

**Vegetation Monitoring at Four Northwest Florida Water  
Management District Mitigation Sites  
Fall 2013**

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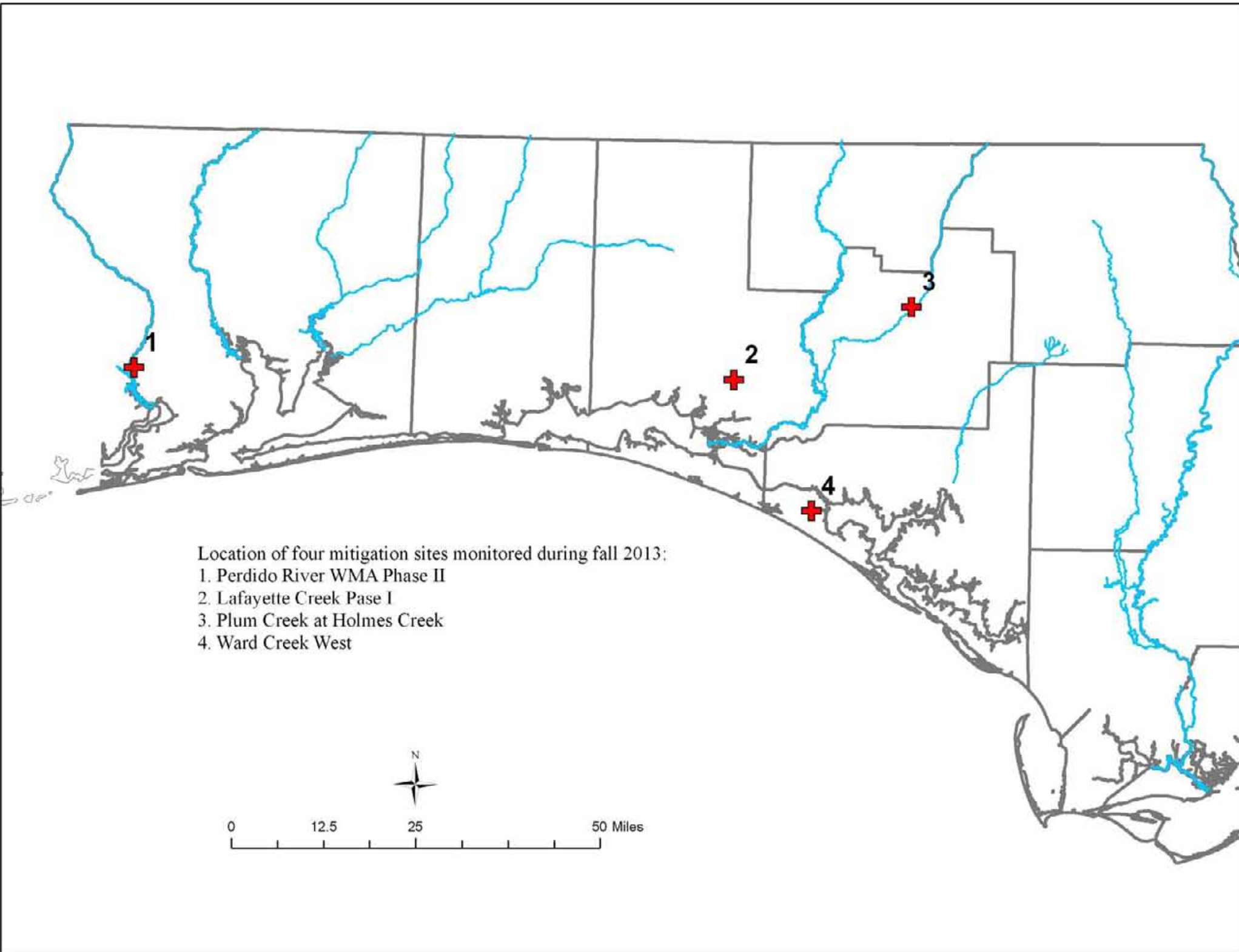
**December 2013**

**Florida Natural Area Inventory  
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This document contains separate qualitative and quantitative vegetation monitoring reports for four 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.



**Perdido River Water Management Area - Phase II Mitigation Site**  
**Qualitative and Quantitative Monitoring**  
**December 2013**

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**INTRODUCTION**

The Perdido River WMA 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 Water Management Area is located along the south side of US 90 (Nine Mile Road) and 6.4 miles west of Interstate Highway 10 (Figure 1). The mitigation project aims to restore areas of mixed forested wetlands (MFW), hydric savanna (HS), hydric pine flatwoods (HPF) and pine flatwoods (PF) which were converted to loblolly pine plantation in 2002 (Figure 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 Ann Johnson (FNAI ecologist) in the fall of 2012.

**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 in each targeted natural community type: hydric savanna, mixed forested wetland, and hydric pine flatwoods (Figure 2). Data recorded consisted of the visually estimated percent cover of each plant species in nine separate meter square quadrats. The quadrats were located at 0, 20, 40, 60, 80, 100, 120, 140, and 150 feet along the left side of the transect line. 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. The field surveys were performed by Gary Schultz (FNAI botanist/ecologist) on September 30, October 1 and 2, 2013.

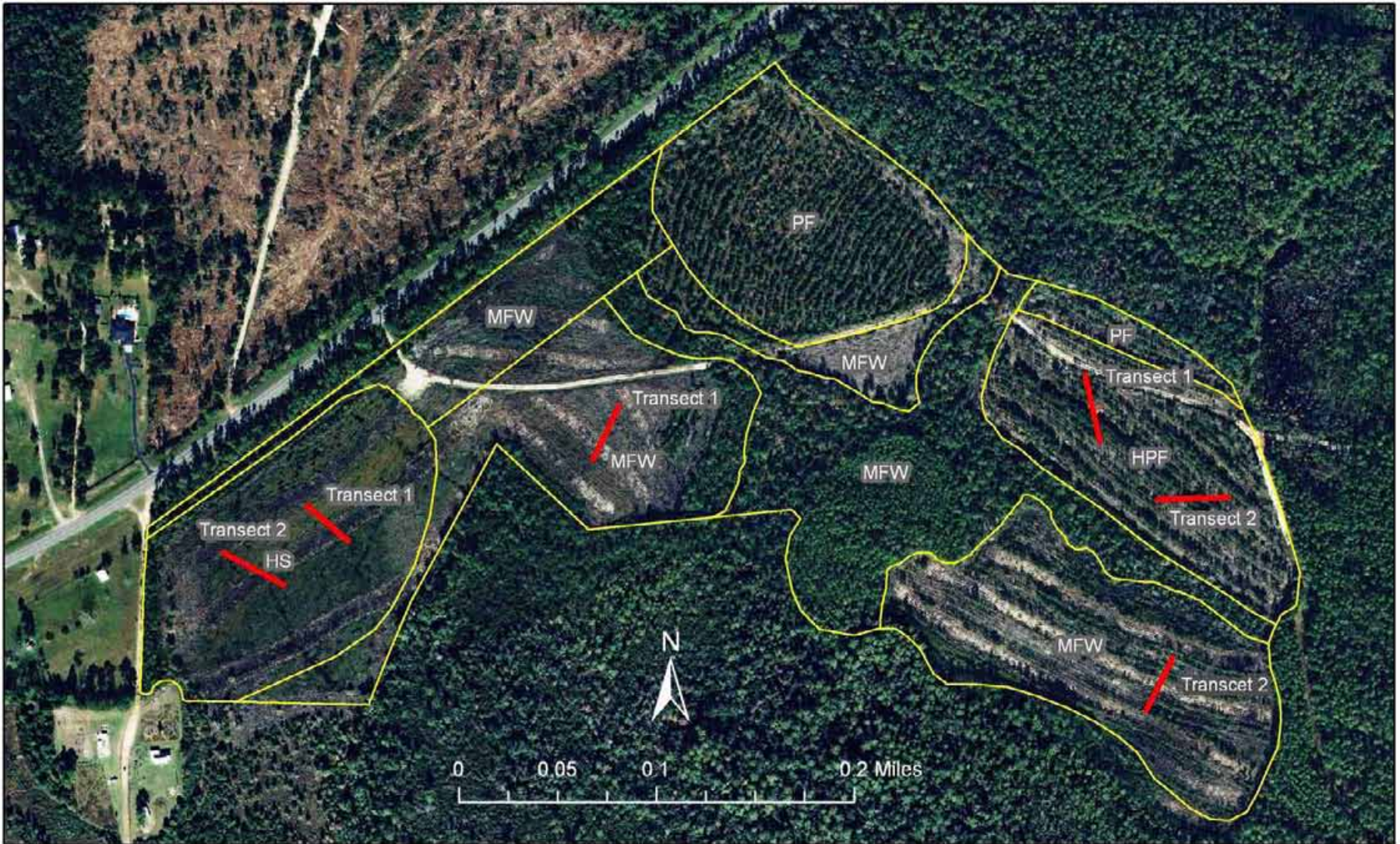


Figure 1. Location of permanent transects at Perdido Phase II Mitigation Site. HS=Hydric Savanna, HPF=Hydric Pine Flatwoods, MFW=Mixed Forested Wetlands, PF=Pine Flatwoods.

## RESULTS AND DISCUSSION

A total of 106 plant species were observed during the 2013 monitoring of the target communities at Perdido Phase II.

### Hydric Savanna

**Qualitative sampling.** The disturbed hydric savanna restoration area was dominated by sphagnum moss, the tall grass purple bluestem, smallfruit beggarticks, viviparous spikerush, and pinebarren goldenrod. Shrubs were primarily coastalplain St John’s wort, sawtooth blackberry, red chokecherry, and swamp bay growing along the slightly elevated windrows formed when the land was cleared for silviculture. Occasional slash pine and red maple saplings were widely scattered. The soil was generally saturated and some sections were inundated during the time of the survey. Table 1 provides a comprehensive list of the 41 plant species identified in this targeted community.

**Quantitative sampling.** Transect 1 (Table 2, Figure 2) had a total of 24 species which covered 100% of the ground surface. The dominant species were sphagnum moss, purple bluestem, smallfruit beggarticks, viviparous spikerush, and pinebarren goldenrod. Transect 2 (Table 3, Figure 3) had a total of 26 species. The dominant species were similar except for the addition of Carolina redroot and absence of viviparous spikerush.

Table 1. Species observed in target communities at Perdido River WMA – Phase II Mitigation Site , September 30, October 1, 2, 2013.

Scientific Name	Common Name	hydric pine flatwoods	hydric savanna	pine flatwoods	mixed forested wetland	Grand Total
<i>Acer rubrum</i>	red maple	X	X	X	X	4
<i>Agalinis fasciculata</i>	beach false foxglove	X	X			2
<i>Aletris sp.</i>	colic-root				X	1
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	X	X	X	X	4
<i>Andropogon virginicus</i>	broomsedge bluestem	X	X	X	X	4
<i>Andropogon virginicus var. glaucus</i>	chalky bluestem	X		X		2
<i>Aristida spiciformis</i>	bottlebrush threeawn	X				1
<i>Aristida stricta var. beyrichiana</i>	wiregrass	X		X		2
<i>Bidens mitis</i>	smallfruit beggarticks	X	X		X	3
<i>Carex albolutescens</i>	greenwhite sedge	X				1
<i>Carex sp.</i>	sedge		X			1
<i>Castanea pumila</i>	chinquapin			X		1
<i>Centella asiatica</i>	spadeleaf	X	X			2
<i>Chamaecrista nictitans</i>	sensitive pea	X				1
<i>Chamaecyparis thuyoides</i>	Atlantic white cedar	X				1

Scientific Name	Common Name	hydric pine flatwoods	hydric savanna	pine flatwoods	mixed forested wetland	Grand Total
<i>Cliftonia monophylla</i>	black titi	X			X	2
<i>Conyza canadensis</i>	Canadian horseweed	X				1
<i>Cyrilla racemiflora</i>	titi	X			X	2
<i>Dichantheium scabriusculum</i>	woolly witchgrass				X	1
<i>Dichantheium sp.</i>	witchgrass	X		X	X	3
<i>Drosera capillaris</i>	pink sundew	X			X	2
<i>Eleocharis vivipara</i>	viviparous spikerush		X			1
<i>Elephantopus nudatus</i>	smooth elephantsfoot	X		X		2
<i>Erechtites hieracifolius</i>	fireweed	X				1
<i>Eriocaulon decangulare</i>	tenangle pipewort	X			X	2
<i>Eupatorium capillifolium</i>	dogfennel	X		X	X	3
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	X	X	X	X	4
<i>Eupatorium rotundifolium</i>	roundleaf thoroughwort	X			X	2
<i>Euthamia caroliniana</i>	slender flattop goldenrod	X	X	X	X	4
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge				X	1
<i>Gaylussacia mosieri</i>	woolly huckleberry				X	1
<i>Helianthus angustifolius</i>	narrowleaf sunflower	X				1
<i>Hydrocotyle umbellata</i>	manyflower marshpennywort		X			1
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	X	X		X	3
<i>Hypericum cistifolium</i>	roundpod St. John's wort	X		X	X	3
<i>Hypericum crux-andreae</i>	St. Peter's wort	X				1
<i>Hypericum hypericoides</i>	St. Andrew's cross	X		X		2
<i>Ilex cassine</i>	dahoon			X		1
<i>Ilex coriacea</i>	large gallberry			X	X	2
<i>Ilex glabra</i>	gallberry	X		X	X	2
<i>Ilex vomitoria</i>	yaupon			X		1
<i>Juncus dichotomus</i>	forked rush		X			1
<i>Juncus marginatus</i>	grassleaf rush				X	1
<i>Juncus scirpoides</i>	needlepod rush	X				1
<i>Juniperus virginiana</i>	red cedar		X			1
<i>Kalmia hirsuta</i>	hairy wicky				X	1
<i>Lachnanthes caroliniana</i>	Carolina redroot	X	X	X	X	4
<i>Lachnocaulon anceps</i>	whitehead bogbutton	X		X		2
<i>Lobelia sp.</i>	lobelia				X	1
<i>Ludwigia suffruticosa</i>	shrubby primrosewillow		X			1
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	X		X	X	3
<i>Lyonia lucida</i>	fetterbush	X			X	2



Scientific Name	Common Name	hydric pine flatwoods	hydric savanna	pine flatwoods	mixed forested wetland	Grand Total
<i>Magnolia virginiana</i>	sweetbay		X	X	X	3
<i>Myrica inodora</i>	odorless bayberry			X		1
<i>Myrica cerifera</i>	wax myrtle		X	X	X	3
<i>Oldenlandia uniflora</i>	clustered mille grains	X			X	2
<i>Osmunda cinnamomea</i>	cinnamon fern	X		X	X	3
<i>Osmunda regalis var. spectabilis</i>	royal fern	X		X		2
<i>Panicum anceps</i>	beaked panicum	X		X	X	3
<i>Panicum verrucosum</i>	warty panicgrass	X				1
<i>Persea palustris</i>	swamp bay	X	X	X	X	4
<i>Photinia pyrifolia</i>	red chokeberry	X	X			2
<i>Pinus elliottii</i>	slash pine	X	X		X	3
<i>Pinus glabra</i>	spruce pine	X			X	2
<i>Pinus taeda</i>	loblolly pine	X	X	X		3
<i>Pluchea longifolia</i>	longleaf camphorweed	X		X		2
<i>Polygala cruciata</i>	drumheads	X			X	2
<i>Polygala lutea</i>	orange milkwort	X			X	2
<i>Polypremum procumbens</i>	rustweed	X				1
<i>Proserpinaca pectinata</i>	combleaf mermaidweed		X			1
<i>Pteridium aquilinum</i>	bracken fern				X	1
<i>Quercus nigra</i>	water oak	X	X	X	X	4
<i>Rhexia sp.</i>	meadowbeauty		X		X	2
<i>Rhexia virginica</i>	handsome harry	X	X		X	3
<i>Rhus copallinum</i>	winged sumac	X			X	2
<i>Rhynchospora cephalantha</i>	bunched beaksedge		X			1
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge		X			1
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	X	X		X	3
<i>Rhynchospora sp.</i>	beaksedge	X			X	2
<i>Rubus argutus</i>	sawtooth blackberry	X	X	X	X	4
<i>Sabatia brevifolia</i>	shortleaf rosegentian				X	1
<i>Saccharum giganteum</i>	sugarcane plumegrass		X		X	1
<i>Sapium sebiferum</i>	Chinese tallow			X		1
<i>Scirpus cyperinus</i>	woolgrass				X	1
<i>Scleria sp.</i>	nutrush	X				1
<i>Smilax bona-nox</i>	saw greenbrier			X		1
<i>Smilax glauca</i>	cat greenbrier	X		X	X	3
<i>Solidago fistulosa</i>	pinebarren goldenrod	X	X	X	X	4
<i>Sphagnum sp.</i>	sphagnum moss	X	X	X	X	4

Scientific Name	Common Name	hydric pine flatwoods	hydric savanna	pine flatwoods	mixed forested wetland	Grand Total
<i>Symphotrichum walteri</i>	Walter's aster	X	X		X	3
<i>Syngonanthus flavidulus</i>	yellow hatpins	X			X	2
<i>Taxodium ascendens</i>	pond cypress				X	1
<i>Taxodium distichum</i>	bald cypress		X		X	2
<i>Toxicodendron radicans</i>	eastern poison ivy	X	X			2
unknown moss	unknown moss	X	X		X	3
<i>Vaccinium corymbosum</i>	highbush blueberry	X		X		2
<i>Vaccinium elliotii</i>	Elliott's blueberry	X		X		2
<i>Viola lanceolata</i>	bog white violet	X				1
<i>Viola sororia</i>	common blue violet	X			X	2
<i>Vitis rotundifolia</i>	muscadine	X	X	X	X	4
<i>Woodwardia areolata</i>	netted chain fern	X	X	X	X	4
<i>Woodwardia virginica</i>	Virginia chain fern	X	X	X	X	4
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass		X		X	2
<i>Xyris elliotii</i>	Elliott's yellow-eyed grass	X				1
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	X			X	2
<i>Xyris sp.</i>	yellow-eyed grass	X		X	X	3
<b>Total number of species: 106</b>		73	41	42	63	

Figure 2. Percent cover of plant species in Hydric Savanna Transect 1.

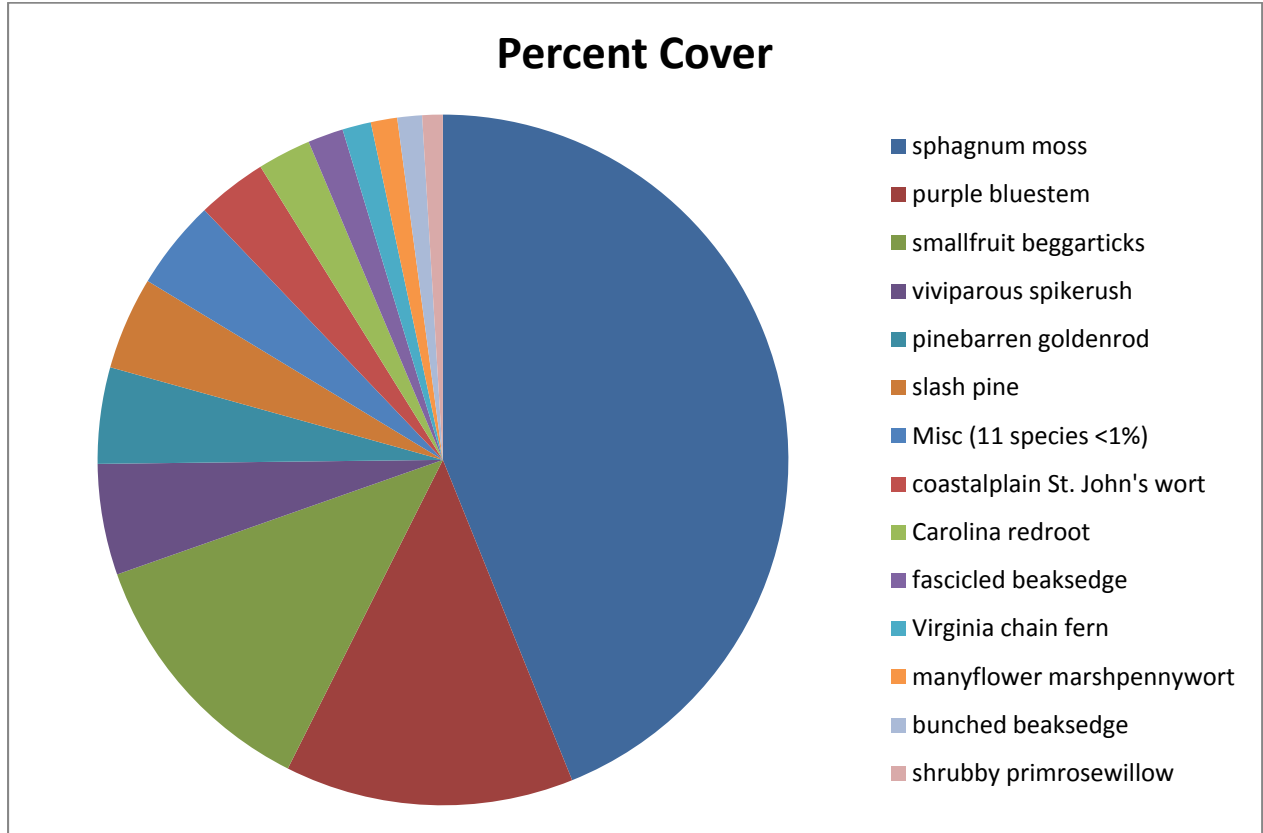


Table 2. Percent cover of plant species in Hydric Savanna Transect 1 when sampled on October 2, 2013.

Scientific name	Common name	Average percent cover per quadrat
Sphagnum sp.	sphagnum moss	63.33
Andropogon glomeratus var. glaucopsis	purple bluestem	19.50
Bidens mitis	smallfruit beggarticks	17.61
Eleocharis vivipara	viviparous spikerush	7.50
Solidago fistulosa	pinebarren goldenrod	6.50
Pinus elliotii	slash pine	6.28
Hypericum brachyphyllum	coastalplain St. John's wort	4.72
Lachnanthes caroliana	Carolina redroot	3.61
Rhynchospora fascicularis	fascicled beaksedge	2.39
Woodwardia virginica	Virginia chain fern	1.94
Hydrocotyle umbellate	manyflower marshpennywort	1.78
Rhynchospora cephalantha	bunched beaksedge	1.67
Ludwigia suffruticosa	shrubby primrosewillow	1.39

Scientific name	Common name	Average percent cover per quadrat
<i>Vitis rotundifolia</i>	muscadine	0.89
<i>Rubus argutus</i>	sawtooth blackberry	0.83
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.83
<i>Rhexia virginica</i>	handsome harry	0.83
<i>Andropogon virginicus</i>	broomsedge bluestem	0.78
<i>Juncus dichotomus</i>	forked rush	0.56
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.56
<i>Photinia pyrifolia</i>	red chokeberry	0.39
<i>Persea palustris</i>	swamp bay	0.17
<i>Toxicodendron radicans</i>	eastern poison ivy	0.17
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.06
	Bare ground	0

Figure 3. Percent cover of plant species in Hydric Savanna Transect 2.

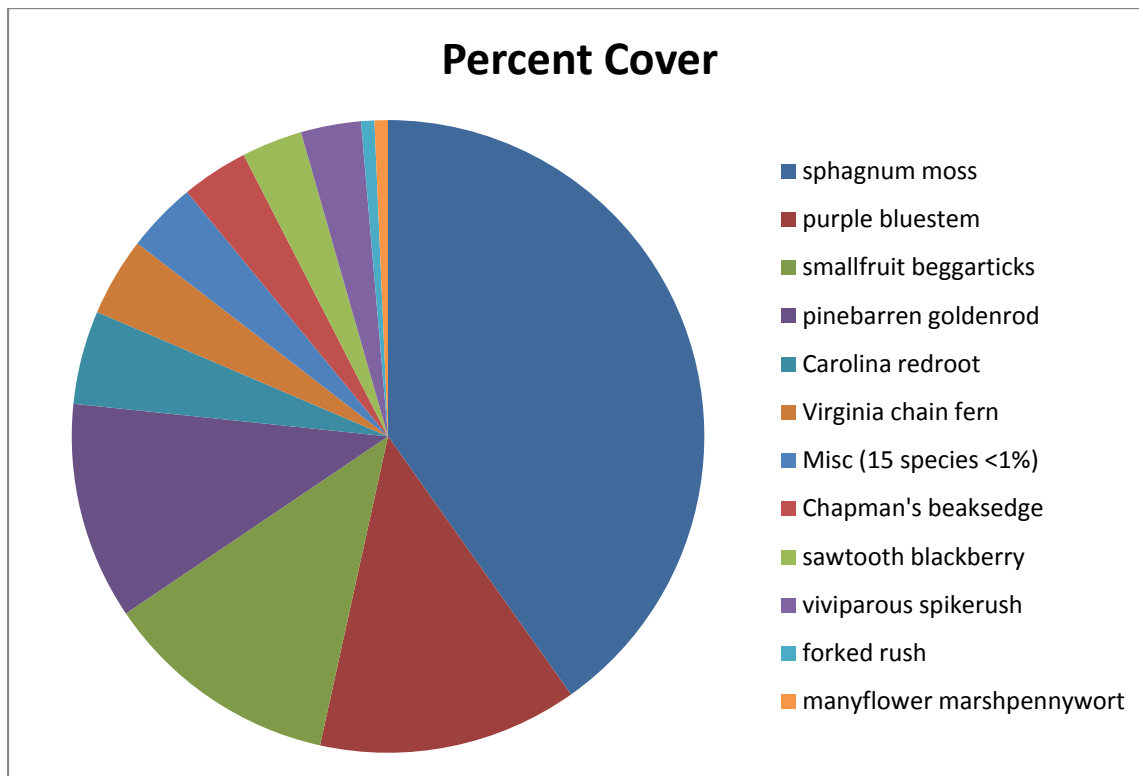


Table 3. Percent cover of plant species in Hydric Savanna Transect 2 when sampled on October 2, 2013.

Scientific name	Common name	Average percent cover per quadrat
Sphagnum sp.	sphagnum moss	58.89
Andropogon glomeratus var. glaucopsis	purple bluestem	19.44
Bidens mitis	smallfruit beggarticks	17.72
Solidago fistulosa	pinebarren goldenrod	16.28
Lachnanthes carolina	Carolina redroot	7.00
Woodwardia virginica	Virginia chain fern	5.89
Rhynchospora chapmanii	Chapman's beaksedge	5.00
Rubus argutus	sawtooth blackberry	4.56
Eleocharis vivipara	viviparous spikerush	4.50
Juncus dichotomus	forked rush	1.00
Hydrocotyle umbellata	marshpennywort	1.00
Andropogon virginicus	broomsedge bluestem	0.83
Woodwardia areolata	netted chain fern	0.78
Ludwigia suffruticosa	shrubby primrosewillow	0.61
Rhynchospora fascicularis	fascicled beaksedge	0.50
Rhexia virginica	handsome harry	0.50
unknown moss	unknown moss	0.39
Eupatorium mohrii	Mohr's thoroughwort	0.39
Proserpinaca pectinata	combleaf mermaidweed	0.39
Centella asiatica	spadeleaf	0.22
Toxicodendron radicans	eastern poison ivy	0.17
Acer rubrum	red maple	0.17
Carex sp.	sedge	0.17
Pinus taeda	loblolly pine	0.06
Euthamia caroliniana	slender flattop goldenrod	0.06
Rhexia sp.	meadowbeauty	0.06
	Bare ground	0

### Mixed Forested Wetland

**Qualitative sampling.** The target community of mixed forested wetland (Figure 1) had a total of 63 observed plant species (Table 1). The vegetative cover was dominated by the tall grasses purple bluestem and broomsedge bluestem. Sphagnum moss, pinebarren goldenrod, beakrush, and witchgrass were common. The shrubs sawtooth blackberry, fetterbush, swamp bay, and black titi, and the vine muscadine, were mainly on slightly elevated windrows from past silviculture activities. Sapling slash pines were widely scattered throughout. Much of the area had saturated soil at the time of the survey.

*Quantitative sampling.* Transect 1 had a total of 38 species and no bare ground (Table 4, Figure 4). Purple bluestem dominated, with sphagnum moss, broomsedge bluestem, pinebarren goldenrod, beakrush, and witchgrass common. Transect 2 (Table 5, Figure 5) had a total of 29 species and no bare ground. The highest percent cover was by purple bluestem, with smaller amounts of broomsedge bluestem, beakrush, and Carolina red root.

Figure 4. Percent cover of species in Mixed Forested Wetland Transect 1.

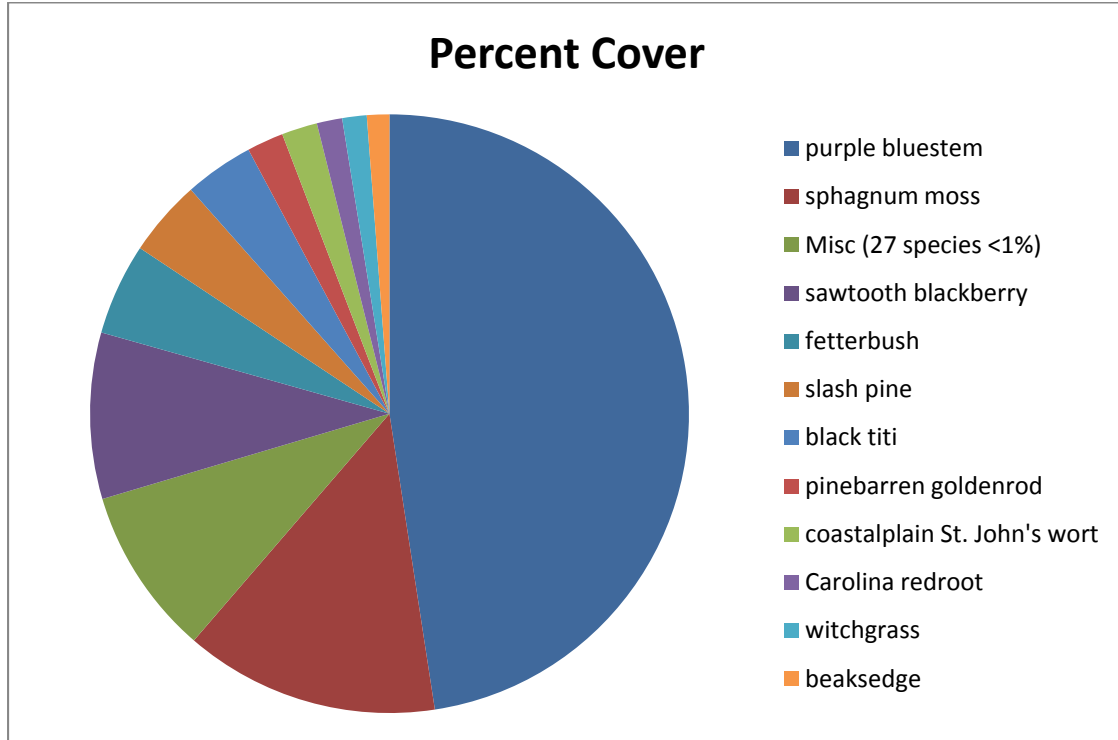


Table 4. Percent cover of plant species in Mixed Forested Wetland Transect 1 when sampled on September 30, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	48.06
<i>Sphagnum</i> sp.	sphagnum moss	13.89
<i>Rubus argutus</i>	sawtooth blackberry	9.06
<i>Lyonia lucida</i>	fetterbush	5.00
<i>Pinus elliotii</i>	slash pine	4.17
<i>Cliftonia monophylla</i>	black titi	3.78
<i>Solidago fistulosa</i>	pinebarren goldenrod	2.00
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	1.94

Scientific name	Common name	Average percent cover per quadrat
<i>Lachnanthes caroliniana</i>	Carolina redroot	1.39
<i>Dichanthelium</i> sp.	witchgrass	1.33
<i>Rhynchospora</i> sp.	beaksedge	1.22
<i>Smilax glauca</i>	cat greenbrier	0.94
<i>Xyris elliotii</i>	Elliott's yellow-eyed grass	0.89
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.83
<i>Pinus glabra</i>	spruce pine	0.83
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.78
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.78
<i>Vitis rotundifolia</i>	muscadine	0.72
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.72
<i>Eupatorium rotundifolium</i>	roundleaf thoroughwort	0.44
<i>Ilex glabra</i>	gallberry	0.39
<i>Xyris</i> sp.	yellow-eyed grass	0.28
<i>Woodwardia virginica</i>	Virginia chain fern	0.22
<i>Viola sororia</i>	common blue violet	0.17
unknown moss	unknown moss	0.17
<i>Chamaecyparis thyoides</i>	Atlantic white cedar	0.17
<i>Drosera capillaries</i>	pink sundew	0.11
<i>Rhexia virginica</i>	handsome harry	0.11
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.11
<i>Photinia pyrifolia</i>	red chokeberry	0.06
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.06
<i>Oldenlandia uniflora</i>	clustered mille grains	0.06
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.06
<i>Polygala cruciata</i>	drumheads	0.06
<i>Juncus scirpoides</i>	needlepod rush	0.06
<i>Agalinis fasciculata</i>	beach false foxglove	0.06
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.06
<i>Syngonanthus flavidulus</i>	yellow hatpins	0.06
	Bare ground	0

Figure 5. Percent cover of plant species in Mixed Forested Wetland Transect 2.

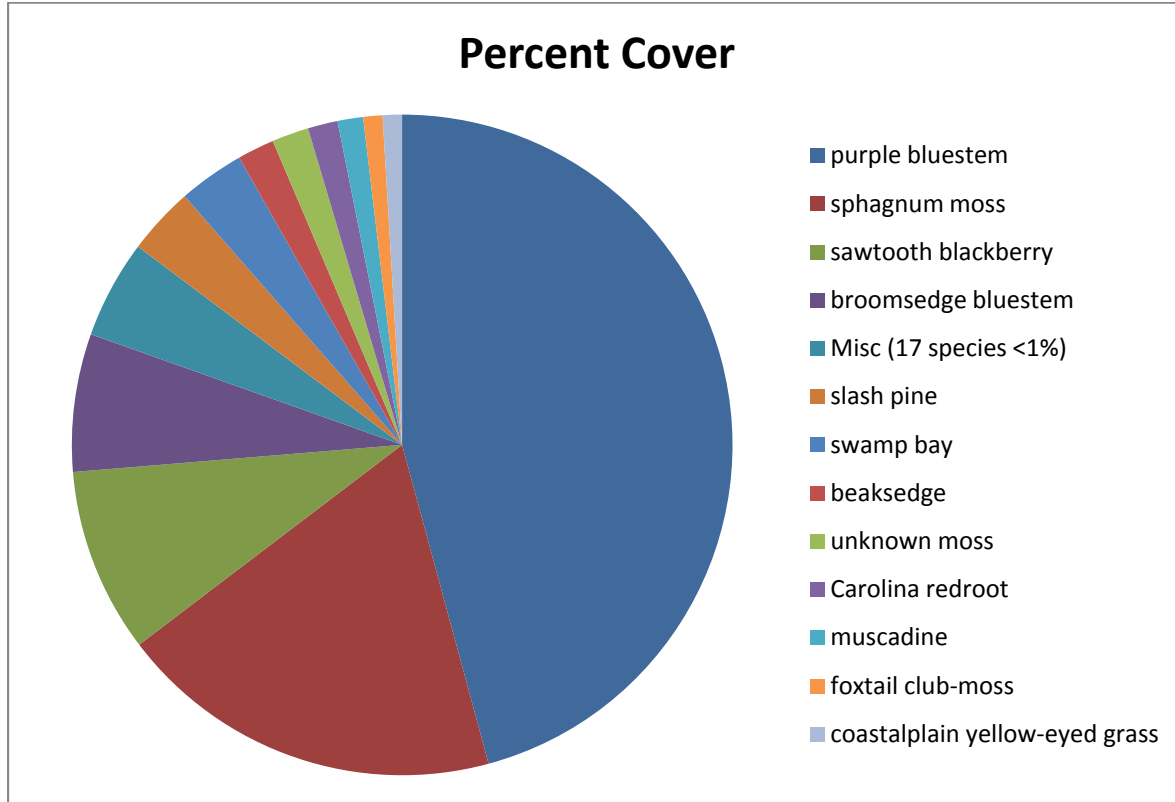


Table 5. Percent cover of plant species in Mixed Forested Wetland Transect 2 when sampled on October 1, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	59.17
<i>Sphagnum</i> sp.	sphagnum moss	24.39
<i>Rubus argutus</i>	sawtooth blackberry	11.67
<i>Andropogon virginicus</i>	broomsedge bluestem	8.72
<i>Pinus elliotii</i>	slash pine	4.28
<i>Persea palustris</i>	swamp bay	4.17
<i>Rhynchospora</i> sp.	beaksedge	2.33
unknown moss	unknown moss	2.33
<i>Lachnanthes caroliniana</i>	Carolina redroot	1.89
<i>Vitis rotundifolia</i>	muscadine	1.61
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	1.22
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	1.22
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.83
<i>Xyris</i> sp.	yellow-eyed grass	0.78



Scientific name	Common name	Average percent cover per quadrat
<i>Viola sororia</i>	common blue violet	0.61
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.56
<i>Smilax glauca</i>	cat greenbrier	0.56
<i>Oldenlandia uniflora</i>	clustered mille graines	0.50
<i>Cliftonia monophylla</i>	black titi	0.44
<i>Panicum anceps</i>	beaked panicum	0.39
<i>Eupatorium rotundifolium</i>	roundleaf thoroughwort	0.39
<i>Juncus marginatus</i>	grassleaf rush	0.39
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.22
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	0.17
<i>Woodwardia areolata</i>	netted chain fern	0.17
<i>Eupatorium capillifolium</i>	dogfennel	0.06
<i>Acer rubrum</i>	red maple	0.06
<i>Magnolia virginiana</i>	sweetbay	0.06
<i>Symphotrichum walteri</i>	Walter's aster	0.06
	Bare ground	0

### Hydric Pine Flatwoods

**Qualitative monitoring.** The target community of hydric pine flatwoods had a total of 73 plant species (Table 1). The nearly closed canopy of planted loblolly pines was about 30 ft tall. The open shrub layer consisted mainly of sawtooth blackberry, St. Andrew's cross, and swamp bay. The muscadine grape vine was common. The bedded ground frequently had patches bare of vegetation. The herbaceous layer was dominated by wiregrass, warty panicum, sphagnum, and broomsedge bluestem. Loblolly pine seedlings were common throughout. At the time of sampling, the ground was generally dry with infrequent areas of saturated soil.

**Quantitative monitoring.** Transect 1 had a total of 29 species and an average cover of 56 percent in the quadrats (Figure 6, Table 6). Wiregrass, warty panicum, sphagnum, mille grains, and broomsedge bluestem were the most abundant herbs. Transect 2 (Figure 7, Table 7) had a total of 37 species and an average cover of 67 percent in the quadrats. The herbs were mainly sphagnum moss, warty panicum, and broomsedge bluestem. Wiregrass was much less common in this transect while muscadine vine was common in both transects.

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

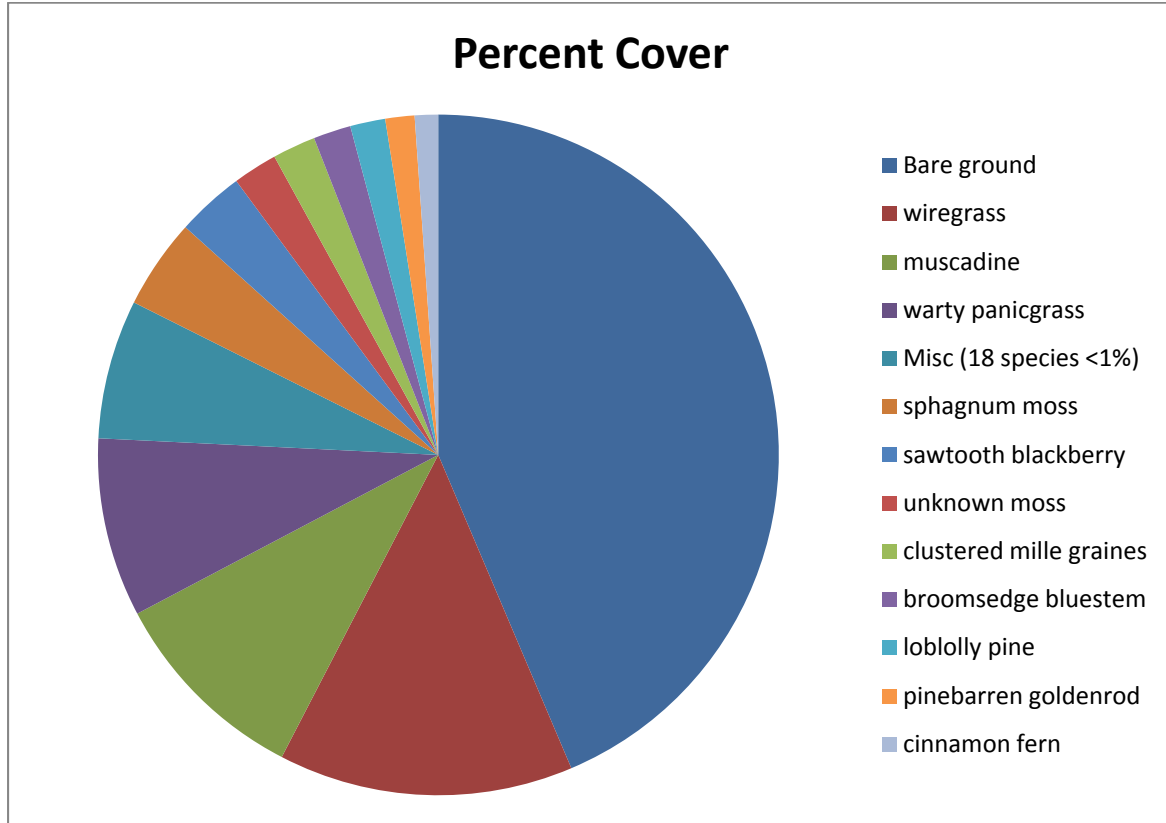


Table 6. Percent cover of species in Hydric Pine Flatwoods Transect 1 when sampled on October 1, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Aristida stricta</i> var. <i>beyrichiana</i>	wiregrass	14.00
<i>Vitis rotundifolia</i>	muscadine	9.67
<i>Panicum verrucosum</i>	warty panicgrass	8.50
<i>Sphagnum</i> sp.	sphagnum moss	4.28
<i>Rubus argutus</i>	sawtooth blackberry	3.22
	unknown moss	2.11
<i>Oldenlandia uniflora</i>	clustered mille grains	2.06
<i>Andropogon virginicus</i>	broomsedge bluestem	1.78
<i>Pinus taeda</i>	loblolly pine	1.67
<i>Solidago fistulosa</i>	pinebarren goldenrod	1.39
<i>Osmunda cinnamomea</i>	cinnamon fern	1.11
<i>Polypremum procumbens</i>	rustweed	0.83
<i>Elephantopus nudatus</i>	smooth elephantsfoot	0.78
<i>Toxicodendron radicans</i>	eastern poison ivy	0.44

Scientific name	Common name	Average percent cover per quadrat
<i>Acer rubrum</i>	red maple	0.44
<i>Dichanthelium</i> sp.	witchgrass	0.39
<i>Scleria</i> sp.	nutrush	0.39
<i>Hypericum hypericoides</i>	St. Andrew's cross	0.39
<i>Persea palustris</i>	swamp bay	0.39
<i>Woodwardia virginica</i>	Virginia chain fern	0.39
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.39
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.39
<i>Andropogon virginicus</i> var. <i>glaucus</i>	chalky bluestem	0.39
<i>Pluchea longifolia</i>	longleaf camphorweed	0.39
<i>Smilax glauca</i>	cat greenbrier	0.17
<i>Polygala nana</i>	candyroot	0.17
<i>Viola lanceolata</i>	bog white violet	0.17
<i>Centella asiatica</i>	spadeleaf	0.06
<i>Chamaecrista nictitans</i>	sensitive pea	0.06
	Bare ground	43.6

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

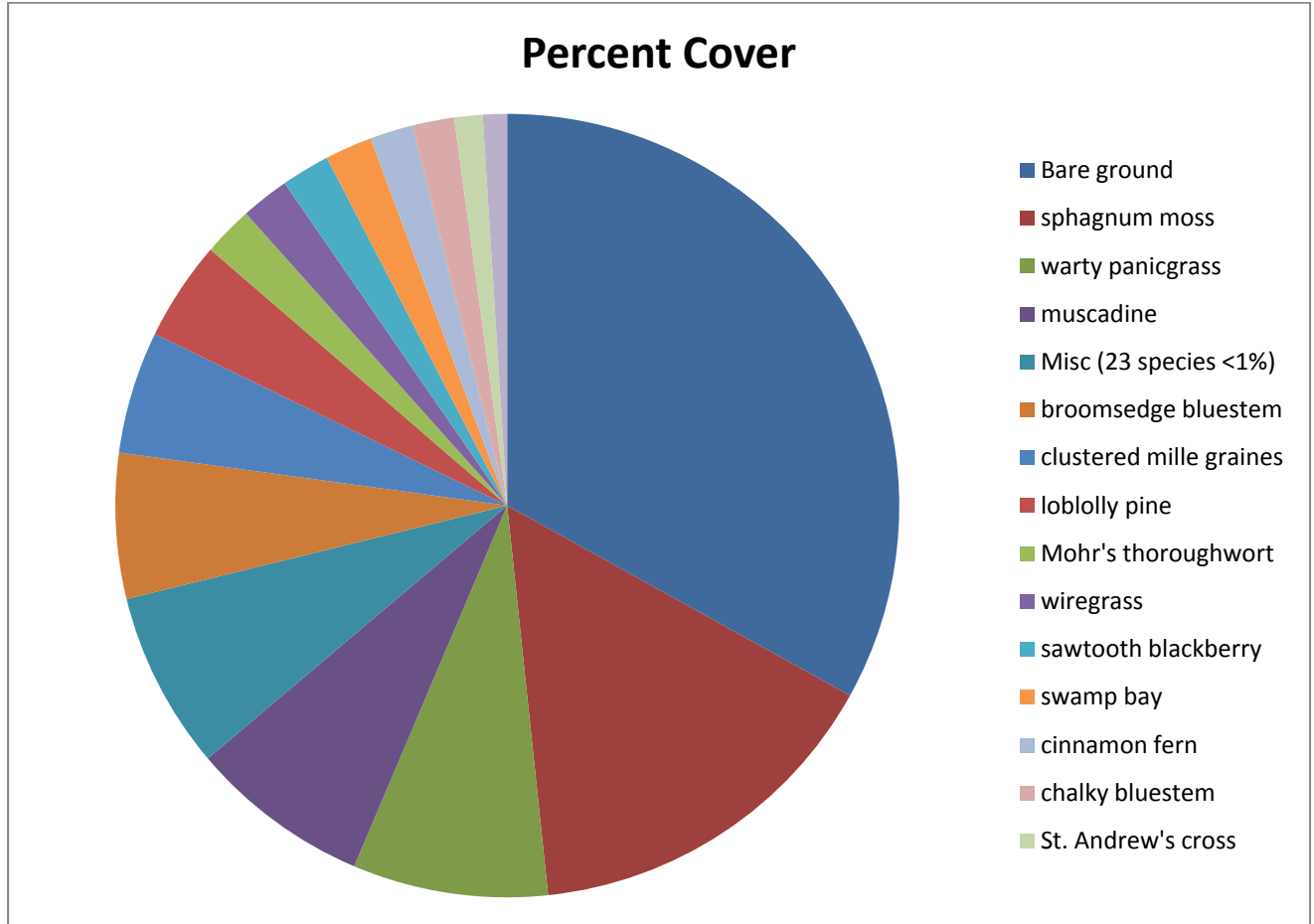


Table 7. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 when sampled on October 1, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Sphagnum</i> sp.	sphagnum moss	15.28
<i>Panicum verrucosum</i>	warty panicgrass	8.06
<i>Vitis rotundifolia</i>	muscadine	7.44
<i>Andropogon virginicus</i>	broomsedge bluestem	6.00
<i>Oldenlandia uniflora</i>	clustered mille grains	5.06
<i>Pinus taeda</i>	loblolly pine	4.11
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	2.06
<i>Aristida stricta</i> var. <i>beyrichiana</i>	wiregrass	2.00
<i>Rubus argutus</i>	sawtooth blackberry	2.00
<i>Persea palustris</i>	swamp bay	1.94
<i>Osmunda cinnamomea</i>	cinnamon fern	1.78

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon virginicus</i> var. <i>glaucus</i>	chalky bluestem	1.72
<i>Hypericum hypericoides</i>	St. Andrew's cross	1.17
<i>Hypericum crux-andreae</i>	St. Peter's wort	1.00
<i>Eupatorium capillifolium</i>	dogfennel	0.83
<i>Woodwardia areolata</i>	netted chain fern	0.83
<i>Elephantopus nudatus</i>	smooth elephantsfoot	0.83
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.72
<i>Dichanthelium</i> sp.	witchgrass	0.39
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	0.39
<i>Woodwardia virginica</i>	Virginia chain fern	0.39
<i>Vaccinium elliotii</i>	Elliott's blueberry	0.39
<i>Solidago fistulosa</i>	pinebarren goldenrod	0.28
<i>Smilax glauca</i>	cat greenbrier	0.22
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.22
<i>Toxicodendron radicans</i>	eastern poison ivy	0.22
<i>Acer rubrum</i>	red maple	0.22
<i>Viola lanceolata</i>	bog white violet	0.22
<i>Carex albolutescens</i>	greenwhite sedge	0.22
<i>Rhus copallinum</i>	winged sumac	0.17
<i>Cyrilla racemiflora</i>	titi	0.17
<i>Aristida spiciformis</i>	bottlebrush threeawn	0.17
<i>Chamaecrista nictitans</i>	sensitive pea	0.17
unknown moss	unknown moss	0.11
<i>Conyza canadensis</i>	Canadian horseweed	0.06
<i>Viola sororia</i>	common blue violet	0.06
<i>Xyris</i> sp.	yellow-eyed grass	0.06
	Bare ground	33.1

## Pine Flatwoods

**Qualitative monitoring.** A total of 42 species (Table 1) were observed in the pine flatwoods area. The open canopy was dominated by mature loblolly pines 30-50 feet tall. Occasional water oak, red maple, and swamp bay made up the subcanopy. The diverse open shrub layer was dominated by gallberry, large gallberry, wax myrtle, sawtooth blackberry, and Elliott's blueberry. Common herbs were sphagnum moss, royal fern, cinnamon fern, netted chain fern, and Virginia chain fern. Wiregrass was sparse and often shaded by pine needle litter and muscadine grape. A mature tree and occasional seedlings of the invasive exotic tallow tree were observed near the center of the polygon. Plants of the previously reported Japanese climbing fern were dead from herbicide treatment.

**Lafayette Creek - Phase I Mitigation Site  
Qualitative and Quantitative Monitoring  
December 2013**

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**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 US 331 re-alignment at 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 on the north side of SR 20. 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 of wetland shrubs (Figure 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 and stream swamp. The site vegetation was previously monitored by Ann Johnson (FNAI ecologist) in the fall of 2012.

**METHODS**

The quantitative monitoring utilized 300 feet long permanent transect lines previously marked during the 2012 survey. Two transects were located in both the sandhill and hydric savanna areas (Figure 1). In 2013, metal T-posts were installed at the ends of each transect to provide more permanent reference points. Data recorded consisted of the visually estimated percent cover of each plant species in sixteen separate meter square quadrats. The quadrats were located 20 feet apart starting at 0 feet (at the north and higher in elevation end) and ending at 300 feet and extending one meter to the left of the transect line. The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through each of these two communities plus high pine (HP), bay swamp (BS), and stream swamp (SS). The field surveys were performed by Gary Schultz and Ann Johnson on September 10, 11, 12, 13, 2013.

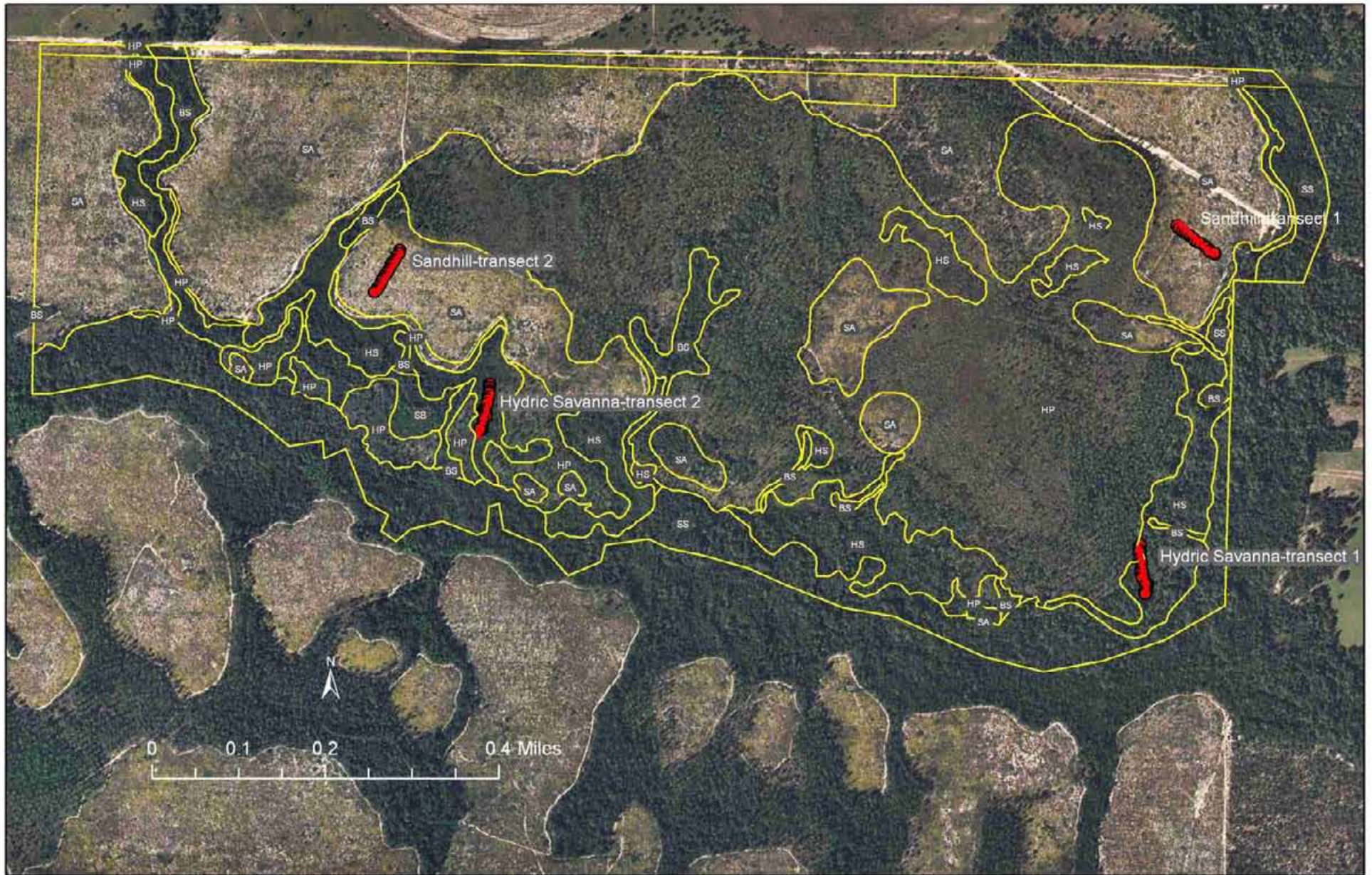


Figure 1. Location of permanent transects at Lafayette Creek – Phase I Mitigation Site. SA=Sandhill, HS=Hydric Savanna, HP=High Pine, BS=Bay Swamp, SS=Stream Swamp, SB=Shrub Bog.



## RESULTS AND DISCUSSION

A total of 164 plant species were recorded in the surveyed areas of Lafayette Creek during the 2013 monitoring period.

### 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, tapered witchgrass, Lynn Haven goldenaster, broomsedge bluestem, and Piedmont gayfeather. Other common species included orangegrass, little bluestem, and yankeeweed. The occasional shrubs were mainly woody goldenrod, young turkey oak, sand live oak, saw palmetto, yaupon, and sand blackberry. The vine earleaf greenbriar was common. Planted longleaf pines were common and ranged from 1 to 15 feet tall. A total of 73 plant species were identified in this community (Table 1).

**Quantitative sampling.** The eastern Transect 1 (Table 2, Figure 2) was located on an east facing slope. It had a total of 38 species and averaged 38% bare ground in each quadrat. The herbs with the highest percent cover were wiregrass, tapered witchgrass, and Lynn Haven goldenaster. The most abundant shrubs were saw palmetto, sand live oak, gopher apple, and sand blackberry. The western Transect 2 (Table 3, Figure 3) was situated near the top of a ridge. It had a total of 47 species and an average of 47% bare ground in each quadrat. Wiregrass, tapered witchgrass, and Lynn Haven goldenaster were again dominant. The open shrub stratum was mainly turkey oak, seedling longleaf pine, and yaupon.

Table 1. Species observed in target communities at Lafayette Creek – Phase I Mitigation Site, September 10-13, 2013.

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>Aletris lutea</i>	yellow colic-root			X			1
<i>Amsonia ciliata</i>	fringed bluestar				X		1
<i>Andropogon glomeratus</i>	bushy bluestem			X			1
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem			X			1
<i>Andropogon sp.</i>	Bluestem			X	X		2
<i>Andropogon virginicus</i>	broomsedge bluestem				X		1
<i>Aristida purpurascens</i>	arrowfeather threeawn				X		1
<i>Aristida stricta var. beyrichiana</i>	Wiregrass		X	X	X		3
<i>Arundinaria gigantea</i>	Switchcane			X		X	2
<i>Aureolaria pedicularia var. pectinata</i>	fernleaf yellow false foxglove				X		1
<i>Berlandiera pumila</i>	soft greeneyes				X		1
<i>Bulbostylis ciliatifolia</i>	capillary hairsedge				X		1
<i>Callicarpa americana</i>	American beautyberry		X		X	X	3

Scientific Name	Common Name	bay swamp	high pine	hydric savanna	sandhill	stream swamp	Grand Total
<i>Carex glaucescens</i>	clustered sedge					X	1
<i>Carex verrucosa</i>	warty sedge			X			1
<i>Carphephorus odoratissimus</i>	Vanillaleaf		X	X	X		3
<i>Ceanothus microphyllus</i>	littleleaf buckbrush				X		1
<i>Chasmanthium laxum var. sessiliflorum</i>	longleaf woodoats					X	1
<i>Chrysoma pauciflosculosa</i>	woody goldenrod				X		1
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster				X		1
<i>Clethra alnifolia</i>	sweet pepperbush	X		X		X	3
<i>Cliftonia monophylla</i>	black titi	X		X		X	3
<i>Clitoria mariana</i>	Atlantic pigeon-wing				X		1
<i>Cnidocolus stimulosus</i>	tread softly				X		1
<i>Conyza canadensis</i>	Canadian horseweed				X		1
<i>Crataegus sp.</i>	Hawthorn			X			1
<i>Ctenium aromaticum</i>	toothache grass		X	X			2
<i>Cyperus sp.</i>	Flatsedge			X	X		2
<i>Cyrilla racemiflora</i>	Titi	X				X	2
<i>Dalea pinnata</i>	summer farewell				X		1
<i>Desmodium sp.</i>	tick-trefoil		X				1
<i>Dichantherium aciculare</i>	needleleaf witchgrass				X		1
<i>Dichantherium acuminatum</i>	tapered witchgrass			X	X		2
<i>Dichantherium ensifolium</i>	cypress witchgrass			X			1
<i>Dichantherium ensifolium var. unciophyllum</i>	cypress witchgrass			X			1
<i>Dichantherium sp.</i>	Witchgrass				X		1
<i>Diodia virginiana</i>	Virginia buttonweed			X			1
<i>Diospyros virginiana</i>	common persimmon				X		1
<i>Drosera capillaris</i>	pink sundew			X			1
<i>Erigeron vernus</i>	early whitetop fleabane			X			1
<i>Eriocaulon decangulare</i>	tenangle pipewort			X			1
<i>Eriogonum tomentosum</i>	dogtongue wild buckwheat				X		1
<i>Eupatorium album</i>	white thoroughwort			X		X	2
<i>Eupatorium compositifolium</i>	Yankeeweed		X		X		2
<i>Eupatorium rotundifolium</i>	roundleaf thoroughwort		X				1
<i>Euphorbia discoidalis</i>	summer spurge				X		1
<i>Euthamia caroliniana</i>	slender flattop goldenrod		X				1
<i>Froelichia floridana</i>	Cottonweed				X		1
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge			X			1
<i>Galactia regularis</i>	eastern milkpea				X		1
<i>Galactia volubilis</i>	downy milkpea				X		1

Scientific Name	Common Name	bay swamp	high pine	hydric savanna	sandhill	stream swamp	Grand Total
<i>Gaylussacia dumosa</i>	dwarf huckleberry		X	X	X		2
<i>Gelsemium sempervirens</i>	yellow Jessamine		X			X	2
<i>Helianthus angustifolius</i>	narrowleaf sunflower		X	X		X	3
<i>Helianthus radula</i>	stiff sunflower		X				1
<i>Hibiscus aculeatus</i>	Comfortroot		X				1
<i>Houstonia procumbens</i>	roundleaf bluet				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	X	X			3
<i>Ilex coriacea</i>	large gallberry	X		X		X	3
<i>Ilex glabra</i>	Gallberry		X	X	X		3
<i>Ilex opaca</i>	American holly		X				1
<i>Ilex vomitoria</i>	Yaupon		X	X	X	X	4
<i>Lachnanthes caroliniana</i>	Carolina redroot			X			1
<i>Leucothoe axillaris</i>	coastal doghobble					X	1
<i>Liatris pauciflora</i>	fewflower gayfeather				X		1
<i>Liatris sp.</i>	blazing star				X		1
<i>Liatris spicata</i>	dense gayfeather			X	X		2
<i>Liatris tenuifolia</i>	shortleaf gayfeather		X		X		2
<i>Licania michauxii</i>	gopher apple			X	X		2
<i>Linum sp.</i>	Flax		X				1
<i>Liriodendron tulipifera</i>	Tuliptree	X				X	2
<i>Lophiola aurea</i>	golden crest			X			1
<i>Ludwigia sp.</i>	Primrosewillow		X				1
<i>Lupinus diffusus</i>	skyblue lupine				X		1
<i>Lycopodiella alopecuroides</i>	foxtail club-moss			X			1
<i>Lyonia lucida</i>	Fetterbush	X		X		X	3
<i>Magnolia grandiflora</i>	southern magnolia		X				1
<i>Magnolia virginiana</i>	Sweetbay	X	X			X	3
<i>Mimosa quadrivalvis</i>	sensitive briar				X		1
<i>Mitchella repens</i>	Partridgeberry					X	1
<i>Mitreola sessilifolia</i>	swamp hornpod		X				1
<i>Myrica caroliniensis</i>	evergreen bayberry	X				X	2
<i>Myrica cerifera</i>	wax myrtle	X	X			X	3
<i>Nyssa sylvatica var. biflora</i>	swamp tupelo	X		X		X	3
<i>Oldenlandia uniflora</i>	clustered mille grains			X			1
<i>Opuntia humifusa</i>	Pricklypear				X		1
<i>Osmunda cinnamomea</i>	cinnamon fern	X				X	2

Scientific Name	Common Name	bay swamp	high pine	hydric savanna	sandhill	stream swamp	Grand Total
<i>Osmunda regalis var. spectabilis</i>	royal fern	X		X		X	3
<i>Panicum anceps</i>	beaked panicum			X			1
<i>Panicum verrucosum</i>	warty panicgrass		X	X			2
<i>Paronychia patula</i>	pineland nailwort				X		1
<i>Paspalum setaceum</i>	thin paspalum				X		1
<i>Persea palustris</i>	swamp bay	X				X	2
<i>Photinia pyrifolia</i>	red chokeberry			X			1
<i>Pinus clausa</i>	sand pine				X		1
<i>Pinus elliotii</i>	slash pine		X			X	2
<i>Pinus palustris</i>	longleaf pine				X		1
<i>Pinus serotina</i>	pond pine	X		X			2
<i>Pinus taeda</i>	loblolly pine					X	1
<i>Pityopsis aspera</i>	pineland silkgrass				X		1
<i>Pityopsis graminifolia</i>	narrowleaf silkgrass		X				1
<i>Polygala lutea</i>	orange milkwort			X			1
<i>Polygonella gracilis</i>	tall jointweed				X		1
<i>Pseudognaphalium obtusifolium</i>	sweet everlasting				X		1
<i>Pteridium aquilinum</i>	bracken fern		X	X			2
<i>Quercus geminata</i>	sand live oak				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 nigra</i>	water oak	X				X	2
<i>Quercus pumila</i>	runner oak		X				1
<i>Rhexia alifanus</i>	savannah meadowbeauty		X	X			2
<i>Rhexia mariana</i>	pale meadowbeauty			X			1
<i>Rhus copallinum</i>	winged sumac				X		1
<i>Rhynchosia cytisoides</i>	royal snoutbean				X		1
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge			X			1
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge			X			1
<i>Rhynchospora ciliaris</i>	fringed beaksedge			X			1
<i>Rhynchospora corniculata</i>	shortbristle horned beaksedge			X			1
<i>Rhynchospora fascicularis</i>	fascicled beaksedge			X			1
<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 argutus</i>	sawtooth blackberry	X				X	2
<i>Rubus cuneifolius</i>	sand blackberry				X		1

Scientific Name	Common Name	bay swamp	high pine	hydric savanna	sandhill	stream swamp	Grand Total
<i>Sabatia brevifolia</i>	shortleaf rosegiant		X				1
<i>Sarracenia leucophylla</i>	white-top pitcherplant			X		X	2
<i>Schizachyrium scoparium</i>	little bluestem			X	X		2
<i>Schizachyrium tenerum</i>	slender bluestem				X		1
<i>Scirpus cyperinus</i>	Woolgrass			X			1
<i>Scleria reticularis</i>	netted nutrush			X			1
<i>Scleria sp.</i>	Nutrush				X		1
<i>Serenoa repens</i>	saw palmetto		X	X	X		3
<i>Smilax auriculata</i>	earleaf greenbrier			X	X		2
<i>Smilax bona-nox</i>	saw greenbrier		X				1
<i>Smilax glauca</i>	cat greenbrier	X	X	X		X	4
<i>Smilax laurifolia</i>	laurel greenbrier	X		X		X	3
<i>Solidago odora</i>	sweet goldenrod		X		X		2
<i>Sphagnum sp.</i>	sphagnum moss			X		X	2
<i>Stillingia sylvatica</i>	queen's delight				X		1
<i>Stylosanthes biflora</i>	sidebeak pencil flower		X				1
<i>Styrax americanus</i>	American snowbell					X	1
<i>Tephrosia chrysophylla</i>	scurf hoary-pea				X		1
<i>Tephrosia virginiana</i>	goat's rue				X		1
<i>Toxicodendron radicans</i>	eastern poison ivy		X			X	2
<i>Tragia urens</i>	wavyleaf noseburn				X		1
unknown euphorb	unknown euphorb				X		1
unknown legume	unknown legume				X		1
<i>Utricularia juncea</i>	southern bladderwort			X		X	2
<i>Utricularia subulata</i>	zigzag bladderwort			X			1
<i>Vaccinium arboreum</i>	Sparkleberry				X		1
<i>Vaccinium corymbosum</i>	highbush blueberry	X	X				2
<i>Vaccinium darrowii</i>	Darrow's blueberry			X			1
<i>Vaccinium myrsinites</i>	shiny blueberry		X	X	X		3
<i>Viola sororia</i>	common blue violet			X			1
<i>Vitis rotundifolia</i>	Muscadine	X	X		X	X	4
<i>Woodwardia areolata</i>	netted chain fern					X	1
<i>Woodwardia virginica</i>	Virginia chain fern		X			X	2
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass		X	X			2
<i>Xyris sp.</i>	yellow-eyed grass					X	1
<i>Yucca filamentosa</i>	Adam's needle		X		X		2
<b>Total number of species: 164</b>		22	43	67	73	39	

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

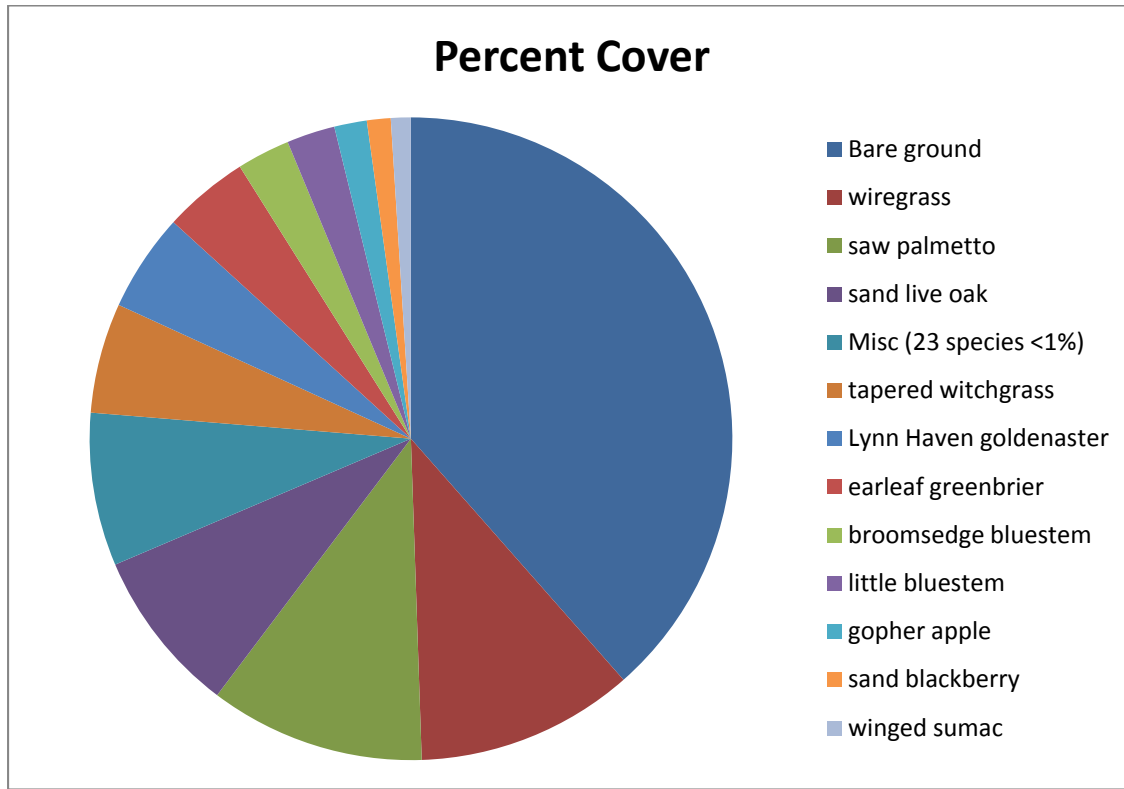


Table 2. Percent cover of plant species in Sandhill Transect 1 when sampled on September 10, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Aristida stricta</i> var. <i>beyrichiana</i>	wiregrass	10.97
<i>Serenoa repens</i>	saw palmetto	10.83
<i>Quercus geminate</i>	sand live oak	8.30
<i>Dichanthelium acuminatum</i>	tapered witchgrass	5.53
<i>Chrysopsis lanuginose</i>	Lynn Haven goldenaster	4.93
<i>Smilax auriculata</i>	earleaf greenbrier	4.30
<i>Andropogon virginicus</i>	broomsedge bluestem	2.67
<i>Schizachyrium scoparium</i>	little bluestem	2.43
<i>Licania michauxii</i>	gopher apple	1.63
<i>Rubus cuneifolius</i>	sand blackberry	1.20
<i>Rhus copallinum</i>	winged sumac	1.00
<i>Eupatorium compositifolium</i>	yankeeweed	0.97
<i>Hypericum gentianoides</i>	orangegrass	0.93
<i>Solidago odora</i>	sweet goldenrod	0.83
<i>Bulbostylis ciliatifolia</i>	capillary hairsedge	0.77

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon</i> sp.	bluestem	0.73
<i>Diospyros virginiana</i>	common persimmon	0.50
<i>Paspalum setaceum</i>	thin paspalum	0.47
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	0.37
<i>Pityopsis aspera</i>	pineland silkgrass	0.33
<i>Scleria</i> sp.	nutrush	0.33
<i>Polygonella gracilis</i>	tall jointweed	0.27
<i>Dichanthelium</i> sp.	witchgrass	0.23
<i>Liatris tenuifolia</i>	shortleaf gayfeather	0.23
<i>Rhynchosia cytisoides</i>	royal snoutbean	0.20
<i>Liatris pauciflora</i>	fewflower gayfeather	0.10
<i>Schizachyrium tenerum</i>	slender bluestem	0.10
<i>Houstonia procumbens</i>	roundleaf bluet	0.10
<i>Cnidocolus stimulosus</i>	tread softly	0.07
<i>Conyza Canadensis</i>	Canadian horseweed	0.03
<i>Mimosa quadrivalvis</i>	sensitive briar	0.03
<i>Pinus palustris</i>	longleaf pine	0.03
<i>Tragia urens</i>	wavyleaf noseburn	0.03
unknown legume	unknown legume	0.03
	Bare ground	38.5

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

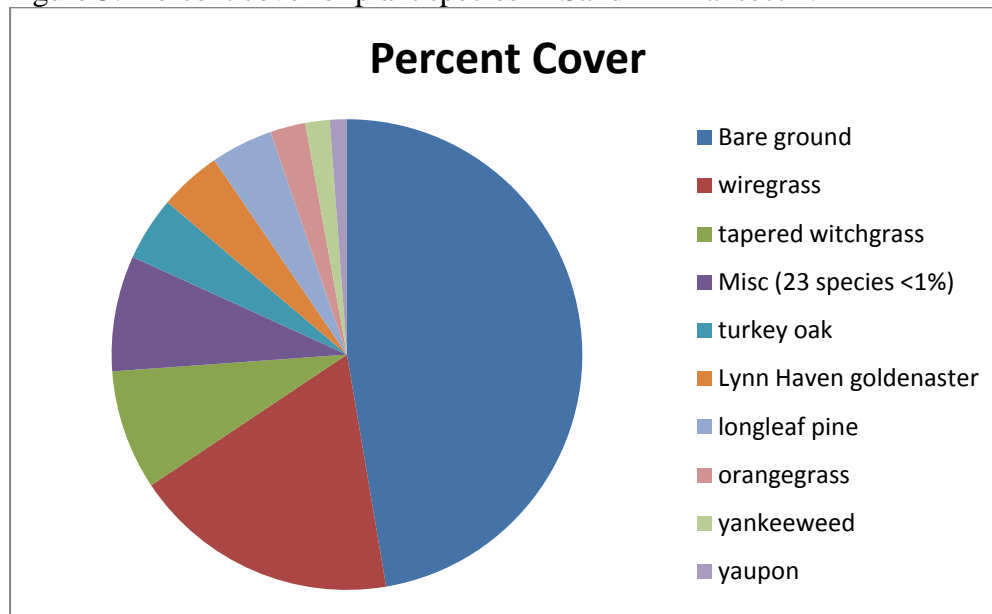


Table 3. Percent cover of plant species in Sandhill Transect 2 when sampled on September 11, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Aristida stricta</i> var. <i>beyrichiana</i>	wiregrass	18.30
<i>Dichantherium acuminatum</i>	tapered witchgrass	8.23
<i>Quercus laevis</i>	turkey oak	4.40
<i>Chrysopsis lanuginose</i>	Lynn Haven goldenaster	4.27
<i>Pinus palustris</i>	longleaf pine	4.27
<i>Hypericum gentianoides</i>	orangegrass	2.43
<i>Eupatorium compositifolium</i>	yankeeweed	1.67
<i>Ilex vomitoria</i>	yaupon	1.17
<i>Smilax auriculata</i>	earleaf greenbrier	0.97
<i>Liatris pauciflora</i>	fewflower gayfeather	0.77
<i>Aristida purpurascens</i>	arrowfeather threeawn	0.73
<i>Andropogon</i> sp.	bluestem	0.67
<i>Bulbostylis ciliatifolia</i>	capillary hairsedge	0.67
<i>Aristida gyrans</i>	corkscrew threeawn	0.57
<i>Schizachyrium scoparium</i>	little bluestem	0.50
<i>Opuntia humifusa</i>	pricklypear	0.47
<i>Galactia regularis</i>	eastern milkpea	0.47
<i>Polygonella gracilis</i>	tall jointweed	0.33
<i>Mimosa quadrivalvis</i>	sensitive briar	0.30
<i>Dichantherium aciculare</i>	needleleaf witchgrass	0.23
<i>Licania michauxii</i>	gopher apple	0.23
<i>Dalea pinnata</i>	summer farewell	0.23
Euphorbiaceae		0.23
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.10
<i>Schizachyrium tenerum</i>	slender bluestem	0.10
<i>Cyperus</i> sp.	flatsedge	0.10
<i>Liatris</i> sp.	blazing star	0.10
<i>Rhynchosia cytisoides</i>	royal snoutbean	0.07
<i>Eriogonum tomentosum</i>	dogtongue wild buckwheat	0.03
<i>Tragia urens</i>	wavyleaf noseburn	0.03
<i>Hypericum hypericoides</i>	St. Andrew's cross	0.03
	Bare ground	47.3

### Hydric Savanna

**Qualitative sampling.** The restoration of the fire-suppressed hydric savanna was begun in the last two years by mowing down the often dense shrubs with a gyro-track machine. Follow-up



prescribed burning had 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. 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 dominating in the wetter sections and wiregrass in the drier parts. The shrubs black titi, large gallberry, sweet pepperbush, red chokecherry, and gallberry were often resprouting from ground level. Scattered mature pond pine provided an open canopy. The soil was often saturated and small areas of inundation were found at the lower elevations. A total of 67 species were recorded from this community (Table 1).

**Quantitative sampling.** The eastern Transect 1 (Table 4, Figure 4) was on a south facing slope and had a total of 44 species and an average of 75% bare ground in each quadrat. The most abundant herbs were tapered witchgrass, wiregrass, loosehead beakrush, warty panicgrass, Chapman’s beaksedge, and purple bluestem. The sparse shrubs included black titi, large gallberry, and dwarf huckleberry. The western Transect 2 (Table 5, Figure 5) was also on a south facing slope. It had a total of 35 species and an average of 82% bare ground in each quadrat. The drier north end had abundant wiregrass and shiny blueberry while the wetter south end had fringed beaksedge, Chapman’s beaksedge, sphagnum moss, sweet pepperbush, large gallberry and black titi.

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

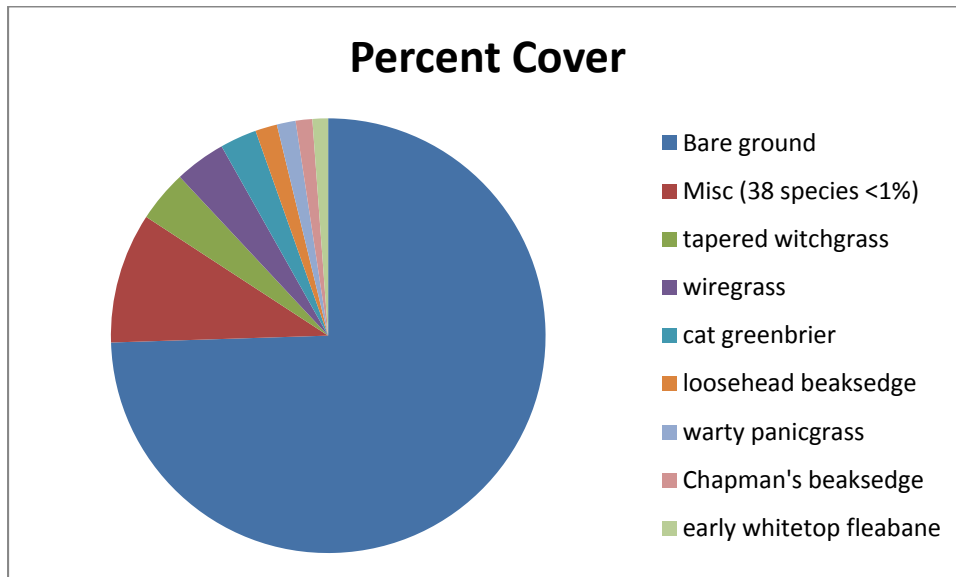


Table 4. Percent cover of plant species in Hydric Savanna Transect 1 when sampled on September 12, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Dichanthelium acuminatum</i>	tapered witchgrass	3.83
<i>Aristida stricta</i> var. <i>beyrichiana</i>	wiregrass	3.80
<i>Smilax glauca</i>	cat greenbrier	2.73

Scientific name	Common name	Average percent cover per quadrat
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	1.63
<i>Panicum verrucosum</i>	warty panicgrass	1.40
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	1.23
<i>Erigeron vernus</i>	early whitetop fleabane	1.17
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.93
<i>Andropogon</i> sp.	bluestem	0.83
<i>Ctenium aromaticum</i>	toothache grass	0.70
<i>Andropogon glomeratus</i>	bushy bluestem	0.67
<i>Lophiola aurea</i>	golden crest	0.67
<i>Cliftonia monophylla</i>	black titi	0.60
<i>Ilex coriacea</i>	large gallberry	0.60
<i>Ilex glabra</i>	gallberry	0.47
<i>Scleria reticularis</i>	netted nutrush	0.43
<i>Eupatorium album</i>	white thoroughwort	0.33
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	0.27
<i>Arundinaria gigantea</i>	switchcane	0.23
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	0.23
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass	0.23
<i>Aletris lutea</i>	yellow colic-root	0.23
<i>Panicum anceps</i>	beaked panicum	0.23
<i>Rhynchospora ciliaris</i>	fringed beaksedge	0.20
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.17
<i>Polygala lutea</i>	orange milkwort	0.17
<i>Helianthus angustifolius</i>	narrowleaf sunflower	0.13
<i>Licania michauxii</i>	gopher apple	0.10
<i>Rhynchospora</i> sp.	beaksedge	0.10
<i>Schizachyrium scoparium</i>	little bluestem	0.10
<i>Smilax auriculata</i>	earleaf greenbrier	0.10
<i>Ilex vomitoria</i>	yaupon	0.10
<i>Photinia pyrifolia</i>	red chokeberry	0.10
<i>Cyperus</i> sp.	flatsedge	0.10
<i>Rhexia alifanus</i>	savannah meadowbeauty	0.10
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	0.10
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.10
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.10
<i>Sarracenia leucophylla</i>	white-top pitcherplant	0.07
<i>Diodia virginiana</i>	Virginia buttonweed	0.03
<i>Osmunda cinnamomea</i>	cinnamon fern	0.03
<i>Dichanthelium ensifolium</i> var. <i>unciphillum</i>	cypress witchgrass	0.03
<i>Oldenlandia uniflora</i>	clustered mille grains	0.03
<i>Drosera capillaris</i>	pink sundew	0.03

Scientific name	Common name	Average percent cover per quadrat
<i>Liatris spicata</i>	dense gayfeather	0.03
	Bare ground	74.5

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

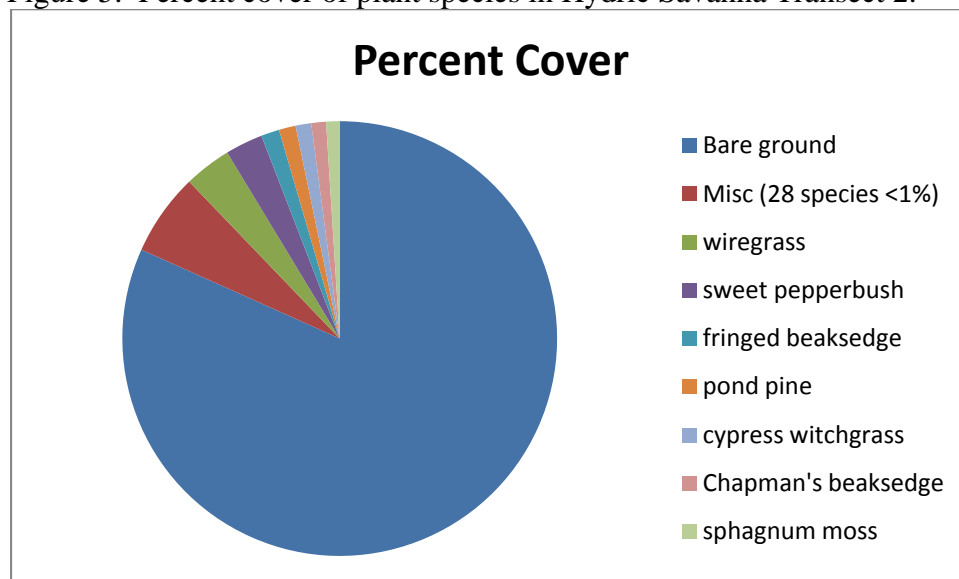


Table 5. Percent cover of plant species in Hydric Savanna Transect 2 when sampled on September 11, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Aristida stricta</i> var. <i>beyrichiana</i>	wiregrass	3.50
<i>Clethra alnifolia</i>	sweet pepperbush	2.80
<i>Rhynchospora ciliaris</i>	fringed beaksedge	1.37
<i>Pinus serotina</i>	pond pine	1.23
<i>Dichantherium ensifolium</i>	cypress witchgrass	1.17
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	1.10
<i>Sphagnum</i> sp.	sphagnum moss	1.00
<i>Panicum verrucosum</i>	warty panicgrass	0.73
<i>Pteridium aquilinum</i>	bracken fern	0.73
<i>Smilax glauca</i>	cat greenbrier	0.67
<i>Dichantherium acuminatum</i>	tapered witchgrass	0.53
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.50
<i>Rhynchospora</i> sp.	beaksedge	0.37
<i>Vaccinium myrsinites</i>	shiny blueberry	0.33
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	0.27
<i>Smilax laurifolia</i>	laurel greenbrier	0.27

Scientific name	Common name	Average percent cover per quadrat
<i>Photinia pyrifolia</i>	red chokeberry	0.23
<i>Scleria reticularis</i>	netted nutrush	0.20
<i>Ilex coriacea</i>	large gallberry	0.17
<i>Cliftonia monophylla</i>	black titi	0.13
<i>Utricularia subulata</i>	zigzag bladderwort	0.13
<i>Ilex glabra</i>	gallberry	0.10
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.10
<i>Vaccinium darrowii</i>	Darrow's blueberry	0.10
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass	0.10
<i>Rhexia alifanus</i>	savannah meadowbeauty	0.10
<i>Lachnanthes carolina</i>	Carolina redroot	0.10
<i>Andropogon glomeratus</i>	bushy bluestem	0.03
<i>Andropogon</i> sp.	bluestem	0.03
<i>Nyssa sylvatica</i> var. <i>biflora</i>	swamp tupelo	0.03
<i>Rhexia mariana</i>	pale meadowbeauty	0.03
<i>Smilax auriculata</i>	earleaf greenbrier	0.03
<i>Crataegus</i> sp.	hawthorn	0.03
<i>Viola sororia</i>	common blue violet	0.03
<i>Lyonia lucida</i>	fetterbush	0.03
	Bare ground	81.7

### 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 had opened up the canopy in some sections. An often dense shrub layer was dominated by gallberry, yaupon, and large gallberry. More open areas had wiregrass, purple bluestem, and other herbs. Other herbs included toothache grass, scaleleaf aster, shortleaf gayfeather, and vanillaleaf. The total number of species observed in this community was 43 (Table 1).

### Bay Swamp

**Qualitative sampling.** This relatively undisturbed natural community occurs as a narrow band along the small stream tributaries to Lafayette Creek. The often dense canopy consisted of sweetbay, swamp bay, black titi, and pond pine. The also dense shrub layer was fetterbush, large gallberry, black titi, sweet pepperbush, wax myrtle, sawtooth blackberry, and hazel alder. The sparse herb stratum had sphagnum moss, netted chain fern, and cinnamon fern. The vines laurel greenbrier, cat greenbrier, and muscadine, were frequent. At the time of sampling the soils were saturated and the water was low but flowing. The total number of species observed in this community was 35 (Table 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 swamp tupelo, sweetbay, red maple, water oak, and slash pines. The often dense shrubs consisted of titi, black titi, wax myrtle, and fetterbush. Sphagnum moss, cinnamon fern, royal fern, and clustered sedge made up the sparse groundcover. The total number of species observed in this community was 39 (Table 1).

**Plum Creek at Holmes Creek Mitigation Site**  
**Qualitative and Quantitative Monitoring**  
**December 2013**

**Plum Creek at Holmes Creek Mitigation Site  
Qualitative and Quantitative Monitoring  
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**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 mixed forested wetlands (MFW) from a wetland impacted by a beaver pond (Figure 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 Ann Johnson (FNAI ecologist) in the fall of 2012.

**METHODS**

The quantitative monitoring utilized 300 feet long permanent transect lines previously marked during the 2012 survey. Two transects were located in the sandhill, one in the restoration mixed forested wetland, and one in preserved mixed forested wetland (Figure 1). In 2013, metal T-posts were installed at the ends of each transect to provide more permanent reference points. Data recorded consisted of the visually estimated percent cover of each plant species in sixteen separate meter square quadrats. The quadrats were located 20 feet apart starting at 0 feet and ending at 300 feet and extending one meter to the left of the transect line. 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 Gary Schultz and Brenda Herring (FNAI botanists) on September 18, 19, and 20, 2013.

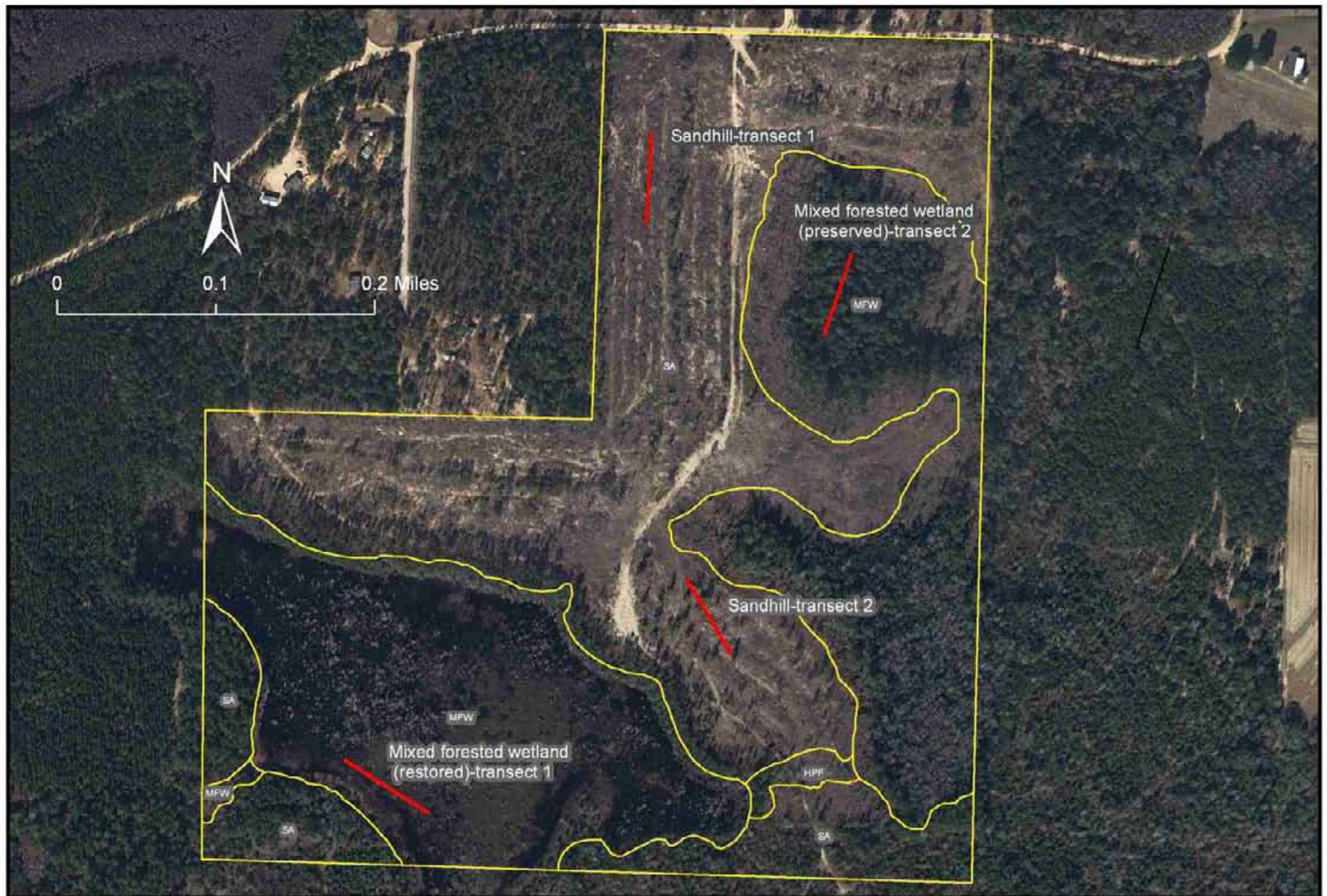


Figure 1. Location of permanent transects at Plum Creek at Holmes Creek Mitigation Site in Sandhill and Mixed Forested Wetland,



## RESULTS AND DISCUSSION

A total of 169 plant species were observed during the 2013 monitoring period in the target communities at Plum Creek at Holmes Creek Mitigation Site.

### 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 wiregrass, broomsedge bluestem, little bluestem, and needleleaf witchgrass. Other common species included orangegrass, pinkscale gayfeather, and yankeeweed. The occasional shrubs were mainly sand live oak, yaupon, turkey oak, sparkleberry, and sand blackberry. The vine earleaf greenbriar was common. A total of 117 plant species were identified in this community (Table 1). A number of active gopher tortoise burrows were noted in the course of the sandhill survey.

**Quantitative sampling.** The northern Transect 1 (Table 2, Figure 2) was located midslope on an east facing hill. It had a total of 59 species and averaged 66% bare ground in each quadrat. The herbs with the highest percent cover were yankeeweed, orangegrass, Lynn Haven goldenaster, sweet goldenrod. The most abundant shrubs were yaupon and deerberry. The southern Transect 2 (Table 3, Figure 3) was situated near the top of a ridge. It had a total of 58 species and an average of 32% bare ground in each quadrat. The herbs were similar plus comfortroot, broomsedge bluestem, and arrowfeather threeawn. The open shrub stratum was mainly sparkleberry and sand blackberry. The vine earleaf greenbriar was common.

Table 1. Plant species observed in target communities at Plum Creek at Holmes Creek Mitigation Site, September 18, 19, and 20, 2013.

Scientific Name	Common Name	Sandhill	Forested Mixed Wetland-Restoration	Forest Mixed Wetland-Preserved	Grand Total
<i>Ampelopsis arborea</i>	peppervine	X			1
<i>Andropogon gerardii</i>	big bluestem	X			1
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem		X		1
<i>Andropogon sp.</i>	bluestem	X			1
<i>Andropogon ternaries</i>	splitbeard bluestem	X			1
<i>Andropogon virginicus</i>	broomsedge bluestem	X			1
<i>Andropogon virginicus var. glaucus</i>	chalky bluestem	X			1
<i>Apteria aphylla</i>	nodding nixie			X	1
<i>Aristida purpurascens</i>	arrowfeather threeawn	X			1
<i>Aristida sp.</i>	threeawn	X			1
<i>Aristida stricta var. beyrichiana</i>	wiregrass	X			1

Scientific Name	Common Name	Sandhill	Forested Mixed Wetland- Restoration	Forest Mixed Wetland- Preserved	Grand Total
<i>Asimina angustifolia</i>	slimleaf pawpaw	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>Bulbostylis ciliatifolia</i>	capillary hairsedge	X			1
<i>Callicarpa Americana</i>	American beautyberry	X			1
<i>Carex glaucescens</i>	clustered sedge			X	1
<i>Carex sp.</i>	sedge	X		X	2
<i>Carphephorus odoratissimus</i>	vanillaleaf	X			1
<i>Chamaecrista nictitans</i>	sensitive pea	X			1
<i>Chenopodium album</i>	lamb's quarters	X			1
<i>Chrysopsis lanuginose</i>	Lynn Haven goldenaster	X			1
<i>Cladina evansii</i>	a lichen	X			1
<i>Cladina subtenuis</i>	a lichen	X			1
<i>Clethra alnifolia</i>	sweet pepperbush		X	X	2
<i>Cliftonia monophylla</i>	black titi			X	1
<i>Cnidocolus stimulosus</i>	tread softly	X			1
<i>Conyza Canadensis</i>	Canadian horseweed	X			1
<i>Cornus florida</i>	dogwood	X			
<i>Croptilon divaricatum</i>	slender scratchdaisy				
<i>Crotalaria rotundifolia</i>	rabbitbells	X			1
<i>Cyperus retrorsus</i>	pinebarren flatsedge	X			1
<i>Cyrilla racemiflora</i>	titi			X	1
<i>Dalea pinnata</i>	summer farewell	X			1
<i>Decodon verticillatus</i>	willow herb		X		1
<i>Desmodium floridanum</i>	Florida tick-trefoil	X			1
<i>Dichantherium aciculare</i>	needleleaf witchgrass	X			1
<i>Dichantherium acuminatum</i>	tapered witchgrass	X			1
<i>Dichantherium commutatum</i>	variable witchgrass	X			1
<i>Dichantherium sp.</i>	witchgrass	X			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 elliottii</i>	Elliott's lovegrass	X			1
<i>Eragrostis spectabilis</i>	purple lovegrass	X			1
<i>Erechtites hieraciifolius</i>	fireweed	X			1

Scientific Name	Common Name	Sandhill	Forested Mixed Wetland- Restoration	Forest Mixed Wetland- Preserved	Grand Total
<i>Eremochloa ophiuroides</i>	centipede grass	X			1
<i>Eriogonum tomentosum</i>	dogtongue wild buckwheat	X			1
<i>Eryngium yuccifolium</i>	button rattlesnakemaster	X			1
<i>Eupatorium capillifolium</i>	dogfennel	X	X		2
<i>Eupatorium compositifolium</i>	yankeeweed	X			1
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	X	X		2
<i>Euphorbia discoidalis</i>	summer spurge	X			1
<i>Euphorbia floridana</i>	greater Florida spurge	X			1
<i>Euthamia caroliniana</i>	slender flattop goldenrod		X		1
<i>Galactia volubilis</i>	downy milkpea	X			1
<i>Galium hispidulum</i>	coastal bedstraw	X			1
<i>Gaylussacia dumosa</i>	dwarf huckleberry	X			1
<i>Gelsemium sempervirens</i>	yellow jessamine	X			1
<i>Gordonia lasianthus</i>	loblolly bay			X	1
<i>Gymnopogon ambiguous</i>	bearded skeletongrass	X			1
<i>Hibiscus aculeatus</i>	comfortroot	X			1
<i>Houstonia procumbens</i>	roundleaf bluet	X			1
<i>Hieracium megacephalon</i>	coastalplain hawkweed	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 var. myrtifolia</i>	myrtle-leaved holly			X	1
<i>Ilex coriacea</i>	large gallberry			X	1
<i>Ilex glabra</i>	gallberry	X			1
<i>Ilex vomitoria</i>	yaupon	X			1
<i>Juncus Canadensis</i>	Canadian rush		X		1
<i>Juniperus virginicus</i>	red cedar	X			1
<i>Lachnanthes caroliniana</i>	Carolina redroot		X		1
<i>Lechea minor</i>	thymeleaf pinweed	X			1
<i>Leucothoe racemosa</i>	swamp doghobble		X	X	2
<i>Liatris elegans</i>	pinkscale gayfeather	X			1
<i>Liatris gracilis</i>	slender gayfeather	X			1
<i>Liatris pauciflora var. secunda</i>	peidmont gayfeather	X			1
<i>Liatris spicata</i>	dense gayfeather	X			1
<i>Licania michauxii</i>	gopher apple	X			1
<i>Lophiola aurea</i>	golden crest		X		1
<i>Ludwigia leptocarpa</i>	anglestem primrosewillow		X		1
<i>Ludwigia pilosa</i>	hairy primrosewillow		X		1

Scientific Name	Common Name	Sandhill	Forested Mixed Wetland- Restoration	Forest Mixed Wetland- Preserved	Grand Total
<i>Ludwigia repens</i>	creeping primrosewillow		X		1
<i>Ludwigia sp.</i>	primrosewillow		X		1
<i>Ludwigia suffruticosa</i>	shrubby primrosewillow		X		1
<i>Lycopus rubellus</i>	taperleaf waterhorehound		X		1
<i>Lyonia lucida</i>	fetterbush		X	X	2
<i>Myrica caroliniensis</i>	evergreen bayberry			X	1
<i>Myrica cerifera</i>	wax myrtle		X	X	2
<i>Nymphaea odorata</i>	white waterlily		X		1
<i>Nymphoides aquatic</i>	big floatingheart		X		1
<i>Nymphoides cordata</i>	little floatingheart		X		1
<i>Nyssa sylvatica var. biflora</i>	swamp tupelo		X	X	2
<i>Osmanthus americanus</i>	wild olive	X		X	2
<i>Osmunda cinnamomea</i>	cinnamon fern			X	1
<i>Panicum anceps</i>	beaked panicum	X			1
<i>Panicum hemitomom</i>	maidencane		X		1
<i>Panicum verrucosum</i>	warty panicgrass		X		1
<i>Paspalum setaceum</i>	thin paspalum	X			1
<i>Paspalum urvillei</i>	vaseygrass	X			1
<i>Persea palustris</i>	swamp bay			X	1
<i>Phytolacca Americana</i>	American pokeweed	X			1
<i>Pinus clausa</i>	sand pine	X			1
<i>Pinus elliotii</i>	slash pine	X		X	2
<i>Pinus palustris</i>	longleaf pine	X			1
<i>Pityopsis aspera</i>	pinelands silkgrass	X			1
<i>Pityopsis graminifolia</i>	narrowleaf silkgrass	X			1
<i>Polygala nana</i>	candyroot	X			1
<i>Polypremum procumbens</i>	rustweed	X			1
<i>Pseudognaphalium obtusifolium</i>	sweet everlasting	X			1
<i>Pteridium aquilinum</i>	bracken fern	X			1
<i>Quercus falcate</i>	southern red oak	X			1
<i>Quercus geminate</i>	sand live oak	X			1
<i>Quercus hemisphaerica</i>	laurel oak	X			1
<i>Quercus incana</i>	bluejack oak	X			1
<i>Quercus margaretta</i>	sand post oak	X			1
<i>Rhododendron canescens</i>	mountain azalea			X	1
<i>Rhus copallinum</i>	winged sumac	X			1
<i>Rhynchosia cytisoides</i>	royal snoutbean	X			1
<i>Rhynchosia reniformis</i>	dollarleaf	X			1

Scientific Name	Common Name	Sandhill	Forested Mixed Wetland- Restoration	Forest Mixed Wetland- Preserved	Grand Total
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge		X		1
<i>Rhynchospora fascicularis</i>	fascicled beaksedge		X		1
<i>Rhynchospora glomerata</i>	clustered beaksedge			X	1
<i>Rhynchospora harveyi</i>	Harvey's beaksedge	X		X	2
<i>Rhynchospora megacephala</i>	sandyfield beaksedge	X			1
<i>Rubus argutus</i>	sawtooth blackberry			X	1
<i>Rubus cuneifolius</i>	sand blackberry	X			1
<i>Schizachyrium scoparium</i>	little bluestem	X			1
<i>Schizachyrium tenerum</i>	slender bluestem	X			1
<i>Scleria ciliate</i>	fringed nutrush	X			1
<i>Scleria sp.</i>	nutrush	X			1
<i>Serenoa repens</i>	saw palmetto	X			1
<i>Smilax auriculata</i>	earleaf 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
<i>Sorghastrum secundum</i>	lopsided indiagrass	X			1
<i>Spermacoce densiflora</i>	bouquet false buttonweed	X			1
<i>Sphagnum sp.</i>	sphagnum moss		X	X	2
<i>Stillingia sylvatica</i>	queen's delight	X			1
<i>Stylisma patens</i>	coastalplain dawnflower	X			1
<i>Stylosanthes biflora</i>	sidebeak pencil flower	X			1
<i>Symphyotrichum dumosum</i>	rice button aster	X			1
<i>Taxodium ascendens</i>	pond cypress		X		1
<i>Tephrosia chrysophylla</i>	scurf hoary-pea	X			1
<i>Tephrosia spicata</i>	spiked hoary-pea	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
unknown moss	unknown moss			X	1
<i>Vaccinium arboretum</i>	sparkleberry	X			1
<i>Vaccinium corymbosum</i>	highbush blueberry			X	1
<i>Vaccinium darrowii</i>	Darrow's blueberry	X			1
<i>Vaccinium elliotii</i>	Elliott's blueberry			X	1
<i>Vaccinium stamineum</i>	deerberry	X			1
<i>Vernonia angustifolia</i>	tall ironweed	X			1

Scientific Name	Common Name	Sandhill	Forested Mixed Wetland- Restoration	Forest Mixed Wetland- Preserved	Grand Total
<i>Vitis rotundifolia</i>	muscadine			X	1
<i>Wahlenbergia marginata</i>	southern rockbell	X			1
<i>Woodwardia virginica</i>	Virginia chain fern			X	1
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass		X		1
<i>Xyris fimbriata</i>	fringed yellow-eyed grass		X		1
<i>Yucca filamentosa</i>	Adam's needle	X			1
<b>Total number of species: 169</b>		117	35	29	

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

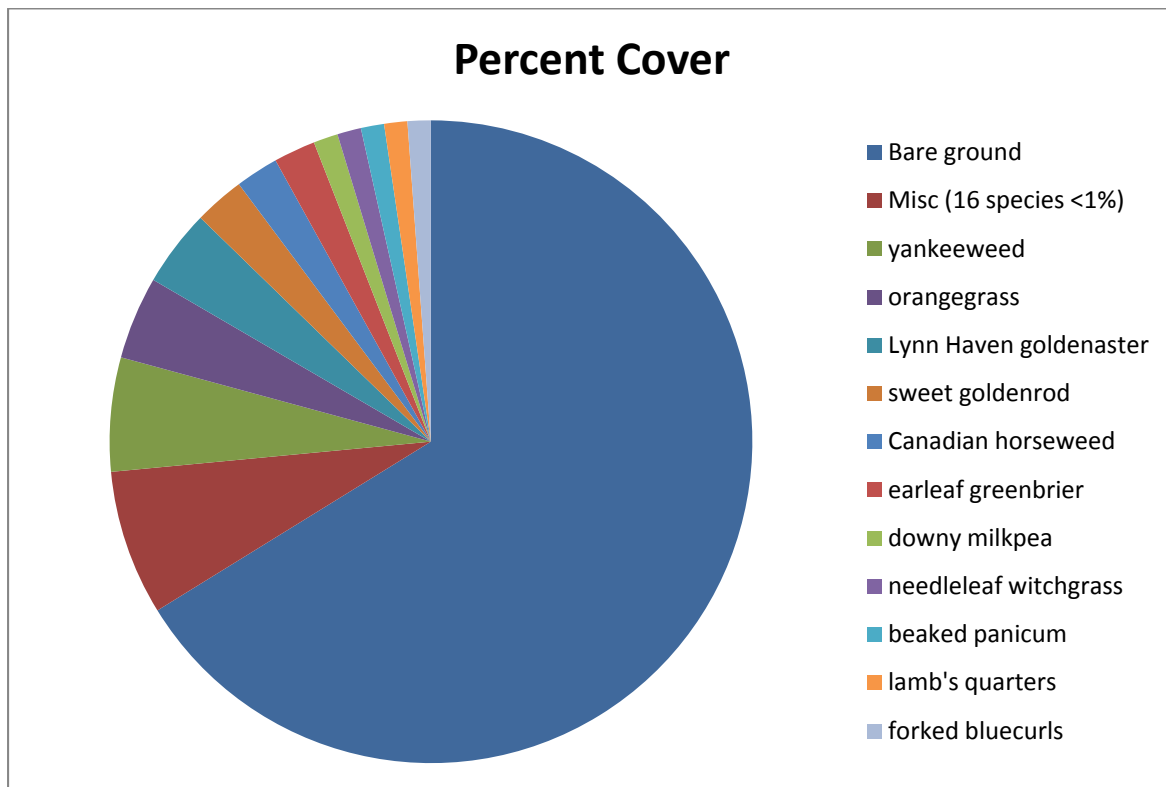


Table 2. Percent cover of plant species in Sandhill Transect 1 when sampled on September 20, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Eupatorium compositifolium</i>	yankeeweed	5.73
<i>Hypericum gentianoides</i>	orangegrass	4.17
<i>Chrysopsis lanuginosa</i>	Lynn Haven goldenaster	3.87
<i>Solidago odora</i>	sweet goldenrod	2.53
<i>Conyza canadensis</i>	Canadian horseweed	2.17
<i>Smilax auriculata</i>	earleaf greenbrier	2.10
<i>Galactia volubilis</i>	downy milkpea	1.23
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	1.20
<i>Panicum anceps</i>	beaked panicum	1.17
<i>Chenopodium album</i>	lamb's quarters	1.17
<i>Trichostema dichotomum</i>	forked bluecurls	1.17
<i>Aristida stricta</i> var. <i>beyrichiana</i>	wiregrass	0.83
<i>Erechtites hieraciifolius</i>	fireweed	0.77
<i>Andropogon virginicus</i>	broomsedge bluestem	0.63
<i>Pteridium aquilinum</i>	bracken fern	0.53
<i>Gelsemium sempervirens</i>	yellow jessamine	0.53
<i>Dichanthelium acuminatum</i>	tapered witchgrass	0.47
<i>Liatris gracilis</i>	slender gayfeather	0.33
<i>Schizachyrium scoparium</i>	little bluestem	0.33
<i>Vaccinium stamineum</i>	deerberry	0.33
<i>Aristida purpurascens</i>	arrowfeather threeawn	0.27
<i>Andropogon virginicus</i> var. <i>glaucus</i>	chalky bluestem	0.23
<i>Ilex vomitoria</i>	yaupon	0.23
<i>Stylisma patens</i>	coastalplain dawnflower	0.23
<i>Berlandiera pumila</i>	soft greeneyes	0.23
<i>Bulbostylis ciliatifolia</i>	capillary hairsedge	0.23
<i>Paspalum setaceum</i>	thin paspalum	0.13

Scientific name	Common name	Average percent cover per quadrat
<i>Scleria</i> sp.	nutrush	0.10
<i>Galium hispidulum</i>	coastal bedstraw	0.10
<i>Quercus margaretta</i>	sand post oak	0.10
<i>Baptisia lanceolata</i>	gopherweed	0.10
<i>Eragrostis elliotii</i>	Elliott's lovegrass	0.10
<i>Dichanthelium commutatum</i>	variable witchgrass	0.10
<i>Scleria ciliata</i>	fringed nutrush	0.07
<i>Vaccinium arboreum</i>	sparkleberry	0.03
<i>Cnidocolus stimulosus</i>	tread softly	0.03
<i>Tragia urens</i>	wavyleaf noseburn	0.03
<i>Houstonia procumbens</i>	roundleaf bluet	0.03
<i>Euphorbia floridana</i>	greater Florida spurge	0.03
<i>Euphorbia discoidalis</i>	summer spurge	0.03
<i>Dalea pinnata</i>	summer farewell	0.03
<i>Rhynchosia reniformis</i>	dollarleaf	0.03
<i>Tephrosia chrysophylla</i>	scurf hoary-pea	0.03
	Bare ground	66.2



Figure 3. Percent species cover in Sandhill Transect 2.

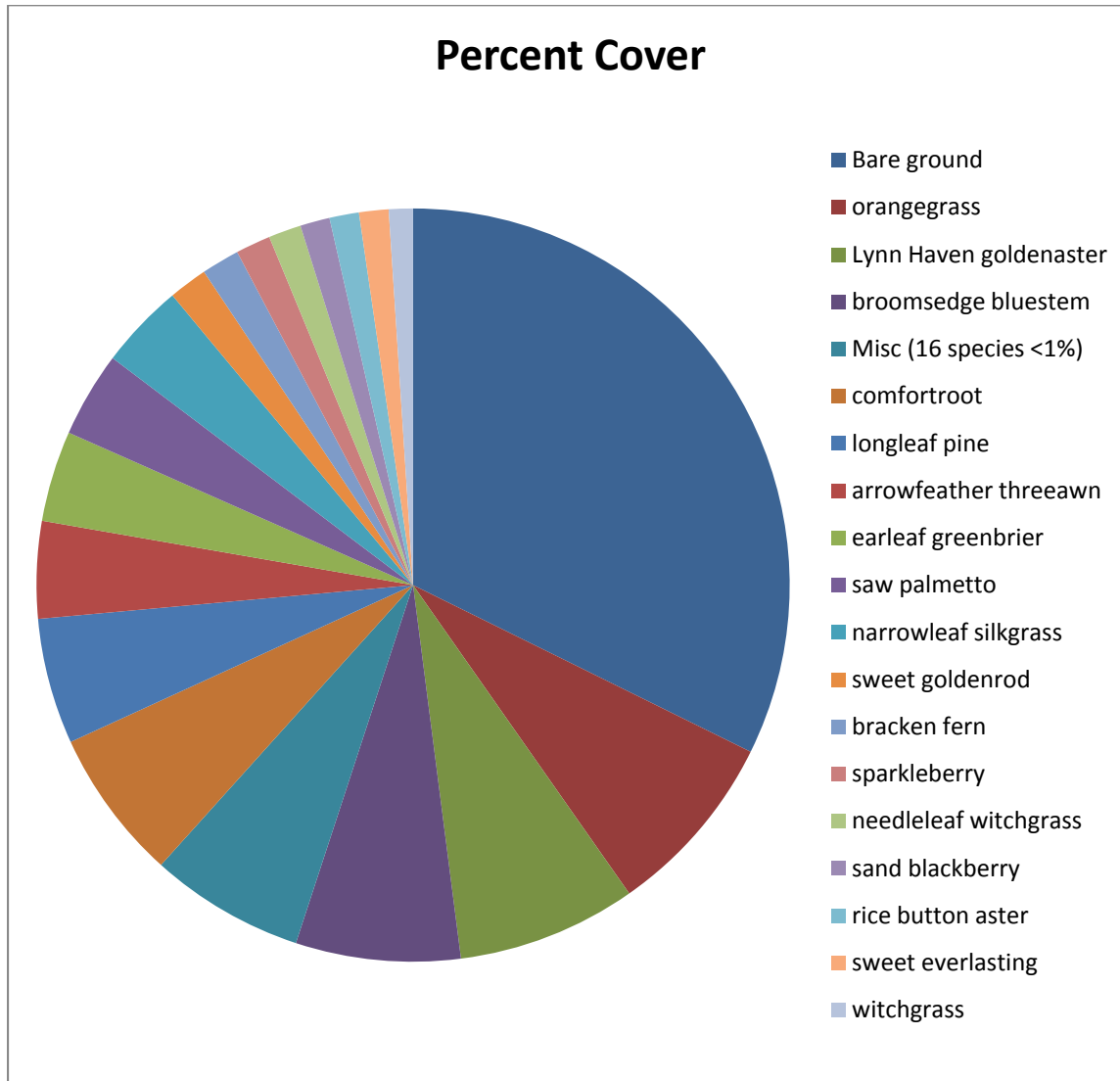


Table 3. Percent cover of plant species in Sandhill Transect 2 when sampled on September 19, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Hypericum gentianoides</i>	orangegrass	7.97
<i>Chrysopsis lanuginose</i>	Lynn Haven goldenaster	7.70
<i>Andropogon virginicus</i>	broomsedge bluestem	7.07
<i>Hibiscus aculeatus</i>	comfortroot	6.50
<i>Pinus palustris</i>	longleaf pine	5.40
<i>Aristida purpurascens</i>	arrowfeather threeawn	4.17
<i>Smilax auriculata</i>	earleaf greenbrier	3.90
<i>Serenoa repens</i>	saw palmetto	3.67

Scientific name	Common name	Average percent cover per quadrat
<i>Pityopsis graminifolia</i>	narrowleaf silkgrass	3.67
<i>Solidago odora</i>	sweet goldenrod	1.67
<i>Pteridium aquilinum</i>	bracken fern	1.63
<i>Vaccinium arboretum</i>	sparkleberry	1.50
<i>Dichanthelium aciculare</i>	needleleaf witchgrass	1.40
<i>Rubus cuneifolius</i>	sand blackberry	1.27
<i>Symphotrichum dumosum</i>	rice button aster	1.27
<i>Pseudognaphalium obtusifolium</i>	sweet everlasting	1.27
<i>Dichanthelium</i> sp.	witchgrass	1.03
<i>Andropogon virginicus</i> var. <i>glaucus</i>	chalky bluestem	0.97
<i>Eupatorium compositifolium</i>	yankeeweed	0.87
<i>Dichanthelium acuminatum</i>	tapered witchgrass	0.83
<i>Liatris gracilis</i>	slender gayfeather	0.77
<i>Phytolacca Americana</i>	American pokeweed	0.50
<i>Conyza Canadensis</i>	Canadian horseweed	0.47
<i>Polypremum procumbens</i>	rustweed	0.33
<i>Aristida gyrans</i>	corkscrew threeawn	0.23
<i>Andropogon</i> sp.	bluestem	0.23
<i>Quercus hemisphaerica</i>	laurel oak	0.23
<i>Dichanthelium commutatum</i>	variable witchgrass	0.23
<i>Cyperus retrorsus</i>	pinebarren flatsedge	0.13
<i>Eupatorium capillifolium</i>	dogfennel	0.10
<i>Liatris spicata</i>	dense gayfeather	0.10
<i>Scleria ciliate</i>	fringed nutrush	0.10
<i>Eriogonum tomentosum</i>	dogtongue wild buckwheat	0.10
<i>Andropogon ternaries</i>	splitbeard bluestem	0.10
<i>Erechtites hieraciifolius</i>	fireweed	0.07
<i>Tragia smallii</i>	Small's noseburn	0.07
<i>Polygala nana</i>	candyroot	0.03
<i>Gelsemium sempervirens</i>	yellow jessamine	0.03
<i>Stylisma patens</i>	coastalplain dawnflower	0.03
<i>Crotalaria rotundifolia</i>	rabbitbells	0.03
<i>Rhynchospora harveyi</i>	Harvey's beaksedge	0.03
<i>Lechea minor</i>	thymeleaf pinweed	0.03
	Misc (16 species <1%)	6.63
	Bare ground	32.3

## Mixed Forested Wetland (Restoration)

**Qualitative sampling.** This mixed forested wetland restoration area (Figure 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 an impenetrable interlacing mass. 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, maidencane, and jointed spikerush. The total number of species observed in this community was 35 (Table 1).

**Quantitative sampling.** Transect 1 (Table 4, Figure 4) had a total of 39 species and averaged 11% bare ground in each quadrat. The highest percent cover was by willow herb followed by taperleaf waterhorehound, fringed yelloweyed grass, hairy primrose willow, and shrubby primrose willow.

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

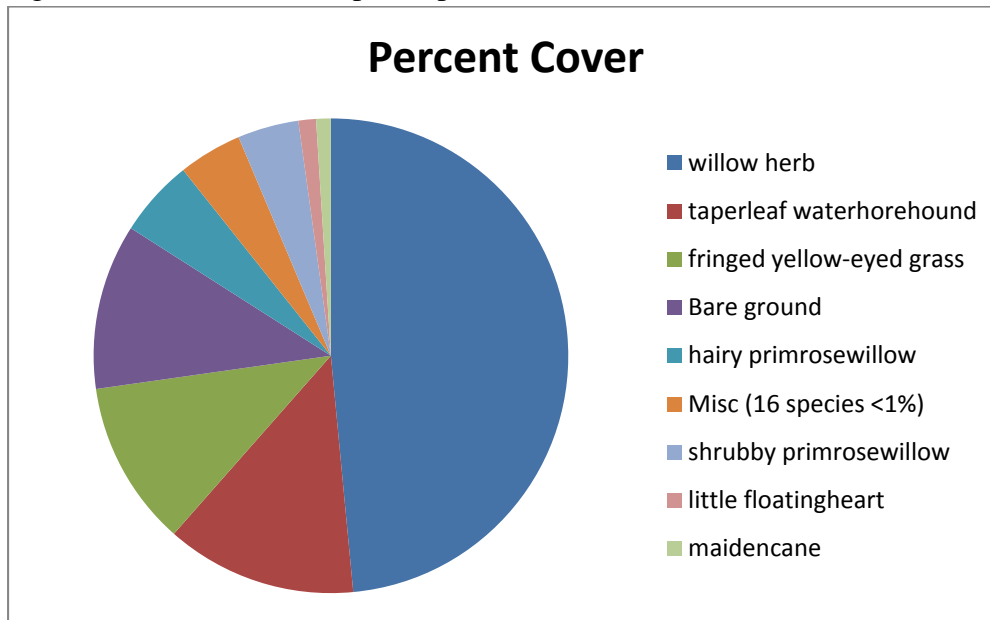


Table 4. Percent cover of plant species in Mixed Forested Wetland (Restoration) Transect 1 when sampled on September 19, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Decodon verticillatus</i>	willow herb	48.50
<i>Lycopus rubellus</i>	taperleaf waterhorehound	13.00
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	11.27
<i>Ludwigia pilosa</i>	hairy primrose willow	5.27
<i>Ludwigia suffruticosa</i>	shrubby primrose willow	4.17
<i>Nymphoides cordata</i>	little floatingheart	1.20

Scientific name	Common name	Average percent cover per quadrat
<i>Panicum hemitomon</i>	maidencane	1.00
<i>Nymphaea odorata</i>	white waterlily	0.73
<i>Juncus canadensis</i>	Canadian rush	0.60
<i>Eleocharis equisetoides</i>	jointed spikerush	0.53
<i>Dulichium arundinaceum</i>	threeway sedge	0.33
<i>Nymphoides aquatica</i>	big floatingheart	0.27
<i>Ludwigia repens</i>	creeping primrosewillow	0.27
<i>Eupatorium mohrii</i>	Mohr's thoroughwort	0.23
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass	0.23
<i>Leucothoe racemosa</i>	swamp doghobble	0.23
<i>Triadenum virginicum</i>	Virginia marsh St. John's wort	0.23
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	0.23
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	0.13
<i>Bidens mitis</i>	smallfruit beggarticks	0.13
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.10
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.03
<i>Nyssa sylvatica</i> var. <i>biflora</i>	swamp tupelo	0.03
	Misc (16 species <1%)	4.33
	Bare ground	11.3

### Mixed Forested Wetland (Preserved)

**Qualitative sampling.** The preserved mixed forested wetland (Figure 1) was a relatively undisturbed mature baygall forest. The tall canopy of large trees was dominated by sweetbay and swamp tupelo. The dense subcanopy had tree-size titi, black tit, and swamp bay. The moderately dense shrub layer consisted of large gallberry, sweet pepperbush, wild olive, and fetterbush. The sparse herb layer was primarily sphagnum moss. The muck soil was saturated and a few scattered pools of standing water were present. The total number of species observed in this community was 30 (Table 1).

**Quantitative sampling.** Transect 2 (Table 5, Figure 5) had a total of 30 species and averaged 11% bare ground in each quadrat. (Note: Species cover included ground layer species, tree trunks rooted in the quadrat, and shrubs less than 2 inches dbh. Shading by canopy and subcanopy species was not included. Only shrubs less than 6 feet tall counted as covering bare ground.) The dominant shrubs were large gallberry, sweet pepperbush, and fetterbush.

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

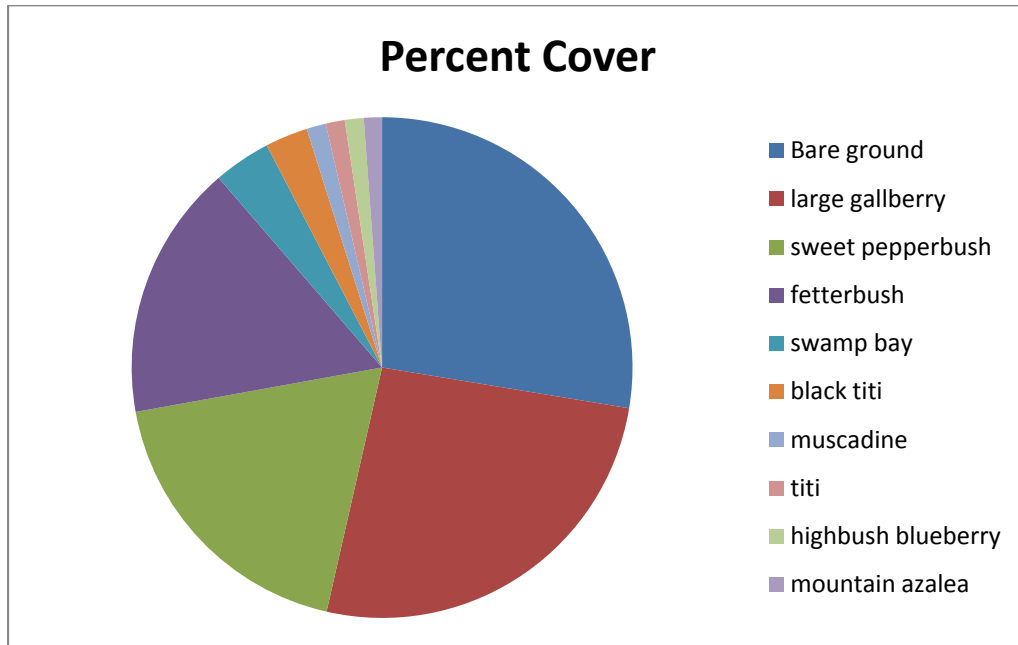


Table 5. Percent cover of plant species in Mixed Forested Wetland (Preserved) Transect 2 when sampled on September 19, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Ilex coriacea</i>	large gallberry	25.77
<i>Clethra alnifolia</i>	sweet pepperbush	18.47
<i>Lyonia lucida</i>	fetterbush	16.40
<i>Persea palustris</i>	swamp bay	3.67
<i>Cliftonia monophylla</i>	black titi	2.73
<i>Vitis rotundifolia</i>	muscadine	1.23
<i>Cyrilla racemiflora</i>	titi	1.23
<i>Vaccinium corymbosum</i>	highbush blueberry	1.20
<i>Rhododendron canescens</i>	mountain azalea	1.17
<i>Sphagnum</i> sp.	sphagnum moss	0.30
<i>Rhynchospora glomerata</i>	clustered beaksedge	0.23
<i>Smilax laurifolia</i>	laurel greenbrier	0.10
unknown moss	unknown moss	0.07
<i>Vaccinium elliotii</i>	Elliott's blueberry	0.03

**Ward Creek West Mitigation Site**  
**Qualitative and Quantitative Monitoring**  
**December 2013**

**Ward Creek West Mitigation Site  
Qualitative and Quantitative Monitoring  
December 2013**

**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), hydric pine savanna (HPS), and portions of the mixed forested wetlands to cypress (CY), which had been converted to slash pine plantation (Figure 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 Ann Johnson (FNAI ecologist) in the fall of 2012.

**METHODS**

The quantitative monitoring utilized 300 feet long permanent transect lines previously marked during the 2012 survey. In 2013, metal T-posts were placed at each end of the transects to provide more permanent reference points. Two transects were located in both the hydric pine flatwoods and hydric pine savanna areas (Figure 1). Data recorded consisted of the visually estimated percent cover of each plant species found in sixteen separate meter square quadrats. The quadrats were located 20 feet apart starting at 0 feet and ending at 300 feet and extended one meter to the left side of the transect line. 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 Gary Schultz and Brenda Herring (FNAI botanists) on September 16, 17, and 18, 2013.



Figure 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 96 plant species were recorded during 2013 monitoring session in the target communities at Ward Creek West.

### 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 dry but old machinery ruts were evident. The open canopy of mature slash pines covered a variously dense shrub layer. The area by the western Transect 1 had been bedded years ago when the pines were planted. This area had an open shrub stratum and a sparse groundcover due to the recent logging operations. The eastern section retained more saw palmetto and other shrubs. The groundcover was dominated by broomsedge bluestem and bushy bluestem along with beaksedges. The total number of species observed in this community was 66 (Table 1).

**Quantitative sampling.** The western Transect 1 (Table 2, Figure 2) had a total of 16 species and an average of 23% bare ground in each quadrat. The shrubs were dominated by large gallberry, black titi, and coastalplain St. John’s wort. The sparse, weedy herbaceous species were mainly purple bluestem, variable witchgrass, fascicled beakrush, and Carolina redroot. The eastern Transect 2 (Table 3, Figure 3) had a total of 41 species and an average of 27% bare ground in each quadrat. The vegetation appeared less disturbed than in Transect 1. The shrubs were dominated by gallberry, dwarf live oak, blue huckleberry, saw palmetto, black titi, and peelbark St. John’s wort. The weedy herbaceous layer was dominated by beakrushes, purple bluestem, and bottlebrush threeawn.

Table 1. Plant species observed in the target communities at Ward Creek West Mitigation Site, September 16, 17, 18, 2013.

Scientific Name	Common Name	cypress	hydric pine flatwoods	hydric pine savanna	Grand Total
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem		X	X	2
<i>Andropogon virginicus</i>	broomsedge bluestem		X		1
<i>Aristida spiciformis</i>	bottlebrush threeawn		X	X	2
<i>Aristida stricta var. beyrichiana</i>	Wiregrass		X	X	2
<i>Carphephorus odoratissimus</i>	Vanillaleaf		X		1
<i>Centella asiatica</i>	Spadeleaf			X	1
<i>Clethra alnifolia</i>	sweet pepperbush	X	X		2
<i>Cliftonia monophylla</i>	black titi	X	X	X	3
<i>Ctenium aromaticum</i>	toothache grass			X	1
<i>Cyrilla racemiflora</i>	Titi	X	X	X	3
<i>Dichantherium acuminatum</i>	tapered witchgrass		X	X	2

Scientific Name	Common Name	cypress	hydric pine flatwoods	hydric pine savanna	Grand Total
<i>Dichantheium commutatum</i>	variable witchgrass		X		1
<i>Dichantheium scabriusculum</i>	woolly witchgrass		X		1
<i>Dichantheium sp.</i>	Witchgrass		X	X	2
<i>Dichantheium sphaerocarpon</i>	roundseed witchgrass		X		1
<i>Drosera capillaries</i>	pink sundew		X	X	2
<i>Erechtites hieracifolia</i>	Fireweed			X	1
<i>Eriocaulon decangulare</i>	tenangle pipewort			X	1
<i>Eupatorium mohrii</i>	Mohr's thoroughwort		X	X	2
<i>Gaylussacia dumosa</i>	dwarf huckleberry		X		1
<i>Gaylussacia frondosa var. tomentosa</i>	blue huckleberry		X		1
<i>Helianthus angustifolius</i>	narrowleaf sunflower			X	1
<i>Hypericum brachyphyllum</i>	coastalplain 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	2
<i>Hypericum hypericoides</i>	St. Andrew's cross		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		1
<i>Ilex vomitoria</i>	Yaupon			X	1
<i>Juncus scirpoides</i>	needlepod rush			X	1
<i>Kalmia hirsute</i>	hairy wicky		X	X	1
<i>Lachnanthes caroliniana</i>	Carolina redroot		X	X	2
<i>Lachnocaulon anceps</i>	whitehead bogbutton		X		1
<i>Liatris spicata</i>	dense gayfeather		X		1
<i>Lophiola aurea</i>	golden crest			X	1
<i>Lycopodiella alopecuroides</i>	foxtail clubmoss			X	1
<i>Lycopodiella appressa</i>	southern club-moss			X	1
<i>Lyonia ferruginea</i>	rusty staggerbush		X		1
<i>Lyonia fruticosa</i>	coastalplain staggerbush			X	1
<i>Lyonia lucida</i>	Fetterbush	X	X	X	3
<i>Magnolia virginiana</i>	Sweetbay	X	X	X	3
<i>Myrica caroliniensis</i>	evergreen bayberry	X	X	X	3
<i>Myrica cerifera</i>	wax myrtle	X	X		2
<i>Nyssa sylvatica var. biflora</i>	swamp tupelo	X		X	2
<i>Oldenlandia uniflora</i>	clustered mille grains		X	X	2
<i>Osmunda cinnamomea</i>	cinnamon fern		X		1

Scientific Name	Common Name	cypress	hydric pine flatwoods	hydric pine savanna	Grand Total
<i>Panicum anceps</i>	beaked panicum		X	X	2
<i>Panicum verrucosum</i>	warty panicgrass		X	X	2
<i>Panicum virgatum</i>	Switchgrass		X		1
<i>Persea palustris</i>	swamp bay	X	X	X	3
<i>Photinia pyrifolia</i>	red chokeberry		X		1
<i>Pinus elliottii</i>	slash pine	X	X	X	3
<i>Polygala cruciata</i>	Drumheads			X	1
<i>Polgala lutea</i>	orange milkwort			X	1
<i>Pteridium aquilinum</i>	bracken fern			X	1
<i>Quercus geminate</i>	sand live oak		X		1
<i>Quercus minima</i>	dwarf live oak		X		1
<i>Rhexia alifanus</i>	savannah meadowbeauty		X		1
<i>Rhexia petiolata</i>	fringed meadowbeauty			X	1
<i>Rhexia virginica</i>	handsome harry		X	X	1
<i>Rhynchospora cephalantha</i>	bunched beaksedge		X	X	1
<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	1
<i>Rhynchospora fascicularis</i>	fascicled beaksedge		X	X	2
<i>Rhynchospora gracilentia</i>	slender beaksedge			X	1
<i>Rhynchospora inundata</i>	narrowfruit horned beaksedge			X	1
<i>Rhynchospora microcephala</i>	bunched beaksedge		X		1
<i>Rhynchospora plumose</i>	plumed beaksedge		X	X	2
<i>Rhynchospora sp.</i>	Beaksedge		X	X	2
<i>Sabatia brevifolia</i>	shortleaf rosegentian		X	X	2
<i>Sarracenia flava</i>	yellow pitcherplant			X	1
<i>Schizachyrium scoparium</i>	little bluestem		X		1
<i>Scleria ciliata</i>	fringed nutrush		X		1
<i>Scleria reticularis</i>	netted nutrush		X	X	2
<i>Serenoa repens</i>	saw palmetto	X	X	X	3
<i>Smilax auriculata</i>	earleaf greenbrier		X		1
<i>Smilax glauca</i>	cat greenbrier	X	X		2
<i>Smilax laurifolia</i>	laurel greenbrier	X	X	X	3
<i>Solidago fistula</i>	pinebarren goldenrod		X	X	2
<i>Sphagnum sp.</i>	sphagnum moss	X	X	X	3
<i>Syngonanthus flavidulus</i>	yellow hatpins			X	1

Scientific Name	Common Name	cypress	hydric pine flatwoods	hydric pine savanna	Grand Total
<i>Taxodium ascendens</i>	pond cypress	X		X	2
<i>Tillandsia usneoides</i>	Spanish moss			X	1
<i>Utricularia juncea</i>	southern bladderwort			X	1
<i>Utricularia subulata</i>	zigzag bladderwort		X	X	2
<i>Vaccinium darrowii</i>	Darrow's blueberry		X		1
<i>Vaccinium myrsinites</i>	shiny blueberry		X		1
<i>Vitis rotundifolia</i>	Muscadine		X		1
<i>Woodwardia virginica</i>	Virginia chain fern		X		1
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass		X	X	2
<i>Xyris elliotii</i>	Elliott's yellow-eyed grass		X	X	2
<i>Xyris fimbriata</i>	fringed yellow-eyed grass		X	X	2
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass		X	X	2
<i>Xyris sp.</i>	yellow-eyed grass	X	X	X	3
<b>Total number of species: 96</b>		18	72	66	

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

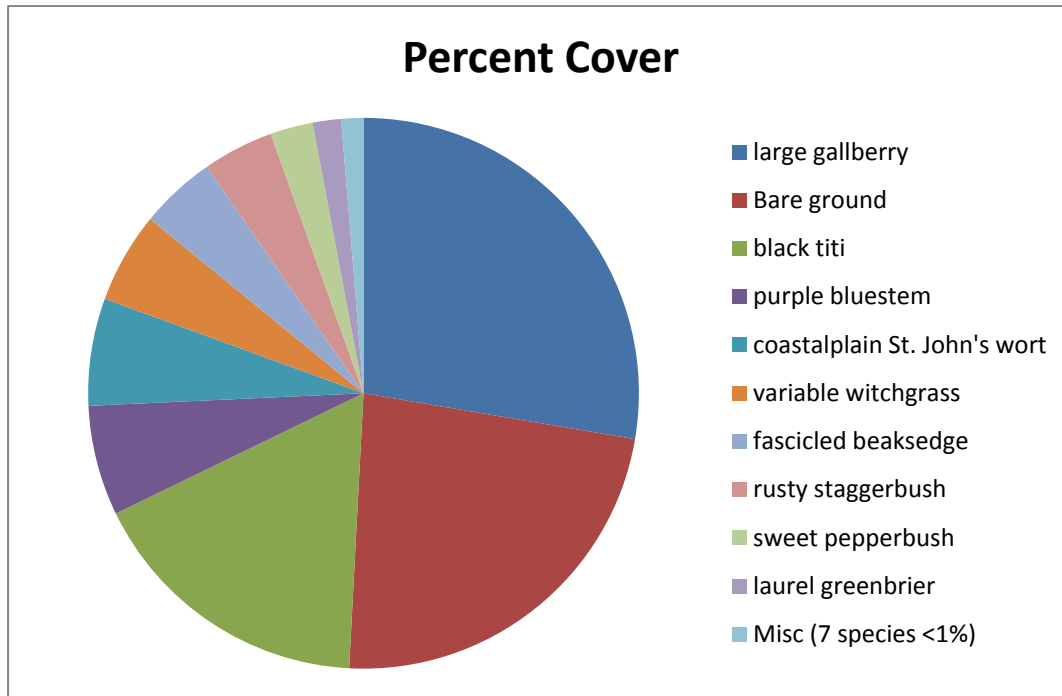


Table 2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1 when sampled on September 17, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Ilex coriacea</i>	large gallberry	27.67
<i>Cliftonia monophylla</i>	black titi	16.97
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	6.47
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	6.30
<i>Dichanthelium commutatum</i>	variable witchgrass	5.33
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	4.47
<i>Lyonia ferruginea</i>	rusty staggerbush	4.17
<i>Clethra alnifolia</i>	sweet pepperbush	2.50
<i>Smilax laurifolia</i>	laurel greenbrier	1.67
<i>Lachnanthes caroliana</i>	Carolina redroot	0.50
<i>Vitis rotundifolia</i>	Muscadine	0.43
<i>Pinus elliottii</i>	slash pine	0.23
<i>Scleria ciliate</i>	fringed nutrush	0.03
<i>Xyris elliottii</i>	Elliott's yellow-eyed grass	0.03
<i>Rhynchospora plumose</i>	plumed beaksedge	0.03
<i>Hypericum hypericoides</i>	St. Andrew's cross	0.03
	Bare ground	23.2

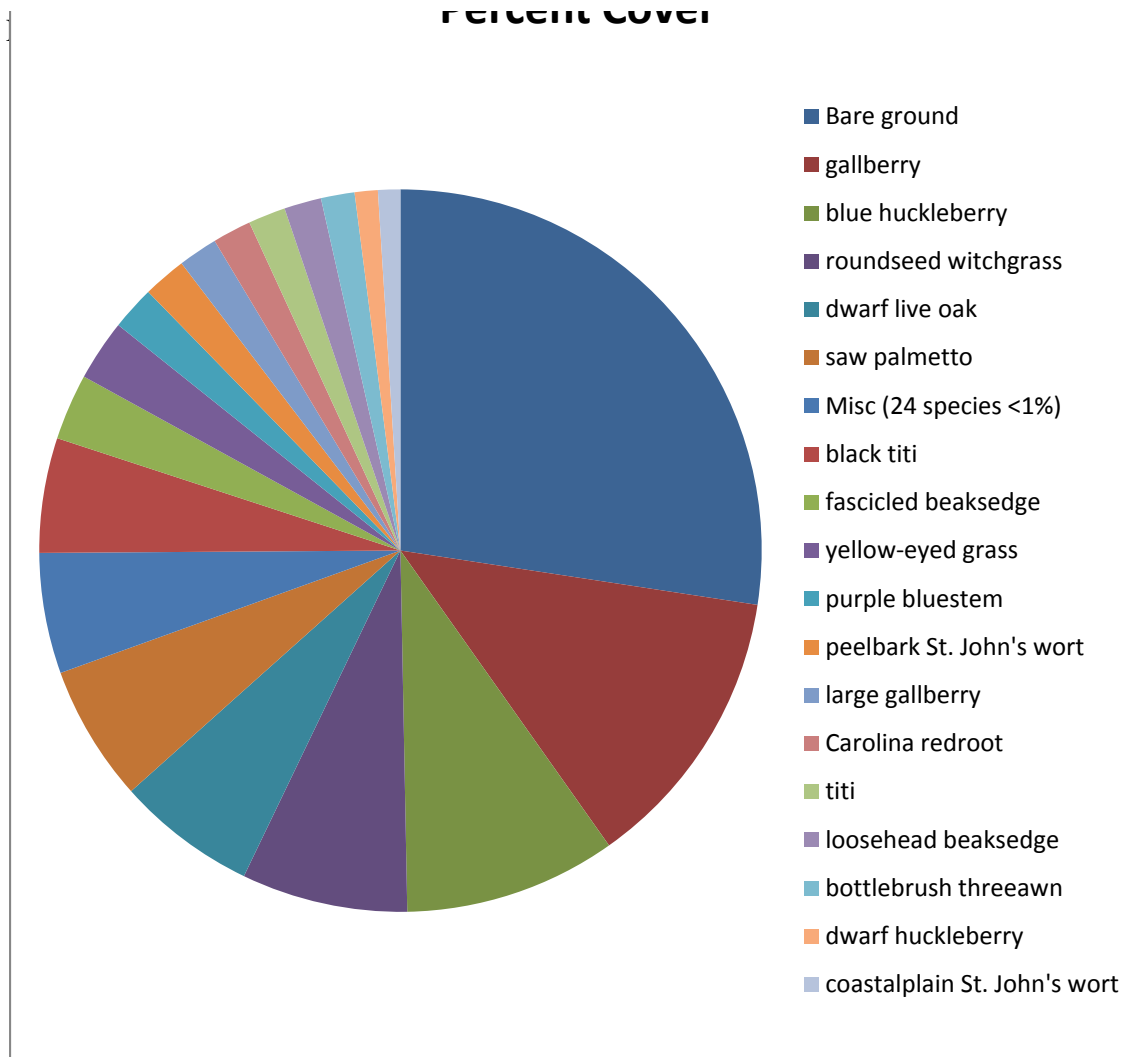


Table 3. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 when sampled on September 17, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Ilex glabra</i>	gallberry	12.80
<i>Gaylussacia frondosa</i> var. <i>tomentosa</i>	blue huckleberry	9.50
<i>Dichanthelium sphaerocarpon</i>	roundseed witchgrass	7.43
<i>Quercus minima</i>	dwarf live oak	6.27
<i>Serenoa repens</i>	saw palmetto	6.10
<i>Cliftonia monophylla</i>	black titi	5.13
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	2.97
<i>Xyris</i> sp.	yellow-eyed grass	2.73

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	1.97
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	1.93
<i>Ilex coriacea</i>	large gallberry	1.77
<i>Lachnanthes caroliana</i>	Carolina redroot	1.73
<i>Cyrilla racemiflora</i>	titi	1.67
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	1.67
<i>Aristida spiciformis</i>	bottlebrush threeawn	1.50
<i>Gaylussacia dumosa</i>	dwarf huckleberry	1.03
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	1.00
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.83
<i>Lyonia lucida</i>	fetterbush	0.50
<i>Vitis rotundifolia</i>	muscadine	0.47
<i>Photinia pyrifolia</i>	red chokeberry	0.47
<i>Scleria reticularis</i>	netted nutrush	0.47
<i>Smilax auriculata</i>	earleaf greenbrier	0.37
<i>Dichanthelium</i> sp.	witchgrass	0.23
<i>Panicum anceps</i>	beaked panicum	0.23
<i>Vaccinium darrowii</i>	Darrow's blueberry	0.23
<i>Vaccinium myrsinites</i>	shiny blueberry	0.23
<i>Sphagnum</i> sp.	sphagnum moss	0.17
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.13
<i>Panicum verrucosum</i>	warty panicgrass	0.13
<i>Dichanthelium acuminatum</i>	tapered witchgrass	0.10
<i>Schizachyrium scoparium</i>	little bluestem	0.10
<i>Sabatia brevifolia</i>	shortleaf rosegentian	0.10
<i>Carphephorus odoratissimus</i>	vanillaleaf	0.10
<i>Quercus geminata</i>	sand live oak	0.10
<i>Woodwardia virginica</i>	Virginia chain fern	0.10
<i>Rhexia alifanus</i>	savannah meadowbeauty	0.10
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.07
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.07
<i>Oldenlandia uniflora</i>	clustered mille grains	0.07
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.03
	Bare ground	27.4

### Hydric Pine Savanna

**Qualitative sampling.** The hydric pine savanna restoration area was highly disturbed by silviculture operations. The pines had been harvested and the vegetative cover currently consisted of a dense, tall stand of purple bluestem with smaller amounts of other herbs

intermixed. Widely scattered young slash pine and pond cypress and shrub clumps of fetterbush, titi and black titi occurred throughout. The soil was dry except in a few lwer pockets with standing water. The total number of 66 plant species were observed in this community (Table 1).

**Quantitative sampling.** Transect 1 (Table 4, Figure 4) had a total of 32 species and no bare ground. The groundcover was dominated by purple bluestem, with lesser amounts of several beaksedge species, and Elliott’s yelloweyed grass. The shrubs were peelbark St. John’s wort, fetterbush, titi, and black titi. Transect 2 (Table 5, Figure 5) had a total of 23 species and an average of 17% bare ground in each quadrat. The vegetation was similar to Transect 1 with the addition of some wiregrass.

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

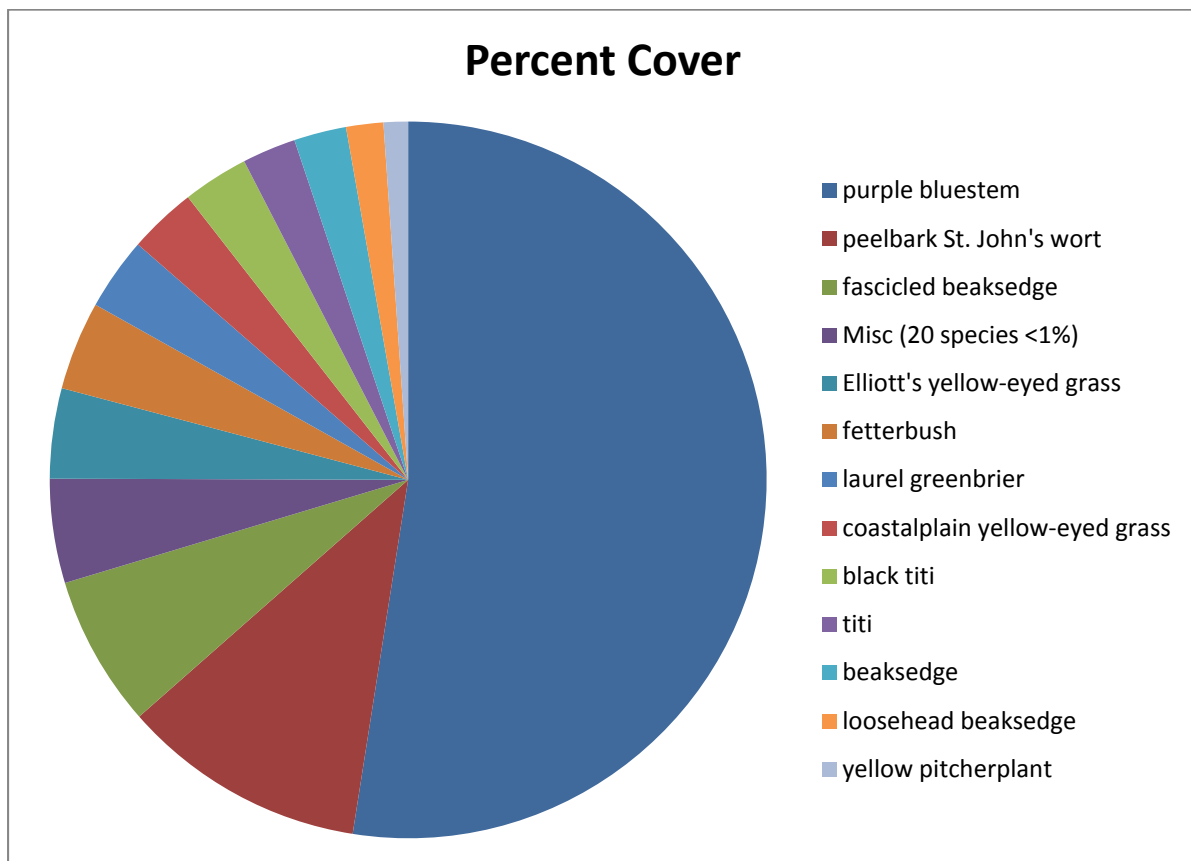


Table 4. Percent cover of species in Hydric Pine Savanna Transect 1 when sampled on September 18, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	55.47
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	11.67



Scientific name	Common name	Average percent cover per quadrat
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	7.23
<i>Xyris elliotii</i>	Elliott's yellow-eyed grass	4.30
<i>Lyonia lucida</i>	fetterbush	4.23
<i>Smilax laurifolia</i>	laurel greenbrier	3.47
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	3.23
<i>Cliftonia monophylla</i>	black titi	3.13
<i>Cyrilla racemiflora</i>	titi	2.57
<i>Rhynchospora</i> sp.	beaksedge	2.50
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	1.77
<i>Sarracenia flava</i>	yellow pitcherplant	1.17
<i>Rhynchospora gracilentata</i>	slender beaksedge	0.97
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.57
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	0.50
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.50
<i>Drosera capillaris</i>	pink sundew	0.47
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.43
<i>Polygala cruciata</i>	drumheads	0.27
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.27
<i>Rhynchospora cephalantha</i>	bunched beaksedge	0.13
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.13
<i>Pinus elliotii</i>	slash pine	0.13
<i>Aristida stricta</i> var. <i>beyrichiana</i>	wiregrass	0.10
<i>Dichanthelium</i> sp.	witchgrass	0.10
<i>Xyris</i> sp.	yellow-eyed grass	0.10
<i>Sabatia brevifolia</i>	shortleaf rosegiantian	0.10
<i>Aristida spiciformis</i>	bottlebrush threeawn	0.07
<i>Dichanthelium acuminatum</i>	tapered witchgrass	0.03
<i>Ilex vomitoria</i>	yaupon	0.03
<i>Helianthus angustifolius</i>	narrowleaf sunflower	0.03
<i>Rhynchospora ciliaris</i>	fringed beaksedge	0.03
	Bare ground	0.0

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

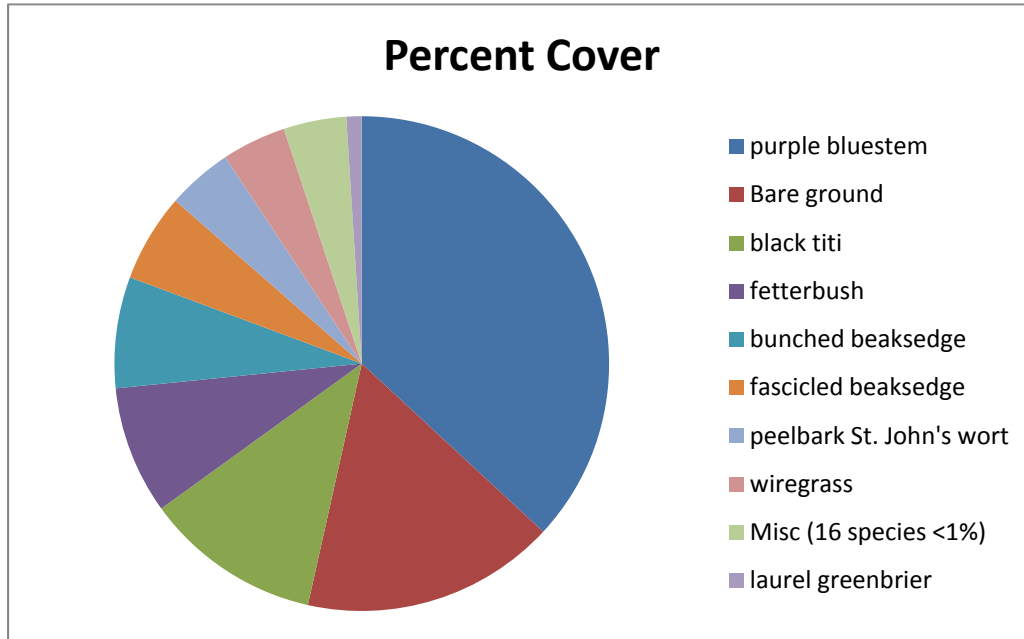


Table 5. Percent cover of plant species in Hydric Pine Savanna Transect 2 when sampled on September 17, 2013.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	36.90
<i>Cliftonia monophylla</i>	black titi	11.53
<i>Lyonia lucida</i>	fetterbush	8.37
<i>Rhynchospora cephalantha</i>	bunched beaksedge	7.27
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	5.77
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	4.27
<i>Aristida stricta</i> var. <i>beyrichiana</i>	wiregrass	4.20
<i>Smilax laurifolia</i>	laurel greenbrier	1.00
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.97
<i>Lyonia fruticosa</i>	coastalplain staggerbush	0.50
<i>Lophiola aurea</i>	golden crest	0.50
<i>Helianthus angustifolius</i>	narrowleaf sunflower	0.43
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.40
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.37
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.17
<i>Pinus elliottii</i>	slash pine	0.17
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.10
<i>Cyrtilla racemiflora</i>	titi	0.10

Scientific name	Common name	Average percent cover per quadrat
<i>Pteridium aquilinum</i>	bracken fern	0.10
<i>Sabatia brevifolia</i>	shortleaf rosegentian	0.10
<i>Kalmia hirsuta</i>	hairy wicky	0.10
<i>Dichantherium acuminatum</i>	tapered witchgrass	0.03
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.03
<i>Polygala cruciata</i>	drumheads	0.03
	Bare ground	16.6

### Cypress

**Qualitative sampling.** The cypress areas occurred along water drainage channels with a dense canopy composed of titi, swamp bay, slash pine, sweetbay, ogeechee tupelo, swamp tupelo, and pond cypress. The dense tall shrub layer of titi, black titi and fetterbush often formed an impenetrable thicket. Herbs were very infrequent. At the time of sampling, the soils were dry but signs of recently flowing water were evident. Total number of species observed in this community was 18 (Table 1).