current condition in 2013, this 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 August 2013 monitoring event for the disturbed areas is typical of a site used as pastureland and consequently the groundcover is dominated by ruderal species. The dominant plant lifeforms are herbaceous. Implementation of active restoration activities observed include installation of appropriate native canopy species, supplemental planting of appropriate native groundcover species, and treatments to eliminate and control invasive exotics plants. The progress of specific practice implementation combined with assurances for perpetual maintenance indicates that the restoration potential of the site is very good.

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1.0 INTRODUCTION

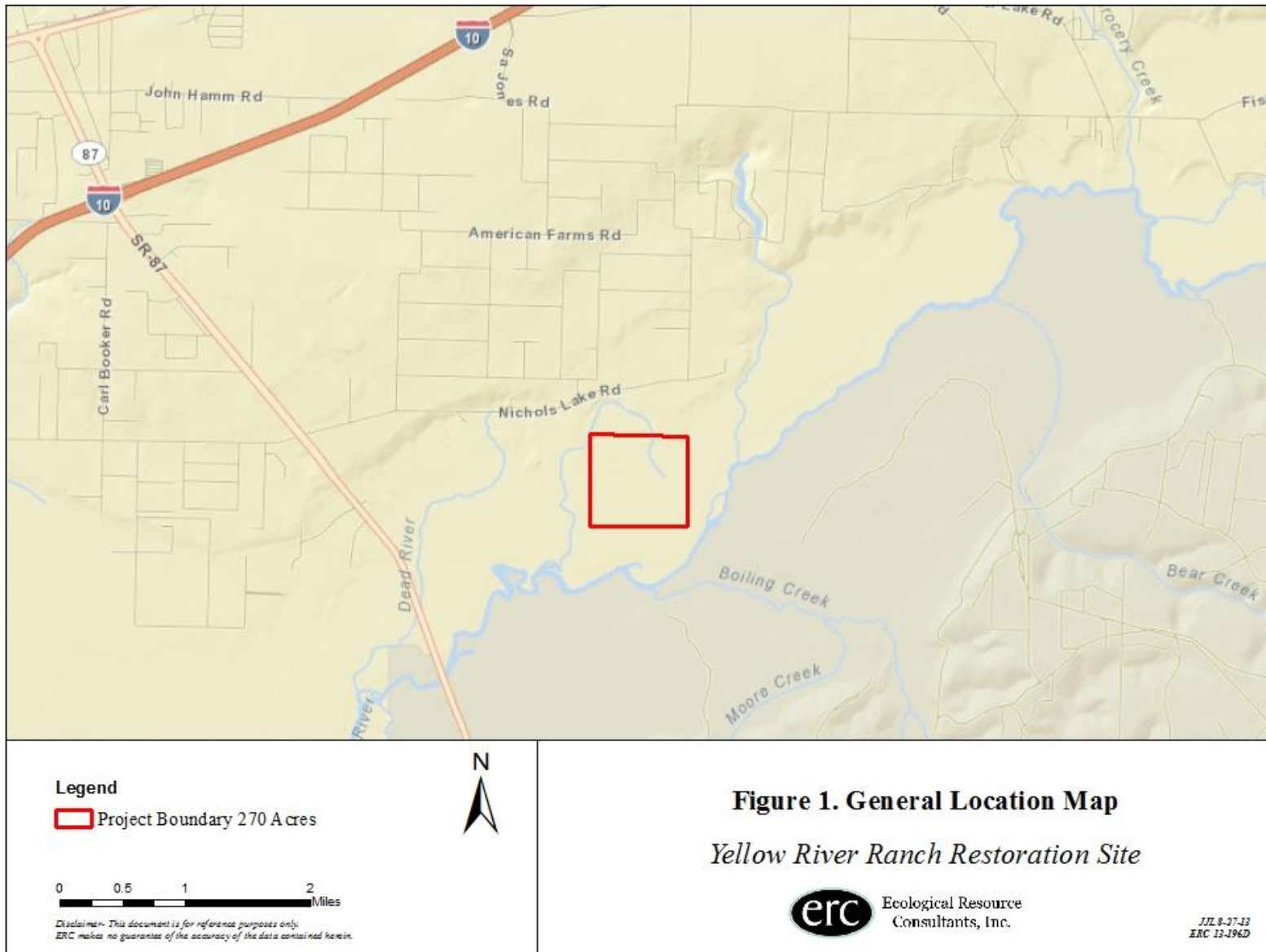
1.1. Purpose and Scope

1.1.1 Purpose

The Yellow River Ranch (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 (NFWFMD) 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.



2.0 METHODS

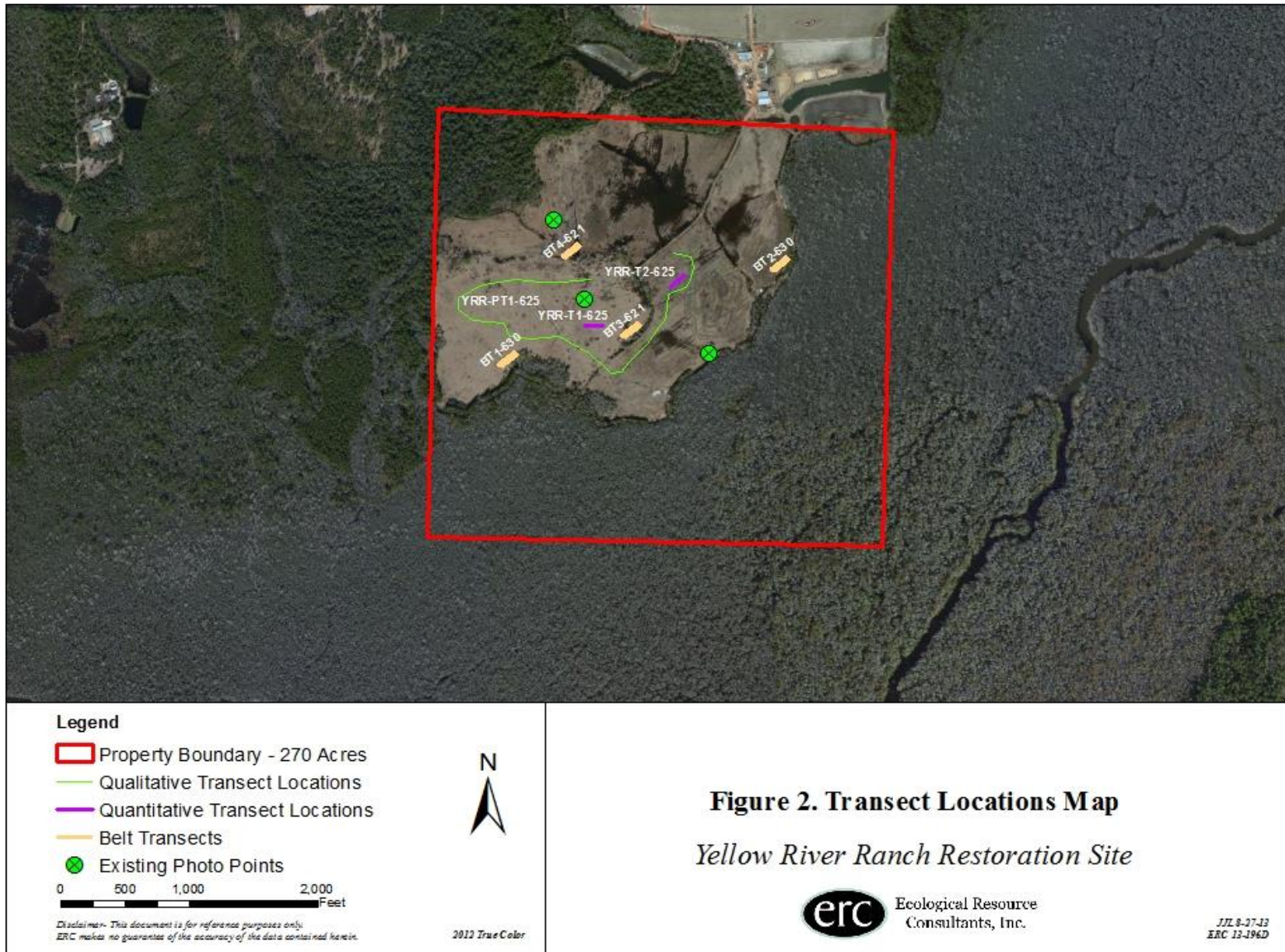
2.1 Field Methods

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 current and 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.



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 health 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 path 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

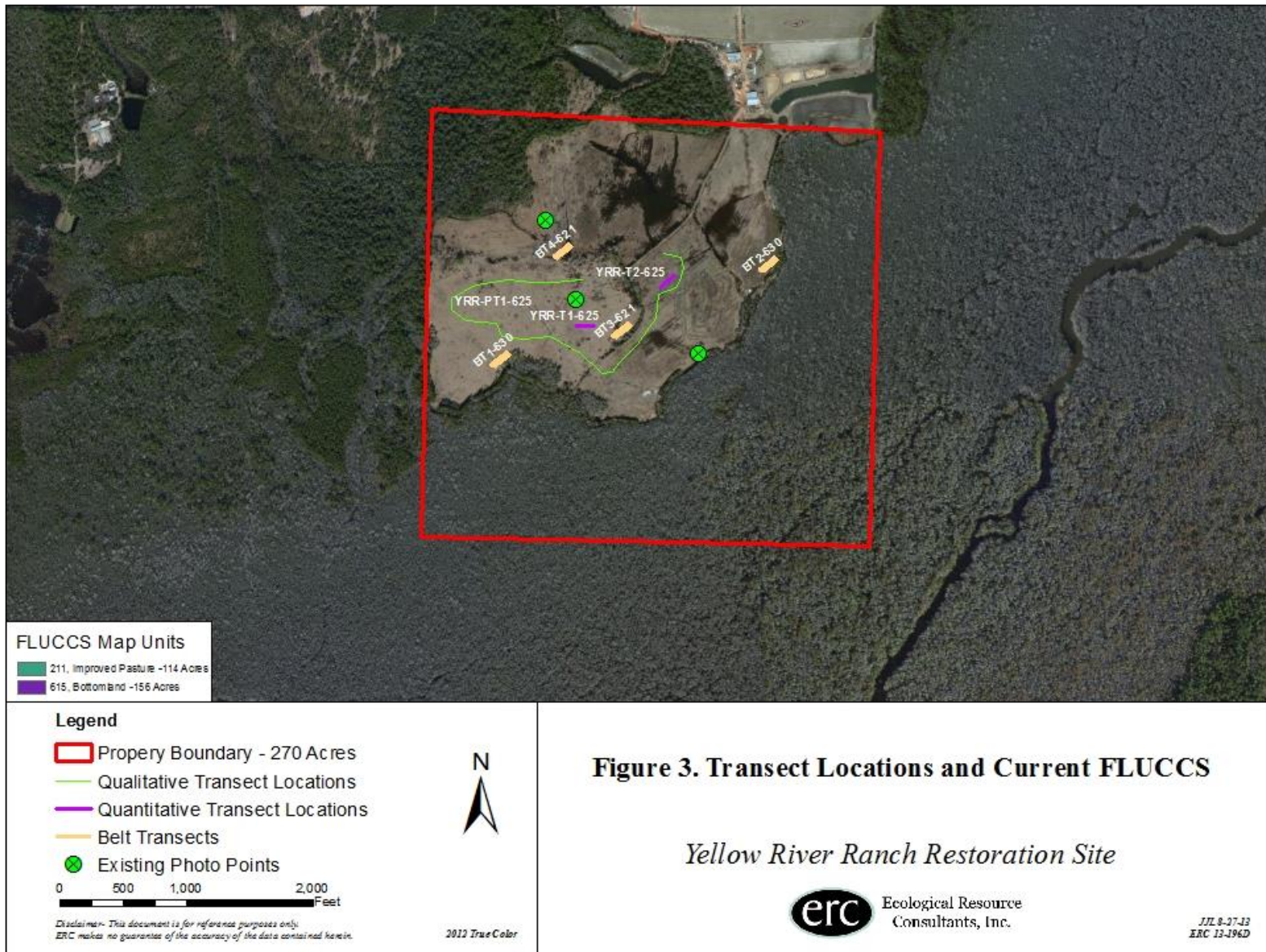
- observed at other points along the transect.
8. An estimation of the fuel load and aspects of the vegetative condition that might affect fire. Measure depth of litter and duff. Observe soil moisture conditions in upper 6 inches by inserting tiling spade into soil and using tactile method to determine moisture state.
 9. A list of plant species encountered during the qualitative transect inspection.

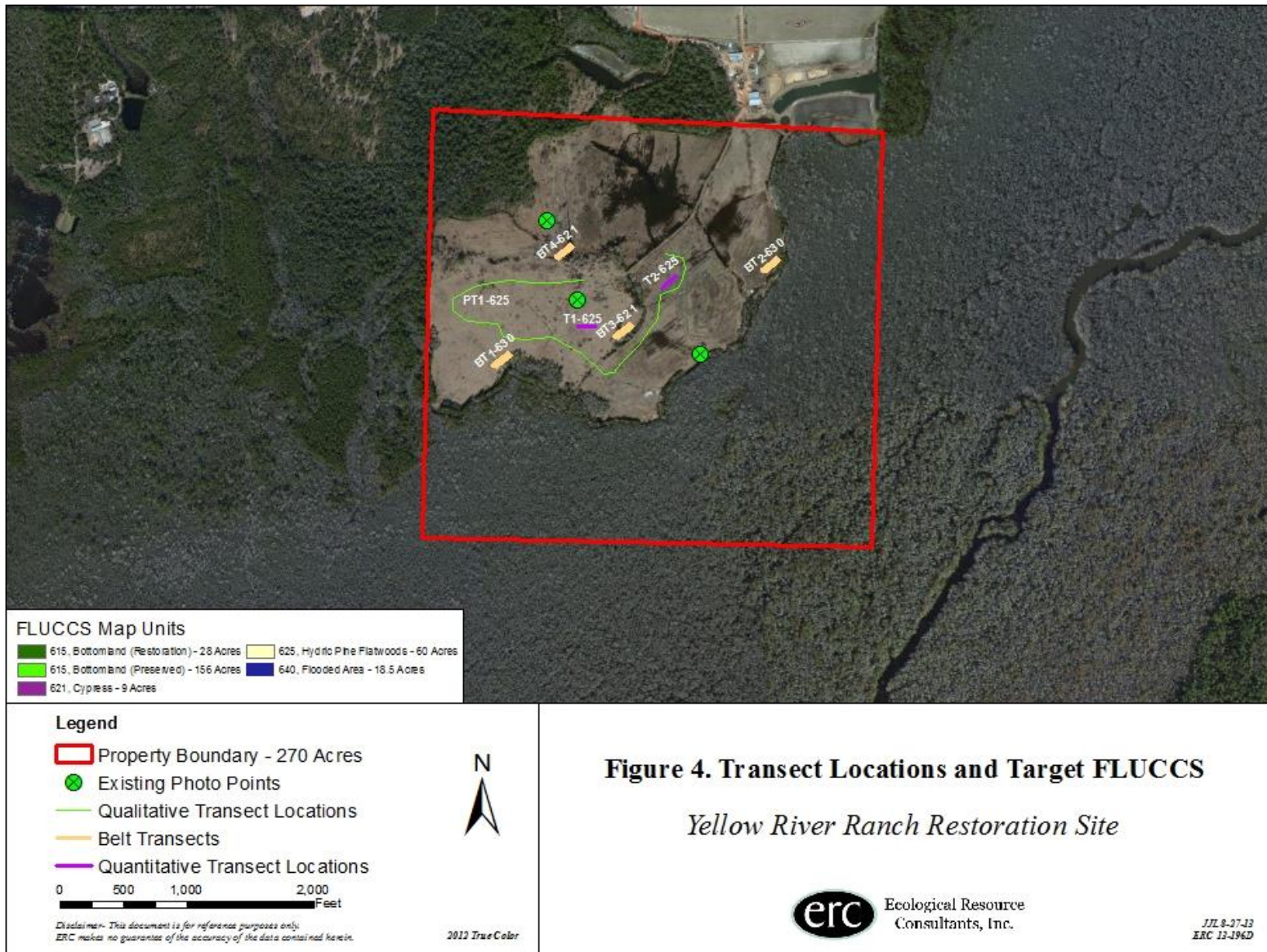
2.1.4 Panoramic Photographs

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.





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.

$$\text{Importance Value} = RC + RD + RF$$

The Importance Value Percentage is the Importance Value multiplied by 100

$$\text{Importance Value Percentage} = \text{Importance Value} * 100$$

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.

$$\text{Trees/Acre} = (1)(14.28)$$

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				
<i>Euthamia caroliniana</i>	11.0	10.3	13.7	8.9
<i>Centella asiatica</i>	10.9	5.6	18.3	8.9
<i>Rubus argutus</i>	10.2	12.5	10.0	8.1
<i>Diodia virginiana</i>	9.3	7.0	12.0	8.9
<i>Rubus cuneifolius</i>	5.7	6.4	5.1	5.6
<i>Rubus trivialis</i>	3.0	2.9	2.7	3.2
<i>Symphotrichum dumosum</i>	1.6	0.8	0.9	3.2
<i>Agalinis fasciculata</i>	1.6	1.7	0.5	2.4
<i>Dichondra carolinensis</i>	1.2	0.5	2.2	0.8
<i>Solidago rugosa subsp. aspera</i>	1.1	0.4	1.4	1.6
<i>Cuphea carthagenensis</i>	1.1	0.7	1.0	1.6
<i>Viola lanceolata</i>	1.0	0.4	1.1	1.6
<i>Hypericum cistifolium</i>	0.7	0.4	0.2	1.6
<i>Solidago fistulosa</i>	0.7	0.5	0.6	0.8
<i>Oldenlandia uniflora</i>	0.6	0.2	0.6	0.8
<i>Rhexia mariana</i>	0.5	0.2	0.5	0.8
<i>Scoparia dulcis</i>	0.4	0.2	0.2	0.8
<i>Hydrocotyle verticillata</i>	0.4	0.2	0.1	0.8
<i>Viola primulifolia</i>	0.4	0.2	0.1	0.8
Graminoids				
<i>Paspalum notatum</i>	16.7	25.5	15.7	8.9
<i>Axonopus furcatus</i>	7.1	7.7	6.3	7.3
<i>Andropogon glomeratus</i>	3.8	4.9	1.5	4.8
<i>Cyperus odoratus</i>	1.0	0.4	1.1	1.6
<i>Ctenium aromaticum</i>	1.0	1.0	0.4	1.6
<i>Aristida stricta</i>	0.9	1.0	0.2	1.6
<i>Kyllinga odorata</i>	0.9	0.4	0.6	1.6
<i>Juncus scirpoides</i>	0.8	0.5	1.0	0.8
<i>Rhynchospora plumosa</i>	0.7	0.4	0.2	1.6
<i>Juncus marginatus</i>	0.4	0.2	0.1	0.8
Woody Plants				
<i>Myrica cerifera</i>	2.7	5.3	0.4	2.4
<i>Ilex vomitoria</i>	1.2	0.9	0.3	2.4
<i>Sapium sebiferum</i>	0.7	0.4	0.2	1.6
<i>Nyssa sylvatica v. biflora</i>	0.5	0.5	0.2	0.8
<i>Baccharis halimifolia</i>	0.4	0.2	0.1	0.8

Table 2b. Transect YRRT1-625 Hydric Pine Flatwoods

Groundcover Vegetation Relative Cover (%)			Average Cover (%)	Species Richness
Forbs	Graminoids	Woody Plants	Bare ground/ Standing water	
50.1%	41.8%	7.2%	31.8%	34
Shrub Height (meters)				0.37

Transect YRRT1-625 Hydric Pine Flatwoods

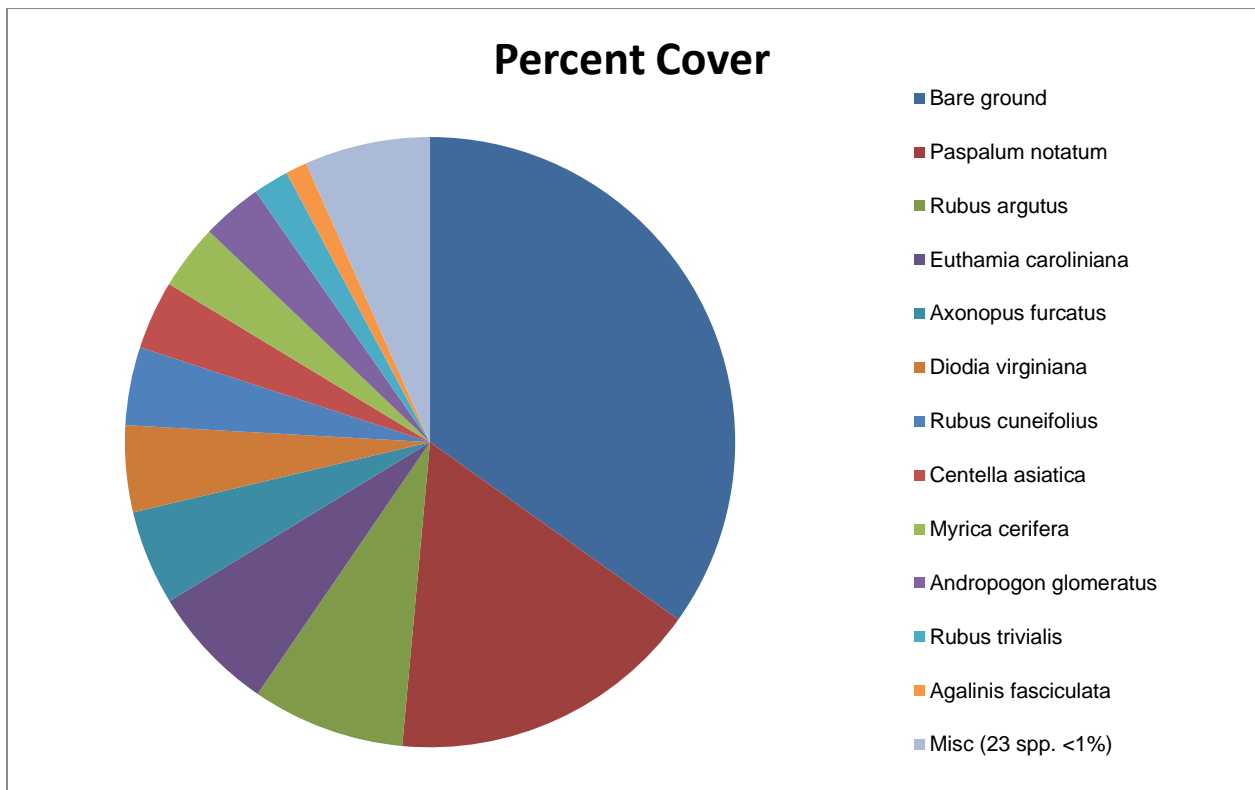


Table 3a. Transect YRRT2-625 Hydric Pine Flatwoods

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Forbs				
<i>Centella asiatica</i>	13.1	9.5	17.6	12.3
<i>Diodia virginiana</i>	11.3	9.1	14.2	10.7
<i>Euthamia caroliniana</i>	9.5	10.1	8.7	9.8
<i>Rhexia virginica</i>	4.0	2.8	2.7	6.6
<i>Symphotrichum dumosum</i>	1.5	0.9	1.0	2.5
<i>Proserpinaca pectinata</i>	1.1	0.3	1.4	1.6
<i>Rhexia mariana</i>	0.9	0.5	0.6	1.6
<i>Rubus cuneifolius</i>	0.8	0.5	0.3	1.6
<i>Ludwigia pilosa</i>	0.6	0.4	0.5	0.8
<i>Solidago fistulosa</i>	0.5	0.4	0.3	0.8
<i>Solidago rugosa</i>	0.5	0.4	0.3	0.8
<i>Lycopus rubellus</i>	0.4	0.2	0.3	0.8
<i>Erechtites hieracifolius</i>	0.4	0.2	0.2	0.8
Graminoids				
<i>Axonopus furcatus</i>	19.7	27.8	19.7	11.5
<i>Paspalum boscianum</i>	6.4	6.8	6.7	5.7
<i>Eleocharis baldwinii</i>	5.6	4.3	9.2	3.3
<i>Rhynchospora plumosa</i>	4.4	3.1	6.0	4.1
<i>Andropogon glomeratus</i>	3.9	5.3	1.5	4.9
<i>Rhynchospora nitens</i>	2.7	2.5	2.3	3.3
<i>Dichanthelium scabriusculum</i>	2.0	2.8	1.5	1.6
<i>Panicum hians</i>	1.7	1.2	1.4	2.5
<i>Rhynchospora fascicularis</i>	1.6	1.2	1.3	2.5
<i>Rhynchospora microcarpa</i>	1.2	2.4	0.5	0.8
<i>Rhynchospora caduca</i>	0.5	0.4	0.3	0.8
Woody Plants				
<i>Nyssa sylvatica v. biflora</i>	3.9	3.8	1.5	6.6
<i>Myrica cerifera</i>	1.1	2.4	0.1	0.8
<i>Hypericum fasciculatum</i>	0.7	1.1	0.1	0.8

Table 3b. Transect YRRT2-625 Hydric Pine Flatwoods

Groundcover Vegetation Relative Cover (%)			Average Cover (%)	Species Richness
Forbs	Graminoids	Woody Plants	Bare ground/ Standing water	
35%	58%	7%	24%	27
Shrub Height (meters)				0.5

Transect YRRT2-625 Hydric Pine Flatwoods

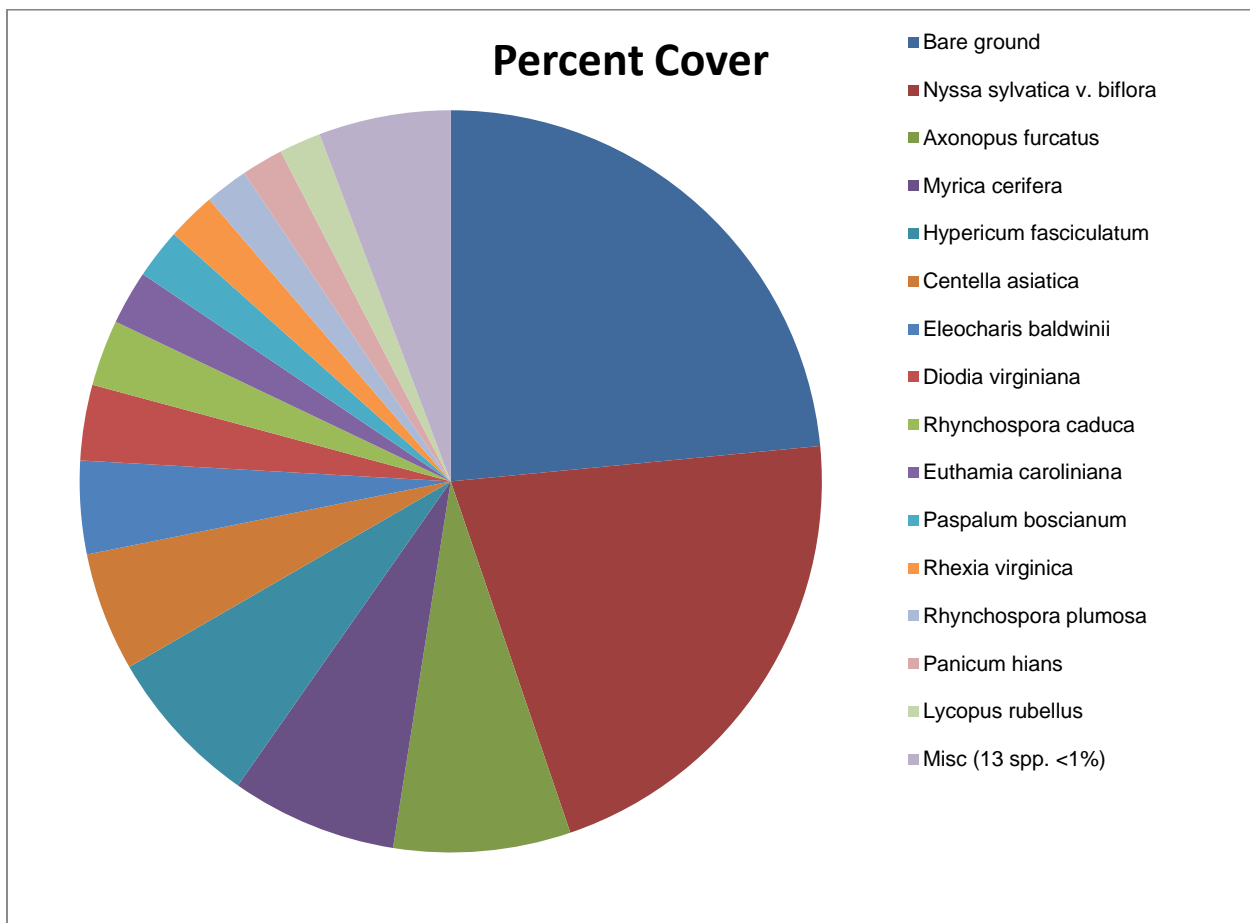


Table 4. Belt Transect Summary for YJR-BT1-615

Belt Transect Summaries for Transect YJR-BT1-615								
Species	Total Number	Height Scale (feet)						Condition
		0-1'	>1'-2'	>2' -3'	>3'-4'	>4'-5'	>5'-6'	
<i>Acer rubrum</i>	39	3	5	31	0	0		healthy/growing
<i>Chamaecyparis thyoides</i>	9	0	0	4	4	0	1	many saplings in decline
<i>Nyssa biflora</i>	2	0	2	0	0	0	0	healthy/growing
<i>Pinus elliotii</i>	15	0	2	4	4	3	2	healthy/growing
<i>Sapinum sebiferum</i>	6	2	2	2	0	0	0	healthy/growing
<i>Taxodium ascendens</i>	33	2	9	14	5	1	2	healthy/growing
Total number of Saplings	104							
Number of Saplings/Acre	1,485.12							

Table 5. Belt Transect Summary for YJR-BT2-615

Belt Transect Summaries for Transect YJR-BT2-615 (Wetland Forested Mix)								
Species	Total Number	Height Scale (feet)						Condition
		0-1'	>1'-2'	>2' -3'	>3'-4'	>4'-5'	>5'-6'	
<i>Chamaecyparis thyoides</i>	29	0	2	4	7	5	11	many saplings in decline
<i>Pinus palustris</i>	1	0	0	1	0	0	0	healthy/growing
<i>Quercus laurifolia</i>	2	0	2	0	0	0	0	healthy/growing
Total number of Saplings	32							
Number of Saplings/Acre	843.06							

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

Belt Transect Summaries for Transect YJR-BT3-621								
Species	Total Number	Height Scale (feet)						Condition
		0-1'	>1'-2'	>2' -3'	>3'-4'	>4'-5'	>5'-6'	
<i>Chamaecyparis thyoides</i>	12	0	1	3	5	2	1	many saplings in decline
<i>Pinus elliotii</i>	3	0	0	2	0	1	0	healthy/growing
<i>Taxodium ascendens</i>	15	0	3	6	6	0	0	plants are stunted
Total number of Saplings	30							
Number of Saplings/Acre	428.4							

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

Belt Transect Summaries for Transect YJR-BT4-621 (Cypress)								
Species	Total Number	Height Scale (feet)						Condition
		0-1'	>1'-2'	>2' -3'	>3'-4'	>4'-5'	>5'-6'	
<i>Chamaecyparis thyoides</i>	3	0	0	3	0	0	0	many saplings in decline
<i>Cyrilla racemiflora</i>	9	0	4	5	0	0	0	healthy/growing
<i>Pinus elliotii</i>	3	1	1	0	1	0	0	healthy/growing
<i>Taxodium ascendens</i>	82	10	6	44	20	2	0	healthy/growing
Total number of Saplings	97							
Number of Saplings/Acre	1,385.16							

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

Groundcover diversity is good and the diversity is expected to increase with increased management of the site. Wildlife observations included a northern mockingbird (*Mimus polyglottos*), a little blue heron (*Egretta caerulea*), a Louisiana heron (*Egretta tricolor*), a blue grosbeak (*Passerina caerulea*), an eastern kingbird (*Tyrannus tyrannus*), an eastern bluebird (*Sialia sialis*), a red-shouldered hawk (*Buteo lineatus*), a turkey vulture (*Cathartes aura*), a starling (*Sturnus vulgaris*), a Carolina anole (*Anolis carolinensis*), a black racer (*Coluber constrictor priapus*), a gray treefrog (*Hyla chrysoscelis*), a green treefrog (*Hyla cinerea*), a cloudless sulfur (*Phoebis sennae*), a buckeye butterfly (*Junonia coenia*), a palamedes swallowtail (*Papilio palamedes*), a sleepy orange (*Eurema nicippe*), grasshoppers, dragonflies, damselflies, a praying mantis, a stink bug, a cicada, a leaf hopper, a green lynx spider (*Peucea viridans*), a flower crab spider (*Misumenops celer*), and a yellow garden orbweaver (*Argiope aurantia*).

Exotic species were observed, including the Chinese tallow (*Sapium sebiferum*), which is found in the 1-5% coverage range, and evidence of feral hogs (*Sus scrofa*) rutting the soils. Natural regeneration of appropriate species is occurring. Forty-one plant species were observed and most of these are successional herbaceous species. Overall, the landscape is fire suppressed. The depth of duff is approximately 1 cm and there are many fine fuels in which to carry a fire across the landscape.

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

Scientific Name	Common Name
<i>Andropogon virginicus</i>	Virginia broomgrass
<i>Agalinis fasciculata</i>	beach false foxglove
<i>Aristida stricta</i>	wiregrass
<i>Axonopus furcatus</i>	big carpetgrass
<i>Baccharis halimifolia</i>	sea myrtle
<i>Bidens mitis</i>	smallfruit beggarticks
<i>Centella asiatica</i>	spade leaf
<i>Chamaecyparis thyoides</i>	white cedar
<i>Ctenium aromaticum</i>	toothachegrass
<i>Cyperus odoratus</i>	flatsedge
<i>Dichanthelium acuminatum</i>	witchgrass
<i>Dichanthelium ensifolium</i>	witchgrass
<i>Dichondra carolinensis</i>	ponyfoot
<i>Diodia virginiana</i>	common persimmon
<i>Erechtites hieraciifolius</i>	American burnweed
<i>Euthamia caroliniana</i>	slender flattop goldenrod
<i>Fuirena breviseta</i>	umbrellasedge
<i>Juncus marginatus</i>	shore rush
<i>Lachnanthes carolina</i>	redroot
<i>Ludwigia linifolia</i>	Southeastern primrosewillow
<i>Ludwigia maritima</i>	seaside primrosewillow
<i>Ludwigia pilosa</i>	hairy primrosewillow
<i>Lycopus virginicus</i>	Virginia bugleweed
<i>Myrica cerifera</i>	wax myrtle
<i>Nyssa biflora</i>	tupelo
<i>Oldenlandia uniflora</i>	clustered mille grains
<i>Panicum hians</i>	gaping panicum
<i>Paspalum notatum</i>	bahiagrass
<i>Rhexia mariana</i>	Maryland meadowbeauty
<i>Rhexia virginica</i>	handsome Harry
<i>Rhynchospora fascicularis</i>	fascicled beaksedge
<i>Rhynchospora plumosa</i>	beaksedge
<i>Rhynchospora inundata</i>	horned beaksedge
<i>Rubus argutus</i>	blackberry
<i>Sapium sebiferum</i>	Chinese tallow tree
<i>Sesbania vesicaria</i>	bladderpod

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

Scientific Name	Common Name
<i>Scoparia dulcis</i>	goats rue
<i>Solidago fistulosa</i>	pinebarren goldenrod
<i>Symphyotrichum dumosum</i>	rice button aster
<i>Viola lanceolata</i>	bog white violet
<i>Viola primulifolia</i>	primrose-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 Yellow River Ranch Restoration site is located within the floodplain of the Yellow River. Intact native bottomland is located on the lowest portion of the floodplain while the restoration area is located on low erosional terrace that is generally flooded less frequently. The erosional terrace also has soil, landform and vegetative signatures of a seepage slope. Significant anthropogenic alteration and drainage of the erosional terrace resulted in a cultural landscape of drained pasture lands managed by the cultivation and grazing of non-native forage grasses. Restoration of the site involves hydrologic modification, installation the appropriate native species, control of invasive species, and prescribed fire in selected areas.

Approximately 155 acres of the Yellow River Ranch consists of existing forested Bottomland (615), with the remaining 120 acres converted to pasture from a previously forested landscape. Of the remaining 120 acres, 27 acres of Bottomland (615), 9 acres of Cypress (621) and 60 acres of Hydric Pine Flatwoods (625) are the focus of the quantitative monitoring. 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 graminoids and forbs representing mostly herbaceous, perennial lifeforms. The presence of successional, herbaceous native species is indicative of a landscape that has been disturbed and is in the process of increasing species richness. Species richness ranges from 29 to 32 species in the quantitative transects. Specifically there are species such as beaksedge (*Rhynchospora plumosa*) and toothache grass (*Ctenium aromaticum*) that are associated with the historic landscape of Hydric Pine Flatwoods. Toothache grass, along with wiregrass (*Aristida stricta*), are species that require prescribed fire to flourish and spread. Wiregrass was found within the transects; however, this species is one of the native groundcover species that has been planted in the Hydric Pine Flatwoods (625) polygon. As measured in transect YRR-T1-625, bahia grass (*Paspalum notatum*), continues to

be the most dominant groundcover species in this area. Bahia grass has been eradicated by herbicide application in other areas of the site.

Seedling swamp gum (*Nyssa sylvatica* var. *biflora*), white cedar (*Chameacyparis thyoides*), Chinese tallow tree (*Sapium sebiferum*) and slash pine (*Pinus elliottii*) were also observed within the Hydric Pine Flatwoods (625) polygon. Significantly the soils on the site were saturated and on the lower slope, flooded. This has likely caused species such as white cedar that are not adapted to long-term inundation to decline. In addition there is significant mortality of all tree seedlings associated with hog rutting. This is especially evident in belt transect BT1-615.

The quantitative summary results for the tree saplings in the target FLUCCS communities identified as forested/cypress wetlands (621 and 615) indicate that there are at least 400 to 1,400 trees/acre in the sample area. YRR-BT3-621 is located in an area of disturbed soils and the planted pond cypress are stunted. White cedar are in decline in all sample areas because the entire site is very wet. As the site is restored hydrologically, the wetland tree saplings will likely recruit naturally from the adjacent, mature bottomland forest and augment the species richness already present.

The landscape traversed during the pedestrian transect is entirely mapped as Hydric Pine Flatwoods (625). Overall the dominance of herbaceous plant lifeforms in the Hydric Pine Flatwoods is consistent with the quantitative measures of groundcover species in the Hydric Pine Flatwoods (625), Cypress (621) and Bottomland (615). All wetland polygons all are undergoing succession and trending toward a woody plant dominated landscape.

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 (bahia) greater 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 undergoing natural succession, it is trending, slowly, toward increased diversity and 80% coverage by native species. Species richness of native plants = 34.

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

Objectives	Performance Standards	Status
150' Linear Transect YRRT1-625 Hydric Pine Flatwoods (Continued)		
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 loblolly and slash pine, red maple, white cedar and swamp tupelo.
Increase coverage and diversity of native, appropriate groundcover vegetation.	Increase in appropriate herbaceous, shrub and /or tree species.	Site is undergoing natural succession toward a forested landscape, it is trending, slowly, toward 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 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 undergoing natural succession, it is trending, slowly, toward increased diversity and 80% coverage by native species. Species richness of native plants = 27.
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 loblolly and slash pine, red maple, white cedar and swamp tupelo.
Increase coverage and diversity of native, appropriate groundcover vegetation.	Increase in appropriate herbaceous, shrub and /or tree species.	Site is undergoing natural succession toward a forested landscape, it is trending, slowly, toward increased diversity and coverage by native species.

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

Belt Transect YJR-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 (Chinese tallow seedlings) 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 undergoing natural succession, it is trending, slowly, toward increased diversity and 80% relative coverage by native species. Species richness of native plants >25.
Increase coverage and diversity of native, appropriate tree vegetation.	Kind and total coverage of tree species appropriate for management goals and target natural community.	Saplings were planted in 2007. Over 500 surviving tree saplings/acre.
Increase coverage and diversity of native, appropriate groundcover vegetation.	Increase in appropriate herbaceous, shrub and /or tree species.	Site is undergoing natural succession toward a forested landscape, it is trending, slowly, toward increased diversity and coverage by native species.
Belt Transect YJR-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 (Chinese tallow seedlings) 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 undergoing natural succession, it is trending, slowly, toward increased diversity and 80% relative coverage by native species. Species richness of native plants >25.
Increase coverage and diversity of native, appropriate tree vegetation.	Kind and total coverage of tree species appropriate for management goals and target natural community.	Saplings were planted in 2007. Over 800 surviving tree saplings/acre.

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

Belt Transect YYR-BT2-615 Bottomland (Continued)		
Increase coverage and diversity of native, appropriate groundcover vegetation.	Increase in appropriate herbaceous, shrub and /or tree species.	Site is undergoing natural succession toward a forested landscape, it is trending, slowly, toward increased 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 (Chinese tallow seedlings) 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 undergoing natural succession, it is trending, slowly, toward increased diversity and 80% relative coverage by native species. Species richness of native plants >25.
Increase coverage and diversity of native, appropriate tree vegetation.	Kind and total coverage of tree species appropriate for management goals and target natural community.	Saplings were planted in 2007. Over 400 surviving tree saplings/acre.
Increase coverage and diversity of native, appropriate groundcover vegetation.	Increase in appropriate herbaceous, shrub and /or tree species.	Site is undergoing natural succession toward a forested landscape, it is trending, slowly, toward 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 (Chinese tallow seedlings) 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 undergoing natural succession, it is trending, slowly, toward increased diversity and 80% relative coverage by native species. Species richness of native plants >25.

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

Belt Transect YYR-BT4-621 Cypress (Continued)		
Increase coverage and diversity of native, appropriate tree vegetation.	Kind and total coverage of tree species appropriate for management goals and target natural community.	Saplings were planted in 2007. Over 1000 surviving tree saplings/acre.
Increase coverage and diversity of native, appropriate groundcover vegetation.	Increase in appropriate herbaceous, shrub and /or tree species.	Site is undergoing natural succession toward a forested landscape, it is trending, slowly, toward increased diversity and coverage by native species.

5.0. CONCLUSIONS AND RECOMMENDATIONS

A snapshot of the current conditions at the Yellow River Ranch restoration site was obtained from ecological monitoring in 2013. The data indicates a landscape that is continuing to trend towards the restoration goals and habitat target.

The bottomland (615) restoration area landscape is continuing to trend toward the desired target; however, invasive exotic Chinese tallow tree saplings should be monitored and treated. The cypress (621) restoration area is also continuing to trend toward the desired target of a pond cypress dominated landscape. Invasive exotic Chinese tallow tree saplings continue to be a concern in this area and should be monitored and treated. There are small areas of pond cypress that are still not thriving in the cypress restoration area.

The hydric pine flatwoods (625) restoration areas could be augmented by additional native groundcover plantings that are typical in wet savanna or wet prairie. 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.

Threats to the inherent biodiversity of this site continue to include fire suppression, hydrologic modification, non-native pasture grass and herbaceous weeds growth, feral hog damage, exotic invasive vegetation, and climate change. The expansion of invasive exotic species incursions on the site should be monitored carefully. ERC recommends removal of feral hogs from the site as soon as is feasible.

6.0 REFERENCES

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APPENDIX A
QUALITATIVE DATA SHEETS

APPENDIX B
PANORAMIC PHOTOGRAPHS
QUANTITATIVE AND QUALITATIVE TRANSECTS

APPENDIX C
QUANTITATIVE MONITORING PLOT PHOTOGRAPHS

TRANSECT YRR-T1-625 HYDRIC PINE FLATWOODS

TRANSECT YRR-T2-625 HYDRIC PINE FLATWOODS

Qualitative assessment data sheet

Transect ID: YRR-PT1-625

Date: 8/22/2013

Plant Community Type: Hydric pine savanna

Time (am/pm): 10:00 AM CT

1. **Weather:** Full Sun Part Sun Cloudy Cloudy with Rain/Fog
 2. **Temperature:** 20-50 F 51-70 F 71-90 F 91-110 F
 Pine Plantation (Rows) Restoration in progress Pine Plantation (Rows) Managed for Pine Natural Forest

3. **CANOPY % cover:** Absent 0-1% 1-5% 6-25% 26-50% 51-75% 76-100%

4. Estimated height class of the majority of **TREES** using the following scale: absent 3-5m 6-10m >10m

List 6 dominant **TREE** species observed in canopy:

1. N/A _____ 2. _____ 3. _____
 4. _____ 5. _____ 6. _____

5. Estimated height class of the majority of **SUBCANOPY** using the following scale: absent 3-5m 6-10m >10m

List up to 6 dominant **SUBCANOPY** species observed:

1. N/A _____ 2. _____ 3. _____
 4. _____ 5. _____ 6. _____

6. **SHRUBS % cover:** Absent 0-1% 1-5% 6-25% 26-50% 51-75% 76-100%

List 3 dominant **SHRUB** species observed:

1. *Baccharis halimifolia* _____ 2. *Myrica cerifera* _____ 3. *Chamaecyparis thyoides* _____

7. Estimated height class of the majority of **SHRUBS** using the following scale: absent 0-.5m .6-1.5m 1.6-3m

List 3 of the most common **SHRUB** and/or **TREE** seedlings observed:

1. *Pinus elliotii* _____ 2. *Chamaecyparis thyoides* _____ 3. *Myrica cerifera* _____

8. **GROUNDCOVER % cover of graminoids (grasses, sedges and rushes):**
 Absent 0-1% 1-5% 6-25% 26-50% 51-75% 76-100%

9. **TOTAL GROUNDCOVER % cover (including graminoids and forbes):**
 Absent 0-1% 1-5% 6-25% 26-50% 51-75% 76-100%

List up to 9 dominant **GROUNDCOVER** species observed:

1. *Andropogon glomeratus* _____ 2. *Paspalum notatum* _____ 3. *Axonopus furcatus* _____
 4. *Rhynchospora* spp. _____ 5. *Euthamia caroliniana* _____ 6. *Centella asiatica* _____
 7. *Diodia virginiana* _____ 8. *Rubus argutus* _____ 9. *Juncus marginatus* _____

List the **NATIVE WEEDY** or **RUDERAL** species observe - otherwise SEE 18. **EXOTIC SPECIES BELOW**

1. *Paspalum notatum* _____ 2. *Diodia virginiana* _____ 3. *Rubus argutus* _____
 4. *Rubus cuneatus* _____ 5. *Rubus trivialis* _____ 6. *Paspalum dilatatum* _____

Vegetation notes: Site is dominated by ruderal species. There are many shrubs/tree saplings beginning to dominate parts of the landscape, most are bird & wind dispersed species. The white cedar saplings are in decline across much of the site, especially in the wettest/flooded areas, due to excessive soil saturation.

Qualitative assessment data sheet

Transect ID: YRR-PT1-625

Date: 8/22/2013

Plant Community Type: Hydric pine savanna

10. Tree density: no canopy

11. Tree health: no canopy

13. Water table: at the surface below surface

Standing water: present absent

14. Water color: tannic non-tannic/clear cloudy

Notes on wildlife usage observed:

1. Red shouldered hawk

2. Eastern bluebirds

3. Eastern kingbirds

4. Turkey vulture

5. Dragon flies

6. Mockingbirds

7. Cloudless sulfur & Buckeye

8. Crickets

9. Carolina anole

17. Wildlife usage and natural history observations: amphibians reptiles fish birds mammals arthropods
 footprints scratch marks songs or calls scat

Wildlife notes: In areas where water has pooled such as in lower parts of landscape, wading birds were seen feeding. These included Louisiana heron and little blue heron. Blue grosbeaks were heard calling from across the landscape. Chimney swifts were seen and heard flying in large flocks of 25-50 birds.

Notes on Exotic species observed:

18. Exotic species: present absent

Sapium sebiferum (1%-5% cover) present as well as Paspalum notatum (> 1% coverage). Extensive areas of soil disturbance from feral pigs.

Notes on Restoration:

19. Notes on the general aspect of the site/techniques to meet restoration goals:

Is natural regeneration occurring? yes no and: species appropriate supplemental planting/seeding needed

Landscape observation: fire suppressed

If planted: not planted

-Tree age: 0-5 yrs. 6-10 yrs. 11-20 yrs. 20+ yrs.

Recommendations for restoration: prescribed burn

other:

20. Notes on prescribed burning and fire conditions:

Fuels: duff (cm): 0.5-1.0 litter (cm) 0.25-1.0 If burning is not possible because of concern for tree s:

Soil moisture: wet undesirable woody species can be herbicided and/or mechanically

Specific notes on restoration, observations, or adaptive management techniques:

Control invasive exotics and burn the site. There are many graminoids and fine fuels in the groundcover, when the landscape dries, a prescribed fire should carry across the site. The fire may kill the young pond cypress to the ground, they should coppice.

Yellow River Ranch site. Quantitative Transect YRR-T1-625: Panoramic Photograph depicted in two 180 degree sections.



0°

180°



180°

360°

Yellow River Ranch site. Quantitative Transect YRR-T2-625: Panoramic Photograph depicted in two 180 degree sections.



Yellow River Ranch site. Qualitative Pedestrian Transect YRR-PT1-625: Panoramic Photograph depicted in two 180 degree sections.



0°

180°



180°

360°

Yellow River Ranch site. Photo point YRR-PP1: Panoramic Photograph taken at photo point depicted in two 180 degree sections.



0°

180°



180°

360°

Yellow River Ranch site. Photo point YRR-PP2: Panoramic Photograph taken at photo point depicted in two 180 degree sections.



0°

180°



180°

360°

Yellow River Ranch site. Photo point YRR-PP3: Panoramic Photograph taken at photo point depicted in two 180 degree sections.



0°

180°



180°

360°



Photographs (left to right): 1) Transect YRRT1-625 Plot – 10 feet; 2) Transect YRRT1-625 Plot – 20 feet



Photographs (left to right): 1) Transect YRRT1-625 Plot – 30 feet; 2) Transect YRRT1-625 Plot – 40 feet



Photographs (left to right): 1) Transect YRRT1-625 Plot – 50 feet; 2) Transect YRRT1-625 Plot – 60 feet



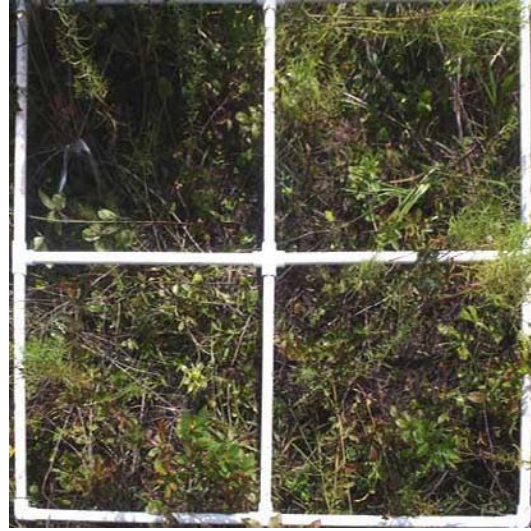
Photographs (left to right): 1) Transect YRRT1-625 Plot – 70 feet; 2) Transect YRRT1-625 Plot – 80 feet



Photographs (left to right): 1) Transect YRRT1-625 Plot – 90 feet; 2) Transect YRRT1-625 Plot – 100 feet



Photographs (left to right): 1) Transect YRRT1-625 Plot – 110 feet; 2) Transect YRRT1-625 Plot – 120 feet



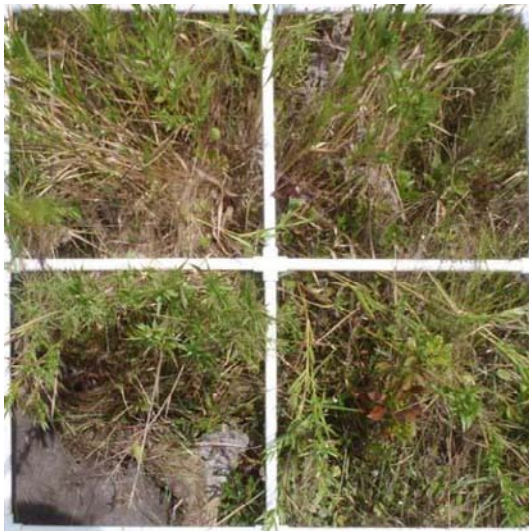
Photographs (left to right): 1) Transect YRRT1-625 Plot – 130 feet; 2) Transect YRRT1-625 Plot – 140 feet



Photographs (left to right): 1) Transect YRRT1-625 Plot – 150 feet



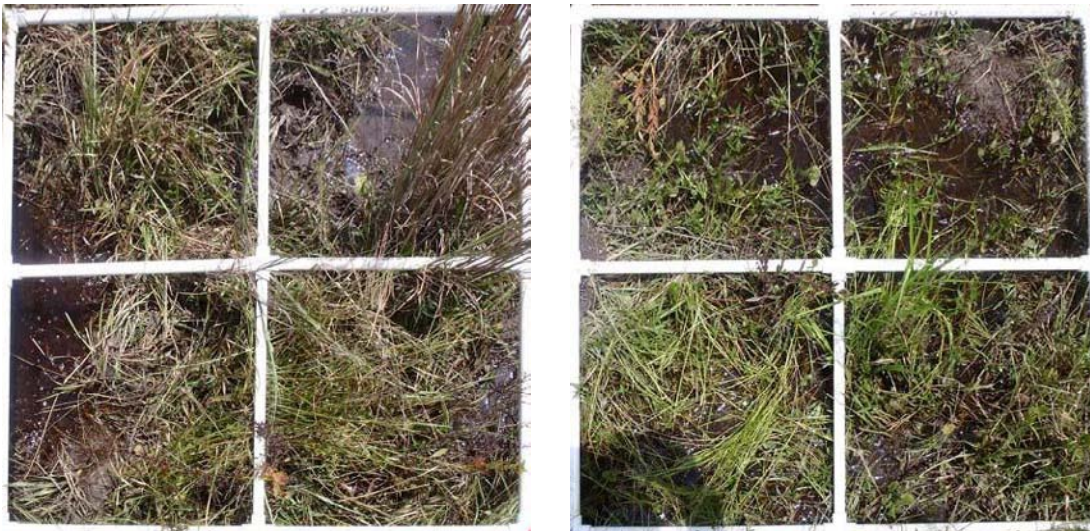
Photographs (left to right): 1) Transect YRRT2-625 Plot – 10 feet; 2) Transect YRRT2-625 Plot – 20 feet



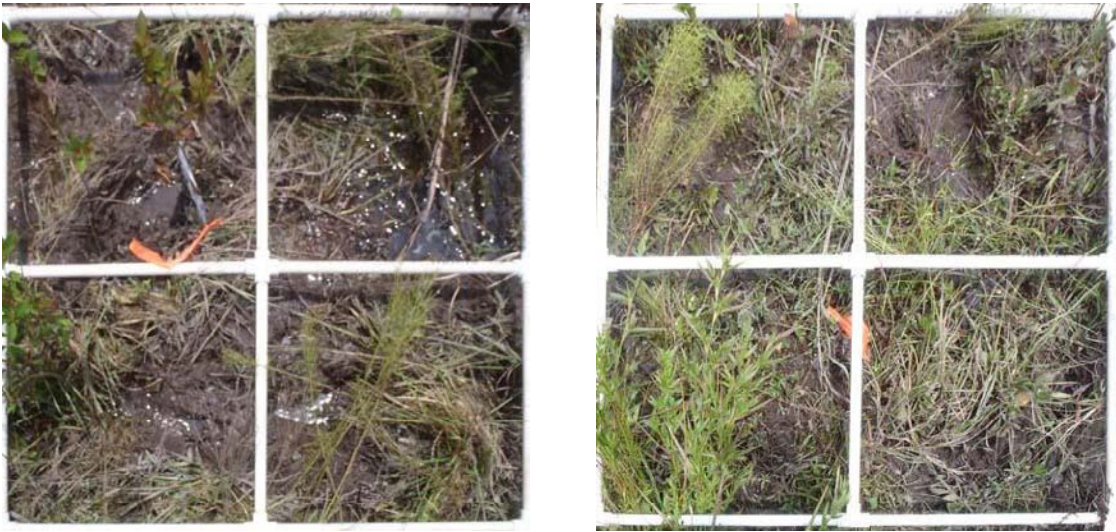
Photographs (left to right): 1) Transect YRRT2-625 Plot – 30 feet; 2) Transect YRRT2-625 Plot – 40 feet



Photographs (left to right): 1) Transect YRRT2-625 Plot – 50 feet; 2) Transect YRRT2-625 Plot – 60 feet



Photographs (left to right): 1) Transect YRRT2-625 Plot – 70 feet; 2) Transect YRRT2-625 Plot – 80 feet



Photographs (left to right): 1) Transect YRRT2-625 Plot – 90 feet; 2) Transect YRRT2-625 Plot – 100 feet



Photographs (left to right): 1) Transect YRRT2-625 Plot – 110 feet; 2) Transect YRRT2-625 Plot – 120 feet



Photographs (left to right): 1) Transect YRRT2-625 Plot – 130 feet; 2) Transect YRRT2-625 Plot – 140 feet



Photographs (left to right): 1) Transect YRRT2-625 Plot – 150 feet