

**Vegetation Monitoring at Six Northwest Florida Water  
Management District Mitigation Sites  
Fall 2018**

**Kimberely Gullede  
Brenda Herring  
Amy Jenkins  
Jenna Annis  
Frank Price**

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**Florida Natural Area Inventory  
1018 Thomasville Road, Suite 200-C  
Tallahassee, FL 32303  
Dan Hipes, Director**

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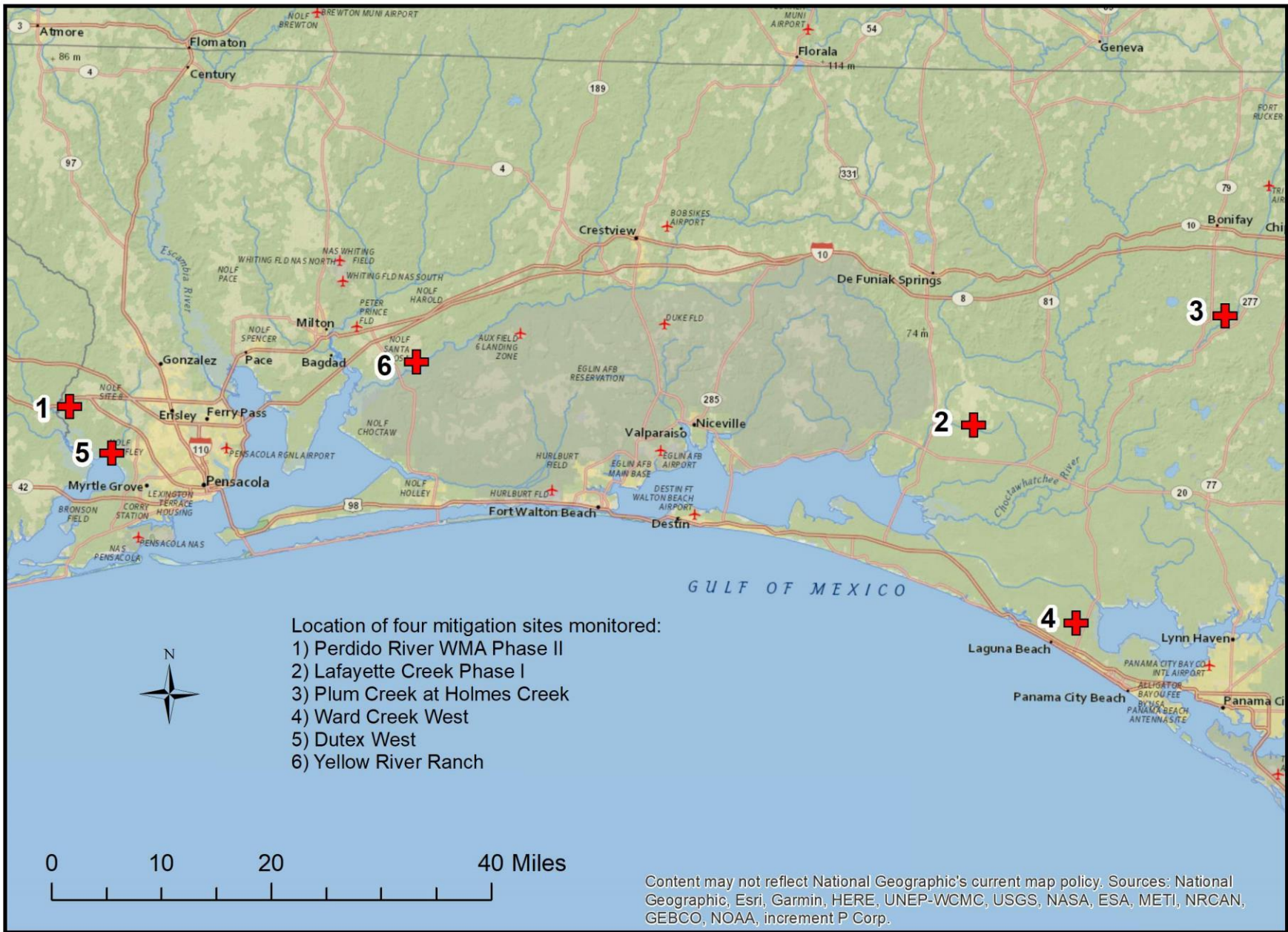
## Florida State University

This document contains separate qualitative and quantitative vegetation monitoring reports for six mitigation sites 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. The resulting changes in scientific names from those used in the 2016 and prior reports are listed below.

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 beeblossom
<i>Gratiola pilosa</i>	<i>Sophranathe 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



**Perdido River Water Management Area – Phase II Mitigation Site**  
**Qualitative and Quantitative Monitoring**  
**October 2018**

**Perdido River Water Management Area – Phase II Mitigation Site  
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**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 2017.

**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 1 m x 1 m 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 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 three target communities plus the pine flatwoods area. Field surveys were performed by FNAI botanists Kim Gullede, Amy Jenkins, and Jenna Annis on October 16-17, 2018.

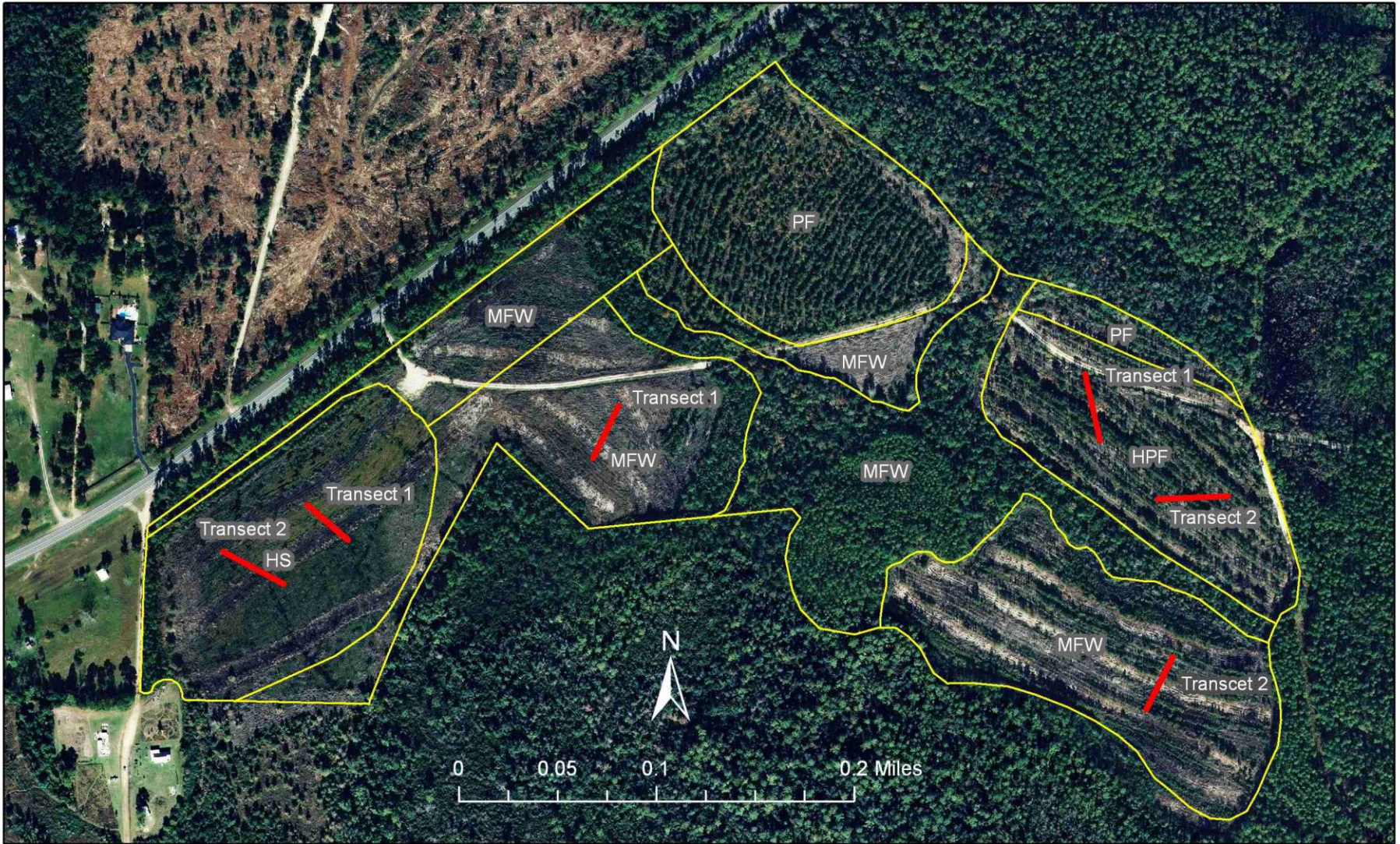


Figure PR-1. Location of permanent transects at Perdido Phase II Mitigation Site. HS=Hydric Savanna, HPF=Hydric Pine Flatwoods, MFW= Forested Wetland Mixed, PF=Pine Flatwoods.

## RESULTS AND DISCUSSION

A total of 130 plant species were observed during the 2018 monitoring of the target communities at Perdido River Phase II (Table PR-1). Fourteen new species were noted, i.e. species not observed in the previous six surveys since 2012.

Table PR-1. Species observed in target communities at Perdido River WMA – Phase II Mitigation Site on October 16-17, 2018. (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	3
<i>Aletris</i> sp.	colic-root				X	1
<i>Andropogon glomeratus</i>	bushy bluestem	X	X	X		3
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	X	X		X	3
<i>Andropogon virginicus</i>	broomsedge bluestem	X	X	X	X	4
<i>Aristida stricta</i>	wiregrass	X		X		2
<i>Aronia arbutifolia</i>	red chokeberry		X	X	X	3
<i>Arundinaria gigantea</i>	switchcane			<b>X</b>		1
<i>Bidens mitis</i>	smallfruit beggarticks	X	X	X	X	4
<i>Calamovilfa curtissii</i>	Curtiss' sandgrass	X				1
<i>Carex glaucescens</i>	clustered sedge	X	X	X	X	4
<i>Carex</i> sp.	sedge	X				1
<i>Centella asiatica</i>	spadeleaf	X	X	X	X	4
<i>Chamaecrista nictitans</i>	sensitive pea	X		<b>X</b>		2
<i>Chamaecyparis thyoides</i>	Atlantic white cedar				X	1
<i>Clethra alnifolia</i>	sweet pepperbush				<b>X</b>	1
<i>Cliftonia monophylla</i>	black titi	X	X		X	3
<i>Coleataenia anceps</i>	beaked panicum				X	1
<b><i>Conoclinium coelestinum</i></b>	<b>blue mistflower</b>				<b>X</b>	1
<i>Ctenium aromaticum</i>	toothache grass	X				1
<i>Cyrilla racemiflora</i>	titi			X	X	2
<b><i>Dichanthelium ensifolium</i></b>	<b>cypress witchgrass</b>				<b>X</b>	1
<i>Dichanthelium leucothrix</i>	rough witchgrass		X		X	2
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	X	<b>X</b>	X	X	4
<i>Drosera brevifolia</i>	dwarf sundew				X	1
<i>Drosera capillaris</i>	pink sundew				X	1
<i>Eleocharis vivipara</i>	viviparous spikerush		X		X	2
<i>Elephantopus carolinianus</i>	Carolina elephantsfoot			X		1
<i>Elephantopus elatus</i>	tall elephantsfoot	X		X		2
<i>Eragrostis elliottii</i>	Elliott's lovegrass				X	1
<b><i>Eragrostis spectabilis</i></b>	<b>purple lovegrass</b>	<b>X</b>				1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
<i>Eragrostis virginica</i>	coastal lovegrass		X			1
<i>Erechtites hieraciifolius</i>	fireweed	X		X		2
<i>Eriocaulon decangulare</i>	tenangle pipewort				X	1
<i>Eupatorium capillifolium</i>	dogfennel	X	X	X	X	4
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	X	X	X	X	4
<b><i>Eupatorium pilosum</i></b>	<b>rough boneset</b>				X	1
<i>Eupatorium rotundifolium</i>	roundleaf thoroughwort			X		1
<i>Euthamia caroliniana</i>	slender flattop goldenrod	X	X	X	X	4
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge		X		X	2
<i>Gaylussacia mosieri</i>	woolly huckleberry	X			X	2
<i>Helianthus angustifolius</i>	narrowleaf sunflower	X		X		2
<i>Hydrocotyle umbellata</i>	manyflower marshpennywort	X	X			2
<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	X	4
<i>Hypericum crux-andreae</i>	St. Peter's wort	X	X		X	3
<i>Hypericum tetrapetalum</i>	fourpetal St. John's wort	X		X		2
<i>Hyptis alata</i>	clustered bushmint	X				1
<i>Ilex cassine</i>	dahoon			X	X	2
<i>Ilex cassine var. myrtifolia</i>	myrtle-leaved holly			X	X	2
<i>Ilex coriacea</i>	large gallberry	X	X	X	X	4
<i>Ilex glabra</i>	gallberry	X	X	X	X	4
<i>Juncus dichotomus</i>	forked rush		X			1
<i>Juncus marginatus</i>	grassleaf rush			X	X	2
<i>Juniperus virginiana</i>	red cedar		X	X	X	3
<i>Kalmia hirsuta</i>	hairy wicky		X		X	2
<i>Kellochloa verrucosa</i>	warty panicgrass	X	X		X	3
<i>Lachnanthes carolina</i>	Carolina redroot	X	X	X	X	4
<i>Lachnocaulon anceps</i>	whitehead bogbutton	X		X	X	3
<b><i>Lobelia brevifolia</i></b>	<b>shortleaf lobelia</b>			X	X	2
<i>Ludwigia linearis</i>	narrowleaf primrosewillow				X	1
<i>Ludwigia maritima</i>	seaside primrosewillow	X				1
<b><i>Ludwigia repens</i></b>	<b>creeping primrosewillow</b>		X			1
<i>Ludwigia suffruticosa</i>	shrubby primrosewillow		X		X	2
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	X	X	X	X	4
<i>Lycopus rubellus</i>	taperleaf waterhorehound		X			1
<i>Lygodium japonicum</i>	Japanese climbing fern	X				1
<i>Lyonia lucida</i>	fetterbush		X		X	2
<i>Magnolia virginiana</i>	sweetbay	X	X	X	X	4
<b><i>Mitreola sessilifolia</i></b>	<b>swamp hornpod</b>				X	1
<i>Morella cerifera</i>	southern bayberry	X	X	X	X	4
<i>Oldenlandia uniflora</i>	clustered mille grains	X	X	X	X	4
<i>Osmunda cinnamomea</i>	cinnamon fern	X	X	X	X	4



Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	X	X	X		3
<i>Panicum</i> sp.	panic grass				X	1
<i>Panicum virgatum</i>	switchgrass	X				1
<i>Paspalum setaceum</i>	thin paspalum				X	1
<i>Persea palustris</i>	swamp bay	X	X	X	X	4
<i>Pinus elliotii</i>	slash pine	X	X		X	3
<i>Pinus glabra</i>	spruce pine				X	1
<i>Pinus taeda</i>	loblolly pine	X	X	X	X	4
<b><i>Platanthera</i> sp.</b>	<b>fringed orchid</b>	<b>X</b>				1
<i>Pluchea baccharis</i>	rosy camphorweed		X			1
<i>Pluchea foetida</i>	stinking camphorweed	X		X		2
<i>Polygala cruciata</i>	drumheads				X	1
<i>Polygala lutea</i>	orange milkwort	X			X	2
<i>Proserpinaca pectinata</i>	combleaf mermaidweed		X			1
<i>Pteridium aquilinum</i>	bracken fern	X		X	X	3
<b><i>Quercus hemisphaerica</i></b>	<b>laurel oak</b>			<b>X</b>		1
<i>Quercus nigra</i>	water oak	X		X	X	3
<i>Quercus virginiana</i>	live oak			X		1
<b><i>Rhexia nuttallii</i></b>	<b>Nuttall's meadowbeauty</b>	<b>X</b>				1
<b><i>Rhexia petiolata</i></b>	<b>fringed meadowbeauty</b>		<b>X</b>			1
<i>Rhexia virginica</i>	handsome harry	X	X	X	X	4
<i>Rhus copallinum</i>	winged sumac	X				1
<i>Rhynchospora cephalantha</i>	bunched beaksedge		X		X	2
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge				X	1
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge		X			1
<i>Rhynchospora fascicularis</i>	fascicled beaksedge		X		X	2
<b><i>Rhynchospora gracilentia</i></b>	<b>slender beaksedge</b>	<b>X</b>			<b>X</b>	2
<b><i>Rhynchospora inexpansa</i></b>	<b>nodding beaksedge</b>	<b>X</b>				1
<i>Rhynchospora plumosa</i>	plumed beaksedge				X	1
<i>Rubus pensilvanicus</i>	sawtooth blackberry	X	X	X	X	4
<i>Sabatia brevifolia</i>	shortleaf rosegentian				X	1
<b><i>Sabatia macrophylla</i></b>	<b>largeleaf rosegentian</b>				<b>X</b>	1
<i>Saccharum giganteum</i>	sugarcane plumegrass		X		X	2
<i>Scirpus cyperinus</i>	woolgrass		X			1
<i>Scleria ciliata</i>	fringed nutrush	<b>X</b>			X	2
<i>Serenoa repens</i>	saw palmetto				X	1
<i>Smilax auriculata</i>	earleaf greenbrier	X		X		2
<i>Smilax glauca</i>	cat greenbrier	X	X	X	X	4
<i>Smilax laurifolia</i>	laurel greenbrier				X	1
<i>Solidago fistulosa</i>	pinebarren goldenrod	X	X	X	X	4
<i>Sphagnum</i> sp.	sphagnum moss	X	X	X	X	4
<i>Symphyotrichum dumosum</i>	rice button aster	X		X	X	3

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
<i>Taxodium ascendens</i>	pond cypress		X		X	2
<i>Taxodium distichum</i>	bald cypress		X		X	2
<i>Toxicodendron radicans</i>	eastern poison ivy	X	X	X	X	4
<i>Vaccinium corymbosum</i>	highbush blueberry	X	X	X		3
<i>Vaccinium elliotii</i>	Elliott's blueberry			X		1
<i>Viola lanceolata</i>	bog white violet	X		X	X	3
<i>Viola primulifolia</i>	primroseleaf violet				X	1
<i>Vitis rotundifolia</i>	muscadine	X	X	X	X	4
<b><i>Wisteria</i> sp.</b>	<b>wisteria</b>			X		1
<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 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	1
<b>Total number of taxa: 130</b>		69	64	60	91	284

### Hydric Savanna

**Qualitative sampling.** The target community of Hydric Savanna (Figure PR-1) had a total of 64 observed plant species (Table PR-1). It was dominated by herbaceous species, primarily sphagnum moss, smallfruit beggarticks, pinebarren goldenrod, handsome harry, and purple bluestem. Shrubs were primarily limited to the slightly elevated windrows formed when the land was cleared for silviculture and consisted mainly of coastalplain St. John's wort and swamp bay. Occasional slash pine and red maple saplings were widely scattered.

**Quantitative sampling.** Transect 1 (Table PR-2, Figure PR-2) had a total of 31 species. Their total cover made up more than 100% of the area since sphagnum moss underlay the other species. The dominant species were sphagnum moss, smallfruit beggarticks, pinebarren goldenrod, handsome harry, and purple bluestem. Woody species made up less than 4% average cover per quadrat.

Transect 2 (Table PR-3, Figure PR-3) had a total of 25 species which also covered more than 100% of the area. The dominant species were sphagnum moss, smallfruit beggarticks, purple bluestem, Virginia chainfern, Carolina redroot, handsome harry, fascicled beaksedge, and pinebarren goldenrod. Woody species made up less than 2% average cover per quadrat.

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

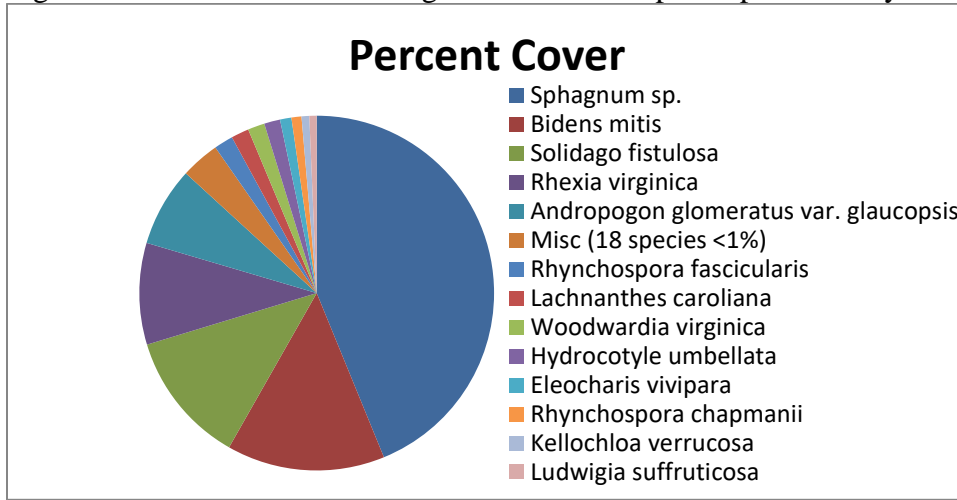


Table PR-2. Percent total vegetative cover of plant species in Hydric Savanna Transect 1 sampled on October 16, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Sphagnum</i> sp.	sphagnum moss	65.94
<i>Bidens mitis</i>	smallfruit beggarticks	21.69
<i>Solidago fistulosa</i>	pinebarren goldenrod	18.19
<i>Rhexia virginica</i>	handsome harry	13.94
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	10.88
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	2.63
<i>Lachnanthes carolina</i>	Carolina redroot	2.44
<i>Woodwardia virginica</i>	Virginia chain fern	2.31
<i>Hydrocotyle umbellata</i>	manyflower marshpennywort	2.19
<i>Eleocharis vivipara</i>	viviparous spikerush	1.56
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	1.38
<i>Kellochloa verrucosa</i>	warty panicgrass	1.06
<i>Ludwigia suffruticosa</i>	shrubby primrosewillow	1.00
<i>Toxicodendron radicans</i>	eastern poison ivy	0.75
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	0.63
<i>Acer rubrum</i>	red maple	0.50
<i>Pinus elliotii</i>	slash pine	0.50
<i>Rhynchospora cephalantha</i>	bunched beaksedge	0.50
<i>Andropogon virginicus</i>	broomsedge bluestem	0.44
<i>Aronia arbutifolia</i>	red chokeberry	0.44
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.44
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.44
<i>Juncus dichotomus</i>	forked rush	0.19
<i>Dichanthelium leucothrix</i>	rough witchgrass	0.06
<i>Oldenlandia uniflora</i>	clustered mille grains	0.06
<i>Persea palustris</i>	swamp bay	0.06
<i>Pinus taeda</i>	loblolly pine	0.06

Scientific name	Common name	Average percent cover per quadrat
Poaceae		0.06
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.06
<i>Saccharum giganteum</i>	sugarcane plumegrass	0.06
<i>Vitis rotundifolia</i>	muscadine	0.06
Bare Ground		0.44

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

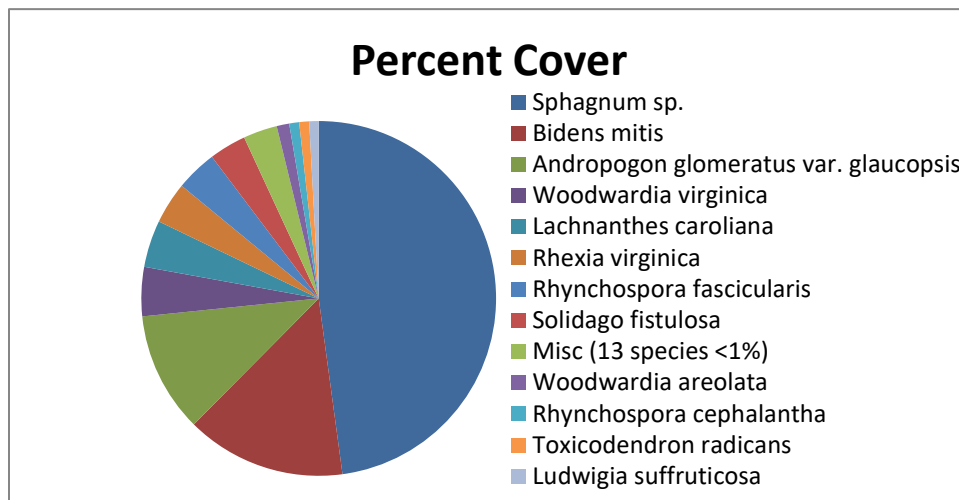


Table PR-3. Percent cover of plant species in Hydric Savanna Transect 2 sampled on October 16, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Sphagnum</i> sp.	sphagnum moss	62.81
<i>Bidens mitis</i>	smallfruit beggarticks	19.13
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	14.38
<i>Woodwardia virginica</i>	Virginia chain fern	5.88
<i>Lachnanthes caroliana</i>	Carolina redroot	5.63
<i>Rhexia virginica</i>	handsome harry	5.00
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	4.94
<i>Solidago fistulosa</i>	pinebarren goldenrod	4.44
<i>Woodwardia areolata</i>	netted chain fern	1.50
<i>Rhynchospora cephalantha</i>	bunched beaksedge	1.19
<i>Toxicodendron radicans</i>	eastern poison ivy	1.19
<i>Ludwigia suffruticosa</i>	shrubby primrosewillow	1.13
<i>Andropogon virginicus</i>	broomsedge bluestem	0.88
<i>Hydrocotyle umbellata</i>	manyflower marshpennywort	0.75
<i>Eleocharis vivipara</i>	viviparous spikerush	0.69
<i>Oldenlandia uniflora</i>	clustered mille grains	0.50
<i>Acer rubrum</i>	red maple	0.25

Scientific name	Common name	Average percent cover per quadrat
<i>Kelochloa verrucosa</i>	warty panicgrass	0.25
<i>Ludwigia repens</i>	creeping primrosewillow	0.19
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.19
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.13
<i>Eupatorium capillifolium</i>	dogfennel	0.06
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.06
<i>Pluchea baccharis</i>	rosy camphorweed	0.06
<i>Proserpinaca pectinata</i>	combleaf mermaidweed	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 91 observed plant species (Table PR-1). The vegetative cover was dominated by tall clumps of purple bluestem. Smalltooth beggarticks, sphagnum moss, pinebarren goldenrod, and fascicled beakrush were common. Shrubs, such as black titi, sawtooth blackberry, southern bayberry, swamp bay, large gallberry, and St. John's wort were mainly on slightly elevated windrows from past silviculture activities. Dense patches of muscadine were observed scattered in this community. Sapling slash and spruce pines were widely scattered throughout.

**Quantitative sampling.** Transect 1 had a total of 43 species and 26% bare ground (Table PR-4, Figure PR-4). The dominant species was purple bluestem, with sphagnum moss, and spruce pine 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 23% average cover per quadrat.

Transect 2 (Table PR-5, Figure PR-5) had a total of 42 species with 4% bare ground. The overall aspect was more open than Transect 1, but it had a similar amount of purple bluestem, with sphagnum moss, sawtooth blackberry, and rough boneset also dominant. Woody species made up around 28% average cover per quadrat.

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

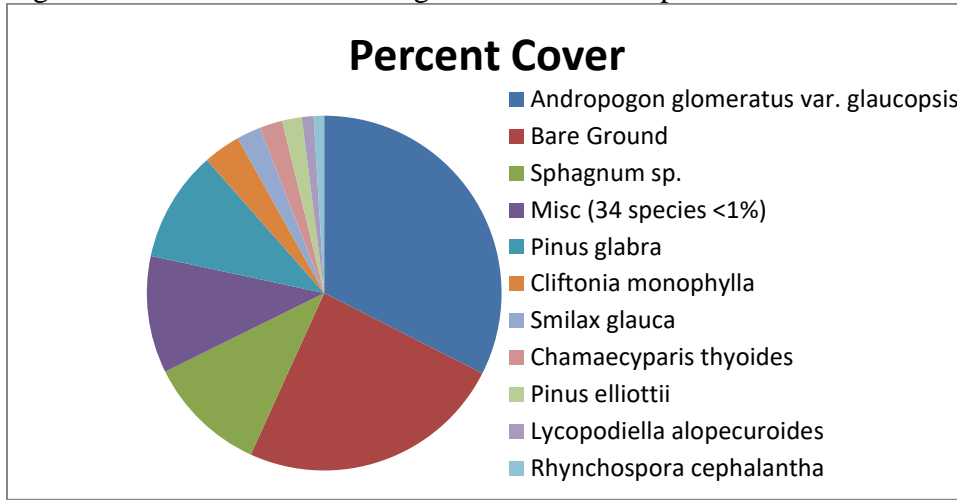


Table PR-4. Percent cover of plant species in Mixed Forested Wetland Transect 1 sampled on October 17, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	34.06
<i>Sphagnum</i> sp.	sphagnum moss	11.44
<i>Pinus glabra</i>	spruce pine	10.63
<i>Cliftonia monophylla</i>	black titi	3.56
<i>Smilax glauca</i>	cat greenbrier	2.31
<i>Chamaecyparis thyoides</i>	Atlantic white cedar	2.19
<i>Pinus elliotii</i>	slash pine	1.88
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	1.13
<i>Rhynchospora cephalantha</i>	bunched beaksedge	1.00
<i>Dichanthelium leucothrix</i>	rough witchgrass	0.94
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.94
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.81
<i>Eupatorium pilosum</i>	rough boneset	0.75
<i>Oldenlandia uniflora</i>	clustered mille grains	0.75
<i>Kelochloa verrucosa</i>	warty panicgrass	0.69
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.63
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.63
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.50
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.44
<i>Ilex glabra</i>	gallberry	0.44
<i>Woodwardia areolata</i>	netted chain fern	0.44
<i>Woodwardia virginica</i>	Virginia chain fern	0.44
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	0.44
<i>Rhexia virginica</i>	handsome harry	0.25
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.25
<i>Aronia arbutifolia</i>	red chokeberry	0.19
<i>Bidens mitis</i>	smallfruit beggarticks	0.19
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.19

Scientific name	Common name	Average percent cover per quadrat
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.19
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.19
<i>Vitis rotundifolia</i>	muscadine	0.19
<i>Acer rubrum</i>	red maple	0.06
<i>Conoclinium coelestinum</i>	blue mistflower	0.06
<i>Drosera brevifolia</i>	dwarf sundew	0.06
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.06
<i>Lachnanthes caroliana</i>	Carolina redroot	0.06
<i>Ludwigia linearis</i>	narrowleaf primrosewillow	0.06
<i>Lyonia lucida</i>	fetterbush	0.06
moss		0.06
<i>Taxodium ascendens</i>	pond cypress	0.06
unknown herb		0.06
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.06
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.06
Bare Ground		25.50

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

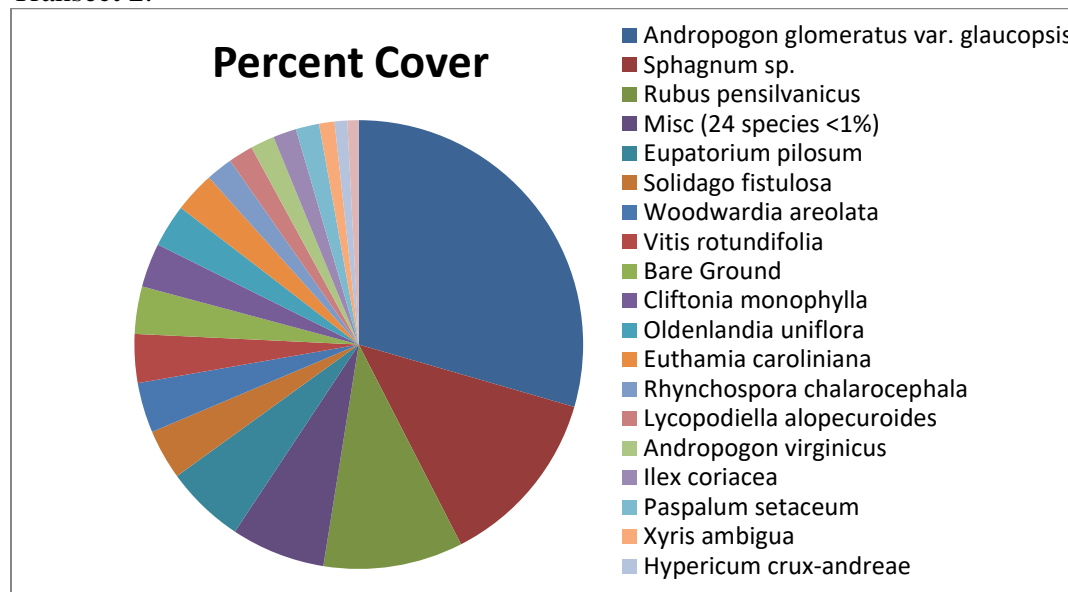


Table PR-5. Percent cover of plant species in Mixed Forested Wetland Transect 2 sampled on October 17, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	38.31
<i>Sphagnum sp.</i>	sphagnum moss	16.88
<i>Rubus pensilvanicus</i>	sawtooth blackberry	13.07

Scientific name	Common name	Average percent cover per quadrat
<i>Eupatorium pilosum</i>	rough boneset	7.44
<i>Solidago fistulosa</i>	pinebarren goldenrod	4.69
<i>Woodwardia areolata</i>	netted chain fern	4.69
<i>Vitis rotundifolia</i>	muscadine	4.56
<i>Cliftonia monophylla</i>	black titi	4.13
<i>Oldenlandia uniflora</i>	clustered mille grains	4.00
<i>Euthamia caroliniana</i>	slender flattop goldenrod	3.81
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	2.50
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	2.31
<i>Andropogon virginicus</i>	broomsedge bluestem	2.25
<i>Ilex coriacea</i>	large gallberry	2.19
<i>Paspalum setaceum</i>	thin paspalum	2.19
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	1.44
<i>Hypericum crux-andreae</i>	St. Peter's wort	1.19
<i>Rhynchospora gracilentia</i>	slender beaksedge	1.06
<i>Centella asiatica</i>	spadeleaf	0.94
<i>Coleataenia anceps</i>	beaked panicum	0.94
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	0.94
<i>Rhexia virginica</i>	handsome harry	0.88
<i>Acer rubrum</i>	red maple	0.63
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.50
<i>Smilax laurifolia</i>	laurel greenbrier	0.50
<i>Magnolia virginiana</i>	sweetbay	0.44
<i>Scleria ciliata</i>	fringed nutrush	0.38
<i>Woodwardia virginica</i>	Virginia chain fern	0.38
<i>Viola primulifolia</i>	primroseleaf violet	0.31
<i>Eleocharis vivipara</i>	viviparous spikerush	0.19
<i>Eragrostis elliotii</i>	Elliott's lovegrass	0.19
<i>Kelochloa verrucosa</i>	warty panicgrass	0.19
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.19
<i>Panicum sp.</i>	panic grass	0.19
<i>Pinus elliotii</i>	slash pine	0.19
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.19
<i>Smilax glauca</i>	cat greenbrier	0.19
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.19
<i>Juncus marginatus</i>	grassleaf rush	0.13
<i>Drosera brevifolia</i>	dwarf sundew	0.06
<i>Lachnanthes caroliana</i>	Carolina redroot	0.06
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	0.06
Bare Ground		4.44

## Hydric Pine Flatwoods

**Qualitative monitoring.** The target community of hydric pine flatwoods had a total of 69 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. 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 purple bluestem, Virginia chain fern, slender flattop goldenrod, and cinnamon fern, with occasional wiregrass. Curtiss' sandgrass (*Calamovilfa curtissii*), state listed as threatened, was noted in this community. A single reproductive stalk of *Platanthera*, likely either *ciliaris* or *blephariglottis* var. *conspicua* (both state listed as threatened), was observed near the road.

**Quantitative monitoring.** Where branches of the felled pines lay across the quadrats, they were removed in order to view the plants beneath. Transect 1 had a total of 25 species with 23% bare ground (Figure PR-6, Table PR-6). The dominant species was muscadine with other species much more sparse. Woody species (including muscadine) made up around 40% average cover per quadrat.

Transect 2 (Figure PR-7, Table PR-7) had a total of 38 species with 35% bare ground. The dominant species were muscadine and wiregrass. Woody species made up around 18% average cover per quadrat.

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

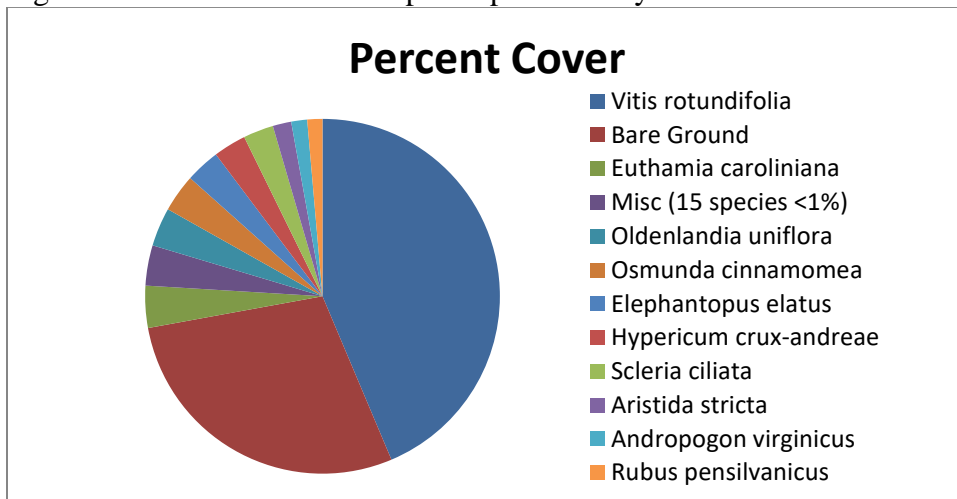


Table PR-6. Percent cover of species in Hydric Pine Flatwoods Transect 1 sampled on October 17, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Vitis rotundifolia</i>	muscadine	35.63
<i>Euthamia caroliniana</i>	slender flattop goldenrod	3.13
<i>Oldenlandia uniflora</i>	clustered mille grains	2.88
<i>Osmunda cinnamomea</i>	cinnamon fern	2.81
<i>Elephantopus elatus</i>	tall elephantsfoot	2.56
<i>Hypericum crux-andreae</i>	St. Peter's wort	2.44
<i>Scleria ciliata</i>	fringed nutrush	2.25
<i>Aristida stricta</i>	wiregrass	1.38
<i>Andropogon virginicus</i>	broomsedge bluestem	1.19

Scientific name	Common name	Average percent cover per quadrat
<i>Rubus pensilvanicus</i>	sawtooth blackberry	1.13
<i>Kelochloa verrucosa</i>	warty panicgrass	0.56
<i>Ctenium aromaticum</i>	toothache grass	0.44
<i>Pinus taeda</i>	loblolly pine	0.31
<i>Smilax glauca</i>	cat greenbrier	0.25
<i>Eupatorium capillifolium</i>	dogfennel	0.19
<i>Rhynchospora inexpansa</i>	nodding beaksedge	0.19
<i>Smilax auriculata</i>	earleaf greenbrier	0.19
<i>Symphotrichum dumosum</i>	rice button aster	0.19
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.19
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.13
<i>Toxicodendron radicans</i>	eastern poison ivy	0.13
<i>Acer rubrum</i>	red maple	0.06
<i>Centella asiatica</i>	spadeleaf	0.06
<i>Magnolia virginiana</i>	sweetbay	0.06
<i>Viola lanceolata</i>	bog white violet	0.06
Bare Ground		23.25

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

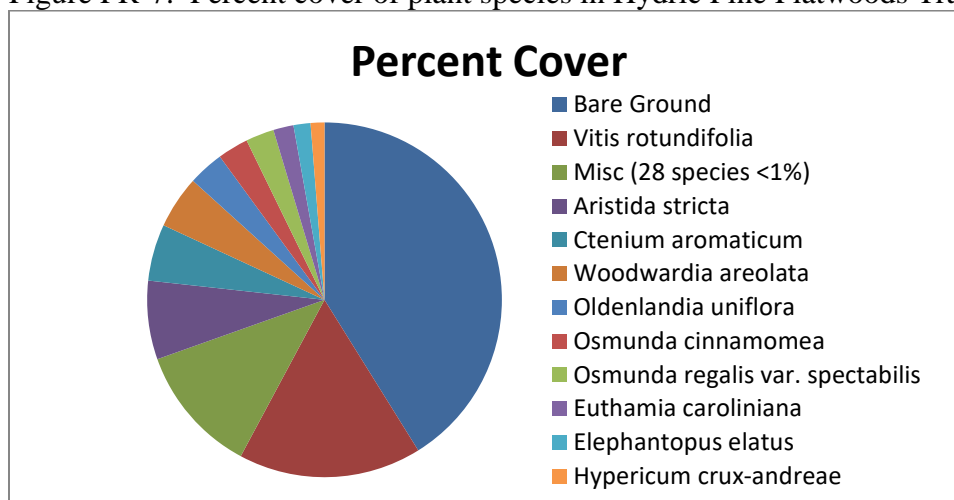


Table PR-7. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 sampled on October 17, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Vitis rotundifolia</i>	muscadine	14.13
<i>Aristida stricta</i>	wiregrass	6.06
<i>Ctenium aromaticum</i>	toothache grass	4.38
<i>Woodwardia areolata</i>	netted chain fern	4.06
<i>Oldenlandia uniflora</i>	clustered mille grains	2.75

Scientific name	Common name	Average percent cover per quadrat
<i>Osmunda cinnamomea</i>	cinnamon fern	2.38
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	2.19
<i>Euthamia caroliniana</i>	slender flattop goldenrod	1.56
<i>Elephantopus elatus</i>	tall elephantsfoot	1.31
<i>Hypericum crux-andreae</i>	St. Peter's wort	1.06
<i>Cliftonia monophylla</i>	black titi	0.94
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.94
<i>Andropogon virginicus</i>	broomsedge bluestem	0.88
<i>Sphagnum</i> sp.	sphagnum moss	0.81
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.69
<i>Woodwardia virginica</i>	Virginia chain fern	0.63
<i>Carex</i> sp.	sedge	0.44
<i>Centella asiatica</i>	spadeleaf	0.44
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.44
moss		0.44
<i>Smilax glauca</i>	cat greenbrier	0.44
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.44
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.38
<i>Kelloggloa verrucosa</i>	warty panicgrass	0.37
<i>Toxicodendron radicans</i>	eastern poison ivy	0.25
<i>Vaccinium corymbosum</i>	highbush blueberry	0.25
<i>Acer rubrum</i>	red maple	0.19
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	0.19
<i>Symphotrichum dumosum</i>	rice button aster	0.19
<i>Pinus elliotii</i>	slash pine	0.13
<i>Ludwigia maritima</i>	seaside primrosewillow	0.06
<i>Panicum</i> sp.	panic grass	0.06
<i>Pinus taeda</i>	loblolly pine	0.06
<i>Quercus nigra</i>	water oak	0.06
<i>Rhexia nuttallii</i>	Nuttall's meadowbeauty	0.06
<i>Rhexia virginica</i>	handsome harry	0.06
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.06
<i>Viola lanceolata</i>	bog white violet	0.06
Bare Ground		34.81

## 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. The diverse open shrub layer was dominated by large gallberry, sweetbay, swamp bay, highbush blueberry, St. John's worts, and young laurel oaks. In the herbaceous layer were scattered clumps of wiregrass, with purple bluestem, broomsedge bluestem, and pinebarren goldenrod also common. A total of 60 species (Table PR-1) were observed in this habitat.

**Lafayette Creek - Phase I Mitigation Site  
Qualitative and Quantitative Monitoring  
November 2018**

**Lafayette Creek – Phase I Mitigation Site  
Qualitative and Quantitative Monitoring  
November 2018**

**INTRODUCTION**

The Lafayette Creek Phase I Mitigation Site of 509 acres was obtained to compensate for the loss of wetland function from the impacts associated with re-alignment of highway US331 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 2017.

**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 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 Gulledd and Brenda Herring on November 5-7, 2018.

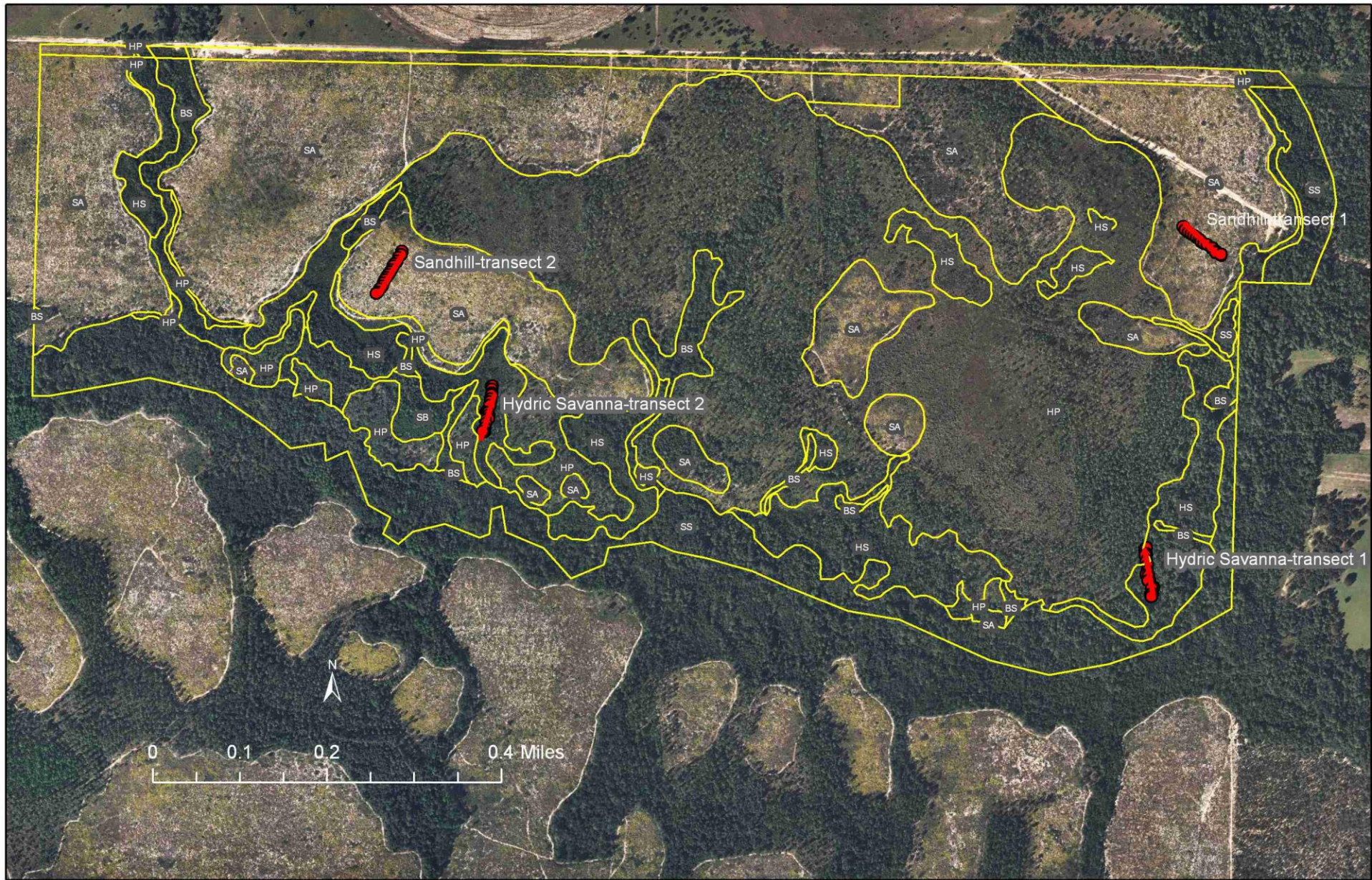


Figure LC-1. Location of permanent transects at Lafayette Creek – Phase I Mitigation Site. SA=Sandhill, HS=Hydric Savanna, HP=High Pine, BS=Bay Swamp, SS=Stream Swamp, SB=Shrub Bog.

## RESULTS AND DISCUSSION

A total of 271 plant species were recorded in the surveyed areas of Lafayette Creek during the 2018 monitoring period (Table LC-1). Twenty-two new species were found during the 2018 monitoring.

Table LC-1. Species observed in target communities at Lafayette Creek – Phase I Mitigation Site, November 5-7, 2018. (bold name = new species; bold X = new observation in community type)

Scientific Name	Common Name	Bay swamp	High pine	Hydric savanna	Sandhill	Stream swamp	Grand Total
<i>Acer rubrum</i>	red maple	X				X	2
<i>Agalinis divaricata</i>	pineland false foxglove		X		X		2
<i>Agalinis fasciculata</i>	beach false foxglove		<b>X</b>		X		2
<i>Aletris lutea</i>	yellow colic-root		X	X			2
<i>Alnus serrulata</i>	hazel alder	X				X	2
<i>Amsonia ciliata</i>	fringed bluestar				X		1
<i>Andropogon gerardii</i>	big bluestem		X				1
<i>Andropogon glomeratus</i>	bushy bluestem		X	X			2
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	<b>X</b>	X	X			3
<i>Andropogon gyrans</i>	Elliott's bluestem		X		X		2
<i>Andropogon gyrans</i> var. <i>stenophyllus</i>	Elliott's bluestem			X			1
<i>Andropogon ternarius</i>	splitbeard bluestem		<b>X</b>	X	X		3
<i>Andropogon virginicus</i>	broomsedge bluestem		<b>X</b>	X	X		3
<i>Andropogon virginicus</i> var. <i>glaucus</i>	chalky bluestem		X	X			2
<i>Aristida purpurascens</i>	arrowfeather threeawn				X		1
<b><i>Aristida spiciformis</i></b>	<b>bottlebrush threeawn</b>		<b>X</b>				1
<i>Aristida stricta</i>	wiregrass		X	X	X		3
<i>Arnoglossum sulcatum</i>	Georgia Indian-plantain	X				<b>X</b>	2
<i>Aronia arbutifolia</i>	red chokeberry			X			1
<i>Arundinaria gigantea</i>	switchcane	X	<b>X</b>	X		X	4
<b><i>Axonopus fissifolius</i></b>	<b>common carpetgrass</b>		<b>X</b>				1
<b><i>Baccharis halimifolia</i></b>	<b>groundsel tree</b>			<b>X</b>			1
<i>Balduina angustifolia</i>	coastalplain honeycomb-head		X		X		2
<i>Baptisia lanceolata</i>	gopherweed				X		1
<i>Berlandiera pumila</i>	soft greeneyes				X		1
<i>Bidens mitis</i>	smallfruit beggarticks	<b>X</b>		X		X	3
<i>Bigelovia nudata</i>	pineland rayless goldenrod			X			1
<i>Bignonia capreolata</i>	crossvine		<b>X</b>			X	2
<i>Bulbostylis ciliatifolia</i>	capillary hairsedge		<b>X</b>		X		2
<i>Calamintha coccinea</i>	scarlet calamint				X		1
<i>Callicarpa americana</i>	American beautyberry	X	X		X	X	4
<i>Carex glaucescens</i>	clustered sedge	X				X	2
<i>Carex</i> sp.	sedge					X	1

Scientific Name	Common Name	Bay swamp	High pine	Hydric savanna	Sandhill	Stream swamp	Grand Total
<i>Carex tenax</i>	sandhill sedge				X		1
<i>Carphephorus odoratissimus</i>	vanillaleaf		X	X	X		3
<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>Chaptalia tomentosa</i>	pineland daisy		X				1
<i>Chrysoma pauciflosculosa</i>	woody goldenrod				X		1
<i>Chrysopsis gossypina</i> ssp. <i>hyssopifolia</i>	cottony goldenaster		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>Cladina evansii</i>	Evans' reindeer lichen		X		X		2
<i>Cladonia leporina</i>	cup lichen		X		X		2
<i>Clethra alnifolia</i>	sweet pepperbush	X		X		X	3
<i>Cliftonia monophylla</i>	black titi	X		X		X	3
<i>Cnidocolus stimulosus</i>	tread softly				X		1
<i>Coleataenia anceps</i>	beaked panicum			X			1
<i>Conyza canadensis</i>	Canadian horseweed		X		X		2
<b>Cornus florida</b>	<b>flowering dogwood</b>				X		1
<i>Croptilon divaricatum</i>	slender scratchdaisy		X		X		2
<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 pinnata</i>	summer farewell				X		1
<i>Dichanthelium aciculare</i>	needleleaf witchgrass				X		1
<i>Dichanthelium acuminatum</i>	tapered witchgrass		X	X	X		3
<i>Dichanthelium commutatum</i>	variable witchgrass				X		1
<i>Dichanthelium ensifolium</i>	cypress witchgrass		X	X	X		3
<i>Dichanthelium leucothrix</i>	rough witchgrass			X			1
<i>Dichanthelium portoricense</i>	hemlock witchgrass			X			1
<i>Dichanthelium scabriusculum</i>	woolly witchgrass			X		X	2
<i>Dichanthelium</i> sp.	witchgrass			X	X		2
<i>Dichanthelium sphaerocarpon</i>	roundseed witchgrass			X			1
<i>Dichanthelium strigosum</i>	roughhair witchgrass		X	X	X		3
<i>Digitaria filiformis</i>	slender crabgrass				X		1
<i>Diodia virginiana</i>	Virginia buttonweed			X			1
<i>Diospyros virginiana</i>	common persimmon		X		X		2
<i>Drosera capillaris</i>	pink sundew			X			1
<b>Dulichium arundinaceum</b>	<b>threeway sedge</b>			X			1
<i>Elephantopus elatus</i>	tall elephantsfoot		X				1
<i>Elephantopus</i> sp.	elephantsfoot		X				1
<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
<i>Eragrostis</i> sp.	lovegrass			X			1
<i>Erigeron vernus</i>	early whitetop fleabane		X				1
<i>Eriocaulon compressum</i>	flattened pipewort		X	X			2
<i>Eriocaulon decangulare</i>	tenangle pipewort	X		X		X	3
<i>Eriogonum tomentosum</i>	dogtongue wild buckwheat				X		1
<i>Eryngium yuccifolium</i>	button rattlesnakemaster		X				1
<i>Eubotrys racemosus</i>	swamp doghobble					X	1
<i>Eupatorium capillifolium</i>	dogfennel	X		X			2
<i>Eupatorium compositifolium</i>	yankeeweed		X		X		2
<i>Eupatorium mohrii</i>	Mohr's thoroughwort		X	X			2
<i>Eupatorium pilosum</i>	rough boneset			X			1
<i>Eupatorium rotundifolium</i>	roundleaf thoroughwort		X				1
<i>Euphorbia discoidalis</i>	summer spurge		X		X		2
<i>Euphorbia floridana</i>	greater Florida spurge				X		1
<i>Eurybia eryngiifolia</i>	thistleleaf aster		X				1
<i>Euthamia caroliniana</i>	slender flattop goldenrod		X	X	X		3
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge			X			1
<b><i>Gaillardia aestivalis</i></b>	<b>lanceleaf blanketflower</b>				X		1
<i>Galactia minor</i>	leafy milkpea				X		1
<i>Gaylussacia dumosa</i>	dwarf huckleberry		X	X	X		3
<i>Gaylussacia frondosa</i> var. <i>tomentosa</i>	blue huckleberry		X				1
<b><i>Gaylussacia mosieri</i></b>	<b>woolly huckleberry</b>	X	X	X		X	4
<i>Gelsemium sempervirens</i>	yellow jessamine		X				1
<i>Geobalanus oblongifolius</i>	gopher apple		X		X		2
<i>Hamamelis virginiana</i>	American witchhazel	X					1
<i>Helianthus angustifolius</i>	narrowleaf sunflower	X	X	X			3
<i>Helianthus heterophyllus</i>	variableleaf sunflower		X	X			2
<i>Helianthus radula</i>	stiff sunflower		X		X		2
<i>Hibiscus aculeatus</i>	comfortroot		X				1
<i>Houstonia procumbens</i>	roundleaf bluet				X		1
<b><i>Hypericum chapmanii</i></b>	<b>Chapman's St. John's wort</b>					X	1
<i>Hypericum cistifolium</i>	roundpod St. John's wort		X	X			2
<i>Hypericum crux-andreae</i>	St. Peter's wort	X	X	X			3
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	X		X			2
<i>Hypericum gentianoides</i>	orangegrass				X		1
<i>Hypericum hypericoides</i>	St. Andrew's cross		X	X	X	X	4
<i>Hypericum suffruticosum</i>	pineland St. John's wort				X		1
<i>Hypericum tetrapetalum</i>	fourpetal St. John's wort		X	X			2
<i>Ilex cassine</i>	dahoon		X			X	2
<i>Ilex coriacea</i>	large gallberry	X	X	X		X	4
<i>Ilex glabra</i>	gallberry	X	X	X	X	X	5
<i>Ilex opaca</i>	American holly				X		1

Scientific Name	Common Name	Bay swamp	High pine	Hydric savanna	Sandhill	Stream swamp	Grand Total
<i>Ilex vomitoria</i>	yaupon		X	X	X	X	4
<i>Ionactis linariifolia</i>	flaxleaf aster		X				1
<i>Ipomoea</i> sp.	morning glory				X		1
<i>Itea virginica</i>	Virginia willow					X	1
<i>Juncus trigonocarpus</i>	redpod rush		X	X			2
<b><i>Juniperus virginiana</i></b>	<b>red cedar</b>					X	1
<i>Kellochloa verrucosa</i>	warty panicgrass		X	X			2
<i>Lachnanthes carolina</i>	Carolina redroot			X			1
<i>Lachnocaulon anceps</i>	whitehead bogbutton				X		1
<i>Lechea sessiliflora</i>	pineland pinweed				X		1
<i>Leucothoe axillaris</i>	coastal doghobble	X					1
<i>Liatris elegans</i>	pinkscale gayfeather		X		X		2
<i>Liatris gracilis</i>	slender gayfeather		X		X		2
<i>Liatris pauciflora</i> var. <i>secunda</i>	Piedmont gayfeather				X		1
<i>Liatris spicata</i>	dense gayfeather		X	X	X		3
<i>Liatris tenuifolia</i>	shortleaf gayfeather				X		1
<b><i>Liquidambar styraciflua</i></b>	<b>sweetgum</b>					X	1
<i>Liriodendron tulipifera</i>	tuliptree	X				X	2
<i>Lobelia brevifolia</i>	shortleaf lobelia			X			1
<i>Lobelia glandulosa</i>	glade lobelia		X				1
<i>Lobelia nuttallii</i>	Nuttall's lobelia				X		1
<i>Lophiola aurea</i>	golden crest	X		X			2
<b><i>Ludwigia maritima</i></b>	<b>seaside primrosewillow</b>		X				1
<i>Ludwigia</i> sp.	primrosewillow			X			1
<i>Lupinus diffusus</i>	skyblue lupine				X		1
<i>Lycopodiella alopecuroides</i>	foxtail club-moss		X	X			2
<i>Lycopodiella caroliniana</i>	slender club-moss		X	X			2
<i>Lygodium japonicum</i>	Japanese climbing fern		X			X	2
<i>Lyonia lucida</i>	fetterbush	X	X	X		X	4
<i>Magnolia grandiflora</i>	southern magnolia		X				1
<i>Magnolia virginiana</i>	sweetbay	X	X	X		X	4
<b><i>Mayaca fluviatilis</i></b>	<b>stream bogmoss</b>	X					1
<i>Mimosa quadrivalvis</i>	sensitive briar				X		1
<i>Morella caroliniensis</i>	evergreen bayberry	X				X	2
<i>Morella cerifera</i>	southern bayberry	X	X			X	3
<i>Morella inodora</i>	odorless bayberry	X	X				2
<i>Muhlenbergia capillaris</i> var. <i>trichopodes</i>	cutover muhly			X			1
<i>Nyssa biflora</i>	swamp tupelo	X		X		X	3
<b><i>Nyssa ogeche</i></b>	<b>ogeechee tupelo</b>					X	1
<i>Oldenlandia corymbosa</i>	flattop mille grains			X			1
<i>Oldenlandia uniflora</i>	clustered mille grains			X			1
<i>Opuntia humifusa</i>	pricklypear		X		X		2

Scientific Name	Common Name	Bay swamp	High pine	Hydric savanna	Sandhill	Stream swamp	Grand Total
<i>Osmunda cinnamomea</i>	cinnamon fern	X				X	2
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	X		X		X	3
<i>Oxydendrum arboreum</i>	sourwood	X				X	2
<i>Panicum virgatum</i>	switchgrass		X	X	X		3
<i>Paspalum setaceum</i>	thin paspalum				X		1
<b><i>Peltandra sagittifolia</i></b>	<b>spoon-flower</b>			X		X	2
<i>Persea palustris</i>	swamp bay					X	1
<b><i>Pinguicula</i> sp.</b>	<b>butterwort</b>					X	1
<i>Pinus clausa</i>	sand pine		X		X		2
<i>Pinus elliotii</i>	slash pine	X	X	X	X	X	5
<i>Pinus palustris</i>	longleaf pine		X		X		2
<i>Pinus serotina</i>	pond pine	X	X	X			3
<i>Pinus taeda</i>	loblolly pine	X		X			2
<i>Pityopsis aspera</i>	pineland silkgrass		X		X		2
<i>Pityopsis graminifolia</i>	narrowleaf silkgrass		X		X		2
<i>Pluchea foetida</i>	stinking camphorweed					X	1
<i>Polygala lutea</i>	orange milkwort			X			1
<i>Polygonella gracilis</i>	tall jointweed		X		X		2
<i>Polypremum procumbens</i>	rustweed			X	X		2
<i>Pteridium aquilinum</i>	bracken fern		X	X	X		3
<i>Pterocaulon pycnostachyum</i>	blackroot		X		X		2
<i>Quercus falcata</i>	southern red oak				X		1
<i>Quercus geminata</i>	sand live oak		X		X		2
<i>Quercus hemisphaerica</i>	laurel oak		X		X		2
<i>Quercus incana</i>	bluejack oak				X		1
<i>Quercus laevis</i>	turkey oak				X		1
<i>Quercus laurifolia</i>	swamp laurel oak	X				X	2
<i>Quercus margarettae</i>	sand post oak		X				1
<i>Quercus minima</i>	dwarf live oak		X		X		2
<i>Quercus nigra</i>	water oak	X	X			X	3
<i>Quercus pumila</i>	runner oak		X				1
<i>Rhexia alifanus</i>	savannah meadowbeauty		X	X			2
<i>Rhexia nuttallii</i>	Nuttall's meadowbeauty		X	X			2
<i>Rhexia petiolata</i>	fringed meadowbeauty			X			1
<i>Rhododendron canescens</i>	mountain azalea					X	1
<i>Rhododendron viscosum</i>	swamp azalea	X					1
<i>Rhus copallinum</i>	winged sumac		X		X		2
<i>Rhynchosia cytisoides</i>	royal snoutbean				X		1
<b><i>Rhynchosia reniformis</i></b>	<b>dollarleaf</b>				X		1
<i>Rhynchospora cephalantha</i>	bunched beaksedge			X			1
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge			X			1
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge			X			1

Scientific Name	Common Name	Bay swamp	High pine	Hydric savanna	Sandhill	Stream swamp	Grand Total
<i>Rhynchospora ciliaris</i>	fringed beaksedge			X			1
<i>Rhynchospora compressa</i>	flatfruit beaksedge			X			1
<i>Rhynchospora fascicularis</i>	fascicled beaksedge			X			1
<i>Rhynchospora gracilentia</i>	slender beaksedge	X		X			2
<i>Rhynchospora megalocarpa</i>	sandyfield beaksedge		X				1
<i>Rhynchospora plumosa</i>	plumed beaksedge			X			1
<i>Rhynchospora sp.</i>	beaksedge		X				1
<i>Rubus cuneifolius</i>	sand blackberry		X		X		2
<i>Rubus pensilvanicus</i>	sawtooth blackberry			X		X	2
<i>Sabatia brevifolia</i>	shortleaf rosegentian		X				1
<b><i>Sabulina caroliniana</i></b>	<b>pinebarren stitchwort</b>				X		1
<i>Saccharum giganteum</i>	sugarcane plumegrass	X					1
<i>Salvia azurea</i>	azure blue sage		X				1
<i>Sarracenia leucophylla</i>	white-top pitcherplant			X		X	2
<i>Sassafras albidum</i>	sassafras		X				1
<i>Schizachyrium stoloniferum</i>	creeping little bluestem		X		X		2
<i>Schizachyrium tenerum</i>	slender bluestem		X		X		2
<i>Scleria ciliata</i>	fringed nutrush				X		1
<i>Scleria reticularis</i>	netted nutrush			X			1
<i>Scleria sp.</i>	nutrush					X	1
<i>Scleria triglomerata</i>	whip nutrush		X		X		2
<i>Serenoa repens</i>	saw palmetto	X	X	X	X	X	5
<i>Sericocarpus tortifolius</i>	whitetop aster		X		X		2
<i>Seymeria cassioides</i>	<i>yaupon blacksen</i>		X				1
<i>Seymeria pectinata</i>	Piedmont blacksen				X		1
<i>Smilax auriculata</i>	earleaf greenbrier		X	X	X		3
<i>Smilax bona-nox</i>	saw greenbrier		X				1
<i>Smilax glauca</i>	cat greenbrier	X	X	X			3
<i>Smilax laurifolia</i>	laurel greenbrier	X	X	X		X	4
<i>Smilax pumila</i>	sarsaparilla vine		X				1
<b><i>Smilax tamnoides</i></b>	<b>bristly greenbrier</b>		X				1
<i>Solidago fistulosa</i>	pinebarren goldenrod	X	X	X			3
<i>Solidago odora</i>	sweet goldenrod		X		X		2
<i>Solidago puberula</i> var. <i>pulverulenta</i>	downy goldenrod				X		1
<i>Sorghastrum elliotii</i>	slender indiagrass		X				1
<i>Sphagnum sp.</i>	sphagnum moss	X				X	2
<i>Sporobolus junceus</i>	pinewoods dropseed				X		1
<i>Stillingia sylvatica</i>	queen's delight		X		X		2
<b><i>Stylisma sp.</i></b>	<b>dawnflower</b>				X		1
<i>Symphotrichum adnatum</i>	scaleleaf aster		X				1
<i>Symphotrichum concolor</i>	eastern silver aster		X		X		2
<i>Symphotrichum dumosum</i>	rice button aster		X	X	X		3

Scientific Name	Common Name	Bay swamp	High pine	Hydric savanna	Sandhill	Stream swamp	Grand Total
<i>Symplocos tinctoria</i>	horse sugar					X	1
<i>Syngonanthus flavidulus</i>	yellow hatpins				X		1
<i>Tephrosia chrysophylla</i>	scurf hoary-pea				X		1
<b><i>Tephrosia florida</i></b>	<b>Florida hoary-pea</b>		X				1
<b><i>Tephrosia mohrii</i></b>	<b>pineland hoary-pea</b>				X		1
<i>Toxicodendron radicans</i>	eastern poison ivy	X	X			X	3
<i>Tragia smallii</i>	Small's noseburn		X		X		2
<i>Tragia urens</i>	wavyleaf noseburn				X		1
<b><i>Triplasis americana</i></b>	<b>perennial sandgrass</b>				X		1
<i>Utricularia juncea</i>	southern bladderwort			X			1
<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				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	2
<i>Woodwardia virginica</i>	Virginia chain fern	X	X	X		X	4
<i>Xyris ambigua</i>	coastalplain 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 elliotii</i>	Elliott's yellow-eyed grass			X			1
<i>Xyris fimbriata</i>	fringed yellow-eyed grass			X			1
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass			X			1
<i>Xyris</i> sp.	yellow-eyed grass			X			1
<i>Xyris stricta</i>	pineland yellow-eyed grass		X				1
<i>Yucca filamentosa</i>	Adam's needle		X		X		2
<b>Total number of taxa: 271</b>		51	134	104	115	60	464

## Sandhill

**Qualitative sampling.** The sandhill natural community has been degraded by past silviculture activities but retains many characteristic species. The diverse but somewhat sparse groundcover was dominated by wiregrass, with Piedmont gayfeather, Lynn Haven goldenaster and yankeeweed also frequent. 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, ranging from 1 to 15 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 115 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 45 species with 34% bare ground. Species cover was over 2/3 herbaceous. Wiregrass was the most abundant species, with Lynn Haven goldenaster, saw palmetto, needleleaf witchgrass, and sand live oak about equally abundant. Woody species made up around 19% average cover per quadrat.

The western Transect 2 (Table LC-3, Figure LC-3) was situated near the top of a ridge. It had a total of 30 species with 34% bare ground. Dominant species were almost entirely herbaceous. Lynn Haven goldenaster, wiregrass, and broomsedge bluestem were the dominant herbs. The open shrub stratum was composed mainly of turkey oak and seedlings and saplings longleaf pine. Woody species made up around 2% average cover per quadrat. Although not recorded in cover, fruticose lichens were observed in several quadrats.

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

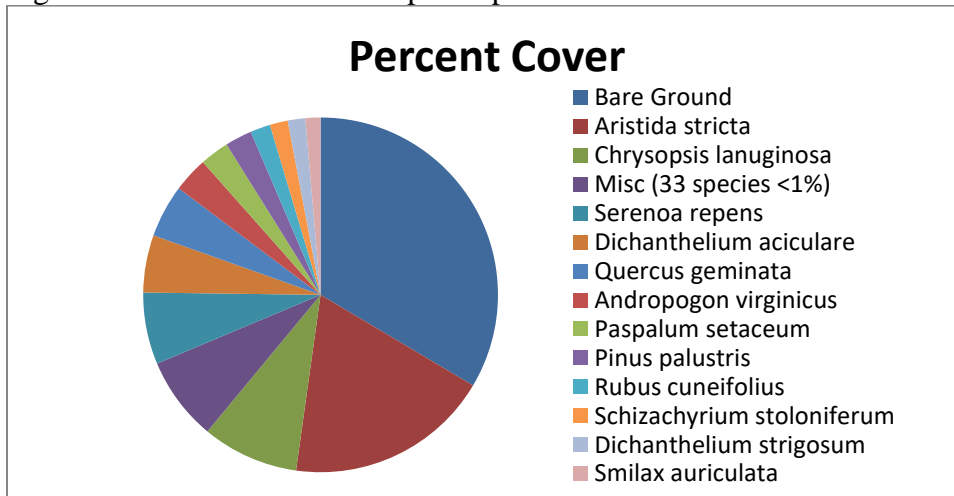


Table LC-2. Percent cover of plant species in Sandhill Transect 1 sampled on November 5, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Aristida stricta</i>	wiregrass	19.03
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster	8.97
<i>Serenoa repens</i>	saw palmetto	6.67
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	5.33
<i>Quercus geminata</i>	sand live oak	4.90
<i>Andropogon virginicus</i>	broomsedge bluestem	3.27
<i>Paspalum setaceum</i>	thin paspalum	2.70
<i>Pinus palustris</i>	longleaf pine	2.50
<i>Rubus cuneifolius</i>	sand blackberry	1.87
<i>Schizachyrium stoloniferum</i>	creeping little bluestem	1.66
<i>Dichanthelium strigosum</i>	roughhair witchgrass	1.63
<i>Smilax auriculata</i>	earleaf greenbrier	1.40
<i>Polygonella gracilis</i>	tall jointweed	0.87

Scientific name	Common name	Average percent cover per quadrat
<i>Solidago odora</i>	sweet goldenrod	0.83
<i>Eupatorium compositifolium</i>	yankeeweed	0.73
<i>Pityopsis aspera</i>	pineland silkgrass	0.73
<i>Quercus minima</i>	dwarf live oak	0.60
moss		0.50
<i>Schizachyrium tenerum</i>	slender bluestem	0.50
<i>Geobalanus oblongifolius</i>	gopher apple	0.43
<i>Hypericum gentianoides</i>	orangegrass	0.40
<i>Aristida purpurascens</i>	arrowfeather threeawn	0.37
<i>Eragrostis elliottii</i>	Elliott's lovegrass	0.37
<i>Rhus copallinum</i>	winged sumac	0.37
<i>Chrysoma pauciflosculosa</i>	woody goldenrod	0.13
<i>Bulbostylis ciliatifolia</i>	capillary hairsedge	0.13
<i>Ilex vomitoria</i>	yaupon	0.10
<i>Dichanthelium acuminatum</i>	tapered witchgrass	0.07
<i>Eriogonum tomentosum</i>	dogtongue wild buckwheat	0.07
<i>Liatris pauciflora</i> var. <i>secunda</i>	Piedmont gayfeather	0.07
<i>Rhynchosia cytisoides</i>	royal snoutbean	0.07
<i>Agalinis divaricata</i>	pineland false foxglove	0.03
<i>Cnidocolus stimulosus</i>	tread softly	0.03
<i>Digitaria filiformis</i>	slender crabgrass	0.03
<i>Euphorbia floridana</i>	greater Florida spurge	0.03
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.03
<i>Houstonia procumbens</i>	roundleaf bluet	0.03
<i>Ipomoea</i> sp.	morning glory	0.03
<i>Lechea sessiliflora</i>	pineland pinweed	0.03
<i>Mimosa quadrivalvis</i>	sensitive briar	0.03
<i>Opuntia humifusa</i>	pricklypear	0.03
<i>Panicum virgatum</i>	switchgrass	0.03
<i>Scleria ciliata</i>	fringed nutrush	0.03
<i>Scleria triglomerata</i>	whip nutrush	0.03
<i>Stylisma</i> sp.	dawnflower	0.03
Bare Ground		34.17

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

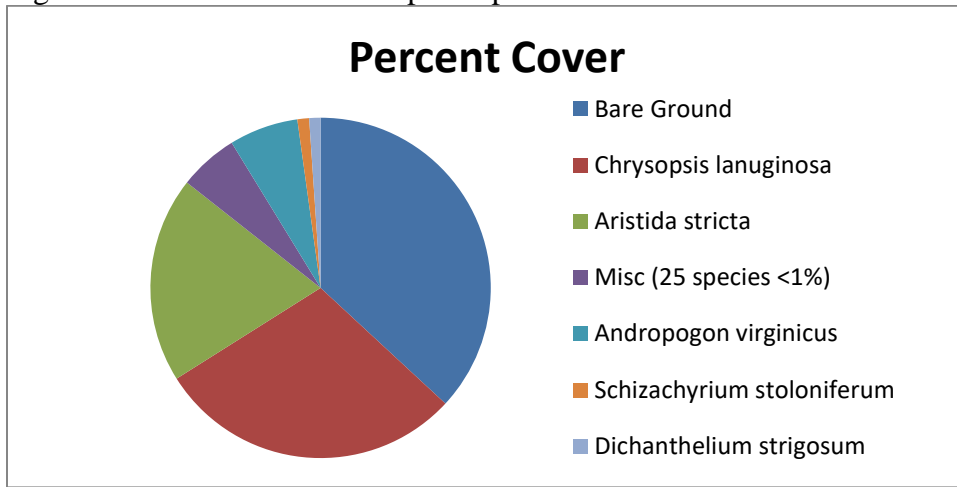


Table LC-3. Percent cover of plant species in Sandhill Transect 2 sampled on November 5, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster	27.10
<i>Aristida stricta</i>	wiregrass	18.20
<i>Andropogon virginicus</i>	broomsedge bluestem	6.10
<i>Schizachyrium stoloniferum</i>	creeping little bluestem	1.03
<i>Dichanthelium strigosum</i>	roughhair witchgrass	1.00
<i>Smilax auriculata</i>	earleaf greenbrier	0.70
<i>Dichanthelium</i> sp.	witchgrass	0.50
<i>Pinus palustris</i>	longleaf pine	0.50
<i>Eupatorium compositifolium</i>	yankeeweed	0.43
<i>Dichanthelium acuminatum</i>	tapered witchgrass	0.37
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	0.33
<i>Liatris pauciflora</i> var. <i>secunda</i>	Piedmont gayfeather	0.30
<i>Polygonella gracilis</i>	tall jointweed	0.27
<i>Quercus laevis</i>	turkey oak	0.27
<i>Eriogonum tomentosum</i>	dogtongue wild buckwheat	0.23
<i>Geobalanus oblongifolius</i>	gopher apple	0.23
<i>Quercus hemisphaerica</i>	laurel oak	0.23
<i>Aristida purpurascens</i>	arrowfeather threeawn	0.17
<i>Bulbostylis ciliatifolia</i>	capillary hairsedge	0.13
<i>Galactia minor</i>	leafy milkpea	0.13
<i>Rubus cuneifolius</i>	sand blackberry	0.10
<i>Hypericum gentianoides</i>	orangegrass	0.07
<i>Dalea pinnata</i>	summer farewell	0.03
<i>Hypericum hypericoides</i>	St. Andrew's cross	0.03
<i>Quercus geminata</i>	sand live oak	0.03
<i>Serenoa repens</i>	saw palmetto	0.03
<i>Solidago odora</i>	sweet goldenrod	0.03
<i>Tephrosia chrysophylla</i>	scurf hoary-pea	0.03



Scientific name	Common name	Average percent cover per quadrat
<i>Tragia urens</i>	wavyleaf noseburn	0.03
<i>Triplasis americana</i>	perennial sandgrass	0.03
Bare Ground		34.30

## 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. In 2014, warty panicum and Chapman’s beaksedge colonized a portion of the formerly bare area. Occasional areas with water seepage at the bottom of the sandhill ridge had whitetop pitcher-plants and abundant beaksedges. A wide variety of herbs were colonizing the rest of the area, with beaksedges and warty panicum dominating in the wetter sections and wiregrass in the drier parts. Scattered shrubs included black titi, large gallberry, sweet pepperbush, and gallberry. Disturbance by current and past hog rooting was noted at many locations. A total of 104 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 53 species with 24% bare ground. Herbaceous species made up most of the transect cover, although the southern end of the transect was heavily damaged from hog rooting. Wiregrass cover remained unchanged from the 2017 sample. Other most abundant herbs included broomsedge bluestem and purple bluestem. Woody species made up around 4% average cover per quadrat.

The western Transect 2 (Table LC-5, Figure LC-5) was also on a south facing slope. It had a total of 51 species with 41% bare ground. 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 largely bare ground due to hog rooting. Other dominant species were slender beaksedge and southern bladderwort. Woody species made up around 6% average cover per quadrat.

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

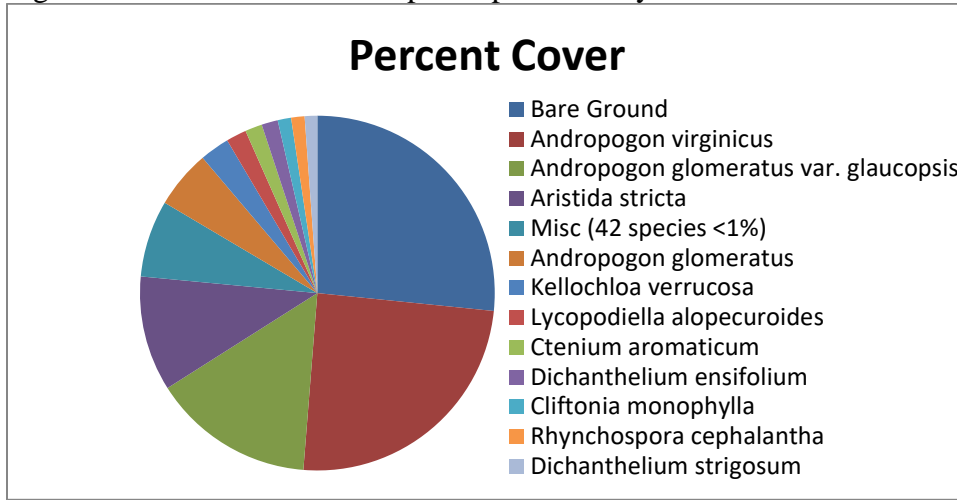


Table LC-4. Percent cover of plant species in Hydric Savanna Transect 1 sampled on November 7, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon virginicus</i>	broomsedge bluestem	22.17
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	13.27
<i>Aristida stricta</i>	wiregrass	9.43
<i>Andropogon glomeratus</i>	bushy bluestem	4.77
<i>Kellochloa verrucosa</i>	warty panicgrass	2.43
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	1.67
<i>Ctenium aromaticum</i>	toothache grass	1.40
<i>Dichantherium ensifolium</i>	cypress witchgrass	1.33
<i>Cliftonia monophylla</i>	black titi	1.10
<i>Rhynchospora cephalantha</i>	bunched beaksedge	1.10
<i>Dichantherium strigosum</i>	roughhair witchgrass	1.03
<i>Smilax glauca</i>	cat greenbrier	0.70
<i>Dichantherium scabriusculum</i>	woolly witchgrass	0.63
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.57
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	0.57
<i>Eupatorium pilosum</i>	rough boneset	0.40
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.33
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.30
<i>Helianthus heterophyllus</i>	variableleaf sunflower	0.27
<i>Ilex coriacea</i>	large gallberry	0.27
<i>Pinus elliotii</i>	slash pine	0.23
<i>Rhexia alifanus</i>	savannah meadowbeauty	0.13
<i>Aletris lutea</i>	yellow colic-root	0.10
<i>Bigelovia nudata</i>	pineland rayless goldenrod	0.10
<i>Diodia virginiana</i>	Virginia buttonweed	0.10
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.10
<i>Hypericum crux-andreae</i>	St. Peter's wort	0.10

Scientific name	Common name	Average percent cover per quadrat
<i>Ilex glabra</i>	gallberry	0.10
<i>Lophiola aurea</i>	golden crest	0.10
<i>Cartrema americanum</i>	wild olive	0.10
<i>Pinus taeda</i>	loblolly pine	0.10
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.10
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.07
<i>Liatris spicata</i>	dense gayfeather	0.07
<i>Lobelia brevifolia</i>	shortleaf lobelia	0.07
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.07
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.07
<i>Scleria reticularis</i>	netted nutrush	0.07
<i>Aronia arbutifolia</i>	red chokeberry	0.03
<i>Arundinaria gigantea</i>	switchcane	0.03
<i>Centella asiatica</i>	spadeleaf	0.03
<i>Dichanthelium ensifolium</i> var. <i>ensifolium</i>	cypress witchgrass	0.03
<i>Dichanthelium portoricense</i>	hemlock witchgrass	0.03
<i>Eragrostis</i> sp.	lovegrass	0.03
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.03
<i>Oldenlandia corymbosa</i>	flattop mille grains	0.03
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	0.03
<i>Polypremum procumbens</i>	rustweed	0.03
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.03
<i>Rhynchospora compressa</i>	flatfruit beaksedge	0.03
<i>Smilax auriculata</i>	earleaf greenbrier	0.03
<i>Smilax laurifolia</i>	laurel greenbrier	0.03
<i>Viola primulifolia</i>	primroseleaf violet	0.03
Bare Ground		23.93

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

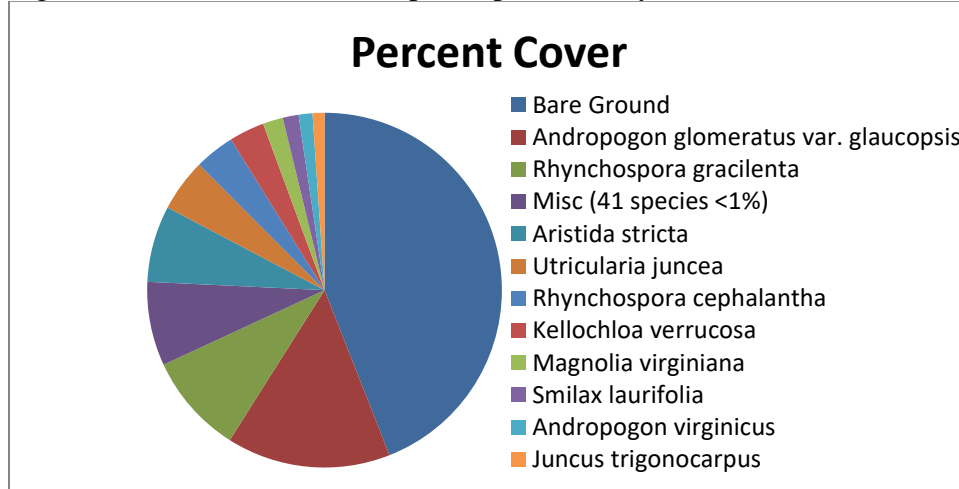


Table LC-5. Percent cover of plant species in Hydric Savanna Transect 2 sampled on November 6, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	13.80
<i>Rhynchospora gracilentia</i>	slender beaksedge	8.43
<i>Aristida stricta</i>	wiregrass	6.43
<i>Utricularia juncea</i>	southern bladderwort	4.43
<i>Rhynchospora cephalantha</i>	bunched beaksedge	3.37
<i>Kelochloa verrucosa</i>	warty panicgrass	2.97
<i>Magnolia virginiana</i>	sweetbay	1.70
<i>Smilax laurifolia</i>	laurel greenbrier	1.33
<i>Andropogon virginicus</i>	broomsedge bluestem	1.17
<i>Juncus trigonocarpus</i>	redpod rush	1.00
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	0.83
<i>Cliftonia monophylla</i>	black titi	0.73
<i>Ilex coriacea</i>	large gallberry	0.53
<i>Viola primulifolia</i>	primroseleaf violet	0.53
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.37
<i>Smilax glauca</i>	cat greenbrier	0.37
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	0.30
<i>Eriocaulon compressum</i>	flattened pipewort	0.27
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.27
<i>Andropogon glomeratus</i>	bushy bluestem	0.23
<i>Andropogon virginicus</i> var. <i>glaucus</i>	chalky bluestem	0.23
<i>Dichanthelium acuminatum</i>	tapered witchgrass	0.23
<i>Rhexia alifanus</i>	savannah meadowbeauty	0.20
<i>Clethra alnifolia</i>	sweet pepperbush	0.13
<i>Dichanthelium</i> sp.	witchgrass	0.13
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.13
<i>Pteridium aquilinum</i>	bracken fern	0.13
<i>Dichanthelium strigosum</i>	roughhair witchgrass	0.10
<i>Eupatorium pilosum</i>	rough boneset	0.10
<i>Ludwigia</i> sp.	primrosewillow	0.10
<i>Lyonia lucida</i>	fetterbush	0.10
<i>Pinus elliotii</i>	slash pine	0.10
<i>Pinus serotina</i>	pond pine	0.10
<i>Dichanthelium sphaerocarpon</i>	roundseed witchgrass	0.07
<i>Eupatorium capillifolium</i>	dogfennel	0.07
<i>Ilex glabra</i>	gallberry	0.07
<i>Nyssa biflora</i>	swamp tupelo	0.07
<i>Rhynchospora ciliaris</i>	fringed beaksedge	0.07
<i>Scleria reticularis</i>	netted nutrush	0.07
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.07
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.03
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	0.03
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	0.03
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.03
<i>Hypericum crux-andreae</i>	St. Peter's wort	0.03

Scientific name	Common name	Average percent cover per quadrat
<i>Lophiola aurea</i>	golden crest	0.03
<i>Lycopodiella caroliniana</i>	slender club-moss	0.03
<i>Oldenlandia uniflora</i>	clustered mille grains	0.03
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.03
<i>Xyris drummondii</i>	Drummond's yellow-eyed grass	0.03
<i>Xyris</i> sp.	yellow-eyed grass	0.03
Bare Ground		40.67

### High Pine

**Qualitative sampling.** Mature slash pine plantation still covers most of the area being restored to high pine. Thinning of the pines and prescribed fire have opened up the canopy in some sections. The understory may be either a dense shrub layer dominated by yaupon or an open grassy groundlayer of wiregrass with scattered saw palmetto and gallberry. Nearer the ecotone with hydric savanna and also in open, flat areas of the community, many other herbs are found with the wiregrass, including pinkscale gayfeather, toothache grass, scaleleaf aster, rough boneset, and vanillaleaf. The total number of species observed in this community was 134 (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, water oak, and swamp tupelo. The frequently dense shrub layer on the edges was primarily composed of fetterbush, large gallberry, black titi, and wild olive. Cinnamon fern and Georgia Indian plantain were in the sparse herb stratum and laurel greenbrier was a common vine. The total number of species observed in this community was 51 (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. The closed canopy was composed of mature pond cypress, swamp tupelo, and sweetbay. The often dense shrubs consisted of coastal doghobble, hazel alder, sweet pepperbush, black titi, and large gallberry. Sphagnum moss, cinnamon fern, royal fern, and netted chainfern made up the sparse groundcover. The total number of species observed in this community was 60 (Table LC-1).

**Plum Creek at Holmes Creek Mitigation Site**  
**Qualitative and Quantitative Monitoring**  
**October 2018**

**Plum Creek at Holmes Creek Mitigation Site  
Qualitative and Quantitative Monitoring  
October 2018**

**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 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 2017.

**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 Gulledege, Brenda Herring, Amy Jenkins, and retired FNAI botanist Ann Johnson on October 29, 2018.

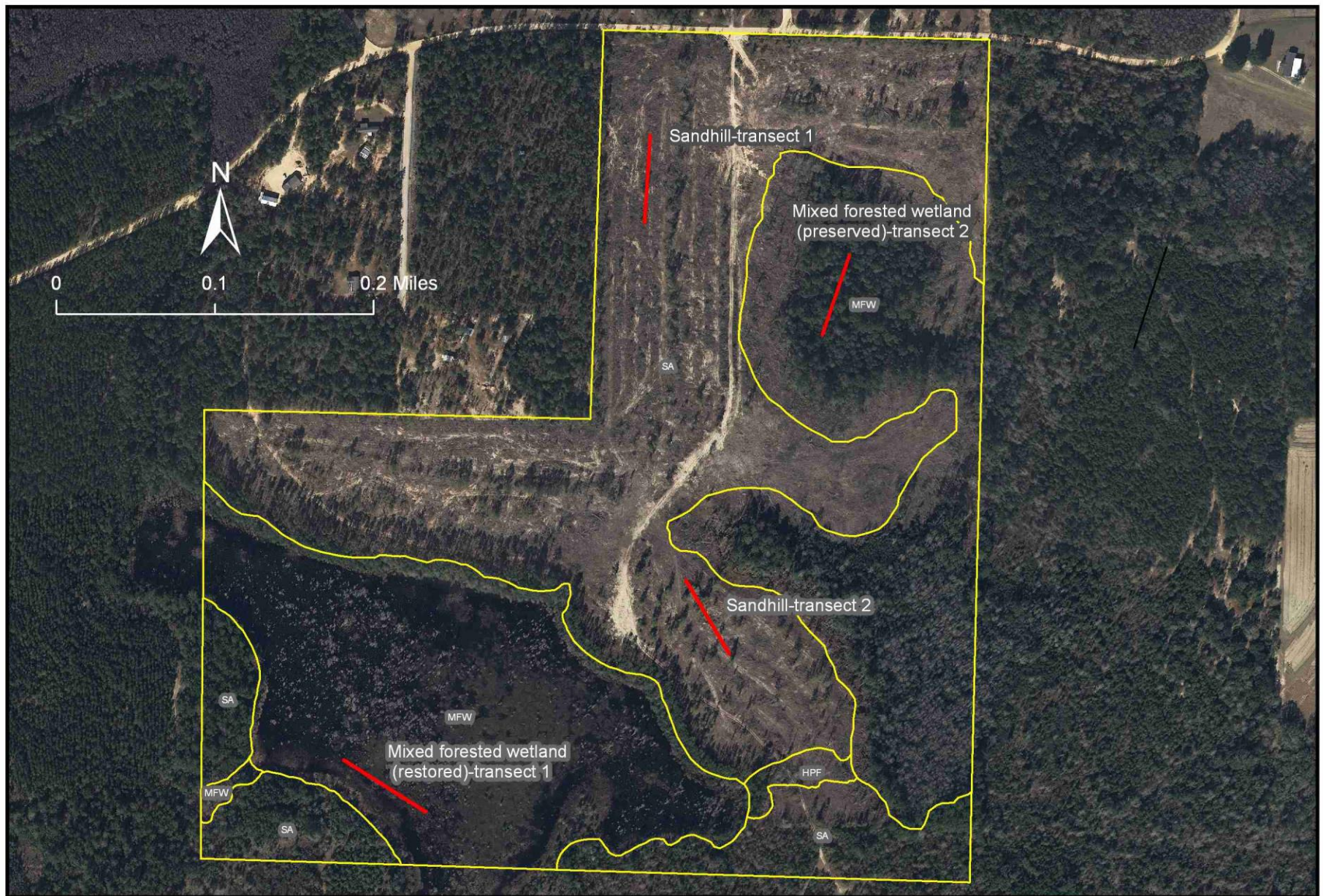


Figure PC-1. Location of permanent transects at Plum Creek at Holmes Creek Mitigation Site in Sandhill and Mixed Forested Wetland.



## RESULTS AND DISCUSSION

A total of 179 plant species were observed during the 2018 monitoring period in the target communities at Plum Creek at Holmes Creek Mitigation Site (Table PC-1). Sixteen new species were found during the 2018 monitoring.

Table PC-1. Plant species observed in target communities at Plum Creek at Holmes Creek Mitigation Site on October 29, 2018 (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
<b><i>Acalypha gracilens</i></b>	slender threeseed mercury	X			1
<i>Acer rubrum</i>	red maple		X		1
<i>Agalinis fasciculata</i>	beach false foxglove	X			1
<i>Agalinis obtusifolia</i>	tenlobe false foxglove	X			1
<i>Ambrosia artemisiifolia</i>	common ragweed	X			1
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem		X		1
<i>Andropogon ternarius</i>	splitbeard bluestem	X		X	2
<i>Andropogon virginicus</i>	broomsedge bluestem	X	X		2
<i>Apteria aphylla</i>	nodding nixie			X	1
<i>Aristida purpurascens</i>	arrowfeather threeawn	X			1
<i>Aristida stricta</i>	wiregrass	X			1
<i>Aronia arbutifolia</i>	red chokeberry		X		1
<i>Asimina spatulata</i>	paw paw	X			1
<i>Baccharis halimifolia</i>	groundsel tree	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>Brasenia schreberi</i>	watershield		X		1
<i>Bulbostylis ciliatifolia</i>	capillary hairsedge	X			1
<i>Callicarpa americana</i>	American beautyberry	X			1
<i>Carex</i> sp.	sedge			X	1
<i>Carex striata</i>	Walter's sedge			X	1
<i>Cartrema americanum</i>	wild olive	X		X	2
<i>Cephalanthus occidentalis</i>	common buttonbush		X		1
<i>Chrysoma pauciflosculosa</i>	woody goldenrod	X			1
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster	X			1
<b><i>Cirsium</i> sp.</b>	<b>thistle</b>	<b>X</b>			1
<i>Cladina evansii</i>	Evans' reindeer lichen	X			1
<i>Cladina subtenuis</i>	reindeer lichen	X			1
<i>Cladonia leporina</i>	cup lichen	X			1
<i>Clethra alnifolia</i>	sweet pepperbush		X	X	2
<i>Cliftonia monophylla</i>	black titi			X	1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
<i>Cnidocolus stimulosus</i>	tread softly	X			1
<i>Coleataenia anceps</i>	beaked panicum	X			1
<i>Conyza canadensis</i>	Canadian horseweed	X			1
<b><i>Crocanthemum carolinianum</i></b>	<b>Carolina frostweed</b>	<b>X</b>			1
<i>Croptilon divaricatum</i>	slender scratchdaisy	X			1
<i>Croton argyranthemus</i>	silver croton	X			1
<i>Cyperus ovatus</i>	pinebarren flatsedge	X			1
<i>Cyperus</i> sp.	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 laxiflorum</i>	openflower witchgrass	X			1
<i>Dichanthelium ovale</i>	eggleaf witchgrass	X			1
<i>Dichanthelium</i> sp.	witchgrass	X			1
<i>Dichanthelium sphaerocarpon</i>	roundseed witchgrass	X			1
<b><i>Dichanthelium strigosum</i></b>	<b>roughhair witchgrass</b>	<b>X</b>			1
<i>Diodia teres</i>	poor joe	X			1
<i>Diospyros virginiana</i>	common persimmon	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 eliottii</i>	Elliott's lovegrass	X			1
<i>Erechtites hieraciifolius</i>	fireweed	X			1
<b><i>Eriocaulon decangulare</i></b>	<b>tenangle pipewort</b>		<b>X</b>		1
<i>Eriogonum tomentosum</i>	dogtongue wild buckwheat	X			1
<i>Eryngium yuccifolium</i>	button rattlesnakemaster	X			1
<i>Eupatorium capillifolium</i>	dogfennel	X			1
<i>Eupatorium compositifolium</i>	yankeeweed	X			1
<i>Eupatorium mohrii</i>	Mohr's thoroughwort		X		1
<b><i>Eupatorium rotundifolium</i></b>	<b>roundleaf thoroughwort</b>	<b>X</b>			1
<i>Euphorbia discoidalis</i>	summer spurge	X			1
<i>Euthamia caroliniana</i>	slender flattop goldenrod	X	X		2
<i>Galactia minor</i>	leafy milkpea	X			1
<i>Galium hispidulum</i>	coastal bedstraw	X			1
<i>Gelsemium sempervirens</i>	yellow jessamine	X			1
<i>Geobalanus oblongifolius</i>	gopher apple	X			1
<i>Gymnopogon ambiguus</i>	bearded skeletongrass	X			1
<i>Hibiscus aculeatus</i>	comfortroot	X			1
<i>Houstonia procumbens</i>	roundleaf bluet	X			1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort		X		1
<i>Hypericum gentianoides</i>	orangegrass	X			1
<i>Hypericum hypericoides</i>	St. Andrew's cross	X			1
<i>Hypericum tetrapetalum</i>	fourpetal St. John's wort	X			1
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly		X		1
<i>Ilex coriacea</i>	large gallberry			X	1
<i>Ilex glabra</i>	gallberry	X	X		2
<i>Ilex opaca</i>	American holly	X		X	2
<i>Ilex vomitoria</i>	yaupon	X			1
<i>Itea virginica</i>	Virginia willow		X		1
<i>Juncus canadensis</i>	Canadian rush		X		1
<i>Juniperus virginiana</i>	red cedar	X			1
<i>Lachnanthes carolina</i>	Carolina redroot		X		1
<i>Lechea sessiliflora</i>	pineland pinweed	X			1
<b><i>Lespedeza hirta</i></b>	<b>hairy lespedeza</b>	X			1
<i>Liatris elegans</i>	pinkscale gayfeather	X			1
<i>Liatris gracilis</i>	slender gayfeather	X			1
<i>Liatris pauciflora</i> var. <i>secunda</i>	Piedmont gayfeather	X			1
<i>Liquidambar styraciflua</i>	sweetgum		X		1
liverwort				X	1
<i>Lophiola aurea</i>	golden crest		X		1
<i>Ludwigia pilosa</i>	hairy primrosewillow		X		1
<i>Ludwigia repens</i>	creeping primrosewillow		X		1
<i>Ludwigia suffruticosa</i>	shrubby primrosewillow		X		1
<b><i>Lycopodiella alopecuroides</i></b>	<b>foxtail club-moss</b>		X		1
<i>Lycopus rubellus</i>	taperleaf waterhorehound		X		1
<i>Lyonia lucida</i>	fetterbush		X	X	2
<i>Magnolia virginiana</i>	sweetbay		X	X	2
<i>Morella caroliniensis</i>	evergreen bayberry			X	1
<i>Morella cerifera</i>	southern bayberry		X		1
<i>Morella inodora</i>	odorless bayberry			X	1
<i>Nymphaea odorata</i>	white waterlily		X		1
<i>Nyssa biflora</i>	swamp tupelo		X		1
<i>Oenothera simulans</i>	southern beeblossom	X			1
<i>Panicum hemitomon</i>	maidencane		X		1
<i>Paronychia patula</i>	pineland nailwort	X			1
<i>Paspalum setaceum</i>	thin paspalum	X			1
<b><i>Pediomelum canescens</i></b>	<b>buckroot</b>	X			1
<i>Persea palustris</i>	swamp bay		X	X	2
<b><i>Physalis walteri</i></b>	<b>Walter's groundcherry</b>	X			1
<i>Pieris phyllireifolia</i>	climbing fetterbush			X	1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
<i>Pinus elliotii</i>	slash pine	X	X	X	3
<i>Pinus palustris</i>	longleaf pine	X			1
<i>Pityopsis aspera</i>	pineland silkgrass	X			1
<i>Pityopsis graminifolia</i>	narrowleaf silkgrass	X			1
<b><i>Pluchea odorata</i></b>	<b>sweetscent</b>		X		1
<i>Polygala nana</i>	candyroot	X			1
<i>Polygonella gracilis</i>	tall jointweed	X			1
<i>Polypremum procumbens</i>	rustweed	X			1
<b><i>Prunus umbellata</i></b>	<b>flatwoods plum</b>	X			1
<i>Pseudognaphalium obtusifolium</i>	sweet everlasting	X			1
<i>Pteridium aquilinum</i>	bracken fern	X			1
<i>Quercus hemisphaerica</i>	laurel oak	X			1
<i>Quercus incana</i>	bluejack oak	X			1
<i>Quercus laevis</i>	turkey oak	X			1
<i>Quercus margarettae</i>	sand post oak	X			1
<b><i>Quercus nigra</i></b>	<b>water oak</b>	X			1
<i>Rhexia mariana</i>	pale meadowbeauty		X		1
<i>Rhexia petiolata</i>	fringed meadowbeauty		X		1
<i>Rhododendron canescens</i>	mountain azalea			X	1
<i>Rhynchosia cytisoides</i>	royal snoutbean	X			1
<i>Rhynchosia reniformis</i>	dollarleaf	X			1
<i>Rhynchospora cephalantha</i>	bunched beaksedge		X		1
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge		X		1
<i>Rhynchospora fascicularis</i>	fascicled beaksedge		X		1
<i>Rubus cuneifolius</i>	sand blackberry	X			1
<b><i>Rubus flagellaris</i></b>	<b>northern dewberry</b>		X		1
<i>Saccharum giganteum</i>	sugarcane plumegrass		X		1
<i>Salvia azurea</i>	azure blue sage	X			1
<i>Schizachyrium stoloniferum</i>	creeping little bluestem	X			1
<i>Schizachyrium tenerum</i>	slender bluestem	X			1
<i>Scleria ciliata</i>	fringed nutrush	X			1
<b><i>Scleria triglomerata</i></b>	<b>whip nutrush</b>	X			1
<i>Serenoa repens</i>	saw palmetto	X			1
<i>Sericocarpus tortifolius</i>	whitetop aster	X			1
<i>Smilax auriculata</i>	earleaf greenbrier	X			1
<i>Smilax bona-nox</i>	saw greenbrier	X			1
<i>Smilax glauca</i>	cat greenbrier	X			1
<i>Smilax laurifolia</i>	laurel greenbrier			X	1
<i>Smilax pumila</i>	sarsaparilla vine	X			1
<i>Solidago fistulosa</i>	pinebarren goldenrod	X	X		2
<i>Solidago odora</i>	sweet goldenrod	X			1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
<i>Sphagnum</i> sp.	sphagnum moss		X	X	2
<i>Stylisma patens</i>	coastalplain dawnflower	X			1
<i>Symphyotrichum concolor</i>	eastern silver aster	X			1
<i>Symphyotrichum dumosum</i>	rice button aster	X			1
<i>Taxodium ascendens</i>	pond cypress		X		1
<i>Tragia smallii</i>	Small's noseburn	X			1
<i>Tragia urens</i>	wavyleaf noseburn	X			1
<i>Triadenum virginicum</i>	Virginia marsh St. John's wort		X		1
<i>Trichostema dichotomum</i>	forked bluecurls	X			1
<i>Utricularia gibba</i>	humped bladderwort		X		1
<i>Vaccinium arboreum</i>	sparkleberry	X			1
<i>Vaccinium corymbosum</i>	highbush blueberry		X	X	2
<i>Vaccinium elliotii</i>	Elliott's blueberry	X		X	2
<i>Vaccinium myrsinites</i>	shiny blueberry	X			1
<i>Vaccinium stamineum</i>	deerberry	X			1
<i>Vernonia angustifolia</i>	tall ironweed	X			1
<i>Viburnum nudum</i>	possumhaw			X	1
<b><i>Viola primulifolia</i></b>	<b>primroseleaf violet</b>	<b>X</b>			<b>1</b>
<i>Vitis rotundifolia</i>	muscadine	X		X	2
<i>Woodwardia areolata</i>	netted chain fern			X	1
<i>Woodwardia virginica</i>	Virginia chain fern			X	1
<i>Xyris fimbriata</i>	fringed yellow-eyed grass		X		1
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass		X		1
<i>Xyris</i> sp.	yellow-eyed grass		X		1
<b>Total number of taxa: 179</b>		<b>117</b>	<b>53</b>	<b>27</b>	<b>197</b>

## Sandhill

**Qualitative sampling.** The sandhill natural community has been degraded by past silviculture activities but retains many characteristic species. Young planted longleaf pines were spaced over the hillside. The diverse but somewhat sparse groundcover included Lynn Haven goldenaster, broomsedge bluestem, little bluestem, and needleleaf witchgrass. 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. The earleaf greenbriar vine was common. A total of 117 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 50 species with 27% bare ground. The ground layer consisted of mainly herbaceous species with scattered shrubs, principally yaupon. Broomsedge bluestem had the the highest percent cover by followed by Lynn Haven goldenaster,

yankeeweed, and yaupon. Wiregrass was present at around 3% cover. Woody species made up around 15% average cover per quadrat.

The southern Transect 2 (Table PC-3, Figure PC-3) was situated near the top of a low ridge. It had a total of 47 species with 35% bare ground. The vegetation was about 60% herbaceous/40% woody species cover. Among the herbs, Lynn Haven goldenaster had the highest cover. Yellow jessamine, sand blackberry, and saw palmetto formed most of the woody cover which made up around 30% average cover per quadrat. Although not recorded as cover, fruticose lichens were observed in several quadrats.

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

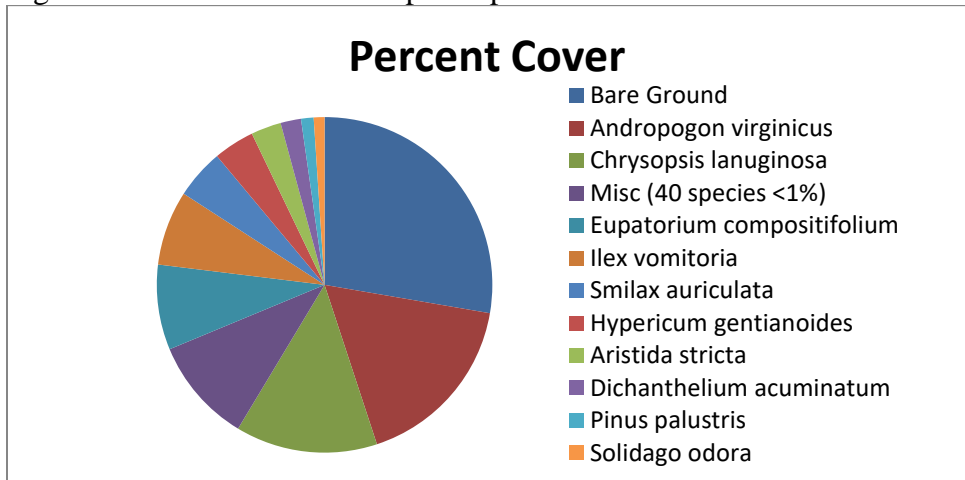


Table PC-2. Percent cover of plant species in Sandhill Transect 1 sampled on October 29, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon virginicus</i>	broomsedge bluestem	16.60
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster	13.17
<i>Eupatorium compositifolium</i>	yankeeweed	7.90
<i>Ilex vomitoria</i>	yaupon	6.93
<i>Smilax auriculata</i>	earleaf greenbrier	4.60
<i>Hypericum gentianoides</i>	orangegrass	3.80
<i>Aristida stricta</i>	wiregrass	2.80
<i>Dichanthelium acuminatum</i>	tapered witchgrass	1.90
<i>Pinus palustris</i>	longleaf pine	1.17
<i>Solidago odora</i>	sweet goldenrod	1.00
<i>Andropogon ternarius</i>	splitbeard bluestem	0.83
<i>Gelsemium sempervirens</i>	yellow jessamine	0.80
<i>Dichanthelium laxiflorum</i>	openflower witchgrass	0.57
<i>Smilax glauca</i>	cat greenbrier	0.57
<i>Rubus cuneifolius</i>	sand blackberry	0.53
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.50
<i>Hypericum hypericoides</i>	St. Andrew's cross	0.43

Scientific name	Common name	Average percent cover per quadrat
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	0.40
<i>Scleria ciliata</i>	fringed nutrush	0.40
<i>Scleria triglomerata</i>	whip nutrush	0.40
<i>Vaccinium stamineum</i>	deerberry	0.37
<i>Aristida purpurascens</i>	arrowfeather threeawn	0.33
<i>Baptisia lanceolata</i>	gopherweed	0.33
<i>Galactia minor</i>	leafy milkpea	0.33
<i>Dalea pinnata</i>	summer farewell	0.27
<i>Bulbostylis ciliatifolia</i>	capillary hairsedge	0.23
<i>Dichanthelium sphaerocarpon</i>	roundseed witchgrass	0.23
<i>Smilax pumila</i>	sarsaparilla vine	0.23
<i>Liatris gracilis</i>	slender gayfeather	0.20
<i>Pityopsis aspera</i>	pineland silkgrass	0.20
<i>Croptilon divaricatum</i>	slender scratchdaisy	0.17
<i>Lechea sessiliflora</i>	pineland pinweed	0.13
<i>Oenothera simulans</i>	southern beeblossom	0.13
<i>Coleataenia anceps</i>	beaked panicum	0.10
<i>Conyza canadensis</i>	Canadian horseweed	0.10
<i>Elephantopus elatus</i>	tall elephantsfoot	0.10
<i>Galium hispidulum</i>	coastal bedstraw	0.10
<i>Hibiscus aculeatus</i>	comfortroot	0.10
<i>Liatris pauciflora</i> var. <i>secunda</i>	Piedmont gayfeather	0.10
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.10
<i>Trichostema dichotomum</i>	forked bluecurls	0.10
<i>Paspalum setaceum</i>	thin paspalum	0.07
<i>Cnidoscolus stimulosus</i>	tread softly	0.03
<i>Pseudognaphalium obtusifolium</i>	sweet everlasting	0.03
<i>Quercus margarettae</i>	sand post oak	0.03
<i>Rhynchosia cytisoides</i>	royal snoutbean	0.03
<i>Rhynchosia reniformis</i>	dollarleaf	0.03
<i>Salvia azurea</i>	azure blue sage	0.03
<i>Stylisma patens</i>	coastalplain dawnflower	0.03
<i>Symphotrichum dumosum</i>	rice button aster	0.03
Bare Ground		26.67

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

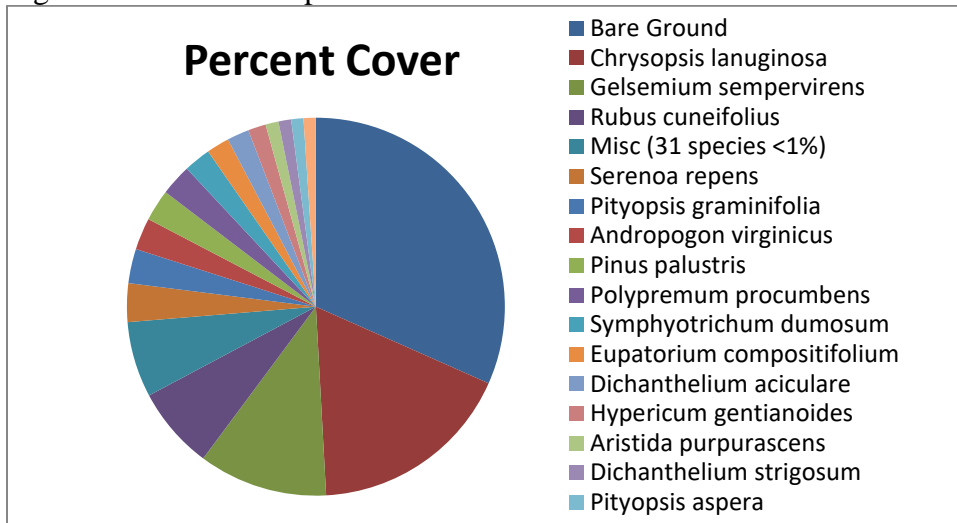


Table PC-3. Percent cover of plant species in Sandhill Transect 2 sampled on October 29, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster	19.43
<i>Gelsemium sempervirens</i>	yellow jessamine	12.27
<i>Rubus cuneifolius</i>	sand blackberry	7.83
<i>Serenoa repens</i>	saw palmetto	3.67
<i>Pityopsis graminifolia</i>	narrowleaf silkgrass	3.27
<i>Andropogon virginicus</i>	broomsedge bluestem	3.03
<i>Pinus palustris</i>	longleaf pine	3.00
<i>Polypremum procumbens</i>	rustweed	2.97
<i>Symphotrichum dumosum</i>	rice button aster	2.57
<i>Eupatorium compositifolium</i>	yankeeweed	2.17
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	2.10
<i>Hypericum gentianoides</i>	orangegrass	1.70
<i>Aristida purpurascens</i>	arrowfeather threeawn	1.23
<i>Dichanthelium strigosum</i>	roughhair witchgrass	1.20
<i>Pityopsis aspera</i>	pineland silkgrass	1.17
<i>Quercus hemisphaerica</i>	laurel oak	1.17
<i>Smilax auriculata</i>	earleaf greenbrier	0.97
<i>Dichanthelium acuminatum</i>	tapered witchgrass	0.80
<i>Agalinis fasciculata</i>	beach false foxglove	0.63
<i>Andropogon ternarius</i>	splitbeard bluestem	0.50
<i>Hibiscus aculeatus</i>	comfortroot	0.50
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.43
<i>Scleria ciliata</i>	fringed nutrush	0.37
<i>Cyperus ovatus</i>	pinebarren flatsedge	0.33
<i>Solidago odora</i>	sweet goldenrod	0.30
<i>Trichostema dichotomum</i>	forked bluecurls	0.27
<i>Cyperus sp.</i>	flatsedge	0.23



Scientific name	Common name	Average percent cover per quadrat
<i>Lechea sessiliflora</i>	pineland pinweed	0.23
<i>Smilax bona-nox</i>	saw greenbrier	0.20
<i>Aristida stricta</i>	wiregrass	0.17
<i>Vaccinium arboreum</i>	sparkleberry	0.13
<i>Diospyros virginiana</i>	common persimmon	0.10
<i>Galium hispidulum</i>	coastal bedstraw	0.10
<i>Galactia minor</i>	leafy milkpea	0.10
<i>Pseudognaphalium obtusifolium</i>	sweet everlasting	0.10
<i>Pteridium aquilinum</i>	bracken fern	0.10
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.10
<i>Tragia urens</i>	wavyleaf noseburn	0.10
unknown herb		0.10
<i>Vaccinium myrsinites</i>	shiny blueberry	0.10
<i>Baccharis halimifolia</i>	groundsel tree	0.03
<i>Dichanthelium</i> sp.	witchgrass	0.03
<i>Eupatorium capillifolium</i>	dogfennel	0.03
<i>Crocanthemum carolinianum</i>	Carolina frostweed	0.03
<i>Lespedeza hirta</i>	hairy lespedeza	0.03
<i>Liatris gracilis</i>	slender gayfeather	0.03
<i>Tragia smallii</i>	Small's noseburn	0.03
Bare Ground		35.17

### 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 inundated at the time of the survey. The vegetative cover 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 53 (Table PC-1).

**Quantitative sampling.** Transect 1 (Table PC-4, Figure PC-4) had a total of 15 species with 40% bare ground (including water). The transect was mostly flooded, ranging from just a few inches deep at the western end to over a foot deep closer to the eastern end where hummocks were common. The highest percent cover was by willow herb followed by white waterlily, humped bladderwort, and threeway sedge. Woody species made around 34% average cover per quadrat.

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

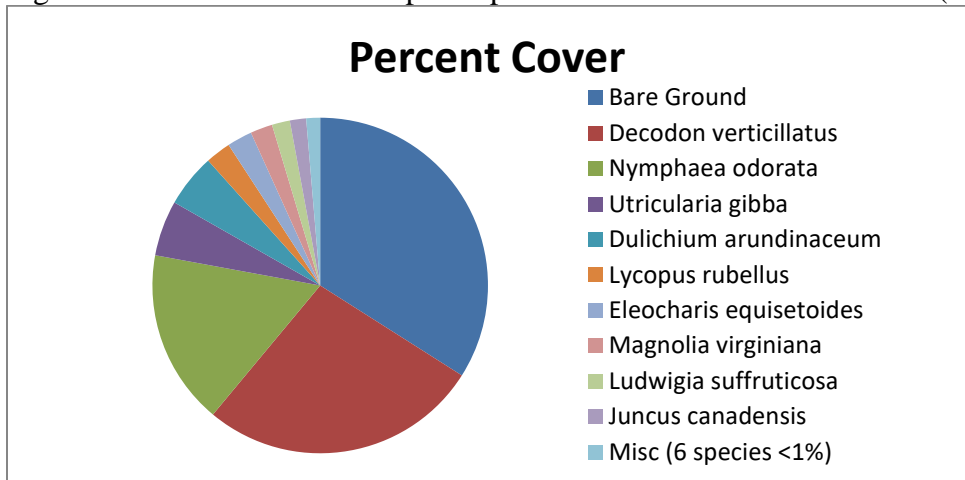


Table PC-4. Percent cover of plant species in Mixed Forested Wetland (Restored) Transect 1 sampled on October 29, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Decodon verticillatus</i>	willow herb	31.67
<i>Nymphaea odorata</i>	white waterlily	19.73
<i>Utricularia gibba</i>	humped bladderwort	6.27
<i>Dulichium arundinaceum</i>	threeway sedge	6.00
<i>Lycopus rubellus</i>	taperleaf waterhorehound	2.87
<i>Eleocharis equisetoides</i>	jointed spikerush	2.83
<i>Magnolia virginiana</i>	sweetbay	2.50
<i>Ludwigia suffruticosa</i>	shrubby primrosewillow	2.03
<i>Juncus canadensis</i>	Canadian rush	1.83
<i>Brasenia schreberi</i>	watershield	0.57
<i>Panicum hemitomon</i>	maidencane	0.33
<i>Taxodium ascendens</i>	pond cypress	0.23
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	0.23
<i>Sphagnum</i> sp.	sphagnum moss	0.10
<i>Triadenum virginicum</i>	Virginia marsh St. John's wort	0.10
Bare Ground		39.83

### 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, many trees and limbs were down in this community. Dominant species were sweetbay, swamp tupelo, and Virginia live oak. 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 muck soil was saturated, but no standing water

was present at the time of sampling. The total number of species observed in this community was 27 (Table PC-1).

**Quantitative sampling.** Transect 2 (Table PC-5, Figure PC-5) had a total of 20 species with 75% bare ground. Many trees and branches were down due to recent storms. One of the quadrats (at 80 feet) was completely obscured by the canopy of a fallen tree. Because the cover of any underlying vegetation was impossible to determine, this quadrat was removed from the sample. The dominant shrubs were large gallberry, sweet pepperbush, fetterbush, and black titi. Woody species made around 22% average cover per quadrat. Sphagnum moss formed most of the sparse herbaceous cover.

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

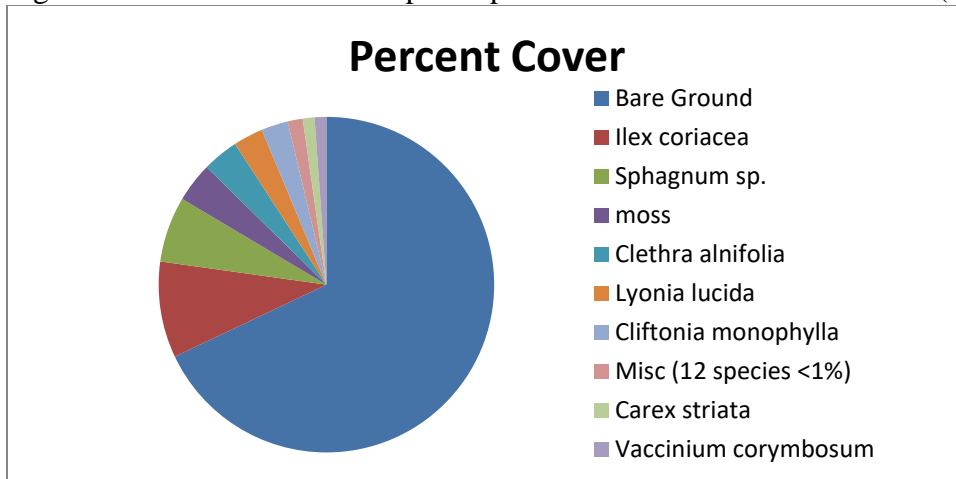


Table PC-5. Percent cover of plant species in Mixed Forested Wetland (Preserved) Transect 2 sampled on October 29, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Ilex coriacea</i>	large gallberry	10.25
<i>Sphagnum sp.</i>	sphagnum moss	7.00
moss		4.21
<i>Clethra alnifolia</i>	sweet pepperbush	3.86
<i>Lyonia lucida</i>	fetterbush	3.18
<i>Cliftonia monophylla</i>	black titi	2.86
<i>Carex striata</i>	Walter's sedge	1.25
<i>Vaccinium corymbosum</i>	highbush blueberry	1.25
<i>Woodwardia virginica</i>	Virginia chain fern	0.54
<i>Woodwardia areolata</i>	netted chain fern	0.25
<i>Vitis rotundifolia</i>	muscadine	0.14
<i>Morella inodora</i>	odorless bayberry	0.11
<i>Persea palustris</i>	swamp bay	0.11
<i>Pieris phyllireifolia</i>	climbing fetterbush	0.11
<i>Rhododendron canescens</i>	mountain azalea	0.11
<i>Smilax laurifolia</i>	laurel greenbrier	0.11

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon ternarius</i>	splitbeard bluestem	0.04
<i>Carex</i> sp.	sedge	0.04
liverwort		0.04
<i>Vaccinium elliotii</i>	Elliott's blueberry	0.04
Bare Ground		75.18

**Ward Creek West Mitigation Site  
Qualitative and Quantitative Monitoring  
October 2018**

**Ward Creek West Mitigation Site  
Qualitative and Quantitative Monitoring  
October 2018**

**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 2016.

**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 transects 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 Kim Gullede and Brenda Herring on October 30-31, 2018.

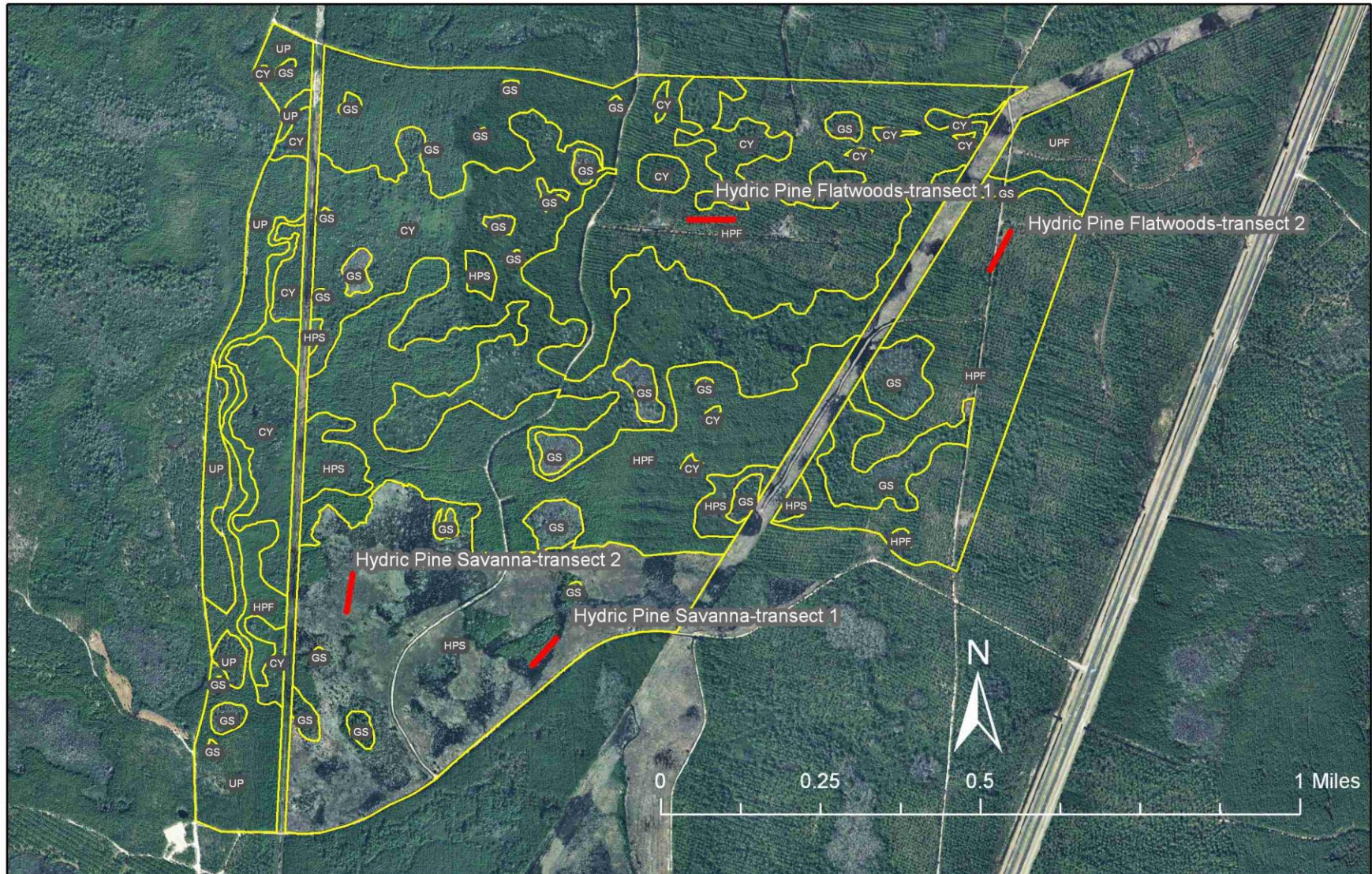


Figure WC-1. Location of permanent transects at Ward Creek West Mitigation Site. CY=Cypress, UP=Upland Pine, HPF=Hydric Pine Flatwoods, HPS=Hydric Pine Savanna, GS=Gum Swamp.

## RESULTS AND DISCUSSION

A total of 132 plant species were recorded during 2018 monitoring session in the target communities at Ward Creek West (Table WC-1). Eight new species were recorded during the 2018 monitoring.

Table WC-1. Plant species observed in the target communities at Ward Creek West Mitigation Site on October 30-31, 2018. (bold name = new species; bold X = new observation in community type)

Scientific Name	Common Name	Cypress	Hydric pine flatwoods	Hydric pine savanna	Grand Total
<i>Acer rubrum</i>	red maple	X			1
<i>Andropogon glomeratus</i>	bushy bluestem			X	1
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem		X	X	2
<i>Andropogon gyrans</i> var. <i>stenophyllus</i>	Elliott's bluestem		X	X	2
<i>Andropogon</i> sp.	bluestem		X		1
<i>Andropogon virginicus</i>	broomsedge bluestem		X	X	2
<i>Andropogon virginicus</i> var. <i>glaucus</i>	chalky bluestem	X	X	X	3
<i>Aristida palustris</i>	longleaf threeawn			X	1
<i>Aristida spiciformis</i>	bottlebrush threeawn		X	X	2
<i>Aristida stricta</i>	wiregrass		X	X	2
<i>Aronia arbutifolia</i>	red chokeberry		X		1
<i>Bidens mitis</i>	smallfruit beggarticks		X	<b>X</b>	2
<i>Carex striata</i>	Walter's sedge	<b>X</b>		X	2
<i>Carphephorus odoratissimus</i>	vanillaleaf		X	X	2
<i>Centella asiatica</i>	spadeleaf	X		X	2
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster			X	1
<i>Clethra alnifolia</i>	sweet pepperbush	X	X		2
<i>Cliftonia monophylla</i>	black titi	X	X	X	3
<i>Coleataenia anceps</i>	beaked panicum			X	1
<i>Coleataenia longifolia</i>	ciliate redtop panicum		X		1
<i>Coreopsis floridana</i>	Florida tickseed		X		1
<i>Ctenium aromaticum</i>	toothache grass			X	1
<i>Cyrilla racemiflora</i>	titi	X	X	X	3
<i>Dichanthelium acuminatum</i>	tapered witchgrass			X	1
<i>Dichanthelium ensifolium</i>	cypress witchgrass		X	X	2
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	X	X	X	3
<i>Dichanthelium sphaerocarpon</i>	roundseed witchgrass		X		1
<i>Drosera capillaris</i>	pink sundew		X	X	2
<b><i>Drosera intermedia</i></b>	<b>spoon-leaved sundew</b>	<b>X</b>			1
<i>Eleocharis tuberculosa</i>	conecup spikerush		X		1
<i>Eriocaulon decangulare</i>	tenangle pipewort	X	X	X	3
<i>Eupatorium mohrii</i>	Mohr's thoroughwort		X	X	2
<i>Euthamia caroliniana</i>	slender flattop goldenrod		X	X	2
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge		X		1



Scientific Name	Common Name	Cypress	Hydric pine flatwoods	Hydric pine savanna	Grand Total
<i>Gaylussacia dumosa</i>	dwarf huckleberry		X		1
<i>Gaylussacia frondosa</i> var. <i>tomentosa</i>	blue huckleberry		X		1
<i>Gaylussacia mosieri</i>	woolly huckleberry		X	X	2
<i>Gelsemium sempervirens</i>	yellow jessamine		X		1
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort			X	1
<i>Hypericum chapmanii</i>	Chapman's St. John's wort			X	1
<i>Hypericum cistifolium</i>	roundpod St. John's wort			X	1
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	X	X	X	3
<i>Hypericum microsepalum</i>	flatwoods St. John's wort		X	X	2
<i>Hypericum tetrapetalum</i>	fourpetal St. John's wort			X	1
<i>Ilex cassine</i>	dahoon	X			1
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	X	X	X	3
<i>Ilex coriacea</i>	large gallberry	X	X	X	3
<i>Ilex glabra</i>	gallberry		X	X	2
<i>Juncus marginatus</i>	grassleaf rush		X	X	2
<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	2
<i>Lachnocaulon anceps</i>	whitehead bogbutton		X		1
<i>Liatris elegantula</i>	grassleaf gayfeather			X	1
<i>Liatris spicata</i>	dense gayfeather		X	X	2
<i>Lophiola aurea</i>	golden crest	X		X	2
<b><i>Ludwigia alata</i></b>	<b>winged primrosewillow</b>		X		1
<i>Ludwigia maritima</i>	seaside primrosewillow		X		1
<i>Lycopodiella alopecuroides</i>	foxtail club-moss		X	X	2
<i>Lyonia ferruginea</i>	rusty staggerbush		X	X	2
<i>Lyonia lucida</i>	fetterbush	X	X	X	3
<i>Magnolia virginiana</i>	sweetbay	X	X	X	3
<i>Morella cerifera</i>	southern bayberry	X			1
<i>Muhlenbergia capillaris</i> var. <i>trichopodes</i>	cutover muhly			X	1
<i>Nyssa biflora</i>	swamp tupelo	X			1
<i>Nyssa ursina</i>	bog tupelo		X	X	2
<i>Oldenlandia uniflora</i>	clustered mille grains		X		1
<b><i>Panicum repens</i></b>	<b>torpedo grass</b>		X	X	2
<i>Panicum virgatum</i>	switchgrass			X	1
<b><i>Paspalum setaceum</i></b>	<b>thin paspalum</b>			X	1
<i>Persea palustris</i>	swamp bay	X			1
<i>Pieris phyllireifolia</i>	climbing fetterbush	X			1
<i>Pinus elliotii</i>	slash pine	X	X	X	3
<i>Pluchea foetida</i>	stinking camphorweed		X	X	2
<i>Polygala cruciata</i>	drumheads			X	1
<i>Polygala cymosa</i>	tall pinebarren milkwort			X	1

Scientific Name	Common Name	Cypress	Hydric pine flatwoods	Hydric pine savanna	Grand Total
<i>Polygala lutea</i>	orange milkwort		X	X	2
<i>Proserpinaca pectinata</i>	combleaf mermaidweed		X		1
<i>Pteridium aquilinum</i>	bracken fern		X	X	2
<i>Quercus minima</i>	dwarf live oak		X		1
<i>Rhexia alifanus</i>	savannah meadowbeauty			X	1
<i>Rhexia mariana</i>	pale meadowbeauty		X	X	2
<i>Rhexia nuttallii</i>	Nuttall's meadowbeauty			X	1
<i>Rhexia petiolata</i>	fringed meadowbeauty			X	1
<i>Rhexia virginica</i>	handsome harry		X	X	2
<i>Rhynchospora cephalantha</i>	bunched beaksedge		X	X	2
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge		X	X	2
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge		X	X	2
<i>Rhynchospora ciliaris</i>	fringed beaksedge		X	X	2
<i>Rhynchospora corniculata</i>	shortbristle horned beaksedge			X	1
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	X	X	X	3
<i>Rhynchospora gracilentata</i>	slender beaksedge			X	1
<i>Rhynchospora plumosa</i>	plumed beaksedge		X	X	2
<i>Rhynchospora sp.</i>	beaksedge		X		1
<b><i>Rubus flagellaris</i></b>	<b>northern dewberry</b>			X	1
<i>Rubus pensilvanicus</i>	sawtooth blackberry		X	X	2
<i>Sabatia brevifolia</i>	shortleaf rosegentian		X	X	2
<i>Saccharum giganteum</i>	sugarcane plumegrass		X	X	2
<i>Sarracenia rubra</i>	sweet pitcherplant			X	1
<i>Scleria ciliata</i>	fringed nutrush		X		1
<i>Scleria reticularis</i>	netted nutrush		X		1
<i>Serenoa repens</i>	saw palmetto		X	X	2
<i>Smilax auriculata</i>	earleaf greenbrier		X		1
<b><i>Smilax bona-nox</i></b>	<b>saw greenbrier</b>		X		1
<i>Smilax glauca</i>	cat greenbrier	X	X	X	3
<i>Smilax laurifolia</i>	laurel greenbrier	X	X	X	3
<b><i>Smilax pumila</i></b>	<b>sarsaparilla vine</b>		X	X	2
<i>Smilax walteri</i>	coral greenbrier	X	X	X	3
<i>Solidago fistulosa</i>	pinebarren goldenrod		X	X	2
<i>Solidago odora</i>	sweet goldenrod			X	1
<b><i>Sophronanthe pilosa</i></b>	<b>shaggy hedgehyssop</b>		X		1
<i>Sphagnum sp.</i>	sphagnum moss	X	X	X	3
<i>Stillingia aquatica</i>	water toothleaf		X		1
<i>Syngonanthus flavidulus</i>	yellow hatpins			X	1
<i>Taxodium ascendens</i>	pond cypress	X		X	2
<i>Tiedemannia filiformis</i> ssp. <i>filiformis</i>	water cowbane		X		1
<i>Utricularia juncea</i>	southern bladderwort			X	1
<i>Utricularia subulata</i>	zigzag bladderwort			X	1
<i>Vaccinium corymbosum</i>	highbush blueberry		X		1

Scientific Name	Common Name	Cypress	Hydric pine flatwoods	Hydric pine savanna	Grand Total
<i>Vaccinium darrowii</i>	Darrow's blueberry		X		1
<i>Vaccinium myrsinites</i>	shiny blueberry		X		1
<i>Vitis rotundifolia</i>	muscadine	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		1
<i>Xyris elliotii</i>	Elliott's yellow-eyed grass		X	X	2
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	X	X	X	3
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass		X	X	2
<i>Xyris jupicai</i>	Richard's yellow-eyed grass		X		1
<i>Xyris platylepis</i>	tall yellow-eyed grass		X		1
<i>Xyris stricta</i>	pineland yellow-eyed grass			X	1
<b>Total number of taxa: 132</b>		31	93	94	218

### 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 soil was currently moist to dry, but old machinery ruts were evident. 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. The eastern section near Transect 2 had more saw palmetto and gallberry and a diverse herbaceous cover with scattered patches of wiregrass and beaksedges. This area was burned in 2018. There were numerous pine trees blown down by the recent hurricane in early October 2018, but these were mostly concentrated in the more densely planted stand immediately north of the large Hydric Pine Savanna. The total number of species observed in this community was 93 (Table WC-1).

**Quantitative sampling.** The western Transect 1 (Table WC-2, Figure WC-2) had a total of 29 species with 33% bare ground. Numerous slash pines had fallen in the area of the transect due to recent storms. Purple bluestem contributed the most cover, followed by woody species (large gallberry, black titi, saw palmetto, and sweet pepperbush). Woody species made up well over half of the total cover, around 45% average cover per quadrat.

The eastern Transect 2 (Table WC-3, Figure WC-3) had a total of 32 species with 38% bare ground. Shrubby species contributed most of the cover, primarily saw palmetto, dwarf live oak, and blue huckleberry. Woody species made around 34% average cover per quadrat. Shortleaf yellow-eyed grass, sphagnum moss, broomsedge bluestem, bunched beaksedge, and fasciated beaksedge made up most of the sparse herbaceous cover.

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

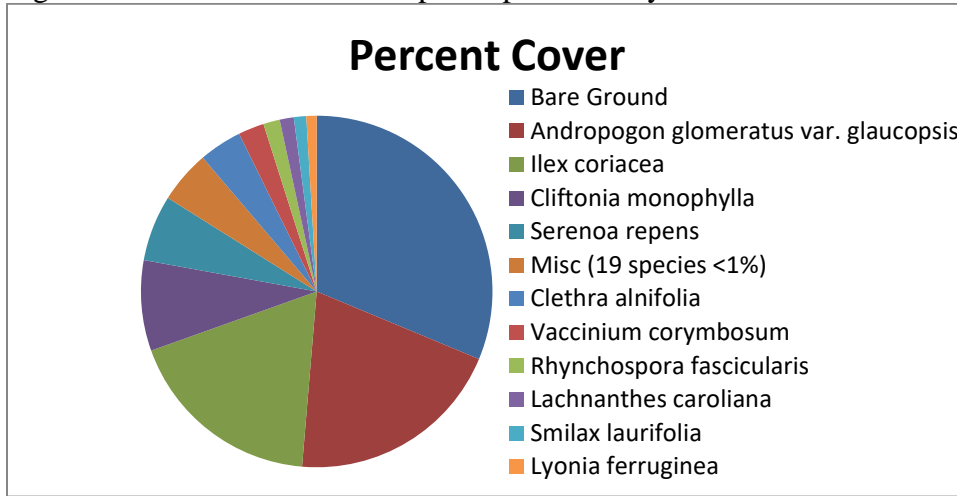


Table WC-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1 sampled on October 31, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	21.13
<i>Ilex coriacea</i>	large gallberry	19.20
<i>Cliftonia monophylla</i>	black titi	8.77
<i>Serenoa repens</i>	saw palmetto	6.40
<i>Clethra alnifolia</i>	sweet pepperbush	4.17
<i>Vaccinium corymbosum</i>	highbush blueberry	2.50
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	1.60
<i>Lachnanthes carolina</i>	Carolina redroot	1.37
<i>Smilax laurifolia</i>	laurel greenbrier	1.20
<i>Lyonia ferruginea</i>	rusty staggerbush	1.00
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.70
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.60
<i>Polygala lutea</i>	orange milkwort	0.53
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.53
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	0.50
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.37
<i>Pinus elliotii</i>	slash pine	0.30
<i>Cyrilla racemiflora</i>	titi	0.23
<i>Oldenlandia uniflora</i>	clustered mille grains	0.23
<i>Rhynchospora ciliaris</i>	fringed beaksedge	0.23
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.23
<i>Aronia arbutifolia</i>	red chokeberry	0.13
<i>Dichanthelium sphaerocarpon</i>	roundseed witchgrass	0.10
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	0.10
<i>Scleria ciliata</i>	fringed nutrush	0.10
<i>Vitis rotundifolia</i>	muscadine	0.10
<i>Ludwigia alata</i>	winged primrosewillow	0.03

<i>Sabatia brevifolia</i>	shortleaf rosegiantian	0.03
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	0.03
Bare Ground		32.97

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

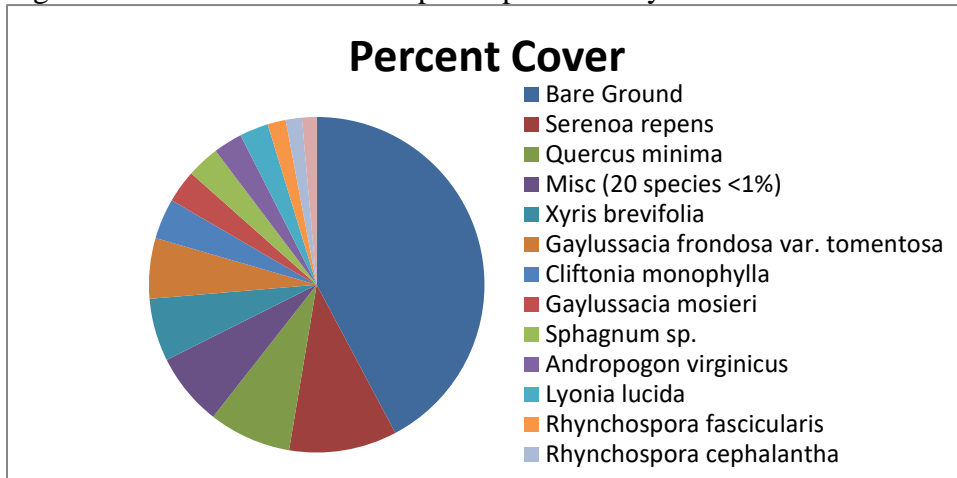


Table WC-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 sampled on October 31, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Serenoa repens</i>	saw palmetto	9.33
<i>Quercus minima</i>	dwarf live oak	7.13
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	5.43
<i>Gaylussacia frondosa</i> var. <i>tomentosa</i>	blue huckleberry	5.23
<i>Cliftonia monophylla</i>	black titi	3.50
<i>Gaylussacia mosieri</i>	woolly huckleberry	2.83
<i>Sphagnum</i> sp.	sphagnum moss	2.83
<i>Andropogon virginicus</i>	broomsedge bluestem	2.50
<i>Lyonia lucida</i>	fetterbush	2.50
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	1.57
<i>Rhynchospora cephalantha</i>	bunched beaksedge	1.40
<i>Ilex glabra</i>	gallberry	1.27
<i>Cyrilla racemiflora</i>	titi	0.97
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	0.83
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.50
<i>Xyris platylepis</i>	tall yellow-eyed grass	0.50
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass	0.47
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.43
<i>Ilex coriacea</i>	large gallberry	0.37
<i>Pinus elliotii</i>	slash pine	0.30
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.27
<i>Smilax auriculata</i>	earleaf greenbrier	0.27
<i>Andropogon</i> sp.	bluestem	0.23

Scientific name	Common name	Average percent cover per quadrat
<i>Aristida spiciformis</i>	bottlebrush threeawn	0.20
<i>Carphephorus odoratissimus</i>	vanillaleaf	0.20
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.20
<i>Dichantherium sphaerocarpon</i>	roundseed witchgrass	0.17
<i>Rhynchospora</i> sp.	beaksedge	0.13
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.10
<i>Vaccinium darrowii</i>	Darrow's blueberry	0.10
<i>Scleria ciliata</i>	fringed nutrush	0.03
<i>Xyris jupicai</i>	Richard's yellow-eyed grass	0.03
Bare Ground		37.90

### 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 shrub clumps of fetterbush, titi and black titi occur throughout. The soil was dry at the time of sampling except in a few lower pockets with standing water. The area southeast of the main road was burned in 2018. 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 (*Cleistes bifaria*). Only red-flowered pitcher plant was observed in the Fall 2018 sampling. The total number of plant species observed in this community was 94 (Table WC-1).

**Quantitative sampling.** Transect 1 (Table WC-4, Figure WC-4) had a total of 34 species and 19% bare ground. The site was burned less than a year ago. Groundcover was heavily dominated by purple bluestem, followed by the shrub fetterbush. Fascicled beaksedge, Carolina redroot, and large gallberry also contributed significant cover. Woody species made up about a quarter of the overall plant cover, around 21% average cover per quadrat.

Transect 2 (Table WC-5, Figure WC-5) had a total of 29 species and 9% bare ground. The vegetation was dominated by purple bluestem followed by shrubby species, primarily black titi, fetterbush, and titi. The next most abundant herbaceous species, totalling around 10% percent of cover, were tenangle pipewort, plumed beaksedge, wiregrass, and broomsedge bluestem. Woody species made up around one third of the overall plant cover, around 33% average cover per quadrat.

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

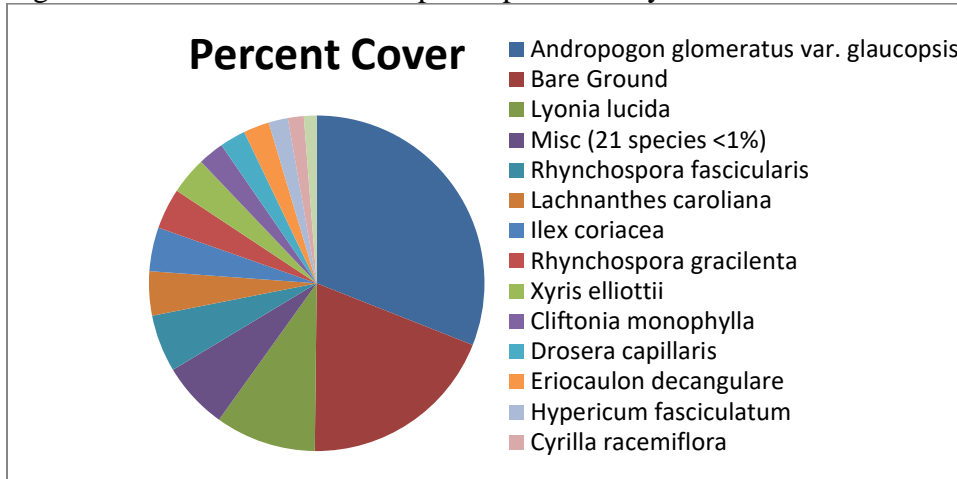


Table WC-4. Percent cover of species in Hydric Pine Savanna Transect 1 sampled on October 30, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	31.07
<i>Lyonia lucida</i>	fetterbush	9.73
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	5.53
<i>Lachnanthes caroliana</i>	Carolina redroot	4.27
<i>Ilex coriacea</i>	large gallberry	4.23
<i>Rhynchospora gracilentia</i>	slender beaksedge	3.93
<i>Xyris elliottii</i>	Elliott's yellow-eyed grass	3.60
<i>Cliftonia monophylla</i>	black titi	2.50
<i>Drosera capillaris</i>	pink sundew	2.50
<i>Eriocaulon decangulare</i>	tenangle pipewort	2.50
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	1.87
<i>Cyrilla racemiflora</i>	titi	1.53
<i>Rhynchospora ciliaris</i>	fringed beaksedge	1.23
<i>Smilax laurifolia</i>	laurel greenbrier	0.93
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	0.90
<i>Aristida stricta</i>	wiregrass	0.60
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.50
<i>Sarracenia rubra</i>	sweet pitcherplant	0.50
<i>Rhynchospora corniculata</i>	shortbristle horned beaksedge	0.47
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.43
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.33
<i>Kelochloa verrucosa</i>	warty panicgrass	0.33
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.27
<i>Andropogon glomeratus</i>	bushy bluestem	0.23
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.23

Scientific name	Common name	Average percent cover per quadrat
<i>Rhexia nuttallii</i>	Nuttall's meadowbeauty	0.13
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	0.13
<i>Ctenium aromaticum</i>	toothache grass	0.10
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.10
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	0.10
<i>Sphagnum</i> sp.	sphagnum moss	0.10
<i>Dichantherium ensifolium</i> var. <i>unciphyllum</i>	cypress witchgrass	0.03
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.03
<i>Pinus elliotii</i>	slash pine	0.03
Bare Ground		19.23

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

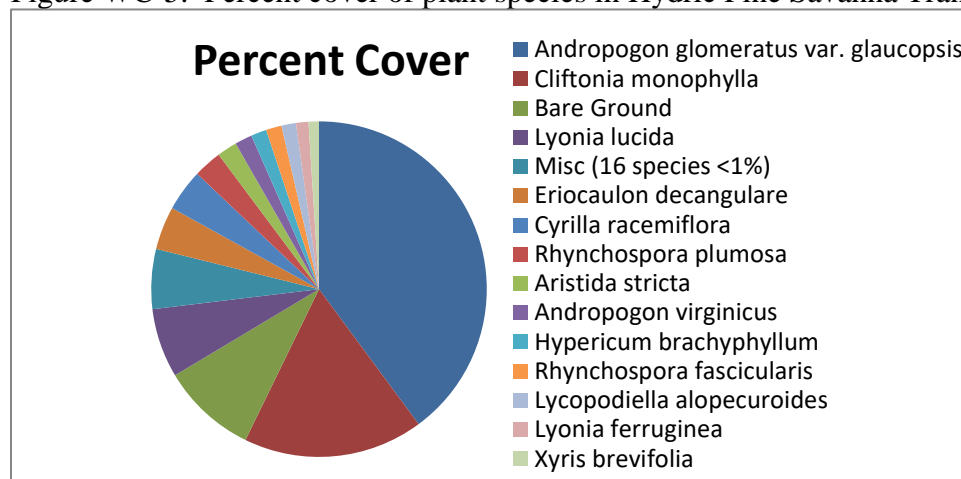


Table WC-5. Percent cover of plant species in Hydric Pine Savanna Transect 2 sampled on October 30, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	39.87
<i>Cliftonia monophylla</i>	black titi	17.33
<i>Lyonia lucida</i>	fetterbush	6.67
<i>Eriocaulon decangulare</i>	tenangle pipewort	4.17
<i>Cyrilla racemiflora</i>	titi	4.03
<i>Rhynchospora plumosa</i>	plumed beaksedge	2.73
<i>Aristida stricta</i>	wiregrass	1.93
<i>Andropogon virginicus</i>	broomsedge bluestem	1.67
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	1.50
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	1.50
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	1.40
<i>Lyonia ferruginea</i>	rusty staggerbush	1.20
<i>Xyris brevifolia</i>	shortleaf yellow-eyed grass	1.00
<i>Dichantherium ensifolium</i>	cypress witchgrass	0.87



Scientific name	Common name	Average percent cover per quadrat
<i>Rhynchospora cephalantha</i>	bunched beaksedge	0.83
<i>Lachnanthes caroliana</i>	Carolina redroot	0.70
<i>Pinus elliotii</i>	slash pine	0.63
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	0.53
<i>Kalmia hirsuta</i>	hairy wicky	0.40
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.37
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.30
<i>Ctenium aromaticum</i>	toothache grass	0.23
<i>Smilax laurifolia</i>	laurel greenbrier	0.23
<i>Polygala cruciata</i>	drumheads	0.17
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.17
<i>Ilex coriacea</i>	large gallberry	0.10
<i>Pluchea foetida</i>	stinking camphorweed	0.10
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.10
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.03
Bare Ground		9.20

## Cypress

**Qualitative sampling.** The cypress target community was visited at two sites, one in the southwestern portion of the Ward Creek project and one in an included (unmapped) cypress stringer within the mapped hydric pine savanna (Figure WC-1). At the large cypress polygon, the canopy consisted of scattered mature pond cypress trees with a dense subcanopy of tree-sized titi. The stringer included an open canopy of pond cypress, slash pine, and sweetbay, with an open shrub layer of large gallberry, black titi, and a few climbing fetterbush. Laurel greenbrier was dense in places, but there were also open stands of water and herbaceous species including Walter's sedge, fascicled beaksedge, fringed yellow-eyed grass, and the state-listed threatened spoon-leaved sundew (*Drosera intermedia*). In many areas of mapped cypress on the Ward Creek project, the original community was likely wet flatwoods rather than cypress, making this community difficult to sample. The total number of species observed in this community was 31 (Table WC-1).

**Dutex West Restoration Site**  
**Qualitative and Quantitative Monitoring**  
**October 2018**

**Dutex West Restoration Site  
Qualitative and Quantitative Monitoring  
October 2018**

**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 was monitored in 2018. 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. The site vegetation was previously 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). 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 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 Gullede, Jenna Annis, and Amy Jenkins on October 15-16, 2018.



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 156 plant species were recorded during 2018 monitoring session in the target communities at Dutex West (Table DW-1). Forty-nine new species were recorded during the 2018 monitoring.

Table DW-1. Plant species observed in the target communities at Dutex West Mitigation Site on October 15-16, 2018. (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
<i>Acer rubrum</i>	red maple	X	X	X	X	X	X	6
<i>Amphicarpum muehlenbergianum</i>	blue maidencane	X						1
<i>Andropogon arctatus</i>	pinewoods bluestem		X					1
<i>Andropogon glomeratus</i>	bushy bluestem	X	X	X	X	X		5
<i>Andropogon virginicus</i>	broomsedge bluestem	X	X		X			3
<i>Anthraenantia rufa</i>	purple silkyscale		X					1
<i>Aristida palustris</i>	longleaf threeawn		X					1
<b><i>Aristida spiciformis</i></b>	<b>bottlebrush threeawn</b>				X			1
<i>Aristida stricta</i>	wiregrass	X	X	X	X			4
<i>Aronia arbutifolia</i>	red chokeberry		X					1
<i>Asclepias lanceolata</i>	fewflower milkweed	X						1
<i>Baccharis halimifolia</i>	groundsel tree		X			X		2
<b><i>Balduina uniflora</i></b>	<b>oneflower honeycomb-head</b>		X					1
<b><i>Bartonia paniculata</i></b>	<b>twining screwstem</b>		X					1
<i>Bidens mitis</i>	smallfruit beggarticks	X	X	X				3
<b><i>Callicarpa americana</i></b>	<b>American beautyberry</b>				X			1
<i>Carex glaucescens</i>	clustered sedge	X	X					2
<b><i>Carphephorus odoratissimus</i></b>	<b>vanillaleaf</b>				X			1
<i>Centella asiatica</i>	spadeleaf	X	X	X				3
<i>Cladium jamaicense</i>	sawgrass	X		X		X	X	4
<i>Clethra alnifolia</i>	sweet pepperbush		X		X			2
<i>Cliftonia monophylla</i>	black titi	X	X	X		X		4
<i>Coelorachis rugosa</i>	wrinkled jointgrass		X					1
<i>Coleataenia anceps</i>	beaked panicum	X	X					2
<b><i>Cyperus haspan</i></b>	<b>haspan flatsedge</b>		X					1
<b><i>Cyperus polystachyos</i></b>	<b>manyspike flatsedge</b>					X		1
<i>Cyrilla racemiflora</i>	titi	X	X	X				3
<i>Dichanthelium ensifolium</i>	cypress witchgrass	X	X	X				3
<b><i>Dichanthelium portoricense</i></b>	<b>hemlock witchgrass</b>				X			1
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	X	X				X	3
<i>Dichanthelium</i> sp.	witchgrass	X						1
<b><i>Diospyros virginiana</i></b>	<b>common persimmon</b>					X		1
<i>Eragrostis virginica</i>	coastal lovegrass	X						1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
<i>Erechtites hieraciifolius</i>	fireweed				X			1
<i>Eriocaulon compressum</i>	flattened pipewort		X	X				2
<i>Eriocaulon decangulare</i>	tenangle pipewort	X	X	X				3
<i>Eupatorium compositifolium</i>	yankeeweed				X			1
<i>Eupatorium leucolepis</i>	justiceweed	X	X					2
<i>Eupatorium mohrii</i>	Mohr's thoroughwort		X					1
<i>Eupatorium serotinum</i>	lateflowering thoroughwort					X		1
<i>Eupatorium sp.</i>	thoroughwort						X	1
<i>Euthamia caroliniana</i>	slender flattop goldenrod	X	X		X			3
<i>Euthamia graminifolia</i>	flattop goldenrod					X	X	2
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge		X	X				2
<i>Fuirena scirpoidea</i>	southern umbrellasedge		X					1
<i>Gaylussacia dumosa</i>	dwarf huckleberry				X			1
<i>Gaylussacia mosieri</i>	woolly huckleberry	X	X		X			3
<i>Helianthus angustifolius</i>	narrowleaf sunflower		X					1
<i>Houstonia procumbens</i>	roundleaf bluet				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 tetrapetalum</i>	fourpetal St. John's wort				X			1
<i>Ilex cassine</i>	dahoon						X	1
<i>Ilex cassine var. myrtifolia</i>	myrtle-leaved holly		X	X			X	3
<i>Ilex coriacea</i>	large gallberry	X	X		X			3
<i>Ilex glabra</i>	gallberry	X	X	X	X		X	5
<i>Ilex vomitoria</i>	yaupon	X					X	2
<i>Juncus marginatus</i>	grassleaf rush		X					1
<i>Juncus roemerianus</i>	needle rush					X		1
<i>Kalmia hirsuta</i>	hairy wicky				X			1
<i>Kellochloa verrucosa</i>	warty panicgrass	X	X					2
<i>Lachnanthes caroliniana</i>	Carolina redroot	X	X					2
<i>Liatris spicata</i>	dense gayfeather		X					1
<i>Lobelia glandulosa</i>	glade lobelia		X					1
<i>Ludwigia linifolia</i>	southeastern primrosewillow		X					1
<i>Ludwigia pilosa</i>	hairy primrosewillow	X	X					2
<i>Ludwigia repens</i>	creeping primrosewillow		X					1
<i>Ludwigia sp.</i>	primrosewillow		X					1
<i>Lycopodiella alopecuroides</i>	foxtail club-moss		X					1
<i>Lycopus rubellus</i>	taperleaf waterhorehound		X					1
<i>Lygodium japonicum</i>	Japanese climbing fern						X	1
<i>Lyonia lucida</i>	fetterbush	X	X	X	X			4
<i>Magnolia grandiflora</i>	southern magnolia				X			1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
<i>Magnolia virginiana</i>	sweetbay	X	X	X	X	X	X	6
<i>Mikania scandens</i>	climbing hempvine		X			X	X	3
<i>Morella carolinensis</i>	evergreen bayberry		X					1
<i>Morella cerifera</i>	southern bayberry	X	X	X		X	X	5
<i>Morella inodora</i>	odorless bayberry		X					1
<b><i>Nymphaea odorata</i></b>	<b>white waterlily</b>			X				1
<i>Nyssa biflora</i>	swamp tupelo	X	X	X			X	4
<i>Nyssa ursina</i>	bog tupelo		X					1
<i>Oldenlandia uniflora</i>	clustered mille grains	X	X		X			3
<i>Osmunda cinnamomea</i>	cinnamon fern	X		X		X		3
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	X		X		X	X	4
<b><i>Panicum hemitomon</i></b>	<b>maidencane</b>	X						1
<b><i>Panicum repens</i></b>	<b>torpedo grass</b>					X		1
<i>Panicum</i> sp.	panic grass				X			1
<i>Panicum virgatum</i>	switchgrass	X		X		X	X	4
<i>Paspalum floridanum</i>	Florida paspalum	X						1
<i>Persea palustris</i>	swamp bay	X	X	X		X	X	5
<b><i>Persicaria hydropiperoides</i></b>	<b>mild waterpepper</b>						X	1
<b><i>Pieris phyllireifolia</i></b>	<b>climbing fetterbush</b>		X					1
<i>Pinus elliotii</i>	slash pine	X	X	X	X	X	X	6
<i>Pluchea baccharis</i>	rosy camphorweed		X					1
<b><i>Pluchea foetida</i></b>	<b>stinking camphorweed</b>		X					1
<b><i>Polygala</i> sp.</b>	<b>milkwort</b>				X			1
<b><i>Pontederia cordata</i></b>	<b>pickerelweed</b>					X		1
<i>Proserpinaca pectinata</i>	combleaf mermaidweed		X					1
<b><i>Pseudognaphalium obtusifolium</i></b>	<b>sweet everlasting</b>				X			1
<i>Pteridium aquilinum</i>	bracken fern		X		X	X		3
<i>Quercus hemisphaerica</i>	laurel oak				X			1
<b><i>Quercus virginiana</i></b>	<b>live oak</b>				X			1
<i>Rhexia mariana</i>	pale meadowbeauty	X						1
<i>Rhexia petiolata</i>	fringed meadowbeauty	X	X					2
<i>Rhexia</i> sp.	meadowbeauty		X					1
<i>Rhexia virginica</i>	handsome harry	X						1
<b><i>Rhododendron canescens</i></b>	<b>mountain azalea</b>				X			1
<b><i>Rhus copallinum</i></b>	<b>winged sumac</b>	X	X					2
<i>Rhynchospora baldwinii</i>	Baldwin's beaksedge		X					1
<i>Rhynchospora cephalantha</i>	bunched beaksedge		X					1
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	X	X					2
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge		X					1
<b><i>Rhynchospora corniculata</i></b>	<b>shortbristle horned beaksedge</b>			X				1
<i>Rhynchospora fascicularis</i>	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
<i>Rhynchospora filifolia</i>	threadleaf beaksedge	X						1
<b><i>Rhynchospora gracilentia</i></b>	<b>slender beaksedge</b>	<b>X</b>	<b>X</b>					2
<b><i>Rhynchospora rariflora</i></b>	<b>fewflower beaksedge</b>		<b>X</b>					1
<i>Rhynchospora sp.</i>	beaksedge	X						1
<i>Rubus pensilvanicus</i>	sawtooth blackberry	X	X	X	X	X	X	6
<i>Rubus trivialis</i>	southern dewberry	X						1
<i>Sabal minor</i>	bluestem palmetto	X						1
<b><i>Sabatia brevifolia</i></b>	<b>shortleaf rosegentian</b>				<b>X</b>			1
<b><i>Sacciolepis striata</i></b>	<b>American cupscale</b>					<b>X</b>		1
<b><i>Sagittaria lancifolia</i></b>	<b>bulltongue arrowhead</b>	<b>X</b>						1
<i>Sarracenia leucophylla</i>	white-top pitcherplant		X					1
<b><i>Schizachyrium stoloniferum</i></b>	<b>creeping little bluestem</b>		<b>X</b>					1
<i>Scleria sp.</i>	nutrush		X					1
<b><i>Scutellaria integrifolia</i></b>	<b>helmet skullcap</b>	<b>X</b>						1
<i>Serenoa repens</i>	saw palmetto		<b>X</b>		X			2
<b><i>Sesbania punicea</i></b>	<b>purple sesban</b>					<b>X</b>		1
<b><i>Smilax auriculata</i></b>	<b>earleaf greenbrier</b>				<b>X</b>			1
<b><i>Smilax bona-nox</i></b>	<b>saw greenbrier</b>					<b>X</b>		1
<i>Smilax laurifolia</i>	laurel greenbrier	X	X	X	X		X	5
<b><i>Smilax tamnoides</i></b>	<b>bristly greenbrier</b>	<b>X</b>	<b>X</b>					2
<i>Solidago fistulosa</i>	pinebarren goldenrod	<b>X</b>	X					2
<i>Solidago rugosa ssp. aspera</i>	wrinkleleaf goldenrod						<b>X</b>	1
<i>Solidago sp.</i>	goldenrod				<b>X</b>	<b>X</b>		2
<b><i>Sophronanthe pilosa</i></b>	<b>shaggy hedgehyssop</b>	<b>X</b>						1
<i>Spartina patens</i>	saltmeadow cordgrass	X					X	2
<i>Sphagnum sp.</i>	sphagnum moss	X	X	X				3
<i>Styrax americanus</i>	American snowbell		X					1
<b><i>Symphyotrichum walteri</i></b>	<b>Walter's aster</b>						<b>X</b>	1
<i>Symplocos tinctoria</i>	horse sugar				X			1
<i>Taxodium ascendens</i>	pond cypress	<b>X</b>	X	X			X	4
<i>Toxicodendron radicans</i>	eastern poison ivy	X		X		X	X	4
<i>Triadica sebifera</i>	Chinese tallow tree		<b>X</b>		<b>X</b>	<b>X</b>		3
<b><i>Typha latifolia</i></b>	<b>broadleaf cattail</b>					<b>X</b>		1
<i>Vaccinium corymbosum</i>	highbush blueberry	X	<b>X</b>	<b>X</b>	X			4
<i>Vaccinium elliotii</i>	Elliott's blueberry		X					1
<b><i>Vaccinium myrsinites</i></b>	<b>shiny blueberry</b>				<b>X</b>			1
<i>Vitis rotundifolia</i>	muscadine	X	<b>X</b>	X	X	<b>X</b>	<b>X</b>	6
<i>Woodwardia areolata</i>	netted chain fern	X	<b>X</b>					2
<i>Woodwardia virginica</i>	Virginia chain fern	X	X	X				3
<i>Xyris fimbriata</i>	fringed yellow-eyed grass		X					1
<i>Xyris sp.</i>	yellow-eyed grass		X	<b>X</b>				2



Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
Total number of taxa: 157		67	93	34	42	30	28	294

### Hydric Pine Flatwoods

**Qualitative sampling.** The eastern area of Hydric Pine Flatwoods in the vicinity of Transect 1 was accessed to create a species list (Figure DW-1). This area had an open canopy (16-25% cover) of mature slash pines 60 to 100 feet in height. The ground layer was mostly herbaceous with purple bluestem dominant along with a mix of other, mostly weedy species including Carolina redroot, fascicled beaksedge, Virginia chain fern, cypress witchgrass, smallfruit beggarticks, slender flattop goldenrod, and fringed meadowbeauty. Shrubs were sparse and included black titi, large gallberry, fetterbush, swamp bay, and coastalplain St. John’s wort. The total number of species observed in this community was 67 (Table DW-1).

**Quantitative sampling.** The eastern Transect 1 (Table DW-2, Figure DW-2) had a total of 25 species with 34% bare ground. Carolina redroot, purple bluestem, laurel greenbrier, titi, and fascicled beaksedge contributed the most cover. Woody species made up about 19% average cover per quadrat.

The western Transect 4 (Table DW-3, Figure DW-3) had a total of 30 species with 47% bare ground. Switchgrass, swamp bay, and slash pine contributed the most cover. Woody species made up about 23% average cover per quadrat.

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

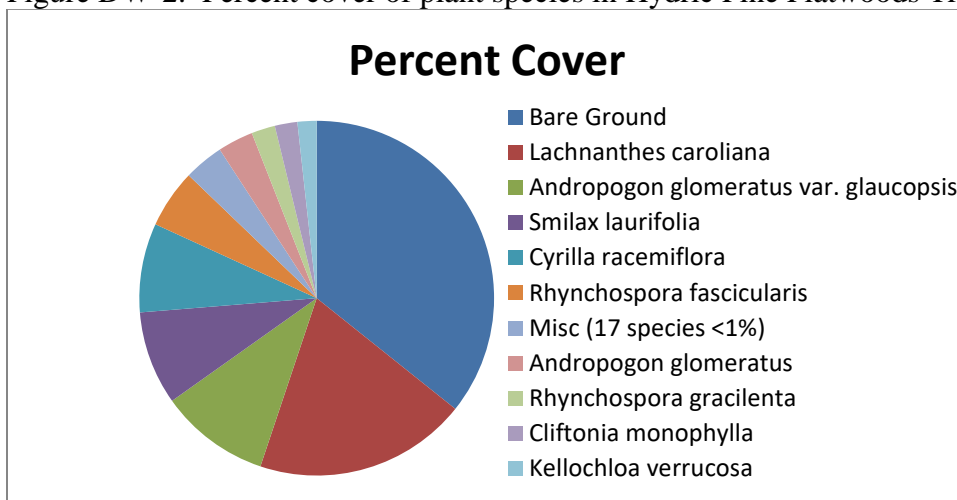


Table DW-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1 sampled on October 16, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Lachnanthes caroliana</i>	Carolina redroot	18.57
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	9.60
<i>Smilax laurifolia</i>	laurel greenbrier	8.17
<i>Cyrilla racemiflora</i>	titi	7.77
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	5.10
<i>Andropogon glomeratus</i>	bushy bluestem	3.10
<i>Rhynchospora gracilentia</i>	slender beaksedge	2.07
<i>Cliftonia monophylla</i>	black titi	1.97
<i>Kelloggloa verrucosa</i>	warty panicgrass	1.67
<i>Pinus elliotii</i>	slash pine	0.67
<i>Woodwardia virginica</i>	Virginia chain fern	0.53
<i>Lyonia lucida</i>	fetterbush	0.50
<i>Sphagnum</i> sp.	sphagnum moss	0.50
<i>Ilex coriacea</i>	large gallberry	0.27
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	0.23
<i>Carex glaucescens</i>	clustered sedge	0.20
<i>Panicum hemitomon</i>	maidencane	0.10
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.10
<i>Rhexia virginica</i>	handsome harry	0.10
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.07
<i>Rhynchospora</i> sp.	beaksedge	0.07
<i>Bidens mitis</i>	smallfruit beggarticks	0.03
<i>Dichanthelium</i> sp.	witchgrass	0.03
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.03
<i>Rhexia mariana</i>	pale meadowbeauty	0.03
Bare Ground		34.17

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

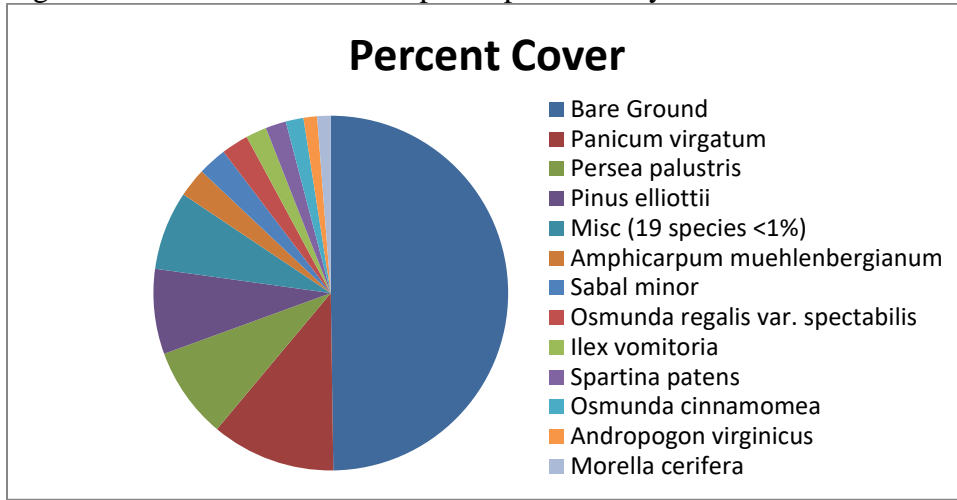


Table DW-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 4 sampled on October 16, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Panicum virgatum</i>	switchgrass	10.70
<i>Persea palustris</i>	swamp bay	7.90
<i>Pinus elliotii</i>	slash pine	7.33
<i>Amphicarpum muehlenbergianum</i>	blue maidencane	2.50
<i>Sabal minor</i>	bluestem palmetto	2.50
<i>Osmunda regalis var. spectabilis</i>	royal fern	2.33
<i>Ilex vomitoria</i>	yaupon	1.80
<i>Spartina patens</i>	saltmeadow cordgrass	1.77
<i>Osmunda cinnamomea</i>	cinnamon fern	1.53
<i>Andropogon virginicus</i>	broomsedge bluestem	1.17
<i>Morella cerifera</i>	southern bayberry	1.17
<i>Toxicodendron radicans</i>	eastern poison ivy	0.97
<i>Bidens mitis</i>	smallfruit beggarticks	0.73
<i>Paspalum floridanum</i>	Florida paspalum	0.70
<i>Taxodium ascendens</i>	pond cypress	0.60
<i>Cladium jamaicense</i>	sawgrass	0.57
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	0.50
<i>Coleataenia anceps</i>	beaked panicum	0.50
<i>Eragrostis virginica</i>	coastal lovegrass	0.50
<i>Ilex glabra</i>	gallberry	0.50
<i>Aristida stricta</i>	wiregrass	0.23
<i>Carex glaucescens</i>	clustered sedge	0.17
<i>Acer rubrum</i>	red maple	0.13
<i>Centella asiatica</i>	spadeleaf	0.13
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.13
<i>Asclepias lanceolata</i>	fewflower milkweed	0.10
<i>Nyssa biflora</i>	swamp tupelo	0.10
<i>Rubus trivialis</i>	southern dewberry	0.10

Scientific name	Common name	Average percent cover per quadrat
<i>Scutellaria integrifolia</i>	helmet skullcap	0.10
<i>Sagittaria lancifolia</i>	bulltongue arrowhead	0.03
Bare Ground		47.07

### Hydric Pine Savanna

**Qualitative sampling.** Hydric Pine Savanna was accessed in the vicinity of Transect 1 to create a species list (Figure DW-1). This area had an open canopy (16-25% cover) of mature slash pines 45 to 60 feet in height. The ground layer was mostly herbaceous with purple bluestem and woolly witchgrass dominant along with a mix of other species including various beaksedges, tenangle pipewort, fringed yellow-eyed grass, slender flattop goldenrod, and wiregrass. Shrubs formed around 30% cover and were mainly under 3 feet tall. These included black titi, large gallberry, sweet pepperbush, and coastalplain St. John’s wort. The total number of plant species observed in this community was 93 (Table DW-1).

**Quantitative sampling.** The southern Transect 2 (Table DW-4, Figure DW-4) had a total of 35 species and 60% bare ground. Transect 2 is dominated by a thicket of tall, woody species, heavily shading out any potential herbaceous cover and leading to a larger amount of bare ground. Titi, large gallberry, gallberry, and saw palmetto contributed the most cover. Woody species made up about 64% average cover per quadrat.

The northern Transect 3 (Table DW-5, Figure DW-5) had a total of 58 species and 20% bare ground. Woolly witchgrass, coastalplain St. John’s wort, laurel greenbrier, purple bluestem, and tenangle pipewort contributed the most cover. Woody species made up about 25% average cover per quadrat. The invasive exotic Chinese tallow tree was seen in the quadrat located at 80 feet along this transect. The state listed endangered whitetop pitcher plant was seen in the quadrat located at 100 feet along this transect.

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

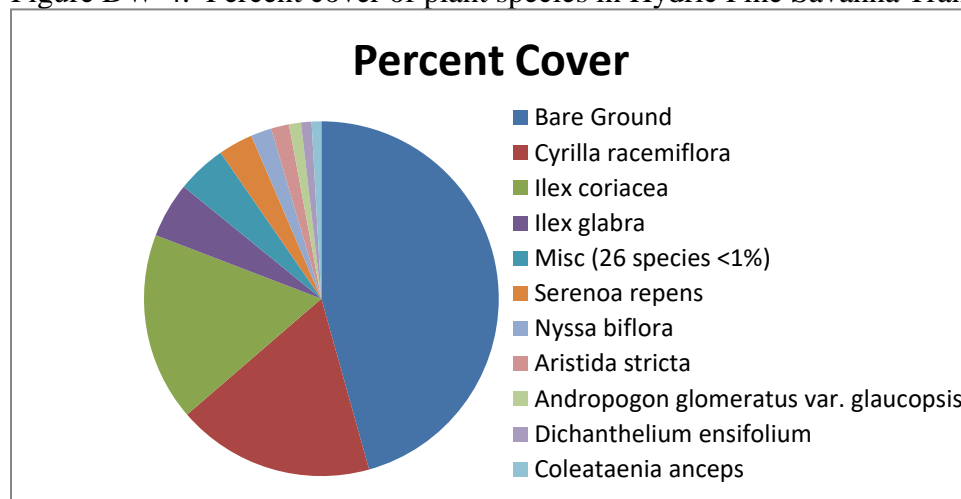


Table DW-4. Percent cover of species in Hydric Pine Savanna Transect 2 sampled on October 15, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Cyrilla racemiflora</i>	titi	23.80
<i>Ilex coriacea</i>	large gallberry	22.67
<i>Ilex glabra</i>	gallberry	6.67
<i>Serenoa repens</i>	saw palmetto	4.17
<i>Nyssa biflora</i>	swamp tupelo	2.50
<i>Aristida stricta</i>	wiregrass	2.17
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	1.43
<i>Dichanthelium ensifolium</i>	cypress witchgrass	1.27
<i>Coleataenia anceps</i>	beaked panicum	1.17
<i>Persea palustris</i>	swamp bay	0.87
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.63
<i>Eriocaulon compressum</i>	flattened pipewort	0.60
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	0.60
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.53
<i>Morella inodora</i>	odorless bayberry	0.50
<i>Vaccinium corymbosum</i>	highbush blueberry	0.43
<i>Lyonia lucida</i>	fetterbush	0.33
<i>Xyris</i> sp.	yellow-eyed grass	0.27
<i>Rubus pensilvanicus</i>	sawtooth blackberry	0.17
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.13
<i>Vitis rotundifolia</i>	muscadine	0.13
<i>Pteridium aquilinum</i>	bracken fern	0.10
<i>Rhynchospora baldwinii</i>	Baldwin's beaksedge	0.10
<i>Smilax laurifolia</i>	laurel greenbrier	0.10
<i>Sphagnum</i> sp.	sphagnum moss	0.10
<i>Aronia arbutifolia</i>	red chokeberry	0.07
<i>Acer rubrum</i>	red maple	0.03
Cyperaceae		0.03
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	0.03
<i>Lachnanthes caroliana</i>	Carolina redroot	0.03
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.03
<i>Rhexia</i> sp.	meadowbeauty	0.03
<i>Rhus copallinum</i>	winged sumac	0.03
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.03
<i>Rhynchospora rariflora</i>	fewflower beaksedge	0.03
Bare Ground		60.33

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

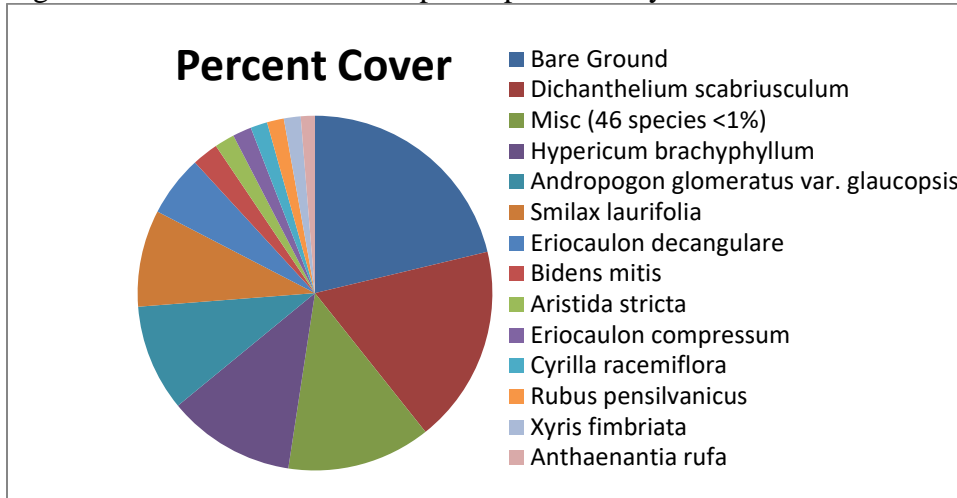


Table DW-5. Percent cover of plant species in Hydric Pine Savanna Transect 3 sampled on October 15, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	16.83
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	10.87
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	9.07
<i>Smilax laurifolia</i>	laurel greenbrier	8.23
<i>Eriocaulon decangulare</i>	tenangle pipewort	5.20
<i>Bidens mitis</i>	smallfruit beggarticks	2.23
<i>Aristida stricta</i>	wiregrass	1.70
<i>Eriocaulon compressum</i>	flattened pipewort	1.60
<i>Cyrilla racemiflora</i>	titi	1.43
<i>Rubus pensilvanicus</i>	sawtooth blackberry	1.43
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	1.43
<i>Anthaenantia rufa</i>	purple silkyscale	1.20
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.93
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.80
<i>Andropogon virginicus</i>	broomsedge bluestem	0.73
<i>Lycopus rubellus</i>	taperleaf waterhorehound	0.73
<i>Lyonia lucida</i>	fetterbush	0.73
<i>Sarracenia leucophylla</i>	white-top pitcherplant	0.73
<i>Coleataenia anceps</i>	beaked panicum	0.63
<i>Pinus elliotii</i>	slash pine	0.63
<i>Rhynchospora rariflora</i>	fewflower beaksedge	0.63
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.60
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.60
<i>Nyssa ursina</i>	bog tupelo	0.50
<i>Triadica sebifera</i>	Chinese tallow tree	0.50
<i>Cliftonia monophylla</i>	black titi	0.33
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.33
<i>Ilex coriacea</i>	large gallberry	0.27

Scientific name	Common name	Average percent cover per quadrat
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.23
<i>Pluchea foetida</i>	stinking camphorweed	0.23
<i>Ilex glabra</i>	gallberry	0.20
<i>Ludwigia repens</i>	creeping primrosewillow	0.20
<i>Mikania scandens</i>	climbing hempvine	0.20
<i>Ludwigia pilosa</i>	hairy primrosewillow	0.17
<i>Rhynchospora gracilentia</i>	slender beaksedge	0.13
<i>Centella asiatica</i>	spadeleaf	0.10
<i>Ludwigia linifolia</i>	southeastern primrosewillow	0.10
<i>Magnolia virginiana</i>	sweetbay	0.10
<i>Aronia arbutifolia</i>	red chokeberry	0.10
<i>Bartonia paniculata</i>	twining screwstem	0.07
Cyperaceae		0.07
<i>Lobelia glandulosa</i>	glade lobelia	0.07
<i>Oldenlandia uniflora</i>	clustered mille grains	0.07
<i>Andropogon glomeratus</i> var. <i>hirsutior</i>	bushy bluestem	0.03
<i>Aristida palustris</i>	longleaf threeawn	0.03
<i>Clethra alnifolia</i>	sweet pepperbush	0.03
<i>Coelorachis rugosa</i>	wrinkled jointgrass	0.03
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	0.03
<i>Fuirena scirpoidea</i>	southern umbrellasedge	0.03
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.03
<i>Hypericum crux-andreae</i>	St. Peter's wort	0.03
<i>Juncus marginatus</i>	grassleaf rush	0.03
<i>Ludwigia</i> sp.	primrosewillow	0.03
<i>Pieris phyllireifolia</i>	climbing fetterbush	0.03
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.03
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	0.03
<i>Scleria</i> sp.	nutrush	0.03
<i>Xyris</i> sp.	yellow-eyed grass	0.03
Bare Ground		19.83

## Bay Swamp

**Qualitative sampling.** An area of Bay Swamp south of the Hydric Pine Savanna Transect 2 was sampled in Fall 2018 (Figure DW-1). This community is more similar to a freshwater tidal swamp or basin marsh than a typical bay swamp. The seepy ecotone to the Hydric Pine Savanna 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. The stunted canopy was around 40% 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 20% cover and was composed of canopy species plus red maple, sweetbay, southern bayberry, and swamp bay. Short shrubs (under 6 feet tall) made up around 40% cover and was composed of titi, gallberry, southern bayberry, black titi, and swamp bay. The patchy herbaceous layer was around 30% cover and consisted mostly of sawgrass, switchgrass,

cinnamon fern, and royal fern. The total number of species observed in this community was 34 (Table DW-1).

### Mesic Flatwoods

**Qualitative sampling.** An area of Mesic Flatwoods was sampled on the eastern side of the property just northeast of the main road through the Dutex West property (Figure DW-1). This area had an open canopy (around 25% cover) of mature slash pine and an open layer of short 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 42 (Table DW-1).

### Freshwater Marsh

**Qualitative sampling.** The Freshwater Marsh target community was accessed from the southeast corner of the property by walking northwest along the shoreline (Figure DW-1). A few scattered slash pines were present, but the community was mostly an open, solid stand of sawgrass with patches of other herbs such as black needle rush and royal fern. Shrubs covered up to around 15% of the area. These were mainly tall individuals of swamp bay, southern bayberry, and groundsel tree. Three invasive exotic species were observed along the shoreline – purple sesban (*Sesbania punicea*), Chinese tallow tree (*Triadica sebifera*), and torpedo grass (*Panicum repens*). The total number of species observed in this community was 30 (Table DW-1).

### Salt Marsh

**Qualitative sampling.** The Salt Marsh target community was accessed by walking southwest from the Hydric Pine Flatwoods Transect 4 (Figure DW-1). The community was largely herbaceous, dominated by saltmarsh cordgrass with patches of black needle grass. Small patches of shrubs throughout formed about 10% cover with most shrubs up to around 9 feet tall. These consisted of dahoon holly, southern bayberry, red maple, swamp bay, and yaupon. The invasive exotic species Japanese climbing fern (*Lygodium japonicum*) was observed. The total number of species observed in this community was 28 (Table DW-1).



**Yellow River Ranch**  
**Qualitative and Quantitative Monitoring**  
**October 2018**

**Yellow River Ranch  
Qualitative and Quantitative Monitoring  
October 2018**

**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 NFWFMD 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. The site vegetation was previously 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 Gullede, Jenna Annis, and Amy Jenkins on October 17-18, 2018.

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 on the recommendation of project manager David Clayton (NFWFMD). Within each transect, all tree species were tallied by height class. The total trees per acre was calculated by multiplying the tally of individuals by 14.28.

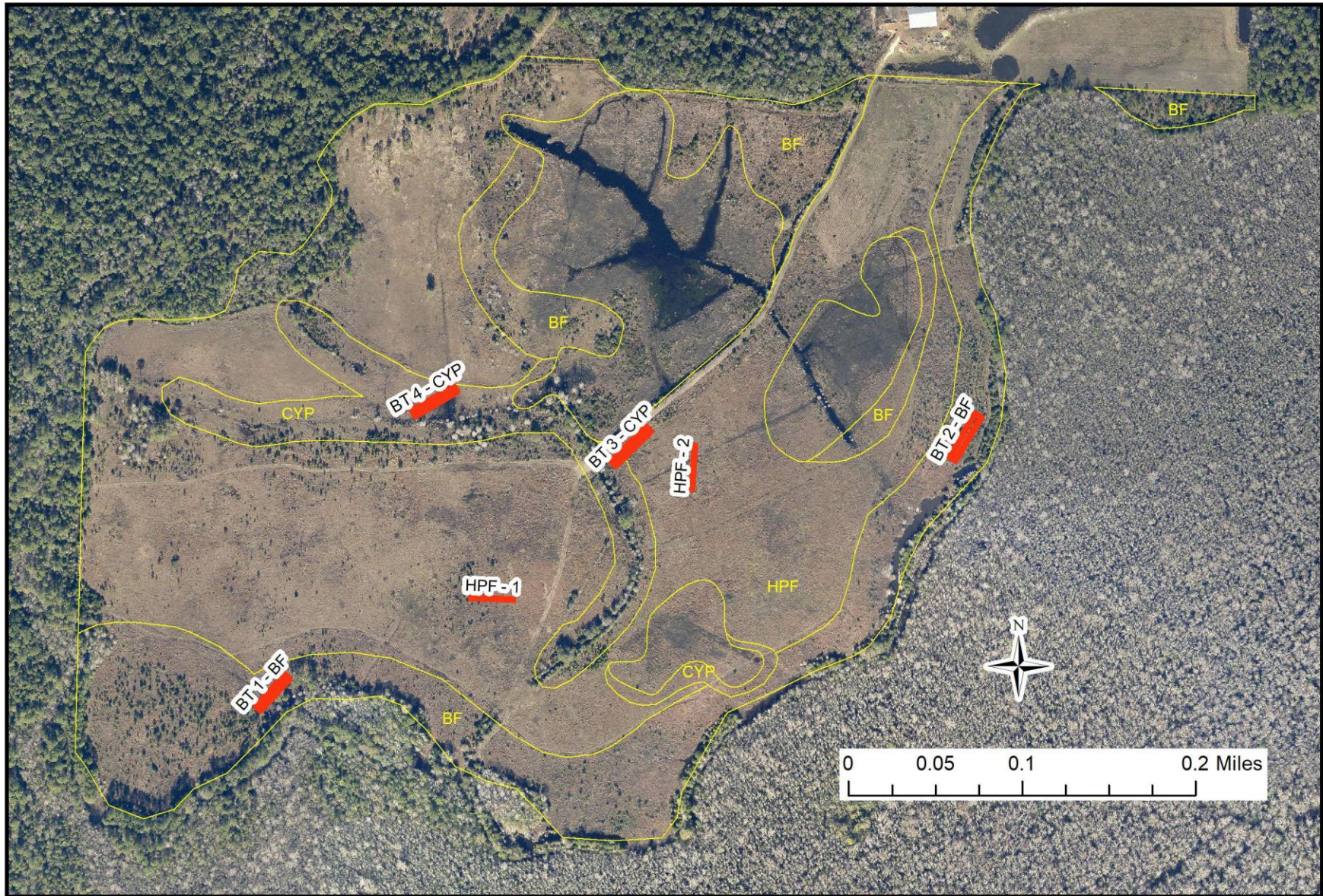


Figure YRR-1. Location of permanent transects at Yellow River Ranch. HPF=Hydric Pine Flatwoods, CYP=Cypress, BF=Bottomland Forest, BT=Belt Transect.

## RESULTS AND DISCUSSION

A total of 79 plant species were recorded during 2018 monitoring session in Hydric Pine Flatwoods at Yellow River Ranch (Table YRR-1). Seven new species were recorded during the 2018 monitoring.

Table YRR-1. Plant species observed in Hydric Pine Flatwoods at Yellow River Ranch Mitigation Site on October 17-18, 2018. (bold name = new species)

Scientific Name	Common Name
<i>Acer rubrum</i>	red maple
<i>Agalinis fasciculata</i>	beach false foxglove
<i>Andropogon virginicus</i>	broomsedge bluestem
<i>Aristida stricta</i>	wiregrass
<i>Axonopus furcatus</i>	big carpetgrass
<i>Baccharis halimifolia</i>	groundsel tree
<i>Bidens mitis</i>	smallfruit beggarticks
<i>Carex glaucescens</i>	clustered sedge
<i>Centella asiatica</i>	spadeleaf
<i>Cephalanthus occidentalis</i>	common buttonbush
<i>Chamaecyparis thyoides</i>	Atlantic white cedar
<i>Cliftonia monophylla</i>	black titi
<i>Coleataenia anceps</i>	beaked panicum
<i>Ctenium aromaticum</i>	toothache grass
<i>Cuphea carthagenensis</i>	Colombian waxweed
<i>Cyrilla racemiflora</i>	titi
<i>Dichanthelium ensifolium</i>	cypress witchgrass
<i>Dichanthelium scabriusculum</i>	woolly witchgrass
<b><i>Digitaria</i> sp.</b>	<b>crabgrass</b>
<i>Diodia virginiana</i>	Virginia buttonweed
<b><i>Drosera brevifolia</i></b>	<b>dwarf sundew</b>
<b><i>Eleocharis vivipara</i></b>	<b>viviparous spikerush</b>
<i>Eragrostis</i> sp.	lovegrass
<i>Erechtites hieraciifolius</i>	fireweed
<i>Eriocaulon decangulare</i>	tenangle pipewort
<i>Eupatorium capillifolium</i>	dogfennel
<i>Eupatorium mohrii</i>	Mohr's thoroughwort
<i>Euthamia caroliniana</i>	slender flattop goldenrod
<i>Euthamia graminifolia</i>	flattop goldenrod
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort
<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>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly

Scientific Name	Common Name
<i>Ilex glabra</i>	gallberry
<b><i>Ilex opaca</i></b>	<b>American holly</b>
<i>Ilex vomitoria</i>	yaupon
<i>Juncus effusus</i> ssp. <i>solutus</i>	soft rush
<i>Juncus marginatus</i>	grassleaf rush
<i>Juncus polycephalos</i>	manyhead rush
<b><i>Juniperus virginiana</i></b>	<b>red cedar</b>
<i>Kelochloa verrucosa</i>	warty panicgrass
<i>Lachnanthes caroliniana</i>	Carolina redroot
<i>Lobelia brevifolia</i>	shortleaf lobelia
<i>Ludwigia linifolia</i>	southeastern primrosewillow
<i>Ludwigia pilosa</i>	hairy primrosewillow
<i>Ludwigia</i> sp.	primrosewillow
<i>Ludwigia suffruticosa</i>	shrubby primrosewillow
<i>Ludwigia virgata</i>	savannah primrosewillow
<i>Lycopus rubellus</i>	taperleaf waterhorehound
<i>Magnolia virginiana</i>	sweetbay
<b><i>Mitreola sessilifolia</i></b>	<b>swamp hornpod</b>
<i>Morella cerifera</i>	southern bayberry
<i>Nyssa biflora</i>	swamp tupelo
<i>Persicaria punctata</i>	dotted smartweed
<i>Pinus elliotii</i>	slash pine
<i>Pluchea foetida</i>	stinking camphorweed
<i>Proserpinaca pectinata</i>	combleaf mermaidweed
<i>Rhexia mariana</i>	pale meadowbeauty
<i>Rhexia virginica</i>	handsome harry
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge
<i>Rhynchospora fascicularis</i>	fascicled beaksedge
<i>Rhynchospora filifolia</i>	threadleaf beaksedge
<i>Rhynchospora plumosa</i>	plumed beaksedge
<i>Rhynchospora rariflora</i>	fewflower beaksedge
<i>Rubus pensilvanicus</i>	sawtooth blackberry
<b><i>Saccharum giganteum</i></b>	<b>sugarcane plumegrass</b>
<i>Sacciolepis indica</i>	Indian cupscale
<i>Scoparia dulcis</i>	licoriceweed
<i>Solidago fistulosa</i>	pinebarren goldenrod
<i>Sphagnum</i> sp.	sphagnum moss
<i>Symphyotrichum dumosum</i>	rice button aster
<i>Triadica sebifera</i>	Chinese tallow tree
<i>Vitis rotundifolia</i>	muscadine
<i>Woodwardia virginica</i>	Virginia chain fern
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass
<i>Xyris fimbriata</i>	fringed yellow-eyed grass

Scientific Name	Common Name
<i>Xyris</i> sp.	yellow-eyed grass
<b>Total number of taxa: 79</b>	

### 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 15 to 30 feet high. Shrubs have been growing quickly since the last fire. This layer formed about 6 to 20% cover with individuals mostly 6 to 9 feet tall. Species included sawtooth blackberry, groundsel tree, southern bayberry, myrtle holly, gallberry, and young slash pine, red maple, and swamp tupelo. The ground layer was mostly herbaceous and weedy with woolly witchgrass, broomsedge bluestem, rice button aster, and dogfennel. Wiregrass was present, but very sparse. The total number of species observed in this community was 79 (Table YRR-1).

**Quantitative sampling.** The western Transect 1 (Table YRR-2, Figure YRR-2) had a total of 37 species with 19% bare ground. Sawtooth blackberry, broomsedge bluestem, rice button aster, fewflower beaksedge, and southern bayberry contributed the most cover. Woody species made up about 45% average cover per quadrat. Chinese tallow tree was recorded the quadrat at 140 feet.

The eastern Transect 2 (Table YRR-3, Figure YRR-3) had a total of 28 species with 6% bare ground. Woolly witchgrass, plumed beaksedge, and rice button aster contributed the most cover. Woody species made up only about 45% average cover per quadrat.

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

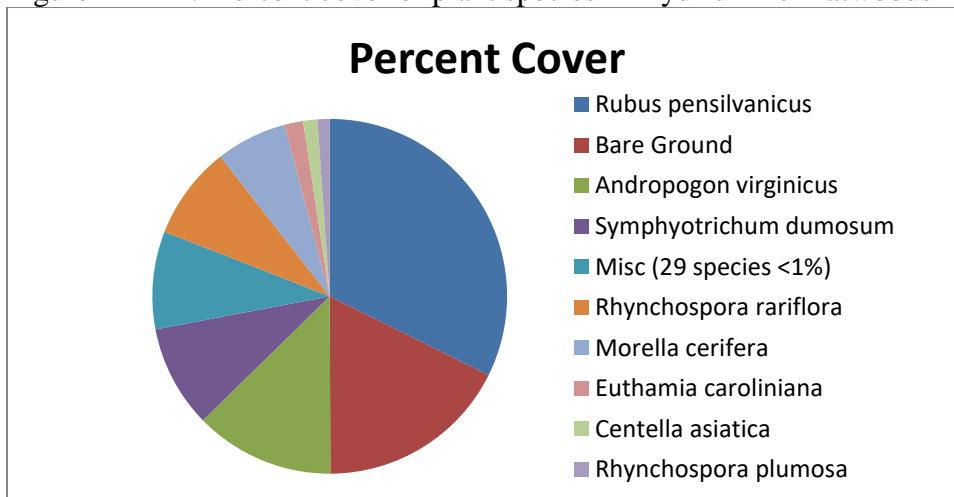


Table YRR-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1 sampled on October 17, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Rubus pensilvanicus</i>	sawtooth blackberry	34.44
<i>Andropogon virginicus</i>	broomsedge bluestem	13.56
<i>Symphotrichum dumosum</i>	rice button aster	9.94
<i>Rhynchospora rariflora</i>	fewflower beaksedge	9.06
<i>Morella cerifera</i>	southern bayberry	6.88
<i>Euthamia caroliniana</i>	slender flattop goldenrod	1.81
<i>Centella asiatica</i>	spadeleaf	1.38
<i>Rhynchospora plumosa</i>	plumed beaksedge	1.19
<i>Axonopus furcatus</i>	big carpetgrass	0.94
<i>Chamaecyparis thyoides</i>	Atlantic white cedar	0.94
<i>Euthamia graminifolia</i>	flattop goldenrod	0.94
<i>Nyssa biflora</i>	swamp tupelo	0.94
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.75
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	0.44
<i>Lycopus rubellus</i>	taperleaf waterhorehound	0.44
<i>Pinus elliotii</i>	slash pine	0.44
<i>Rhynchospora filifolia</i>	threadleaf beaksedge	0.44
<i>Triadica sebifera</i>	Chinese tallow tree	0.44
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.38
<i>Scoparia dulcis</i>	licoriceweed	0.31
<i>Acer rubrum</i>	red maple	0.25
<i>Coleataenia anceps</i>	beaked panicum	0.25
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.19
<i>Digitaria</i> sp.	crabgrass	0.19
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.19
<i>Ilex vomitoria</i>	yaupon	0.19
<i>Juncus marginatus</i>	grassleaf rush	0.19
<i>Hypericum crux-andreae</i>	St. Peter's wort	0.13
<i>Cuphea carthagenensis</i>	Colombian waxweed	0.06
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	0.06
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	0.06
<i>Ludwigia virgata</i>	savannah primrosewillow	0.06
<i>Proserpinaca pectinata</i>	combleaf mermaidweed	0.06
<i>Rhexia mariana</i>	pale meadowbeauty	0.06
<i>Sacciolepis indica</i>	Indian cupscale	0.06
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.06
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	0.06
Bare Ground		18.75

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

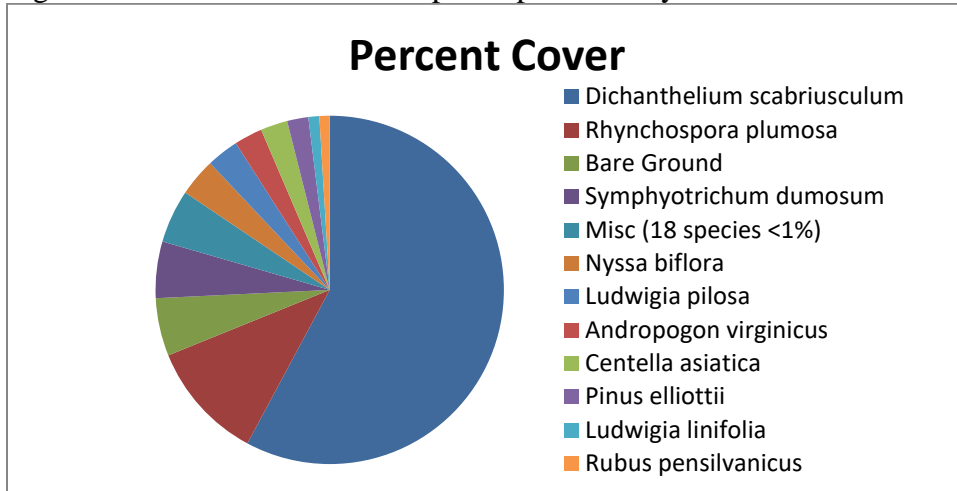


Table YRR-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 sampled on October 17, 2018.

Scientific name	Common name	Average percent cover per quadrat
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	60.63
<i>Rhynchospora plumosa</i>	plumed beaksedge	11.56
<i>Symphotrichum dumosum</i>	rice button aster	5.50
<i>Nyssa biflora</i>	swamp tupelo	3.69
<i>Ludwigia pilosa</i>	hairy primrosewillow	3.13
<i>Andropogon virginicus</i>	broomsedge bluestem	2.75
<i>Centella asiatica</i>	spadeleaf	2.63
<i>Pinus elliotii</i>	slash pine	2.06
<i>Ludwigia linifolia</i>	southeastern primrosewillow	1.06
<i>Rubus pensilvanicus</i>	sawtooth blackberry	1.00
<i>Ilex glabra</i>	gallberry	0.94
<i>Morella cerifera</i>	southern bayberry	0.94
<i>Coleataenia anceps</i>	beaked panicum	0.50
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.50
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.50
<i>Kelochloa verrucosa</i>	warty panicgrass	0.44
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.25
<i>Cliftonia monophylla</i>	black titi	0.19
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	0.19
<i>Lycopus rubellus</i>	taperleaf waterhorehound	0.19
<i>Ludwigia</i> sp.	primrosewillow	0.13
<i>Drosera brevifolia</i>	dwarf sundew	0.06
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.06
<i>Proserpinaca pectinata</i>	combleaf mermaidweed	0.06
<i>Rhexia mariana</i>	pale meadowbeauty	0.06
<i>Rhexia virginica</i>	handsome harry	0.06
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	0.06
<i>Xyris</i> sp.	yellow-eyed grass	0.06
Bare Ground		5.63



## Bottomland Forest

**Quantitative sampling.** Belt transect 1 contained a mix of mostly red maple, slash pine, and pond cypress, with a few additional species occurring only occasionally (Table YRR-4). While slash pines and pond cypress were mostly taller, red maples in the transect were mostly small, regenerating saplings. 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, and was difficult to traverse and spot saplings.

## Cypress

**Quantitative sampling.** Belt transect 3 was moved to a new location based on information provided by project manager David Clayton (NFWMD). This transect is now 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). Belt Transect 4 was quite open and contained almost exclusively young pond cypress with only a single slash pine (Table YRR-7).

Table YRR-4. Belt Transect Summary for Bottomland Forest Transect 1 sampled on October 18, 2018.

Belt Transect Summary for Bottomland Forest Transect 1 (YR-BT1-630)									
Species	Total Number	Height Scale (feet)							Condition
		0-1'	>1'-2'	>2'-3'	>3'-4'	>4'-5'	>5'-6'	>6'	
<i>Acer rubrum</i>	139	6	40	38	24	3	4	24	
<i>Cephalanthus occidentalis</i>	1							1	Counted a large individual overhanging
<i>Chamaecyparis thyoides</i>	5		1	2			1	1	
<i>Ilex myrtifolia</i>	1							1	
<i>Nyssa biflora</i>	11		1	1	7	1		1	
<i>Pinus elliotii</i>	96			4	15	17	17	43	
<i>Styrax americana</i>	1							1	Counted one overhanging
<i>Taxodium ascendens</i>	36		1	6	3	2	4	20	
<b>Total Number All Species</b>	290								
<b>Number of Trees per Acre</b>	4141								

Table YRR-5. Belt Transect Summary for Bottomland Forest Transect 2 sampled on October 18, 2018.

Belt Transect Summary for Bottomland Forest Transect 2 (YR-BT2-630)									
Species	Total Number	Height Scale (feet)							Condition
		0-1'	>1'-2'	>2'-3'	>3'-4'	>4'-5'	>5'-6'	>6'	
<i>Acer rubrum</i>	21	5	2	3	7	3		1	
<i>Chamaecyparis thyoides</i>	22							22	
<i>Ilex opaca</i>	3			1				2	
<i>Magnolia virginiana</i>	1							1	
<i>Nyssa biflora</i>	1							1	
<i>Pinus palustris</i>	1							1	
<i>Pinus sp.</i>	1							1	
<i>Quercus laurifolia</i>	3							3	
<i>Sapium sebiferum</i>	3				2	1			
<i>Taxodium ascendens</i>	1				1				
<b>Total Number All Species</b>	57								
<b>Number of Trees per Acre</b>	814								

Table YRR-6. Belt Transect Summary for Cypress Transect 3 sampled on October 17, 2018.

Belt Transect Summary for Cypress Transect 3 (YR-BT3-621)									
Species	Total Number	Height Scale (feet)							Condition
		0-1'	>1'-2'	>2'-3'	>3'-4'	>4'-5'	>5'-6'	>6'	
<i>Acer rubrum</i>	15	2	4	5	4				
<i>Chamaecyparis thyoides</i>	57		3	16	5	10	12	11	
<i>Ilex myrtifolia</i>	3							3	
<i>Ilex verticillata</i>	2			1				1	
<i>Magnolia virginiana</i>	9							9	
<i>Nyssa biflora</i>	231		1			3	11	216	
<i>Pinus elliotii</i>	23			5	3	2	5	8	
<i>Taxodium ascendens</i>	70						1	69	
<b>Total Number All Species</b>	410								
<b>Number of Trees per Acre</b>	5855								

Table YRR-7. Belt Transect Summary for Cypress Transect 4 sampled on October 17, 2018.

Belt Transect Summary for Cypress Transect 4 (YR-BT4-621)									
Species	Total Number	Height Scale (feet)							Condition
		0-1'	>1'-2'	>2'-3'	>3'-4'	>4'-5'	>5'-6'	>6'	
<i>Pinus elliotii</i>	1							1	
<i>Taxodium ascendens</i>	94		1	5	8	21	11	48	
<b>Total Number All Species</b>	95								
<b>Number of Trees per Acre</b>	1357								