

2012 Monitoring Report

DUTEX RESTORATION SITE

Escambia County, Florida

ERC #: 12-196A

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Ecological Resource
Consultants, Inc.

2012 Monitoring Report

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EXECUTIVE SUMMARY

Annual monitoring of the 809.85 acre Dutex Restoration Site located in coastal Escambia County, Florida was conducted in October 2012 to assess the hydrologic, vegetative, and ecological condition of the site. Assessments were conducted at specific transect sites located within discrete mapped delineations of Florida Land Use and Cover Classification (FLUCCS) habitats. Newly selected transect locations were marked with metal stakes in the field and located with sub-meter precision using GPS receivers. Thirty sample points in each of eight quantitative transects documented the coverage of each species, open water, and bare ground in a meter square grid. Two quantitative transects were conducted in each of habitats representative of Hydric Pine Flatwoods (FLUCCS 625) and Hydric Pine Savanna (FLUCCS 626). Eleven qualitative transects 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. Qualitative transects were conducted in Mesic Pine Flatwoods (FLUCCS 411), Bay Swamp (FLUCCS 611/613), Titi Swamp (FLUCCS 614), Hydric Pine Flatwoods (FLUCCS 625), Hydric Pine Savannah (FLUCCS 626), Wetland Forested Mixed (FLUCCS 630), Freshwater marsh (FLUCCS 641), and Saltwater Marsh (FLUCCS 642) habitats. Quantitative and qualitative transects were documented with a panoramic photograph at a location that was marked in the field. All transects and photograph points are depicted on maps that accompany the monitoring report.

The results of the 2012 monitoring represent a baseline condition that can be compared to future monitoring events to assess the progress of restoration efforts. The monitoring report also documents compliance with permit conditions for the Dutex Restoration Site. Data obtained during the October 2012 monitoring event reaffirms that the habitats at the Dutex Restoration Site are fire suppressed and consequently exhibit low species diversity and significant coverage of bare ground; however, the presence of a few scattered habitats exhibiting species richness above 40 taxa indicate that the restoration potential of the site is very good.

Implementation of management strategies that reduce weedy shrub growth to appropriate coppice lifeform is essential to reduce resource competition from woody shrubs and to create conditions that favor herbaceous growth and reproduction. Prescribed burning is the preferred practice to accomplish canopy and subcanopy reduction. Safe and effective burning requires management of natural fuels by practices such as mechanical walk-down or other means. Mechanical fuel management is typically necessary in the early phases of habitat restoration and should eventually be replaced by practices that insure continuous ground fuels.

Growth and competition from exotic invasive plants is a serious management concern because of multiple species infestations on adjacent lands and throughout the Elevenmile Creek

watershed. The only practical management option to address potential invasive plant infestations is vigilant site monitoring and control with herbicides and mechanical removal, as needed.

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1.0 INTRODUCTION

1.1. Purpose and Scope

1.1.1 Purpose

The Dutex Restoration Site (809.85 acres), located on Perdido Bay, was acquired June 12, 2009 specifically for use as mitigation to offset current and future Florida Department of Transportation (FDOT) wetland impacts. The goal of the mitigation is to restore the site to pre-disturbance conditions. Restoration activities include mechanical brush reduction, prescribed fire, herbicide treatments, selective planting and hydrologic enhancements. Full implementation of the approved mitigation plan will yield 107.16 UMAM credits (IRT-approval: 3/24/2011). The purpose of the study is to obtain data that reflect the current vegetative condition. The data will be reported to document permit compliance and will be used for a reference by which the success of future restoration efforts can be assessed.

1.1.2 Scope

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

For this study, field maps are prepared that depict prior habitat mapping and other pertinent spatial data including the most recent aerial photographs (January 1, 2012) and spatial data intersections. A review is conducted to evaluate existing habitat mapping and data intersections to select locations of 4 quantitative transects and 6 qualitative transects on the West Tract and 4 quantitative transects and 5 qualitative transects on the East Tract. The goal for choosing the habitat evaluation sites is to select areas for the quantitative transects that are not within ecotones and that are likely to represent the most acceptable example of the central concept for the habitats that are monitored. Qualitative transect locations are selected based upon habitats depicted in the existing FLUCCS maps and areas of interest with respect to restoration management activities. Specifications of habitat and transect types and numbers provided by the Water Management District are in Table 1 below.

Table 1: Dutex Monitoring Scope by Activity

Project Name	Transect Name	Transect/Activity Type	Polygon Descriptor	Number of Transects
Dutex Restoration Site	Dutex:West Tract	Pedestrian Transect/Qualitative	411 - Mesic Pine Flatwoods	1
Dutex Restoration Site	Dutex:West Tract	Pedestrian Transect/Qualitative	611/613 - Bay Swamp	1
Dutex Restoration Site	Dutex:West Tract	Pedestrian Transect/Qualitative	625-Hydric Pine Flatwoods	1
Dutex Restoration Site	Dutex:West Tract	Pedestrian Transect/Qualitative	626-Hydric Pine Savanna	1
Dutex Restoration Site	Dutex:West Tract	Pedestrian Transect/Qualitative	641-Freshwater Marsh	1
Dutex Restoration Site	Dutex:West Tract	Pedestrian Transect/Qualitative	642-Saltwater Marsh	1
Total				6
Dutex Restoration Site	Dutex:East Tract	Pedestrian Transect/Qualitative	611- Bay Swamp	1
Dutex Restoration Site	Dutex:East Tract	Pedestrian Transect/Qualitative	614-Titi Swamp	1
Dutex Restoration Site	Dutex:East Tract	Pedestrian Transect/Qualitative	625-Hydric Pine Flatwoods	1
Dutex Restoration Site	Dutex:East Tract	Pedestrian Transect/Qualitative	626-Hydric Pine Savanna	1
Dutex Restoration Site	Dutex:East Tract	Pedestrian Transect/Qualitative	630-Wetland Forested Mixed	1
Total				5
Dutex Restoration Site	Dutex:West Tract	Quantitative Transect	625-Hydric Pine Flatwoods	2
Dutex Restoration Site	Dutex:West Tract	Quantitative Transect	626-Hydric Pine Savanna	2
Total				4
Dutex Restoration Site	Dutex:East Tract	Quantitative Transect	625-Hydric Pine Flatwoods	2
Dutex Restoration Site	Dutex:East Tract	Quantitative Transect	626-Hydric Pine Savanna	2
Total				4

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

The locations for the qualitative and quantitative transects are depicted on maps and submitted to the Water Management District for approval. Following approval, each of the transect sites is assessed in the field. The transect locations and paths are adjusted slightly in the field to assure that each selection is appropriate for accomplishing the goals of monitoring. Each transect is staked with half inch, 5 foot galvanized stake. Each stake is located with a GPS.

For each quantitative transect, a metal stake is placed at the terminus of the 300 foot transect. At each sample point, a meter square grid is placed on the ground to demarcate the sample area. Coverage for each species, bare ground, and open water is determined and recorded. Each sample point is photographed with the grid in place. Thirty sample points are monitored in each quantitative transect. A representative point is selected and located with a GPS to obtain a 360 degree (panoramic) photograph of the landscape.

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

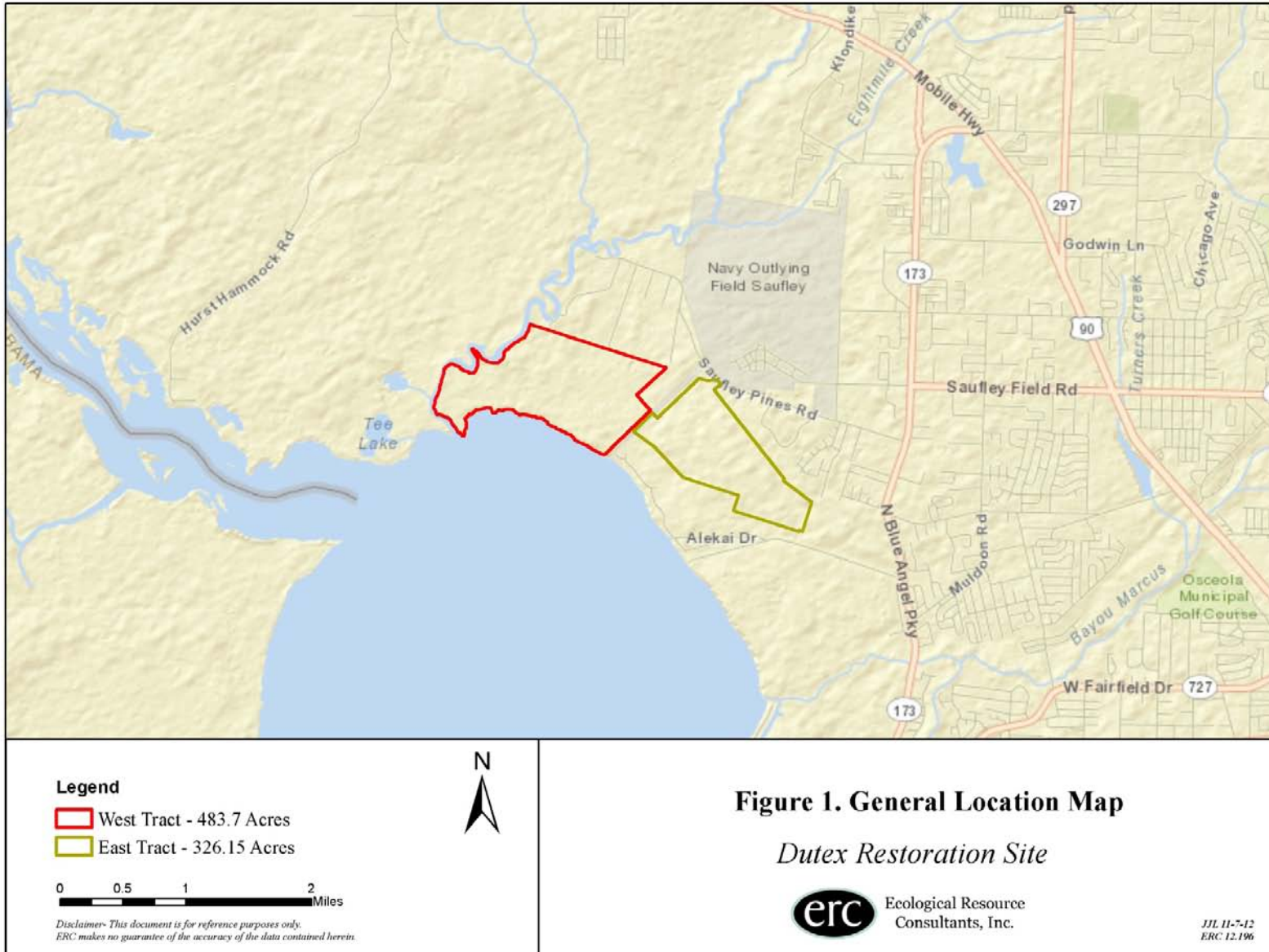
Following completion of the field assessment, data is summarized and parameters are calculated. Percent cover for each species, bare ground and open water coverage, and nuisance or invasive exotic species are determined for each quantitative transect. A summary of species richness is determined for each sample pedestrian walk-path in the qualitative transects.

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

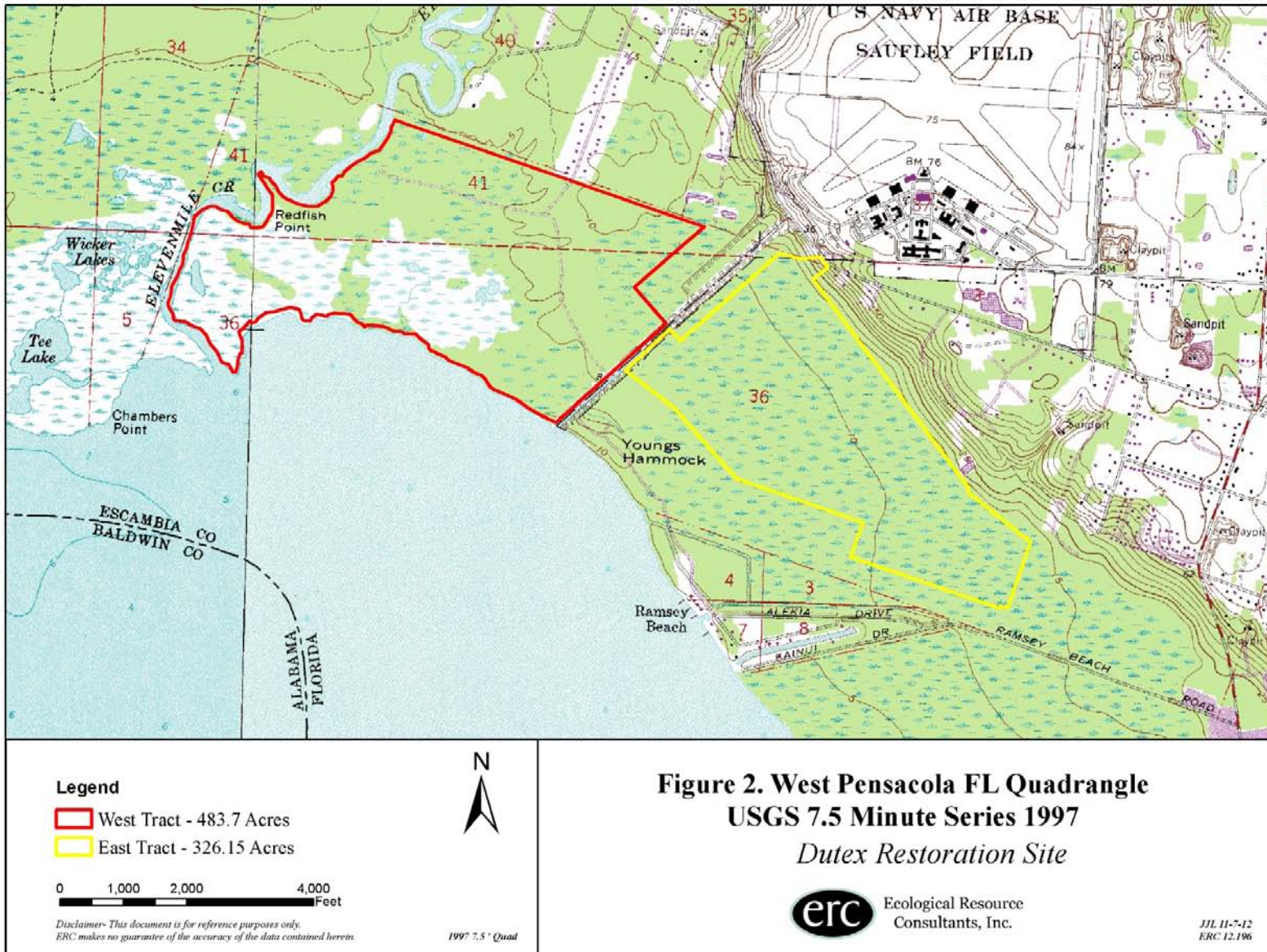
1.2 Natural Setting of the Dutex Restoration Site

1.2.1 Physiography and Climate

The 809.85 acre Dutex Restoration Site is located in southwestern Escambia County, Florida, adjacent to Perdido Bay in Section 36, Township 2 South, Range 31 West. The site is divided into a 483.7 acres western tract and a 326.15 acres eastern tract (Figure 1).



The two nearly contiguous tracts are separated from each other by a large drainage ditch and associated parallel spoil berm emanating from the Pensacola Naval Air Station at Saufley Field, located northeast of the Dutex site. The site is located almost entirely on the Silver Bluff surface in the Southern Pine Hills District of the terraced coastal lowlands of the Gulf Coastal Plain (Healy, 1975). The landscape at the site is characterized by a matrix of nearly level to depressional flats interspersed with a few low knolls. A significant portion of the western site at the mouth of Elevenmile Creek is a low tidal delta with areas of natural levees formed from recent alluvium located along the creek, north of the tidal marsh. A narrow sandy beach is present along Perdido Bay. The eastern tract increases in elevation immediately north of and parallel to the northern site boundary from approximately 15 feet to more than 70 feet in elevation above mean sea level (Figure 2). The slope is a Pleistocene shoreline escarpment to the Penholoway Terrace. The lower portion of the escarpment is a very poorly drained seepage slope while the upper slope and Penholoway surface has a well-drained matrix.



Escambia County averages approximately 62 inches of rain per year, (Williams 2004) with approximately 55 percent of the precipitation falling in the rainy season from April to December. April is typically the driest month of the year. The climate is humid-temperate, with average monthly temperatures ranging from 54°F in January to 80°F in July (Williams, 2004).

The Dutex site is located within the Perdido Bay watershed and mostly within the Perdido Bay-Bridge Creek subwatershed. The westernmost portion of the western tract is located in the Elevenmile Creek subwatershed. A small un-named creek and several small ponds are present in the tidal marsh in the western tract. The eastern tract lies immediately below the toe of the Penholoway Escarpment and likely receives a significant component of shallow subsurface seepage.

Elevenmile Creek forms the western boundary of the Dutex Restoration Site. Other natural boundaries include Perdido Bay forms the southern boundary of the western tract and the toe of the Penholoway Escarpment forms the northern boundary of the eastern tract. The western and eastern tracts are bisected by a large drainage ditch and parallel spoil berms for most of the boundary between the tract segments.

The Elevenmile Creek watershed drains urban and industrial portions of Escambia County. A large industrial wastewater treatment wetland, located west of Elevenmile Creek and less than one mile north of the mouth of the creek, receives paper mill effluent that was previously discharged into the creek.

1.2.2. Soils

This section describes soil conditions at the Dutex Restoration Site and provides an update to soils information discussed in the Conceptual Mitigation Plan (Entrix, 2010). Soil, as used in this report, is defined as the uppermost layers of the surface of the earth to a depth of 6 feet or more. Soil is the most biologically active component of the planet's geology and thereby significantly affects the plant community that is supported at any given location. Soil morphology refers to characteristics of the soil that either formed from or were inherited from the parent material and that can easily be observed. The primary morphological units in soils are layers called horizons. Different types of soil horizons characterize soil conditions that can affect plant growth and other land uses.

All soils data and information in this report complies with the standards of the USDA-NRCS Soil Survey Program. Soil surveys have been produced by the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) for most counties in the United States. The Soil Survey of Escambia County, Florida was published in 2004 at a map scale for detailed soil survey maps of 1:24,000. The entity that is delineated by soil scientists and depicted on the soil survey maps is called the map unit. The map unit is typically comprised of one soil series (identified by geographic names such as Lynn Haven or Leon) but may contain several soil series or even components of non-soil such as urban land or water. Map units are identified by a numeric or alpha

numeric symbols, the soil series name, the typical topsoil texture, and other information reflecting the geomorphic position where the soil is typically identified and mapped. In the map unit descriptions below, 9-Leon sand is an example of the map unit symbol and name.

Soil series are distinguished from each other by their classification in Soil Taxonomy. Most of the soils at the Dutex site vary primarily by their organic carbon (organic matter) content and depth, the effect of tidal inundation, and the drainage class (wetness class). Most of the soils at the Dutex site are associated with wetlands hydrology and plants, and are classified as hydric soils.

The parent material of soils on the Dutex site is dominated by recent organic matter accumulation and sandy alluvium. Lesser amounts of silt and clay are present in some subsoils and the underlying C horizons. Un-oxidized iron sulfide bearing sediments are present in some areas at varying depths below 6 feet and to the soil surface in the tidal areas, mostly located at the mouth of Elevenmile Creek in the western tract. Sandy alluvium is the parent material on low natural levees of Elevenmile Creek, which is located predominantly in the western tract. (Williams, 2004)

Water tables in most soils fluctuate seasonally in response to rainfall, evaporation and transpiration, and tides in coastal areas. The shallowest depth to sustained saturation is called the depth to seasonal high saturation/inundation or seasonal high water table (SHWT). In Escambia County, the seasonal high water table is typically observed in the later winter months during years of normal precipitation amounts and distribution. Water tables also rise during the summer thunderstorm season or at other times in response to prolonged heavy rains. Subaqueous water tables are present in shallow water bodies and represent permanent inundation. Subaqueous soils were not mapped nor distinguished from water in the Soil Survey of Escambia County, Florida. Very poorly drained soil water tables in tidal areas are not seasonal but more typically fluctuate daily or more frequently. Flooding is defined as the temporary inundation of an area caused by overflowing streams, runoff from adjacent slopes, or by tides. The drainage class can be used to classify soils into groups of ranges in SHWT depths (Table 2). Flooding is not represented by the drainage class.

Table 2: Soil Drainage Classes

Drainage Class	Code	Depth (inches)	Notes
Subaqueous	SA	12+	Permanent water table, not seasonal.
Very Poorly Drained	VPD	0 to 24+	
Poorly Drained	PD	0 to 12	
Somewhat Poorly Drained	SPD	12 to 30	
Moderately Well Drained	MWD	30 to 48	
Well Drained	WD	48 to >72	Not sandy throughout
Excessively Drained	ED	>72	Sand to 72 inches or more

The dominant soil types on the Dutex site are very poorly drained Histosols and Histic intergrades, comprising 70 percent or more of mapped soils (Williams, 2004). Histosols are soils that contain thick deposits of organic soil material. Organic soil material contains greater than about 12 percent organic carbon where the mineral component is sandy. Histosols at the Dutex site have soil organic matter typically in the form of very well decomposed plant materials called muck. The very poorly drained Histic intergrades are Inceptisols with organic surfaces that are not thick enough (generally less than 10 inches) to be classified as Histosols. These Histic intergrades sometimes lie on nearly imperceptibly higher landforms that are often distinguishable for subtle vegetative composition changes.

Fluvaquents are mapped in an undifferentiated map unit with the organic Dorovan soils in a north-south oriented linear delineation in the western tract with a small lobe in the eastern tract. This map unit contains an undetermined percentage of mineral alluvial soils and organic soils on a landscape that is flooded at least once every two years. Histosols on the Dutex site are mapped in either tidal or non-tidal map units. There is only one tidal unit mapped, 6-Dirego Muck, and it comprises approximately 22 percent of the soils on the Dutex site. Non-tidal Histosols and Histic intergrades comprise approximately 48 percent of the soils on the Dutex site. Undifferentiated Fluvaquents (alluvial mineral soils) and Histosols comprise approximately 18 percent of the soils mapped on the Dutex site. Ninety-six (96) percent of the soils on the Dutex site are very poorly drained and therefore inundated for at least part of most years.

Minor soils on the Dutex Site are located mostly on natural levees along Elevenmile Creek or on low knolls in the frequently flooded landform mapped as undifferentiated alluvial and organic soils (49-Dorovan Muck and Fluvaquents, Frequently Flooded). These minor soils have sandy surfaces and are underlain by spodic horizons, horizons containing an increase in clay content, or undifferentiated alluvial strata of sand or loamy mineral textures. (Figure 3).

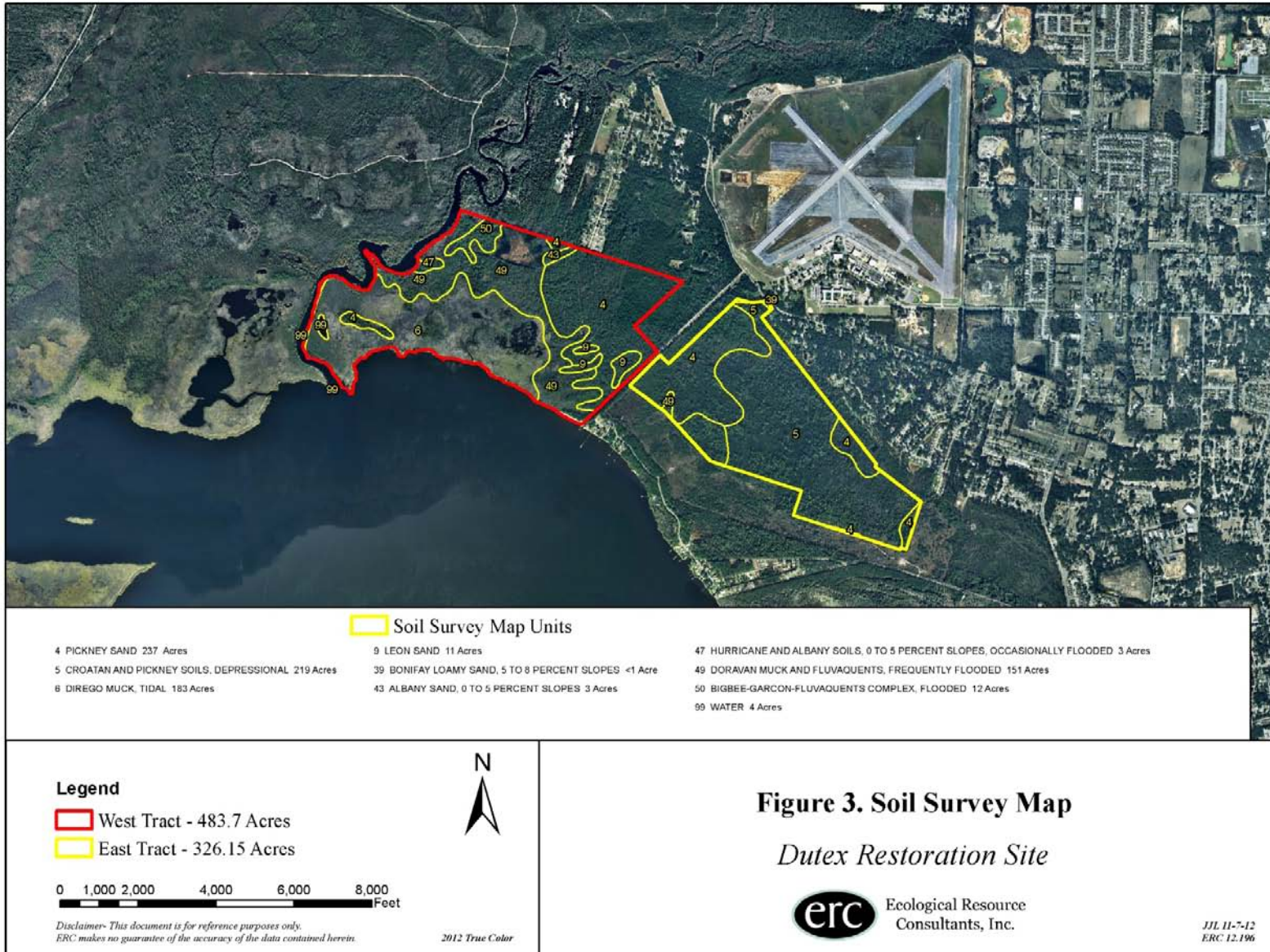


Table 3-Soil Survey Map Unit Data for the Dutex Restoration Site

Map Unit	Map Unit Name	Acres	Landforms	Percent of Site	Drainage Class	Ecological Community
4	Pickney sand	234	Level Wet Flats	28	VPD	Pitcher Plant Bog
5	Croatan and Pickney soils, depressional	219	Depressions	27	VPD	Swamp Hardwoods
6	Dirego Muck, tidal	183	Tidal Marsh	22	VPD	Tidal Marsh
9	Leon sand	11	Natural Levees	1	PD	North Florida Flatwoods (mesic)
43	Albany Sand	30	Natural Levees	<1	SPD	Mixed Hardwood Pine
47	Hurricane and Albany Soils, 0 to 5 percent slopes, occasionally flooded	3	Natural Levees	<1	SPD	Mixed Hardwood and Pine
49	Dorovan Muck and Fluvaquents, frequently flooded	151	Floodplains	18	VPD	Swamp Hardwoods
50	Bigbee-Garcon-Fluvaquents, frequently flooded	12	Natural Levees and Bottomlands	1	VPD to ED	Bottomland Hardwoods

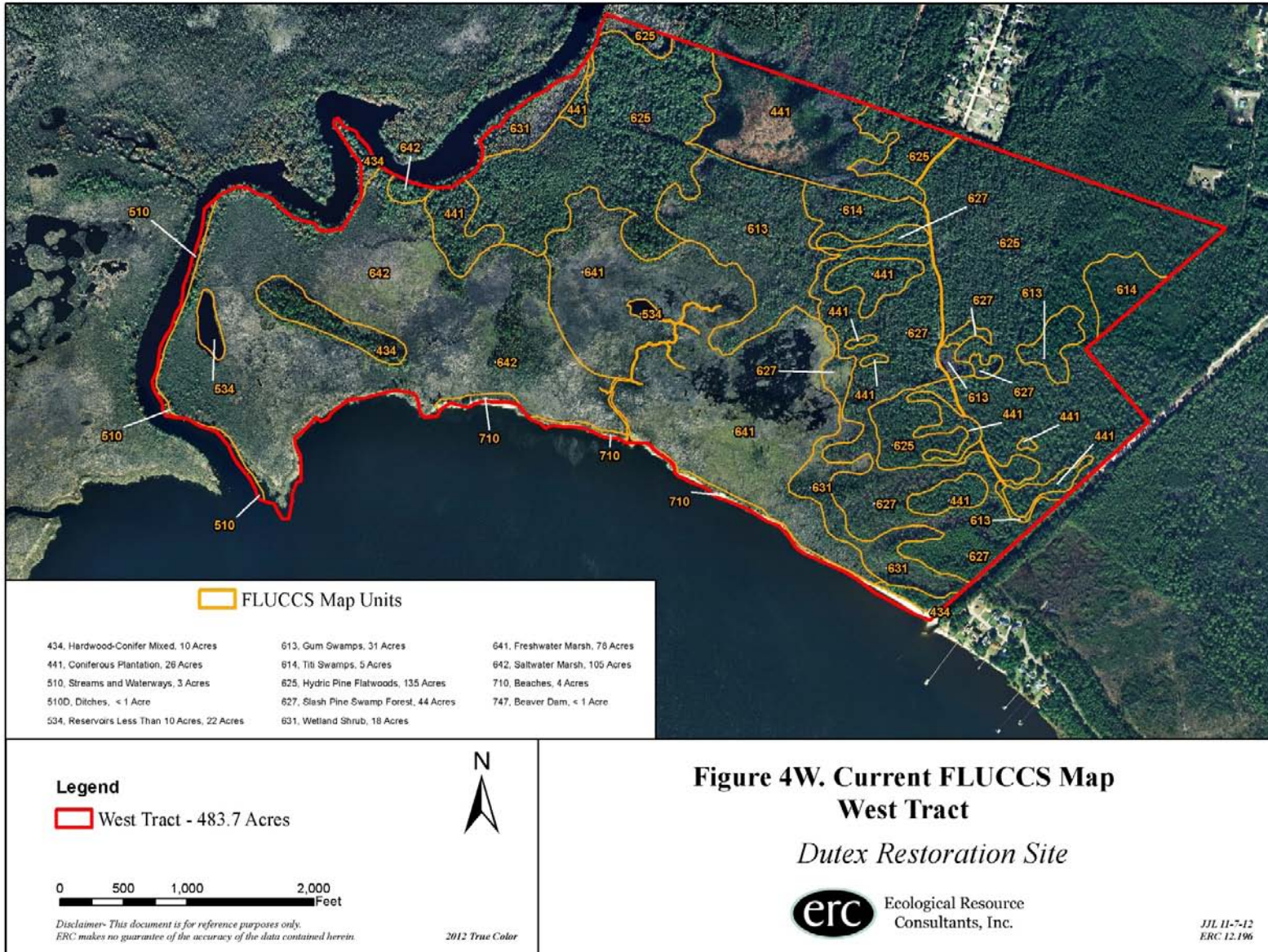
1. 26 Ecological Communities of Florida. Soil Conservation Service, 198x.
2. Soil data from the Soil Survey of Escambia County, Florida. (Williams, 2004)

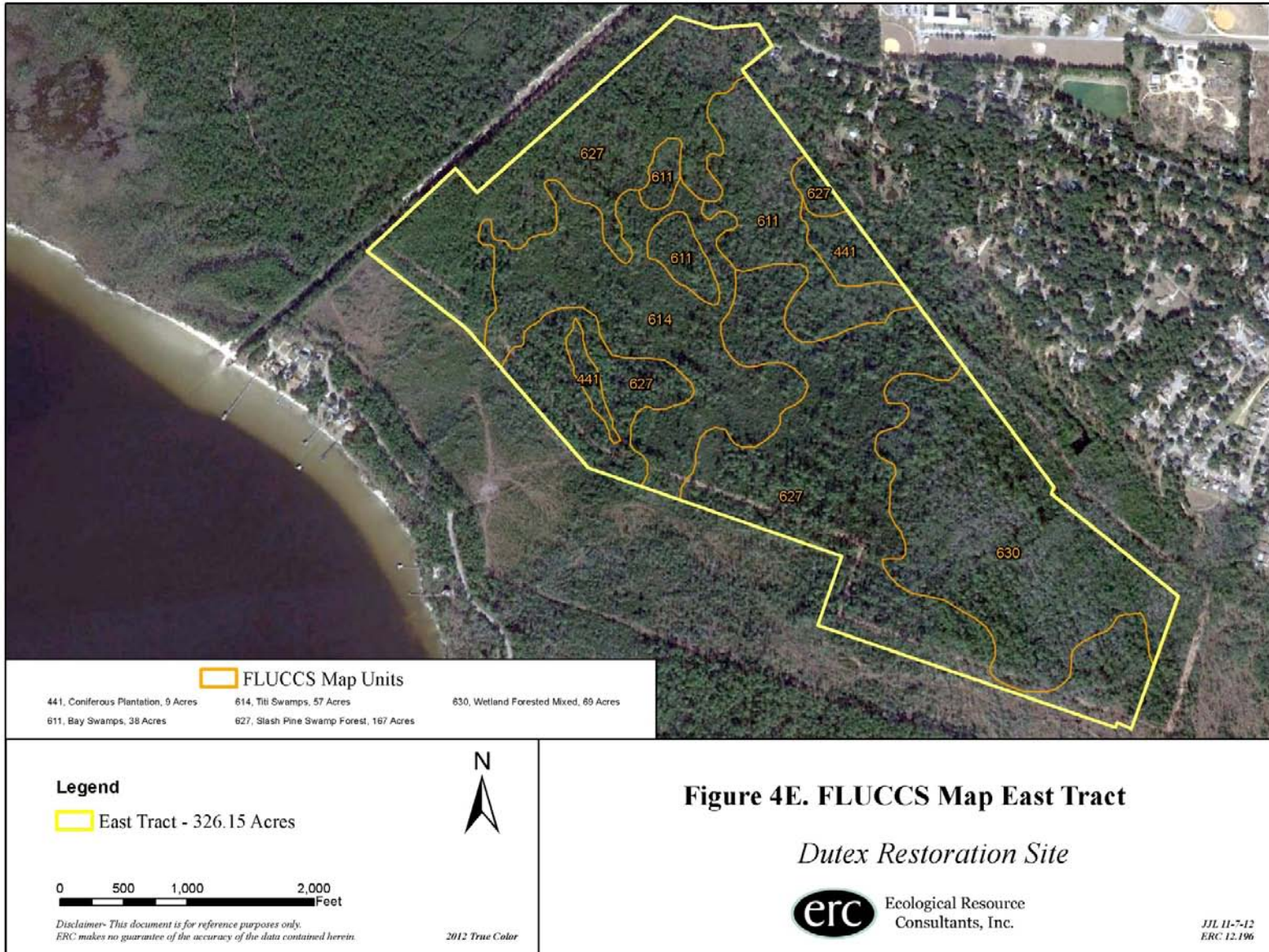
1.2.3. Vegetation

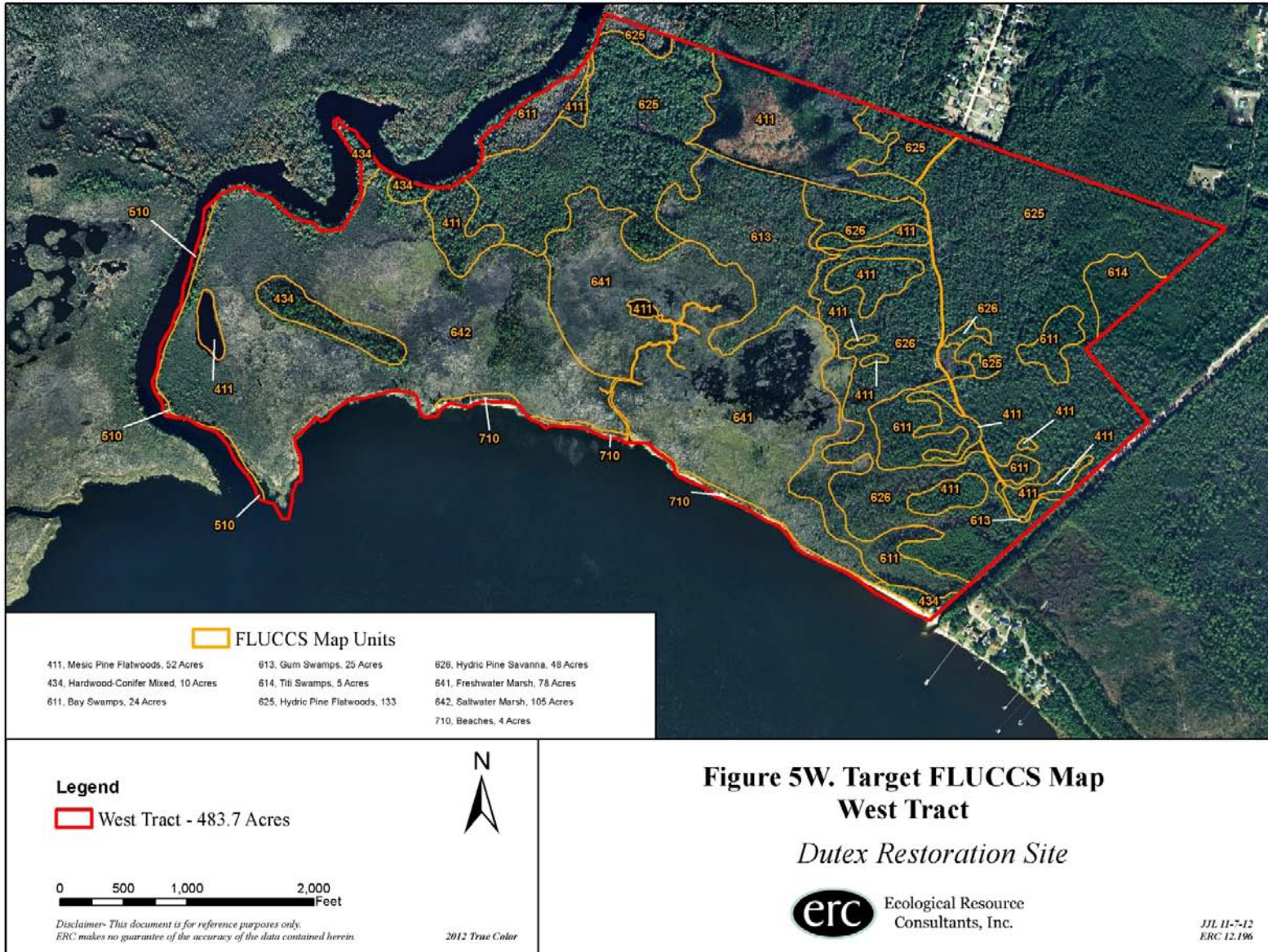
Baseline habitat mapping for the Dutex Restoration Site was conducted using the Florida Land Use Cover Classification System (FLUCCS). The habitat maps and maps depicting the target restoration goals were prepared using FLUCCS. Habitat descriptions and maps were excerpted from the Conceptual Mitigation Plan and inserted in this report for reference. New maps depicting the current and target habitats were prepared from spatial data obtained from the NFWFMD. The new maps correct some minor inconsistencies in the legends and labeling of the original habitat maps (Figures 4E and 4W). The target habitats are depicted on Figures 5W and 5E.

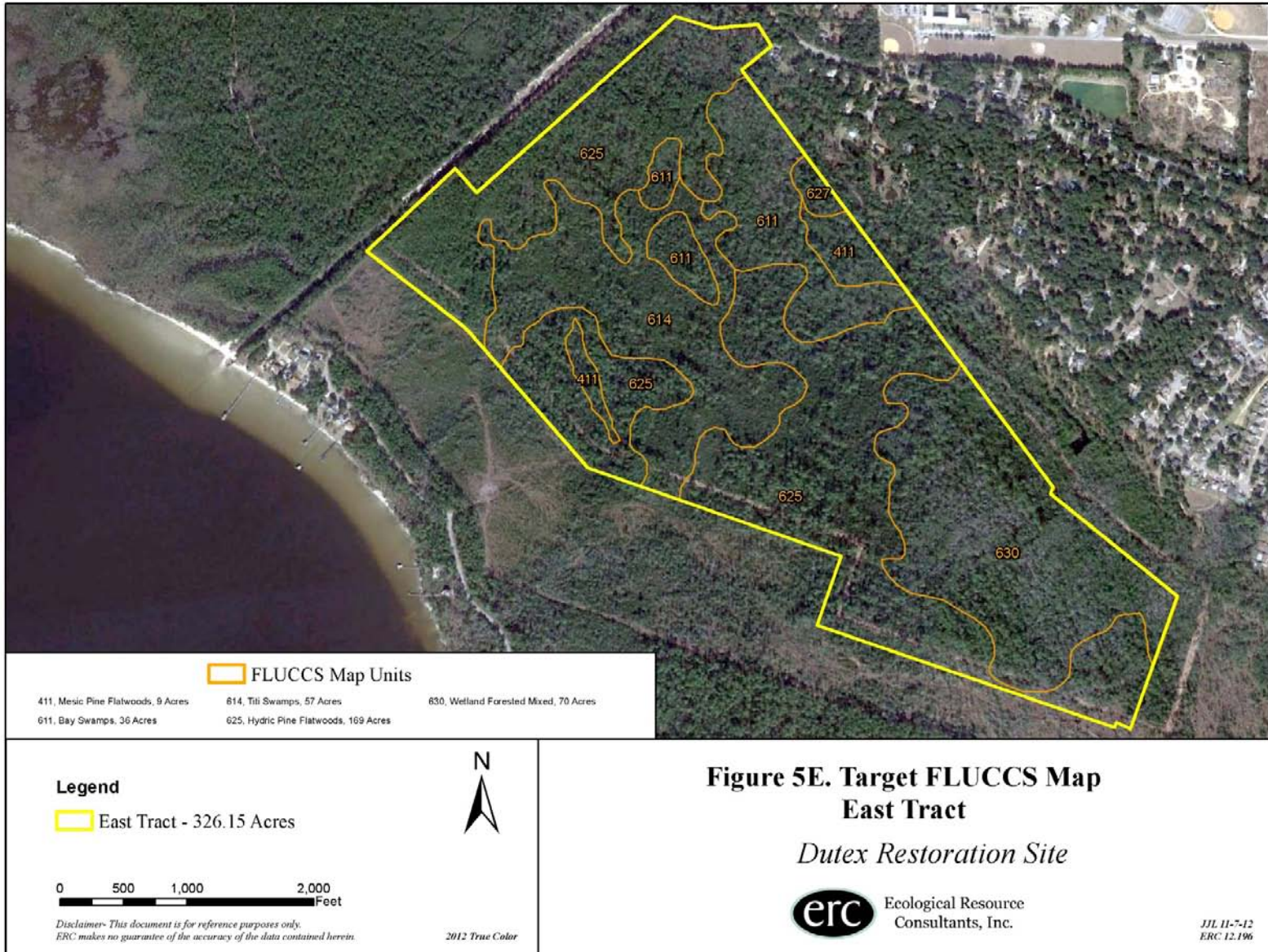
The FLUCCS habitats mapped at the Dutex Restoration Site for the Conceptual Mitigation Plan are Mesic Pine Flatwoods (411), Hardwood Conifer Mixed (434), Streams (510) and Lakes (523), Ditches (510D), Lakes (524), Beaver Pond (534), Bay Swamp (611), Gum Swamp (613), Titi Swamp (614), Hydric Pine Flatwoods (625), Hydric Pine Swamp Forest (627), Wetland Forested Mix (630), Wetland Shrub (631), Freshwater Marsh (641), Saltwater Marsh (642), Beaches (710), and Beaver Dam (747).

**This District acknowledges that the acreage for the Eastern Tract is greater than the purchased acreage. The District is rectifying the acreage discrepancy. For this report we will use FLUCCS acreages consistent with the original plan and adjust the acreage and plan once the correct boundary is established.*









Numerous classification systems have been used in Florida to describe habitats often with a different focus and purpose. Habitats correlated with USDA-NRCS Soil Survey mapping for example are shown above in Table 3 for the Dutex Restoration Site using the 26 Ecological Communities of Florida system. This classification system correlates soil conditions with vegetative communities (Figure 6). The NRCS system evolved from a rangeland classification system that was modified to portray ecological conditions of various soil properties and landforms. The Florida Natural Areas Inventory (FNAI) classification system has been favored by some restoration ecologists, however neither the FNAI system nor the NRCS system emphasize land use to the extent utilized by the FLUCCS system. In 2009, the Florida Fish and Wildlife Conservation Commission published the results of an effort to correlate several habitat classification systems used in the state including FLUCCS, FNAI, and other classification schemes creating the Florida Land Cover Classification System (FLCCS). FLCCS is hierarchical and based primarily upon FLUCCS and attempts to incorporate FNAI habitats that could not be correlated into existing FLUCCS habitats. The FLCCS system does not consider the NRCS classification system and neither FLUCCS, FLCCS, nor FNAI systems correlate soil survey data with habitat types.

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

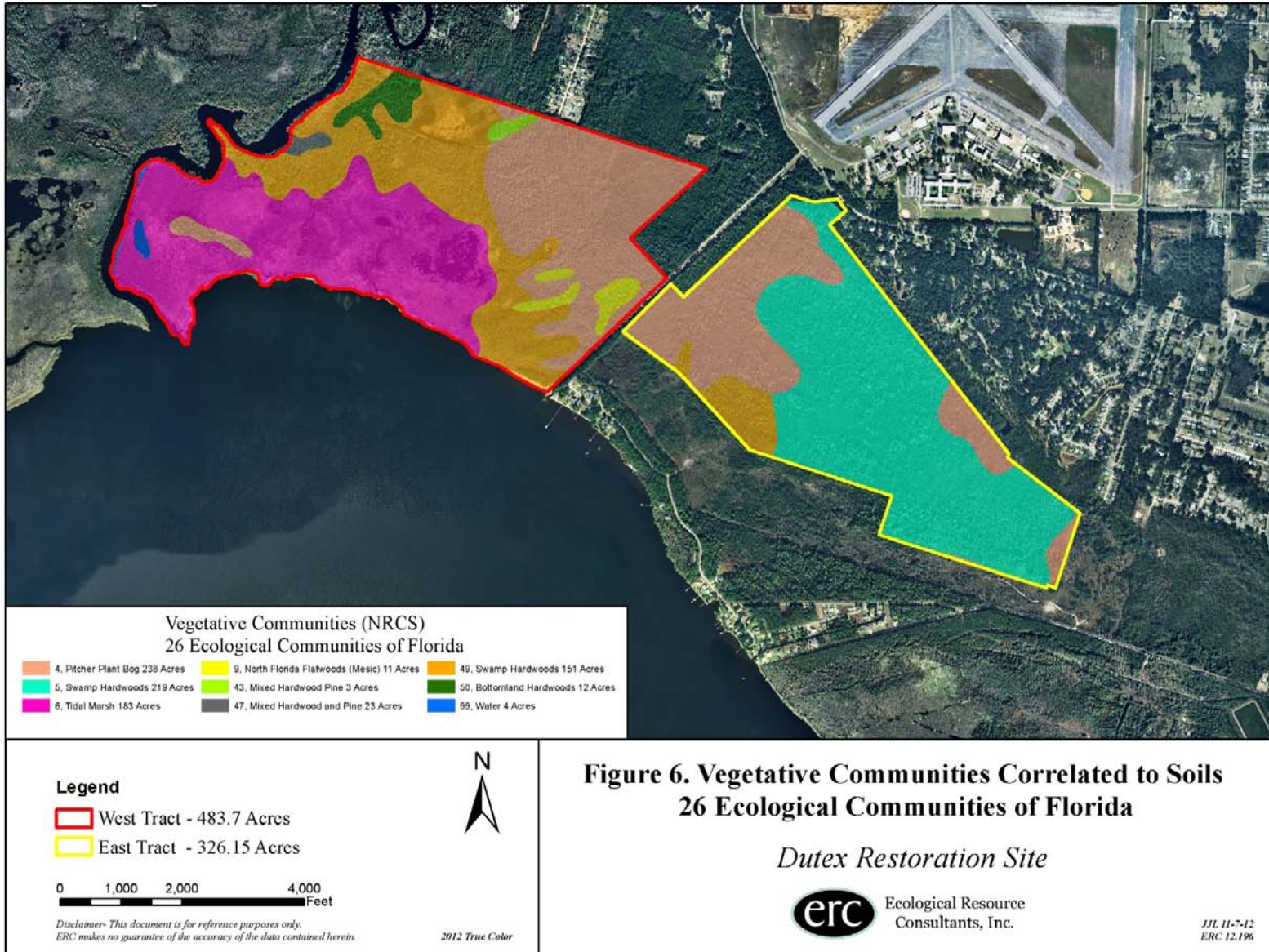


Table 4: Current FLUCCS Habitats

FLUCCS Habitat Descriptions and Acreages	
Mesic Pine Flatwoods (FLUCCS 411), 34.5 Acres	
	The mesic pine flatwoods at the Dutex site exhibit an open-to-dense canopy dominated by slash pine. Understory and shrub strata have dense growth of black titi (<i>Cyrilla racemiflora</i>) and other species. Shrub and low growing woody species observed included dwarf live oak (<i>Quercus minima</i>), wax myrtle (<i>Myrica cerifera</i>), saw palmetto (<i>Serenoa repens</i>), coastal sweet pepperbush (<i>Clethra alnifolia</i>), horse sugar (<i>Symplocos tinctoria</i>), sweet gallberry (<i>Ilex coriacea</i>), woolly huckleberry (<i>Gaylussacia mosieri</i>), Elliott's blueberry (<i>Vaccinium elliotii</i>), shiny blueberry (<i>V. myrsinites</i>), Darrow's blueberry (<i>V. darrowii</i>), and hairy wicky (<i>Kalmia hirsuta</i>). The duff layer is typically deep and ground cover sparse. Few canopy openings contain relictual flatwoods herbaceous species including wiregrass (<i>Aristida stricta</i>), downy milkpea (<i>Galactia volubilis</i>), Carolina yelloweyed grass (<i>Xyris caroliniana</i>), and pale meadowbeauty (<i>Rhexia mariana</i>).
Hardwood Conifer Mixed (FLUCCS 434), 9.9 Acres	
	Two narrow linear, areas of hardwood conifer mixed landscapes were delineated adjacent to Elevenmile Creek and one area is delineated in the southeastern corner of the western tract. The areas adjacent to Elevenmile Creek are natural levees. The canopy includes large, mature southern magnolia (<i>Magnolia grandiflora</i>), slash pine (<i>Pinus elliotii</i>), and red cedar (<i>Juniperus</i> sp.). Understory and shrub species observed include overstory recruits, laurel oak (<i>Quercus hemisphaerica</i>), sand live oak (<i>Q. geminata</i>), red bay (<i>Persea borbonia</i>), yaupon (<i>Ilex vomitoria</i>), and sparkleberry (<i>Vaccinium arboreum</i>). Groundcover species included muscadine grape (<i>Vitis rotundifolia</i>), saw palmetto (<i>Serenoa repens</i>), tall elephants foot (<i>Elephantopus elatus</i>), bracken fern (<i>Pteridium aquilinum</i>), highbush blackberry (<i>Rubus argutus</i>), and laurel greenbrier (<i>Smilax laurifolia</i>). The understory and groundcover is sparse with a thick layer of pine duff.
Stream (FLUCCS 510), 3.0 Acres and Lakes <10 Acres (FLUCCS 523), 3.0 Acres	
	One small unnamed tidal stream and two small lakes are delineated in the freshwater marsh located in the western tract. Water levels are affected by tide and wind. A network of small streams drain areas landward of these delineations. Salinity in the streams and lakes ranged from freshwater to near saline (30 ppt) depending on local rainfall distribution and tide cycle. The edges of the marsh creek and rivulets provide habitat for several brackish fish species such as killifishes (<i>Fundulus</i> spp.), silversides (<i>Menidia</i> sp.), mullet (<i>Mugil</i> sp.), and pinfish (<i>Lagodon</i> sp.). Blue crabs (<i>Callinectes sapidus</i>), oysters (<i>Crassostrea virginica</i>), and Penaeidae were observed in the streams and lakes. The portion of Elevenmile Creek within the Dutex property boundaries is also designated as FLUCCS 510. An area of wild taro (<i>Colocasia esculenta</i>) was observed growing within Elevenmile Creek.
Ditches and Roads (FLUCCS 510D), 0.9 Acre	
	Wetland cut ditches and associated roads are located on the western tract. The ditches are associated with either existing or historic fill road. The ditches were likely created as a result of fill road construction and not for the sole purpose of wetland drainage. Commonly observed ditch vegetation includes southern umbrellasedge (<i>Fuirena scirpoides</i>), manyhead rush (<i>Juncus polycephalos</i>), fringed beaksedge (<i>Rhynchospora ciliaris</i>), needlepod rush (<i>Juncus scirpoides</i>), fascicled beaksedge (<i>Rhynchospora fascicularis</i>), torpedograss (<i>Panicum repens</i>), and common water-hyacinth (<i>Eichhornia crassipes</i>). Roads/trails not slated for removal as proposed by the Conceptual Mitigation Plan are not delineated.

Table 4: Current FLUCCS Habitats (Continued)

FLUCCS Habitat Descriptions and Acreages	
Beaver Pond (FLUCCS 534), 19.3 Acres	
	The beaver pond was created by flooding a gum swamp. Downstream wetlands are functional and sufficiently hydrated, and the vegetative structure is appropriate. Remnant tree stumps and standing dead cypress trees are present in this community. The center of the delineation contains an area of floating and emergent herbaceous vegetation. Herbaceous vegetation is also rooted on persisting hummocks and cypress buttresses. Deeper inundated lands are dominated by fragrant water lily (<i>Nymphaea odorata</i>). Vegetation observed included white-topped pitcherplant (<i>Sarracenia leucophylla</i>), southern umbrellasedge (<i>Fuirena scirpoidea</i>), saltmarsh umbrellasedge (<i>F. breviseta</i>), witchgrass (<i>Dichanthelium scabriusculum</i>), yellow-eyed grass (<i>Xyris serotina</i>), coastal love grass (<i>Eragrostis virginica</i>), hairy primrosewillow (<i>Ludwigia pilosa</i>), beaksedge (<i>Rhynchospora gracilentia</i>), beaksedge (<i>Rhynchospora cephalantha</i>), and switch grass (<i>Panicum virgatum</i>).
Bay Swamp (FLUCCS 611), 40.9 Acres	
	The bay swamp community is located in the northwestern corner of the eastern tract. The sweet bay canopy is dense and shady with reduced midstory and understory coverage. Several small creeks are present and become more defined closer to the bay. Additional canopy species observed include tulip popular (<i>Liriodendron tulipifera</i>), swamp bay (<i>Persea palustris</i>) and red maple (<i>Acer rubrum</i>). Slash pines are also present as canopy trees. Although no cypress species were observed in the bay swamp, several small cypress stumps were present. Herbaceous groundcover was dominated by sensitive fern. Additional species observed included poison ivy, evergreen bayberry (<i>Myrica heterophylla</i>), Virginia chain fern, and littlehead nutrush (<i>Scleria oligantha</i>), common boneset (<i>Eupatorium perfoliatum</i>), water cowbane (<i>Oxypolis filiformis</i>), mild waterpepper (<i>Polygonum cf. hydropiperoides</i>), possumhaw (<i>Viburnum nudum</i>), fringed yelloweyed grass (<i>Xyris fimbriata</i>), hairy maiden fern (<i>Thelypteris hispidula</i>), lax hornpod (<i>Mitreola petiolata</i>), yellow-eyed grass (<i>Xyris laxifolia</i> var. <i>iridifolia</i>) and marsh fern (<i>Thelypteris palustris</i>). Chinese privet (<i>Ligustrum sinense</i>) is present throughout the northern half of the bay swamp.
Gum Swamp (FLUCCS 613), 25.9 Acres	
	This system is located immediately south of the beaver dam and grades into the freshwater marsh. Very few large trees were observed within this community and were primarily limited to a few pond cypress and slash pine. Shrub growth is mostly on hummocks. Some cypress cut stumps were observed. Pond cypress recruitment was also observed. This community is typified by an open canopy comprised of swamp tupelo (<i>Nyssa biflora</i>), sweet bay, red maple, swamp bay, as well as occasional slash pine and pond cypress (<i>Taxodium ascendens</i>). Understory trees and shrubs included overstory recruits, red chokeberry (<i>Photinia pyrifolia</i>), fetterbush, highbush blueberry (<i>Vaccinium corymbosum</i>), dahoon (<i>Ilex cassine</i>), Virginia willow (<i>Itea virginica</i>), and wax myrtle. Herbaceous species observed include royal fern (<i>Osmunda regalis</i> var. <i>spectabilis</i>), threeway sedge (<i>Dulichium arundinaceum</i>), Virginia marsh St. John's-wort (<i>Triadenum virginicum</i>), Virginia chain fern (<i>Woodwardia virginica</i>), cinnamon fern (<i>Osmunda cinnamomea</i>), caric sedge (<i>Carex glaucescens</i>), and string-lily (<i>Crinum americanum</i>). One small isolated delineation, immediately north of a fill road within the eastern-central portion of the western tract, might have historically been part of a larger bay swamp (FLUCCS 611). Existing vegetation in this small gum swamp might be attributed to lengthened hydroperiod caused by water impounded by a fill road.

Table 4: Current FLUCCS Habitats (Continued)

FLUCCS Habitat Descriptions and Acreages	
Titi Swamp (FLUCCS 614), 65.6 Acres	
	This vegetative community is in the northeastern corner of the western tract. Vegetation is dominated by pure stands of very dense 15-20 foot tall black titi (<i>Cliftonia monophylla</i>). The few canopy trees present are limited to 40-60-foot tall slash pine. No slash pine recruitment was observed. Additional shrub species were a minor component of this community and included fetter bush and gallberry. No herbaceous groundcover vegetation was observed.
Hydric Pine Flatwoods (FLUCCS 625), 131.7 Acres	
	This forested wetland community dominates the majority of the western tract. Canopy trees are dominated by slash pine. Pine height averages approximately 50 to 60 feet and slash pine recruitment is low. The understory is typically dense containing sweet bay, myrtle leafed holly (<i>Ilex myrtifolia</i>), large gallberry (<i>I. coriacea</i>), red bay, Elliott's blueberry (<i>Vaccinium elliotii</i>), highbush blueberry, Virginia willow, swamp tupelo, gallberry, red maple, and black titi. The duff layer in this delineation is typically deep. Ground cover vegetation is nearly absent. Occasional canopy openings contain relict hydric flatwoods herbaceous species including wiregrass, Carolina yellow-eyed grass (<i>Xyris caroliniana</i>), hairy wicky, bracken fern, foxtail club moss (<i>Lycopodiella alopecuroides</i>), whitehead bogbutton (<i>Lachnocaulon anceps</i>), redroot (<i>Lachnanthes caroliniana</i>), yellow hatpins (<i>Syngonanthus flavidulus</i>), beaksedge (<i>Rhynchospora gracilentia</i>), beaksedge (<i>Rhynchospora cf. inundata</i>), Camphorweed (<i>Pluchea</i> sp.), woolly witchgrass (<i>Dichantherium scabriusculum</i>), switchgrass (<i>Panicum virgatum</i>), beaksedge (<i>Rhynchospora chalarocephala</i>), yellow-eyed grass (<i>Xyris laxifolia</i> var. <i>iridifolia</i>), Elliott's yellow-eyed grass (<i>Xyris elliotii</i>), flatsedge (<i>Cyperus polystachyos</i>), honeycombhead (<i>Balduina uniflora</i>), meadowbeauty (<i>R. alifanus</i>), meadowbeauty (<i>R. nashii</i>), blue maidencane (<i>Amphicarpum muhlenbergianum</i>), tapered witchgrass (<i>Dichantherium acuminatum</i>), pineland yelloweyed grass (<i>Xyris stricta</i>), and Chapman's beaksedge (<i>Rhynchospora chapmanii</i>).
Slash Pine Swamp Forest (FLUCCS 627), 211.7 Acres	
	This community designation includes forested wetlands in which slash pine dominates the canopy. Historically these areas were occupied by pine flatwoods, hydric flatwoods, hydric savannas, and bay swamps. Fire exclusion and possible hydrologic impacts allowed slash pine to encroach into these areas. Vegetative assemblages and structure are comprised of a combination of the plant communities historically present. Numerous large slash and longleaf pines in the southeastern corner of the eastern tract exhibit scars from past turpentine extraction. This is the only location on the Dutex site where longleaf pine was observed. Understory vegetation was sparse and wiregrass was absent from these areas.
Wetland Forested Mixed (FLUCCS 630), 69.9 Acres	
	This community occurs on the southeastern corner of the eastern tract. This FLUCCS unit represents mixed wetland forest communities in which neither hardwoods nor conifers achieve dominance of the crown canopy composition. Vegetative assemblages and structure are comprised of a combination of the plant communities historically present.

Table 4: Current FLUCCS Habitats (Continued)

FLUCCS Habitats Descriptions and Acreages	
Wetland Shrub (FLUCCS 631), 17.7 Acres	Canopy trees are mostly absent from this community. Scattered slash pine are present in some areas. Shrub growth typically exceeds ten feet in height. Typical shrubs observed included titi (<i>Cyrilla racemiflora</i>), black titi (<i>Cliftonia monophylla</i>), fetterbush (<i>Lyonia lucida</i>), large gallberry (<i>Ilex coriacea</i>), gallberry (<i>I. glabra</i>), wax myrtle (<i>Myrica cerifera</i>), and sweet pepperbush (<i>Clethra alnifolia</i>), and shrubs are often laced together with laurel greenbrier. Herbs are sparse, patchy, and confined to sunny openings.
Freshwater Marsh (FLUCCS 641), 78.0 Acres	A freshwater marsh dominates the southeastern half of the western tract. Additionally, two small disjunct freshwater marshes are in the northwestern corner of the western tract. The northernmost of these marshes is an oxbow of Elevenmile Creek. Few small trees observed were small in stature. Scattered tall slash pine were also present. Herbaceous vegetation is distributed as a mosaic of nearly pure stands of saw grass (<i>Cladium jamaicense</i>) to areas containing combinations of saw grass, wool-grass bulrush (<i>Scirpus cyperinus</i>), Leconte's flatsedge (<i>Cyperus lecontei</i>), wand loosestrife (<i>Lythrum lineare</i>), bighead rush (<i>Juncus megacephalus</i>), fragrant flatsedge (<i>Cyperus odoratus</i>), herb-of-grace (<i>Bacopa monnieri</i>), torpedograss (<i>Panicum repens</i>), switchgrass (<i>Panicum virgatum</i>), barnyard grass (<i>Echinochloa muricata</i>), spikerush (<i>Eleocharis tuberculosa</i>), comfort root (<i>Hibiscus aculeatus</i>), water cowbane (<i>Oxypolis filiformis</i>), and dotted smartweed (<i>Polygonum punctatum</i>).
Saltwater Marsh (FLUCCS 642), 104.6	A salt marsh dominates the southwestern half of the western tract. Salt marshes are tidal areas dominated by grasses and other salt-tolerant plants. Two vegetation zones are often present in the tidal marsh including a low marsh that is subject to daily tidal flooding and a high marsh that is flooded less often. Low marsh on the Dutex site is limited to a patchy fringe dominated by smooth cordgrass (<i>Spartina alterniflora</i>). The majority of the Saltwater Marsh is dominated by a black needlerush (<i>Juncus roemerianus</i>) with a few associated species. Also observed were marsh-hay cordgrass (<i>Spartina patens</i>), rattlebox (<i>Sesbania punicea</i>), smallflower thoroughwort (<i>Eupatorium semiserratum</i>), wand loosestrife (<i>Lythrum lineare</i>), common reed (<i>Phragmites australis</i>), torpedograss (<i>Panicum repens</i>), coastal groundcherry (<i>Physalis angustifolia</i>), switchgrass (<i>Panicum virgatum</i>), saltmarsh morning glory (<i>Ipomoea sagittata</i>), seaside goldenrod (<i>Solidago sempervirens</i>), seashore mallow (<i>Kosteletzkya virginica</i>), and salt marsh aster (<i>Aster tenuifolius</i>).
Beaches (FLUCCS 710), 4.3 Acres	This community is a narrow strand between Perdido Bay and the freshwater and saltwater marsh on the western tract. Shoreline erosion is indicated by stumps located 15 to 20 from shore in Perdido Bay. The beach is mostly devoid of vegetation except limited encroachment from the adjacent freshwater and saltwater marshes. Exotic invasive species including Chinese tallow and rattlebox (<i>Sesbania punicea</i>) were observed.
Beaver Dam (FLUCCS 747), 0.3 Acres	One large earthen beaver dam occurs on the north central portion of the western tract. The dam is approximately 1,280 feet in length and up to 6 feet in height.

This table is a modified excerpt from the Dutex Conceptual Mitigation Plan (Entrix, 2010).

The Florida Natural Area Inventory (FNAI) habitats at the Dutex Restoration Site consist primarily of wetlands classified as Floodplain Marsh, Floodplain Swamp, Baygall, Tidal Marsh, Wet Prairie, Wet Flatwoods, and Shrub Bog. Upland plant communities are primarily Mesic Pine Flatwoods and Xeric Hammocks (FNAI 2010).

The focus for quantitative monitoring in this study are existing habitats mapped as FLUCCS 625-Hydric Pine Flatwoods (West Tract) and FLUCCS 627-Slash Pine Swamp Forest (East Tract). Target restoration goals at the quantitative monitoring sites are FLUCCS 625-Hydric Pine Flatwoods and 626-Hydric Pine Savanna (West Tract and East Tract). The habitats are classified using FNAI descriptors as predominantly fire suppressed Wet Prairie and Shrub Bog. The landscapes that support these habitats are present on the majority of the site excluding the lower west tract tidal and freshwater marshes.

The Wet Prairie/Bog landscapes are forested lands with a canopy dominated by slash pine (*Pinus elliottii*). Pine density varies from 100 –200 trees/acre. The additional woody understory species increase the density of stems to over 1,000 stems/acre. The additional stems are primarily black titi (*Cliftonia monophylla*), red titi (*Cyrilla racemiflora*), sweet bay (*Magnolia virginiana*) and swamp tupelo (*Nyssa biflora*). Additional understory subcanopy and large shrubs include; myrtle-leaf holly (*Ilex myrtifolia*), large gallberry (*Ilex coriacea*), red bay (*Persea palustris*), fetterbush (*Lyonia lucida*), southern wax myrtle (*Myrica cerifera*), Mosier's huckleberry (*Gaylussacia mosieri*), red chokeberry (*Photinia pyrifolia*), Elliott's blueberry (*Vaccinium elliottii*), highbush blueberry (*Vaccinium corymbosum*), and red maple (*Acer rubrum*). Relictual groundcover species persist in the dense shade and thick duff layer beneath the multiple strata of fire suppressed woody vegetation. The observed surviving constituents of the groundcover forbs and graminoids include warty panicgrass (*Panicum verrucosum*), bogbuttons (*Eriocaulon decangulare*), panic grasses (*Dichantherium* spp.), yellow-eyed grass (*Xyris* spp.), beaksedge (*Rhynchospora* spp.), redroot (*Lachnanthes carolina*), Virginia chain fern (*Woodwardia virginica*), foxtail club moss (*Lycopodiella alopecuroides*), meadow beauty (*Rhexia* spp.), partridgeberry (*Mitchella repens*), St Johns Wort (*Hypericum* spp.), sundews (*Drosera capillaris* and *D. intermedia*), nutrush (*Scleria* spp.), toothache grass (*Ctenium aromaticum*), pitcherplants (*Sarracenia* spp.), and wiregrass and three-awn grass (*Aristida palustris* and other *Aristida* spp.). In landscapes where Wet Prairie/Wet Flatwoods are influenced by floodplain ecology, blue maidencane (*Amphicarpum muhlenbergianum*), switchgrass (*Panicum virgatum*), bluestem palmetto (*Sabal minor*), sawgrass (*Cladium jamaicense*), wood oats (*Chasmanthium sessiliflorum*) and saltmarsh hay (*Spartina patens*) may be present.

1.2.4 Anthropogenic Impacts

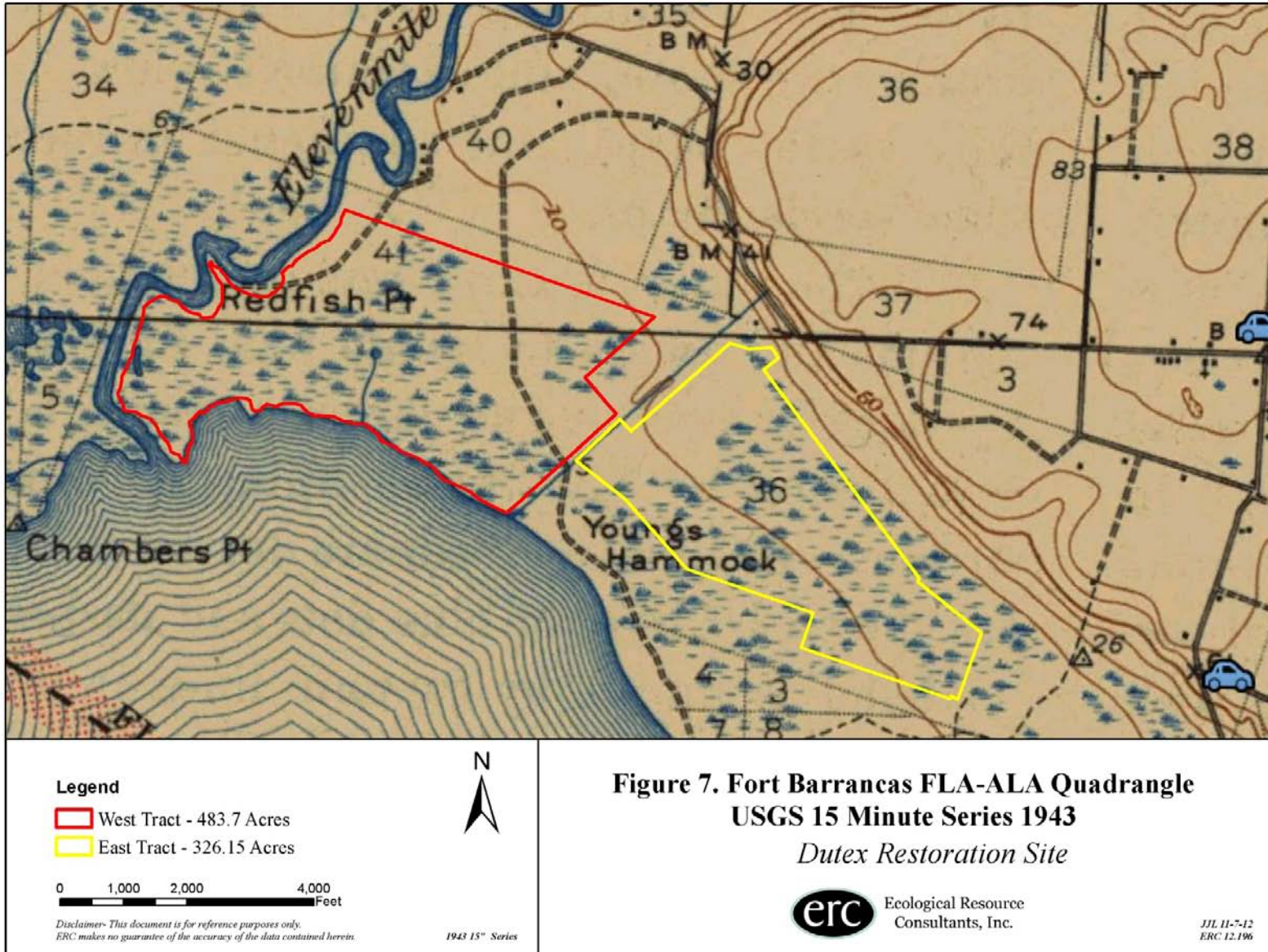
The property comprising the Dutex Restoration Site is mostly in a natural state except for a few notable impacts. Most easily observed on recent and historic aerial photographs and maps is the large drainage ditch and parallel spoil berm that divides the western tract from the eastern tract. Neither the ditch nor the spoil berm is located on the restoration site and the hydrologic effects to the adjacent wetlands is unknown. The date of the ditch construction is unknown; however, it appears on the 1943 USGS topographic quadrangle.

The ditch originates at Saufley Field and flows southwest into Perdido Bay.

Elevenmile Creek forms the western boundary of the Dutex Restoration Site. The creek drains urban and industrial areas of Escambia County and until recently has been the receiving water for treated industrial waste discharged by the International Paper Mill located north of Interstate 10. The effect to the Dutex Restoration site from the effluent discharge into Elevenmile Creek is unknown. The floodplain of Elevenmile Creek is infested with exotic invasive vegetation for most of its length, to at least the International Paper Mill. Exotic invasive species documented on the floodplain of the creek include: Taro (*Colocasia esculenta*), air potato (*Dioscorea bulbifera*), Japanese privet (*Ligustrum japonicum*), Chinese privet (*Ligustrum sinense*), Japanese climbing fern (*Lygodium japonicum*), torpedograss (*Panicum repens*), Chinese tallow (*Sapium sebiferum*), and Brazilian rattlebox (*Sesbania punicea*). Seeds and other propagules of exotic invasive vegetation might be a source of these species that are currently growing on the restoration site.

There is little documentation of past development activity on the restoration site. The 1943 topographic quadrangle depicts one unimproved road that traversed the site along the natural levees of Elevenmile Creek to Redfish Point, located near the transition between freshwater ecosystems and the tidal marsh at the mouth of the Creek (Figure 7). Another unimproved road is shown traversing the northeast corner of the western tract as it continues southeast towards Ramsey Beach. No structures appear on the restoration site in either aerial photographs or topographic maps (Figures 2 and 7) or historic photographs (See Figures 12-17).

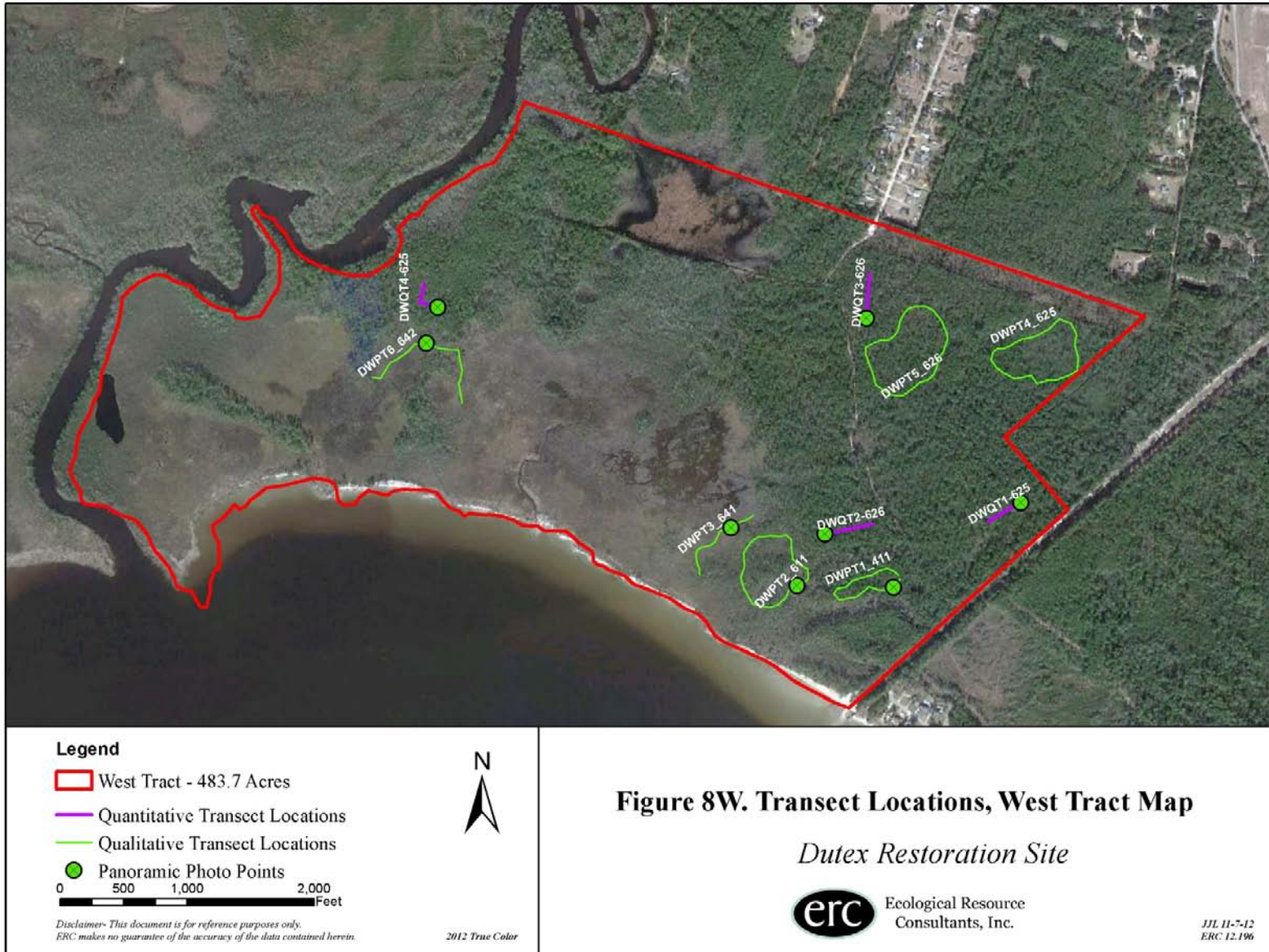
Fire exclusion is likely the anthropogenic factor that has most altered this site from historic conditions and trajectories. Fire exclusion limits herbaceous growth, allows encroachment of atypical species and persistence of inappropriate lifeforms, and encourages weedy growth of shrubs.



2.0 METHODS

2.1 Field Methods

The location of all transects is depicted on Figures 8W and 8E. A list of all the transect names appears in Table 5, Dutex Transects, along with the current and target FLUCCS codes for each transect.



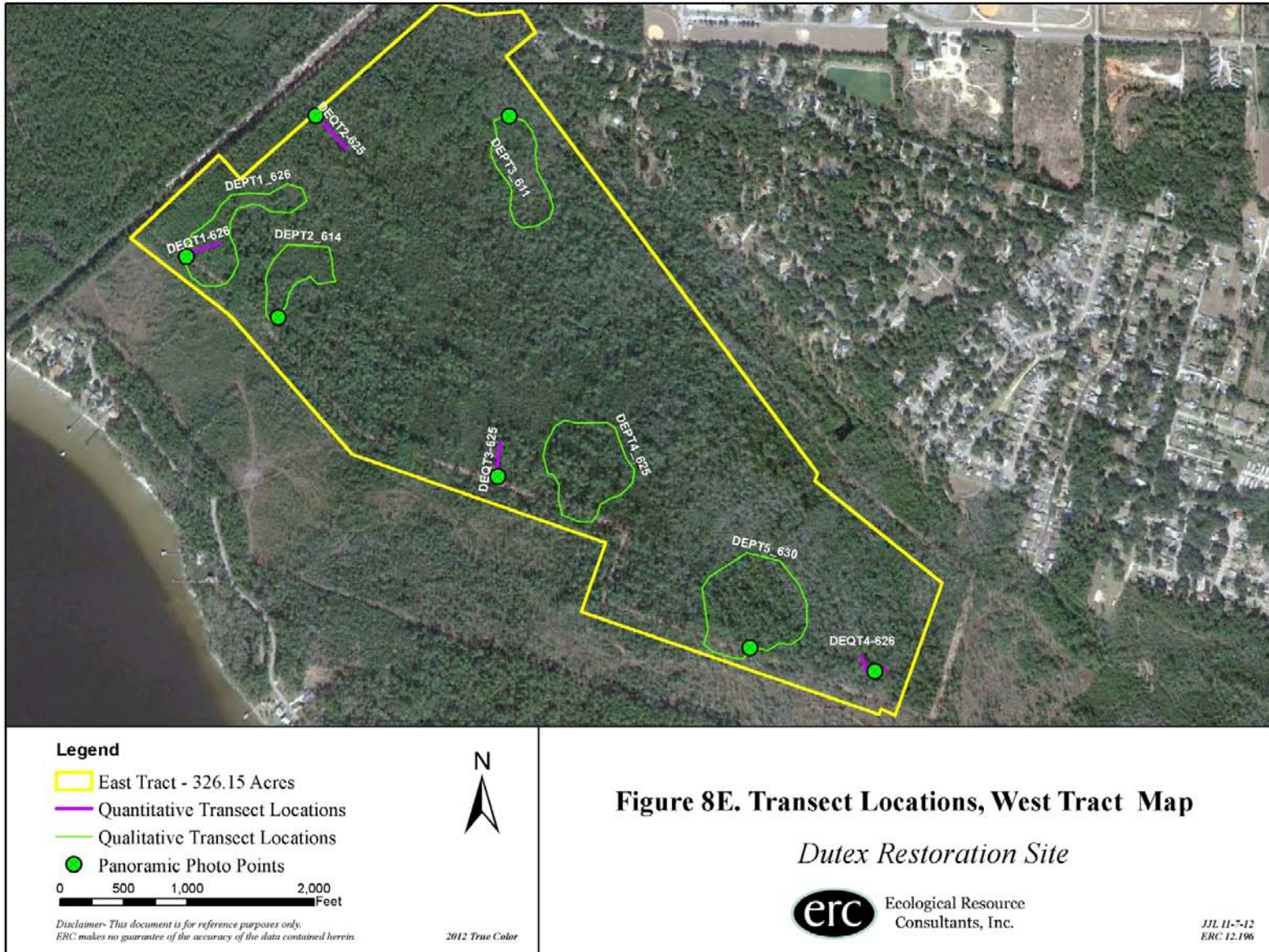


Table 5: Dutex Transects

Transect Location	Transect Type	Transect Name	Current Polygon Descriptor (FLUCCS)	Target Polygon Descriptor (FLUCCS)	Number of Transects
Dutex: West Tract	Pedestrian /Qualitative	DWPT1-411	441 – Coniferous Plantations	411 - Mesic Pine Flatwoods	1
Dutex: West Tract	Pedestrian /Qualitative	DWPT2-611	631-Wetland Scrub	611/613-Bay Swamp	1
Dutex: West Tract	Pedestrian /Qualitative	DWPT3-641	641-Freshwater Marsh	641-Freshwater Marsh	1
Dutex: West Tract	Pedestrian /Qualitative	DWPT4-625	614-Titi Swamp	625-Hydric Pine Flatwoods	1
Dutex: West Tract	Pedestrian /Qualitative	DWPT5-626	625-Hydric Pine Flatwoods	626-Hydric Pine Savanna	1
Dutex: West Tract	Pedestrian /Qualitative	DWPT6-642	642-Saltwater Marsh	642-Saltwater Marsh	1
Total Number of Transects					6
Dutex: East Tract	Pedestrian /Qualitative	DEPT1-626	627-Slash Pine Swamp Forest	626-Hydric Pine Savanna	1
Dutex: East Tract	Pedestrian /Qualitative	DEPT2-614	614-Titi Swamp	614-Titi Swamp	1
Dutex: East Tract	Pedestrian /Qualitative	DEPT3-611	611- Bay Swamp	611- Bay Swamp	1
Dutex: East Tract	Pedestrian /Qualitative	DEPT4-625	627-Slash Pine Swamp Forest	625-Hydric Pine Flatwoods	1
Dutex: East Tract	Pedestrian /Qualitative	DEPT5-630	630-Wetland Forested Mixed	630-Wetland Forested Mixed	1
Total Number of Transects					5
Dutex: West Tract	Quantitative	DWQT1-625	625-Hydric Pine Flatwoods	625-Hydric Pine Flatwoods	1
Dutex: West Tract	Quantitative	DWQT2-626	625-Hydric Pine Flatwoods	626-Hydric Pine Savanna	1
Dutex: West Tract	Quantitative	DWQT3-626	625-Hydric Pine Flatwoods	626-Hydric Pine Savanna	1
Dutex: West Tract	Quantitative	DWQT4-625	625-Hydric Pine Flatwoods	625-Hydric Pine Flatwoods	1
Total Number of Transects					4
Dutex: East Tract	Quantitative	DEQT1-626	627-Slash Pine Swamp Forest	626-Hydric Pine Savanna	1
Dutex: East Tract	Quantitative	DEQT2-625	627-Slash Pine Swamp Forest	625-Hydric Pine Flatwoods	1
Dutex: East Tract	Quantitative	DEQT3-625	627-Slash Pine Swamp Forest	625-Hydric Pine Flatwoods	1
Dutex: East Tract	Quantitative	DEQT4-626	627-Slash Pine Swamp Forest	626-Hydric Pine Savanna	1
Total Number of Transects					4

2.1.1 Quantitative Transects

Biological indicators are commonly used criteria for analyzing the value, health and restoration success of habitats. Indicators employed in the monitoring methodology for the Dutex 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:

- a) Consultant and Water Management District Staff select map polygons that are representative for Hydric Pine Flatwoods (FLUCCS 625) and Slash Pine Swamp Forest (FLUCCS 627) to be preserved and/or restored to Hydric Pine Flatwoods (FLUCCS 625) and Hydric Pine Savanna (FLUCCS 626).
- b) Establish two permanent 300 foot linear transects in each sampling polygon. Two 300 foot transects were established as representative sample areas within the polygon. All transects are located and marked at each end with labeled metal stakes and photographed for visual reference.
- c) Establish sample points every 10 feet per 300 foot transect. For each transect, the first sampling point is located at 10 feet and the final point is located at 300 feet. The configuration establishes a total of 30 points along the 300 foot transect.
- d) Measure and apply one 1m x 1m quadrat at each of the 30 points. Thirty (30) quadrats are used to sample each transect. The methodology samples 30 square meters along each 300 foot transect.
- e) Photograph each sample point with the grid in place. A representative point is selected and located with a GPS to obtain a 360 degree (panoramic) photograph of the landscape.

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

2.1.2 Qualitative Transects

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

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

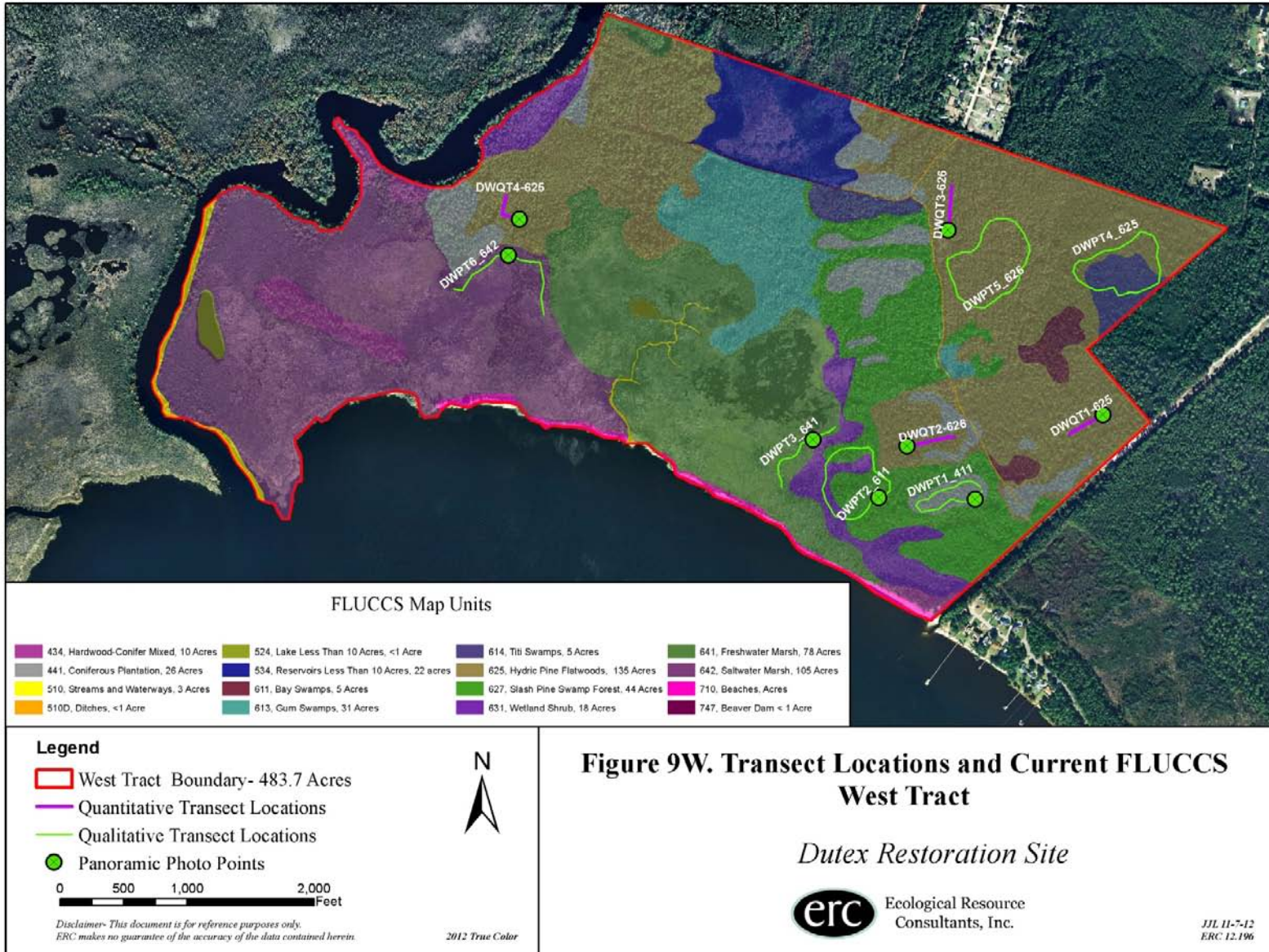
The specific parameters observed and recorded at the observation point for all polygons include the following:

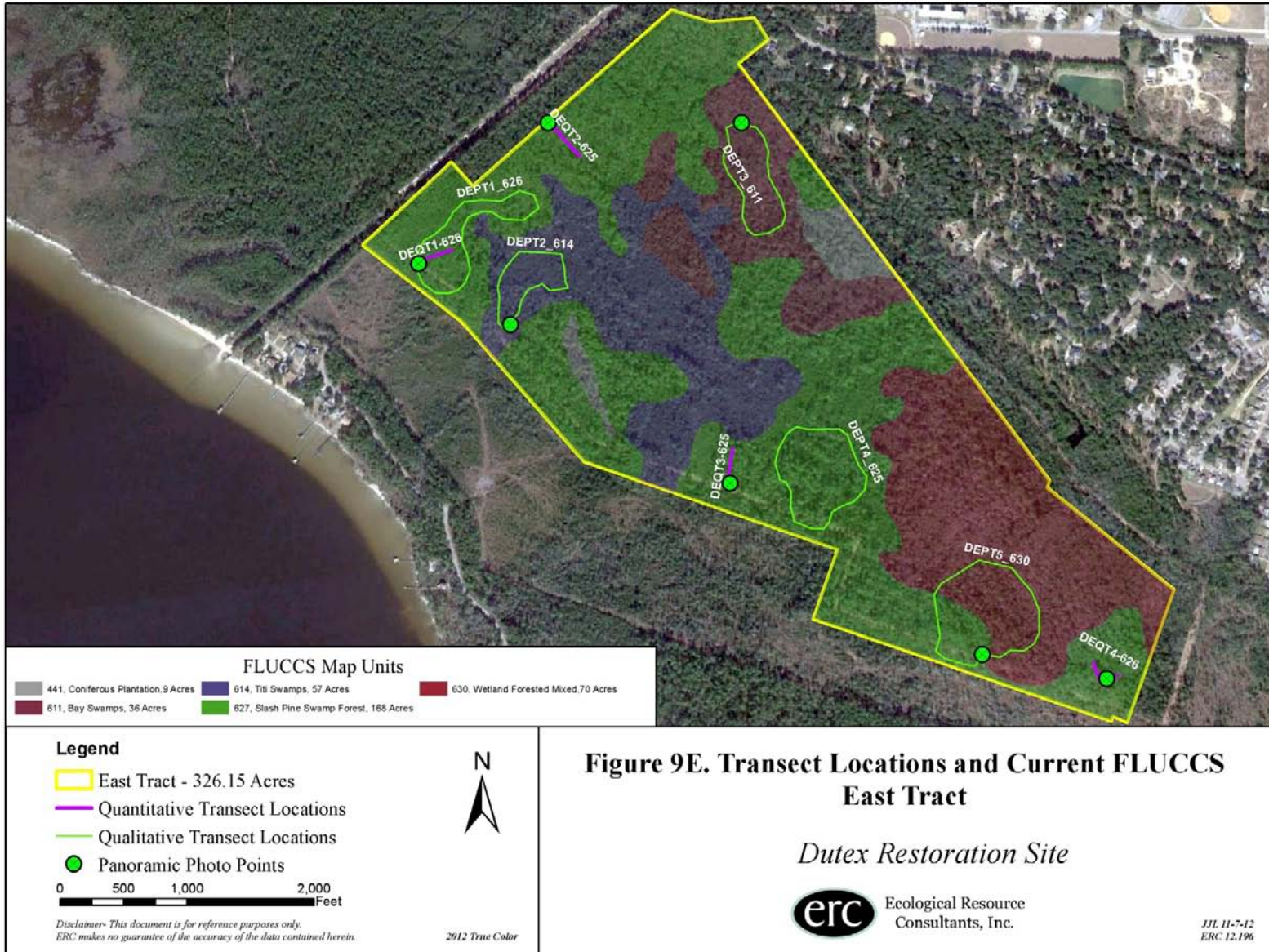
1. The type of plant community sampled.
2. The date, time and weather conditions.
3. An estimation of the aerial coverage of plants in the canopy, subcanopy and shrub strata and identification of the dominant species in the canopy, subcanopy and shrub strata.
4. An estimation of the coverage of graminoids (grasses, sedges and rushes) and total coverage of groundcover including graminoids and forbs, based on the following cover classes as per a modified Braun/Blanquet scale: 0-1%; 1-5%; 5-25%; 25-50%; 50-75%; 75-100%.
5. Identification of at least four dominant species in the groundcover.
6. Indications of wildlife usage and natural history including presence of any threatened or endangered species. Also note and obtain gps locations for threatened and endangered species observed at other points along the transect.

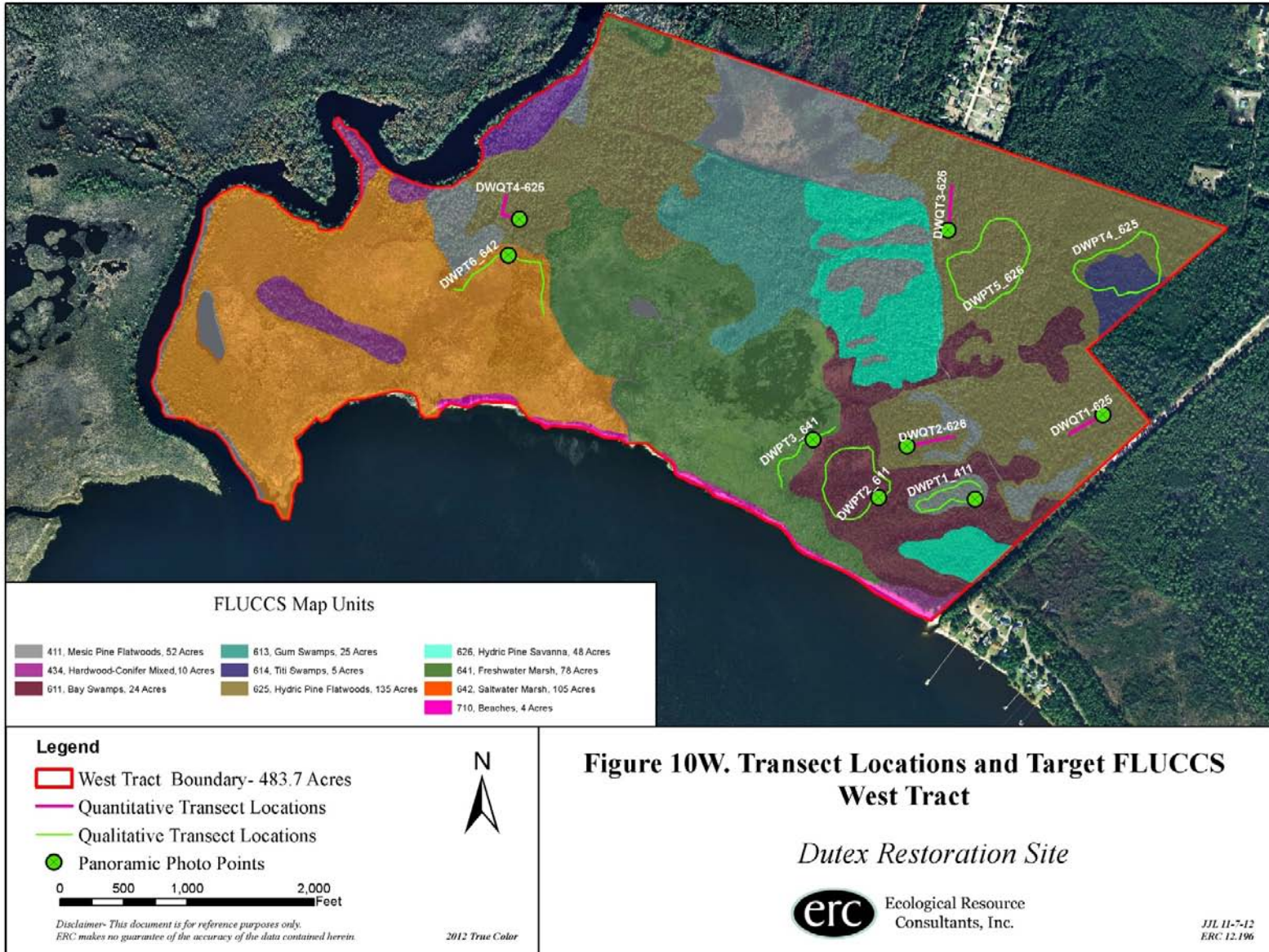
7. Identification of exotic species and estimated coverage of exotics as per Brower, et al., 1998. Also note and obtain gps locations for exotic invasive species observed at other points along the transect.
8. An estimation of the fuel load and aspects of the vegetative condition that might affect fire. Measure depth of litter and duff. Observe soil moisture conditions in upper 6 inches by inserting tiling spade into soil and using tactile method to determine moisture state.
9. A list of plant species encountered during the qualitative transect inspection.

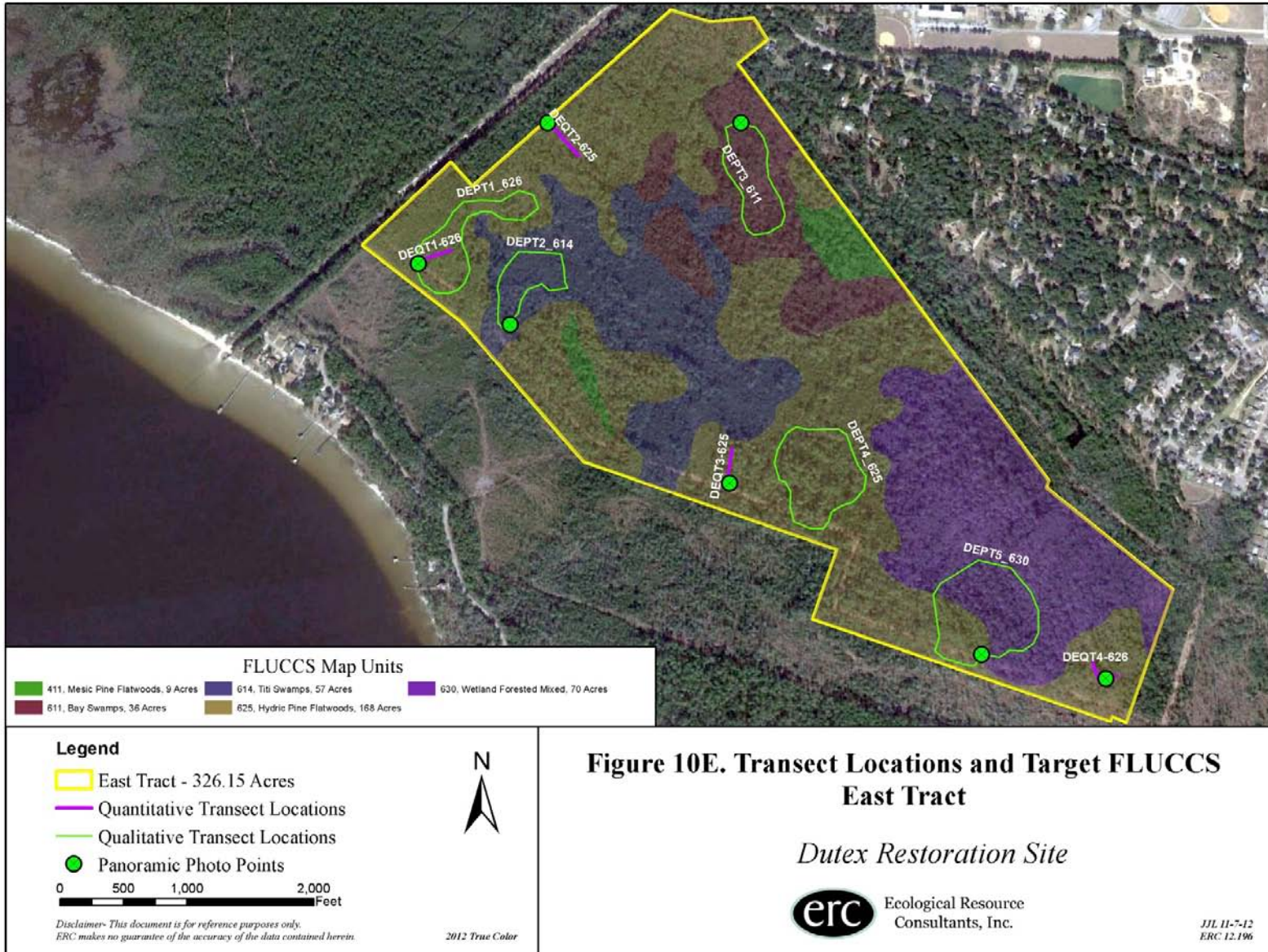
2.1.3 Panoramic Photographs

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





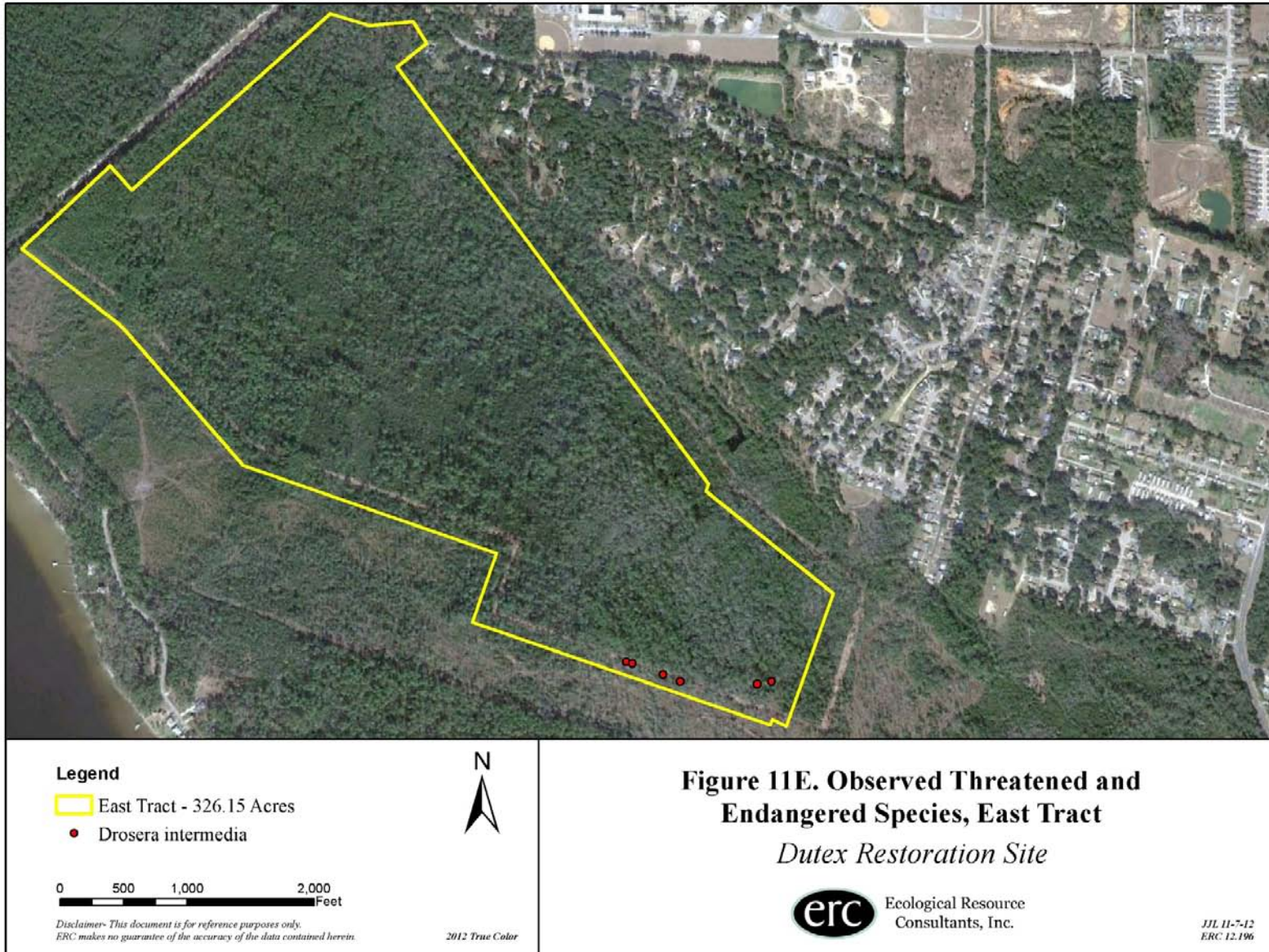


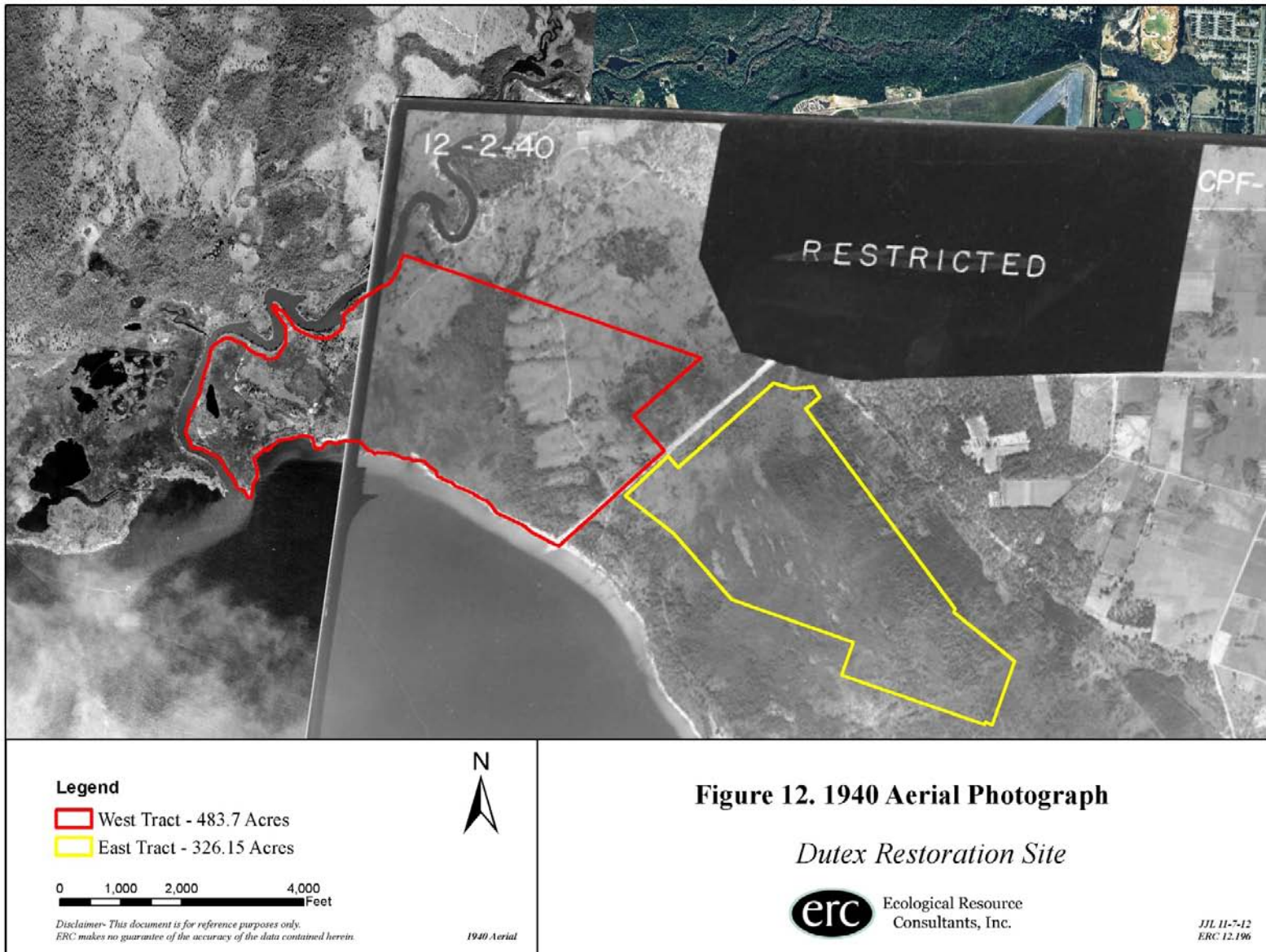


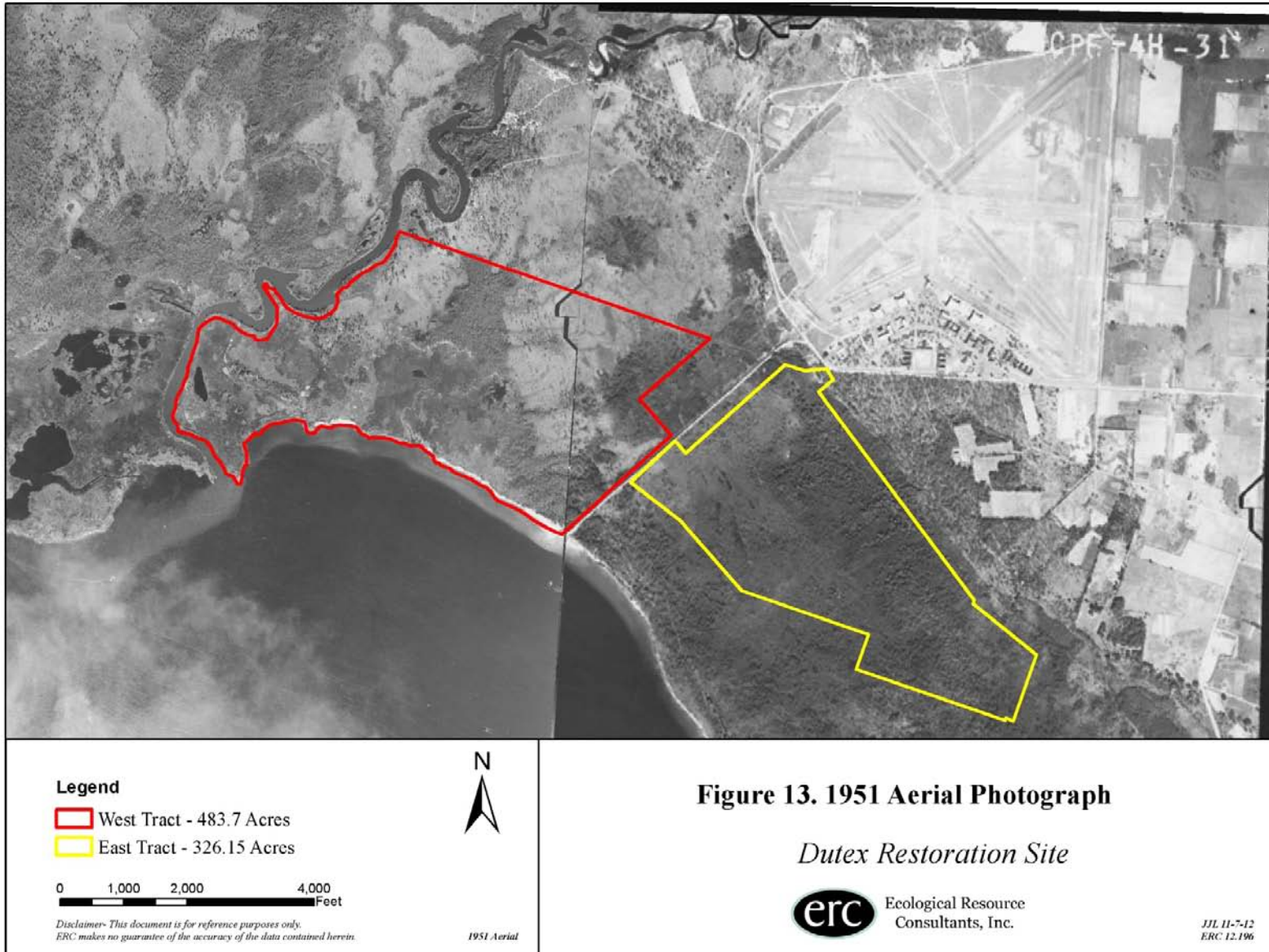
2.1.4. Additional Field Data Collection/Observations

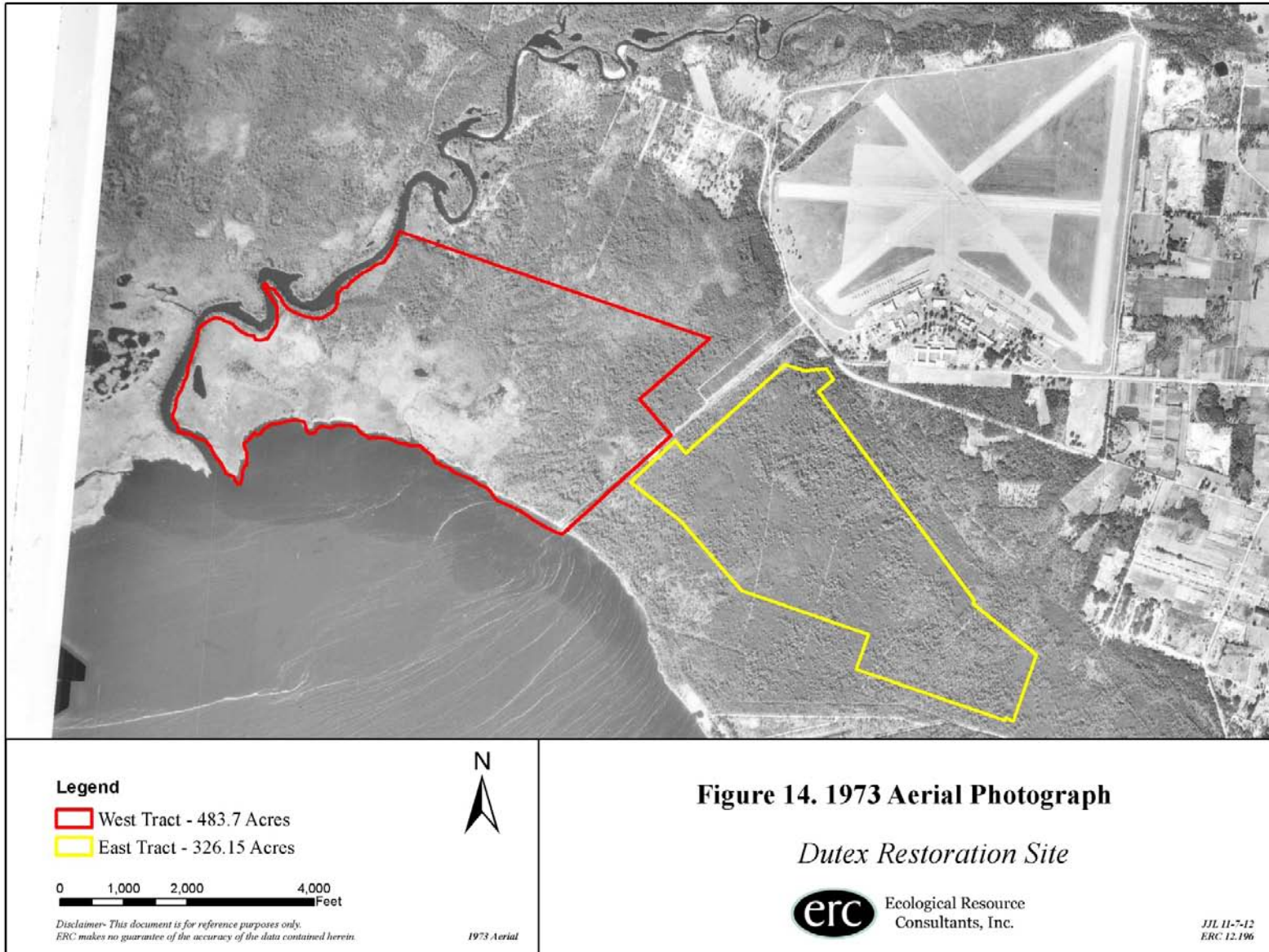
All incidental listed wildlife and botanical observations are recorded during site visits. Surveys are conducted concurrently with overall site assessments performed as part of the quantitative and qualitative transect field work. GPS point locations of any observed threatened and endangered species are depicted in Figures 11W and 11E.

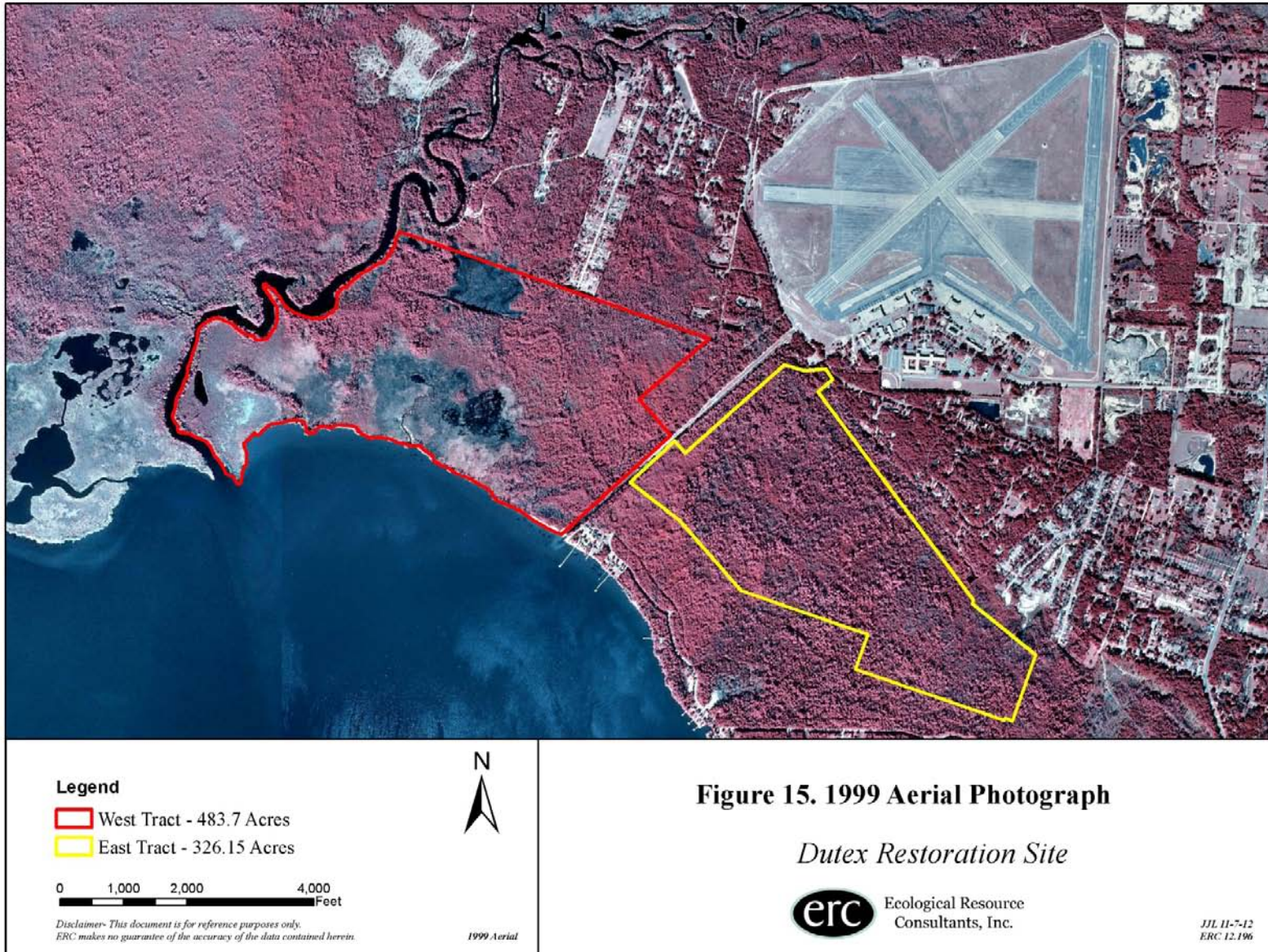


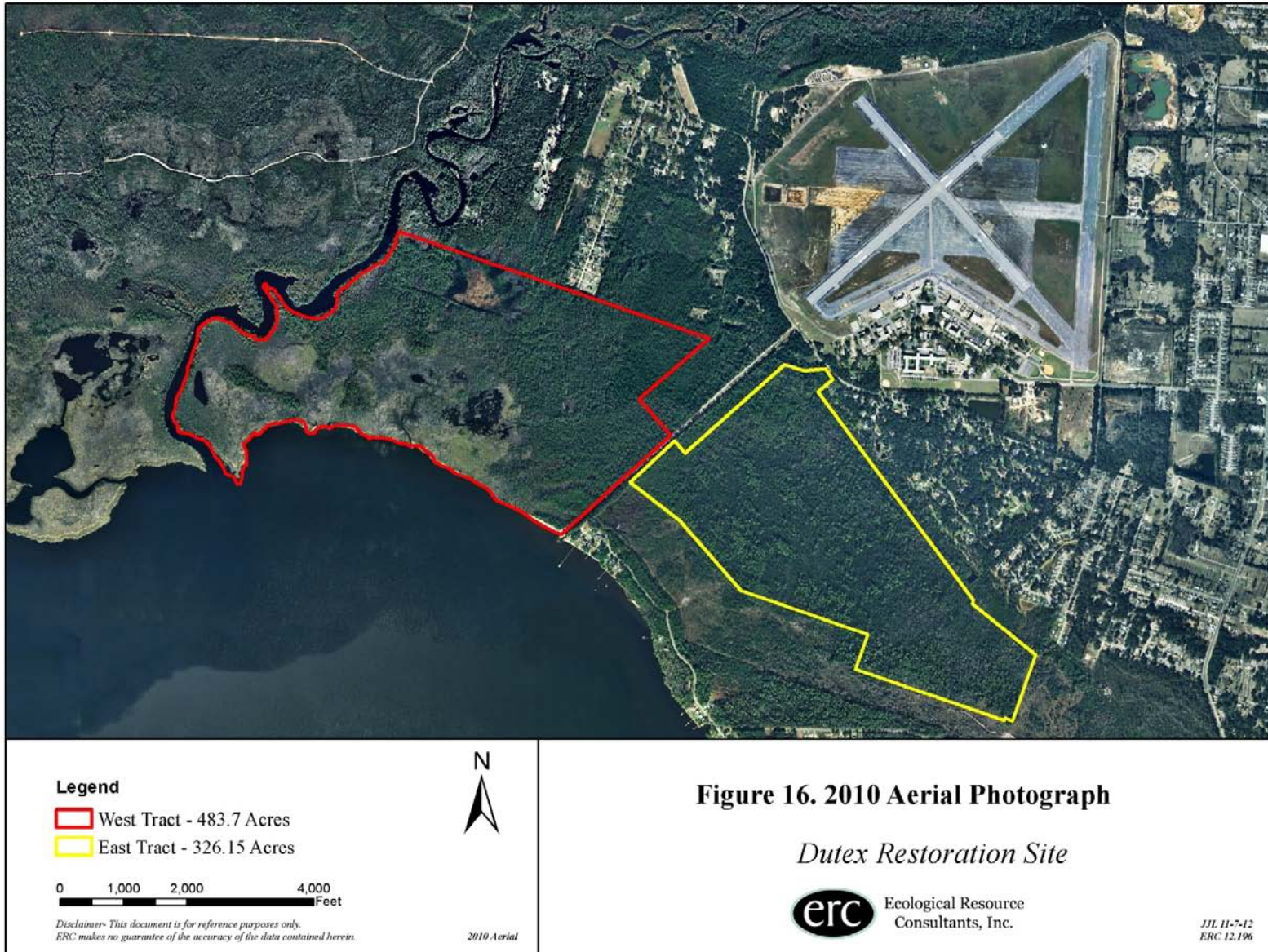


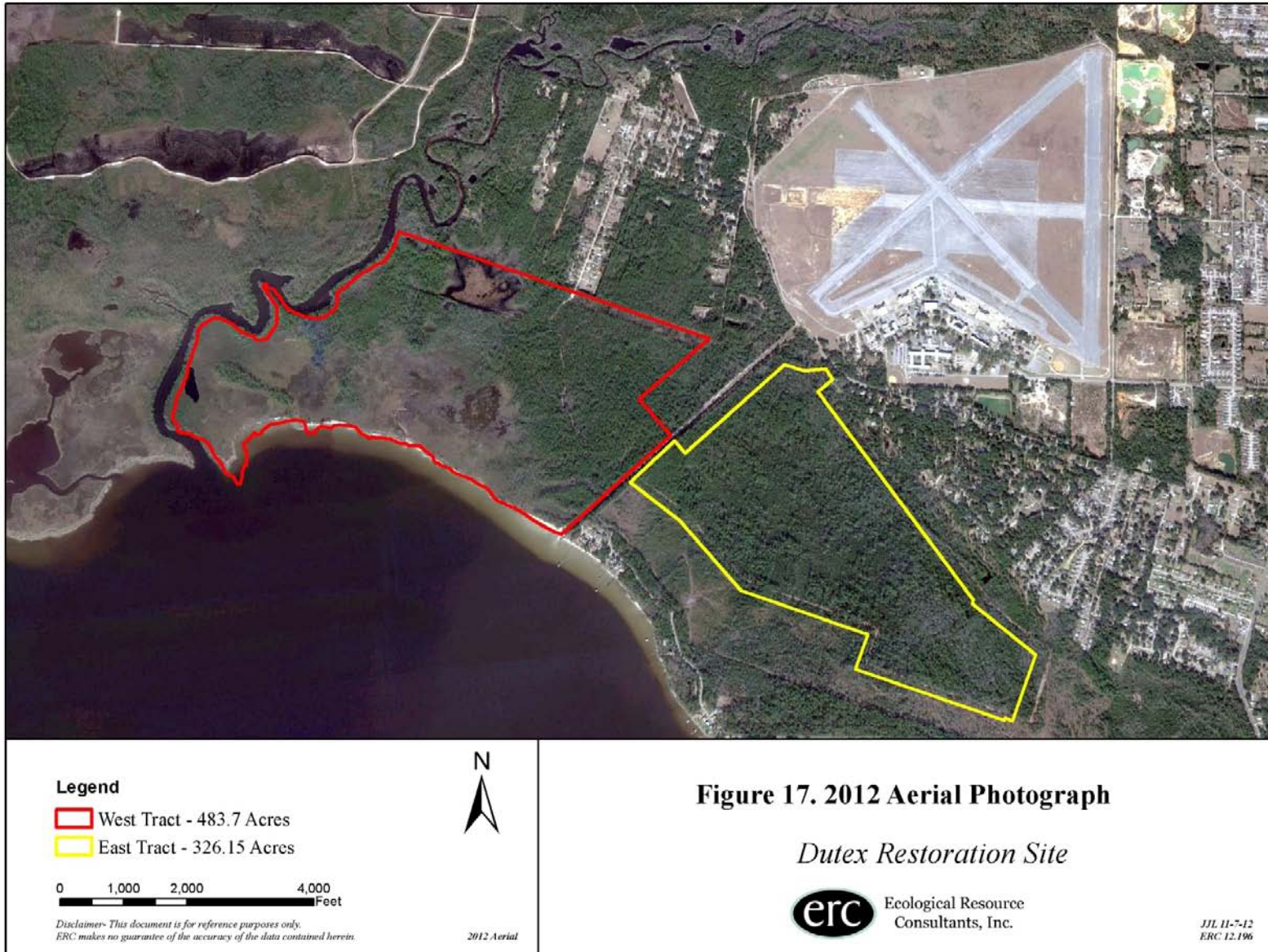












2.2 Analytical Methods

Biostatistical methods are employed to quantitatively describe and summarize the monitoring field data. The data collected in quadrats or quadrants along a 300 foot transect is analyzed by calculating the proportional distribution of all plants in 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 Methodology

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

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

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 6a, 7a, 8a, 9a, 10a, 11a, 12a, and 13a). Quantitative summary data is reported for each transect and broken down by plant community (See Tables 6b, 7b, 8b, 9b, 10b, 11b, 12b, and 13b).

Table 6a: Transect DEQT1-626 Hydric Pine Savanna

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Bryophytes				
Mosses and liverworts	3.71	4.46	2.5	4.17
Vines				
<i>Smilax laurifolia</i>	2.82	1.79	2.5	4.17
Woody Plants				
<i>Cliftonia monophylla</i>	25.85	25.89	22.5	29.17
<i>Ilex coriacea</i>	14.4	10.71	20	12.5
<i>Pinus elliottii</i>	13.21	19.64	7.5	12.5
<i>Lyonia lucida</i>	9.92	8.93	12.5	8.33
<i>Magnolia virginiana</i>	9.21	14.29	0.05	8.33
<i>Gaylussacia mosieri</i>	7.88	4.46	0.15	4.17
<i>Nyssa sylvatica v. biflora</i>	7.36	6.25	7.5	8.33
<i>Cyrilla racemiflora</i>	5.63	3.57	0.05	8.33

Table 6b: Transect DEQT1-626 Hydric Pine Savanna

Groundcover Vegetation Relative Cover (%)			Average Cover (%)	Species Richness
Bryophytes	Forbs	Woody Plants	Bare ground/ Standing water	
4%	2%	94%	96%	10
Shrub Height (meters)				0.5

Transect DEQT1-626 Hydric Pine Savanna

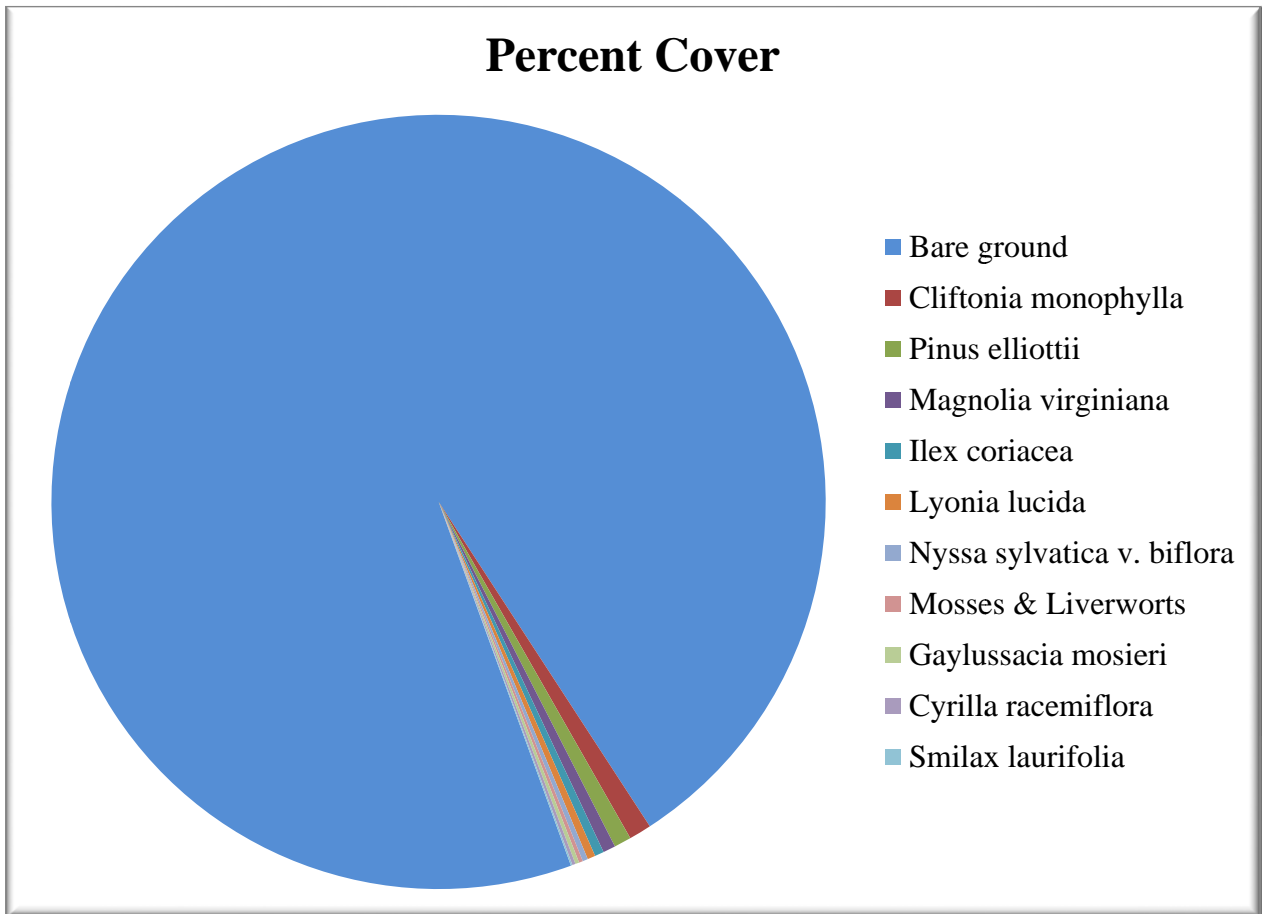


Table 7a: Transect DEQT2-625 Hydric Pine Flatwoods

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Bryophytes				
Mosses and liverworts	4	3.85	1.66	6.5
Forbs				
<i>Eriocaulon decangulare</i>	13.48	9.42	23.7	7.32
<i>Woodwardia virginica</i>	1.64	1.44	1.04	2.44
<i>Xyris serotina</i>	0.95	0.38	0.83	1.63
<i>Lachnanthes caroliana</i>	0.4	0.19	0.21	0.81
<i>Xyris sp.</i>	0.4	0.19	0.21	0.81
<i>Coreopsis linifolia</i>	0.4	0.19	0.21	0.81
Graminoids				
<i>Dichanthelium ensifolium v. unciphyllum</i>	1.88	0.67	3.33	1.63
<i>Rhynchospora plumosa</i>	0.81	0.38	0.42	1.63
<i>Rhynchospora chapmanii</i>	0.4	0.19	0.21	0.81
Vines				
<i>Smilax laurifolia</i>	6.87	3.56	8.11	8.94
<i>Gelsemium rankinii</i>	0.81	0.38	0.42	1.63
Woody Plants				
<i>Lyonia lucida</i>	13.6	10.1	18.5	12.2
<i>Nyssa sylvatica v. biflora</i>	8.73	14.52	3.53	8.13
<i>Persea palustris</i>	8.16	8.27	6.44	9.76
<i>Ilex cassine v. myrtifolia</i>	7.74	8.65	6.44	8.13
<i>Gaylussacia mosieri</i>	7.41	6.15	10.4	5.69
<i>Myrica caroliniensis</i>	6.85	8.65	5.41	6.5
<i>Ilex coriacea</i>	6.28	7.12	6.03	5.69
<i>Magnolia virginiana</i>	4.22	8.17	1.25	3.25
<i>Myrica cerifera</i>	2.7	6.25	0.21	1.63
<i>Acer rubrum</i>	0.81	0.38	0.42	1.63
<i>Cliftonia monophylla</i>	0.54	0.19	0.62	0.81
<i>Ilex glabra</i>	0.5	0.48	0.21	0.81
<i>Photinia pyrifolia</i>	0.4	0.19	0.21	0.81

Table 7b: Transect DEQT2-625 Hydric Pine Flatwoods

Groundcover Vegetation Relative Cover (%)					Average Cover (%)	Species Richness
Bryophytes	Forbs	Graminoids	Vines	Woody Plants	Bare ground/ Standing water	
4%	12%	1%	4%	79%	83%	25
Shrub Height (meters)						1.5

Transect DEQT2-625 Hydric Pine Flatwoods

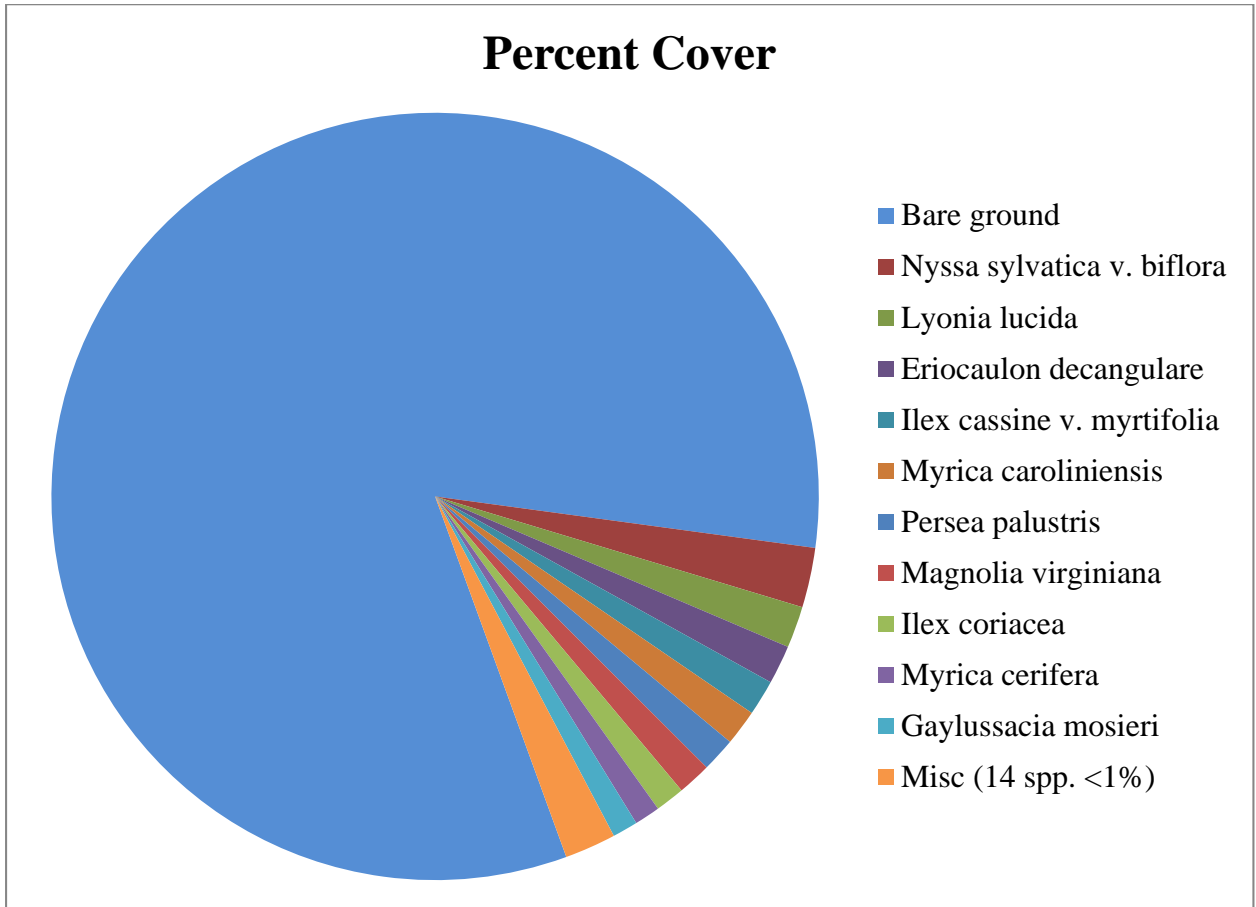


Table 8a: Transect DEQT3-625 Hydric Pine Flatwoods

Species	Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)
Forbs				
<i>Woodwardia virginica</i>	0.9	0.69	0.7	1.3
Vines				
<i>Toxicodendron radicans</i>	9.61	4.56	12.59	11.69
<i>Smilax laurifolia</i>	8.29	6.08	8.39	10.39
<i>Vitis rotundifolia</i>	7.24	7.04	5.59	9.09
Woody Plants				
<i>Ilex coriacea</i>	38.6	42.13	45.1	28.57
<i>Persea palustris</i>	15.61	12.15	12.59	22.08
<i>Cliftonia monophylla</i>	11.94	19.75	6.99	9.09
<i>Gaylussacia mosieri</i>	4.38	4.7	4.55	3.9
<i>Vaccinium corymbosum</i>	1.36	0.69	2.1	1.3
<i>Magnolia virginiana</i>	1.31	1.93	0.7	1.3
<i>Lyonia lucida</i>	0.76	0.28	0.7	1.3

Table 8b: Transect DEQT3-625 Hydric Pine Flatwoods

Groundcover Vegetation Relative Cover (%)			Average Cover (%)	Species Richness
Forbs	Vines	Woody Plants	Bare ground/ Standing water	
0.7%	17.7%	81.6%	86%	11
Shrub Height (meters)				2.0

Transect DEQT3-625 Hydric Pine Flatwoods

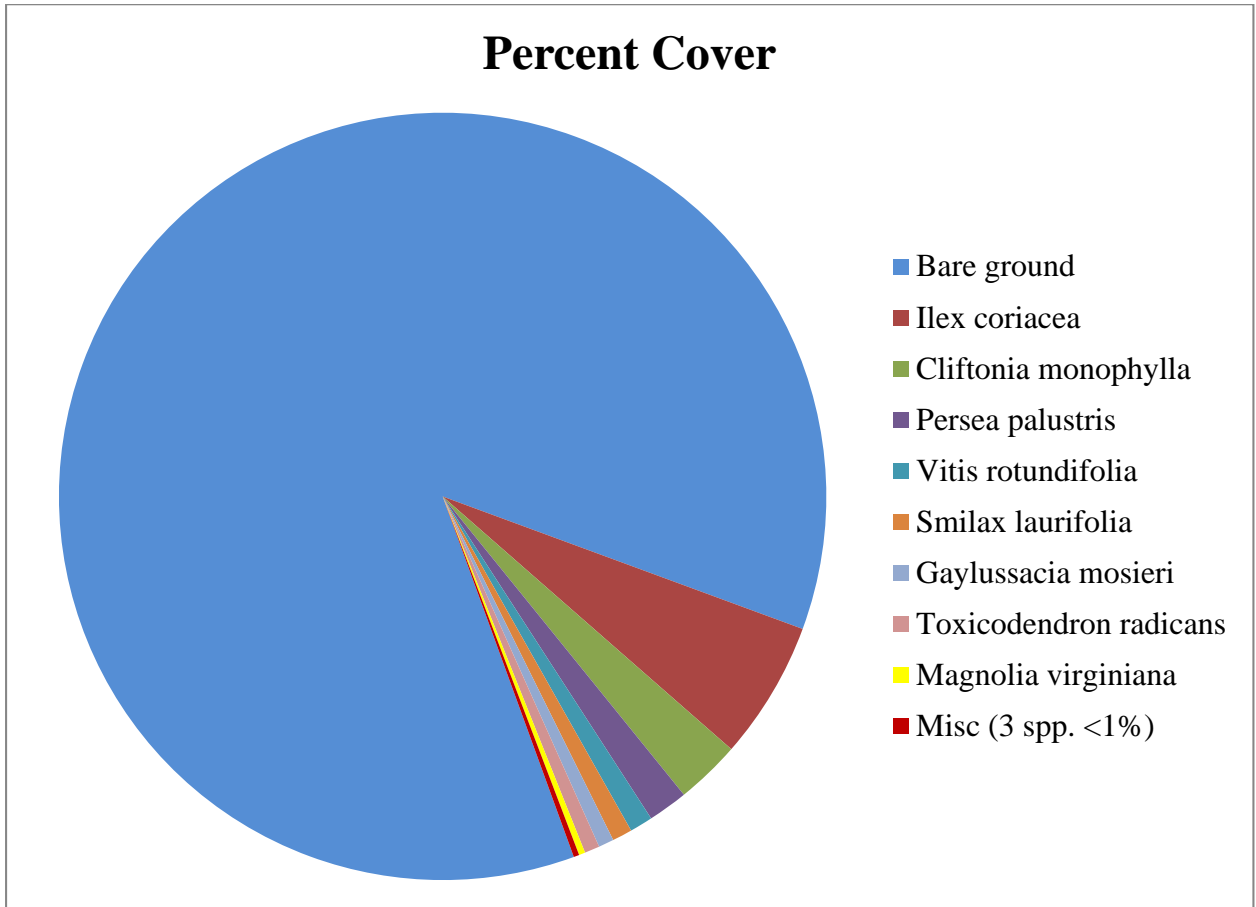


Table 9a: Transect DEQT4-626 Hydric Pine Savanna

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Bryophytes				
Mosses and liverworts	2.71	3.91	0	4.22
Forbs				
<i>Drosera intermedia</i>	6.82	1.56	16.48	2.41
<i>Lachnanthes caroliana</i>	6.65	3.24	10.68	6.02
<i>Ludwigia pilosa</i>	3.3	2.68	3.61	3.61
<i>Hypericum brachyphyllum</i>	3.06	4.13	2.04	3.01
<i>Woodwardia areolata</i>	2.73	3.13	2.04	3.01
<i>Rubus argutus</i>	2.11	1.45	1.88	3.01
<i>Mitchella repens</i>	2.04	0.89	2.83	2.41
<i>Pluchea baccharis</i>	1.96	1.45	1.41	3.01
<i>Proserpinaca pectinata</i>	1.94	0.89	2.51	2.41
<i>Eriocaulon decangulare</i>	1.94	3.68	0.94	1.2
<i>Hypericum cistifolium</i>	1.51	0.67	2.04	1.81
<i>Bidens mitis</i>	1.3	1.0	1.1	1.81
<i>Osmunda regalis</i> v. <i>spectabilis</i>	1.03	0.78	1.1	1.2
<i>Xyris flabelliformis</i>	0.53	0.22	0.78	0.6
<i>Lycopodiella alopecuroides</i>	0.43	0.22	0.47	0.6
<i>Xyris fimbriata</i>	0.33	0.22	0.16	0.6
<i>Osmunda cinnamomea</i>	0.33	0.22	0.16	0.6
<i>Burmannia capitata</i>	0.33	0.22	0.16	0.6
<i>Drosera capillaris</i>	0.33	0.22	0.16	0.6
Graminoids				
<i>Dichantherium ensifolium</i> v. <i>unciphyllum</i>	3.12	1.34	4.4	3.61
<i>Rhynchospora microcarpa</i>	2.27	1.45	2.35	3.01
<i>Panicum verrucosum</i>	1.4	0.67	1.73	1.81
<i>Rhynchospora plumosa</i>	1.25	0.67	1.26	1.81
<i>Rhynchospora fascicularis</i>	1.08	0.78	1.26	1.2
<i>Andropogon glomeratus</i>	0.65	0.45	0.31	1.2
<i>Carex glaucescens</i>	0.43	0.22	0.47	0.6
<i>Rhynchospora chapmanii</i>	0.33	0.22	0.16	0.6
Vines				
<i>Smilax laurifolia</i>	6.18	4.46	5.65	8.43
<i>Gelsemium rankinii</i>	5.08	5.02	7.22	3.01
<i>Vitis rotundifolia</i>	3.21	2.46	2.35	4.82
<i>Toxicodendron radicans</i>	0.33	0.22	0.16	0.6
Woody Plants				
<i>Cliftonia monophylla</i>	11.34	14.73	11.46	7.83
<i>Ilex coriacea</i>	8.91	15.96	5.34	5.42
<i>Persea palustris</i>	3.25	6.7	0.63	2.41
<i>Myrica caroliniensis</i>	2.92	7.25	0.31	1.2
<i>Lyonia lucida</i>	1.59	2.01	0.94	1.81
<i>Acer rubrum</i>	1.09	0.01	0.47	1.81

Table 9a: Transect DEQT4-626 Hydric Pine Savanna (Continued)

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Woody Plants				
<i>Gaylussacia mosieri</i>	0.98	1.56	0.78	0.6
<i>Pinus elliottii</i>	0.98	0.67	0.47	1.81
<i>Magnolia virginiana</i>	0.71	0.45	0.47	1.2
<i>Nyssa ursina</i>	0.65	0.45	0.31	1.2
<i>Myrica cerifera</i>	0.53	0.22	0.78	0.6
<i>Liriodendron tulipifera</i>	0.33	0.22	0.16	0.6

Table 9b: Transect DEQT4-626 Hydric Pine Savanna

Groundcover Vegetation Relative Cover (%)					Average Cover (%)	Species Richness
Bryophytes	Forbs	Graminoids	Vines	Woody Plants	Bare ground/ Standing water	
4%	27%	6%	12%	51%	82%	44
Shrub Height (meters)						1.75

Transect DEQT4-626 Hydric Pine Savanna

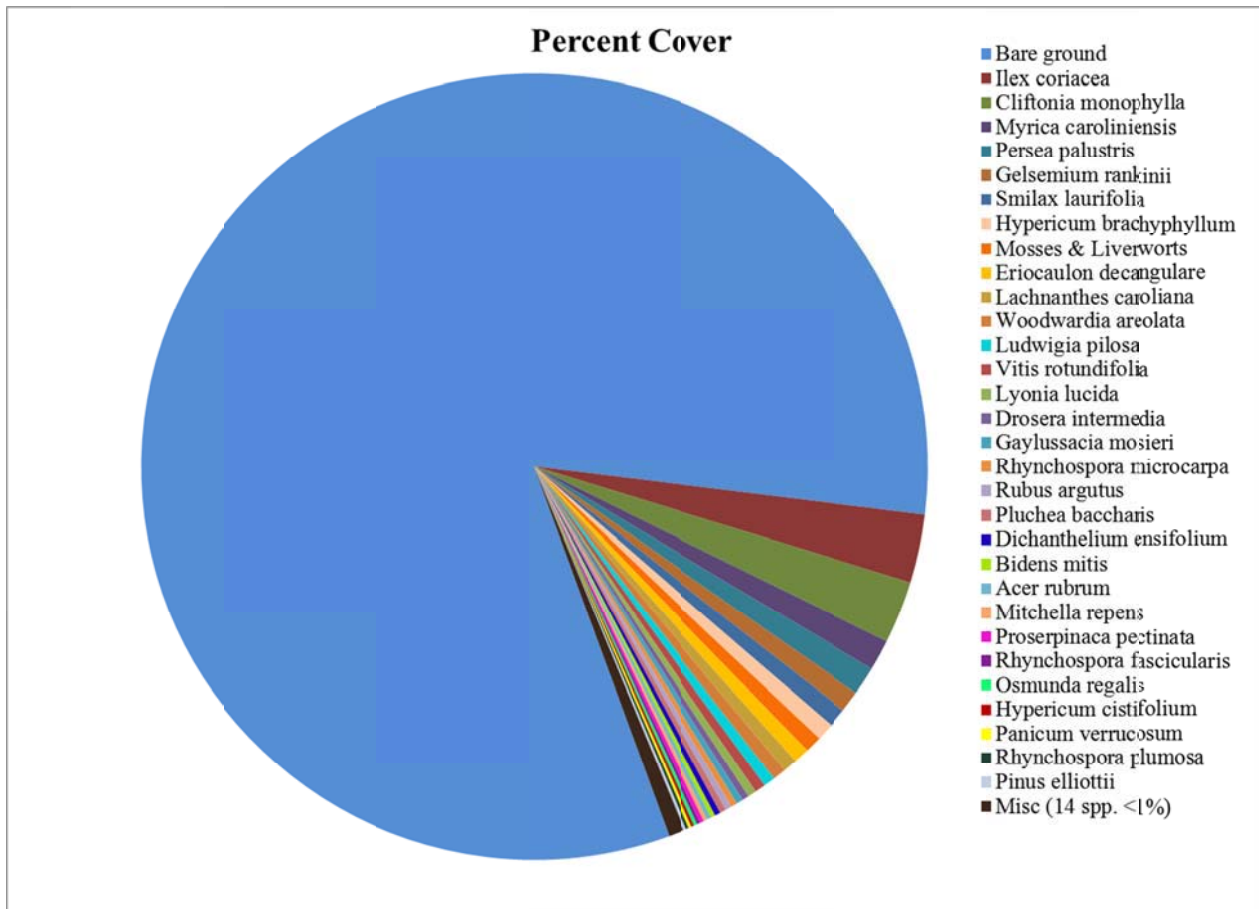


Table 10a: Transect DWQT1-625 Hydric Pine Flatwoods

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Vines				
<i>Smilax laurifolia</i>	16.92	12.08	11.27	27.4
<i>Vitex rotundifolia</i>	3.62	6.46	1.67	2.74
Forbs				
<i>Lachnanthes caroliniana</i>	2.26	1.69	0.97	4.11
<i>Woodwardia virginica</i>	0.74	0.56	0.28	1.37
Graminoids				
<i>Rhynchospora fascicularis</i>	12.58	9.27	7.93	20.55
Woody Plants				
<i>Cliftonia monophylla</i>	51.73	60.11	73.16	21.92
<i>Ilex coriacea</i>	5.11	3.93	1.81	9.59
<i>Lyonia lucida</i>	2.21	1.69	0.83	4.11
<i>Gaylussacia mosieri</i>	2.17	1.69	0.7	4.11
<i>Vaccinium corymbosum</i>	1.85	1.97	0.83	2.74
<i>Nyssa ursina</i>	0.83	0.56	0.56	1.37

Table 10b: Transect DWQT1-625 Hydric Pine Flatwoods

Groundcover Vegetation Relative Cover (%)				Average Cover (%)	Species Richness
Forbs	Graminoids	Vines	Woody Plants	Bare ground/ Standing water	
2%	9%	19%	70%	90%	11
Shrub Height (meters)					0.5

Transect DWQT1-625 Hydric Pine Flatwoods

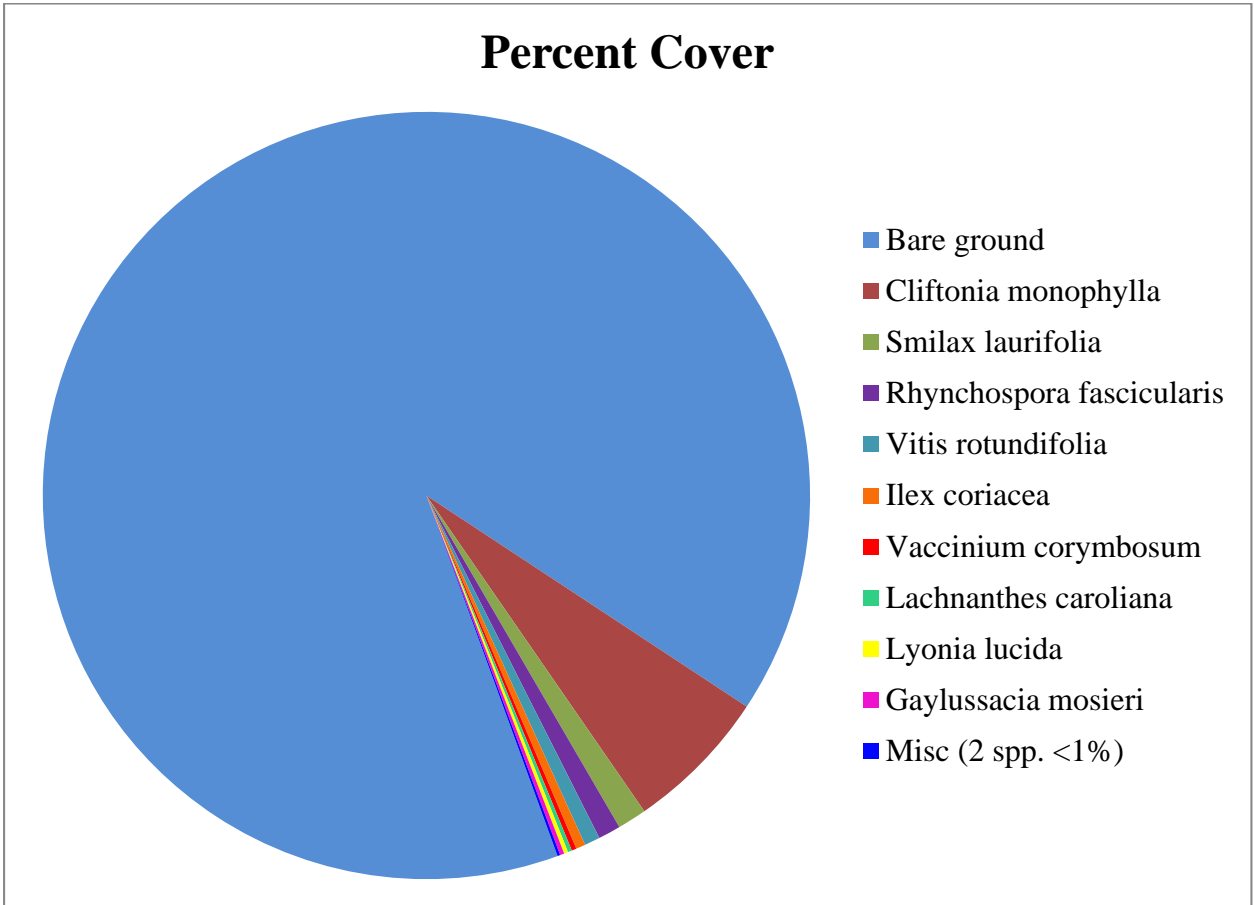


Table 11a: Transect DWQT2-626 Hydric Pine Savanna

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Bryophytes				
Mosses and liverworts	2.5	2.84	0	4.65
Forbs				
<i>Lachnanthes caroliana</i>	2.6	0.29	5.96	1.55
<i>Eriocaulon decangulare</i>	1.22	0.73	1.38	1.55
<i>Hypericum brachyphyllum</i>	0.99	0.51	0.92	1.55
<i>Rhexia mariana</i>	0.92	0.29	0.92	1.55
<i>Xyris sp.</i>	0.84	0.29	0.69	1.55
<i>Drosera capillaris</i>	0.77	0.29	0.46	1.55
<i>Woodwardia areolata</i>	0.39	0.15	0.23	0.78
<i>Mitchella repens</i>	0.39	0.15	0.23	0.78
<i>Lobelia glandulosa</i>	0.39	0.15	0.23	0.78
Graminoids				
<i>Dichantherium ensifolium v. unciphyllum</i>	5.28	0.95	11.01	3.88
<i>Aristida stricta v. beyrichiana</i>	2.28	1.9	1.83	3.1
<i>Rhynchospora plumosa</i>	1.07	0.29	1.38	1.55
<i>Carex glaucescens</i>	0.84	0.29	0.69	1.55
<i>Rhynchospora microcarpa</i>	0.39	0.15	0.23	0.78
<i>Rhynchospora chapmanii</i>	0.39	0.15	0.23	0.78
<i>Rhynchospora fascicularis</i>	0.39	0.15	0.23	0.78
Vines				
<i>Smilax laurifolia</i>	1.69	0.58	1.38	3.1
Woody Plants				
<i>Cliftonia monophylla</i>	30.2	48.14	23.85	18.6
<i>Ilex coriacea</i>	13.78	13.06	17.43	10.85
<i>Lyonia lucida</i>	7.55	6.13	10.32	6.2
<i>Cyrilla racemiflora</i>	5.9	8.97	2.52	6.2
<i>Gaylussacia mosieri</i>	5.66	1.9	7.34	7.75
<i>Ilex glabra</i>	5.19	7.15	2.98	5.43
<i>Persea palustris</i>	2.91	2.33	2.52	3.88
<i>Photinia pyrifolia</i>	2.3	0.73	2.29	3.88
<i>Vaccinium corymbosum</i>	0.84	0.29	0.69	1.55
<i>Myrica cerifera</i>	0.62	0.15	0.92	0.78
<i>Styrax americanus</i>	0.53	0.36	0.46	0.78
<i>Myrica caroliniensis</i>	0.46	0.36	0.23	0.78
<i>Acer rubrum</i>	0.39	0.15	0.23	0.78
<i>Nyssa ursina</i>	0.39	0.15	0.23	0.78

Table 11b: Transect DWQT2-626 Hydric Pine Savanna

Groundcover Vegetation Relative Cover (%)					Average Cover (%)	Species Richness
Bryophytes	Forbs	Graminoids	Vines	Woody Plants	Bare ground/ Standing water	
3%	3%	4%	0.6%	90%	78%	32
Shrub Height (meters)						1.0

Transect DWQT2-626 Hydric Pine Savanna

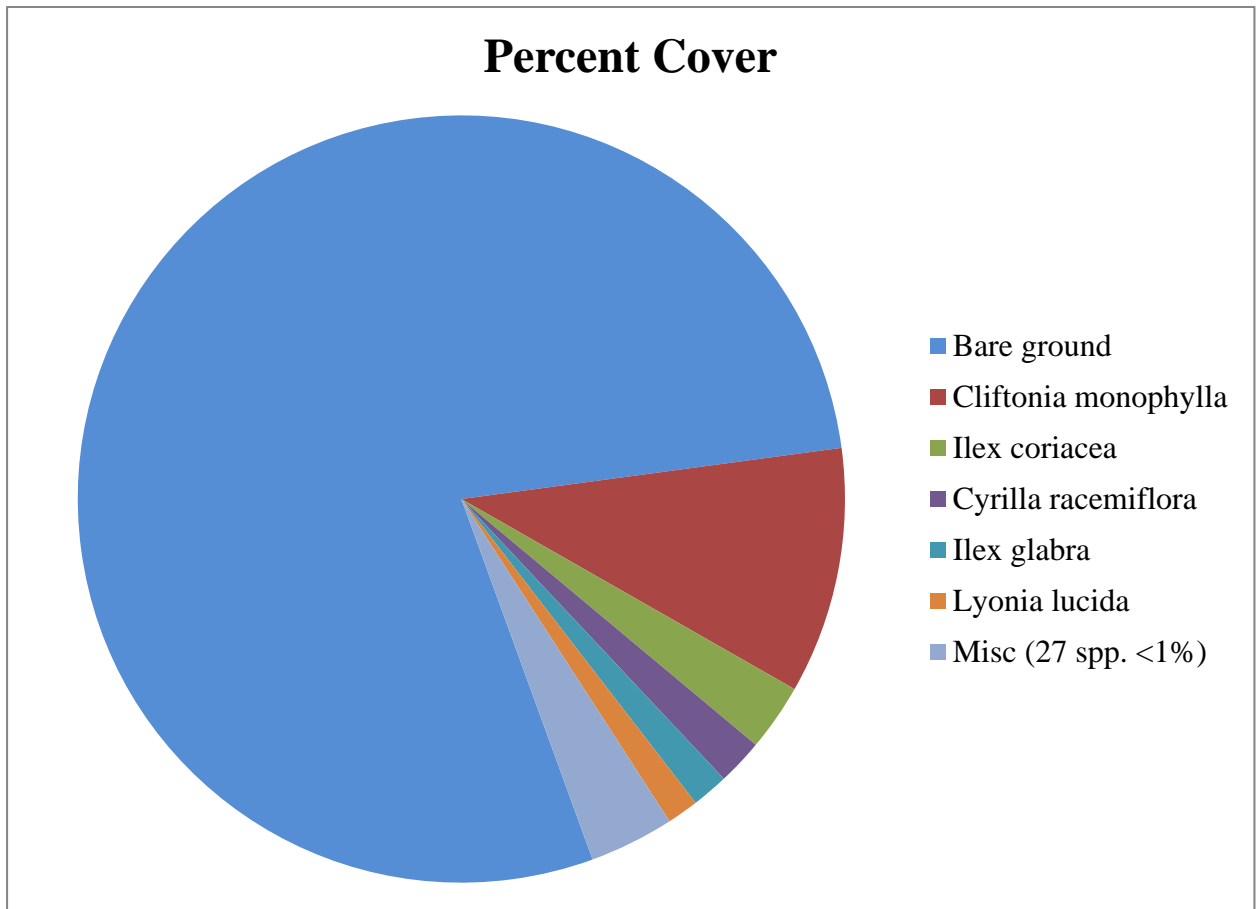


Table 12a: Transect DWQT3-626 Hydric Pine Savanna

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Forbs				
<i>Utricularia gibba</i>	3.08	0.19	8.57	0.47
<i>Sarracenia leucophylla</i>	1.79	1.07	2.4	1.89
<i>Hypericum brachyphyllum</i>	1.57	0.97	1.37	2.36
<i>Drosera capillaris</i>	1.33	0.39	2.66	0.94
<i>Rubus argutus</i>	0.59	0.39	0.43	0.94
<i>Rhexia alifanus</i>	0.36	0.19	0.43	0.47
<i>Ludwigia pilosa</i>	0.28	0.19	0.17	0.47
<i>Eriocaulon compressum</i>	0.25	0.19	0.09	0.47
<i>Erigeron vernus</i>	0.25	0.19	0.09	0.47
<i>Rhexia lutea</i>	0.25	0.19	0.09	0.47
Graminoids				
<i>Rhynchospora fascicularis</i>	4.18	3.4	3	6.13
<i>Scleria reticularis</i>	3.04	3.5	2.31	3.3
<i>Rhynchospora plumosa</i>	2.99	1.95	2.31	4.72
<i>Fuirena breviseta</i>	2.37	3.5	0.77	2.83
<i>Rhynchospora chapmanii</i>	2.29	1.46	2.57	2.83
<i>Dichanthelium ensifolium v. unciphyllum</i>	1.85	0.97	2.23	2.36
<i>Rhynchospora microcarpa</i>	1.44	1.26	0.69	2.36
<i>Scleria triglomerata</i>	0.85	0.88	0.26	1.42
<i>Dichanthelium erectifolium</i>	0.61	0.39	0.51	0.94
<i>Aristida stricta v. beyrichiana</i>	0.59	0.39	0.43	0.94
<i>Rhynchospora chalarocephala</i>	0.28	0.19	0.17	0.47
<i>Andropogon gyrans v. stenophyllus</i>	0.25	0.19	0.09	0.47
<i>Ctenium aromaticum</i>	0.25	0.19	0.09	0.47
<i>Dichanthelium portoricense</i>	0.25	0.19	0.09	0.47
Vines				
<i>Smilax laurifolia</i>	5.69	3.79	4.8	8.49
<i>Toxicodendron radicans</i>	0.25	0.19	0.09	0.47
Woody Plants				
<i>Ilex glabra</i>	10.69	13.13	13.28	5.66
<i>Cliftonia monophylla</i>	9.04	11.19	10.28	5.66
<i>Gaylussacia mosieri</i>	7.89	6.61	9.51	7.55
<i>Ilex coriacea</i>	7.58	10.02	7.54	5.19
<i>Photinia pyrifolia</i>	6.38	4.18	6.94	8.02
<i>Clethra alnifolia</i>	4.31	4.57	5.06	3.3
<i>Lyonia lucida</i>	2.69	2.72	3.0	2.36
<i>Pinus elliotii</i>	2.38	6.03	0.17	0.94
<i>Myrica caroliniensis</i>	2.34	1.65	2.06	3.3
<i>Magnolia virginiana</i>	1.85	3.5	1.11	0.94
<i>Cyrilla racemiflora</i>	1.7	2.53	0.69	1.89
<i>Taxodium ascendens</i>	1.64	3.21	0.77	0.94

Table 12a: Transect DWQT3-626 Hydric Pine Savanna (Continued)

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Woody Plants				
<i>Styrax americanus</i>	1.51	1.36	1.29	1.89
<i>Ilex cassine v. myrtifolia</i>	1.01	1.17	0.43	1.42
<i>Persea palustris</i>	0.91	0.88	0.43	1.42
<i>Nyssa ursina</i>	0.59	0.39	0.43	0.94
<i>Vaccinium corymbosum</i>	0.31	0.19	0.26	0.47
<i>Sapium sebiferum</i>	0.25	0.19	0.09	0.47

Table 12b: Transect DWQT3-626 Hydric Pine Savanna

Groundcover Vegetation Relative Cover (%)				Average Cover (%)	Species Richness
Forbs	Graminoids	Vines	Woody Plants	Bare ground/ Standing water	
4%	18.5%	4%	73.5%	72.5%	44
Shrub Height (meters)					0.5

Transect DWQT3-626 Hydric Pine Savanna

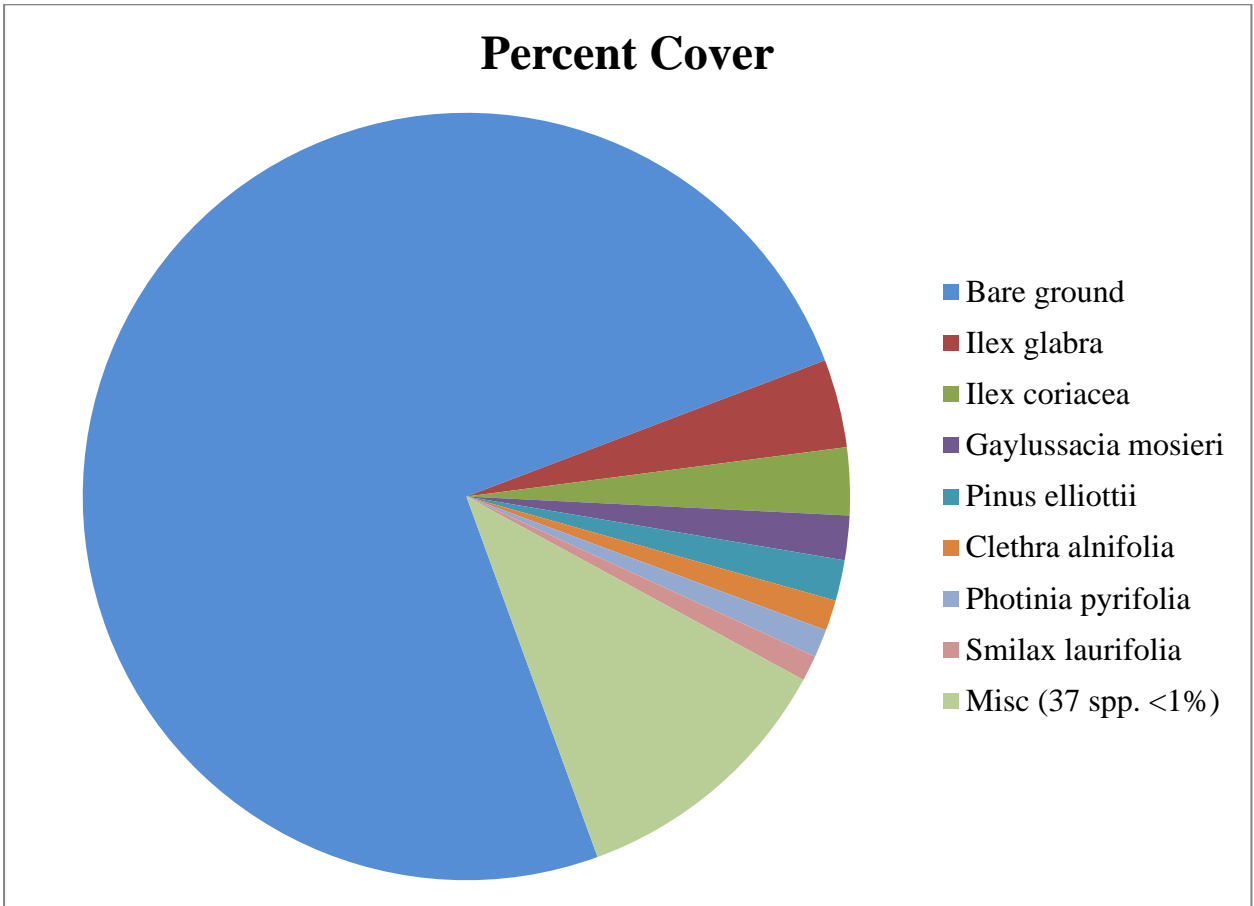


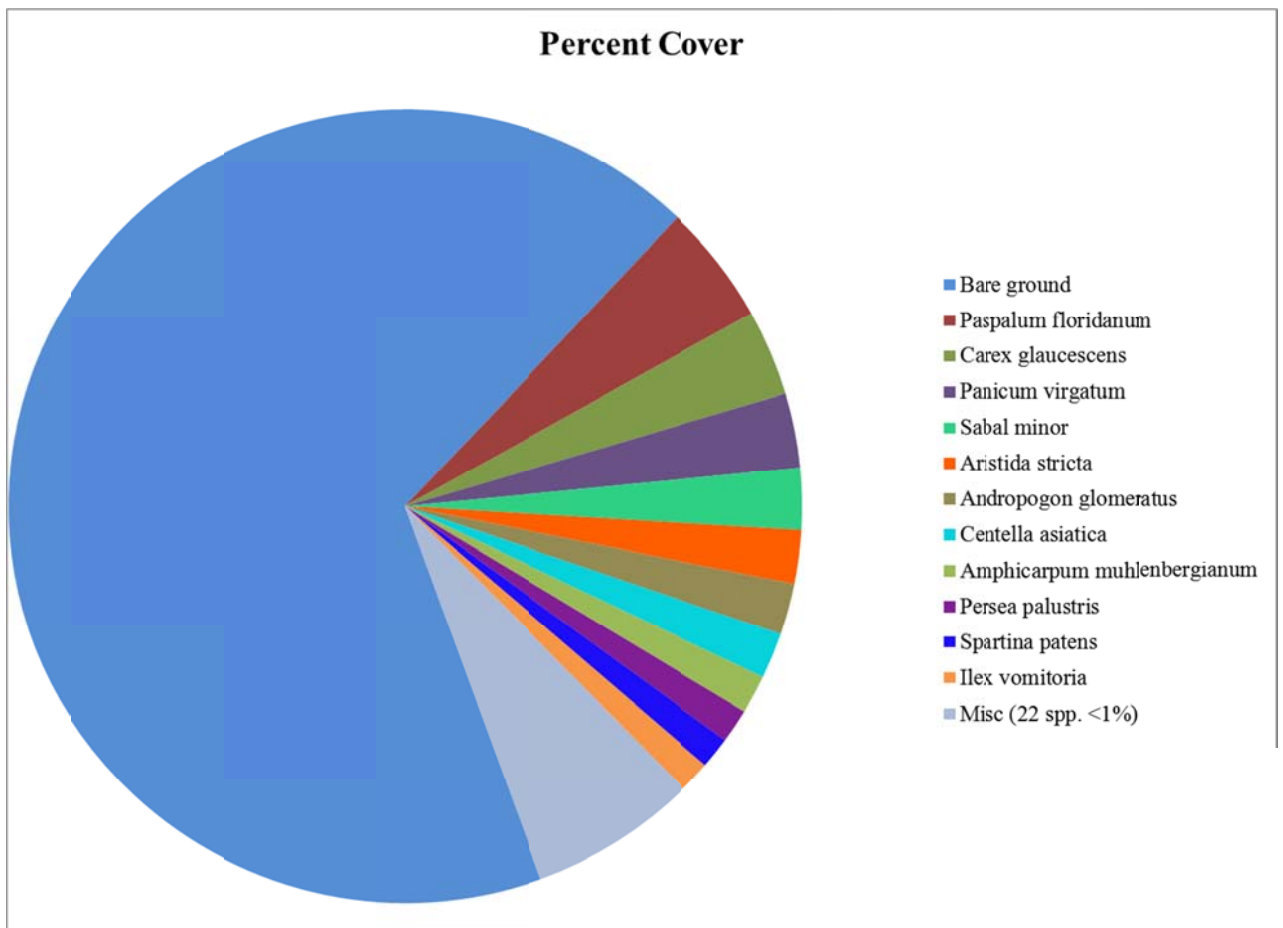
Table 13a: Transect DWQT4-625 Hydric Pine Flatwoods

Species	Importance Value (%)	Relative Cover (%)	Relative Density (%)	Relative Frequency (%)
Forbs				
<i>Centella asiatica</i>	15.32	5.74	28.23	11.98
<i>Sabal minor</i>	3.09	7.71	0.36	1.2
<i>Rubus argutus</i>	1.51	1.03	1.09	2.4
<i>Osmunda cinnamomea</i>	1.25	1.41	0.55	1.8
<i>Bidens mitis</i>	1.03	0.56	0.73	1.8
<i>Osmunda regalis</i> var. <i>spectabilis</i>	0.74	0.66	0.36	1.2
<i>Baccharis glomeruliflora</i>	0.42	0.47	0.18	0.6
<i>Xyris elliotii</i>	0.32	0.19	0.18	0.6
<i>Pluchea baccharis</i>	0.32	0.19	0.18	0.6
Graminoids				
<i>Paspalum floridanum</i>	10.59	14.96	7.83	8.98
<i>Carex glaucescens</i>	9.44	10.72	8.01	9.58
<i>Amphicarpum muhlenbergianum</i>	7.77	4.8	13.11	5.39
<i>Panicum virgatum</i>	7.48	9.31	4.74	8.38
<i>Spartina patens</i>	5.0	3.95	7.47	3.59
<i>Andropogon glomeratus</i>	4.82	6.4	3.28	4.79
<i>Aristida stricta</i> v. <i>beyrichiana</i>	4.03	6.68	1.82	3.59
<i>Panicum verrucosum</i>	3.13	1.98	3.83	3.59
<i>Andropogon glomeratus</i> v. <i>glaucopsis</i>	2.32	2.73	1.82	2.4
<i>Dichantherium scabriusculum</i>	1.5	0.94	2.37	1.2
<i>Dichantherium ensifolium</i> v. <i>unciphillum</i>	0.74	0.66	0.36	1.2
<i>Dichantherium portoricense</i>	0.71	0.38	0.55	1.2
<i>Cladium jamaicense</i>	0.65	0.38	0.36	1.2
<i>Rhynchospora fascicularis</i>	0.48	0.47	0.36	0.6
<i>Carex verrucosa</i>	0.42	0.47	0.18	0.6
<i>Chasmanthium laxum</i> var. <i>sessiliflorum</i>	0.42	0.47	0.18	0.6
<i>Rhynchospora plumosa</i>	0.38	0.19	0.36	0.6
<i>Andropogon virginicus</i>	0.38	0.19	0.36	0.6
<i>Spartina bakeri</i>	0.32	0.19	0.18	0.6
Vines				
<i>Toxicodendron radicans</i>	5.47	2.45	6.19	7.78
<i>Mikania scandens</i>	0.32	0.19	0.18	0.6
Woody Plants				
<i>Persea palustris</i>	3.27	4.23	2.0	3.59
<i>Ilex vomitoria</i>	2.94	3.95	1.28	3.59
<i>Nyssa sylvatica</i> v. <i>biflora</i>	1.29	2.92	0.36	0.6
<i>Acer rubrum</i>	0.97	0.56	0.55	1.8
<i>Magnolia virginiana</i>	0.82	1.69	0.18	0.6
<i>Ilex cassine</i> v. <i>myrtifolia</i>	0.32	0.19	0.18	0.6

Table 13b: Transect DWQT4-625 Hydric Pine Flatwoods

Groundcover Vegetation Relative Cover (%)				Average Cover (%)	Species Richness
Forbs	Graminoids	Vines	Woody Plants	Bare ground/ Standing water	
18%	66%	2.6%	13.5%	67.5%	36
Shrub Height (meters)					1.0

Transect DWQT4-625 Hydric Pine Flatwoods



3.2. Qualitative Transect Data

A summary of the qualitative data and plant lists are provided below for each transect (See Tables 14-24 for the plant lists). The qualitative data sheets recorded for each transect are located in Appendix A.

Qualitative Transect DEPT1-626 Hydric Pine Savanna

The plant community is a wet prairie using the FNAI classification. The location where this transect was conducted is not managed for pine production. The estimated canopy coverage class is 26-50 percent and the majority of the canopy trees are greater than 10m high. The dominant canopy species are *Pinus elliottii*, *Cyrilla racemiflora*, *Cliftonia monophylla*, *Magnolia virginiana*, and *Nyssa sylvatica* var. *biflora*. The estimated height class for the majority of the subcanopy is 6 to 10m. The dominant subcanopy species are *Cliftonia monophylla* and *Magnolia virginiana*. The shrub coverage is 0-1 percent and the majority of the shrubs are in the 0.6-1.5m height class. The dominant shrub species are *Ilex coriacea*, *Vaccinium corymbosum*, and *Cliftonia monophylla*. The graminoid groundcover coverage class is 0-1 percent and the total groundcover cover class is 0-1 percent. The dominant groundcover species are *Smilax laurifolia* and *Gaylussacia mosieri*. The site has significant bare ground coverage due to long term fire suppression, thick continuous duff layers, and competition from multiple woody strata above the groundcover.

The tree density is very high. Wildlife observations included blue jays (*Cyanocitta cristata*) and red-bellied woodpeckers (*Melanerpes carolinus*). No exotic species were observed. Natural regeneration of appropriate species is not occurring. Eleven appropriate species were observed and the majority of these species are woody species, which also comprise the shrub and subcanopy strata. The landscape is fire suppressed. The depth of duff is approximately 3 cm and the depth of litter is approximately 3 cm. The soil surface moisture class is damp.

Table 14: Plant List for DEPT1-626 Hydric Pine Savanna

Scientific Name	Common Name
<i>Cliftonia monophylla</i>	black titi
<i>Cyrilla racemiflora</i>	red titi
<i>Gaylussacia mosieri</i>	woolly huckleberry
<i>Ilex coriacea</i>	large gallberry
<i>Magnolia virginiana</i>	sweet bay
<i>Myrica heterophylla</i>	evergreen bayberry
<i>Nyssa sylvatica</i> var. <i>biflora</i>	tupelo
<i>Persea palustris</i>	silk bay
<i>Pinus elliottii</i>	slash pine
<i>Smilax laurifolia</i>	laurel greenbrier
<i>Vaccinium corymbosum</i>	highbush blueberry

Qualitative Transect DEPT2-614 Titi Swamp

The plant community is a wet prairie/shrub bog using the FNAI classification. The location where this transect was conducted is not managed for pine production. The estimated canopy coverage class is 6-25 percent and the majority of the canopy trees are 6-10m tall. The dominant canopy species are *Pinus elliottii*, *Cliftonia monophylla*, *Magnolia virginiana*, and *Nyssa sylvatica* var. *biflora*. The estimated height class for the majority of the subcanopy is 3-5m. The dominant subcanopy species are *Magnolia virginiana* and *Nyssa sylvatica* v. *biflora*. The shrub coverage is 1-5 percent and the majority of the shrubs are in the 1.6-3m height class. The dominant shrub species are *Ilex coriacea*, *Lyonia lucida*, and *Gaylussacia mosieri*. The graminoid groundcover coverage class is 1-5 percent and the total groundcover cover class is 0-1 percent. The dominant groundcover species are *Smilax laurifolia*, *Woodwardia virginica*, *Gaylussacia mosieri*, and *Sphagnum* spp. The site has significant bare ground coverage due to long term fire suppression, thick continuous duff layers, and competition from multiple woody strata above the groundcover.

The trees are in good condition. Wildlife observations included a ruby-crowned kinglet (*Regulus calendula*), a red-shouldered hawk (*Buteo lineatus*), and a blue jay (*Cyanocitta cristata*). No exotic species were observed. Natural regeneration of appropriate species is not occurring. Thirteen species were observed and the majority of these species comprise the strata above the groundcover. The landscape is fire suppressed. The depth of duff is approximately 2 cm and the depth of litter is approximately 1 cm. The soil surface moisture class is damp.

Table 15: Plant List for Transect DEPT2-614 Titi Swamp

Scientific Name	Common Name
<i>Cliftonia monophylla</i>	black titi
<i>Cyrilla racemiflora</i>	red titi
<i>Gaylussacia mosieri</i>	woolly huckleberry
<i>Ilex coriacea</i>	large gallberry
<i>Lyonia lucida</i>	fetterbush
<i>Magnolia virginiana</i>	sweet bay
<i>Myrica heterophylla</i>	evergreen bayberry
<i>Nyssa sylvatica</i> var. <i>biflora</i>	tupelo
<i>Persea palustris</i>	silk bay
<i>Pinus elliottii</i>	slash pine
<i>Smilax laurifolia</i>	laurel greenbrier
<i>Sphagnum</i> spp.	peat moss
<i>Vaccinium corymbosum</i>	highbush blueberry

Qualitative Transect DEPT3-611 Bay Swamp

The plant community is a baygall using the FNAI classification. The location where this transect was conducted is not managed for pine production. The estimated canopy coverage class is 25-50 percent and the majority of the canopy trees are 6-10m tall. The dominant canopy species are *Liriodendron tulipifera*, *Cliftonia monophylla*, *Magnolia virginiana*, and *Nyssa sylvatica* var. *biflora*. The estimated height class for the majority of the subcanopy is 6-10m. The dominant subcanopy species are *Cliftonia monophylla*, *Acer rubrum*, and *Nyssa sylvatica* var. *biflora*. The shrub coverage is 1-5 percent and the majority of the shrubs are in the 1.6-3m height class. The dominant shrub species are *Ilex coriacea*, *Myrica heterophylla*, and *Persea palustris*. The graminoid groundcover coverage class is 26-50 percent and the total groundcover cover class is 26-50 percent. The dominant groundcover species are *Scleria triglomerata*, *Rhynchospora* spp., *Carex verrucosum*, *Osmunda cinnamomea*, *Sphagnum* spp., *Woodwardia areolata*, and *Vitis rotundifolia*. The site has significant bare ground coverage due to long term fire suppression, continuous coverage of thick duff layers, and competition from multiple woody strata above the groundcover.

The trees are in good condition. Wildlife observations included a northern cardinal (*Cardinalis cardinalis*), red-bellied woodpeckers (*Melanerpes carolinus*), a northern mockingbird (*Mimus polyglottos*), a southern cricket frog (*Acris gryllus*), white-tailed deer (*Odocoileus virginianus*), a northern raccoon (*Procyon lotor*), and a blue jay (*Cyanocitta cristata*). No exotic species were observed. Natural regeneration of appropriate 27 species is occurring and the landscape is fire suppressed. The depth of duff is approximately 2 cm and the depth of litter is approximately 3 cm. The soil surface moisture class is damp.

Table 16: Plant List for Transect DEPT3-611 Bay Swamp

Scientific Name	Common Name
<i>Acer rubrum</i>	red maple
<i>Carex verrucosum</i>	swamp sedge
<i>Cliftonia monophylla</i>	black titi
<i>Cyrilla racemiflora</i>	red titi
<i>Gaylussacia mosieri</i>	woolly huckleberry
<i>Ilex coriacea</i>	large gallberry
<i>Liriodendron tulipifera</i>	tulip tree
<i>Lyonia lucida</i>	fetterbush
<i>Magnolia virginiana</i>	sweet bay
<i>Mitchella repens</i>	partridgeberry
<i>Myrica heterophylla</i>	evergreen bayberry
<i>Myrica inodora</i>	odorless bayberry
<i>Nyssa sylvatica</i> var. <i>biflora</i>	tupelo
<i>Osmanthus americanus</i>	American wild olive
<i>Osmunda cinnamomea</i>	cinnamon fern
<i>Persea palustris</i>	silk bay
<i>Pinus elliotii</i>	slash pine
<i>Scleria triglomerata</i>	nutrush

Table 16: Plant List for Transect DEPT3-611 Bay Swamp (Continued)

Scientific Name	Common Name
<i>Smilax laurifolia</i>	laurel greenbrier
<i>Sphagnum</i> sp.	peat moss
<i>Toxicodendron radicans</i>	poison ivy
<i>Toxicodendron vernix</i>	poison sumac
<i>Vaccinium corymbosum</i>	highbush blueberry
<i>Viburnum nudum</i>	possumhaw
<i>Vitis rotundifolia</i>	muscadine grape
<i>Woodwardia areolata</i>	netted chain fern
<i>Woodwardia virginica</i>	Virginia chain fern

Qualitative Transect DEPT4-625 Hydric Pine Flatwoods

The plant community is a wet prairie/shrub bog using the FNAI classification. The location where this transect was conducted is not managed for pine production. The estimated canopy coverage class is 6-25 percent and the majority of the canopy trees are 6-10m high. The dominant canopy species are *Pinus elliotii*, *Cliftonia monophylla*, *Magnolia virginiana*, *Nyssa sylvatica* var. *biflora* and *Persea palustris*. The estimated height class for the majority of the subcanopy is 6-10m. The dominant subcanopy species are *Cliftonia monophylla*, *Nyssa sylvatica* var. *biflora*, and *Magnolia virginiana*. The shrub coverage is 1-5 percent and the majority of the shrubs are in the 1.6-3m height class. The dominant shrub species are *Ilex coriacea* and *Magnolia virginiana*. The graminoid groundcover coverage class is 0 percent and the total groundcover cover class is 1-5 percent. The dominant groundcover species are *Toxicodendron radicans*, *Smilax laurifolia*, and *Vitis rotundifolia*. The site has significant bare ground coverage due to long term fire suppression, deep duff layer, and competition from multiple woody strata above the groundcover.

The trees are in good condition. Wildlife observations included a golden-orb weaver spider (*Nephila clavipes*), a blue jay (*Cyanocitta cristata*) and a red-winged blackbird (*Agelaius phoeniceus*). No exotic species were observed. Natural regeneration of appropriate species is not occurring. Twenty species were observed and the majority of these species are woody species, which also comprise the shrub, subcanopy, and canopy strata. Overall, the landscape is fire suppressed. The depth of duff is approximately 4 cm and the depth of litter is approximately 5 cm. The soil surface moisture class is damp.

Table 17: Plant List for Transect DEPT4-625 Hydric Pine Flatwoods

Scientific Name	Common Name
<i>Cliftonia monophylla</i>	black titi
<i>Cyrilla racemiflora</i>	red titi
<i>Gaylussacia mosieri</i>	woolly huckleberry
<i>Ilex coriacea</i>	large gallberry

Table 17: Plant List for Transect DEPT4-625 Hydric Pine Flatwoods (Continued)

Scientific Name	Common Name
<i>Ilex glabra</i>	gallberry
<i>Lyonia lucida</i>	fetterbush
<i>Magnolia grandiflora</i>	southern magnolia
<i>Magnolia virginiana</i>	sweet bay
<i>Myrica heterophylla</i>	evergreen bayberry
<i>Myrica inodora</i>	odorless bayberry
<i>Nyssa sylvatica</i> var. <i>biflora</i>	tupelo
<i>Osmunda cinnamomea</i>	cinnamon fern
<i>Persea palustris</i>	swamp bay
<i>Pinus elliotii</i>	slash pine
<i>Smilax laurifolia</i>	laurel greenbrier
<i>Toxicodendron radicans</i>	poison ivy
<i>Vaccinium corymbosum</i>	highbush blueberry
<i>Vitis rotundifolia</i>	muscadine grape
<i>Woodwardia areolata</i>	netted chain fern

Qualitative Transect DEPT5-630 Wetland Forested Mixed

The plant community is a baygall using the FNAI classification. The location where this transect was conducted is not managed for pine production. The estimated canopy coverage class is 26-50 percent and the majority of the canopy trees are 6-10m high. The dominant canopy species are *Pinus elliotii*, *Cliftonia monophylla*, *Magnolia virginiana*, *Nyssa sylvatica* var. *biflora*, and *Persea palustris*. The estimated height class for the majority of the subcanopy is 3-5m. The dominant subcanopy species are *Ilex cassine*, *Cliftonia monophylla*, and *Magnolia virginiana*. The shrub coverage is 6-25 percent and the majority of the shrubs are in the 0.6-1.5m height class. The dominant shrub species are *Ilex coriacea*, *Magnolia virginiana*, *Viburnum nudum*, and *Lyonia lucida*. The graminoid groundcover coverage class is 6-25 percent and the total groundcover cover class is 6-25 percent. The dominant groundcover species are *Woodwardia areolata*, *Woodwardia virginica*, *Osmunda cinnamomea*, *Sphagnum* spp., *Rhynchospora miliacea*, *Carex verrucosum*, and *Smilax laurifolia*. The site has significant bare ground coverage due to infrequent fire intervals, a continuous thick duff layer, and competition from multiple woody strata above the groundcover.

The trees appear to be healthy. Wildlife observations included a blue jay (*Cyanocitta cristata*), a red-shouldered hawk (*Buteo lineatus*) and white-tailed deer (*Odocoileus virginianus*). No exotic species were observed. Natural regeneration of appropriate species is not occurring. Twenty-one species were observed and the majority of these species are woody species, which also comprise the shrub, subcanopy, and canopy strata. The depth of duff is approximately 3 cm and the depth of litter is approximately 3 cm. The soil surface moisture class is damp.

Table 18: Plant List for Transect DEPT5-630 Wetland Forested Mixed

Scientific Name	Common Name
<i>Carex verrucosum</i>	caric sedge
<i>Cliftonia monophylla</i>	black titi
<i>Cyrilla racemiflora</i>	red titi
<i>Gaylussacia mosieri</i>	woolly huckleberry
<i>Ilex cassine</i>	dahoon
<i>Ilex coriacea</i>	large gallberry
<i>Lyonia lucida</i>	fetterbush
<i>Magnolia virginiana</i>	sweet bay
<i>Myrica heterophylla</i>	evergreen bayberry
<i>Nyssa biflora</i>	tupelo
<i>Osmunda cinnamomea</i>	cinnamon fern
<i>Persea palustris</i>	swamp bay
<i>Pinus elliottii</i>	slash pine
<i>Rhynchospora miliacea</i>	beakrush
<i>Smilax laurifolia</i>	laurel greenbrier
<i>Sphagnum</i> sp.	peat moss
<i>Toxicodendron radicans</i>	poison ivy
<i>Toxicodendron vernix</i>	poison sumac
<i>Vaccinium corymbosum</i>	highbush blueberry
<i>Viburnum nudum</i>	possumhaw
<i>Vitis rotundifolia</i>	muscadine grape

Qualitative Transect DWPT1-411 Mesic Pine Flatwoods

The plant community is a mesic flatwoods using the FNAI classification. The location where this transect was conducted is not managed for pine production. The estimated canopy coverage class is 51-75 percent and the majority of the canopy trees are 6-10m high. The dominant canopy species are *Pinus elliottii*, *Quercus hemisphaerica* and *Symplocos tinctoria*. The estimated height class for the majority of the subcanopy is 6-10m. The dominant subcanopy species are *Quercus hemisphaerica* and *Symplocos tinctoria*. The shrub coverage is 6-25 percent and the majority of the shrubs are in the 1.6-3m height class. The dominant shrub species are *Ilex coriacea* and *Quercus hemisphaerica*. The graminoid groundcover coverage class is 0 percent and the total groundcover cover class is 6-25 percent. The dominant groundcover species are *Serenoa repens*, *Ilex coriacea*, *Vitis rotundifolia*, and *Clethra alnifolia*. The site has significant bare ground coverage due to long term fire suppression, continuous layers of thick duff layer, and competition from multiple woody strata above the groundcover.

The trees are in good condition. Wildlife observations included an eastern gray squirrel (*Sciurus carolinensis*), a nine-banded armadillo (*Dasypus novemcinctus*) and crickets. No exotic species were observed. Natural regeneration of appropriate species is not occurring. Thirteen species were observed and the majority of these species are woody species, which also comprise the shrub, subcanopy, and canopy strata. Overall, the landscape is fire

suppressed. The depth of duff is approximately 4 cm and the depth of litter is approximately 3 cm. The soil surface moisture class is damp.

Table 19: Plant List for Transect DWPT1-411 Mesic Pine Flatwoods

Scientific Name	Common Name
<i>Clethra alnifolia</i>	sweet pepper bush
<i>Ilex coriacea</i>	large gallberry
<i>Ilex glabra</i>	gallberry
<i>Lyonia lucida</i>	fetterbush
<i>Magnolia virginiana</i>	sweet bay
<i>Pinus elliotii</i>	slash pine
<i>Quercus hemisphaerica</i>	laurel oak
<i>Serenoa repens</i>	saw-palmetto
<i>Smilax laurifolia</i>	laurel greenbrier
<i>Symplocos tinctoria</i>	common sweetleaf
<i>Vaccinium arboreum</i>	sparkleberry
<i>Vaccinium corymbosum</i>	highbush blueberry
<i>Vitis rotundifolia</i>	muscadine grape

Qualitative Transect DWPT2-611 Bay Swamp

The plant community is a palustrine marsh using the FNAI classification. The location where this transect was conducted is not managed for pine production. The estimated canopy coverage class is 6-25 percent and the majority of the canopy trees are 3-5m high. The dominant canopy species are *Pinus elliotii*, *Taxodium ascendens*, *Acer rubrum*, *Magnolia virginiana*, *Nyssa sylvatica* var. *biflora*, and *Persea palustris*. The estimated height class for the majority of the subcanopy is 3-5m. The dominant subcanopy species are *Pinus elliotii*, *Acer rubrum*, *Nyssa sylvatica* var. *biflora*, and *Persea palustris*. The shrub coverage is 6-25 percent and the majority of the shrubs are in the 1.6-3m height class. The dominant shrub species are *Myrica cerifera*, *Lyonia lucida*, and *Myrica heterophylla*. The graminoid groundcover coverage class is 6-25 percent and the total groundcover cover class is 6-25 percent. The dominant groundcover species are *Smilax laurifolia*, *Aristida stricta*, *Fuirena scirpoidea*, *Cladium jamaicense*, *Anthraenantia rufa*, *Andropogon glomeratus*, and *Bidens mitis*. The site has less bare ground coverage because the soils are saturated and the tree and shrub layer is stunted, allowing herbaceous species to dominate the groundcover.

The trees in the marsh are stunted. Wildlife observations included pine warblers (*Dendroica pinus*), a gray catbird (*Dumetella carolinensis*), a mosquito fish (*Gambusia affinis*), and red-bellied woodpeckers (*Melanerpes carolinus*). No exotic species were observed. Natural regeneration of appropriate species is occurring. Thirty-three species were observed and the majority of these species are herbaceous species. Overall, the landscape is fire suppressed. The duff and recent litter accumulation is absent. The soil surface moisture class is saturated.

Table 20: Plant List for Transect DWPT2-611 Bay Swamp

Scientific Name	Common Name
<i>Acer rubrum</i>	red maple
<i>Andropogon glomeratus</i>	broomgrass
<i>Anthaenantia rufa</i>	purple silky-scale grass
<i>Aristida palustris</i>	swamp three-awn grass
<i>Aristida stricta</i>	wiregrass
<i>Bidens mitis</i>	smallfruit beggarticks
<i>Carex verrucosum</i>	caric sedge
<i>Cladium jamaicense</i>	sawgrass
<i>Cliftonia monophylla</i>	black titi
<i>Cyrilla racemiflora</i>	red titi
<i>Eriocaulon compressum</i>	pipewort
<i>Fuirena scirpoidea</i>	southern umbrella sedge
<i>Gaylussacia mosieri</i>	woolly huckleberry
<i>Ilex cassine</i>	dahoon
<i>Ilex coriacea</i>	large gallberry
<i>Ilex glabra</i>	gallberry
<i>Lachnanthes caroliniana</i>	redroot
<i>Lyonia lucida</i>	fetterbush
<i>Magnolia virginiana</i>	sweet bay
<i>Myrica cerifera</i>	wax myrtle
<i>Myrica heterophylla</i>	evergreen bayberry
<i>Nyssa sylvatica</i> var. <i>biflora</i>	tupelo
<i>Osmunda cinnamomea</i>	cinnamon fern
<i>Panicum virgatum</i>	switchgrass
<i>Persea palustris</i>	swamp bay
<i>Photinia pyrifolia</i>	red chokeberry
<i>Pinus elliottii</i>	slash pine
<i>Rubus argutus</i>	blackberry
<i>Smilax laurifolia</i>	laurel greenbrier
<i>Smilax walteri</i>	Walter's greenbrier
<i>Sphagnum</i> sp.	peat moss
<i>Taxodium ascendens</i>	pond cypress
<i>Toxicodendron radicans</i>	poison ivy

Qualitative Transect DWPT3-641 Freshwater Marsh

The plant community is a Tidal Marsh (low salinity variant) using the FNAI classification. The location where this transect was conducted is not managed for pine production. The estimated canopy coverage class is 0-1 percent and the majority of the canopy trees are 6-10m high. The dominant canopy species are *Pinus elliottii*, *Taxodium ascendens*, and *Cliftonia monophylla*. There is no subcanopy. The shrub coverage is 1-5 percent and the majority of the shrubs are in the 0.6-1.5m height class. The dominant shrub species are *Myrica cerifera*, *Ilex cassine* var. *myrtifolia*, and *Ilex glabra*. The graminoid

groundcover coverage class is 76-100 percent and the total groundcover cover class is 76-100 percent. The dominant groundcover species are *Cladium jamaicense* and *Juncus roemerianus*. The site has less bare ground coverage because the soils are saturated and the tree layer is limited, allowing herbaceous species to dominate the groundcover.

The trees in the marsh are in poor conditions because of inundated soils. Wildlife observations included eastern bluebirds (*Sialia sialis*), eastern meadowlarks (*Sturnella magna*) and red-bellied woodpeckers (*Melanerpes carolinus*). No exotic species were observed. Natural regeneration of appropriate species is occurring. Fourteen species were observed and the majority of the species are herbaceous species. Overall, the landscape is fire suppressed. The duff and recent litter accumulation is absent. The soil surface moisture class is inundated.

Table 21: Plant List for Transect DWPT3-641 Freshwater Marsh

Scientific Name	Common Name
<i>Acer rubrum</i>	red maple
<i>Cladium jamaicense</i>	sawgrass
<i>Cliftonia monophylla</i>	black titi
<i>Ilex myrtifolia</i>	myrtle-leaf holly
<i>Ilex glabra</i>	gallberry
<i>Juncus roemerianus</i>	black needle rush
<i>Magnolia virginiana</i>	sweet bay
<i>Myrica cerifera</i>	wax myrtle
<i>Panicum virgatum</i>	switchgrass
<i>Persea palustris</i>	swamp bay
<i>Pinus elliottii</i>	slash pine
<i>Rubus argutus</i>	blackberry
<i>Taxodium ascendens</i>	pond cypress
<i>Toxicodendron radicans</i>	poison ivy

Qualitative Transect DWPT4-625 Hydric Pine Flatwoods

The plant community is a wet prairie using the FNAI classification. The location where this transect was conducted is not managed for pine production. The estimated canopy coverage class is 6-25 percent and the majority of the canopy trees are 6-10m high. The dominant canopy species are *Pinus elliottii*, *Taxodium ascendens*, *Nyssa sylvatica* var. *biflora*, and *Magnolia virginiana*. The estimated height class for the majority of the subcanopy is 3-5m. The dominant subcanopy species are *Ilex cassine* var. *myrtifolia*, *Cliftonia monophylla*, *Nyssa sylvatica* var. *biflora*, and *Magnolia virginiana*. The shrub coverage is 6-25 percent and the majority of the shrubs are in the 0.6-1.5m height class. The dominant shrub species are *Ilex cassine* var. *myrtifolia*, *Cliftonia monophylla*, and *Ilex coriacea*. The graminoid groundcover coverage class is 1-5 percent and the total groundcover cover class is 1-5 percent. The dominant groundcover species are *Smilax laurifolia*, *Rhynchospora chapmanii*, *Rhynchospora fascicularis*, *Rhynchospora plumosa*, *Eriocaulon decangulare*, *Drosera*

capillaris, *Dichanthelium sp.*, *Lachnanthes Carolina*, and *Woodwardia virginica*. Although there were many more groundcover species observed, these species were depauperate. The site has significant bare ground coverage due to the shading and competition from multiple layers of woody species above the groundcover.

The trees in the wet prairie appear to be healthy. Wildlife observations included crawfish, an oak toad (*Anaxyrus quercicus*), southern cricket frogs (*Acris gryllus*), an American crow (*Corvus brachyrhynchos*), a red-bellied woodpecker (*Melanerpes carolinus*), a blue jay (*Cyanocitta cristata*), a green heron (*Butorides virescens*), an eastern ribbon snake (*Thamnophis sauritus sauritus*), and a crawfish snake (*Regina rigida*). Seedlings of Chinese tallow tree (*Sapium sebiferum*), which is an invasive species, were observed. Natural regeneration of appropriate species is not occurring. Eighty-eight species were observed but most of the native plants are depauperate and in poor condition. Overall, the landscape is fire suppressed. The depth of duff is approximately 1 cm and the depth of litter is approximately 1 cm. The soil surface moisture class is saturated.

Table 22: Plant List for Transect DWPT4-625 Hydric Pine Flatwoods

Scientific Name	Common Name
<i>Acer rubrum</i>	red maple
<i>Andropogon glomeratus</i>	broomgrass
<i>Andropogon virginicus</i> var. <i>virginicus</i>	Virginia broomgrass
<i>Anthaenantia rufa</i>	purple silky-scale grass
<i>Aristida palustris</i>	swamp three-awn grass
<i>Aristida stricta</i>	wiregrass
<i>Baccharis halimifolia</i>	sea myrtle
<i>Biglowia nudata</i>	rayless goldenrod
<i>Carex glaucescens</i>	caric sedge
<i>Centella asiatica</i>	spadeleaf
<i>Clethra alnifolia</i>	sweet pepper bush
<i>Cliftonia monophylla</i>	black titi
<i>Coelorachis rugosa</i>	wrinkled jointtailgrass
<i>Coreopsis linifolia</i>	Texas tickseed
<i>Cyperus odoratus</i>	fragrant flatsedge
<i>Cyrilla racemiflora</i>	red titi
<i>Dichanthelium aciculare</i>	needleleaf witchgrass
<i>Dichanthelium ensifolium</i>	panic grass
<i>Dichanthelium scabriusculum</i>	woolly witchgrass
<i>Drosera capillaris</i>	pink sundew
<i>Drosera intermedia</i>	water sundew
<i>Eleocharis baldwinii</i>	Baldwin's spikerush
<i>Erigeron vernus</i>	early whitetop fleabane
<i>Euthamia graminifolia</i>	grass-leaved goldenrod
<i>Gaylussacia mosieri</i>	woolly huckleberry
<i>Eriocaulon compressum</i>	pipewort

Table 22: Plant List for Transect DWPT4-625 Hydric Pine Flatwoods (Continued)

Scientific Name	Common Name
<i>Eriocaulon decangulare</i>	pipewort
<i>Fuirena breviseta</i>	umbrellasedge
<i>Hypericum brachyphyllum</i>	coastal plain St. John's-wort
<i>Ilex cassine</i>	dahoon
<i>Ilex coriacea</i>	large gallberry
<i>Ilex glabra</i>	gallberry
<i>Ilex myrtifolia</i>	myrtle leaf holly
<i>Ilex vomitoria</i>	yaupon
<i>Lachnanthes caroliniana</i>	redroot
<i>Lachnocaulon anceps</i>	whitehead bogbutton
<i>Liatris spicata</i>	shooting star
<i>Lobelia glandulosa</i>	glade lobelia
<i>Lophiola americana</i>	golden-crest
<i>Ludwigia pilosa</i>	hairy primrosewillow
<i>Lycopus rubellus</i>	waterhoarhound
<i>Lyonia lucida</i>	fetterbush
<i>Magnolia virginiana</i>	sweet bay
<i>Mikania scandens</i>	milk vine
<i>Myrica cerifera</i>	wax myrtle
<i>Myrica heterophylla</i>	evergreen bayberry
<i>Nyssa sylvatica</i> var. <i>biflora</i>	tupelo
<i>Oldenlandia uniflora</i>	clustered mille grains
<i>Osmunda cinnamomea</i>	cinnamon fern
<i>Osmunda regalis</i>	royal fern
<i>Panicum verrucosum</i>	warty panicgrass
<i>Persea palustris</i>	swamp bay
<i>Photinia pyrifolia</i>	red chokeberry
<i>Pinus elliottii</i>	slash pine
<i>Polygala cruciata</i>	drumheads
<i>Polygala lutea</i>	orange milkwort
<i>Proserpinaca pectinata</i>	combleaf mermaidweed
<i>Rhexia lutea</i>	yellow flower meadow beauty
<i>Rhexia petiolata</i>	meadow beauty
<i>Rhexia virginica</i>	meadow beauty
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge
<i>Rhynchospora plumosa</i>	beaksedge
<i>Rhynchospora inundata</i>	horned beaksedge
<i>Sapium sebiferum</i>	popcorn tree
<i>Sarracenia leucophylla</i>	white top pitcher plant
<i>Sarracenia psittacina</i>	parrot pitcher plant
<i>Sarracenia purpurea</i>	purple pitcher plant
<i>Scleria georgiana</i>	Georgia nutrush
<i>Scleria oligantha</i>	littlehead nutrush
<i>Scleria triglomerata</i>	nutrush
<i>Smilax laurifolia</i>	laurel greenbrier

Table 22: Plant List for Transect DWPT4-625 Hydric Pine Flatwoods (Continued)

Scientific Name	Common Name
<i>Smilax walteri</i>	Walter's greenbrier
<i>Solidago rugosa</i>	goldenrod
<i>Sphagnum</i> spp.	peat moss
<i>Sporobolus curtisii</i>	Curtiss' dropseed grass
<i>Styrax americana</i>	snowbell
<i>Toxicodendron radicans</i>	poison ivy
<i>Utricularia cornuta</i>	bladderwort
<i>Utricularia purpurea</i>	purple flower bladderwort
<i>Vaccinium corymbosum</i>	highbush blueberry
<i>Viburnum nudum</i>	possumhaw
<i>Viola primulifolia</i>	primrose-leaf violet
<i>Vitis rotundifolia</i>	muscadine grape
<i>Woodwardia areolata</i>	netted chain fern
<i>Woodwardia virginica</i>	Virginia chain fern
<i>Xyris flabelliformis</i>	yellow-eyed grass
<i>Xyris serotina</i>	swamp yellow-eyed grass
<i>Xyris stricta</i>	pineland yellow-eyed grass

Qualitative Transect DWPT5-626 Hydric Pine Savanna

The plant community is a wet prairie/shrub bog using the FNAI classification. The location where this transect was conducted is not managed for pine production. The estimated canopy coverage class is 6-25 percent and the majority of the canopy trees are 6-10m high. The dominant canopy species are *Pinus elliotii*, *Taxodium ascendens*, *Nyssa sylvatica* var. *biflora*, and *Magnolia virginiana*. The estimated height class for the majority of the subcanopy is 3-5m. The dominant subcanopy species are *Cliftonia monophylla* and *Nyssa sylvatica* var. *biflora*. The shrub coverage is 6-25 percent and the majority of the shrubs are in the 1.6-3m height class. The dominant shrub species are *Gaylussacia mosieri*, *Cliftonia monophylla*, and *Ilex glabra*. The graminoid groundcover coverage class is 1-5 percent and the total groundcover cover class is 1-5 percent. The dominant groundcover species are *Eriocaulon decangulare*, *Rhynchospora inundata*, *Rhynchospora fascicularis*, and *Sarracenia leucophylla*. The site has significant bare ground coverage due to shading and competition from multiple layers of woody species above the groundcover.

The trees in the wet prairie/shrub bog are in good condition. Wildlife observations included a gray catbird (*Dumetella carolinensis*), a northern cardinal (*Cardinalis cardinalis*), white-tailed deer (*Odocoileus virginianus*) and a northern raccoon (*Procyon lotor*). No exotic species were observed. Natural regeneration of appropriate species is occurring. Thirty-one species were observed and the majority of these species are herbaceous species. Overall, the landscape is fire suppressed. The depth of duff is approximately 2 cm and the depth of litter is approximately 2 cm. The soil surface moisture class is wet.

Table 23: Plant List for Transect DWPT5-626 Hydric Pine Savanna

Scientific Name	Common Name
<i>Clethra alnifolia</i>	sweet pepper bush
<i>Cliftonia monophylla</i>	black titi
<i>Coelorachis rugosa</i>	wrinkled jointtailgrass
<i>Coreopsis linifolia</i>	Texas tickseed
<i>Cyperus odoratus</i>	fragrant flatsedge
<i>Cyrilla racemiflora</i>	red titi
<i>Dichantheium aciculare</i>	needleleaf witchgrass
<i>Gaylussacia mosieri</i>	woolly huckleberry
<i>Eriocaulon compressum</i>	pipewort
<i>Eriocaulon decangulare</i>	pipewort
<i>Fuirena breviseta</i>	umbrellasedge
<i>Ilex coriacea</i>	large gallberry
<i>Ilex glabra</i>	gallberry
<i>Ilex myrtifolia</i>	myrtle leaf holly
<i>Lachnanthes caroliana</i>	redroot
<i>Lyonia lucida</i>	fetterbush
<i>Magnolia virginiana</i>	sweet bay
<i>Myrica heterophylla</i>	evergreen bayberry
<i>Nyssa sylvatica</i> var. <i>biflora</i>	tupelo
<i>Panicum verrucosum</i>	warty panicgrass
<i>Persea palustris</i>	swamp bay
<i>Pinus elliottii</i>	slash pine
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge
<i>Rhynchospora fascicularis</i>	fascicled beaksedge
<i>Rhynchospora microcarpa</i>	southern beaksedge
<i>Rhynchospora plumosa</i>	beaksedge
<i>Rhynchospora inundata</i>	horned beaksedge
<i>Sarracenia leucophylla</i>	white top pitcher plant
<i>Scleria triglomerata</i>	nutrush
<i>Smilax laurifolia</i>	laurel greenbrier
<i>Taxodium ascendens</i>	pond cypress

Qualitative Transect DWPT6-642 Saltwater Marsh

The plant community is a palustrine marsh (very low salinity variant) using the FNAI classification. The location where this transect was conducted is not managed for pine production. The estimated canopy coverage class is 6-25 percent and the majority of the canopy trees are 6-10m high. The dominant canopy species are *Pinus elliottii*, *Taxodium ascendens*, *Acer rubrum*, *Nyssa sylvatica* var. *biflora*, and *Juniperus virginiana*. The estimated subcanopy height is 3-5m. The subcanopy species are *Myrica cerifera* and *Nyssa sylvatica* var. *biflora*. The shrub coverage is 1-5 percent and the majority of the shrubs are in the 0.6-1.5m height class. The dominant shrub species are *Ilex vomitoria* and *Ilex cassine*. The graminoid groundcover coverage class is 76-100 percent and the total

groundcover cover class is 76-100 percent. The dominant groundcover species are *Cladium jamaicense*, *Osmunda cinnamomea*, *Toxicodendron radicans*, and *Juncus roemerianus*. The site has less bare ground coverage because the soils are inundated and the tree layer is limited, allowing herbaceous species to dominate the groundcover.

The trees in the marsh appear to be stressed because of the inundated soils. Wildlife observations included northern cardinals (*Cardinalis cardinalis*), pine warblers (*Dendroica pinus*), gulf fritillary (*Agraulis vanillae*) and clouded sulfur (*Colias philodice*). No exotic species were observed. Natural regeneration of appropriate species is occurring. Forty species were observed and the majority of these species are herbaceous species. Overall, the landscape is fire suppressed. The depth of duff is approximately 0 cm and the depth of litter is approximately 0 cm. The soil surface moisture class is inundated.

Table 24: Plant List for Transect DWPT6-642 Saltwater Marsh

Scientific Name	Common Name
<i>Acer rubrum</i>	red maple
<i>Clethra alnifolia</i>	sweet pepper bush
<i>Cliftonia monophylla</i>	black titi
<i>Cyrilla racemiflora</i>	red titi
<i>Dichantherium aciculare</i>	needleleaf witchgrass
<i>Gaylussacia mosieri</i>	woolly huckleberry
<i>Eriocaulon compressum</i>	pipewort
<i>Eriocaulon decangulare</i>	pipewort
<i>Fuirena breviseta</i>	umbrellasedge
<i>Ilex cassine</i>	dahoon
<i>Ilex glabra</i>	gallberry
<i>Ilex myrtifolia</i>	myrtle leaf holly
<i>Ilex vomitoria</i>	yaupon
<i>Ipomoea sagittata</i>	salt marsh morning glory
<i>Juncus roemerianus</i>	black needle rush
<i>Juniperus virginiana</i>	coastal red cedar
<i>Lachnanthes caroliniana</i>	redroot
<i>Lyonia lucida</i>	fetterbush
<i>Magnolia virginiana</i>	sweet bay
<i>Myrica heterophylla</i>	evergreen bayberry
<i>Nyssa sylvatica</i> var. <i>biflora</i>	tupelo
<i>Osmunda cinnamomea</i>	cinnamon fern
<i>Osmunda regalis</i>	royal fern
<i>Panicum verrucosum</i>	warty panicgrass
<i>Persea palustris</i>	swamp bay
<i>Pinus elliotii</i>	slash pine
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge
<i>Rhynchospora fascicularis</i>	fascicled beaksedge

Table 24: Plant List for Transect DWPT6-642 Saltwater Marsh (Continued)

Scientific Name	Common Name
<i>Rhynchospora microcarpa</i>	southern beaksedge
<i>Rhynchospora plumosa</i>	beaksedge
<i>Rhynchospora inundata</i>	horned beaksedge
<i>Rubus argutus</i>	blackberry
<i>Sabal minor</i>	bluestem palmetto
<i>Sarracenia leucophylla</i>	white top pitcher plant
<i>Scirpus cyperinus</i>	wool-grass bulrush
<i>Scleria triglomerata</i>	nutrush
<i>Smilax laurifolia</i>	laurel greenbrier
<i>Taxodium ascendens</i>	pond cypress
<i>Toxicodendron radicans</i>	poison ivy
<i>Woodwardia areolata</i>	netted chain fern

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

Although the Dutex Restoration Site is not planted in pine for silvicultural benefit, large slash pine are present possibly in merchantable quantities and densities throughout the wet prairie, wet flatwoods and mesic flatwoods in some parts of the site. The slash pine are fire suppressed and swamp tupelo, sweet bay and titi are the dominant subcanopy and canopy tree, as observed in the qualitative transects DEPT1-626 hydric pine savanna (wet prairie/hydric pine flatwoods), DWPT4-625 hydric pine flatwoods (wet prairie/hydric pine flatwoods), DWPT5-626 hydric pine savanna (wet prairie/hydric pine flatwoods), DEPT2-614 titi swamp (bog), DEPT4-625 hydric pine flatwoods (bog), and DEPT5-630 wetland forested mixed (baygall). Many of the mature slash pine are over 50 feet tall. Several quantitative transects contained a canopy density of over 100 slash pine per acre, such as observed in DEPT1-626 hydric pine savanna (wet prairie/hydric pine flatwoods), DEPT2-625 hydric pine flatwoods (wet prairie/hydric pine flatwoods), DWPT3-626 hydric pine savanna (wet prairie/hydric pine flatwoods), and DWPT4-625 hydric pine flatwoods (wet prairie/hydric pine flatwoods). Reduction of slash pine density and reduction of other woody growth to coppice during management of the site will create an open landscape of scattered trees and appropriate conditions for continued use of prescribed fire for future management. Activities that increase the density of herbaceous groundcover species, especially graminoids including wiregrass, such as planting will help create appropriate continuous fuel loads that should enhance the success of prescribed burning efforts. In some areas of flatwoods, the slash pine canopy will not be immediately reduced because herbicide treated shrubs exhibit higher mortality rates as compared to areas where the canopy has been

removed. Site managers also hope that needle cast from the dense canopy will provide a good fuel source for control burns. (Clayton, 2012)

Fire suppressed vegetation, thick layers of duff, and low plant species diversity was observed in the dense, shaded areas dominated by large titi as measured in the following qualitative transects: DEPT1-626 hydric pine savanna (wet prairie/hydric pine flatwoods), DWPT4-625 hydric pine flatwoods (wet prairie/hydric pine flatwoods), DWPT5-626 hydric pine savanna (wet prairie/hydric pine flatwoods), DEPT2-614 titi swamp (bog), DEPT4-625 hydric pine flatwoods (bog), DEPT5-630 wetland forested mixed (baygall), and DWPT1-411 mesic pine flatwoods (mesic flatwoods). Duff layers of 2-4 cm are indicative of long periods of fire suppression and were observed in the wet prairie, bog, and mesic pine flatwoods qualitative transects. Greater plant diversity was observed in a few scattered refugia exhibiting very high species richness in excess of 40 species as measured in quantitative transects DEQT4-626 hydric pine savanna (wet prairie) and DWQT3-626 hydric pine savanna (wet prairie). This is a significant factor given the long history of fire suppression at the site and the accompanying competition from the dominant woody lifeforms that exhaust the resources required for herbaceous species survival. Plant diversity on the site ranging from good to moderate, i.e. lowest range of approximately 10-25 species was found in quantitative transects DEQT1-626 hydric pine savanna (wet prairie), DEQT2-625 hydric pine flatwoods (wet prairie/hydric pine flatwoods), DEQT3-625 hydric pine flatwoods (wet prairie/hydric pine flatwoods), and DWQT1-625 hydric pine flatwoods (wet prairie/hydric pine flatwoods). Plant diversity on the site in the good range, i.e. greater than 25 species but less than 40 species was found in quantitative transects DWQT2-626 hydric pine savanna (wet prairie/hydric pine flatwoods) and DWQT4-625 hydric pine flatwoods (bog). The existing species diversity is an indicator that restoration activities can be successful. A portion of the Dutex Restoration Site located in quantitative transect DWQT1-625 hydric pine flatwoods (wet prairie/shrub bog) has been mechanically treated and selectively treated with herbicide. This has resulted in the reduction of fire suppressed woody strata to the coppice lifeform below the primarily slash pine canopy. The transect should be evaluated after it is burned to measure the change in the coverage, lifeform, and reproductive success of groundcover species following treatment.

Threats to the inherent biodiversity of this site are not restricted to fire suppression. The expansion of exotic invasive species incursions on the site will likely be a significant challenge to restoration. Chinese tallow (*Sapium sebiferum*) is an invasive species that should be monitored carefully. Very small seedlings of Chinese tallow were observed in the following qualitative transect, DWPT4-625 hydric pine flatwoods (wet prairie/shrub bog), and quantitative transect, DWQT3-626 hydric pine savanna (wet prairie). In addition, seedlings of Chinese tallow were found in each of the FLUCCS communities on the site. Other invasive plant species observed on adjacent properties that present threats to management: Air potato (*Dioscorea bulbifera*), Chinese privet (*Ligustrum sinense*), torpedo grass (*Panicum repens*), Japanese privet (*Ligustrum japonicum*), rattlebox (*Sesbania punicea*), wild taro (*Colocasia esculenta*), and Japanese climbing fern (*Lygodium japonicum*). One of the largest concentrations of exotic invasive species on the eastern tract is located between the adjacent houses and the boundary of

the site. Approximately 5.45 acres along that interface have been treated for 2 years for popcorn tree, privet, scattered wild taro and climbing fern. (Clayton, 2012)

Another large concentration of exotic invasive plant species in the area is the floodplain of Elevenmile creek where infestations of the observed species are common upstream to at least the paper mill complex, south of Muscogee Road. Flooding events following heavy rainfall in the Elevenmile Creek watershed will disperse seeds and propagules of exotic invasive species. Although the creek channel is located on the western boundary of the site and discharges into Perdido Bay, severe events may result in the flooding of the tidal marsh and interior areas of the western tract, delineated as map unit 49 on the soil survey map (Figure 3).

5.0. CONCLUSIONS AND RECOMMENDATIONS

Existing conditions at the Dutex Restoration Site are typical of fire suppressed wetlands in coastal Northwest Florida. The quantitative and qualitative monitoring data summaries support the observations of a landscape dominated by dense, fire suppressed shrub growth beneath a subcanopy and/or canopy of dense fire suppressed titi (*Cliftonia* and *Cyrilla*) and slash pines. In these areas where woody plants dominate multiple vegetative strata, herbaceous growth in the understory is extremely limited compared to the percentage of bare ground. The dominance of bare ground is evident in the quantitative measurements and is depicted graphically in the data and results section of this report. Shade and physical competition in the fire suppressed landscape inhibit herbaceous recruitment, growth and flowering, and survivorship. The lack of air circulation and the physical barrier created by the woody strata limits recruitment of herbaceous plants by seed drift from adjacent populations of reproducing plants.

Ecological monitoring provides data for developing management strategies and a point from which the success of implementation of the strategies can be measured. The monitoring results create a quantitative and qualitative portrait for the assessment of measured and observed differences at later monitoring dates. The comparative assessment not only provides a tool for measuring success but is also a regulatory gauge to determine if permitted success criteria are being achieved. In each successive monitoring event, additional data clarifies trends of success and future challenges, allowing restoration managers to adapt management strategies as necessary to improve site conditions.

Fire-suppression has a pronounced effect on the groundcover where much of the species diversity within landscapes is contained. Fire suppression often results in increased woody strata coverage (shrub, subcanopy and canopy), exacerbates a thickening duff layer, decreases light penetration to the ground floor, and inhibits the growth and establishment of desirable, native graminoids and forbs. The historic aerial photograph series from the 1941 to the present (Figures 12 - 17) are useful forensic tools for evaluating the landscape composition prior to and during early anthropogenic impacts on the ecosystem. The historically open landscape recorded in the early aerial photographs contrasts greatly with current observations of a dense slash pine (*Pinus elliottii*) and titi (*Cyrilla* and *Cliftonia*) dominated landscape that has obscured the wet prairies and bogs.

Fourteen ecological community types are identified in the Conceptual Mitigation Plan as likely components of the Dutex property. The majority of the habitats targeted for restoration are wetlands that can be classified in the FNAI system as wet prairie/wet flatwoods and shrub bog. Performance standards for the Dutex site restoration are linked to the nearly equivalent FLUCCS habitats of Hydric Pine Savanna (626) and Hydric Pine Flatwoods (625) (Figures 4W and 4E).

The monitoring results corroborate a qualitative assessment of severe landscape impacts caused by fire suppression. The plant communities of greatest extent excluding the tidal and freshwater marshes are Hydric Pine Savanna (626) and Hydric Pine Flatwoods (625). The Hydric Pine Savanna and Hydric Pine Flatwoods habitats were selected for quantitative measure within both parcels. Woody plants comprise the majority of the vegetation with a relative coverage of 50% or more, often in the range of 70-90% in the dominant habitats monitored. The bare ground coverage is also significant with the typical range above 70% total coverage. The high percentage of bare ground coverage is not unexpected since there are high coverage densities in multiple strata (shrub, subcanopy and canopy) and intense competition for resources by fire suppressed woody species. Groundcover species such as forbs and graminoids have a significantly lower relative coverage versus those of woody plants and vines.

Dominance by woody subcanopy and shrub species can be reversed with aggressive management of the site including mechanical reduction of shrubs and subcanopy. Selective herbicide treatment of woody coppice and frequent prescribed fires are recommended practices during the first few years of restoration management.

Species richness is in the low range for the landscapes with multiple layers of woody species; however, there are relictual populations of appropriate native plants, some of which exhibit species richness exceeding 40 species. The presence of the relictual populations is a good indicator of restoration potential for the Dutex Restoration site. Despite the currently degraded condition of the natural landscape, the potential for successful restoration is high.

6.0 REFERENCES

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