

Vegetation Monitoring at Six Northwest Florida Water Management District Mitigation Sites

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This document contains separate qualitative and quantitative vegetation monitoring reports for six mitigation sites (Figure 1) managed by the Northwest Florida Water Management District:

- 1) Perdido River Water Management Area – Phase II in Escambia County
- 2) Lafayette Creek – Phase I in Walton County
- 3) Plum Creek at Holmes Creek in Washington County
- 4) Ward Creek West in Bay County
- 5) Dutex West in Escambia County
- 6) Yellow River Ranch in Santa Rosa County

Taxonomy follows Wunderlin, R. P., B.F. Hansen, A.R. Franck, and F.B. Essig. 2017. Atlas of Florida Plants (<http://florida.plantatlas.usf.edu/>), Institute for Systematic Botany, University of South Florida, Tampa. In the summer of 2017, the Florida Natural Areas Inventory (FNAI) incorporated recent changes in scientific plant names found on this website (Table 1).

Table 1. Changes to scientific names adopted in 2017 from those used in the 2016 and prior reports.

2016 Name	2017 Name	Common Name
<i>Aristida stricta</i> var. <i>beyrichiana</i>	<i>Aristida stricta</i>	wiregrass
<i>Asimina angustifolia</i>	<i>Asimina spatulata</i>	pawpaw
<i>Cyperus retrorsus</i>	<i>Cyperus ovatus</i>	pinebarren flatsedge
<i>Galactia volubilis</i> or <i>regularis</i>	<i>Galactia minor</i>	leafy milkpea
<i>Gaura angustifolia</i>	<i>Oenothera simulans</i>	southern beeblossum
<i>Gratiola pilosa</i>	<i>Sophronanthe pilosa</i>	shaggy hedgehyssop
<i>Leucothoe racemosa</i>	<i>Eubotrys racemosus</i>	swamp doghobble
<i>Licania michauxii</i>	<i>Geobalanus oblongifolius</i>	gopher apple
<i>Muhlenbergia expansa</i>	<i>Muhlenbergia capillaris</i> var. <i>trichopodes</i>	cutover muhly
<i>Myrica caroliniensis</i>	<i>Morella caroliniensis</i>	evergreen bayberry
<i>Myrica cerifera</i>	<i>Morella cerifera</i>	southern bayberry
<i>Myrica inodora</i>	<i>Morella inodora</i>	odorless bayberry
<i>Osmanthus americanus</i>	<i>Cartrema americana</i>	wild olive
<i>Oxypolis filiformis</i>	<i>Tiedemannia filiformis</i> ssp. <i>filiformis</i>	water dropwort
<i>Panicum anceps</i>	<i>Coleataenia anceps</i>	beaked panicum
<i>Panicum hians</i>	<i>Steinchisma hians</i>	gaping panicum
<i>Panicum longifolium</i>	<i>Coleataenia longifolia</i>	ciliate redtop panicum
<i>Panicum verrucosum</i>	<i>Kellochloa verrucosa</i>	warty panicum
<i>Photinia pyrifolia</i>	<i>Aronia arbutifolia</i>	red chokeberry
<i>Pluchea rosea</i>	<i>Pluchea baccharis</i>	rosy camphorweed
<i>Polygonum punctatum</i>	<i>Persicaria punctata</i>	dotted smartweed
<i>Rubus argutus</i>	<i>Rubus pensylvanicus</i>	sawtooth blackberry
<i>Sapium sabiferum</i>	<i>Triadica sebifera</i>	Chinese tallow tree
<i>Schizachyrium scoparium</i>	<i>Schizachyrium stoloniferum</i>	creeping little bluestem

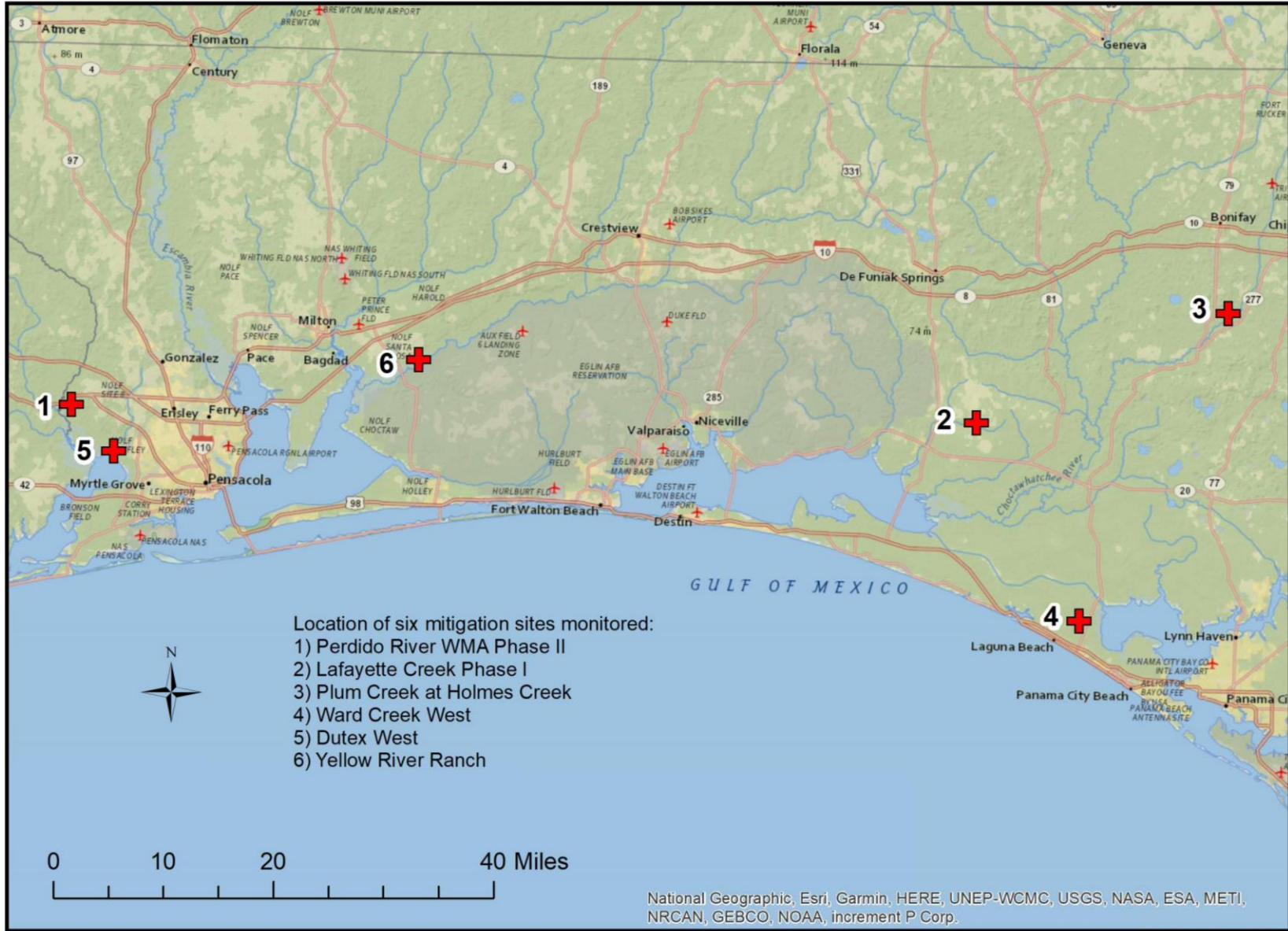


Figure 1. Location map of six NFWMD mitigation sites monitored by FNAI.

PERDIDO RIVER WATER MANAGEMENT AREA – PHASE II MITIGATION SITE

Qualitative and Quantitative Monitoring

October 2021

Perdido River Water Management Area – Phase II Mitigation Site
Qualitative and Quantitative Monitoring
October 2021

INTRODUCTION

The Perdido River Water Management Area Phase II mitigation project compensates for the loss of wetland function of bottomland hardwood forest resulting from the 2007 replacement of the US 90 Perdido River Bridge in Escambia County, Florida. The mitigation area of 67 acres in the Perdido River WMA is located along the south side of US 90 (Nine Mile Road) and 6.4 miles west of Interstate Highway 10 (Figure PR-1). The mitigation project aims to restore areas of Wetland Forest Mixed (MFW), Hydric Savanna (HS), Hydric Pine Flatwoods (HPF) and Pine Flatwoods (PF; Figure PR-1). The HPF and PF were converted to loblolly pine plantation in 2002. Quantitative and qualitative monitoring was used to document the current plant species composition and vegetation structure of these targeted communities. The site vegetation was previously monitored by FNAI biologists every fall from 2012 to 2020.

METHODS

The quantitative monitoring utilized 150-foot long permanent transect lines previously marked at each end with metal t-posts during the 2012 survey. Two transects were set up in each targeted natural community type: Hydric Savanna, Wetland Forest Mixed, and Hydric Pine Flatwoods (Figure PR-1). Along each transect line, eight 1m x 1m quadrats were placed along the left side, beginning at 0 and then spaced every 20 feet. Data recorded in each quadrat consisted of the visually estimated percent cover of each plant species, including individuals rooted in the quadrat as well as overhanging. Canopy over 2 m in height was excluded from cover estimates. Only the lower 2 m portions of larger individuals were counted as cover, including the lower portions of tree trunks rooted in quadrats. Bare ground was estimated in each quadrat as a percentage of ground not obscured by plant cover or large woody debris. This represents a slight change in procedure from FNAI monitoring reports up to 2017 where percent bare ground was calculated by subtracting the total percent for all species from 100.

The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through each of the three target communities plus the pine flatwoods area. Field surveys were performed by FNAI botanists Kim Alexander, Amy Jenkins, Ethan Hughes, and Pete Stango on October 18, 2021.

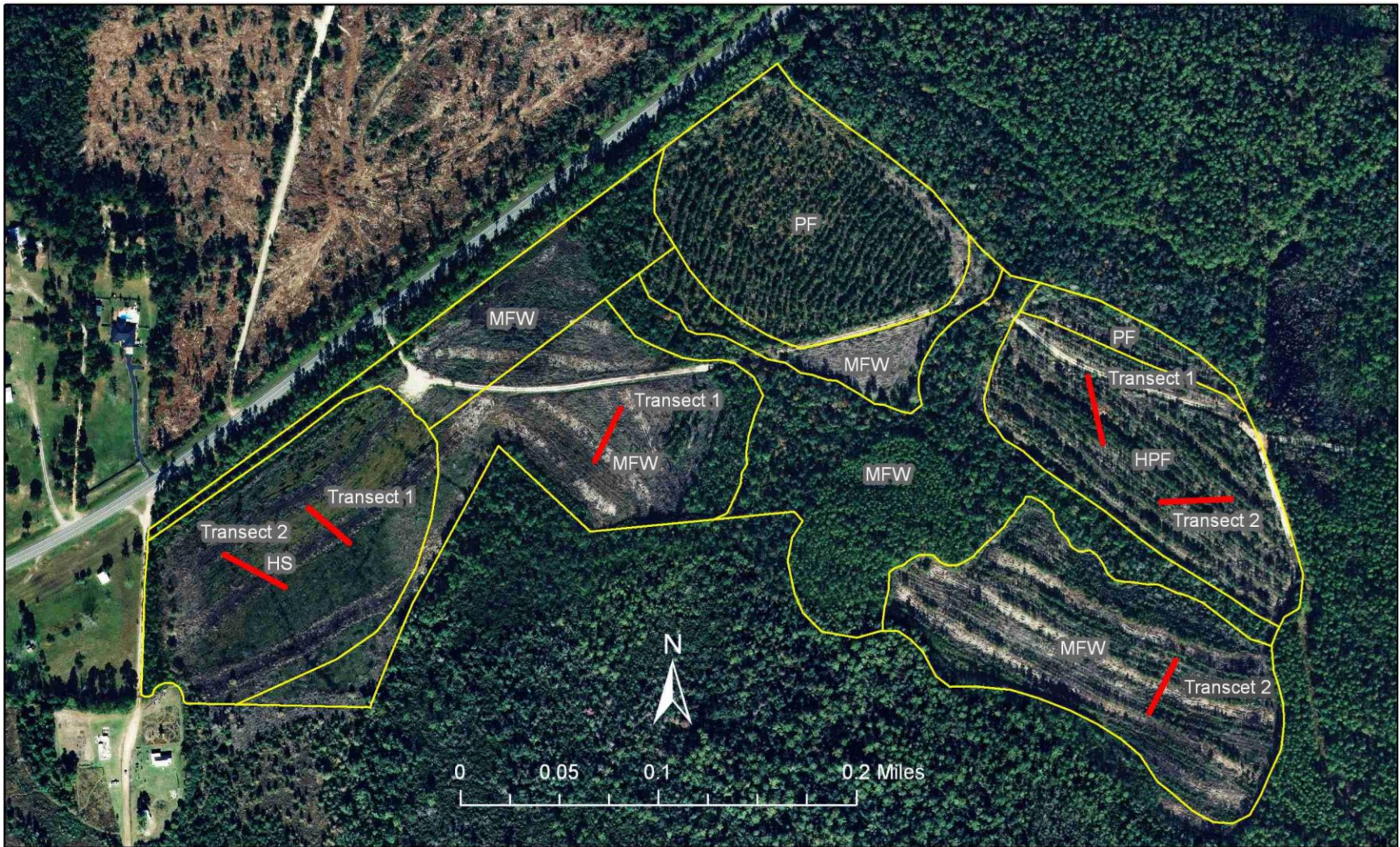


Figure PR-1. Location of permanent transects at Perdido Phase II Mitigation Site. HS=Hydric Savanna, HPF=Hydric Pine Flatwoods, MFW= Forested Wetland Mixed, PF=Pine Flatwoods.

RESULTS AND DISCUSSION

A total of 203 plant taxa were observed during the 2021 monitoring of the target communities at Perdido River Phase II (Table PR-1). Twenty-four new taxa were noted, i.e. species or varieties not observed in any previous survey.

Table PR-1. Species observed in target communities at Perdido River WMA – Phase II Mitigation Site on October 18, 2021. (bold name = new species; bold X = new observation in community type)

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
<i>Acer rubrum</i>	red maple	X	X	X	X	4
<i>Agalinis fasciculata</i>	beach false foxglove		X	X	X	3
<i>Aletris lutea</i>	yellow colic-root				X	1
<i>Ampelopsis arborea</i>	peppervine			X		1
<i>Andropogon arctatus</i>	pinewoods bluestem	X	X			2
<i>Andropogon glomeratus</i>	bushy bluestem	X	X	X	X	4
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	X	X	X	X	4
<i>Andropogon virginicus</i>	broomsedge bluestem	X	X	X	X	4
<i>Aristida purpurascens</i> var. <i>virgata</i>	arrowfeather threeawn	X		X	X	3
<i>Aristida spiciformis</i>	bottlebrush threeawn				X	1
<i>Aristida stricta</i>	wiregrass	X		X		2
<i>Aronia arbutifolia</i>	red chokeberry	X	X	X	X	4
<i>Arundinaria gigantea</i>	switchcane	X		X		2
<i>Baccharis halimifolia</i>	groundsel tree		X			1
<i>Balduina uniflora</i>	oneflower honeycomb-head				X	1
<i>Bidens bipinnata</i>	Spanish needles	X	X	X	X	4
<i>Bidens mitis</i>	smallfruit beggarticks	X	X	X	X	4
<i>Calamovilfa curtissii</i>	Curtiss' sandgrass	X				1
<i>Carex festucacea</i>	fescue sedge			X		1
<i>Carex glaucescens</i>	clustered sedge	X	X	X	X	4
<i>Carex longii</i>	Long's sedge	X	X	X		3
<i>Carex verrucosa</i>	warty sedge			X		1
<i>Carphephorus odoratissimus</i>	vanillaleaf				X	1
<i>Centella asiatica</i>	spadeleaf	X	X	X	X	4
<i>Chamaecrista nictitans</i>	sensitive pea	X				1
<i>Chamaecyparis thyoides</i>	Atlantic white cedar		X		X	2
<i>Clethra alnifolia</i>	sweet pepperbush	X			X	2
<i>Cliftonia monophylla</i>	black titi				X	1
<i>Coleataenia anceps</i>	beaked panicum	X		X	X	3
<i>Coleataenia longifolia</i>	ciliate redtop panicum			X	X	2
<i>Ctenium aromaticum</i>	toothache grass	X				1
<i>Cyperus croceus</i>	Baldwin's flatsedge	X	X			2
<i>Cyperus haspan</i>	haspan flatsedge	X	X	X		3
<i>Cyperus ovatus</i>	pinebarren flatsedge	X		X	X	3

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
Cyrilla racemiflora	titi	X	X		X	3
Dichanthelium acuminatum var. acuminatum	tapered witchgrass	X				1
Dichanthelium dichotomum	cypress witchgrass	X				1
Dichanthelium ensifolium	cypress witchgrass	X			X	2
Dichanthelium ensifolium var. unciphillum	cypress witchgrass			X	X	2
Dichanthelium leucothrix	rough witchgrass	X			X	2
Dichanthelium portoricense	hemlock witchgrass			X	X	2
Dichanthelium scabriusculum	woolly witchgrass	X	X	X	X	4
Dichanthelium strigosum	roughhair witchgrass				X	1
Diospyros virginiana	common persimmon			X		1
Drosera brevifolia	dwarf sundew				X	1
Drosera capillaris	pink sundew				X	1
Dulichium arundinaceum	threeway sedge		X			1
Eleocharis tuberculosa	conecup spikerush			X	X	2
Eleocharis vivipara	viviparous spikerush		X			1
Elephantopus elatus	tall elephantsfoot	X				1
Elephantopus nudatus	smooth elephantsfoot	X		X	X	3
Eragrostis elliotii	Elliott's lovegrass	X			X	2
Eragrostis sp.	lovegrass	X				1
Erechtites hieraciifolius	fireweed	X		X		2
Eriocaulon decangulare	tenangle pipewort	X		X	X	3
Eupatorium capillifolium	dogfennel	X	X	X		3
Eupatorium mohrii	Mohr's thoroughwort	X	X	X	X	4
Eupatorium pilosum	rough boneset	X	X	X	X	4
Eupatorium rotundifolium	roundleaf thoroughwort	X	X	X	X	4
Eupatorium semiserratum	smallflower thoroughwort	X		X		2
Euthamia caroliniana	slender flattop goldenrod	X	X	X	X	4
Fuirena breviseta	saltmarsh umbrellasedge		X		X	2
Fuirena squarrosa	hairy umbrellasedge		X			1
Gaylussacia dumosa	dwarf huckleberry				X	1
Gaylussacia mosieri	woolly huckleberry	X	X		X	3
Gelsemium sempervirens	yellow jessamine	X	X			2
Helianthus angustifolius	narrowleaf sunflower	X			X	2
Hydrocotyle umbellata	manyflower marshpennywort		X	X		2
Hypericum brachyphyllum	coastalplain St. John's wort		X	X	X	3
Hypericum cistifolium	roundpod St. John's wort	X	X	X	X	4
Hypericum crux-andreae	St. Peter's wort	X	X	X	X	4
Hypericum gentianoides	orangegrass	X				1
Hypericum hypericoides	St. Andrew's cross	X		X		2
Hypericum setosum	hairy St. John's wort			X		1
Hyptis alata	clustered bushmint	X		X		2
Ilex cassine	dahoon				X	1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	X	X	X	X	4
<i>Ilex coriacea</i>	large gallberry	X	X	X	X	4
<i>Ilex glabra</i>	gallberry	X	X	X	X	4
<i>Ilex vomitoria</i>	yaupon	X		X		2
<i>Juncus coriaceus</i>	leathery rush		X			1
<i>Juncus dichotomus</i>	forked rush		X		X	2
<i>Juncus diffusissimus</i>	slimpod rush	X	X			2
<i>Juncus effusus</i> ssp. <i>solutus</i>	soft rush		X			1
<i>Juncus marginatus</i>	grassleaf rush	X		X	X	3
<i>Kalmia hirsuta</i>	hairy wicky				X	1
<i>Kelochloa verrucosa</i>	warty panicgrass	X	X	X	X	4
<i>Lachnanthes caroliniana</i>	Carolina redroot	X	X	X	X	4
<i>Lachnocaulon anceps</i>	whitehead bogbutton				X	1
<i>Lobelia brevifolia</i>	shortleaf lobelia	X		X	X	3
<i>Lobelia rogersii</i>	Mcvaugh's lobelia			X		1
<i>Lobelia</i> sp.	lobelia				X	1
<i>Lophiola aurea</i>	golden crest				X	1
<i>Ludwigia linearis</i>	narrowleaf primrosewillow		X	X		2
<i>Ludwigia maritima</i>	seaside primrosewillow	X		X	X	3
<i>Ludwigia pilosa</i>	hairy primrosewillow		X	X	X	3
<i>Ludwigia repens</i>	creeping primrosewillow		X			1
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	X	X	X	X	4
<i>Lycopodiella prostrata</i>	feather-stem club-moss				X	1
<i>Lycopus rubellus</i>	taperleaf waterhorehound		X	X		2
<i>Lyonia lucida</i>	fetterbush		X		X	2
<i>Magnolia virginiana</i>	sweetbay	X	X	X	X	4
<i>Mikania scandens</i>	climbing hempvine		X			1
<i>Morella caroliniensis</i>	evergreen bayberry				X	1
<i>Morella cerifera</i>	southern bayberry	X	X	X	X	4
<i>Muhlenbergia capillaris</i> var. <i>trichopodes</i>	cutover muhly	X				1
<i>Nyssa biflora</i>	swamp tupelo		X			1
<i>Oldenlandia uniflora</i>	clustered mille grains	X	X	X	X	4
<i>Osmunda cinnamomea</i>	cinnamon fern	X	X	X	X	4
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	X	X	X	X	4
<i>Paspalum setaceum</i>	thin paspalum				X	1
<i>Persea palustris</i>	swamp bay	X	X	X	X	4
<i>Persicaria hydropiperoides</i>	mild waterpepper		X			1
<i>Pinus elliotii</i>	slash pine	X	X		X	3
<i>Pinus glabra</i>	spruce pine				X	1
<i>Pinus palustris</i>	longleaf pine				X	1
<i>Pinus taeda</i>	loblolly pine	X	X	X	X	4
<i>Pityopsis graminifolia</i>	narrowleaf silkgrass			X		1
<i>Pluchea baccharis</i>	rosy camphorweed			X		1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
<i>Pluchea foetida</i>	stinking camphorweed	X				1
<i>Polygala brevifolia</i>	littleleaf milkwort				X	1
<i>Polygala cruciata</i>	drumheads				X	1
<i>Polygala lutea</i>	orange milkwort				X	1
<i>Polypremum procumbens</i>	rustweed	X				1
<i>Polytrichum commune</i>					X	1
<i>Proserpinaca pectinata</i>	combleaf mermaidweed		X			1
<i>Pteridium aquilinum</i>	bracken fern		X		X	2
<i>Quercus hemisphaerica</i>	laurel oak			X		1
<i>Quercus michauxii</i>	swamp chestnut oak				X	1
<i>Quercus nigra</i>	water oak	X	X	X		3
<i>Quercus virginiana</i>	live oak	X				1
<i>Rhexia alifanus</i>	savannah meadowbeauty		X		X	2
<i>Rhexia lutea</i>	yellow meadowbeauty				X	1
<i>Rhexia mariana</i>	pale meadowbeauty	X			X	2
<i>Rhexia nashii</i>	maid marian	X		X		2
<i>Rhexia nuttallii</i>	Nuttall's meadowbeauty	X				1
<i>Rhexia petiolata</i>	fringed meadowbeauty	X	X	X	X	4
<i>Rhexia virginica</i>	handsome harry	X	X	X	X	4
<i>Rhus copallinum</i>	winged sumac	X			X	2
<i>Rhynchospora baldwinii</i>	Baldwin's beaksedge				X	1
<i>Rhynchospora cephalantha</i>	bunched beaksedge	X	X	X	X	4
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	X	X		X	3
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge				X	1
<i>Rhynchospora ciliaris</i>	fringed beaksedge				X	1
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	X	X	X	X	4
<i>Rhynchospora gracilentia</i>	slender beaksedge	X	X	X	X	4
<i>Rhynchospora inexpansa</i>	nodding beaksedge	X			X	2
<i>Rhynchospora inundata</i>	narrowfruit horned beaksedge	X	X			2
<i>Rhynchospora plumosa</i>	plumed beaksedge				X	1
<i>Rhynchospora pusilla</i>	fairy beaksedge				X	1
<i>Rubus cuneifolius</i>	sand blackberry	X				1
<i>Rubus pensilvanicus</i>	sawtooth blackberry	X	X	X	X	4
<i>Rubus trivialis</i>	southern dewberry	X		X		2
<i>Sabatia difformis</i>	lanceleaf rosegentian				X	1
<i>Sabatia macrophylla</i>	largeleaf rosegentian				X	1
<i>Saccharum baldwinii</i>	narrow plumegrass	X				1
<i>Saccharum giganteum</i>	sugarcane plumegrass	X	X	X	X	4
<i>Sacciolepis striata</i>	American cupscale	X				1
<i>Sagittaria graminea</i>	grassy arrowhead		X			1
<i>Schizachyrium stoloniferum</i>	creeping little bluestem	X				1
<i>Scirpus cyperinus</i>	woolgrass	X	X			2
<i>Scleria ciliata</i>	fringed nutrush	X		X	X	3

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
<i>Scleria reticularis</i>	netted nutrush	X		X	X	3
<i>Scleria triglomerata</i>	whip nutrush	X		X	X	3
<i>Serenoa repens</i>	saw palmetto				X	1
<i>Smilax auriculata</i>	earleaf greenbrier	X		X	X	3
<i>Smilax glauca</i>	cat greenbrier	X	X	X	X	4
<i>Smilax laurifolia</i>	laurel greenbrier		X	X	X	3
<i>Smilax pumila</i>	sarsaparilla vine				X	1
<i>Smilax walteri</i>	coral greenbrier		X			1
<i>Solidago fistulosa</i>	pinebarren goldenrod	X	X	X	X	4
<i>Sophronanthe pilosa</i>	shaggy hedgehyssop			X	X	2
<i>Sphagnum</i> sp.	sphagnum moss	X	X		X	3
<i>Styrax americanus</i>	American snowbell	X				1
<i>Symphotrichum dumosum</i>	rice button aster	X	X	X	X	4
<i>Syngonanthus flavidulus</i>	yellow hatpins				X	1
<i>Taxodium ascendens</i>	pond cypress		X		X	2
<i>Taxodium distichum</i>	bald cypress				X	1
<i>Thelypteris palustris</i> var. <i>pubescens</i>	marsh fern		X			1
<i>Toxicodendron radicans</i>	eastern poison ivy	X	X	X	X	4
<i>Tridens ambiguus</i>	pinebarren fluffgrass	X				1
unknown moss			X		X	2
<i>Utricularia juncea</i>	southern bladderwort				X	1
<i>Vaccinium arboreum</i>	sparkleberry	X				1
<i>Vaccinium corymbosum</i>	highbush blueberry	X	X	X	X	4
<i>Vaccinium elliottii</i>	Elliott's blueberry	X		X		2
<i>Vaccinium myrsinites</i>	shiny blueberry				X	1
<i>Viola lanceolata</i>	bog white violet	X			X	2
<i>Viola primulifolia</i>	primroseleaf violet	X		X	X	3
<i>Vitis rotundifolia</i>	muscadine	X	X	X	X	4
<i>Woodwardia areolata</i>	netted chain fern	X	X	X	X	4
<i>Woodwardia virginica</i>	Virginia chain fern	X	X	X	X	4
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	X	X	X	X	4
<i>Xyris baldwiniana</i>	Baldwin's yellow-eyed grass				X	1
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass				X	1
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass				X	1
<i>Xyris drummondii</i>	Drummond's yellow-eyed grass	X				1
<i>Xyris elliottii</i>	Elliott's yellow-eyed grass				X	1
<i>Xyris fimbriata</i>	fringed yellow-eyed grass		X		X	2
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	X			X	2
<i>Xyris floridana</i>	Florida yellow-eyed grass			X		1
<i>Xyris platylepis</i>	tall yellow-eyed grass	X	X	X	X	4
<i>Xyris stricta</i>	pineland yellow-eyed grass		X			1
Total number of taxa: 203		115	92	95	134	436

Hydric Savanna

Qualitative sampling. The target community of Hydric Savanna (Figure PR-1) had a total of 92 observed plant species (Table PR-1). The groundcover was dominated by a dense cover of sphagnum moss and a diversity of herbaceous species with mostly weedy species, primarily purple bluestem and pinebarren goldenrod. Pinewoods bluestem, state-listed as threatened, was seen in this community for the first time in 2020 along the qualitative meandering transect, and was observed again this year. A small patch of wiregrass was observed in this community for the first time during the 2019 monitoring, located about 70 m southwest of Hydric Savanna Transect 2. These plants are likely still present, but the meandering transect this year did not go through that area. Shrubs formed less than 5% cover, primarily limited to the slightly elevated windrows formed when the land was cleared for silviculture, and consisted mainly of sweetbay, myrtle-leaved holly, and large gallberry. Occasional slash pine and red maple saplings were widely scattered.

Quantitative sampling. Transect 1 (Table PR-2, Figure PR-2) had a total of 24 species. Their total cover made up more than 100% of the area since a large amount of sphagnum moss underlay the other species. The dominant species were sphagnum moss, smallfruit beggarticks, purple bluestem, and pinebarren goldenrod. Woody species made up around 9% average cover per quadrat. Vegetation along the transect was very similar in composition to the previous year, but with an increase in smallfruit beggarticks and decrease in viviparous spikerush, likely a seasonal effect.

Transect 2 (Table PR-3, Figure PR-3) had a total of 25 species which covered over 100% of the area. The dominant species were sphagnum moss, hairy primrosewillow, purple bluestem, pinebarren goldenrod, and smallfruit beggarticks. Woody species made up about 1% average cover per quadrat. Vegetation along the transect was very similar in composition to the previous year, but with an increase in smallfruit beggarticks and decrease in viviparous spikerush, likely a seasonal effect.

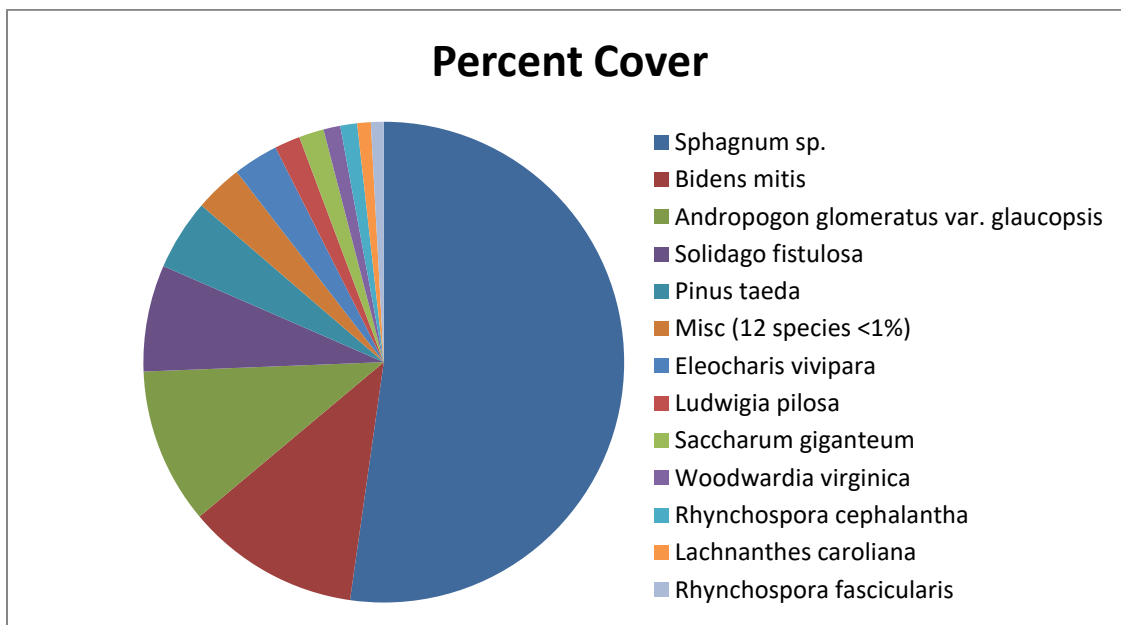


Figure PR-2. Percent of total vegetative cover for plant species in Hydric Savanna Transect 1.

Table PR-2. Percent total vegetative cover of plant species in Hydric Savanna Transect 1 sampled on October 18, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Sphagnum</i> sp.	sphagnum moss	72.00
<i>Bidens mitis</i>	smallfruit beggarticks	16.06
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	14.44
<i>Solidago fistulosa</i>	pinebarren goldenrod	9.88
<i>Pinus taeda</i>	loblolly pine	6.56
<i>Eleocharis vivipara</i>	viviparous spikerush	4.19
<i>Ludwigia pilosa</i>	hairy primrosewillow	2.38
<i>Saccharum giganteum</i>	sugarcane plumegrass	2.31
<i>Woodwardia virginica</i>	Virginia chain fern	1.56
<i>Rhynchospora cephalantha</i>	bunched beaksedge	1.56
<i>Lachnanthes caroliana</i>	Carolina redroot	1.25
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	1.19
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.75
<i>Pinus elliotii</i>	slash pine	0.63
<i>Acer rubrum</i>	red maple	0.63
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	0.56
<i>Hydrocotyle umbellata</i>	manyflower marshpennywort	0.56
<i>Vitis rotundifolia</i>	muscadine	0.44
<i>Toxicodendron radicans</i>	eastern poison ivy	0.44
<i>Rhexia virginica</i>	handsome harry	0.19
<i>Pteridium aquilinum</i>	bracken	0.06
<i>Kelochloa verrucosa</i>	warty panicgrass	0.06
<i>Ilex glabra</i>	gallberry	0.06
<i>Aronia arbutifolia</i>	red chokeberry	0.06
Bare Ground		0.00

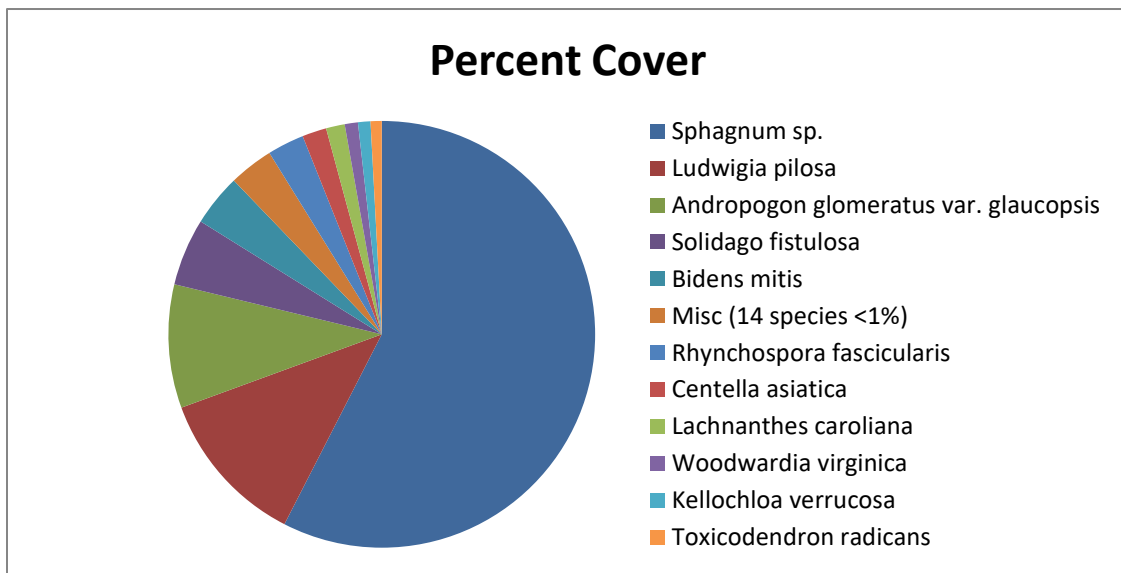


Figure PR-3. Percent of total vegetative cover for plant species in Hydric Savanna Transect 2.

Table PR-3. Percent cover of plant species in Hydric Savanna Transect 2 sampled on October 18, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Sphagnum</i> sp.	sphagnum moss	68.44
<i>Ludwigia pilosa</i>	hairy primrosewillow	14.13
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	11.13
<i>Solidago fistulosa</i>	pinebarren goldenrod	6.06
<i>Bidens mitis</i>	smallfruit beggarticks	4.69
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	3.31
<i>Centella asiatica</i>	spadeleaf	2.19
<i>Lachnanthes caroliniana</i>	Carolina redroot	1.69
<i>Woodwardia virginica</i>	Virginia chain fern	1.19
<i>Kelochloa verrucosa</i>	warty panicgrass	1.13
<i>Toxicodendron radicans</i>	eastern poison ivy	1.00
<i>Eleocharis vivipara</i>	viviparous spikerush	0.69
<i>Woodwardia areolata</i>	netted chain fern	0.63
<i>Hydrocotyle umbellata</i>	manyflower marshpennywort	0.56
<i>Rhexia virginica</i>	handsome harry	0.56
<i>Proserpinaca pectinata</i>	combleaf mermaidweed	0.50
<i>Rhynchospora cephalantha</i>	bunched beaksedge	0.25
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.19
<i>Oldenlandia uniflora</i>	clustered mille grains	0.19
<i>Aronia arbutifolia</i>	red chokeberry	0.13
<i>Acer rubrum</i>	red maple	0.06
<i>Carex longii</i>	Long's sedge	0.06
<i>Hypericum crux-andreae</i>	St. Peter's wort	0.06
<i>Juncus dichotomus</i>	forked rush	0.06
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.06
Bare Ground		0.00

Wetland Forest Mixed

Qualitative sampling. The target community of Wetland Forest Mixed (Figure PR-1) had a total of 134 observed plant species (Table PR-1). The vegetative cover was dominated by tall clumps of purple bluestem. Sphagnum moss, pinebarren goldenrod, and fascicled beakrush were common. In the vicinity of the eastern transect woody species, such as black titi, large gallberry, dahoon, sweetbay, fetterbush, and St. John's wort, have been reduced in recent years. Patches of muscadine were observed scattered in this community. In the vicinity of the western transect, shrubs were taller and denser and beginning to form an open, low canopy. Young slash and loblolly pines were widely scattered throughout.

Quantitative sampling. Transect 1 had a total of 44 species and 28% bare ground (Table PR-4, Figure PR-4). The dominant species was purple bluestem, with Atlantic white cedar, black titi, and sphagnum moss also contributing significant cover. The pines and other woody species are starting to form a shrubbier, more closed habitat in this area. Woody species made up around 30% average cover per quadrat, a small increase from 2020.

Transect 2 (Table PR-5, Figure PR-5) had a total of 55 species with 19% bare ground. The overall aspect was more open than Transect 1 and had less woody cover. Sphagnum moss, Virginia chain fern, warty panic grass, bunched beaksedge, and black titi were also dominants. Woody species made up around 9% average cover per quadrat, a reduction from last year.

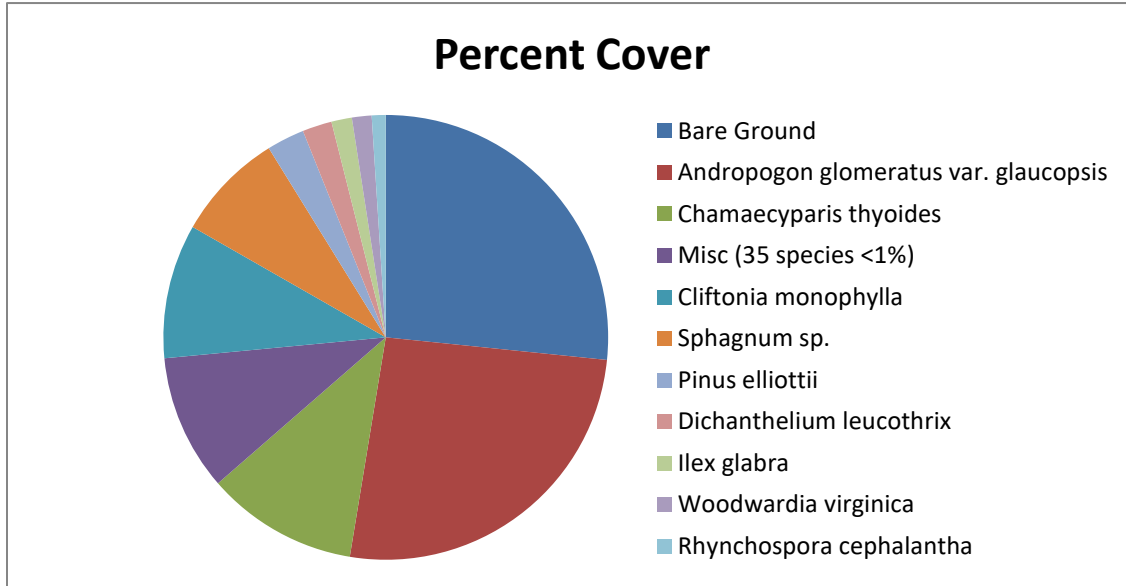


Figure PR-4. Percent of total vegetative cover for species in Mixed Forested Wetland Transect 1.

Table PR-4. Percent cover of plant species in Mixed Forested Wetland Transect 1 sampled on October 18, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	27.25
<i>Chamaecyparis thyoides</i>	Atlantic white cedar	11.56
<i>Cliftonia monophylla</i>	black titi	10.25
<i>Sphagnum sp.</i>	sphagnum moss	8.31
<i>Pinus elliotii</i>	slash pine	2.88
<i>Dichanthelium leucothrix</i>	rough witchgrass	2.25
<i>Ilex glabra</i>	gallberry	1.56
<i>Woodwardia virginica</i>	Virginia chain fern	1.50
<i>Rhynchospora cephalantha</i>	bunched beaksedge	1.06
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.94
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.94
<i>Lyonia lucida</i>	fetterbush	0.94
<i>Smilax glauca</i>	cat greenbrier	0.81
<i>Kelochloa verrucosa</i>	warty panicgrass	0.75
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.75
<i>Xyris baldwiniana</i>	Baldwin's yellow-eyed grass	0.63
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.56
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.44
<i>Rhynchospora ciliaris</i>	fringed beaksedge	0.44
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.44

Scientific name	Common name	Average percent cover per quadrat
<i>Drosera capillaris</i>	pink sundew	0.31
<i>Woodwardia areolata</i>	netted chain fern	0.31
<i>Eupatorium pilosum</i>	rough boneset	0.25
<i>Lachnanthes caroliana</i>	Carolina redroot	0.25
<i>Oldenlandia uniflora</i>	clustered mille grains	0.19
<i>Taxodium ascendens</i>	pond cypress	0.19
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.13
<i>Scleria ciliata</i>	fringed nutrush	0.13
<i>Acer rubrum</i>	red maple	0.06
<i>Drosera brevifolia</i>	dwarf sundew	0.06
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	0.06
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.06
<i>Juncus marginatus</i>	grassleaf rush	0.06
<i>Magnolia virginiana</i>	sweetbay	0.06
<i>Morella cerifera</i>	southern bayberry	0.06
<i>Osmunda cinnamomea</i>	cinnamon fern	0.06
<i>Polygala cruciata</i>	drumheads	0.06
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.06
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.06
<i>Rhynchospora pusilla</i>	fairy beaksedge	0.06
<i>Vitis rotundifolia</i>	muscadine	0.06
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass	0.06
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.06
<i>Xyris</i> sp.	yellow-eyed grass	0.06
Bare Ground		27.94

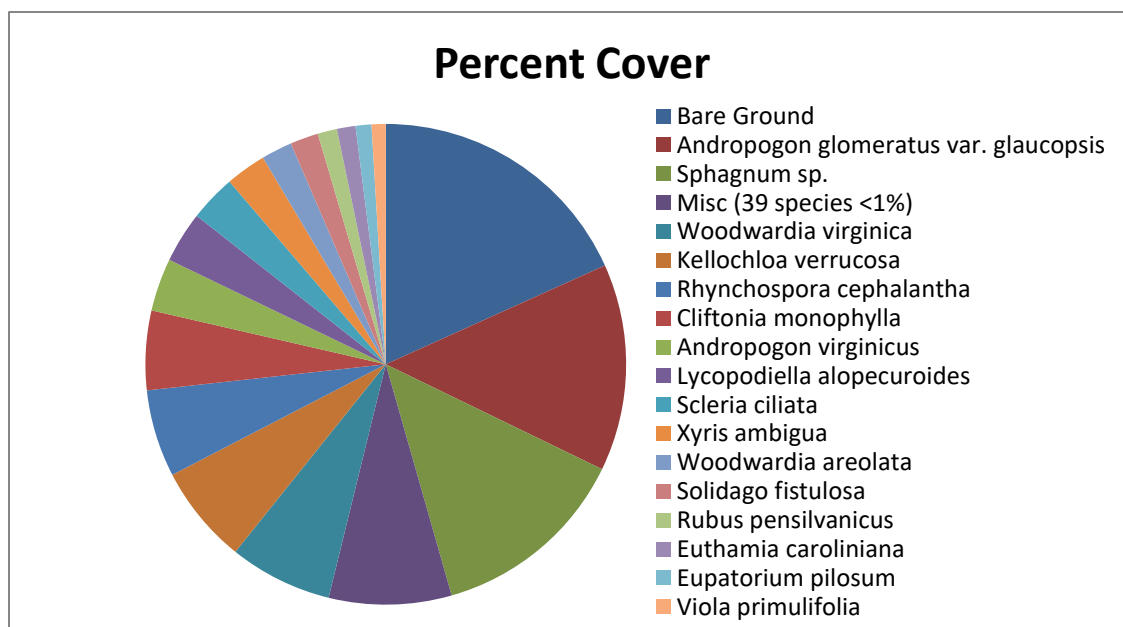


Figure PR-5. Percent of total vegetative cover for plant species in Mixed Forested Wetland Transect 2.

Table PR-5. Percent cover of plant species in Mixed Forested Wetland Transect 2 sampled on October 18, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	14.69
<i>Sphagnum</i> sp.	sphagnum moss	14.13
<i>Woodwardia virginica</i>	Virginia chain fern	7.31
<i>Kelochloa verrucosa</i>	warty panicgrass	7.00
<i>Rhynchospora cephalantha</i>	bunched beaksedge	6.19
<i>Cliftonia monophylla</i>	black titi	5.63
<i>Andropogon virginicus</i>	broomsedge bluestem	3.75
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	3.63
<i>Scleria ciliata</i>	fringed nutrush	3.31
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	2.88
<i>Woodwardia areolata</i>	netted chain fern	2.19
<i>Solidago fistulosa</i>	pinebarren goldenrod	2.00
<i>Rubus pensilvanicus</i>	sawtooth blackberry	1.38
<i>Euthamia caroliniana</i>	slender flattop goldenrod	1.31
<i>Eupatorium pilosum</i>	rough boneset	1.13
<i>Viola primulifolia</i>	primroseleaf violet	1.00
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	0.94
<i>Paspalum setaceum</i>	thin paspalum	0.94
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.69
<i>Aletris lutea</i>	yellow colic-root	0.44
<i>Eragrostis elliottii</i>	Elliott's lovegrass	0.44
<i>Magnolia virginiana</i>	sweetbay	0.44
<i>Oldenlandia uniflora</i>	clustered mille grains	0.44
<i>Polygala lutea</i>	orange milkwort	0.44
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.38
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.31
<i>Acer rubrum</i>	red maple	0.25
<i>Drosera brevifolia</i>	dwarf sundew	0.25
<i>Rhexia lutea</i>	yellow meadowbeauty	0.25
<i>Rhynchospora ciliaris</i>	fringed beaksedge	0.25
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.19
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.19
<i>Vitis rotundifolia</i>	muscadine	0.19
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.13
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.13
<i>Ludwigia maritima</i>	seaside primrosewillow	0.13
<i>Polygala cruciata</i>	drumheads	0.13
<i>Rhynchospora pusilla</i>	fairy beaksedge	0.13
<i>Centella asiatica</i>	spadeleaf	0.06
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	0.06
<i>Hypericum crux-andreae</i>	St. Peter's wort	0.06
<i>Hypericum</i> sp.	St. John's wort	0.06
<i>Juncus marginatus</i>	grassleaf rush	0.06
<i>Osmunda cinnamomea</i>	cinnamon fern	0.06
<i>Persea palustris</i>	swamp bay	0.06

Scientific name	Common name	Average percent cover per quadrat
<i>Polygala</i> sp.	milkwort	0.06
<i>Rhexia mariana</i>	pale meadowbeauty	0.06
<i>Rhexia</i> sp.	meadowbeauty	0.06
<i>Rhexia virginica</i>	handsome harry	0.06
<i>Smilax glauca</i>	cat greenbrier	0.06
<i>Smilax laurifolia</i>	laurel greenbrier	0.06
<i>Sophronanthe pilosa</i>	shaggy hedgehyssop	0.06
<i>Viola lanceolata</i>	bog white violet	0.06
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.06
<i>Xyris</i> sp.	yellow-eyed grass	0.06
Bare Ground		19.25

Hydric Pine Flatwoods

Qualitative monitoring. The target community of hydric pine flatwoods had a total of 115 plant species (Table PR-1). The 60-100 foot planted loblolly pines were thinned in 2017 by cutting selected rows of trees off near ground level. The resulting logs were left where they fell on the ground. Recent tropical storms have felled additional trees. Vines of muscadine grape were common and often dense. Much of the ground was covered by a thick layer of pine needle litter. The herbaceous layer was dominated by cinnamon fern, toothache grass with occasional wiregrass, as well as many weedy species. Curtiss' sandgrass (*Calamovilfa curtissii*), state listed as threatened, is known from this community and was confirmed present this year.

Quantitative monitoring. Where branches of the felled pines lay across the quadrats, they were moved aside in order to view the plants beneath. Transect 1 had a total of 33 species with 44% bare ground (Figure PR-6, Table PR-6). The dominant species was muscadine with other species much sparser. Woody species (including muscadine) made up around 25% average cover per quadrat, similar to last year.

Transect 2 (Figure PR-7, Table PR-7) had a total of 37 species with 44% bare ground. The dominant species were muscadine, wiregrass, and cinnamon fern, with wiregrass showing a small increase in cover from last year. Woody species made up around 16% average cover per quadrat, similar to last year. A large downed pine tree (present last year, also) at the beginning of the transect made sampling difficult.

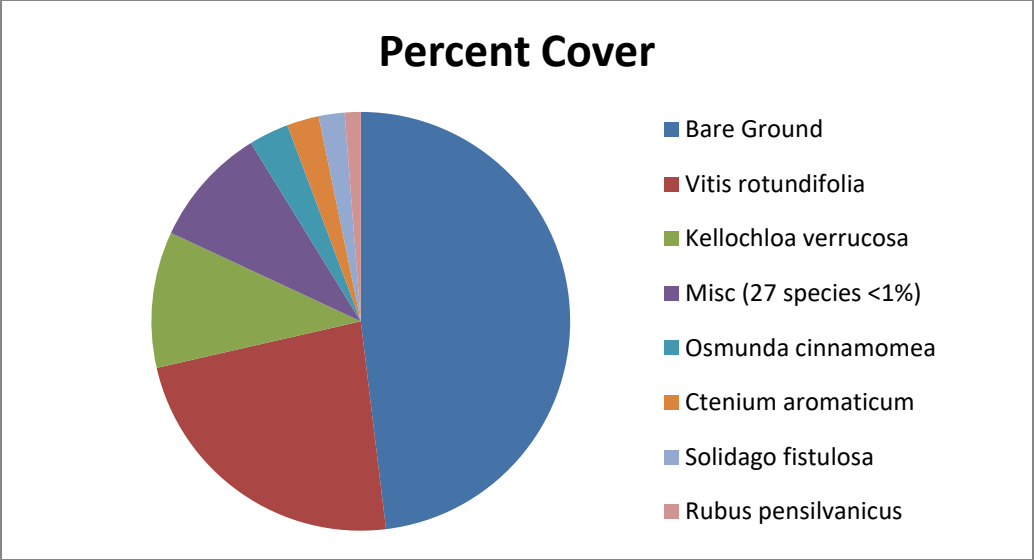


Figure PR-6. Percent cover of plant species in Hydric Pine Flatwoods Transect 1.

Table PR-6. Percent cover of species in Hydric Pine Flatwoods Transect 1 sampled on October 18, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Vitis rotundifolia</i>	muscadine	21.25
<i>Kellochloa verrucosa</i>	warty panicgrass	9.56
<i>Osmunda cinnamomea</i>	cinnamon fern	2.81
<i>Ctenium aromaticum</i>	toothache grass	2.25
<i>Solidago fistulosa</i>	pinebarren goldenrod	1.81
<i>Rubus pensilvanicus</i>	sawtooth blackberry	1.13
<i>Andropogon virginicus</i>	broomsedge bluestem	0.94
<i>Rubus cuneifolius</i>	sand blackberry	0.88
<i>Aristida stricta</i>	wiregrass	0.69
<i>Rubus trivialis</i>	southern dewberry	0.63
<i>Scleria ciliata</i>	fringed nutrush	0.63
<i>Dichanthelium dichotomum</i>	cypress witchgrass	0.50
<i>Oldenlandia uniflora</i>	clustered mille grains	0.44
<i>Woodwardia virginica</i>	Virginia chain fern	0.44
<i>Xyris platylepis</i>	tall yellow-eyed grass	0.44
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.31
<i>Symphotrichum dumosum</i>	rice button aster	0.31
<i>Elephantopus elatus</i>	tall elephantsfoot	0.25
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.25
<i>Hypericum crux-andreae</i>	St. Peter's wort	0.25
<i>Pinus taeda</i>	loblolly pine	0.25
<i>Hypericum hypericoides</i>	St. Andrew's cross	0.19
<i>Juncus marginatus</i>	grassleaf rush	0.19
<i>Toxicodendron radicans</i>	eastern poison ivy	0.19
<i>Viola primulifolia</i>	primroseleaf violet	0.19
<i>Centella asiatica</i>	spadeleaf	0.06

Scientific name	Common name	Average percent cover per quadrat
<i>Cyperus ovatus</i>	pinebarren flatsedge	0.06
<i>Eupatorium capillifolium</i>	dogfennel	0.06
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.06
<i>Ludwigia maritima</i>	seaside primrosewillow	0.06
<i>Rhexia nashii</i>	maid marian	0.06
<i>Smilax auriculata</i>	earleaf greenbrier	0.06
<i>Woodwardia areolata</i>	netted chain fern	0.06
Bare Ground		43.75

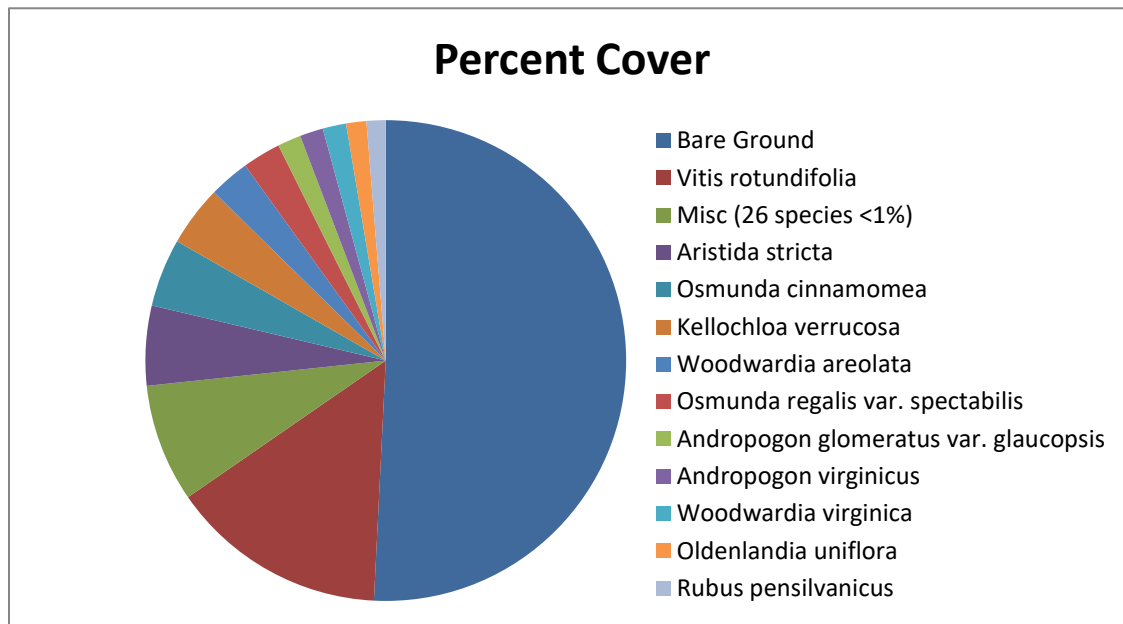


Figure PR-7. Percent cover of plant species in Hydric Pine Flatwoods Transect 2.

Table PR-7. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 sampled on October 18, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Vitis rotundifolia</i>	muscadine	12.75
<i>Aristida stricta</i>	wiregrass	4.69
<i>Osmunda cinnamomea</i>	cinnamon fern	4.00
<i>Kelochloa verrucosa</i>	warty panicgrass	3.56
<i>Woodwardia areolata</i>	netted chain fern	2.38
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	2.25
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	1.38
<i>Andropogon virginicus</i>	broomsedge bluestem	1.38
<i>Woodwardia virginica</i>	Virginia chain fern	1.38
<i>Oldenlandia uniflora</i>	clustered mille grains	1.19
<i>Rubus pensilvanicus</i>	sawtooth blackberry	1.13
<i>Sphagnum</i> sp.	sphagnum moss	0.81
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.75
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.75
<i>Smilax glauca</i>	cat greenbrier	0.63
<i>Ctenium aromaticum</i>	toothache grass	0.50
<i>Cyrilla racemiflora</i>	titi	0.44
<i>Rhynchospora inexpansa</i>	nodding beaksedge	0.44
<i>Elephantopus elatus</i>	tall elephantsfoot	0.38
<i>Toxicodendron radicans</i>	eastern poison ivy	0.31
<i>Pinus taeda</i>	loblolly pine	0.25
<i>Carex longii</i>	Long's sedge	0.19
<i>Ludwigia maritima</i>	seaside primrosewillow	0.19
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	0.19
<i>Viola</i> sp.	violet	0.19
<i>Acer rubrum</i>	red maple	0.13
<i>Centella asiatica</i>	spadeleaf	0.13
<i>Rhexia</i> sp.	meadowbeauty	0.13
<i>Calamovilfa curtissii</i>	Curtiss' sandgrass	0.06
<i>Hypericum hypericoides</i>	St. Andrew's cross	0.06
<i>Juncus marginatus</i>	grassleaf rush	0.06
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.06
<i>Rhexia virginica</i>	handsome harry	0.06
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.06
<i>Rubus trivialis</i>	southern dewberry	0.06
<i>Vaccinium corymbosum</i>	highbush blueberry	0.06
<i>Xyris</i> sp.	yellow-eyed grass	0.06
Bare Ground		44.38

Pine Flatwoods

Qualitative monitoring. The mature pines were thinned in 2017 by cutting selected rows of trees off near ground level. The resulting logs were left where they fell on the ground. The hardwoods in the subcanopy had been cut down in 2014 and some stumps had re-sprouted. Muscadine vine was abundant, scrambling over and obscuring much of the remaining groundcover. The diverse shrub layer formed up to 25% cover and was dominated by sweetbay, swamp bay, St. John's worts, southern bayberry, sawtooth blackberry and young loblolly pines. In the herbaceous layer were scattered clumps of wiregrass, with abundant broomsedge bluestem and pinebarren goldenrod. A total of 95 species (Table PR-1) were observed in this habitat.

LAFAYETTE CREEK – PHASE I MITIGATION SITE

Qualitative and Quantitative Monitoring

October 2021

Lafayette Creek – Phase I Mitigation Site Qualitative and Quantitative Monitoring October 2021

INTRODUCTION

The Lafayette Creek Phase I Mitigation Site consisting of 509 acres was obtained to compensate for the loss of wetland function from the impacts associated with re-alignment of highway US 331 in Freeport. The site is located north of SR 20 and Lafayette Creek. Access to the site is via Hollington Road, which is located 4.5 miles east of US 331. The gate to the site is at the north end of Hollington Road. The Phase I Mitigation Project aims to restore Sandhill (SA) to areas formerly planted with sand pine plantation and Hydric Savanna (HS) to areas formerly covered by wetland shrubs (Figure LC-1). Quantitative and qualitative monitoring documented the current plant species composition and vegetation structure of these targeted communities. Qualitative monitoring was used to document areas of slash pine plantation being restored to High Pine (HP) as well as the intact Bay Swamp (BS) and Stream Swamp (SS). The site vegetation was previously monitored by FNAI biologists every fall from 2012 to 2020.

METHODS

The quantitative monitoring utilized 300-foot long permanent transect lines previously marked during the 2012 survey. Two transects were located in Sandhill and two in Hydric Savanna (Figure LC-1). In 2013, metal T-posts were installed at the ends of each transect to provide permanent reference points. In 2014, the northern metal T-post in hydric savanna Transect 2 was missing. Its position was re-established and the metal T-post was replaced. In 2015 the northern metal T-post in sandhill Transect 2 was missing. Its location was reestablished using the bearing from the remaining T-post and permanently staked in 2016. As additional markers, one-foot sections of rebar with 3-inch-square orange caps were staked at ground level at quadrats 20 and 40 along this transect, so the transect line could be recovered if the end stakes were lost in the future. Along each transect line, fifteen 1m x 1m quadrats were placed along the left side beginning at 0 and then spaced every 20 feet, ending at 280 feet. Data recorded in each quadrat consisted of the visually estimated percent cover of each plant species including individuals rooted in the the quadrat as well as overhanging. Canopy over 2 m in height was excluded from cover estimates. Only the lower 2 m portions of larger individuals were counted as cover, including the lower portions of tree trunks rooted in quadrats. Bare ground was estimated in each quadrat as a percentage of ground not obscured by plant cover or large woody debris. This represents a slight change in procedure from previous FNAI monitoring reports up until 2017 where percent bare ground was calculated by subtracting the total percent for all species from 100.

The qualitative monitoring consisted of recording species and vegetation structure observed along meandering pedestrian transects through the two target communities plus High Pine (HP), Bay Swamp (BS), and Stream Swamp (SS). Field surveys were performed by FNAI botanists Kim Alexander and Jenna Annis on October 11-12, 2021.

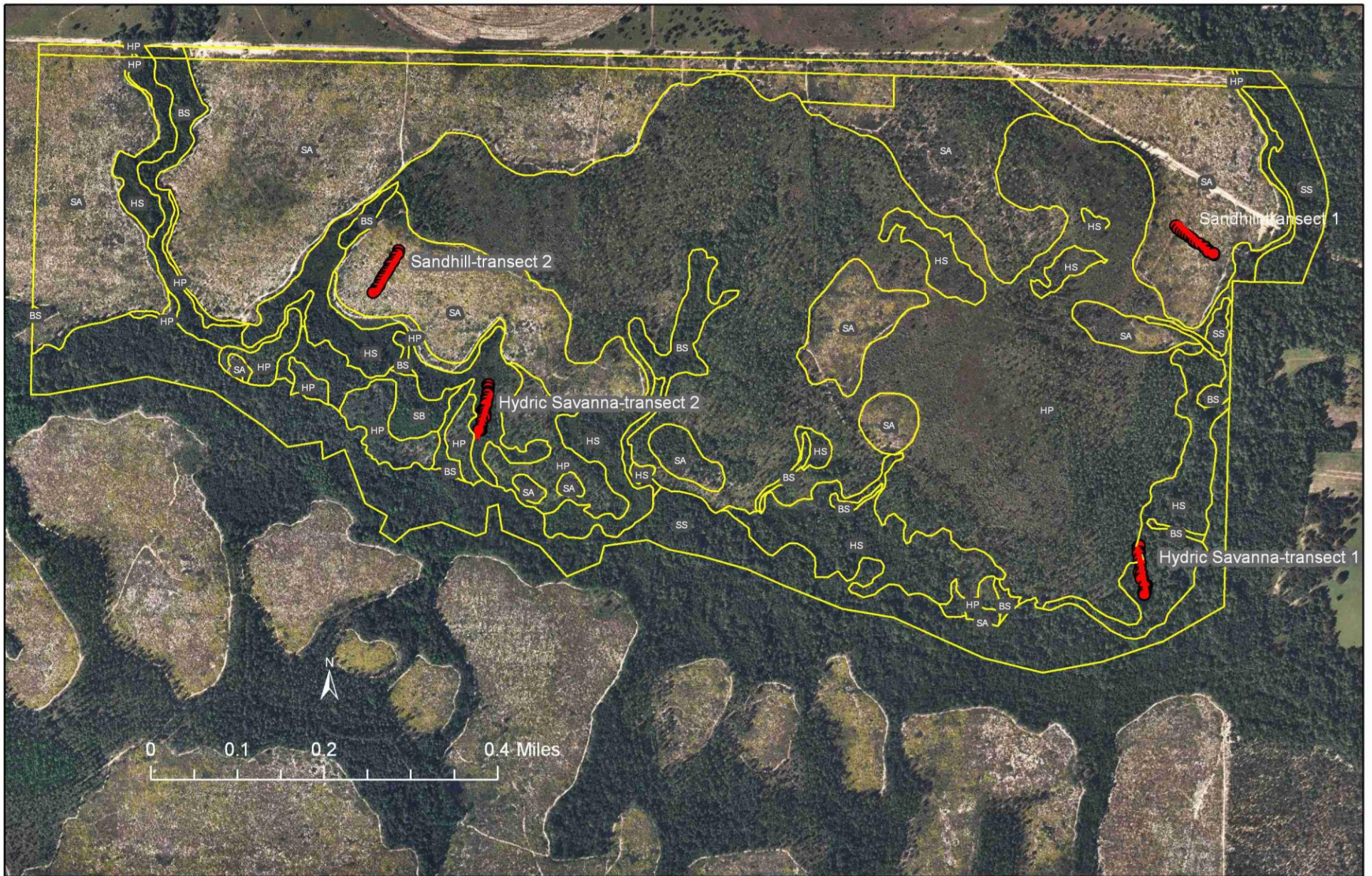


Figure LC-1. Location of permanent transects at Lafayette Creek – Phase I Mitigation Site. SA=Sandhill, HS=Hydic Savanna, HP=High Pine, BS=Bay Swamp, SS=Stream Swamp, SB=Shrub Bog.

RESULTS AND DISCUSSION

A total of 297 plant taxa were recorded in the surveyed areas of Lafayette Creek during the 2021 monitoring period (Table LC-1). Fourteen new taxa were found during the 2021 monitoring.

Table LC-1. Species observed in target communities at Lafayette Creek – Phase I Mitigation Site, October 11-12, 2021. (bold name = new species; bold X = new observation in community)

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Acer rubrum	red maple	X				X	2
Agalinis divaricata	pineland false foxglove		X				1
Agalinis fasciculata	beach false foxglove		X	X	X		3
Aletris lutea	yellow colic-root		X	X			2
Alnus serrulata	hazel alder	X					1
Amsonia ciliata	fringed bluestar				X		1
Andropogon arctatus	pinewoods bluestem			X			1
Andropogon gerardii	big bluestem		X				1
Andropogon glomeratus	bushy bluestem			X			1
Andropogon glomeratus var. glaucopsis	purple bluestem	X	X	X			3
Andropogon gyrans	Elliott's bluestem		X		X		2
Andropogon ternarius	splitbeard bluestem				X		1
Andropogon virginicus	broomsedge bluestem		X	X	X		3
Andropogon virginicus var. glaucus	chalky bluestem			X	X		2
Aristida purpurascens	arrowfeather threeawn			X	X		2
Aristida sp.	threeawn				X		1
Aristida stricta	wiregrass		X	X	X		3
Arnoglossum sulcatum	Georgia Indian-plantain	X					1
Aronia arbutifolia	red chokeberry			X			1
Arundinaria gigantea	switchcane		X	X			2
Asclepias sp.	milkweed		X				1
Asimina parviflora	smallflower pawpaw				X		1
Aureolaria flava	smooth yellow false foxglove		X				1
Balduina angustifolia	coastalplain honeycomb-head				X		1
Baptisia lanceolata	gopherweed				X		1
Berlandiera pumila	soft greeneyes				X		1
Bidens mitis	smallfruit beggarticks	X		X			2
Bigelovia nudata	pineland rayless goldenrod			X			1
Bignonia capreolata	crossvine					X	1
Boehmeria cylindrica	false nettle	X					1
Bulbostylis ciliatifolia	capillary hairsedge				X		1
Burmannia capitata	southern bluethead			X			1
Calamintha coccinea	scarlet calamint				X		1
Callicarpa americana	American beautyberry	X	X	X	X		4
Carex glaucescens	clustered sedge	X				X	2

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
<i>Carphephorus odoratissimus</i>	vanillaleaf		X				1
<i>Cartrema americanum</i>	wild olive		X		X	X	3
<i>Ceanothus microphyllus</i>	littleleaf buckbrush		X				1
<i>Centella asiatica</i>	spadeleaf			X			1
<i>Chamaecrista fasciculata</i>	partridge pea				X		1
<i>Chaptalia tomentosa</i>	pineland daisy		X				1
<i>Chasmanthium laxum</i> var. <i>sessiliflorum</i>	longleaf woodoats					X	1
<i>Chrysoma pauciflosculosa</i>	woody goldenrod		X		X		2
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster		X		X		2
<i>Chrysopsis linearifolia</i>	narrowleaf goldenaster				X		1
<i>Chrysopsis mariana</i>	Maryland goldenaster		X		X		2
<i>Clethra alnifolia</i>	sweet pepperbush	X	X	X		X	4
<i>Cliftonia monophylla</i>	black titi	X		X		X	3
<i>Cnidocolus stimulosus</i>	tread softly				X		1
<i>Conradina canescens</i>	false rosemary				X		1
<i>Coreopsis linifolia</i>	Texas tickseed			X			1
<i>Crocianthemum carolinianum</i>	Carolina frostweed				X		1
<i>Crotalaria rotundifolia</i>	rabbitbells		X				1
<i>Croton argyranthemus</i>	silver croton				X		1
<i>Ctenium aromaticum</i>	toothache grass		X	X			2
<i>Cyrilla racemiflora</i>	titi	X				X	2
<i>Dalea carnea</i>	whitetassels		X				1
<i>Dalea pinnata</i>	summer farewell				X		1
<i>Desmodium lineatum</i>	sand tick-trefoil		X				1
<i>Desmodium</i> sp.	tick-trefoil		X				1
<i>Dichanthelium aciculare</i>	needleleaf witchgrass				X		1
<i>Dichanthelium ensifolium</i>	cypress witchgrass			X			1
<i>Dichanthelium leucothrix</i>	rough witchgrass				X		1
<i>Dichanthelium ovale</i>	eggleaf witchgrass					X	1
<i>Dichanthelium portoricense</i>	hemlock witchgrass				X		1
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	X		X		X	3
<i>Dichanthelium</i> sp.	witchgrass			X	X		2
<i>Dichanthelium strigosum</i>	roughhair witchgrass		X	X	X	X	4
<i>Digitaria filiformis</i>	slender crabgrass		X				1
<i>Diodia teres</i>	poor joe		X		X		2
<i>Diodia virginiana</i>	Virginia buttonweed		X	X			2
<i>Diospyros virginiana</i>	common persimmon		X		X	X	3
<i>Drosera capillaris</i>	pink sundew			X			1
<i>Drosera tracyi</i>	dewthreads			X			1
<i>Dulichium arundinaceum</i>	threeway sedge	X					1
<i>Eleocharis flavescens</i>	yellow spikerush	X					1
<i>Elephantopus elatus</i>	tall elephantsfoot		X		X	X	3
<i>Eragrostis elliottii</i>	Elliott's lovegrass		X		X		2

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Eragrostis sp.	lovegrass	X					1
Eragrostis virginica	coastal lovegrass				X		1
Erechtites hieraciifolius	fireweed			X			1
Erigeron vernus	early whitetop fleabane		X	X			2
Eriocaulon compressum	flattened pipewort			X			1
Eriocaulon decangulare	tenangle pipewort			X			1
Eriogonum tomentosum	dogtongue wild buckwheat				X		1
Eryngium yuccifolium	button rattlesnakemaster		X				1
Eupatorium capillifolium	dogfennel			X		X	2
Eupatorium compositifolium	yankeeweed	X	X	X	X		4
Eupatorium mohrii	Mohr's thoroughwort		X	X			2
Eupatorium pilosum	rough boneset	X	X	X			3
Eupatorium rotundifolium	roundleaf thoroughwort		X	X			2
Eupatorium semiserratum	smallflower thoroughwort		X				1
Euphorbia discoidalis	summer spurge		X		X		2
Euphorbia floridana	greater Florida spurge				X		1
Eurybia eryngiifolia	thistleleaf aster		X				1
Euthamia caroliniana	slender flattop goldenrod	X	X	X			3
Fimbristylis sp.	fimbry			X			1
Froelichia floridana	cottonweed				X		1
Fuirena breviseta	saltmarsh umbrellasedge	X		X			2
Fuirena squarrosa	hairy umbrellasedge			X			1
Galactia minor	leafy milkpea				X		1
Gaylussacia dumosa	dwarf huckleberry		X	X	X		3
Gaylussacia frondosa var. tomentosa	blue huckleberry		X				1
Gaylussacia mosieri	woolly huckleberry	X	X	X			3
Gelsemium sempervirens	yellow jessamine		X				1
Geobalanus oblongifolius	gopher apple				X		1
Gymnopogon brevifolius	shortleaf skeletongrass		X				1
Gymnopogon ambiguus	bearded skeletongrass				X		1
Hamamelis virginiana	American witchhazel		X				1
Helianthus angustifolius	narrowleaf sunflower	X	X	X			3
Helianthus heterophyllus	variableleaf sunflower		X	X			2
Helianthus radula	stiff sunflower		X		X		2
Hibiscus aculeatus	comfortroot		X	X			2
Hieracium gronovii	queen-devil		X				1
Houstonia procumbens	roundleaf bluet				X		1
Hypericum brachyphyllum	coastalplain St. John's wort	X		X			2
Hypericum chapmanii	Chapman's St. John's wort					X	1
Hypericum cistifolium	roundpod St. John's wort			X			1
Hypericum crux-andreae	St. Peter's wort		X	X			2
Hypericum fasciculatum	peelbark St. John's wort	X		X			2
Hypericum gentianoides	orangegrass		X		X		2

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Hypericum hypericoides	St. Andrew's cross				X	X	2
Hypericum microsepalum	flatwoods St. John's wort		X				1
Hypericum suffruticosum	pineland St. John's wort				X		1
Ilex cassine	dahoon			X			1
Ilex coriacea	large gallberry	X	X	X		X	4
Ilex glabra	gallberry	X	X	X	X		4
Ilex opaca	American holly					X	1
Ilex vomitoria	yaupon	X	X	X	X	X	5
Ionactis linariifolia	flaxleaf aster		X				1
Itea virginica	Virginia willow	X					1
Jacquemontia tamnifolia	hairy clustervine				X		1
Juncus scirpoides	needlepod rush	X		X			2
Juncus trigonocarpus	redpod rush	X		X			2
Juniperus virginiana	red cedar					X	1
Kelochloa verrucosa	warty panicgrass	X	X	X			3
Lachnanthes carolina	Carolina redroot		X	X			2
Lachnocaulon anceps	whitehead bogbutton		X	X			2
Lechea minor	thymeleaf pinweed		X				1
Lechea sessiliflora	pineland pinweed				X		1
Lespedeza cuneata	Chinese lespedeza					X	1
Leucothoe axillaris	coastal doghobble					X	1
Liatris elegans	pinkscale gayfeather		X		X		2
Liatris gracilis	slender gayfeather		X		X		2
Liatris pauciflora var. secunda	Piedmont gayfeather				X		1
Liatris spicata	dense gayfeather		X	X			2
Liatris tenuifolia	shortleaf gayfeather				X		1
Liriodendron tulipifera	tuliptree	X		X		X	3
Lobelia brevifolia	shortleaf lobelia			X			1
Lobelia glandulosa	glade lobelia	X	X				2
Lobelia nuttallii	Nuttall's lobelia		X				1
Lophiola aurea	golden crest	X		X			2
Ludwigia maritima	seaside primrosewillow		X				1
Ludwigia octovalvis	Mexican primrosewillow	X					1
Ludwigia peruviana	Peruvian primrosewillow	X					1
Ludwigia sp.	primrosewillow			X			1
Lycopodiella alopecuroides	foxtail club-moss	X	X	X			3
Lycopodiella appressa	southern club-moss			X			1
Lycopodiella caroliniana	slender club-moss			X			1
Lycopus rubellus	taperleaf waterhorehound	X					1
Lygodium japonicum	Japanese climbing fern					X	1
Lyonia lucida	fetterbush	X	X	X		X	4
Magnolia grandiflora	southern magnolia		X			X	2
Magnolia virginiana	sweetbay	X	X	X		X	4

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Mayaca fluviatilis	stream bogmoss	X					1
Mimosa quadrivalvis	sensitive briar		X		X		2
Mitchella repens	partridgeberry					X	1
Mitreola sessilifolia	swamp hornpod		X				1
Morella caroliniensis	evergreen bayberry	X				X	2
Morella cerifera	southern bayberry	X	X	X		X	4
Morella inodora	odorless bayberry	X					1
Nyssa biflora	swamp tupelo	X				X	2
Oclemena reticulata	whiteweed			X			1
Oldenlandia uniflora	clustered mille grains	X		X			2
Opuntia humifusa	pricklypear		X		X		2
Osmunda cinnamomea	cinnamon fern	X	X	X		X	4
Osmunda regalis var. spectabilis	royal fern	X		X		X	3
Oxydendrum arboreum	sourwood		X			X	2
Panicum virgatum	switchgrass		X	X	X		3
Paspalum setaceum	thin paspalum				X		1
Peltandra sagittifolia	spoon-flower	X		X			2
Persea palustris	swamp bay					X	1
Pinus clausa	sand pine				X		1
Pinus elliotii	slash pine	X	X	X		X	4
Pinus palustris	longleaf pine		X		X		2
Pinus serotina	pond pine	X	X	X			3
Pityopsis aspera	pineland silkgrass		X		X		2
Pityopsis graminifolia	narrowleaf silkgrass		X				1
Pluchea baccharis	rosy camphorweed			X			1
Polygala cruciata	drumheads		X	X			2
Polygala lutea	orange milkwort			X			1
Polygala nana	candyroot				X		1
Polygonella gracilis	tall jointweed				X		1
Polypremum procumbens	rustweed				X		1
Pteridium aquilinum	bracken fern		X	X	X		3
Pterocaulon pycnostachyum	blackroot		X				1
Quercus falcata	southern red oak				X		1
Quercus geminata	sand live oak		X		X		2
Quercus hemisphaerica	laurel oak				X		1
Quercus incana	bluejack oak				X		1
Quercus laevis	turkey oak		X		X		2
Quercus laurifolia	swamp laurel oak	X					1
Quercus margarettae	sand post oak				X		1
Quercus minima	dwarf live oak		X		X		2
Quercus myrtifolia	myrtle oak				X		1
Quercus nigra	water oak		X			X	2
Quercus pumila	runner oak		X				1

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Rhexia alifanus	savannah meadowbeauty		X	X			2
Rhexia mariana	pale meadowbeauty			X			1
Rhexia petiolata	fringed meadowbeauty			X			1
Rhexia virginica	handsome harry	X					1
Rhododendron canescens	mountain azalea					X	1
Rhododendron viscosum	swamp azalea	X					1
Rhus copallinum	winged sumac		X	X	X		3
Rhynchosia cytisoides	royal snoutbean				X		1
Rhynchospora cephalantha	bunched beaksedge	X		X			2
Rhynchospora chalarocephala	loosehead beaksedge			X			1
Rhynchospora chapmanii	Chapman's beaksedge			X			1
Rhynchospora ciliaris	fringed beaksedge			X			1
Rhynchospora fascicularis	fascicled beaksedge	X					1
Rhynchospora gracilentia	slender beaksedge	X		X			2
Rhynchospora inundata	narrowfruit horned beaksedge	X					1
Rhynchospora megalocarpa	sandyfield beaksedge				X		1
Rhynchospora plumosa	plumed beaksedge			X			1
Rubus cuneifolius	sand blackberry		X		X		2
Rubus pensilvanicus	sawtooth blackberry	X		X		X	3
Sabatia brevifolia	shortleaf rosegentian		X	X			2
Sabulina caroliniana	pinebarren stitchwort				X		1
Saccharum giganteum	sugarcane plumegrass	X					1
Sagittaria lancifolia	bulltongue arrowhead	X					1
Salvia azurea	azure blue sage		X				1
Sarracenia leucophylla	white-top pitcherplant			X			1
Sarracenia rosea	Gulf purple pitcherplant			X			1
Schizachyrium sanguineum	crimson bluestem				X		1
Schizachyrium stoloniferum	creeping little bluestem		X		X		2
Schizachyrium tenerum	slender bluestem				X		1
Scleria ciliata	fringed nutrush			X			1
Scleria reticularis	netted nutrush			X			1
Scleria triglomerata	whip nutrush				X		1
Scoparia dulcis	licoriceweed			X	X		2
Serenoa repens	saw palmetto	X	X	X	X	X	5
Sericocarpus tortifolius	whitetop aster		X		X		2
Seymeria cassioides	yaupon blacksenna		X	X	X		3
Seymeria pectinata	Piedmont blacksenna				X		1
Smilax auriculata	earleaf greenbrier		X		X		2
Smilax bona-nox	saw greenbrier		X		X		2
Smilax glauca	cat greenbrier	X	X	X		X	4
Smilax laurifolia	laurel greenbrier	X	X	X		X	4
Smilax pumila	sarsaparilla vine		X		X		2
Smilax tamnoides	bristly greenbrier					X	1
Solidago fistulosa	pinebarren goldenrod	X	X	X			3

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
<i>Solidago odora</i>	sweet goldenrod		X		X		2
<i>Solidago stricta</i>	wand goldenrod			X			1
<i>Sophranthe pilosa</i>	shaggy hedgehyssop			X			1
<i>Sphagnum</i> sp.	sphagnum moss	X		X		X	3
<i>Sporobolus junceus</i>	pineywoods dropseed				X		1
<i>Steinchisma hians</i>	gaping panicum			X			1
<i>Stillingia sylvatica</i>	queen's delight		X		X		2
<i>Stylisma patens</i>	coastalplain dawnflower				X		1
<i>Stylosanthes biflora</i>	sidebeak pencil flower		X				1
<i>Symphotrichum adnatum</i>	scaleleaf aster		X				1
<i>Symphotrichum concolor</i>	eastern silver aster				X		1
<i>Symphotrichum dumosum</i>	rice button aster		X	X	X		3
<i>Symplocos tinctoria</i>	horse sugar		X				1
<i>Syngonanthus flavidulus</i>	yellow hatpins			X			1
<i>Taxodium ascendens</i>	pond cypress					X	1
<i>Tephrosia chrysophylla</i>	scurf hoary-pea				X		1
<i>Tephrosia florida</i>	Florida hoary-pea		X				1
<i>Tephrosia mohrii</i>	pineland hoary-pea				X		1
<i>Teucrium canadense</i>	Canadian germander					X	1
<i>Tiedemannia filiformis</i> ssp. <i>filiformis</i>	water cowbane			X			1
<i>Toxicodendron radicans</i>	eastern poison ivy	X					1
<i>Tragia smallii</i>	Small's noseburn		X		X		2
<i>Triadenum virginicum</i>	Virginia marsh St. John's wort	X					1
<i>Triplasis americana</i>	perennial sandgrass				X		1
<i>Utricularia juncea</i>	southern bladderwort			X			1
<i>Utricularia subulata</i>	zigzag bladderwort	X		X			2
<i>Vaccinium arboreum</i>	sparkleberry		X		X		2
<i>Vaccinium corymbosum</i>	highbush blueberry		X				1
<i>Vaccinium elliotii</i>	Elliott's blueberry					X	1
<i>Vaccinium myrsinites</i>	shiny blueberry		X		X		2
<i>Viburnum nudum</i>	possumhaw	X					1
<i>Viola palmata</i>	early blue violet		X	X			2
<i>Viola primulifolia</i>	primroseleaf violet		X	X		X	3
<i>Vitis rotundifolia</i>	muscadine	X	X	X	X	X	5
<i>Wahlenbergia marginata</i>	southern rockbell				X		1
<i>Woodwardia areolata</i>	netted chain fern	X		X		X	3
<i>Woodwardia virginica</i>	Virginia chain fern			X			1
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	X		X			2
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass			X			1
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass		X	X			2
<i>Xyris elliotii</i>	Elliott's yellow-eyed grass			X			1
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	X		X		X	3
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass			X			1
<i>Xyris platylepis</i>	tall yellow-eyed grass			X			1

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Xyris sp.	yellow-eyed grass			X			1
Yucca filamentosa	Adam's needle		X		X		2
Total number of taxa: 297		73	125	125	110	51	484

Sandhill

Qualitative sampling. The sandhill natural community has been degraded by past silviculture activities but retains many characteristic species. Both gopher tortoise and pocket gopher activity were noted during the 2020 site visit. The diverse but somewhat sparse groundcover was dominated by wiregrass, with Lynn Haven goldenaster also frequent. The groundcover was yellow with the frequent blooms of coastalplain honeycomb-head and woody goldenrod. Scattered shrubs and small trees include saw palmetto, sand live oak, and turkey oak. Characteristic sandhill species, such as summer farewell, sandhill sedge, and soft greeneyes were also noted in small numbers. Planted longleaf pines were frequent but nicely spaced, ranging from 1 to 20 feet tall. The state-listed threatened pineland hoary-pea (*Tephrosia mohrii*) was observed in both the eastern and far northwestern sections of sandhill. A total of 110 plant species were identified in this community (Table LC-1).

Quantitative sampling. The eastern Transect 1 (Figure LC-2, Table LC-2) was located on an east-facing slope. It had a total of 48 species with 48% average bare ground cover. Species cover was just over half herbaceous. Wiregrass was the most abundant species, with saw palmetto and sand live oak about equally abundant. Woody species made up around 18% average cover per quadrat. Vegetation composition along the transect was very similar to that measured in 2020.

The western Transect 2 (Table LC-3, Figure LC-3) was situated near the top of a ridge. It had a total of 31 species with 61% average bare ground cover. Dominant species were almost entirely herbaceous. Wiregrass and Lynn Haven goldenaster were the dominant herbs. Woody species made up around 2% average cover per quadrat. Although not recorded in cover, fruticose lichens were observed in two quadrats. There was a slight increase in the amount of wiregrass cover recorded, but otherwise, vegetation composition along the transect was very similar to that measured in 2020.

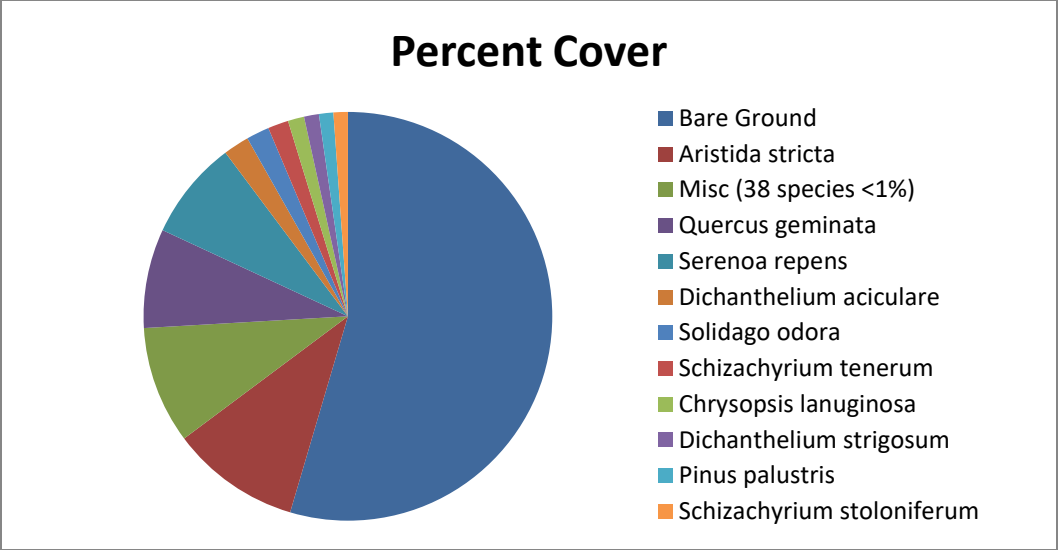


Figure LC-2. Percent cover of plant species in Sandhill Transect 1.

Table LC-2. Percent cover of plant species in Sandhill Transect 1 sampled on October 11, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Aristida stricta</i>	wiregrass	9.00
<i>Quercus geminata</i>	sand live oak	6.90
<i>Serenoa repens</i>	saw palmetto	6.90
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	1.80
<i>Solidago odora</i>	anisescented goldenrod	1.60
<i>Schizachyrium tenerum</i>	slender bluestem	1.43
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster	1.13
<i>Dichanthelium strigosum</i>	roughhair witchgrass	1.03
<i>Pinus palustris</i>	longleaf pine	1.00
<i>Schizachyrium stoloniferum</i>	creeping little bluestem	1.00
<i>Smilax auriculata</i>	earleaf greenbrier	0.90
<i>Geobalanus oblongifolius</i>	gopher apple	0.87
<i>Pityopsis aspera</i>	pineland silkgrass	0.83
<i>Quercus minima</i>	dwarf live oak	0.60
<i>Rubus cuneifolius</i>	sand blackberry	0.57
<i>Liatris pauciflora var. secunda</i>	Piedmont gayfeather	0.53
<i>Rhus copallinum</i>	winged sumac	0.47
<i>Andropogon virginicus</i>	broomsedge bluestem	0.43
<i>Eragrostis elliottii</i>	Elliott's lovegrass	0.30
<i>Andropogon gyrans</i>	Elliott's bluestem	0.23
<i>Dichanthelium leucothrix</i>	rough witchgrass	0.23
<i>Scleria triglomerata</i>	whip nutrush	0.23
<i>Eupatorium compositifolium</i>	yankeeweed	0.20
<i>Aristida purpurascens</i>	arrowfeather threeawn	0.17
<i>Aristida sp.</i>	threeawn	0.13
<i>Paspalum setaceum</i>	thin paspalum	0.13
<i>Chrysoma pauciflosculosa</i>	woody goldenrod	0.10

Scientific name	Common name	Average percent cover per quadrat
<i>Dichanthelium sp.</i>	witchgrass	0.10
<i>Diospyros virginiana</i>	common persimmon	0.10
<i>Galactia minor</i>	leafy milkpea	0.10
<i>Liatris tenuifolia</i>	shortleaf gayfeather	0.10
<i>Mimosa quadrivalvis</i>	sensitive brier	0.10
<i>Rhynchosia cytisoides</i>	royal snoutbean	0.10
<i>Tephrosia chrysophylla</i>	scurf hoary-pea	0.10
<i>Bulbostylis ciliatifolia</i>	capillary hairsedge	0.07
<i>Polygonella gracilis</i>	tall jointweed	0.07
<i>Crocanthemum carolinianum</i>	Carolina frostweed	0.03
<i>Eragrostis virginica</i>	coastal lovegrass	0.03
<i>Eriogonum tomentosum</i>	dogtongue wild buckwheat	0.03
<i>Euphorbia discoidalis</i>	summer spurge	0.03
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.03
<i>Ilex vomitoria</i>	yaupon	0.03
<i>Jacquemontia tamnifolia</i>	hairy clustervine	0.03
<i>Lechea sessiliflora</i>	pineland pinweed	0.03
<i>Panicum virgatum</i>	switchgrass	0.03
<i>Schizachyrium sanguineum</i>	crimson bluestem	0.03
<i>Stylisma patens</i>	coastalplain dawnflower	0.03
<i>Wahlenbergia marginata</i>	southern rockbell	0.03
Bare Ground		48.00

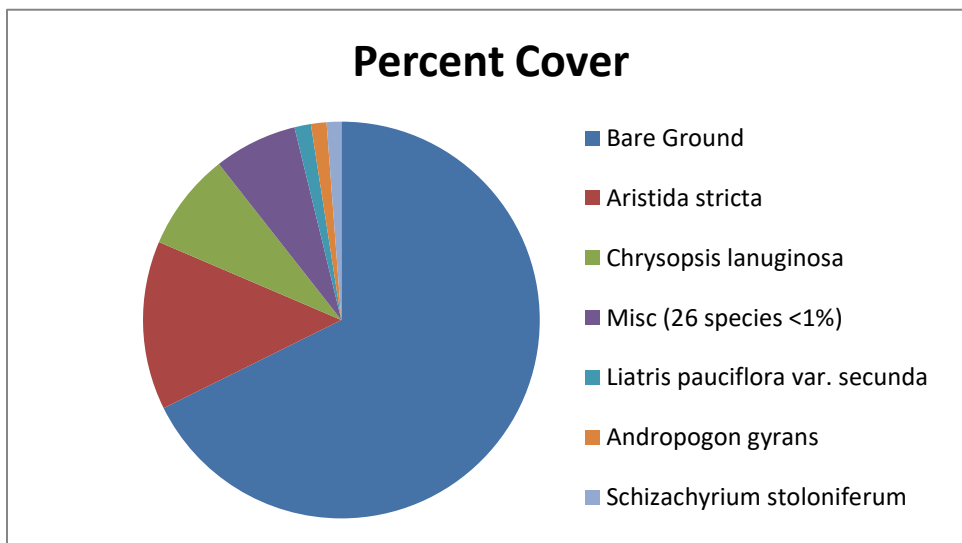


Figure LC-3. Percent cover of plant species in Sandhill Transect 2.

Table LC-3. Percent cover of plant species in Sandhill Transect 2 sampled on October 11, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Aristida stricta</i>	wiregrass	12.30

Scientific name	Common name	Average percent cover per quadrat
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster	7.13
<i>Liatris pauciflora</i> var. <i>secunda</i>	Piedmont gayfeather	1.20
<i>Andropogon gyrans</i>	Elliott's bluestem	1.13
<i>Schizachyrium stoloniferum</i>	creeping little bluestem	1.07
<i>Smilax auriculata</i>	earleaf greenbrier	0.93
<i>Quercus laevis</i>	turkey oak	0.60
<i>Andropogon virginicus</i>	broomsedge bluestem	0.50
<i>Aristida purpurascens</i>	arrowfeather threeawn	0.47
<i>Galactia minor</i>	leafy milkpea	0.37
<i>Dichanthelium strigosum</i>	roughhair witchgrass	0.33
<i>Pinus palustris</i>	longleaf pine	0.33
<i>Bulbostylis ciliatifolia</i>	capillary hairsedge	0.27
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	0.27
<i>Dichanthelium portoricense</i>	hemlock witchgrass	0.27
<i>Eriogonum tomentosum</i>	dogtongue wild buckwheat	0.27
<i>Andropogon virginicus</i> var. <i>glaucus</i>	chalky bluestem	0.23
<i>Geobalanus oblongifolius</i>	gopher apple	0.23
<i>Eupatorium compositifolium</i>	yankeeweed	0.17
<i>Rubus cuneifolius</i>	sand blackberry	0.13
<i>Chrysoma pauciflosculosa</i>	woody goldenrod	0.10
<i>Croton argyranthemus</i>	silver croton	0.10
<i>Dalea pinnata</i>	summer farewell	0.10
<i>Tephrosia chrysophylla</i>	scurf hoary-pea	0.10
<i>Dichanthelium leucothrix</i>	rough witchgrass	0.07
<i>Euphorbia floridana</i>	greater Florida spurge	0.07
<i>Lechea sessiliflora</i>	pineland pinweed	0.03
<i>Rhynchosia cytisoides</i>	royal snoutbean	0.03
<i>Solidago odora</i>	anisescented goldenrod	0.03
<i>Tragia smallii</i>	Small's noseburn	0.03
<i>Triplasis americana</i>	perennial sandgrass	0.03
Bare Ground		60.50

Hydric Savanna

Qualitative sampling. The restoration of the fire-suppressed hydric savanna was begun in 2010 by mowing down the often dense shrubs with a Gyro-Trac machine. Follow-up prescribed burning further reduced the shrub strata. As a result, much of the ground was bare or sparsely vegetated and there was some disturbance by vehicle tracks in the two sampling periods prior to 2014. Fires and hog rooting have created continual shifts in the herbaceous vegetation, primarily in the lowest, wettest portions of the community. A wide variety of herbs have been observed colonizing the area, with mainly beaksedges and warty panicum dominating in the wetter sections and wiregrass in the drier parts, although purple bluestem remains a dominant in the driest areas in the vicinity of Transect 2. In addition to the state-endangered white-top pitcherplant found in previous years, the state-threatened Gulf purple pitcherplant was detected for the first time during this year's sampling effort. Scattered shrubs included

black titi, large gallberry, sweet pepperbush, and gallberry. A total of 125 species were recorded from this community (Table LC-1).

Quantitative sampling. The eastern Transect 1 (Table LC-4, Figure LC-4) was on a south-facing slope and had a total of 67 species with 7% average bare ground cover. Herbaceous species made up most of the transect cover, and wiregrass increased slightly from the 2020 sample. The southern end of the transect remained heavily damaged from hog rooting. Warty panicum, a species that can shift dramatically in cover from year to year, remained similar to the 2020 sample, while weedy purple bluestem cover was slightly reduced. Woody species made up around 4% average cover per quadrat, the same as last year.

The western Transect 2 (Table LC-5, Figure LC-5) was also on a south facing slope. It had a total of 60 species with 44% average bare ground cover. The drier north end had abundant purple bluestem and wiregrass and was shaded by pond pine, while the wetter and more open south end was more disturbed from hog rooting and largely dominated by beaksedges. Weedy bluestem cover was reduced and warty panicum cover increased compared to the 2020 sample. Woody species made up around 3% average cover per quadrat.

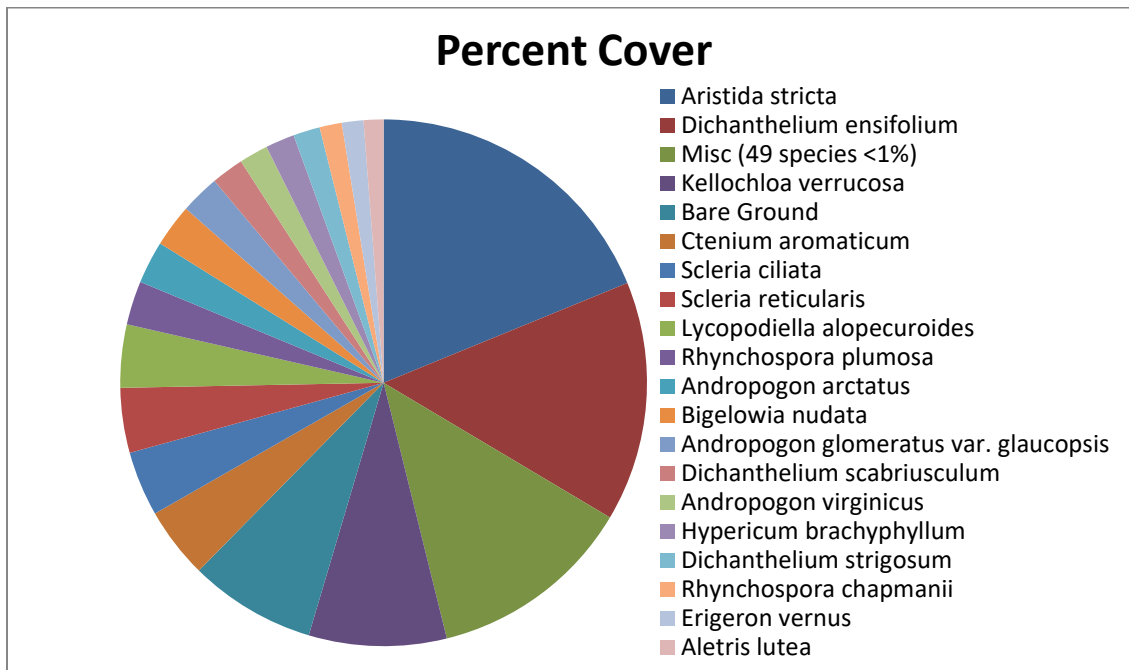


Figure LC-4. Percent cover of plant species in Hydric Savanna Transect 1.

Table LC-4. Percent cover of plant species in Hydric Savanna Transect 1 sampled on October 12, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Aristida stricta</i>	wiregrass	17.97
<i>Dichanthelium ensifolium</i>	cypress witchgrass	14.07
<i>Kellochloa verrucosa</i>	warty panicgrass	8.07
<i>Ctenium aromaticum</i>	toothache grass	4.17

Scientific name	Common name	Average percent cover per quadrat
<i>Scleria ciliata</i>	fringed nutrush	3.80
<i>Scleria reticularis</i>	netted nutrush	3.80
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	3.70
<i>Rhynchospora plumosa</i>	plumed beaksedge	2.57
<i>Andropogon arctatus</i>	pinewoods bluestem	2.50
<i>Bigelovia nudata</i>	pineland rayless goldenrod	2.50
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	2.30
<i>Dichantherium scabriusculum</i>	woolly witchgrass	1.90
<i>Andropogon virginicus</i>	broomsedge bluestem	1.70
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	1.70
<i>Dichantherium strigosum</i>	roughhair witchgrass	1.57
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	1.30
<i>Erigeron vernus</i>	early whitetop fleabane	1.27
<i>Aletris lutea</i>	yellow colic-root	1.17
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.90
<i>Rhynchospora ciliaris</i>	fringed beaksedge	0.83
<i>Eriocaulon compressum</i>	flattened pipewort	0.73
<i>Lycopodiella caroliniana</i>	slender club-moss	0.73
<i>Eupatorium pilosum</i>	rough boneset	0.70
<i>Rhynchospora cephalantha</i>	bunched beaksedge	0.57
<i>Cliftonia monophylla</i>	black titi	0.50
<i>Ilex coriacea</i>	large gallberry	0.50
<i>Eupatorium rotundifolium</i>	roundleaf thoroughwort	0.47
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.47
<i>Liatris spicata</i>	dense gayfeather	0.40
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.37
<i>Diodia virginiana</i>	Virginia buttonweed	0.33
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.30
<i>Smilax glauca</i>	cat greenbrier	0.30
<i>Hypericum crux-andreae</i>	St. Peter's wort	0.27
<i>Pinus elliotii</i>	slash pine	0.27
<i>Rhexia alifanus</i>	savannah meadowbeauty	0.27
<i>Arundinaria gigantea</i>	switchcane	0.23
<i>Helianthus angustifolius</i>	narrowleaf sunflower	0.23
<i>Sphagnum</i> sp.	sphagnum moss	0.23
<i>Tiedemannia filiformis</i> ssp. <i>filiformis</i>	water cowbane	0.23
<i>Andropogon glomeratus</i>	bushy bluestem	0.20
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.20
<i>Polygala lutea</i>	orange milkwort	0.20
<i>Xyris</i> sp.	yellow-eyed grass	0.20
<i>Coreopsis linifolia</i>	Texas tickseed	0.13
<i>Solidago stricta</i>	wand goldenrod	0.13
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	0.10
<i>Ilex glabra</i>	gallberry	0.10
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.10
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.10
<i>Viola primulifolia</i>	primroseleaf violet	0.10

Scientific name	Common name	Average percent cover per quadrat
<i>Centella asiatica</i>	spadeleaf	0.07
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.07
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass	0.07
<i>Aronia arbutifolia</i>	red chokeberry	0.03
<i>Burmanna capitata</i>	southern bluethread	0.03
<i>Drosera capillaris</i>	pink sundew	0.03
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.03
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.03
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.03
<i>Lobelia brevifolia</i>	shortleaf lobelia	0.03
<i>Lophiola aurea</i>	golden crest	0.03
<i>Seymeria cassioides</i>	yaupon blacksenna	0.03
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.03
<i>Sophronanthe pilosa</i>	shaggy hedgehyssop	0.03
unknown		0.03
<i>Viola palmata</i>	early blue violet	0.03
Bare Ground		7.43

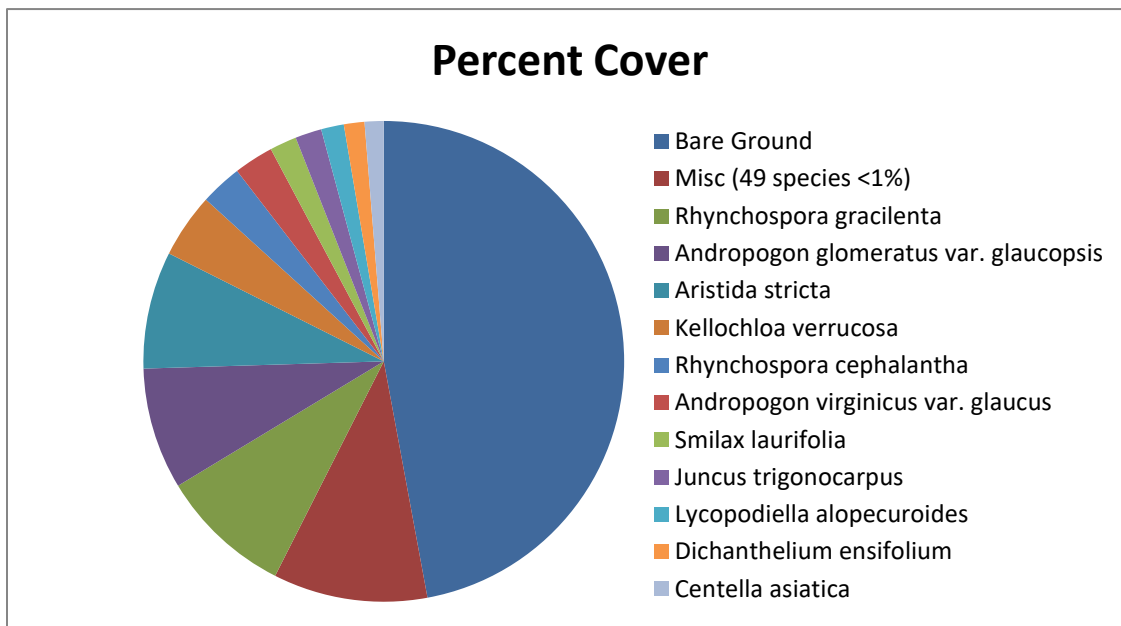


Figure LC-5. Percent cover of plant species in Hydric Savanna Transect 2.

Table LC-5. Percent cover of plant species in Hydric Savanna Transect 2 sampled on October 12, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Rhynchospora gracilentia</i>	slender beaksedge	8.33
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	7.67
<i>Aristida stricta</i>	wiregrass	7.40
<i>Kellochloa verrucosa</i>	warty panicgrass	4.07

Scientific name	Common name	Average percent cover per quadrat
<i>Rhynchospora cephalantha</i>	bunched beaksedge	2.63
<i>Andropogon virginicus</i> var. <i>glaucus</i>	chalky bluestem	2.50
<i>Smilax laurifolia</i>	laurel greenbrier	1.70
<i>Juncus trigonocarpus</i>	redpod rush	1.67
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	1.43
<i>Dichanthelium ensifolium</i>	cypress witchgrass	1.30
<i>Centella asiatica</i>	spadeleaf	1.20
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	0.97
<i>Dichanthelium strigosum</i>	roughhair witchgrass	0.63
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	0.63
<i>Eriocaulon compressum</i>	flattened pipewort	0.60
<i>Smilax glauca</i>	cat greenbrier	0.57
<i>Andropogon virginicus</i>	broomsedge bluestem	0.53
<i>Magnolia virginiana</i>	sweetbay	0.50
<i>Pteridium aquilinum</i>	bracken	0.47
<i>Rhexia alifanus</i>	savannah meadowbeauty	0.37
<i>Scleria ciliata</i>	fringed nutrush	0.37
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.33
<i>Scleria reticularis</i>	netted nutrush	0.33
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	0.33
<i>Rhynchospora ciliaris</i>	fringed beaksedge	0.30
<i>Clethra alnifolia</i>	sweet pepperbush	0.27
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.27
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.23
<i>Ilex vomitoria</i>	yaupon	0.23
<i>Andropogon glomeratus</i>	bushy bluestem	0.10
<i>Cliftonia monophylla</i>	black titi	0.10
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	0.10
<i>Dichanthelium</i> sp.	witchgrass	0.10
<i>Drosera capillaris</i>	pink sundew	0.10
<i>Lycopodiella caroliniana</i>	slender club-moss	0.10
<i>Lyonia lucida</i>	fetterbush	0.10
<i>Utricularia juncea</i>	southern bladderwort	0.10
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.10
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.07
<i>Fuirena squarrosa</i>	hairy umbrellasedge	0.07
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.07
<i>Ilex glabra</i>	gallberry	0.07
<i>Polygala lutea</i>	orange milkwort	0.07
<i>Aristida purpurascens</i>	arrowfeather threeawn	0.03
<i>Bidens mitis</i>	smallfruit beggarticks	0.03
<i>Burmannia capitata</i>	southern bluethead	0.03
<i>Ctenium aromaticum</i>	toothache grass	0.03
<i>Eupatorium compositifolium</i>	yankeeweed	0.03
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.03
<i>Eupatorium pilosum</i>	rough boneset	0.03
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.03
<i>Lobelia brevifolia</i>	shortleaf lobelia	0.03

Scientific name	Common name	Average percent cover per quadrat
<i>Oldenlandia uniflora</i>	clustered mille grains	0.03
<i>Osmunda cinnamomea</i>	cinnamon fern	0.03
<i>Pinus serotina</i>	pond pine	0.03
<i>Steinchisma hians</i>	gaping panicum	0.03
<i>Viola primulifolia</i>	primroseleaf violet	0.03
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	0.03
<i>Xyris elliottii</i>	Elliott's yellow-eyed grass	0.03
<i>Xyris</i> sp.	yellow-eyed grass	0.03
Bare Ground		44.17

High Pine

Qualitative sampling. Mature slash pine plantation once covered most of the area being restored to high pine, but pine thinning and prescribed fire have much improved the community from even three years ago. The canopy is now very open, shrubs are shorter, and herbs and grasses more prevalent throughout. Much of the high pine had been burned within the last year, and a fox squirrel was seen just north of Sandhill Transect 2. Throughout the high pine area at Lafayette Creek, the understory may be either shrub dominated, usually by yaupon, or an open grassy groundlayer of wiregrass with scattered saw palmetto and gallberry. Nearer the ecotone with hydric savanna and in open, flat areas of the community, many other herbs are found with the wiregrass, including pinkscale gayfeather, narrowleaf silkgrass, sweet goldenrod, scaleleaf aster, and rough boneset. The total number of species observed in this community was 125 (Table LC-1).

Bay Swamp

Qualitative sampling. This relatively undisturbed natural community occurs as a narrow band along the small stream tributaries to Lafayette Creek. The open to dense canopy consisted of sweetbay, titi, and swamp tupelo. The frequently dense and tall shrub layers were primarily composed of fetterbush, dahoon holly, large gallberry, and black titi. The herb stratum is relatively sparse in more shaded areas with clustered sedge and cinnamon fern seen most frequently. However, cleared areas of bay swamp along road crossings contain many more herb species that tend to be weedy. The narrow bay swamp in the vicinity of Hydric Savanna Transect 2 had recently burned through and lost most of its canopy components. In the northwest corner of the property, Peruvian primrosewillow, a FISC Category I invasive non-native plant species, was observed growing on the west side of the stream not far from the road. Laurel greenbrier was a common vine. The total number of species observed in this community was 73 (Table LC-1).

Stream Swamp

Qualitative sampling. This relatively undisturbed natural community occurred along the narrow floodplain of Lafayette Creek and its major tributary, Wolf Creek. On the west side of the site, the closed canopy was composed of mature red maple, swamp tupelo, water oak, and sweetbay. The often dense shrubs consisted of coastal doghobble, yaupon holly, sweet pepperbush, titi, black titi, and large

gallberry. Sphagnum moss and cinnamon fern made up most of the sparse groundcover. There was evidence of recent flooding in Lafayette Creek. The total number of species observed in this community was 51 (Table LC-1).

PLUM CREEK AT HOLMES CREEK MITIGATION SITE

Qualitative and Quantitative Monitoring

October 2021

Plum Creek at Holmes Creek Mitigation Site
Qualitative and Quantitative Monitoring
October 2021

INTRODUCTION

The Plum Creek at Holmes Creek Mitigation Site compensates for the loss of wetland function due to the impact of the SR 79 Open Creek Bridge in Washington County, Florida. The 130-acre tract lies just north of Holmes Creek and is contiguous with other Northwest Florida Water Management District holdings along the creek. Access is gained by going south on SR 79 for 6.3 miles from I-10 to Johnson Road. Head east on Johnson Road to the gate on the south side of the winding road. The Plum Creek Mitigation project aims to restore Sandhill (SA) from pine plantation and Wetland Forest Mixed (MFW) from a wetland impacted by a beaver pond (Figure PC-1). Quantitative and qualitative monitoring documented the current plant species composition and vegetation structure of the communities targeted for restoration as well as an intact mixed forested wetland community. The site vegetation was previously monitored by FNAI biologists every fall from 2012 to 2020.

METHODS

The quantitative monitoring utilized 300-foot long permanent transect lines previously marked during the 2012 survey. Two transects were located in the Sandhill community, one in the Restoration Wetland Forest Mixed, and one in the Preserved Wetland Forest Mixed (Figure PC-1). In 2013, metal T-posts were installed at the ends of each transect to provide more permanent reference points. Along each transect line, fifteen 1m x 1m quadrats were placed along the left side beginning at 0 and then spaced every 20 feet, ending at 280 feet. Data recorded in each quadrat consisted of the visually estimated percent cover of each plant species including individuals rooted in the the quadrat as well as overhanging. Canopy over 2 m in height was excluded from cover estimates. Only the lower 2 m portions of larger individuals were counted as cover, including the lower portions of tree trunks rooted in quadrats. Bare ground was estimated in each quadrat as a percentage of ground not obscured by plant cover or large woody debris. This represents a slight change in procedure from previous FNAI monitoring reports where percent bare ground was calculated by subtracting the total percent for all species from 100.

The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through each of these communities. The field surveys were performed by FNAI botanists Kim Alexander, Amy Jenkins, and Ethan Hughes on October 20-21, 2021.

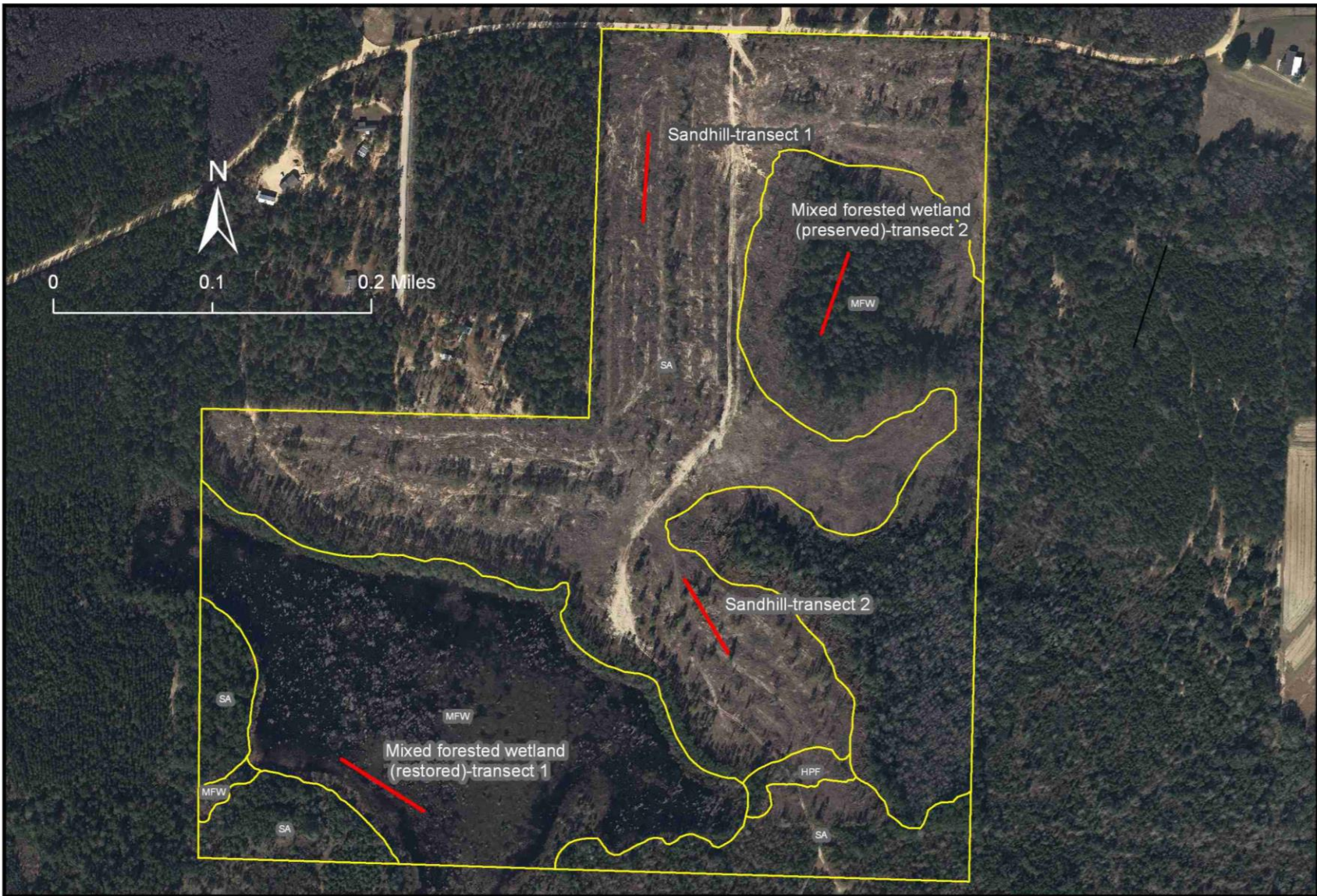


Figure PC-1. Location of permanent transects at Plum Creek at Holmes Creek Mitigation Site in Sandhill and Mixed Forested Wetland.

RESULTS AND DISCUSSION

A total of 220 plant taxa were observed during the 2021 monitoring period in the target communities at Plum Creek at Holmes Creek Mitigation Site (Table PC-1). Thirty-seven new taxa were found during the 2021 monitoring.

Table PC-1. Plant species observed in target communities at Plum Creek at Holmes Creek Mitigation Site on October 20-21, 2021 (bold name = new species; bold X = new observation in community type)

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
<i>Acalypha gracilens</i>	slender threeseed mercury	X			1
<i>Acer rubrum</i>	red maple			X	1
<i>Agalinis fasciculata</i>	beach false foxglove	X			1
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem		X	X	2
<i>Andropogon</i> sp.	bluestem	X			1
<i>Andropogon ternarius</i>	splitbeard bluestem	X			1
<i>Andropogon virginicus</i>	broomsedge bluestem	X	X	X	3
<i>Apteria aphylla</i>	nodding nixie			X	1
<i>Aristida purpurascens</i>	arrowfeather threeawn	X			1
<i>Aristida stricta</i>	wiregrass	X			1
<i>Arundinaria gigantea</i>	switchcane			X	1
<i>Asclepias tuberosa</i>	butterflyweed	X			1
<i>Asimina spatulata</i>	paw paw	X			1
<i>Baptisia lanceolata</i>	gopherweed	X			1
<i>Berlandiera pumila</i>	soft greeneyes	X			1
<i>Bidens mitis</i>	smallfruit beggarticks		X		1
<i>Callicarpa americana</i>	American beautyberry	X			1
<i>Carex elliotii</i>	Elliott's sedge			X	1
<i>Carex striata</i>	Walter's sedge		X	X	2
<i>Cartrema americanum</i>	wild olive	X		X	2
<i>Chamaecrista fasciculata</i>	partridge pea	X			1
<i>Chrysoma pauciflosculosa</i>	woody goldenrod	X			1
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster	X			1
<i>Chrysopsis mariana</i>	Maryland goldenaster	X			1
<i>Cirsium horridulum</i>	purple thistle	X			1
<i>Clethra alnifolia</i>	sweet pepperbush		X	X	2
<i>Cliftonia monophylla</i>	black titi			X	1
<i>Clitoria mariana</i>	Atlantic pigeon-wing	X			1
<i>Cnidoscolus stimulosus</i>	tread softly	X			1
<i>Conyza canadensis</i>	Canadian horseweed	X			1
<i>Crocianthemum carolinianum</i>	Carolina frostweed	X			1
<i>Croptilon divaricatum</i>	slender scratchdaisy	X			1
<i>Crotalaria rotundifolia</i>	rabbittbells	X			1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
<i>Croton argyranthemus</i>	silver croton	X			1
<i>Croton glandulosus</i>	vente conmigo	X			1
Ctenium aromaticum	toothache grass	X			1
Cyperus haspan	haspan flatsedge			X	1
<i>Cyperus ovatus</i>	pinebarren flatsedge	X			1
<i>Cyrilla racemiflora</i>	titi		X	X	2
<i>Dalea pinnata</i>	summer farewell	X			1
<i>Decodon verticillatus</i>	willow herb		X		1
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	X			1
<i>Dichanthelium acuminatum</i>	tapered witchgrass	X			1
<i>Dichanthelium commutatum</i>	variable witchgrass	X			1
<i>Dichanthelium ensifolium</i> var. <i>unciphillum</i>	cypress witchgrass	X			1
<i>Dichanthelium ovale</i>	eggleaf witchgrass	X			1
Dichanthelium scabriusculum	woolly witchgrass		X		1
<i>Dichanthelium sphaerocarpon</i>	roundseed witchgrass	X			1
<i>Dichanthelium strigosum</i>	roughhair witchgrass	X			1
<i>Dichondra carolinensis</i>	Carolina ponyfoot	X			1
<i>Digitaria filiformis</i> var. <i>filiformis</i>	slender crabgrass	X			1
<i>Diodia teres</i>	poor joe	X			1
<i>Diodia virginiana</i>	Virginia buttonweed	X			1
<i>Diospyros virginiana</i>	common persimmon	X			1
Drosera capillaris	pink sundew			X	1
<i>Dulichium arundinaceum</i>	threeway sedge		X		1
<i>Eleocharis equisetoides</i>	jointed spikerush		X		1
<i>Elephantopus elatus</i>	tall elephantsfoot	X			1
<i>Eragrostis elliottii</i>	Elliott's lovegrass	X			1
<i>Eremochloa ophiuroides</i>	centipede grass	X			1
<i>Erigeron strigosus</i>	prairie fleabane	X			1
<i>Eupatorium compositifolium</i>	yankeeweed	X			1
<i>Eupatorium leptophyllum</i>	falsefennel		X		1
<i>Eupatorium mohrii</i>	Mohr's thoroughwort		X	X	2
<i>Eupatorium rotundifolium</i>	roundleaf thoroughwort			X	1
<i>Eupatorium semiserratum</i>	smallflower thoroughwort			X	1
<i>Euphorbia curtisii</i>	Curtis' spurge	X			1
<i>Euphorbia floridana</i>	greater Florida spurge	X			1
<i>Euthamia caroliniana</i>	slender flattop goldenrod	X	X	X	3
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge		X	X	2
Fuirena scirpoidea	southern umbrellasedge			X	1
<i>Galactia minor</i>	leafy milkpea	X			1
<i>Galium hispidulum</i>	coastal bedstraw	X			1
Galium pilosum	hairy bedstraw	X			1
<i>Gelsemium sempervirens</i>	yellow jessamine	X			1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
Habenaria repens	waterspider false rein orchid		X		1
Hibiscus aculeatus	comfortroot	X	X		2
Houstonia procumbens	roundleaf bluet	X			1
Hypericum brachyphyllum	coastalplain St. John's wort		X	X	2
Hypericum cistifolium	roundpod St. John's wort			X	1
Hypericum crux-andreae	St. Peter's wort	X			1
Hypericum gentianoides	orangegrass	X			1
Hypericum hypericoides	St. Andrew's cross	X			1
Hypericum setosum	hairy St. John's wort	X			1
Ilex cassine var. myrtifolia	myrtle-leaved holly		X		1
Ilex coriacea	large gallberry		X	X	2
Ilex glabra	gallberry		X		1
Ilex vomitoria	yaupon	X			1
Itea virginica	Virginia willow		X	X	2
Iva microcephala	Piedmont marshelder	X			1
Jacquemontia tamnifolia	hairy clustervine	X			1
Juncus canadensis	Canadian rush		X		1
Juncus scirpoides	needlepod rush		X		1
Juniperus virginiana	red cedar	X			1
Kellochloa verrucosa	warty panicgrass		X		1
Lachnanthes carolina	Carolina redroot		X		1
Lechea minor	thymeleaf pinweed	X			1
Lechea sessiliflora	pineland pinweed	X			1
Lespedeza capitata	roundhead lespedeza	X			1
Lespedeza hirta	hairy lespedeza	X			1
Lespedeza virginica	slender lespedeza	X			1
Liatris elegans	pinkscale gayfeather	X			1
Liatris gracilis	slender gayfeather	X			1
Liquidambar styraciflua	sweetgum		X		1
Lobelia brevifolia	shortleaf lobelia	X		X	2
Lobelia glandulosa	glade lobelia			X	1
Lonicera sempervirens	trumpet honeysuckle	X			1
Ludwigia linearis	narrowleaf primrosewillow		X	X	2
Ludwigia maritima	seaside primrosewillow	X			1
Ludwigia pilosa	hairy primrosewillow		X	X	2
Ludwigia sphaerocarpa	globefruit primrosewillow		X		1
Ludwigia suffruticosa	shrubby primrosewillow		X		1
Lycopodiella alopecuroides	foxtail club-moss		X	X	2
Lycopodiella caroliniana	slender club-moss		X	X	2
Lycopus rubellus	taperleaf waterhorehound		X	X	2
Lyonia lucida	fetterbush		X	X	2
Magnolia virginiana	sweetbay		X	X	2
Mecardonia acuminata	axilflower	X			1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
Mikania scandens	climbing hempvine			X	1
Mimosa quadrivalvis	sensitive briar	X			1
Mitreola sessilifolia	swamp hornpod			X	1
Morella caroliniensis	evergreen bayberry			X	1
Morella cerifera	southern bayberry	X	X	X	3
Morella inodora	odorless bayberry			X	1
Nymphaea odorata	white waterlily		X		1
Nyssa biflora	swamp tupelo		X	X	2
Oenothera filipes	slenderstalk beeblossom	X			1
Oldenlandia uniflora	clustered mille grains	X	X	X	3
Osmunda cinnamomea	cinnamon fern			X	1
Osmunda regalis var. spectabilis	royal fern			X	1
Packera anonyma	Small's ragwort	X			1
Panicum hemitomon	maidencane		X		1
Panicum virgatum	switchgrass	X			1
Paronychia patula	pineland nailwort	X			1
Paspalum setaceum	thin paspalum	X			1
Paspalum urvillei	vaseygrass			X	1
Penstemon multiflorus	manyflower beardtongue	X			1
Persea palustris	swamp bay			X	1
Pieris phillyreifolia	climbing fetterbush		X		1
Pinus elliotii	slash pine	X	X	X	3
Pinus palustris	longleaf pine	X			1
Pityopsis aspera	pineland silkgrass	X			1
Pluchea baccharis	rosy camphorweed		X	X	2
Polygala nana	candyroot	X			1
Polygonella gracilis	tall jointweed	X			1
Polypremum procumbens	rustweed	X			1
Prunus serotina	black cherry	X			1
Pseudognaphalium obtusifolium	sweet everlasting	X			1
Pteridium aquilinum	bracken fern	X			1
Quercus falcata	southern red oak	X			1
Quercus hemisphaerica	laurel oak	X			1
Quercus incana	bluejack oak	X			1
Quercus margarettae	sand post oak	X			1
Quercus nigra	water oak	X		X	2
Quercus virginiana	live oak	X			1
Rhexia mariana	pale meadowbeauty	X	X	X	3
Rhexia petiolata	fringed meadowbeauty			X	1
Rhexia virginica	handsome harry		X	X	2
Rhododendron viscosum	swamp azalea		X	X	2
Rhus copallinum	winged sumac	X			1
Rhynchosia cytisoides	royal snoutbean	X			1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
Rhynchosia reniformis	dollarleaf	X			1
Rhynchospora cephalantha	bunched beaksedge		X		1
Rhynchospora chalarocephala	loosehead beaksedge		X	X	2
Rhynchospora harveyi	Harvey's beaksedge	X			1
Rhynchospora leptocarpa	brownish beaksedge			X	1
Rhynchospora scirpoides	longbeak beaksedge		X		1
Richardia sp.	Mexican clover	X			1
Rubus cuneifolius	sand blackberry	X			1
Rubus pensilvanicus	sawtooth blackberry	X			1
Saccharum giganteum	sugarcane plumegrass		X	X	2
Salvia azurea	azure blue sage	X			1
Schizachyrium sanguineum	crimson bluestem	X			1
Schizachyrium stoloniferum	creeping little bluestem	X			1
Scleria ciliata	fringed nutrush	X			1
Serenoa repens	saw palmetto	X			1
Sericocarpus tortifolius	whitetop aster	X			1
Smilax auriculata	earleaf greenbrier	X			1
Smilax bona-nox	saw greenbrier	X			1
Smilax glauca	cat greenbrier	X			1
Smilax laurifolia	laurel greenbrier			X	1
Smilax pumila	sarsaparilla vine	X			1
Smilax smallii	lanceleaf greenbrier	X			1
Smilax walteri	coral greenbrier		X		1
Solidago fistulosa	pinebarren goldenrod		X	X	2
Solidago odora	sweet goldenrod	X			1
Solidago petiolaris	downy ragged goldenrod	X			1
Sophronanthe pilosa	shaggy hedgehyssop	X			1
Sphagnum sp.	sphagnum moss			X	1
Stipulicida setacea	pineland scalypink	X			1
Stylisma patens	coastalplain dawnflower	X			1
Symphotrichum dumosum	rice button aster	X		X	2
Symplocos tinctoria	horse sugar	X			1
Taxodium ascendens	pond cypress		X		1
Toxicodendron radicans	eastern poison ivy			X	1
Tradescantia sp.	spiderwort	X			1
Tragia smallii	Small's noseburn	X			1
Triadenum virginicum	Virginia marsh St. John's wort		X		1
Trichostema dichotomum	forked bluecurls	X			1
Trichostema setaceum	narrowleaf bluecurls	X			1
Utricularia sp.	bladderwort			X	1
Vaccinium arboreum	sparkleberry	X			1
Vaccinium corymbosum	highbush blueberry			X	1
Vaccinium elliotii	Elliott's blueberry			X	1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
Vaccinium myrsinites	shiny blueberry	X			1
Vaccinium stamineum	deerberry	X			1
Vernonia angustifolia	tall ironweed	X			1
Viburnum nudum	possumhaw			X	1
Viola sp.	violet	X			1
Vitis rotundifolia	muscadine	X		X	2
Woodwardia areolata	netted chain fern			X	1
Woodwardia virginica	Virginia chain fern		X	X	2
Xyris ambigua	coastalplain yellow-eyed grass		X		1
Xyris baldwiniana	Baldwin's yellow-eyed grass			X	1
Xyris brevifolia	shortleaf yellow-eyed grass		X	X	2
Xyris difformis	bog yellow-eyed grass		X		1
Xyris fimbriata	fringed yellow-eyed grass		X	X	2
Xyris flabelliformis	savannah yellow-eyed grass			X	1
Xyris sp.	yellow-eyed grass		X		1
Yucca filamentosa	Adam's needle	X			1
Total number of taxa: 220		135	60	69	264

Sandhill

Qualitative sampling. The sandhill natural community has been degraded by past silviculture activities but retains many characteristic species. Young planted longleaf pines were widely spaced over the hillside. The diverse but somewhat sparse groundcover included Lynn Haven goldenaster, broomsedge bluestem, and witchgrasses. Wiregrass was very sparse and native weedy species constituted most of the herb layer. The occasional shrubs were mainly yaupon, turkey oak, sparkleberry, and sand blackberry. Earleaf greenbrier and yellow jessamine vines were common. A total of 135 plant species were identified in this community (Table PC-1).

Quantitative sampling. The northern Transect 1 (Table PC-2, Figure PC-2) was located midslope on an east-facing hill. It had a total of 68 species with 37% bare ground. The ground layer consisted of mainly herbaceous species with scattered shrubs. Broomsedge bluestem had the the highest percent cover by followed by yaupon, wiregrass, longleaf pine, and earleaf greenbrier. Wiregrass was present at around 4% cover, unchanged from 2020. Woody species made up around 17% average cover per quadrat, mostly due to clumps of yaupon on the south end of the transect. Although not recorded as cover, fruticose lichens were observed in two quadrats. Overall, vegetation measurements were very similar to last year.

The southern Transect 2 (Table PC-3, Figure PC-3) was situated near the top of a low ridge. It had a total of 50 species with 36% bare ground. The vegetation averaged about 79% herbaceous cover, with the highest cover contributions from Lynn Haven goldenaster, pineland silkgrass, and broomsedge bluestem. Yellow jessamine, saw palmetto, laurel oak, and earleaf greenbrier formed most of the woody

cover which made up around 21% average cover per quadrat, a small decrease from 2020. Although not recorded as cover, fruticose lichens were observed in two quadrats.

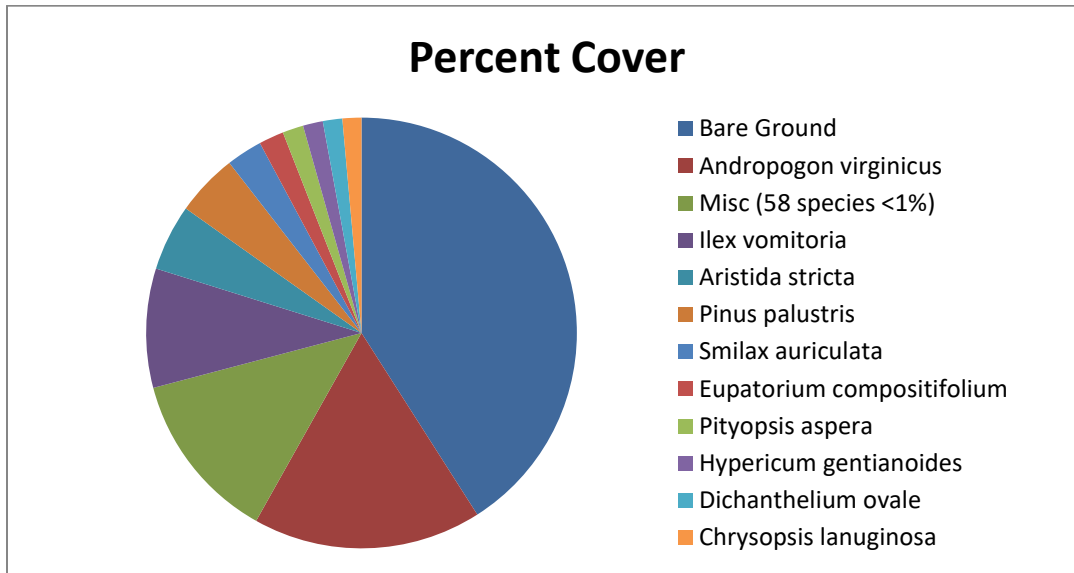


Figure PC-2. Percent cover of plant species in Sandhill Transect 1.

Table PC-2. Percent cover of plant species in Sandhill Transect 1 sampled on October 21, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon virginicus</i>	broomsedge bluestem	15.30
<i>Ilex vomitoria</i>	yaupon	7.97
<i>Aristida stricta</i>	wiregrass	4.43
<i>Pinus palustris</i>	longleaf pine	4.17
<i>Smilax auriculata</i>	earleaf greenbrier	2.40
<i>Eupatorium compositifolium</i>	yankeeweed	1.67
<i>Pityopsis aspera</i>	pineland silkgrass	1.40
<i>Hypericum gentianoides</i>	orangegrass	1.33
<i>Dichanthelium ovale</i>	eggleaf witchgrass	1.30
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster	1.27
<i>Aristida purpurascens</i>	arrowfeather threeawn	0.93
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	0.93
<i>Gelsemium sempervirens</i>	yellow jessamine	0.87
<i>Scleria ciliata</i>	fringed nutrush	0.83
<i>Pteridium aquilinum</i>	bracken	0.80
<i>Andropogon ternarius</i>	splitbeard bluestem	0.67
<i>Rubus cuneifolius</i>	sand blackberry	0.60
<i>Panicum virgatum</i>	switchgrass	0.50
<i>Solidago odora</i>	anisescented goldenrod	0.47
<i>Dichanthelium acuminatum</i>	tapered witchgrass	0.33
<i>Trichostema dichotomum</i>	forked bluecurls	0.27
<i>Elephantopus elatus</i>	tall elephantsfoot	0.23
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.23
<i>Quercus margarettae</i>	sand post oak	0.23

Scientific name	Common name	Average percent cover per quadrat
<i>Schizachyrium stoloniferum</i>	creeping little bluestem	0.23
<i>Croptilon divaricatum</i>	slender scratchdaisy	0.20
<i>Galactia minor</i>	leafy milkpea	0.20
<i>Smilax glauca</i>	cat greenbrier	0.20
<i>Ctenium aromaticum</i>	toothache grass	0.13
<i>Dalea pinnata</i>	summer farewell	0.13
<i>Eragrostis elliottii</i>	Elliott's lovegrass	0.13
<i>Liatris gracilis</i>	slender gayfeather	0.13
<i>Oenothera filipes</i>	slenderstalk beeblossom	0.13
<i>Vaccinium stamineum</i>	deerberry	0.13
<i>Digitaria filiformis</i>	slender crabgrass	0.10
<i>Houstonia procumbens</i>	roundleaf bluet	0.10
<i>Paspalum setaceum</i>	thin paspalum	0.10
<i>Smilax pumila</i>	sarsaparilla vine	0.10
<i>Stylisma patens</i>	coastalplain dawnflower	0.10
<i>Vitis rotundifolia</i>	muscadine	0.10
<i>Acalypha gracilens</i>	slender threeseed mercury	0.07
<i>Euphorbia floridana</i>	greater Florida spurge	0.07
<i>Hypericum hypericoides</i>	St. Andrew's cross	0.07
<i>Polygala nana</i>	candyroot	0.07
<i>Polygonella gracilis</i>	tall jointweed	0.07
<i>Polypremum procumbens</i>	rustweed	0.07
<i>Pseudognaphalium obtusifolium</i>	sweet everlasting	0.07
<i>Tragia smallii</i>	Small's noseburn	0.07
unknown		0.07
<i>Asimina spatulata</i>	paw paw	0.03
<i>Berlandiera pumila</i>	soft greeneyes	0.03
<i>Crocanthemum carolinianum</i>	Carolina frostweed	0.03
<i>Cyperus ovatus</i>	pinebarren flatsedge	0.03
<i>Dichanthelium sphaerocarpon</i>	roundseed witchgrass	0.03
<i>Galium hispidulum</i>	coastal bedstraw	0.03
<i>Galium pilosum</i>	hairy bedstraw	0.03
<i>Hibiscus aculeatus</i>	comfortroot	0.03
<i>Lechea sessiliflora</i>	pineland pinweed	0.03
<i>Quercus incana</i>	bluejack oak	0.03
<i>Rhynchosia reniformis</i>	dollarleaf	0.03
<i>Richardia</i> sp.	Mexican clover	0.03
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.03
<i>Rubus</i> sp.	blackberry	0.03
<i>Solidago petiolaris</i>	downy ragged goldenrod	0.03
<i>Stipulicida setacea</i>	pineland scalypink	0.03
<i>Symphotrichum dumosum</i>	rice button aster	0.03
<i>Vernonia angustifolia</i>	tall ironweed	0.03
<i>Viola</i> sp.	violet	0.03
Bare Ground		36.50

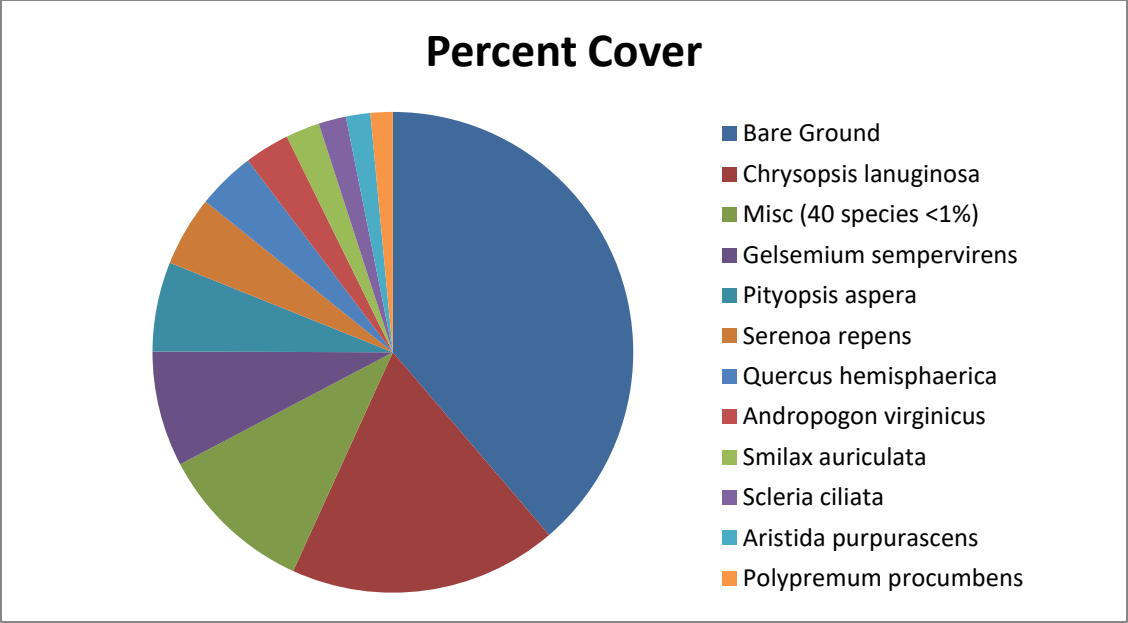


Figure PC-3. Percent species cover in Sandhill Transect 2.

Table PC-3. Percent cover of plant species in Sandhill Transect 2 sampled on October 21, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster	16.90
<i>Gelsemium sempervirens</i>	yellow jessamine	7.27
<i>Pityopsis aspera</i>	pineland silkgrass	5.63
<i>Serenoa repens</i>	saw palmetto	4.40
<i>Quercus hemisphaerica</i>	laurel oak	3.67
<i>Andropogon virginicus</i>	broomsedge bluestem	2.83
<i>Smilax auriculata</i>	earleaf greenbrier	2.13
<i>Scleria ciliata</i>	fringed nutrush	1.73
<i>Aristida purpurascens</i>	arrowfeather threeawn	1.53
<i>Polypremum procumbens</i>	rustweed	1.40
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	0.90
<i>Rubus cuneifolius</i>	sand blackberry	0.87
<i>Smilax bona-nox</i>	saw greenbrier	0.73
<i>Dichanthelium ovale</i>	eggleaf witchgrass	0.70
<i>Hypericum gentianoides</i>	orangegrass	0.70
<i>Houstonia procumbens</i>	roundleaf bluet	0.57
<i>Pteridium aquilinum</i>	bracken	0.57
<i>Pinus palustris</i>	longleaf pine	0.47
<i>Aristida stricta</i>	wiregrass	0.43
<i>Diospyros virginiana</i>	common persimmon	0.37
<i>Dichanthelium commutatum</i>	variable witchgrass	0.33
<i>Lechea sessiliflora</i>	pineland pinweed	0.30
<i>Pinus elliotii</i>	slash pine	0.27
<i>Smilax pumila</i>	sarsaparilla vine	0.23
<i>Solidago odora</i>	anisescented goldenrod	0.23

Scientific name	Common name	Average percent cover per quadrat
unknown		0.23
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.20
<i>Trichostema dichotomum</i>	forked bluecurls	0.20
<i>Crocanthemum carolinianum</i>	Carolina frostweed	0.13
<i>Dichanthelium sphaerocarpon</i>	roundseed witchgrass	0.13
<i>Symphyotrichum dumosum</i>	rice button aster	0.13
<i>Dichondra carolinensis</i>	Carolina ponysfoot	0.10
<i>Eupatorium compositifolium</i>	yankeeweed	0.10
<i>Smilax glauca</i>	cat greenbrier	0.10
<i>Tragia smallii</i>	Small's noseburn	0.10
<i>Vaccinium arboreum</i>	sparkleberry	0.10
<i>Andropogon ternarius</i>	splitbeard bluestem	0.07
<i>Croton glandulosus</i> var. <i>septentrionalis</i>	vente conmigo	0.07
<i>Hibiscus aculeatus</i>	comfortroot	0.07
<i>Hypericum hypericoides</i>	St. Andrew's cross	0.07
<i>Andropogon</i> sp.	bluestem	0.03
<i>Conyza canadensis</i>	Canadian horseweed	0.03
<i>Dichanthelium strigosum</i>	roughhair witchgrass	0.03
<i>Galactia minor</i>	leafy milkpea	0.03
<i>Liatris gracilis</i>	slender gayfeather	0.03
<i>Oldenlandia uniflora</i>	clustered mille grains	0.03
<i>Paspalum setaceum</i>	thin paspalum	0.03
<i>Polygala nana</i>	candyroot	0.03
<i>Pseudognaphalium obtusifolium</i>	sweet everlasting	0.03
<i>Smilax smallii</i>	lanceleaf greenbrier	0.03
Bare Ground		36.23

Wetland Forest Mixed (Restoration)

Qualitative sampling. The Wetland Forest Mixed Restoration area (Figure PC-1) resembled a marsh due to its sparse tree cover. The muck soil of the former beaver pond was partially inundated at the time of the survey. The vegetative cover in the inundated portions consisted primarily of willow herb, a low shrub with woody base and herbaceous stems that arch over to form a nearly impenetrable interlacing thicket. Interspersed with the willow herb were patches of young cypress with occasional swamp tupelo, sweetbay, and red maple. Shallower areas near the shore were lined with a diverse set of wetland herbs, including taperleaf waterhorehound, loosehead beaksedge, and maidencane. Shrubs and small trees dominated the ecotone to the adjacent uplands. The total number of species observed in this community was 60 (Table PC-1).

Quantitative sampling. Transect 1 (Table PC-4, Figure PC-4) had a total of 19 species with 54% bare ground (including water). The transect was mostly flooded with up to 3 inches of standing water over deep, mucky soils. In general, the western end of the transect was shallower than the eastern end where hummocks were common. The highest percent cover was by willow herb followed by hairy primrosewillow, white waterlily, and loosehead beaksedge. The slightly lower water levels this year compared to 2020 seem to have led to a decrease in white waterlily and an increase in hairy

primrosewillow. Humped bladderwort, a dominant species in 2018, was not detected at all along the transect in the last 2 years. Woody species made around 14% average cover per quadrat, mainly attributable to a decrease in willow herb from last year.

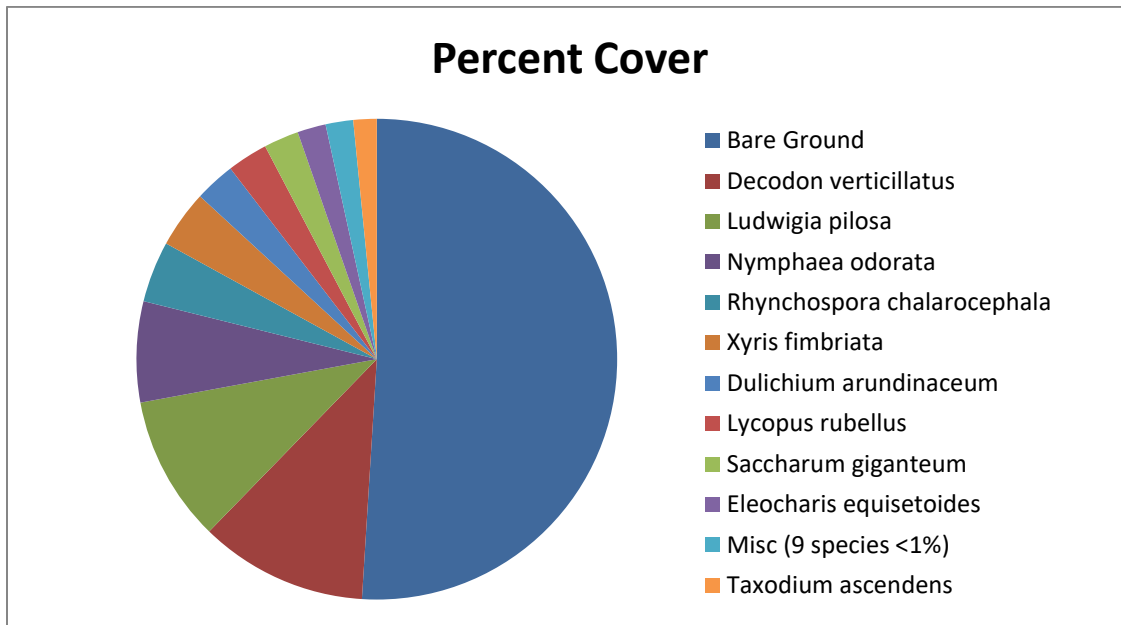


Figure PC-4. Percent cover of plant species in Mixed Forested Wetland (Restored) Transect 1.

Table PC-4. Percent cover of plant species in Mixed Forested Wetland (Restored) Transect 1 sampled on October 20, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Decodon verticillatus</i>	willow herb	12.00
<i>Ludwigia pilosa</i>	hairy primrosewillow	10.43
<i>Nymphaea odorata</i>	white waterlily	7.20
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	4.37
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	4.10
<i>Dulichium arundinaceum</i>	threeway sedge	2.90
<i>Lycopus rubellus</i>	taperleaf waterhorehound	2.90
<i>Saccharum giganteum</i>	sugarcane plumegrass	2.50
<i>Eleocharis equisetoides</i>	jointed spikerush	2.03
<i>Taxodium ascendens</i>	pond cypress	1.67
<i>Juncus canadensis</i>	Canadian rush	0.70
<i>Rhynchospora scirpoides</i>	longbeak beaksedge	0.33
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.30
<i>Magnolia virginiana</i>	sweetbay	0.23
<i>Ludwigia sphaerocarpa</i>	globefruit primrosewillow	0.10
<i>Nyssa biflora</i>	swamp tupelo	0.10
<i>Panicum hemitomon</i>	maiden cane	0.10
<i>Xyris</i> sp.	yellow-eyed grass	0.07
<i>Ludwigia suffruticosa</i>	shrubby primrosewillow	0.03
Bare Ground		54.17

Wetland Forest Mixed (Preserved)

Qualitative sampling. The Preserved Wetland Forest Mixed (Figure PC-1) was a relatively undisturbed mature baygall forest. The tall canopy of large trees formed dense shade with occasional openings. Following Hurricane Michael in 2018, many trees and limbs were down in this community. Dominant species were sweetbay and swamp tupelo. The dense subcanopy was formed primarily by tree-size black titi, and swamp bay. The moderately dense shrub layer consisted mainly of large gallberry, fetterbush, and sweet pepperbush. The sparse herb layer was primarily sphagnum moss. The total number of species observed in this community was 69 (Table PC-1). Many of the new species encountered this year were on the open, mostly herbaceous slope that is mapped as part of this community.

Quantitative sampling. Transect 2 (Table PC-5, Figure PC-5) had a total of 25 species with 57% bare ground. The dominant shrubs were fetterbush, large gallberry, and sweet pepperbush. Woody species made around 35% average cover per quadrat, accounting for around $\frac{3}{4}$ of the total cover observed. Sphagnum moss formed most of the sparse herbaceous cover.

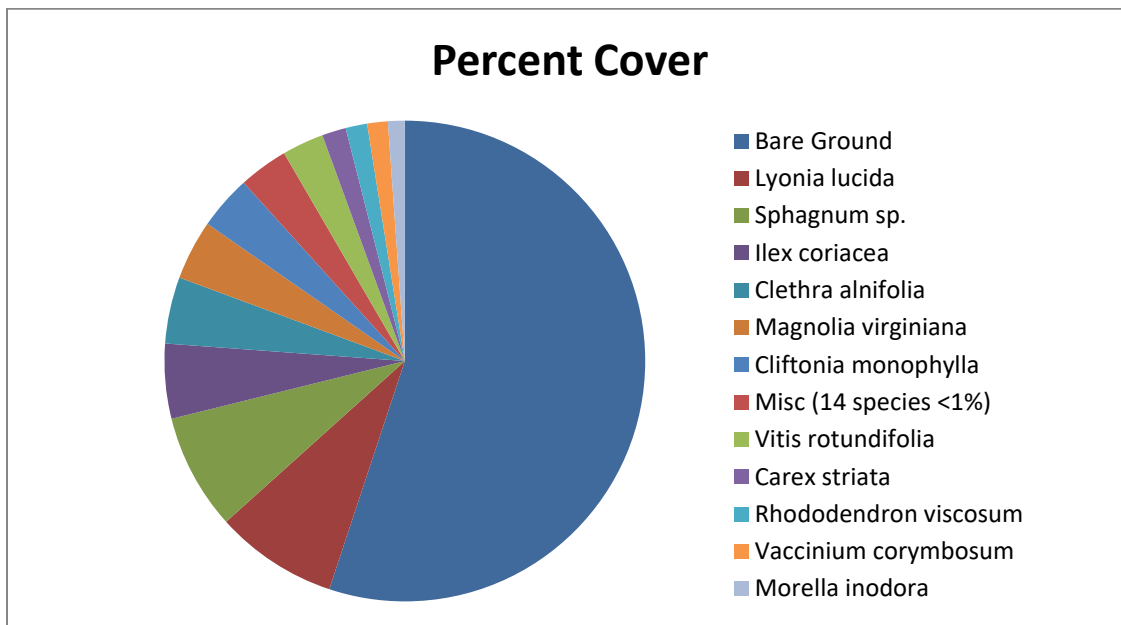


Figure PC-5. Percent cover of plant species in Mixed Forested Wetland (Preserved) Transect 2.

Table PC-5. Percent cover of plant species in Mixed Forested Wetland (Preserved) Transect 2 sampled on October 20, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Lyonia lucida</i>	fetterbush	8.53
<i>Sphagnum sp.</i>	sphagnum moss	8.07
<i>Ilex coriacea</i>	large gallberry	5.20
<i>Clethra alnifolia</i>	sweet pepperbush	4.63
<i>Magnolia virginiana</i>	sweetbay	4.17
<i>Cliftonia monophylla</i>	black titi	3.77
<i>Vitis rotundifolia</i>	muscadine	2.90

Scientific name	Common name	Average percent cover per quadrat
<i>Carex striata</i>	Walter's sedge	1.67
<i>Rhododendron viscosum</i>	swamp azalea	1.50
<i>Vaccinium corymbosum</i>	highbush blueberry	1.43
<i>Morella inodora</i>	odorless bayberry	1.17
<i>Woodwardia areolata</i>	netted chain fern	0.77
<i>Rhynchospora leptocarpa</i>	brownish beaksedge	0.63
<i>Nyssa biflora</i>	swamp tupelo	0.60
<i>Viburnum nudum</i>	possumhaw	0.53
<i>Smilax laurifolia</i>	laurel greenbrier	0.27
<i>Woodwardia virginica</i>	Virginia chain fern	0.23
<i>Vaccinium elliotii</i>	Elliott's blueberry	0.10
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	0.07
moss		0.07
<i>Andropogon virginicus</i>	broomsedge bluestem	0.03
<i>Cartrema americanum</i>	wild olive	0.03
<i>Cyrilla racemiflora</i>	titi	0.03
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.03
<i>Persea palustris</i>	swamp bay	0.03
Bare Ground		57.00

WARD CREEK WEST MITIGATION SITE

Qualitative and Quantitative Monitoring

October 2021

Ward Creek West Mitigation Site
Qualitative and Quantitative Monitoring
October 2021

INTRODUCTION

The Ward Creek West Mitigation Site consists of 724 acres in Bay County managed by the Northwest Florida Water Management District. It is located 0.5 mile west of SR 79 and 2.5 miles north of the junction of SR 79 and US 98. The Ward Creek West Mitigation Project aims to restore hydric pine flatwoods (HPF) and hydric pine savanna (HPS) which had been converted to slash pine plantation, as well as to convert portions of the mixed forested wetlands to cypress (CY; Figure WC-1). Quantitative and qualitative monitoring was used to document the current plant species composition and vegetation structure of these targeted communities. The site vegetation was previously monitored by FNAI biologists during the fall from 2012 through 2020.

METHODS

The quantitative monitoring utilized 300-foot long permanent transect lines previously marked during the 2012 survey. In 2013, metal T-posts were placed at the ends of each transect to provide permanent reference points. Two transects were located in the Hydric Pine Flatwoods target community and two in Hydric Pine Savanna (Figure WC-1). Along each transect line, fifteen 1m x 1m quadrats were placed along the left side beginning at 0 and then spaced every 20 feet, ending at 280 feet. Data recorded in each quadrat consisted of the visually estimated percent cover of each plant species including individuals rooted in the the quadrat as well as overhanging. Canopy over 2 m in height was excluded from cover estimates. Only the lower 2 m portions of larger individuals were counted as cover, including the lower portions of tree trunks rooted in quadrats. Bare ground was estimated in each quadrat as a percentage of ground not obscured by plant cover or large woody debris. This represents a slight change in procedure from previous FNAI monitoring reports where percent bare ground was calculated by subtracting the total percent for all species from 100.

The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through each of the two target communities plus the Cypress area. The field surveys were performed by FNAI botanists Jenna Annis and Kim Alexander on October 13-14, 2021.

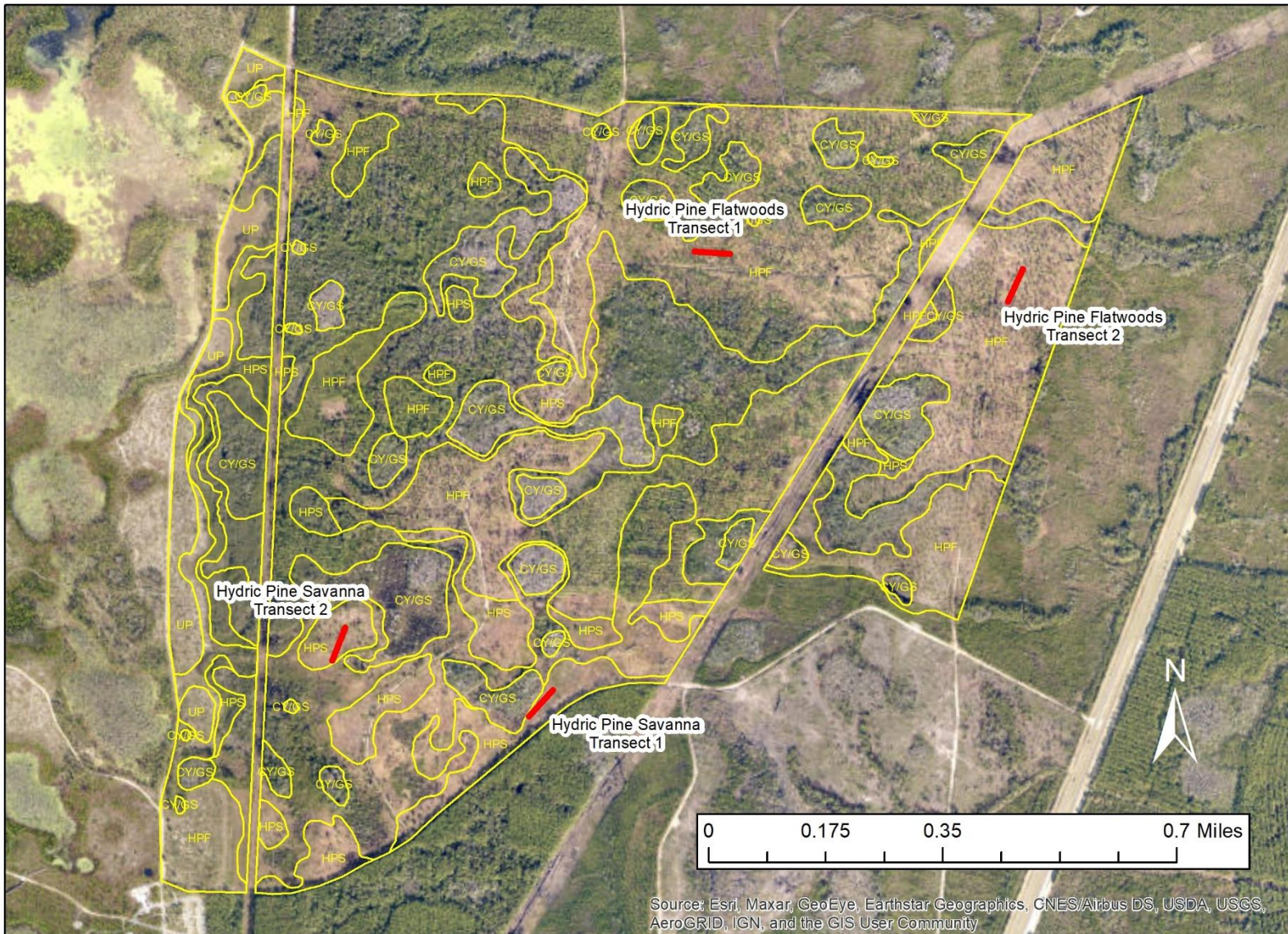


Figure WC-1. Location of permanent transects at Ward Creek West Mitigation Site. CY=Cypress, UP=Upland Pine, HPF=Hydrich Pine Flatwoods, HPS=Hydrich Pine Savanna, GS=Gum Swamp.

RESULTS AND DISCUSSION

A total of 151 plant taxa were recorded during the 2021 monitoring period in the target communities at Ward Creek West (Table WC-1). Three new taxa were recorded during the 2021 monitoring.

Table WC-1. Plant species observed in the target communities at Ward Creek West Mitigation Site on October 13-14, 2021. (bold name = new species; bold X = new observation in community type)

Scientific Name	Common Name	Cypress	Hydric Pine Flatwoods	Hydric Pine Savanna	Grand Total
Agalinis fasciculata	beach false foxglove		X		1
Andropogon glomeratus	bushy bluestem			X	1
Andropogon glomeratus var. glaucopsis	purple bluestem	X	X	X	3
Andropogon virginicus	broomsedge bluestem		X	X	2
Andropogon virginicus var. glaucus	chalky bluestem		X	X	2
Aristida spiciformis	bottlebrush threeawn		X	X	2
Aristida stricta	wiregrass		X	X	2
Aronia arbutifolia	red chokeberry		X		1
Balduina angustifolia	coastalplain honeycomb-head		X		1
Balduina uniflora	oneflower honeycomb-head		X		1
Bidens mitis	smallfruit beggarticks		X		1
Burmannia capitata	southern bluethread		X		1
Calamovilfa curtissii	Curtiss' sandgrass			X	1
Carex glaucescens	clustered sedge			X	1
Carex striata	Walter's sedge	X			1
Carphephorus odoratissimus	vanillaleaf		X	X	2
Centella asiatica	spadeleaf		X	X	2
Chamaecrista fasciculata	partridge pea		X		1
Chrysopsis lanuginosa	Lynn Haven goldenaster		X	X	2
Chrysopsis mariana	Maryland goldenaster		X		1
Cleistes bifaria	Fernald's pogonia		X		1
Clethra alnifolia	sweet pepperbush	X	X		2
Cliftonia monophylla	black titi	X	X	X	3
Coleataenia anceps	beaked panicum		X	X	2
Ctenium aromaticum	toothache grass			X	1
Cyperus ovatus	pinebarren flatsedge		X		1
Cyrilla racemiflora	titi	X	X	X	3
Dichanthelium ensifolium	cypress witchgrass		X	X	2
Dichanthelium ensifolium var. unciphyllum	cypress witchgrass			X	1
Dichanthelium oligosanthes	Heller's witchgrass		X		1
Dichanthelium scabriusculum	woolly witchgrass		X	X	2
Dichanthelium sphaerocarpon	roundseed witchgrass		X		1
Dichanthelium strigosum	roughhair witchgrass		X		1
Drosera capillaris	pink sundew		X	X	2
Eragrostis elliottii	Elliott's lovegrass			X	1
Erechtites hieraciifolius	fireweed		X		1
Eriocaulon decangulare	tenangle pipewort	X	X	X	3

Scientific Name	Common Name	Cypress	Hydric Pine Flatwoods	Hydric Pine Savanna	Grand Total
<i>Eubotrys racemosus</i>	swamp doghobble	X			1
<i>Eupatorium capillifolium</i>	dogfennel		X		1
<i>Eupatorium mohrii</i>	Mohr's thoroughwort		X	X	2
<i>Eupatorium pilosum</i>	rough boneset			X	1
<i>Euthamia caroliniana</i>	slender flattop goldenrod		X	X	2
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge		X	X	2
<i>Gaylussacia dumosa</i>	dwarf huckleberry		X	X	2
<i>Gaylussacia frondosa</i> var. <i>toментosa</i>	blue huckleberry		X		1
<i>Gaylussacia mosieri</i>	woolly huckleberry			X	1
<i>Helianthus angustifolius</i>	narrowleaf sunflower			X	1
<i>Helianthus heterophyllus</i>	variableleaf sunflower		X		1
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort		X	X	2
<i>Hypericum cistifolium</i>	roundpod St. John's wort		X	X	2
<i>Hypericum crux-andreae</i>	St. Peter's wort		X		1
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	X	X	X	3
<i>Hypericum gentianoides</i>	orangegrass		X		1
<i>Hypericum microsepalum</i>	flatwoods St. John's wort		X	X	2
<i>Hypericum tetrapetalum</i>	fourpetal St. John's wort		X	X	2
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	X		X	2
<i>Ilex coriacea</i>	large gallberry	X	X	X	3
<i>Ilex glabra</i>	gallberry	X	X	X	3
<i>Juncus scirpoides</i>	needlepod rush		X	X	2
<i>Kalmia hirsuta</i>	hairy wicky		X	X	2
<i>Kellochloa verrucosa</i>	warty panicgrass		X	X	2
<i>Lachnanthes caroliniana</i>	Carolina redroot	X	X	X	3
<i>Lachnocaulon anceps</i>	whitehead bogbutton		X		1
<i>Lechea pulchella</i> var. <i>ramosissima</i>	Leggett's pinweed		X	X	2
<i>Liatris spicata</i>	dense gayfeather		X	X	2
<i>Lobelia brevifolia</i>	shortleaf lobelia			X	1
<i>Lophiola aurea</i>	golden crest			X	1
<i>Ludwigia linifolia</i>	southeastern primrosewillow			X	1
<i>Ludwigia pilosa</i>	hairy primrosewillow		X		1
<i>Lycopodiella alopecuroides</i>	foxtail club-moss		X	X	2
<i>Lycopodiella appressa</i>	southern club-moss		X	X	2
<i>Lycopodiella caroliniana</i>	slender club-moss			X	1
<i>Lyonia ferruginea</i>	rusty staggerbush		X	X	2
<i>Lyonia fruticosa</i>	coastalplain staggerbush			X	1
<i>Lyonia lucida</i>	fetterbush	X	X	X	3
<i>Magnolia virginiana</i>	sweetbay	X	X	X	3
<i>Morella caroliniensis</i>	evergreen bayberry		X		1
<i>Morella cerifera</i>	southern bayberry		X		1
moss	#N/A		X		1
<i>Muhlenbergia capillaris</i> var. <i>trichopodes</i>	cutover muhly			X	1
<i>Nyssa biflora</i>	swamp tupelo	X			1

Scientific Name	Common Name	Cypress	Hydric Pine Flatwoods	Hydric Pine Savanna	Grand Total
Nyssa ogeche	ogeechee tupelo	X			1
Oldenlandia uniflora	clustered mille graines		X	X	2
Osmunda cinnamomea	cinnamon fern		X		1
Panicum hemitomom	maiden cane		X		1
Panicum repens	torpedo grass		X		1
Persea palustris	swamp bay	X			1
Pieris phyllireifolia	climbing fetterbush	X		X	2
Pinus elliotii	slash pine	X	X	X	3
Pluchea baccharis	rosy camphorweed		X		1
Pluchea foetida	stinking camphorweed			X	1
Polygala cruciata	drumheads			X	1
Polygala lutea	orange milkwort		X		1
Polygonella gracilis	tall jointweed		X		1
Proserpinaca pectinata	combleaf mermaidweed		X	X	2
Pteridium aquilinum	bracken fern		X	X	2
Pterocaulon pycnostachyum	blackroot		X		1
Quercus hemisphaerica	laurel oak		X		1
Quercus minima	dwarf live oak		X		1
Rhexia alifanus	savannah meadowbeauty		X	X	2
Rhexia mariana	pale meadowbeauty		X	X	2
Rhexia nuttallii	Nuttall's meadowbeauty			X	1
Rhexia petiolata	fringed meadowbeauty		X	X	2
Rhexia virginica	handsome harry	X	X	X	3
Rhynchospora cephalantha	bunched beaksedge	X	X	X	3
Rhynchospora chalarocephala	loosehead beaksedge		X	X	2
Rhynchospora chapmanii	Chapman's beaksedge		X	X	2
Rhynchospora ciliaris	fringed beaksedge		X	X	2
Rhynchospora corniculata	shortbristle horned beaksedge		X	X	2
Rhynchospora fascicularis	fascicled beaksedge	X	X	X	3
Rhynchospora fernaldii	Fernald's beaksedge		X	X	2
Rhynchospora gracilentia	slender beaksedge		X	X	2
Rhynchospora inundata	narrowfruit horned beaksedge	X			1
Rhynchospora plumosa	plumed beaksedge		X	X	2
Rubus pensilvanicus	sawtooth blackberry		X	X	2
Sabatia brevifolia	shortleaf rosegentian		X	X	2
Saccharum giganteum	sugarcane plume grass			X	1
Sarracenia flava	yellow pitcherplant			X	1
Schizachyrium stoloniferum	creeping little bluestem		X		1
Scleria ciliata	fringed nutrush		X		1
Scleria reticularis	netted nutrush			X	1
Serenoa repens	saw palmetto		X	X	2
Smilax auriculata	earleaf greenbrier		X		1
Smilax glauca	cat greenbrier		X		1
Smilax laurifolia	laurel greenbrier	X	X	X	3

Scientific Name	Common Name	Cypress	Hydric Pine Flatwoods	Hydric Pine Savanna	Grand Total
<i>Smilax pumila</i>	sarsaparilla vine		X	X	2
<i>Solidago fistulosa</i>	pinebarren goldenrod		X	X	2
<i>Solidago odora</i>	sweet goldenrod			X	1
<i>Sophronanthe hispida</i>	rough hedgehyssop		X		1
<i>Sophronanthe pilosa</i>	shaggy hedgehyssop		X		1
<i>Sphagnum</i> sp.	sphagnum moss	X	X	X	3
<i>Syngonanthus flavidulus</i>	yellow hatpins		X	X	2
<i>Taxodium ascendens</i>	pond cypress	X		X	2
<i>Tillandsia usneoides</i>	Spanish moss	X			1
<i>Utricularia cornuta</i>	horned bladderwort		X		1
<i>Utricularia juncea</i>	southern bladderwort			X	1
<i>Utricularia purpurea</i>	eastern purple bladderwort	X			1
<i>Utricularia subulata</i>	zigzag bladderwort		X	X	2
<i>Vaccinium corymbosum</i>	highbush blueberry		X		1
<i>Vaccinium myrsinites</i>	shiny blueberry		X		1
<i>Vitis rotundifolia</i>	muscadine	X	X	X	3
<i>Woodwardia areolata</i>	netted chain fern	X	X		2
<i>Woodwardia virginica</i>	Virginia chain fern	X	X	X	3
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	X	X	X	3
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass		X	X	2
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass		X	X	2
<i>Xyris elliotii</i>	Elliott's yellow-eyed grass			X	1
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	X		X	2
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass		X	X	2
<i>Xyris platylepis</i>	tall yellow-eyed grass		X		1
<i>Xyris</i> sp.	yellow-eyed grass		X		1
Total number of taxa: 151		33	115	97	245

Hydric Pine Flatwoods

Qualitative sampling. The hydric pine flatwoods areas had been disturbed in the past few years by the silviculture action of thinning of the mature planted slash pines. The open canopy of mature slash pines covered a variously dense shrub layer. The area near Transect 1 (western transect) had been bedded years ago when the pines were planted. This area had a moderately dense shrub stratum and an herbaceous layer composed primarily of purple bluestem. In the past, the eastern section near Transect 2 had more saw palmetto and gallberry and a diverse herbaceous cover with scattered patches of wiregrass and beaksedges. Recent shrub reduction efforts (chopping and chemical treatment) seem to have drastically altered this area, with less saw palmetto and even runner oak, and an increase in weedy purple bluestem. The state-endangered Fernald's pogonia was detected in hydric pine flatwoods for the first time this year. The total number of species observed in this community was 115 (Table WC-1).

Quantitative sampling. The western Transect 1 (Table WC-2, Figure WC-2) had a total of 34 species with 35% bare ground. Numerous slash pines had fallen in the area of the transect due to past storms.

Woody species (large gallberry, black titi, and saw palmetto) contributed the most cover, followed by purple bluestem. Woody species made around three quarters of the total cover, around 48% average cover per quadrat. This represented an increase in woody cover from last year, but otherwise the transect was largely unchanged.

The eastern Transect 2 (Table WC-3, Figure WC-3) had a total of 45 species with 28% bare ground. Woody species, primarily saw palmetto and flatwoods St. John's wort, contributed about one third of the total cover (around 22% average cover per quadrat). Purple bluestem, bunched beaksedge, sphagnum moss, and creeping little bluestem made up most of the herbaceous cover. Since 2018, dwarf live oak and shortleaf yellow-eyed grass, once dominants, are now only trace components, while weedy purple bluestem is now the most abundant species.

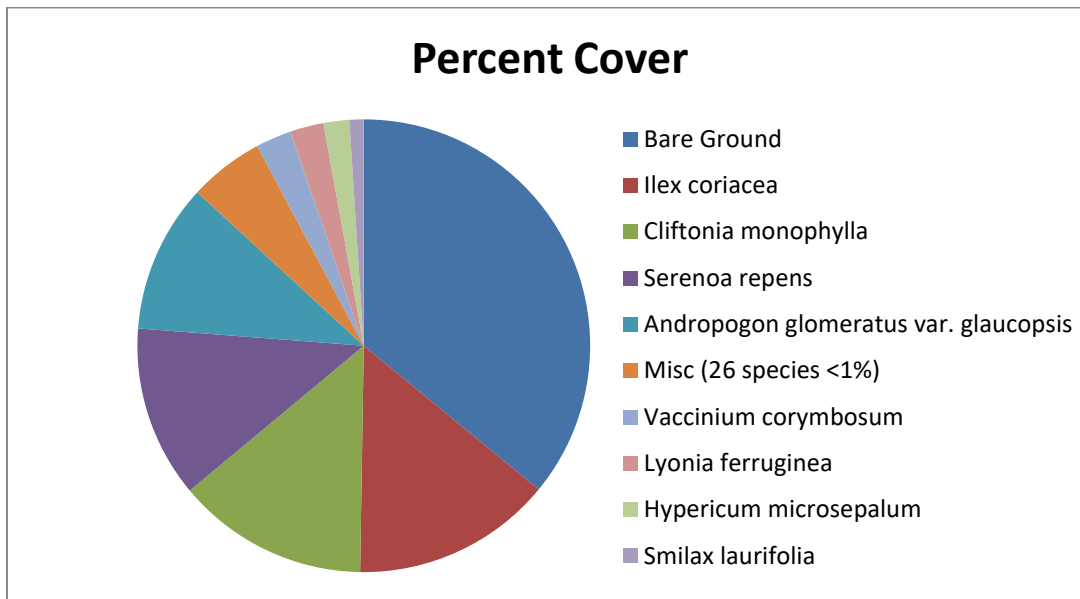


Figure WC-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1.

Table WC-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1 sampled on October 13, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Ilex coriacea</i>	large gallberry	14.00
<i>Cliftonia monophylla</i>	black titi	13.40
<i>Serenoa repens</i>	saw palmetto	12.00
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	10.40
<i>Vaccinium corymbosum</i>	highbush blueberry	2.50
<i>Lyonia ferruginea</i>	rusty staggerbush	2.33
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	1.80
<i>Smilax laurifolia</i>	laurel greenbrier	1.00
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.90
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.67
<i>Sphagnum sp.</i>	sphagnum moss	0.53
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.50

Scientific name	Common name	Average percent cover per quadrat
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.40
<i>Lachnanthes caroliana</i>	Carolina redroot	0.37
<i>Clethra alnifolia</i>	sweet pepperbush	0.23
<i>Cyrilla racemiflora</i>	titi	0.23
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.13
<i>Rhynchospora fernaldii</i>	Fernald's beaksedge	0.13
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.13
<i>Ludwigia pilosa</i>	hairy primrosewillow	0.10
<i>Pinus elliotii</i>	slash pine	0.10
<i>Rhynchospora ciliaris</i>	fringed beaksedge	0.10
<i>Scleria ciliata</i>	fringed nutrush	0.10
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.10
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	0.10
<i>Dichanthelium sphaerocarpon</i>	roundseed witchgrass	0.07
<i>Vitis rotundifolia</i>	muscadine	0.07
<i>Xyris</i> sp.	yellow-eyed grass	0.07
<i>Cleistes bifaria</i>	Fernald's pogonia	0.03
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.03
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	0.03
<i>Kelochloa verrucosa</i>	warty panicgrass	0.03
<i>Oldenlandia uniflora</i>	clustered mille grains	0.03
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.03
Bare Ground		35.17

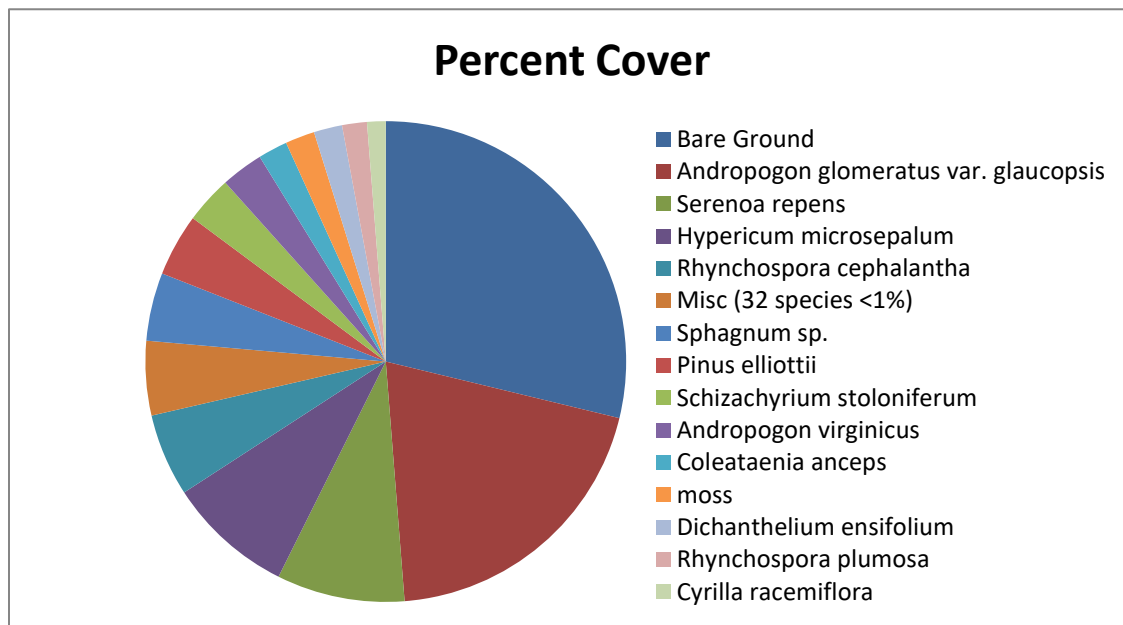


Figure WC-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 2.

Table WC-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 sampled on October 13, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	19.17
<i>Serenoa repens</i>	saw palmetto	8.27
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	8.13
<i>Rhynchospora cephalantha</i>	bunched beaksedge	5.33
<i>Sphagnum</i> sp.	sphagnum moss	4.40
<i>Pinus elliotii</i>	slash pine	4.03
<i>Schizachyrium stoloniferum</i>	creeping little bluestem	3.07
<i>Andropogon virginicus</i>	broomsedge bluestem	2.73
<i>Coleataenia anceps</i>	beaked panicum	1.90
moss		1.90
<i>Dichantherium ensifolium</i>	cypress witchgrass	1.83
<i>Rhynchospora plumosa</i>	plumed beaksedge	1.60
<i>Cyrilla racemiflora</i>	titi	1.20
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.90
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.57
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.27
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	0.27
<i>Aristida spiciformis</i>	bottlebrush threeawn	0.23
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	0.23
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	0.23
<i>Dichantherium oligosanthes</i>	Heller's witchgrass	0.20
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.20
<i>Ilex glabra</i>	gallberry	0.17
<i>Carphephorus odoratissimus</i>	vanillaleaf	0.13
<i>Oldenlandia uniflora</i>	clustered mille grains	0.10
<i>Pluchea baccharis</i>	rosy camphorweed	0.10
<i>Quercus minima</i>	dwarf live oak	0.10
<i>Rhexia virginica</i>	handsome harry	0.10
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.10
<i>Smilax auriculata</i>	earleaf greenbrier	0.10
unknown		0.10
<i>Woodwardia virginica</i>	Virginia chain fern	0.10
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass	0.10
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.07
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.07
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.07
<i>Cliftonia monophylla</i>	black titi	0.03
<i>Cyperus ovatus</i>	pinebarren flatsedge	0.03
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.03
<i>Hypericum tetrapetalum</i>	fourpetal St. John's wort	0.03
<i>Juncus scirpoides</i>	needlepod rush	0.03
<i>Lyonia lucida</i>	fetterbush	0.03
<i>Sabatia brevifolia</i>	shortleaf rosegentian	0.03
<i>Scleria ciliata</i>	fringed nutrush	0.03
<i>Sophronanthe hispida</i>	rough hedgehyssop	0.03

Scientific name	Common name	Average percent cover per quadrat
Bare Ground		27.63

Hydric Pine Savanna

Qualitative sampling. The hydric pine savanna restoration area was highly disturbed by past silviculture operations. The pines have been harvested and the vegetative cover currently consists of a dense, tall stand of purple bluestem intermixed with widely scattered clumps of wiregrass. Widely scattered young slash pine and pond cypress and shrubby clumps of fetterbush, titi and black titi occur throughout. Three state-listed species are known from this community, the threatened Curtiss' sandgrass (*Calamovilfa curtissii*) and red-flowered pitcher plant (*Sarracenia rubra*), plus the endangered upland spreading pogonia (*Cleistis bifaria*). However, only Curtiss' sandgrass was observed in 2021. Hog digging was frequent in the areas visited. The total number of plant species observed in this community was 97 (Table WC-1).

Quantitative sampling. Transect 1 (Table WC-4, Figure WC-4) had a total of 35 species and 29% bare ground. Groundcover was heavily dominated by purple bluestem, followed by the fetterbush. Elliott's yellow-eyed grass, broomsedge bluestem, slender beaksedge, and black titi also contributed significant cover. Woody species made up about a quarter of the overall plant cover, around 15% average cover per quadrat, a decrease from last year. Yellow pitcherplant was much reduced. Otherwise, vegetation along the transect was largely unchanged except for a marked decrease in warty panicgrass, a species that can quickly increase and decrease in cover from year to year.

Transect 2 (Table WC-5, Figure WC-5) had a total of 32 species and 8% bare ground. The vegetation was dominated by purple bluestem followed by black titi shrubs. The next most abundant species were tenangle pipewort, titi, fetterbush, and wiregrass. Woody species made up over one third of the overall plant cover, around 35% average cover per quadrat. Overall, the measured vegetation along this transect was similar to last year. Shrub cover increased, while wiregrass cover remained the same.

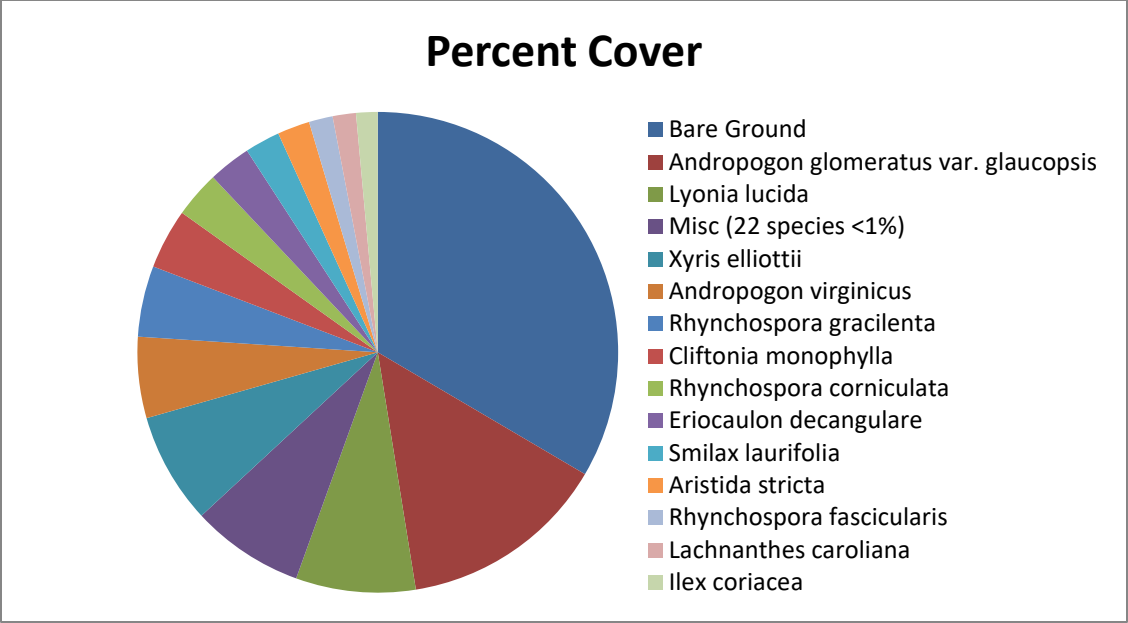


Figure WC-4. Percent cover of plant species in Hydric Pine Savanna Transect 1.

Table WC-4. Percent cover of species in Hydric Pine Savanna Transect 1 sampled on October 13, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	12.23
<i>Lyonia lucida</i>	fetterbush	7.03
<i>Xyris elliottii</i>	Elliott's yellow-eyed grass	6.53
<i>Andropogon virginicus</i>	broomsedge bluestem	4.77
<i>Rhynchospora gracilentia</i>	slender beaksedge	4.17
<i>Cliftonia monophylla</i>	black titi	3.53
<i>Rhynchospora corniculata</i>	shortbristle horned beaksedge	2.73
<i>Eriocaulon decangulare</i>	tenangle pipewort	2.50
<i>Smilax laurifolia</i>	laurel greenbrier	2.07
<i>Aristida stricta</i>	wiregrass	1.90
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	1.40
<i>Lachnanthes caroliniana</i>	Carolina redroot	1.37
<i>Ilex coriacea</i>	large gallberry	1.27
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.93
<i>Cyrilla racemiflora</i>	titi	0.80
<i>Kelochloa verrucosa</i>	warty panicgrass	0.67
<i>Rhynchospora ciliaris</i>	fringed beaksedge	0.57
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	0.57
<i>Andropogon glomeratus</i>	bushy bluestem	0.50
<i>Andropogon virginicus var. glaucus</i>	chalky bluestem	0.50
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	0.50
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.47
<i>Sphagnum sp.</i>	sphagnum moss	0.33
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.13

Scientific name	Common name	Average percent cover per quadrat
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.10
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	0.10
<i>Rhynchospora fernaldii</i>	Fernald's beaksedge	0.10
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.10
<i>Rhexia nuttallii</i>	Nuttall's meadowbeauty	0.07
<i>Dichantherium ensifolium</i>	cypress witchgrass	0.03
<i>Drosera capillaris</i>	pink sundew	0.03
<i>Eupatorium pilosum</i>	rough boneset	0.03
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.03
<i>Sarracenia flava</i>	yellow pitcherplant	0.03
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass	0.03
Bare Ground		29.23

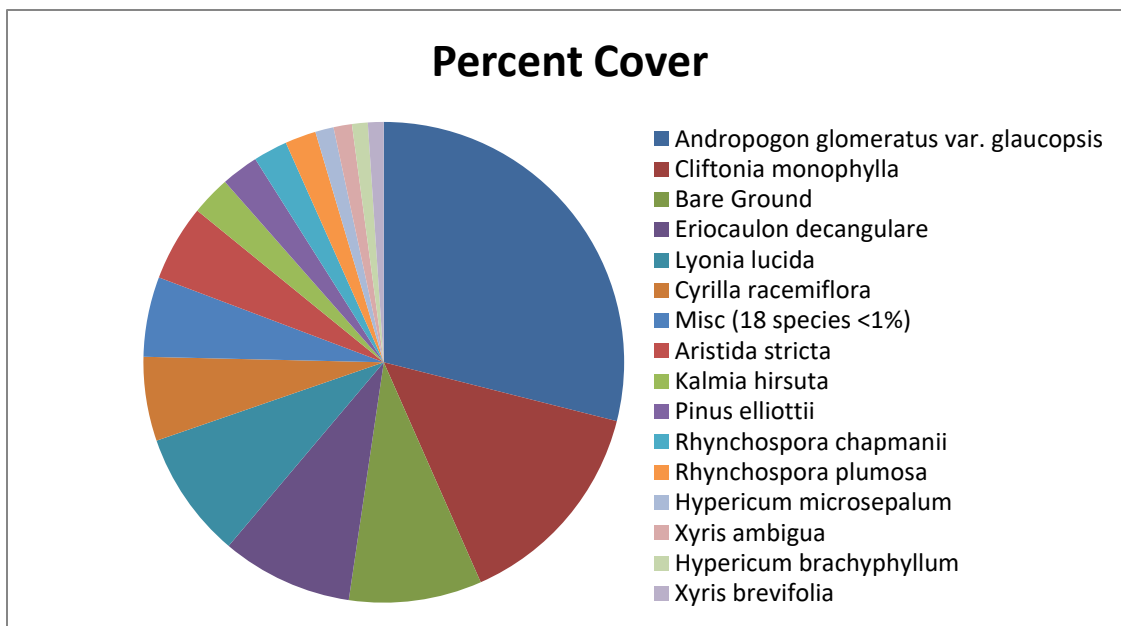


Figure WC-5. Percent cover of plant species in Hydric Pine Savanna Transect 2.

Table WC-5. Percent cover of plant species in Hydric Pine Savanna Transect 2 sampled on October 13, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	27.30
<i>Cliftonia monophylla</i>	black titi	13.63
<i>Eriocaulon decangulare</i>	tenangle pipewort	8.33
<i>Lyonia lucida</i>	fetterbush	8.07
<i>Cyrilla racemiflora</i>	titi	5.33
<i>Aristida stricta</i>	wiregrass	4.83
<i>Kalmia hirsuta</i>	hairy wicky	2.50
<i>Pinus elliotii</i>	slash pine	2.37
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	2.17

Scientific name	Common name	Average percent cover per quadrat
<i>Rhynchospora plumosa</i>	plumed beaksedge	1.97
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	1.17
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	1.17
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	1.00
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	1.00
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.83
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.77
<i>Pteridium aquilinum</i>	bracken	0.73
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.43
<i>Andropogon virginicus</i>	broomsedge bluestem	0.33
<i>Ilex glabra</i>	gallberry	0.30
<i>Dichantherium ensifolium</i>	cypress witchgrass	0.27
<i>Juncus scirpoides</i>	needlepod rush	0.23
<i>Smilax laurifolia</i>	laurel greenbrier	0.20
<i>Sphagnum</i> sp.	sphagnum moss	0.20
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.13
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.13
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	0.10
<i>Polygala cruciata</i>	drumheads	0.10
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.10
<i>Rhynchospora cephalantha</i>	bunched beaksedge	0.10
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.07
<i>Pluchea foetida</i>	stinking camphorweed	0.03
Bare Ground		8.43

Cypress

Qualitative sampling. The cypress target community was visited at four sites, two just west of and one just east of the main north/south road through the center of the property, as well as one adjacent to the power line right-of-way (Figure WC-1). The canopy was around 45-60 feet tall and dominated by pond cypress and sweetbay, with smaller sweetbay, titi, and swamp bay in the subcanopy and tall shrub layers. Shorter shrubs included sweet pepperbush, swamp bay, sweetbay, and climbing fetterbush. A dense perimeter of shrubs and vines limited access to two of the swamps. Areas of hog digging were common. The total number of species observed in this community was 33 (Table WC-1).

DUTEX WEST RESTORATION SITE
Qualitative and Quantitative Monitoring
October 2021

Dutex West Restoration Site Qualitative and Quantitative Monitoring October 2021

INTRODUCTION

The Dutex Restoration Site consists of 820 acres in Escambia County managed by the Northwest Florida Water Management District. It is located on Perdido Bay, just to the southwest of Saufley Field. This site mitigates current and future Florida Department of Transportation (FDOT) wetland impacts. Only the western tract has been monitored from 2018-2020. This tract is accessed by taking Saufley Pines Road west from North Blue Angel Parkway and then turning south onto Wyndotte Road. The NFWFMD goal is to return the Dutex Restoration Site to pre-disturbance conditions. Target communities include Hydric Pine Flatwoods (HPF), Hydric Pine Savanna (HPS), Bay Swamp (BS), Mesic Flatwoods (MF), Freshwater Marsh (FM), and Salt Marsh. (Figure DW-1). Quantitative and qualitative monitoring was used to document the current plant species composition and vegetation structure of these targeted communities. FNAI began annual monitoring in October 2018. Prior to 2018, the site vegetation was monitored by Ecological Resource Consultants, Inc. (ERC).

METHODS

The quantitative monitoring utilized 300-foot long permanent transect lines previously marked in surveys conducted by ERC. Two transects were located in the Hydric Pine Flatwoods target community and two in Hydric Pine Savanna (Figure DW-1). In 2018 during the first year of monitoring by FNAI, only the northern post was relocated for the HPS Transect 3, so the southern point was re-established and marked with a metal T-post. The HPS Transect 2 was also re-established and marked at the north and south ends, although the transect line did intersect the center marking post established by ERC. Along each transect line, fifteen 1m x 1m quadrats were placed along the left side beginning at 0 and then spaced every 20 feet, ending at 280 feet. Data recorded in each quadrat consisted of the visually estimated percent cover of each plant species including individuals rooted in the the quadrat as well as overhanging. Canopy over 2 m in height was excluded from cover estimates. Only the lower 2 m portions of larger individuals were counted as cover, including the lower portions of tree trunks rooted in quadrats. Bare ground was estimated in each quadrat as a percentage of ground not obscured by plant cover or large woody debris.

The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through each of the two target communities plus Bay Swamp, Mesic Flatwoods, Freshwater Marsh, and Salt Marsh. The field surveys were performed by FNAI botanists Kim Alexander, Amy Jenkins, Ethan Hughes, and Pete Stango on October 19, 2021.



Figure DW-1. Location of permanent transects at Dutex Restoration Site – West Tract. HPF=Hydric Pine Flatwoods, HPS=Hydric Pine Savanna, MF=Mesic Flatwoods, BS=Bay Swamp, FM=Freshwater Marsh, SM=Salt Marsh.

RESULTS AND DISCUSSION

A total of 230 plant taxa were recorded during the 2021 monitoring period in the target communities at Dutex West (Table DW-1). Twenty-nine new species were recorded during the 2021 monitoring.

Table DW-1. Plant species observed in the target communities at Dutex West Mitigation Site on October 19, 2021. (bold name = new species; bold X = new observation in community type)

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
Acer rubrum	red maple	X	X	X		X		4
Amphicarpum muehlenbergianum	blue maidencane	X	X					2
Andropogon arctatus	pinewoods bluestem		X		X			2
Andropogon glomeratus	bushy bluestem	X	X		X			3
Andropogon glomeratus var. glaucopsis	purple bluestem	X	X	X	X			4
Andropogon virginicus	broomsedge bluestem	X	X		X			3
Anthaenantia rufa	purple silkyscale		X					1
Aristida palustris	longleaf threeawn		X					1
Aristida purpurascens var. virgata	arrowfeather threeawn				X			1
Aristida stricta	wiregrass	X	X		X			3
Aronia arbutifolia	red chokeberry	X	X	X	X			4
Arundinaria gigantea	switchcane		X					1
Baccharis halimifolia	groundsel tree					X		1
Bacopa monnieri	herb-of-grace					X		1
Balduina uniflora	oneflower honeycomb-head		X					1
Bidens mitis	smallfruit beggarticks	X	X	X			X	4
Boehmeria cylindrica	false nettle	X					X	2
Bolboschoenus robustus	saltmarsh bulrush					X		1
Carex glaucescens	clustered sedge	X	X	X				3
Carphephorus odoratissimus	vanillaleaf				X			1
Carphephorus pseudoliatris	bristleleaf chaffhead		X					1
Centella asiatica	spadeleaf	X	X	X				3
Chamaecrista nictitans	sensitive pea				X			1
Chamaecyparis thyoides	Atlantic white cedar			X				1
Chionanthus virginicus	white fringe tree		X					1
Cladium jamaicense	sawgrass	X		X		X	X	4
Clethra alnifolia	sweet pepperbush		X	X				2
Cliftonia monophylla	black titi	X	X	X				3
Coelorachis rugosa	wrinkled jointgrass		X					1
Coleataenia anceps	beaked panicum	X	X					2
Coleataenia longifolia	ciliate redbop panicum	X	X	X				3
Conoclinium coelestinum	blue mistflower		X	X				2
Crinum americanum	string lily			X				1
Ctenium aromaticum	toothache grass		X		X			2
Cyperus haspan	haspan flatsedge			X				1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
Cyperus odoratus	fragrant flatsedge		X					1
Cyperus ovatus	pinebarren flatsedge	X			X			2
Cyperus polystachyos	manyspike flatsedge					X		1
Cyrilla racemiflora	titi	X	X	X				3
Dichanthelium aciculare	needleleaf witchgrass		X					1
Dichanthelium dichotomum	cypress witchgrass		X			X	X	3
Dichanthelium ensifolium	cypress witchgrass	X	X	X	X			4
Dichanthelium ensifolium var. unciophyllum	cypress witchgrass				X			1
Dichanthelium leucothrix	rough witchgrass	X	X					2
Dichanthelium portoricense	hemlock witchgrass	X			X			2
Dichanthelium scabriusculum	woolly witchgrass	X	X	X				3
Dichanthelium sp.	witchgrass	X						1
Dichanthelium strigosum	roughhair witchgrass				X			1
Digitaria ciliaris	southern crabgrass				X			1
Drosera brevifolia	dwarf sundew	X	X					2
Drosera capillaris	pink sundew		X					1
Dulichium arundinaceum	threeway sedge			X				1
Echinodorus sp.	burrhead			X				1
Eichhornia crassipes	water hyacinth			X				1
Eleocharis albida	white spikerush					X		1
Eleocharis flavescens	yellow spikerush			X				1
Eleocharis sp.	spikerush		X					1
Eleocharis tuberculosa	conecup spikerush		X					1
Elephantopus elatus	tall elephantsfoot		X		X			2
Erechtites hieraciifolius	fireweed		X		X			2
Erigeron vernus	early whitetop fleabane		X					1
Eriocaulon compressum	flattened pipewort		X	X				2
Eriocaulon decangulare	tenangle pipewort	X	X					2
Eupatorium capillifolium	dogfennel		X					1
Eupatorium compositifolium	yankeeweed				X			1
Eupatorium leucolepis	justiceweed	X						1
Eupatorium mohrii	Mohr's thoroughwort	X	X	X				3
Eupatorium pilosum	rough boneset		X					1
Eupatorium rotundifolium	roundleaf thoroughwort				X			1
Eupatorium semiserratum	smallflower thoroughwort			X				1
Eupatorium serotinum	lateflowering thoroughwort					X		1
Eupatorium x anomalum	Florida thoroughwort		X	X	X			3
Eupatorium x pinnatifidum	throughwort				X			1
Euthamia caroliniana	slender flattop goldenrod	X	X	X	X			4
Euthamia graminifolia	flattop goldenrod	X	X	X	X	X	X	6
Fuirena breviseta	saltmarsh umbrellasedge	X	X	X				3
Fuirena scirpoidea	southern umbrellasedge			X				1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
<i>Gaylussacia dumosa</i>	dwarf huckleberry				X			1
<i>Gaylussacia mosieri</i>	woolly huckleberry	X	X	X	X			4
<i>Gelsemium sempervirens</i>	yellow jessamine			X	X			2
<i>Helianthus angustifolius</i>	narrowleaf sunflower		X					1
<i>Hydrocotyle umbellata</i>	manyflower marshpennywort					X		1
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	X	X	X				3
<i>Hypericum cistifolium</i>	roundpod St. John's wort	X	X	X				3
<i>Hypericum crux-andreae</i>	St. Peter's wort			X	X			2
<i>Hypericum hypericoides</i>	St. Andrew's cross	X	X					2
<i>Hyptis alata</i>	clustered bushmint						X	1
<i>Ilex cassine</i>	dahoon	X	X	X				3
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	X	X	X				3
<i>Ilex coriacea</i>	large gallberry	X	X	X	X			4
<i>Ilex glabra</i>	gallberry	X	X	X	X			4
<i>Ilex vomitoria</i>	yaupon	X		X	X		X	4
<i>Ipomoea sagittata</i>	saltmarsh morning glory	X				X	X	3
<i>Itea virginica</i>	Virginia willow			X				1
<i>Juncus pelocarpus</i>	annual rush			X				1
<i>Juncus roemerianus</i>	needle rush					X	X	2
<i>Juncus trigonocarpus</i>	redpod rush		X					1
<i>Kalmia hirsuta</i>	hairy wicky				X			1
<i>Kellochloa verrucosa</i>	warty panicgrass	X	X		X			3
<i>Kosteletzkya pentacarpos</i>	Virginia saltmarsh mallow					X	X	2
<i>Lachnanthes caroliniana</i>	Carolina redroot	X	X	X				3
<i>Lechea pulchella</i> var. <i>ramosissima</i>	Leggett's pinweed				X			1
<i>Liatris spicata</i>	dense gayfeather		X					1
<i>Liatris tenuifolia</i>	shortleaf gayfeather		X					1
<i>Lilium iridollae</i>	Panhandle lily			X				1
<i>Lobelia brevifolia</i>	shortleaf lobelia		X					1
<i>Lobelia nuttallii</i>	Nuttall's lobelia		X		X			2
<i>Lophiola aurea</i>	golden crest		X					1
<i>Ludwigia lanceolata</i>	lanceleaf primrosewillow						X	1
<i>Ludwigia linifolia</i>	southeastern primrosewillow		X					1
<i>Ludwigia maritima</i>	seaside primrosewillow				X			1
<i>Ludwigia pilosa</i>	hairy primrosewillow		X	X				2
<i>Lycopodiella alopecuroides</i>	foxtail club-moss		X					1
<i>Lycopodiella caroliniana</i>	slender club-moss		X					1
<i>Lycopus rubellus</i>	taperleaf waterhorehound		X					1
<i>Lyonia lucida</i>	fetterbush	X	X	X	X			4
<i>Lythrum lineare</i>	wand loosestrife					X		1
<i>Magnolia grandiflora</i>	southern magnolia				X			1
<i>Magnolia virginiana</i>	sweetbay	X	X	X			X	4

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
Mikania scandens	climbing hempvine		X			X		2
Mitchella repens	partridgeberry			X				1
Morella caroliniensis	evergreen bayberry			X				1
Morella cerifera	southern bayberry	X		X		X	X	4
Nymphaea odorata	white waterlily			X				1
Nyssa biflora	swamp tupelo	X	X	X				3
Nyssa ursina	bog tupelo		X					1
Oldenlandia uniflora	clustered mille grains	X	X		X			3
Osmunda cinnamomea	cinnamon fern	X	X	X				3
Osmunda regalis var. spectabilis	royal fern	X		X	X	X	X	5
Panicum repens	torpedo grass			X		X		2
Panicum virgatum	switchgrass	X		X		X	X	4
Paspalum floridanum	Florida paspalum	X						1
Peltandra sagittifolia	spoon-flower			X				1
Persea palustris	swamp bay	X	X	X			X	4
Persicaria hydropiperoides	mild waterpepper					X		1
Phragmites berlandieri	common reed					X	X	2
Phytolacca americana	American pokeweed				X			1
Pinus elliotii	slash pine	X	X	X	X	X	X	6
Pinus palustris	longleaf pine				X			1
Pluchea baccharis	rosy camphorweed		X					1
Pluchea foetida	stinking camphorweed		X	X				2
Pluchea odorata	sweetscent		X			X		2
Polygala brevifolia	littleleaf milkwort	X	X	X				3
Polygala cruciata	drumheads		X					1
Polygala lutea	orange milkwort	X	X					2
Pontederia cordata	pickerelweed					X		1
Pteridium aquilinum	bracken fern	X	X		X	X		4
Quercus hemisphaerica	laurel oak				X			1
Quercus nigra	water oak	X			X			2
Rhexia alifanus	savannah meadowbeauty		X		X			2
Rhexia lutea	yellow meadowbeauty		X					1
Rhexia petiolata	fringed meadowbeauty	X	X					2
Rhexia virginica	handsome harry	X	X					2
Rhus copallinum	winged sumac	X	X		X	X		4
Rhynchospora baldwinii	Baldwin's beaksedge		X					1
Rhynchospora cephalantha	bunched beaksedge	X	X					2
Rhynchospora chapmanii	Chapman's beaksedge	X	X					2
Rhynchospora ciliaris	fringed beaksedge		X		X			2
Rhynchospora compressa	flatfruit beaksedge		X					1
Rhynchospora corniculata	shortbristle horned beaksedge			X				1
Rhynchospora fascicularis	fascicled beaksedge	X	X		X			3

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
Rhynchospora filifolia	threadleaf beaksedge	X	X					2
Rhynchospora glomerata	clustered beaksedge		X					1
Rhynchospora gracilentata	slender beaksedge	X	X	X				3
Rhynchospora inundata	narrowfruit horned beaksedge	X	X	X			X	4
Rhynchospora rariflora	fewflower beaksedge	X	X					2
Rhynchospora sp.	beaksedge	X	X					2
Rubus pensilvanicus	sawtooth blackberry	X	X	X	X	X		5
Rubus trivialis	southern dewberry	X		X	X	X	X	5
Rumex verticillatus	swamp dock					X		1
Sabal minor	bluestem palmetto					X	X	2
Sabatia decandra	Bartram's rosegentian		X					1
Sabatia difformis	lanceleaf rosegentian		X					1
Sabatia macrophylla	largeleaf rosegentian			X				1
Sacciolepis striata	American cupscale					X		1
Sagittaria graminea	grassy arrowhead					X		1
Sagittaria lancifolia	bulltongue arrowhead			X		X	X	3
Sarracenia leucophylla	white-top pitcherplant		X					1
Schizachyrium sanguineum	crimson bluestem		X				X	2
Schizachyrium stoloniferum	creeping little bluestem		X		X			2
Schoenoplectus sp.	naked-stemmed bulrush					X		1
Scleria ciliata	fringed nutrush	X	X		X			3
Scleria reticularis	netted nutrush		X	X				2
Scleria sp.	nutrush	X	X					2
Scleria triglomerata	whip nutrush	X	X					2
Serenoa repens	saw palmetto	X	X		X			3
Sesbania punicea	purple sesban					X	X	2
Smilax auriculata	earleaf greenbrier				X			1
Smilax bona-nox	saw greenbrier					X		1
Smilax glauca	cat greenbrier	X	X		X			3
Smilax laurifolia	laurel greenbrier	X	X	X	X		X	5
Smilax walteri	coral greenbrier	X	X					2
Solidago fistulosa	pinebarren goldenrod	X	X	X				3
Solidago sempervirens	seaside goldenrod					X	X	2
Sophronanthe pilosa	shaggy hedgehyssop		X					1
Spartina patens	saltmeadow cordgrass	X				X	X	3
Sphagnum sp.	sphagnum moss	X	X	X				3
Styrax americanus	American snowbell		X					1
Symphotrichum dumosum	rice button aster					X		1
Symphotrichum tenuifolium	perennial saltmarsh aster					X		1
Syngonanthus flavidulus	yellow hatpins	X	X					2
Taxodium ascendens	pond cypress	X	X	X		X	X	5
Tiedemannia filiformis ssp. filiformis	water cowbane			X				1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
<i>Toxicodendron radicans</i>	eastern poison ivy	X	X	X		X	X	5
<i>Triadenum virginicum</i>	Virginia marsh St. John's wort			X				1
<i>Triadica sebifera</i>	Chinese tallow tree					X		1
<i>Typha latifolia</i>	broadleaf cattail					X		1
<i>Utricularia cornuta</i>	horned bladderwort		X					1
<i>Utricularia purpurea</i>	eastern purple bladderwort	X	X					2
<i>Vaccinium corymbosum</i>	highbush blueberry	X	X	X	X			4
<i>Vaccinium darrowii</i>	Darrow's blueberry				X			1
<i>Vaccinium elliotii</i>	Elliott's blueberry	X						1
<i>Vaccinium myrsinites</i>	shiny blueberry				X			1
<i>Viburnum nudum</i>	possumhaw			X				1
<i>Vigna luteola</i>	hairypod cowpea					X		1
<i>Viola lanceolata</i>	bog white violet		X					1
<i>Viola primulifolia</i>	primroseleaf violet	X	X	X	X			4
<i>Vitis rotundifolia</i>	muscadine	X	X	X	X	X	X	6
<i>Woodwardia areolata</i>	netted chain fern	X	X	X				3
<i>Woodwardia virginica</i>	Virginia chain fern	X	X	X			X	4
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	X	X					2
<i>Xyris baldwiniana</i>	Baldwin's yellow-eyed grass		X					1
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass		X					1
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	X	X					2
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	X	X					2
<i>Xyris floridana</i>	Florida yellow-eyed grass	X	X					2
<i>Xyris platylepis</i>	tall yellow-eyed grass	X	X					2
<i>Xyris serotina</i>	acid swamp yellow-eyed grass		X					1
<i>Xyris sp.</i>	yellow-eyed grass		X					1
<i>Xyris stricta</i>	pineland yellow-eyed grass	X	X	X				3
Total number of taxa: 230		95	141	82	63	47	31	459

Hydric Pine Flatwoods

Qualitative sampling. Hydric Pine Flatwoods in the vicinities of Transect 1 and 2 were accessed to create a species list (Figure DW-1). The eastern area had an open canopy (26-35% cover) of mature slash pines. The ground layer was mainly herbaceous, although short shrubs and sprawling laurel greenbrier vines were dense in many areas. Purple bluestem and Carolina redroot were dominant along with a mix of other, mostly weedy species. Shrubs were mostly black titi, but also included large gallberry, coastalplain St. John's wort, sweetbay, and highbush blueberry. The western flatwoods is only accessible by traversing a large bay swamp and does not appear to be actively managed. The canopy is denser and groundcover sparser than the eastern area. The total number of species observed in this community was 95 (Table DW-1).

Quantitative sampling. The eastern Transect 1 (Table DW-2, Figure DW-2) had a total of 32 species with 32% bare ground. Carolina redroot, laurel greenbrier, warty panicgrass, and purple bluestem contributed the most cover. Woody species made up about 14% average cover per quadrat, a modest decline from last year. Sedge cover appears to have rebounded to 2019 levels after a large decline last year.

The western Transect 4 (Table DW-3, Figure DW-3) had a total of 26 species with 68% bare ground. Switchgrass, swamp bay, and slash pine contributed the most cover. Woody species made up about 15% average cover per quadrat, similar to last year. This transect has flooded over the past few years.

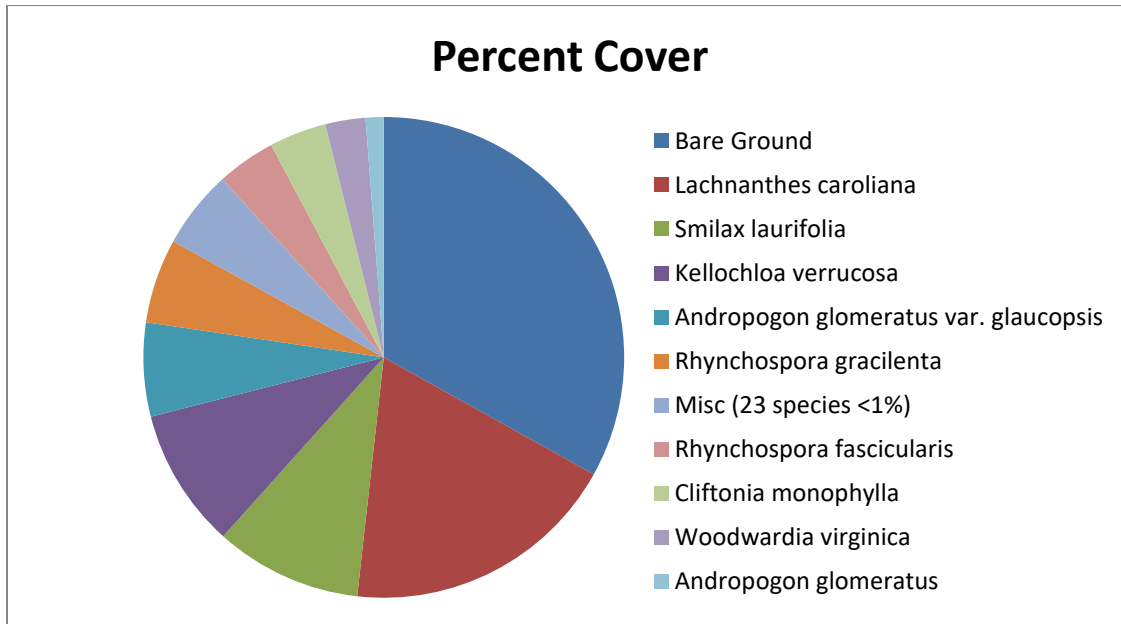


Figure DW-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1.

Table DW-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1 sampled on October 19, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Lachnanthes caroliana</i>	Carolina redroot	17.97
<i>Smilax laurifolia</i>	laurel greenbrier	9.50
<i>Kellochloa verrucosa</i>	warty panicgrass	9.03
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	6.07
<i>Rhynchospora gracilentia</i>	slender beaksedge	5.47
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	3.80
<i>Cliftonia monophylla</i>	black titi	3.70
<i>Woodwardia virginica</i>	Virginia chain fern	2.60
<i>Andropogon glomeratus</i>	bushy bluestem	1.17
<i>Sphagnum sp.</i>	sphagnum moss	0.87
<i>Rhynchospora cephalantha</i>	bunched beaksedge	0.77
<i>Carex glaucescens</i>	clustered sedge	0.60
<i>Lyonia lucida</i>	fetterbush	0.60

Scientific name	Common name	Average percent cover per quadrat
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.53
<i>Dichanthelium</i> sp.	witchgrass	0.37
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.27
<i>Scleria ciliata</i>	fringed nutrush	0.13
<i>Ilex coriacea</i>	large gallberry	0.10
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.10
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.10
<i>Scleria</i> sp.	nutrush	0.10
<i>Xyris floridana</i>	Florida yellow-eyed grass	0.10
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.07
<i>Polygala lutea</i>	orange milkwort	0.07
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.07
<i>Amphicarpum muehlenbergianum</i>	blue maidencane	0.03
<i>Cyperus ovatus</i>	pinebarren flatsedge	0.03
<i>Hypericum</i> sp.	St. John's wort	0.03
<i>Oldenlandia uniflora</i>	clustered mille grains	0.03
<i>Rhynchospora</i> sp.	beaksedge	0.03
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	0.03
<i>Aristida stricta</i>	wiregrass	0.03
Bare Ground		31.83

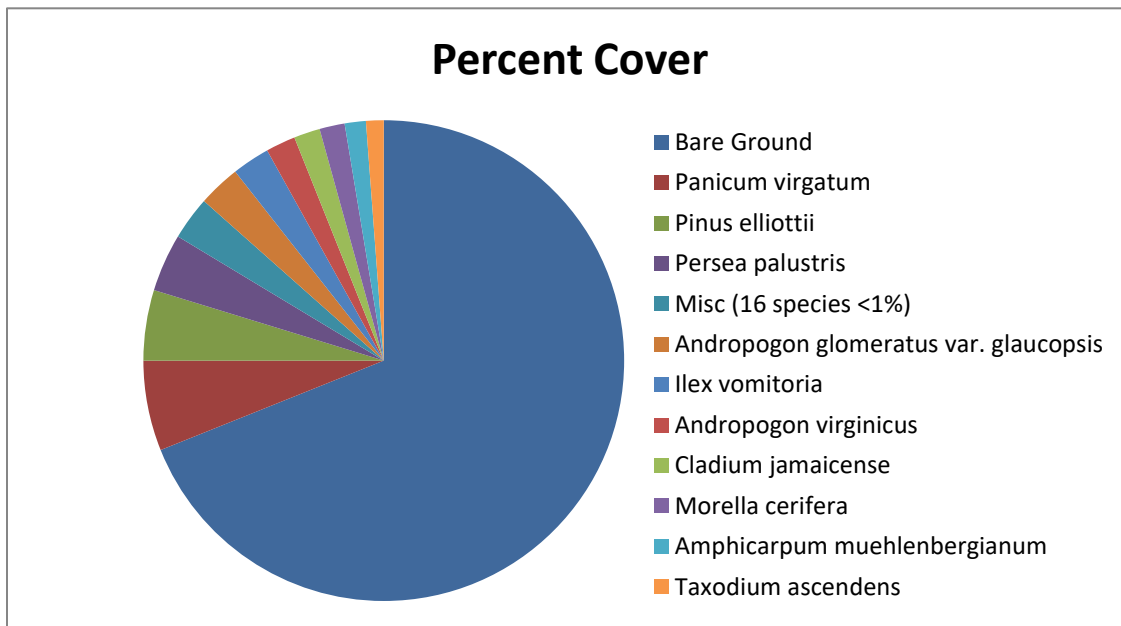


Figure DW-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 4.

Table DW-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 4 sampled on October 19, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Panicum virgatum</i>	switchgrass	5.97
<i>Pinus elliotii</i>	slash pine	4.67
<i>Persea palustris</i>	swamp bay	3.83
<i>Andropogon glomeratus</i> var. <i>glauopsis</i>	purple bluestem	2.80
<i>Ilex vomitoria</i>	yaupon	2.50
<i>Andropogon virginicus</i>	broomsedge bluestem	1.97
<i>Cladium jamaicense</i>	sawgrass	1.73
<i>Morella cerifera</i>	southern bayberry	1.67
<i>Amphicarpum muehlenbergianum</i>	blue maidencane	1.40
<i>Taxodium ascendens</i>	pond cypress	1.17
<i>Nyssa biflora</i>	swamp tupelo	0.73
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	0.30
<i>Paspalum floridanum</i>	Florida paspalum	0.27
<i>Spartina patens</i>	saltmeadow cordgrass	0.27
<i>Centella asiatica</i>	spadeleaf	0.23
<i>Osmunda cinnamomea</i>	cinnamon fern	0.23
<i>Toxicodendron radicans</i>	eastern poison ivy	0.23
<i>Carex glaucescens</i>	clustered sedge	0.10
<i>Ipomoea sagittata</i>	saltmarsh morning glory	0.10
<i>Rubus trivialis</i>	southern dewberry	0.10
<i>Smilax glauca</i>	cat greenbrier	0.10
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.07
<i>Acer rubrum</i>	red maple	0.03
<i>Boehmeria cylindrica</i>	false nettle	0.03
<i>Dichanthelium</i> sp.	witchgrass	0.03
<i>Polygala lutea</i>	orange milkwort	0.03
Bare Ground		67.83

Hydric Pine Savanna

Qualitative sampling. Hydric Pine Savanna was accessed in an area between Transects 2 and 3 to create a species list (Figure DW-1). This area had an open canopy of mature slash pines. The ground layer was mostly herbaceous with hairy primrosewillow and woolly witchgrass dominant along with a mix of other species including various beaksedges, tenangle pipewort, yellow-eyed grass, slender flattop goldenrod, and wiregrass. Shrubs included coastalplain St. John’s wort, titi, gallberry, sweet pepperbush, and southern bayberry. The state-listed endangered whitetop pitcherplant has been seen in prior years and was also observed during this survey. The total number of plant species observed in this community was 141 (Table DW-1).

Quantitative sampling. The southern Transect 2 (Table DW-4, Figure DW-4) had a total of 49 species and 76% bare ground. Until 2019, Transect 2 was dominated by a thicket of tall, woody species. The area was mechanically treated to reduce shrubs, and the 2019 monitoring transect recorded the very open habitat that resulted from this treatment. All shrubs had been mowed to the ground which was covered

in the resulting mulch. Herbs had not had time to recover and formed only a miniscule cover. Woody species made up about 2% average cover per quadrat. In 2021, the habitat is still very open, but shrub and herb cover is increasing, now averaging 17% and 11%, respectively. And overall diversity is much higher, from 13 species in 2019 to 30 in 2020 to 49 this year.

The northern Transect 3 (Table DW-5, Figure DW-5) had a total of 55 species and 27% bare ground. Laurel greenbrier, tenangle pipewort, hairy primrosewillow, sweetbay, woolly witchgrass, and conecup spikerush contributed the most cover. Woody species made up about 27% average cover per quadrat. Woolly witchgrass continues to decrease in cover, and there has been a marked increase in conecup spikerush. Otherwise, vegetation along the transect is very similar to 2020. The state listed endangered whitetop pitcherplant was seen again this year along this transect.

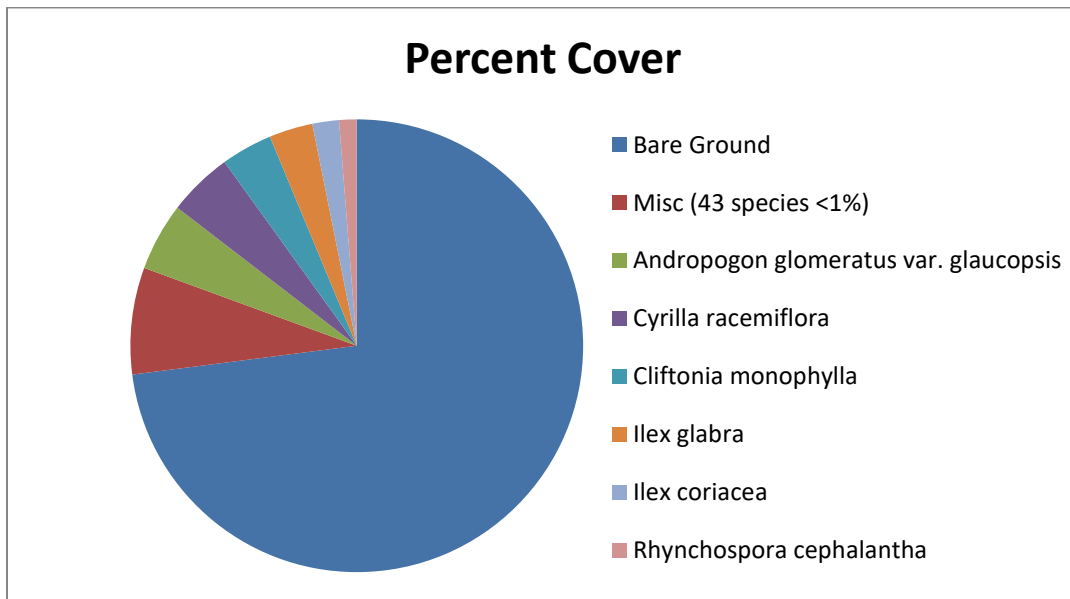


Figure DW-4. Percent cover of plant species in Hydric Pine Savanna Transect 2.

Table DW-4. Percent cover of species in Hydric Pine Savanna Transect 2 sampled on October 19, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	5.03
<i>Cyrilla racemiflora</i>	titi	4.80
<i>Cliftonia monophylla</i>	black titi	3.80
<i>Ilex glabra</i>	gallberry	3.23
<i>Ilex coriacea</i>	large gallberry	1.97
<i>Rhynchospora cephalantha</i>	bunched beaksedge	1.30
<i>Dichantheium leucothrix</i>	rough witchgrass	0.83
<i>Vitis rotundifolia</i>	muscadine	0.53
<i>Andropogon arctatus</i>	pinewoods bluestem	0.50
<i>Coleataenia anceps</i>	beaked panicum	0.50
<i>Dichantheium ensifolium var. ensifolium</i>	cypress witchgrass	0.43
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.37

Scientific name	Common name	Average percent cover per quadrat
<i>Persea palustris</i>	swamp bay	0.37
<i>Smilax laurifolia</i>	laurel greenbrier	0.37
<i>Aristida stricta</i>	wiregrass	0.27
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.27
<i>Lyonia lucida</i>	fetterbush	0.27
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.27
<i>Andropogon virginicus</i>	broomsedge bluestem	0.23
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	0.23
<i>Lachnanthes caroliana</i>	Carolina redroot	0.23
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.23
<i>Vaccinium corymbosum</i>	highbush blueberry	0.23
<i>Scleria ciliata</i>	fringed nutrush	0.17
<i>Hypericum</i> sp.	St. John's wort	0.13
<i>Kellochloa verrucosa</i>	warty panicgrass	0.13
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.13
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.13
<i>Andropogon</i> sp.	bluestem	0.10
<i>Aronia arbutifolia</i>	red chokeberry	0.10
<i>Nyssa biflora</i>	swamp tupelo	0.10
<i>Drosera brevifolia</i>	dwarf sundew	0.07
<i>Magnolia virginiana</i>	sweetbay	0.07
<i>Pinus elliotii</i>	slash pine	0.07
<i>Smilax glauca</i>	cat greenbrier	0.07
<i>Sphagnum</i> sp.	sphagnum moss	0.07
<i>Acer rubrum</i>	red maple	0.03
<i>Carex glaucescens</i>	clustered sedge	0.03
<i>Carex</i> sp.	sedge	0.03
<i>Centella asiatica</i>	spadeleaf	0.03
<i>Drosera capillaris</i>	pink sundew	0.03
<i>Rhexia lutea</i>	yellow meadowbeauty	0.03
<i>Utricularia</i> sp.	bladderwort	0.03
<i>Viola lanceolata</i>	bog white violet	0.03
<i>Woodwardia virginica</i>	Virginia chain fern	0.03
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.03
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.03
<i>Xyris floridana</i>	Florida yellow-eyed grass	0.03
<i>Xyris</i> sp.	yellow-eyed grass	0.03
Bare Ground		75.67

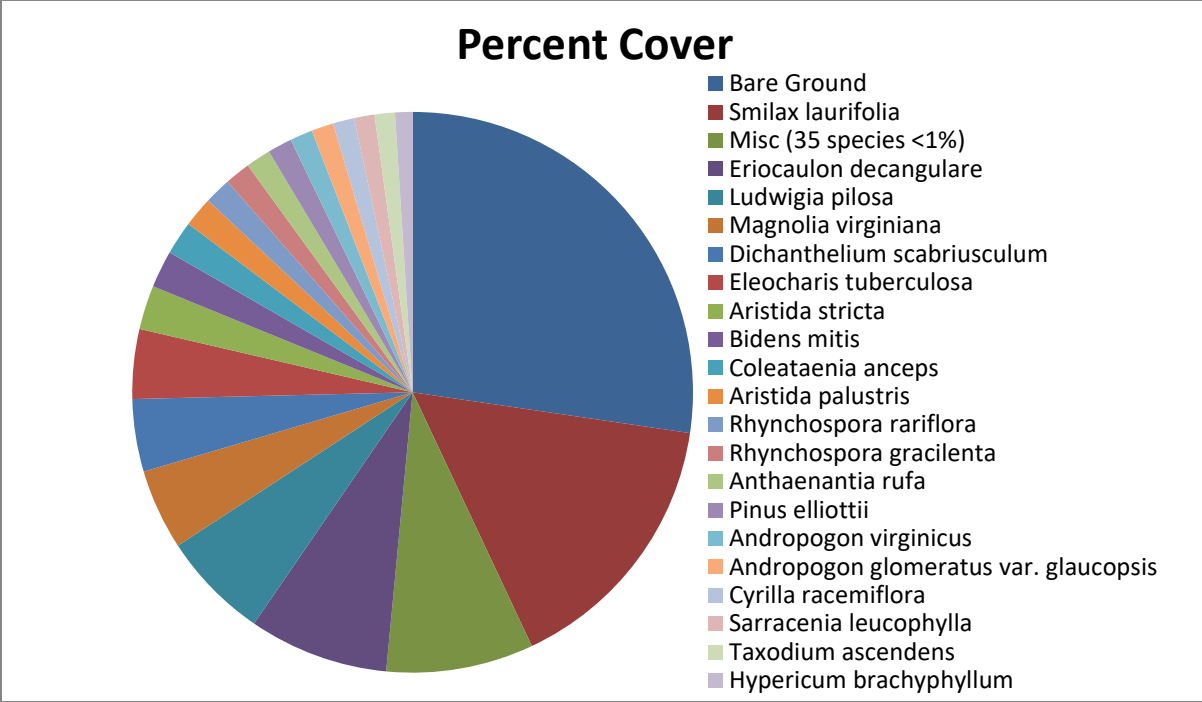


Figure DW-5. Percent cover of plant species in Hydric Pine Savanna Transect 3.

Table DW-5. Percent cover of plant species in Hydric Pine Savanna Transect 3 sampled on October 19, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Smilax laurifolia</i>	laurel greenbrier	15.63
<i>Eriocaulon decangulare</i>	tenangle pipewort	8.03
<i>Ludwigia pilosa</i>	hairy primrosewillow	6.20
<i>Magnolia virginiana</i>	sweetbay	4.63
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	4.17
<i>Eleocharis tuberculosa</i>	conecup spikerush	4.00
<i>Aristida stricta</i>	wiregrass	2.53
<i>Bidens mitis</i>	smallfruit beggarticks	2.13
<i>Coleataenia anceps</i>	beaked panicum	1.93
<i>Aristida palustris</i>	longleaf threeawn	1.73
<i>Rhynchospora rariflora</i>	fewflower beaksedge	1.53
<i>Rhynchospora gracilentia</i>	slender beaksedge	1.47
<i>Anthaenantia rufa</i>	purple silkyscale	1.43
<i>Pinus elliotii</i>	slash pine	1.40
<i>Andropogon virginicus</i>	broomsedge bluestem	1.30
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	1.27
<i>Cyrilla racemiflora</i>	titi	1.23
<i>Sarracenia leucophylla</i>	white-top pitcherplant	1.17
<i>Taxodium ascendens</i>	pond cypress	1.17
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	1.00
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	0.90
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.87

Scientific name	Common name	Average percent cover per quadrat
<i>Ilex coriacea</i>	large gallberry	0.87
<i>Dichantherium leucothrix</i>	rough witchgrass	0.73
<i>Ilex cassine</i>	dahoon	0.50
<i>Ilex glabra</i>	gallberry	0.50
<i>Lachnanthes caroliana</i>	Carolina redroot	0.40
<i>Mikania scandens</i>	climbing hempvine	0.37
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.33
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.30
<i>Cliftonia monophylla</i>	black titi	0.27
<i>Ctenium aromaticum</i>	toothache grass	0.23
<i>Dichantherium ensifolium</i>	cypress witchgrass	0.23
<i>Juncus trigonocarpus</i>	redpod rush	0.23
<i>Scleria</i> sp.	nutsedge	0.23
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.23
<i>Pluchea foetida</i>	stinking camphorweed	0.20
<i>Carex glaucescens</i>	clustered sedge	0.13
<i>Andropogon glomeratus</i>	bushy bluestem	0.10
<i>Aronia arbutifolia</i>	red chokeberry	0.10
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.10
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	0.10
<i>Lycopus rubellus</i>	taperleaf waterhorehound	0.07
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.07
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	0.07
<i>Cyperus</i> sp.	flatsedge	0.03
<i>Eleocharis</i> sp.	spikerush	0.03
<i>Erigeron vernus</i>	early whitetop fleabane	0.03
<i>Kellochloa verrucosa</i>	warty panicgrass	0.03
<i>Ludwigia linifolia</i>	southeastern primrosewillow	0.03
<i>Nyssa ursina</i>	bog tupelo	0.03
<i>Oldenlandia uniflora</i>	clustered mille grains	0.03
<i>Rhynchospora glomerata</i>	clustered beaksedge	0.03
<i>Rhynchospora</i> sp.	beaksedge	0.03
<i>Woodwardia areolata</i>	netted chain fern	0.03
Bare Ground		27.23

Bay Swamp

Qualitative sampling. An area of Bay Swamp south of the Hydric Pine Savanna Transect 2 was sampled in fall 2021. Species were also noted while walking across the restored bay swamp that separates the two main areas of pine flatwoods (Figure DW-1). This community is more similar to a freshwater tidal swamp or basin marsh than a typical bay swamp. Following large scale titi reductions in the savannas and flatwoods adjacent to the bay swamp in the vicinity of Hydric Pine Savanna Transect 2, the Perdido River can now be seen through the open canopy. There is a seepy ecotone from the Hydric Pine Savanna to the swamp that was more herbaceous with wiregrass. However, the majority of the community was more of a mix of trees and shrubs with patches of herbs typical of marshes. The ground was mucky with pools of ankle deep water, large patches of sphagnum moss, and numerous hummocks. In the southern

bay swamp, the stunted canopy was around 25% cover and composed of slash pine, pond cypress, and swamp tupelo to about 45 feet tall. A subcanopy and tall shrub layer mostly around 15 feet tall made up about 45% cover and was composed of canopy species plus red maple, sweetbay, southern bayberry, and swamp bay. The short shrub (under 6 feet tall) layer made up around 25% cover and was composed of black titi, southern bayberry, and swamp bay. The patchy herbaceous layer was around 50% cover and consisted mostly of sawgrass, cinnamon fern, and clustered sedge. While walking across the area of bay swamp where an old road was removed for hydrology restoration, a few stems of the state-listed endangered Panhandle lily were seen in fruit. The same clump was observed in 2019 and 2020, and several additional clumps were seen elsewhere in the vicinity in 2021. The total number of species observed in this community was 82 (Table DW-1).

Mesic Flatwoods

Qualitative sampling. Two areas of Mesic Flatwoods were sampled, one on the eastern side of the property between Hydric Pine Flatwoods Transect 1 and the main road through the Dutex West property, and the other on the western side near Hydric Pine Flatwoods Transect 2 (Figure DW-1). The eastern area has a canopy of mature slash pine and an open layer of shrubs intermixed with patches of herbaceous species and open ground. Shrubs were mainly saw palmetto, shiny blueberry, and dwarf huckleberry with a diversity of other species present. Wiregrass was common, along with weedy species, such as purple bluestem, and typical flatwoods species. The total number of species observed in this community was 63 (Table DW-1).

Freshwater Marsh

Qualitative sampling. The Freshwater Marsh target community was accessed along the Perdido River southwest of the Hydric Pine Flatwoods 1 Transect (Figure DW-1). The community was mostly an open, solid stand of sawgrass with patches of other herbs. Shrubs were mainly tall individuals of swamp bay, southern bayberry, yaupon, and groundsel tree. The total number of species observed in this community was 47 (Table DW-1).

Salt Marsh

Qualitative sampling. The Salt Marsh target community was accessed by walking south from the Hydric Pine Flatwoods Transect 4 (Figure DW-1). The community was largely herbaceous, dominated by sawgrass or saltmarsh cordgrass with patches of needle rush. Small patches of shrubs throughout formed about 10% cover with most shrubs up to around 9 feet tall. These consisted of southern bayberry and swamp bay. The invasive non-native Japanese climbing fern (*Lygodium japonicum*), Chinese tallow tree, and purple sesban have been observed in prior years invading in the ecotone between the hydric pine flatwoods and the salt marsh, but only purple sesban was seen in 2021. The total number of species observed in this community was 31 (Table DW-1).

YELLOW RIVER RANCH

Qualitative and Quantitative Monitoring

October 2021

Yellow River Ranch

Qualitative and Quantitative Monitoring

October 2021

INTRODUCTION

The Yellow River Ranch consists of 275 acres in Santa Rosa County managed by the Northwest Florida Water Management District. It is located just north of the Yellow River adjacent to the floodplain and mitigates current and future wetland impacts by the Florida Department of Transportation (FDOT). The NFWMD goal is to return the Yellow River Ranch to pre-disturbance conditions in former Hydric Pine Flatwoods (HPS), Bottomland Forest, and Cypress through ditch plugging, breaching of dikes, prescribed fire, herbicide treatment, and planting of native species while preserving intact Bottomland Forest in the floodplain (Figure YRR-1). Quantitative and qualitative monitoring was used to document the current plant species composition and vegetation structure of Hydric Pine Flatwoods, and belt transects were used to measure tree species composition and structure in restoration Bottomland Forest and Cypress areas with planted saplings. FNAI began annual monitoring in October 2018. Prior to 2018, the site vegetation was monitored by Ecological Resource Consultants, Inc. (ERC).

METHODS

The quantitative monitoring utilized 150-foot long permanent transect lines previously marked with metal posts in surveys conducted by Ecological Resource Consultants (ERC). Two transects were located in the Hydric Pine Flatwoods target community (Figure YRR-1). Along each transect line, eight 1m x 1m quadrats were placed along the left side beginning at 0 and then spaced every 20 feet, ending at 140 feet. Data recorded in each quadrat consisted of the visually estimated percent cover of each plant species including individuals rooted in the the quadrat as well as overhanging. Canopy over 2 m in height was excluded from cover estimates. Only the lower 2 m portions of larger individuals were counted as cover, including the lower portions of tree trunks rooted in quadrats. Bare ground was estimated in each quadrat as a percentage of ground not obscured by plant cover or large woody debris.

The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through Hydric Pine Flatwoods. The field surveys were performed by FNAI botanists Kim Alexander, Amy Jenkins, Ethan Hughes, and Pete Stango on October 20, 2021.

To measure the success of tree plantings in Cypress and Bottomland Forest areas, belt transects measuring 20 feet by 150 feet were utilized. These were previously marked with metal posts by ERC. Two transects are placed in Cypress, and two in Bottomland Forest. Belt Transect #3 in Cypress was moved to a new location in 2018 on the recommendation of project manager David Clayton (NFWMD). Within each transect, all tree species were tallied by height class. The total trees per acre were calculated by multiplying the tally of individuals by 14.28.

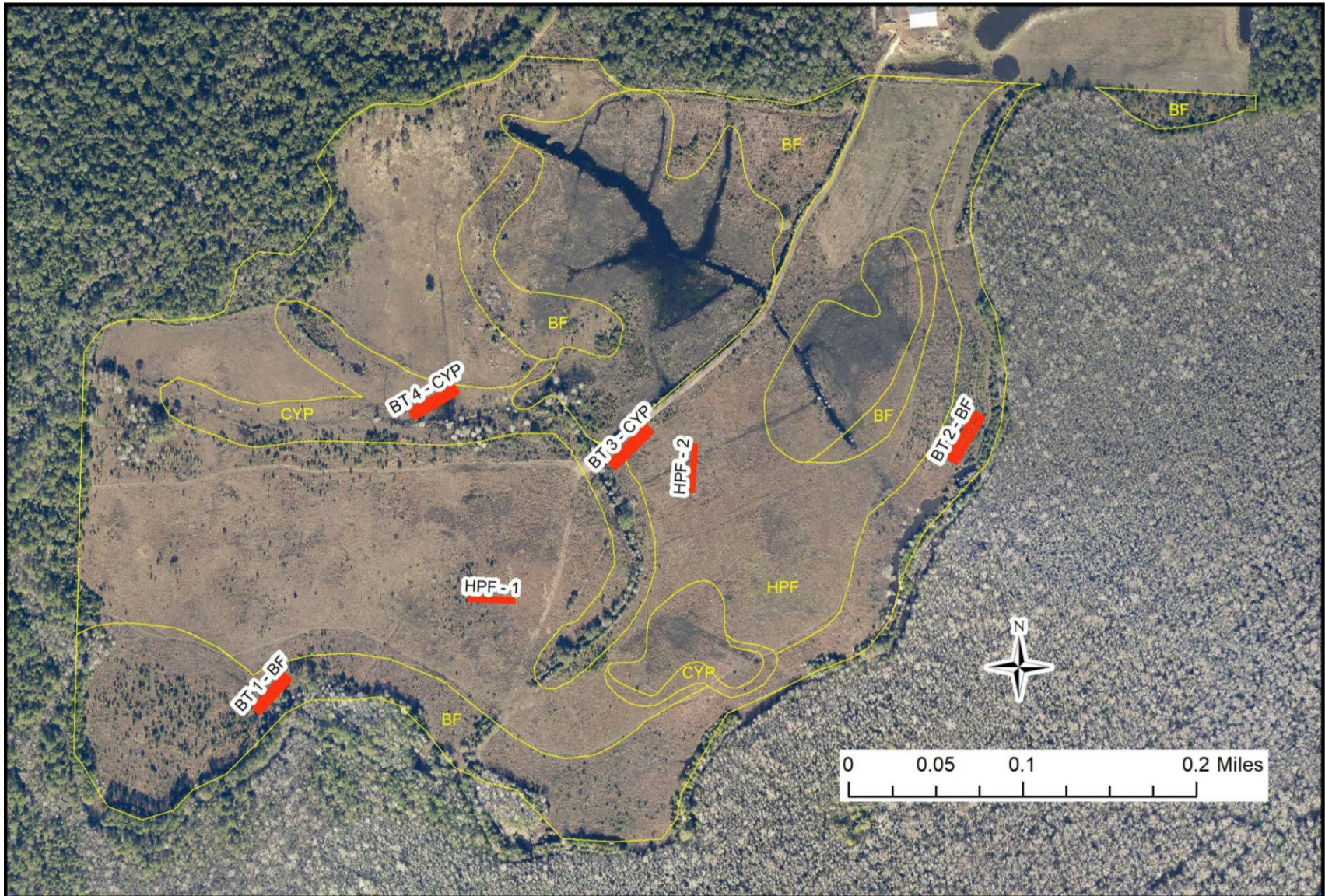


Figure YRR-1. Location of permanent transects at Yellow River Ranch. HPF=Hydrich Pine Flatwoods, CYP=Cypress, BF=Bottomland Forest, BT=Belt Transect.

RESULTS AND DISCUSSION

A total of 114 plant taxa were recorded during the Fall 2021 monitoring in Hydric Pine Flatwoods at Yellow River Ranch (Table YRR-1). Thirteen new taxa were recorded during the 2021 monitoring.

Table YRR-1. Plant species observed in Hydric Pine Flatwoods at Yellow River Ranch Mitigation Site on October 20, 2021. (bold name = new species)

Scientific Name	Common Name
Acer rubrum	red maple
Agalinis fasciculata	beach false foxglove
Agalinis purpurea	purple false foxglove
Andropogon glomeratus var. glaucopsis	purple bluestem
Andropogon sp.	bluestem
Andropogon virginicus	broomsedge bluestem
Aristida stricta	wiregrass
Baccharis halimifolia	groundsel tree
Bidens mitis	smallfruit beggarticks
Carex glaucescens	clustered sedge
Centella asiatica	spadeleaf
Cephalanthus occidentalis	common buttonbush
Chamaecrista fasciculata	partridge pea
Chamaecyparis thyoides	Atlantic white cedar
Coleataenia anceps	beaked panicum
Coleataenia longifolia	ciliate redtop panicum
Cornus foemina	swamp dogwood
Ctenium aromaticum	toothache grass
Cuphea carthagenensis	Colombian waxweed
Cyperus haspan	haspan flatsedge
Cyrilla racemiflora	titi
Dichanthelium acuminatum	tapered witchgrass
Dichanthelium ensifolium	cypress witchgrass
Dichanthelium leucothrix	rough witchgrass
Dichanthelium scabriusculum	woolly witchgrass
Dichanthelium strigosum	roughhair witchgrass
Dichondra carolinensis	Carolina ponysfoot
Diodia virginiana	Virginia buttonweed
Drosera capillaris	pink sundew
Eleocharis tuberculosa	conecup spikerush
Eragrostis elliottii	Elliott's lovegrass
Eriocaulon decangulare	tenangle pipewort
Eupatorium x anomalum	Florida thoroughwort
Eupatorium capillifolium	dogfennel
Eupatorium mohrii	Mohr's thoroughwort
Eupatorium pilosum	rough boneset

Scientific Name	Common Name
<i>Eupatorium semiserratum</i>	smallflower thoroughwort
<i>Euthamia caroliniana</i>	slender flattop goldenrod
<i>Euthamia graminifolia</i>	flattop goldenrod
<i>Fraxinus caroliniana</i>	Carolina ash
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge
Habenaria sp.	false rein orchid
<i>Helianthus angustifolius</i>	narrowleaf sunflower
<i>Hydrocotyle umbellata</i>	manyflower marshpennywort
<i>Hypericum cistifolium</i>	roundpod St. John's wort
<i>Hypericum crux-andreae</i>	St. Peter's wort
<i>Hypericum fasciculatum</i>	peelbark St. John's wort
<i>Hypericum hypericoides</i>	St. Andrew's cross
<i>Hypericum sp.</i>	St. John's wort
<i>Hypoxis juncea</i>	fringed yellow stargrass
<i>Hyptis alata</i>	clustered bushmint
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly
<i>Ilex glabra</i>	gallberry
<i>Ilex verticillata</i>	common winterberry
<i>Ilex vomitoria</i>	yaupon
<i>Juncus effusus</i> ssp. <i>solutus</i>	soft rush
<i>Juncus scirpoides</i>	needlepod rush
<i>Kelochloa verrucosa</i>	warty panicgrass
<i>Lachnanthes caroliniana</i>	Carolina redroot
<i>Lobelia brevifolia</i>	shortleaf lobelia
<i>Ludwigia linearis</i>	narrowleaf primrosewillow
<i>Ludwigia linifolia</i>	southeastern primrosewillow
<i>Ludwigia maritima</i>	seaside primrosewillow
<i>Ludwigia pilosa</i>	hairy primrosewillow
Lycopodiella alopecuroides	foxtail club-moss
<i>Lycopus rubellus</i>	taperleaf waterhorehound
<i>Magnolia virginiana</i>	sweetbay
Mecardonia acuminata	axilflower
<i>Mitreola sessilifolia</i>	swamp hornpod
<i>Morella cerifera</i>	southern bayberry
<i>Nyssa biflora</i>	swamp tupelo
<i>Oldenlandia uniflora</i>	clustered mille grains
Panicum virgatum	switchgrass
<i>Persea palustris</i>	swamp bay
<i>Persicaria hydropiperoides</i>	mild waterpepper
<i>Phyllanthus urinaria</i>	chamber bitter
<i>Pinus elliotii</i>	slash pine
<i>Pluchea baccharis</i>	rosy camphorweed
<i>Polypremum procumbens</i>	rustweed
Proserpinaca palustris	marsh mermaidweed

Scientific Name	Common Name
<i>Proserpinaca pectinata</i>	combleaf mermaidweed
<i>Quercus laurifolia</i>	swamp laurel oak
<i>Rhexia mariana</i>	pale meadowbeauty
<i>Rhexia virginica</i>	handsome harry
<i>Rhynchospora cephalantha</i>	bunched beaksedge
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge
<i>Rhynchospora debilis</i>	savannah beaksedge
<i>Rhynchospora elliottii</i>	Elliott's beaksedge
<i>Rhynchospora fascicularis</i>	fascicled beaksedge
<i>Rhynchospora filifolia</i>	threadleaf beaksedge
<i>Rhynchospora inundata</i>	narrowfruit horned beaksedge
<i>Rhynchospora microcarpa</i>	southern beaksedge
<i>Rhynchospora plumosa</i>	plumed beaksedge
<i>Rhynchospora rariflora</i>	fewflower beaksedge
<i>Rhynchospora</i> sp.	beaksedge
<i>Rubus pensilvanicus</i>	sawtooth blackberry
<i>Saccharum giganteum</i>	sugarcane plumegrass
<i>Scleria ciliata</i>	fringed nutrush
<i>Scoparia dulcis</i>	licoriceweed
<i>Solidago fistulosa</i>	pinebarren goldenrod
<i>Sphagnum</i> sp.	sphagnum moss
<i>Symphotrichum dumosum</i>	rice button aster
<i>Taxodium ascendens</i>	pond cypress
<i>Triadica sebifera</i>	Chinese tallow tree
<i>Viola lanceolata</i>	bog white violet
<i>Viola primulifolia</i>	primroseleaf violet
<i>Woodwardia virginica</i>	Virginia chain fern
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass
<i>Xyris fimbriata</i>	fringed yellow-eyed grass
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass
<i>Xyris serotina</i>	acid swamp yellow-eyed grass
<i>Xyris stricta</i>	pineland yellow-eyed grass
Total number of taxa: 114	

Hydric Pine Flatwoods

Qualitative sampling. The Hydric Pine Flatwoods in the vicinity of Transect 2 was accessed to create a species list (Figure YRR-1). This area had a very sparse canopy of young slash pines around 30 feet high. Shrubs have been growing quickly since the last fire. Common species included sawtooth blackberry, groundsel tree, southern bayberry, myrtle holly, gallberry, young slash pine, and swamp tupelo. The ground layer was mostly herbaceous and weedy with rice button aster, woolly witchgrass, slender flattop goldenrod, Carolina redroot, pinebarren goldenrod, and broomsedge bluestem. Wiregrass was

present, but very sparse. The total number of species observed in this community was 114 (Table YRR-1).

Quantitative sampling. The western Transect 1 (Table YRR-2, Figure YRR-2) had a total of 51 species with 38% bare ground. Atlantic white cedar, southern bayberry, rice button aster, slash pine, and broomsedge bluestem contributed the most cover. Woody species made up about 37% average cover per quadrat, a decrease from last year mostly attributable to a continued decline in sawtooth blackberry cover. Dead canes of blackberry were common along the transect but were not counted as cover. Otherwise, vegetation along the the transect was similar to last year.

The eastern Transect 2 (Table YRR-3, Figure YRR-3) had a total of 44 species with 36% bare ground. Rice button aster, hairy primrosewillow, fewflower beaksedge, southern bayberry, swamp tupelo, gallberry, and woolly witchgrass contributed the most cover. Woody species made up about 16% average cover per quadrat. Woolly witchgrass continues to show reductions in cover, down from around 40% last year to 3% this year. Fewflower beaksedge has increased, but otherwise, the vegetation was similar to last year.

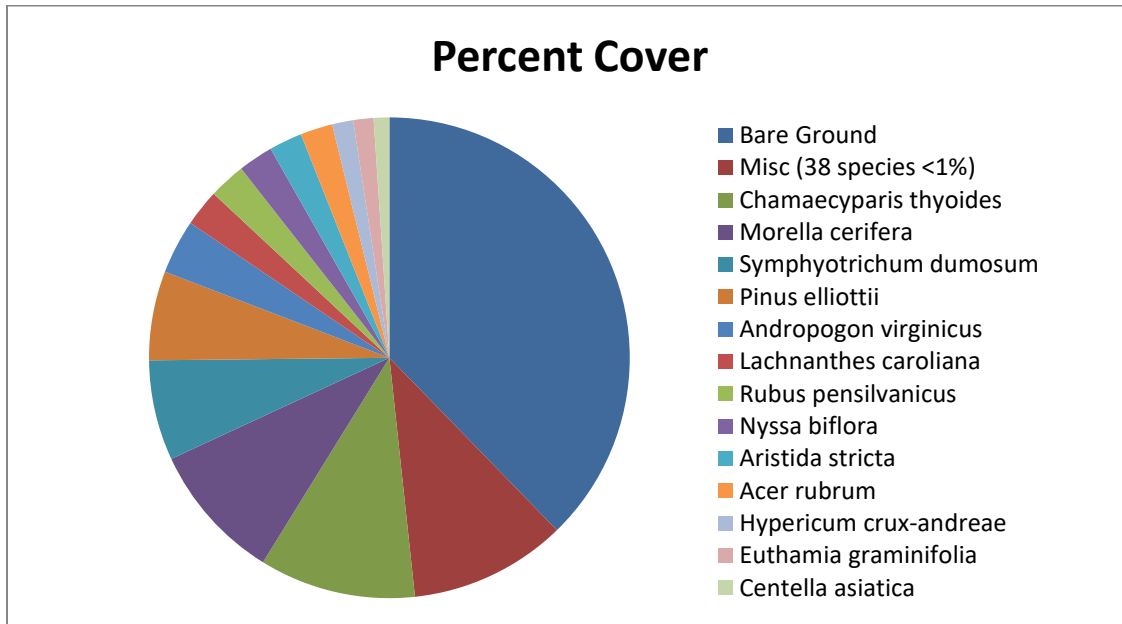


Figure YRR-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1.

Table YRR-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1 sampled on October 20, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Chamaecyparis thyoides</i>	Atlantic white cedar	10.63
<i>Morella cerifera</i>	southern bayberry	9.38
<i>Symphyotrichum dumosum</i>	rice button aster	6.81
<i>Pinus elliotii</i>	slash pine	6.06
<i>Andropogon virginicus</i>	broomsedge bluestem	3.69

Scientific name	Common name	Average percent cover per quadrat
<i>Lachnanthes caroliniana</i>	Carolina redroot	2.50
<i>Rubus pensilvanicus</i>	sawtooth blackberry	2.50
<i>Nyssa biflora</i>	swamp tupelo	2.38
<i>Aristida stricta</i>	wiregrass	2.25
<i>Acer rubrum</i>	red maple	2.19
<i>Hypericum crux-andreae</i>	St. Peter's wort	1.44
<i>Euthamia graminifolia</i>	flattop goldenrod	1.38
<i>Centella asiatica</i>	spadeleaf	1.06
<i>Coleataenia anceps</i>	beaked panicum	0.94
<i>Mecardonia acuminata</i>	axilflower	0.94
<i>Hydrocotyle umbellata</i>	manyflower marshpennywort	0.69
<i>Dichantherium scabriusculum</i>	woolly witchgrass	0.63
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.56
<i>Rhexia virginica</i>	handsome harry	0.56
<i>Viola lanceolata</i>	bog white violet	0.56
<i>Agalinis fasciculata</i>	beach false foxglove	0.44
<i>Ilex glabra</i>	gallberry	0.44
<i>Ilex vomitoria</i>	yaupon	0.44
<i>Lycopus rubellus</i>	taperleaf waterhorehound	0.44
<i>Persea palustris</i>	swamp bay	0.44
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.44
<i>Dichondra carolinensis</i>	Carolina ponysfoot	0.38
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.31
<i>Cuphea carthagenensis</i>	Colombian waxweed	0.25
<i>Eupatorium capillifolium</i>	dogfennel	0.25
<i>Rhynchospora rariflora</i>	fewflower beaksedge	0.25
<i>Hypericum hypericoides</i>	St. Andrew's cross	0.19
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.19
<i>Baccharis halimifolia</i>	groundsel tree	0.13
<i>Hypericum sp.</i>	St. John's wort	0.13
<i>Kellochloa verrucosa</i>	warty panicgrass	0.13
<i>Oldenlandia uniflora</i>	clustered mille graines	0.13
<i>Bidens mitis</i>	smallfruit beggarticks	0.06
<i>Carex glaucescens</i>	clustered sedge	0.06
<i>Cyrilla racemiflora</i>	titi	0.06
<i>Dichantherium strigosum</i>	roughhair witchgrass	0.06
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.06
<i>Hypoxis juncea</i>	fringed yellow stargrass	0.06
<i>Lobelia brevifolia</i>	shortleaf lobelia	0.06
<i>Ludwigia maritima</i>	seaside primrosewillow	0.06
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.06
<i>Rhynchospora sp.</i>	beaksedge	0.06
<i>Scleria ciliata</i>	fringed nutrush	0.06
<i>Scoparia dulcis</i>	licoriceweed	0.06
<i>Woodwardia virginica</i>	Virginia chain fern	0.06
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.06
Bare Ground		38.13

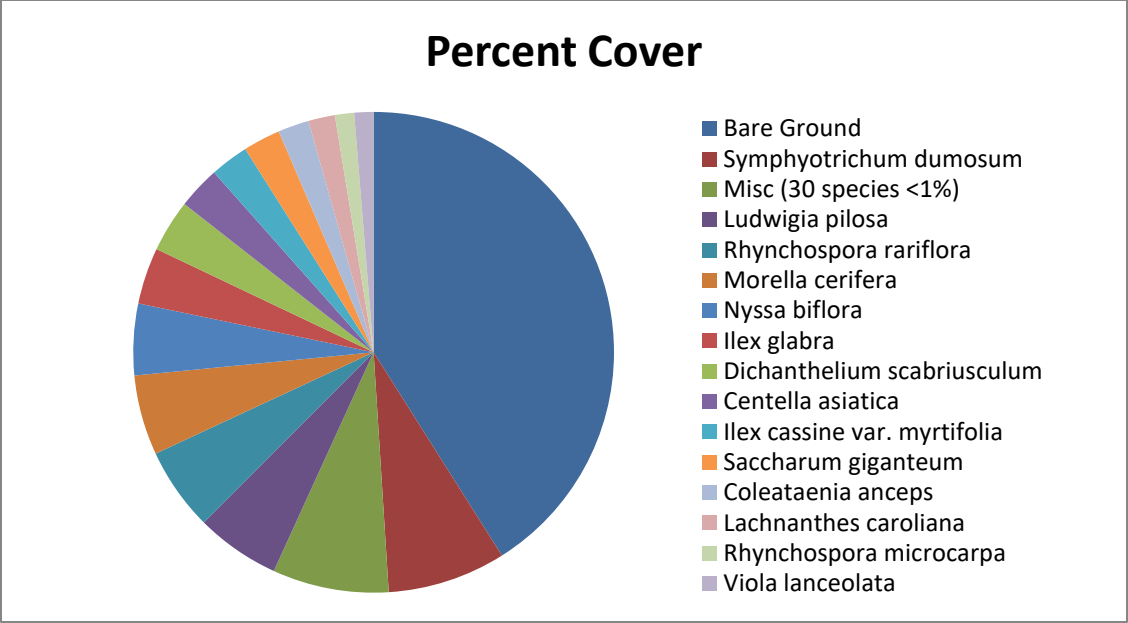


Figure YRR-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 2.

Table YRR-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 sampled on October 20, 2021.

Scientific name	Common name	Average percent cover per quadrat
<i>Symphyotrichum dumosum</i>	rice button aster	6.94
<i>Ludwigia pilosa</i>	hairy primrosewillow	4.94
<i>Rhynchospora rariflora</i>	fewflower beaksedge	4.88
<i>Morella cerifera</i>	southern bayberry	4.69
<i>Nyssa biflora</i>	swamp tupelo	4.19
<i>Ilex glabra</i>	gallberry	3.31
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	3.06
<i>Centella asiatica</i>	spadeleaf	2.50
<i>Ilex cassine var. myrtifolia</i>	myrtle-leaved holly	2.25
<i>Saccharum giganteum</i>	sugarcane plumegrass	2.19
<i>Coleataenia anceps</i>	beaked panicum	1.81
<i>Lachnanthes caroliana</i>	Carolina redroot	1.56
<i>Rhynchospora microcarpa</i>	southern beaksedge	1.13
<i>Viola lanceolata</i>	bog white violet	1.13
<i>Triadica sebifera</i>	Chinese tallow tree	0.94
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.88
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.63
<i>Lycopus rubellus</i>	taperleaf waterhorehound	0.50
<i>Rhynchospora debilis</i>	savannah beaksedge	0.44
<i>Dichanthelium leucothrix</i>	rough witchgrass	0.25
<i>Hydrocotyle umbellata</i>	manyflower marshpennywort	0.25
<i>Kelochloa verrucosa</i>	warty panicgrass	0.25
<i>Rhexia virginica</i>	handsome harry	0.25
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.25
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.25
<i>Andropogon sp.</i>	bluestem	0.19

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon virginicus</i>	broomsedge bluestem	0.19
<i>Pinus elliotii</i>	slash pine	0.19
<i>Rhynchospora</i> sp.	beaksedge	0.19
<i>Eragrostis elliotii</i>	Elliott's lovegrass	0.13
<i>Proserpinaca palustris</i>	marsh mermaidweed	0.13
<i>Proserpinaca pectinata</i>	combleaf mermaidweed	0.13
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	0.13
<i>Acer rubrum</i>	red maple	0.06
<i>Bidens mitis</i>	smallfruit beggarticks	0.06
<i>Cyperus haspan</i>	haspan flatsedge	0.06
<i>Diodia virginiana</i>	Virginia buttonweed	0.06
<i>Eupatorium pilosum</i>	rough boneset	0.06
<i>Hypericum hypericoides</i>	St. Andrew's cross	0.06
<i>Hypericum</i> sp.	St. John's wort	0.06
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.06
<i>Pluchea baccharis</i>	rosy camphorweed	0.06
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	0.06
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	0.06
Bare Ground		35.75

Bottomland Forest

Quantitative sampling. Belt transect 1 contained a mix of mostly red maple, slash pine, and cypress, with a few additional species occurring only occasionally (Table YRR-4). While slash pines, cypress, and Atlantic white cedar were mostly taller, red maples in the transect were mostly small, regenerating saplings. Both bald cypress and pond cypress stems were recorded in 2020 and 2021, but mimicry between these two types make them difficult to distinguish when young, and many taxonomists consider them to be a single species. The invasive non-native Chinese tallow tree was recorded along the transect for the first time in 2020 but was not seen this year. There was an increase in the number of stems.

Belt Transect 2 consisted of a mix of larger Atlantic white cedars with many small, regenerating red maples (Table YRR-5). This transect has a dense thicket of sawtooth blackberry that has been slowly opening up over the last two years. Nine stems of the invasive non-native Chinese tallow tree were spotted along the transect, an increase from last year. Overall, stems increased due to an explosion of Atlantic white cedar and red maple seedlings sprouting up as the blackberry cover reduces.

Cypress

Quantitative sampling. Belt transect 3 is located adjacent to the elevated road through the site in an area that was previously planted with native trees. Trees consisted of mainly larger swamp tupelo and pond cypress with a fair number of Atlantic white cedars and a mix of other species (Table YRR-6). The number of stems increased somewhat this year. Most of this increase is probably attributable to better detection as well as an increase in young red maples.

Belt Transect 4 was quite open and contained mostly young pond cypress with only one other stem taller than 6 feet, a swamp tupelo (Table YRR-7). Cypress on the transect appear to be maturing well, although fewer stems were counted compared to last year. The increase in stems is mostly attributable to an increase in swamp tupelo detected along the transect.

Table YRR-4. Belt Transect Summary for Bottomland Forest Transect 1 (YRR-BT1-630) sampled on October 20, 2021.

Species	Total Number of Stems	0-1'	>1'-2'	>2'-3'	>3'-4'	>4'-5'	>5'-6'	>6'	Condition
<i>Acer rubrum</i>	358	48	70	97	62	32	7	42	
<i>Cephalanthus occidentalis</i>	14				1			13	
<i>Chamaecyparis thyoides</i>	2						1	1	
<i>Ilex myrtifolia</i>	5				4	1			
<i>Nyssa biflora</i>	28			4	7	7	5	5	
<i>Pinus elliotii</i>	65							65	
<i>Styrax americana</i>	39	36	3						
<i>Taxodium ascendens</i>	13							13	
<i>Taxodium distichum</i>	20		4	2	4			10	
<i>Triadica sebifera</i>	0								new in plot in Fall 2020
<i>Ilex verticillata</i>	0								
Total Number All Species	544								
Number of Saplings/Acre	7768								

Table YRR-5. Belt Transect Summary for Bottomland Forest Transect 2 (YR-BT2-630) sampled on October 20, 2021.

Species	Total Number	0-1'	>1'-2'	>2'-3'	>3'-4'	>4'-5'	>5'-6'	>6'	Condition
<i>Acer rubrum</i>	79	32	15	9	6	5	4	8	
<i>Chamaecyparis thyoides</i>	102	68	3	2	1			28	Likely more seedlings in NE corner
<i>Diospyros virginiana</i>	1	1							
<i>Ilex opaca</i>	2							2	
<i>Juniperus virginiana</i>	1							1	
<i>Magnolia virginiana</i>	2							2	Two stems from the same base
<i>Nyssa biflora</i>	0								
<i>Pinus palustris</i>	1							1	
<i>Pinus elliotii</i>	1							1	
<i>Quercus laurifolia</i>	4							4	
<i>Triadica sebifera</i>	9	4		1	1		1	2	
<i>Taxodium ascendens</i>	3		1		1	1			
<i>Persea palustris</i>	0								
<i>Fraxinus caroliniana</i>	1					1			
Total Number All Species	206								
Number of Saplings/Acre	2942								

**Lygodium japonicum* is increasing in the transect.

Table YRR-6. Belt Transect Summary for Cypress Transect 3 (YR-BT3-621) sampled on October 20, 2021.

Species	Total Number	0-1'	>1'-2'	>2'-3'	>3'-4'	>4'-5'	>5'-6'	>6'	Condition
<i>Acer rubrum</i>	89	10	19	19	24	6	5	6	
<i>Chamaecyparis thyoides</i>	45			1	1	1	7	35	
<i>Ilex myrtifolia</i>	30			1	7	3		19	
<i>Ilex verticillata</i>	2					1	1		
<i>Magnolia virginiana</i>	16		4	1		1	1	9	
<i>Nyssa biflora</i>	275						1	274	
<i>Pinus elliotii</i>	30				2	1	2	25	
<i>Taxodium ascendens</i>	66							66	
<i>Triadica sebifera</i>	1							1	
Total Number All Species	554								
Number of Saplings/Acre	7911								

Table YRR-7. Belt Transect Summary for Cypress Transect 4 (YR-BT4-621) sampled October 20, 2021.

Species	Total Number	0-1'	>1'-2'	>2'-3'	>3'-4'	>4'-5'	>5'-6'	>6'	Condition
<i>Magnolia virginiana</i>	5			1	3		1		
<i>Nyssa biflora</i>	75			10	34	16	14	1	
<i>Pinus elliotii</i>	1			1					
<i>Taxodium ascendens</i>	136		3	4	13	9	12	95	
<i>Acer rubrum</i>	17	4	8	3	2				
<i>Persea palustris</i>	0								
<i>Ilex myrtifolia</i>	2				2				
<i>Chamaecyparis thyoides</i>	1				1				
Total Number All Species	237								
Number of Saplings/Acre	3384								