Vegetation Monitoring at Six Northwest Florida Water Management District Mitigation Sites
Fall 2019

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December 2019

Florida Natural Area Inventory
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Funding for this project was provided by the Northwest Florida Water Management District under the agreement PO#00200106-000 with the Florida Natural Areas Inventory

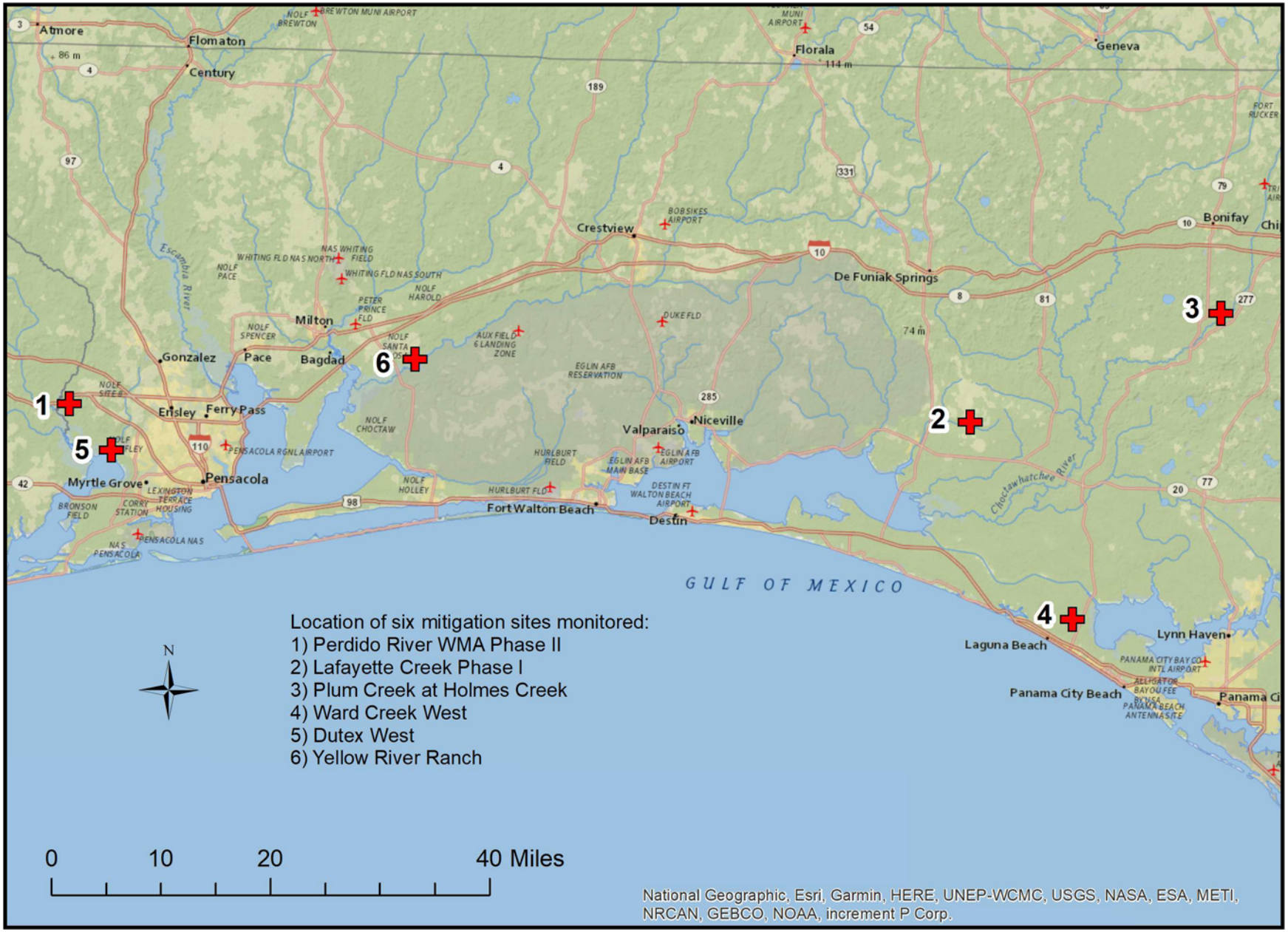
Florida State University

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

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

Taxonomy follows Wunderlin, R. P., B.F. Hansen, A.R. Franck, and F.B. Essig. 2017. Atlas of Florida Plants (htpp://florida.plantatlas.usf.edu/), Institute for Systematic Botany, University of South Florida, Tampa. In the summer of 2017 the Florida Natural Areas Inventory (FNAI) incorporated recent changes in scientific plant names found on this website. The resulting changes in scientific names from those used in the 2016 and prior reports are listed below.

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


Location of six mitigation sites monitored:
1) Perdido River WMA Phase II
2) Lafayette Creek Phase I
3) Plum Creek at Holmes Creek
4) Ward Creek West
5) Dutex West
6) Yellow River Ranch
N
0
10
20
40 Miles
GULF OF MEXICO
Atmore
Flomaton
Century
Florala
Geneva
Crestview
Bonifay
De Funiak Springs
Milton
Gonzalez
Pace
Bagdad
Ensley
Ferry Pass
Valparaiso
Niceville
Myrtle Grove
Pensacola
Fort Walton Beach
Destin
Laguna Beach
Lynn Haven
Panama City Beach
Choctawhatchee River
Escambia River
National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Perdido River Water Management Area – Phase II Mitigation Site

Qualitative and Quantitative Monitoring

October 2019

Perdido River Water Management Area – Phase II Mitigation Site
Qualitative and Quantitative Monitoring
October 2019

INTRODUCTION

The Perdido River Water Management Area Phase II mitigation project compensates for the loss of wetland function of bottomland hardwood forest resulting from the 2007 replacement of the US 90 Perdido River Bridge in Escambia County, Florida. The mitigation area of 67 acres in the Perdido River WMA is located along the south side of US 90 (Nine Mile Road) and 6.4 miles west of Interstate Highway10 (Figure PR-1). The mitigation project aims to restore areas of Wetland Forest Mixed (MFW), Hydric Savanna (HS), Hydric Pine Flatwoods (HPF) and Pine Flatwoods (PF; Figure PR-1). The HPF and PF were converted to loblolly pine plantation in 2002. Quantitative and qualitative monitoring was used to document the current plant species composition and vegetation structure of these targeted communities. The site vegetation was previously monitored by FNAI biologists every fall from 2012 to 2018.

METHODS

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

The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through each of the three target communities plus the pine flatwoods area. Field surveys were performed by FNAI botanists Kim Alexander, Amy Jenkins, and Jenna Annis on October 8-9, 2019.

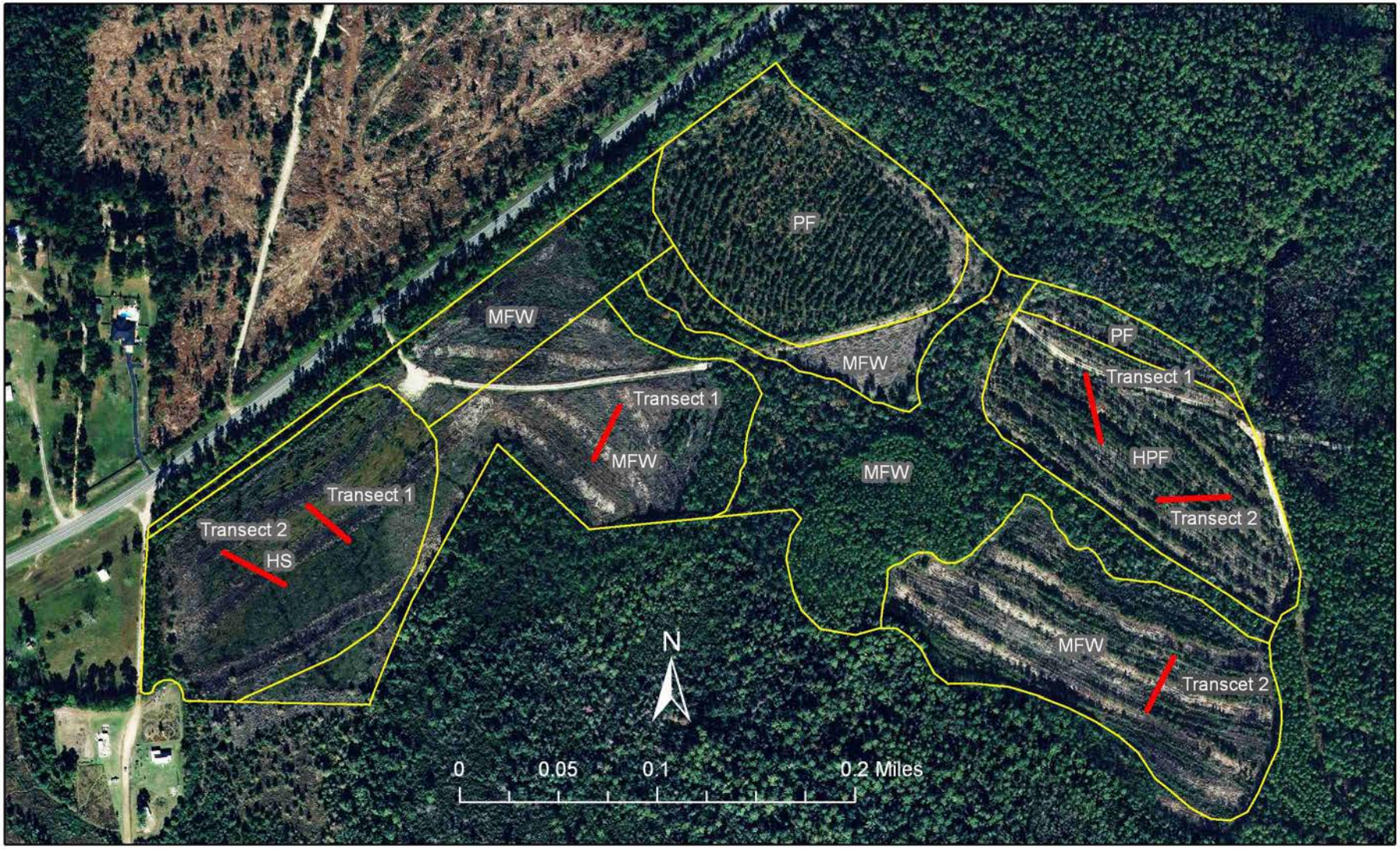


Figure PR-1. Location of permanent transects at Perdido Phase II Mitigation Site. HS=Hydric Savanna, HPF=Hydric Pine Flatwoods, MFW= Forested Wetland Mixed, PF=Pine Flatwoods.

RESULTS AND DISCUSSION

A total of 131 plant species were observed during the 2019 monitoring of the target communities at Perdido River Phase II (Table PR-1). Fifteen new species were noted, i.e. species not observed in the previous six surveys since 2012.

Table PR-1. Species observed in target communities at Perdido River WMA – Phase II Mitigation Site on October 8-9, 2019. (bold name = new species; bold X = new observation in community type)

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
Acalypha gracilens	slender threeseed mercury				X	1
Acer rubrum	red maple	X	X	X	X	4
Agalinis fasciculata	beach false foxglove		X	X		2
Aletris lutea	**yellow colic-root**				**X**	1
Ambrosia artemisiifolia	**common ragweed**	**X**				1
Andropogon glomeratus	bushy bluestem	X	X	X		3
Andropogon glomeratus var. *glaucopsis*	purple bluestem	X	X		X	3
Andropogon virginicus	broomsedge bluestem	X	X	X	X	4
Aristida spiciformis	bottlebrush threeawn	X			X	2
Aristida stricta	wiregrass	X	**X**	X		3
Aronia arbutifolia	red chokeberry		X	X	X	3
Arundinaria gigantea	switchcane	X				1
Bidens mitis	smallfruit beggarticks	X	X	X	X	4
Calamovilfa curtissii	Curtiss' sandgrass	X				1
Callicarpa americana	American beautyberry	X				1
Carex glaucescens	clustered sedge	X	X	X	X	4
Centella asiatica	spadeleaf	X	X	X	X	4
Cephalanthus occidentalis	common buttonbush		**X**	**X**		2
Chamaecyparis thyoides	Atlantic white cedar		X		X	2
Clethra alnifolia	sweet pepperbush			**X**		1
Cliftonia monophylla	black titi	X			X	2
Ctenium aromaticum	toothache grass	X				1
Cyperus croceus	**Baldwin's flatsedge**	**X**				1
Cyperus haspan	**haspan flatsedge**		**X**			1
Cyperus sp.	flatsedge		X			1
Cyrilla racemiflora	titi	X			X	2
Dichanthelium ensifolium	cypress witchgrass				X	1
Dichanthelium leucothrix	rough witchgrass				X	1
Dichanthelium scabriusculum	woolly witchgrass	X	X	X	X	4
Drosera capillaris	pink sundew				X	1
Eleocharis vivipara	viviparous spikerush	X	X		X	3
Elephantopus elatus	tall elephantsfoot	X		X		2
Eragrostis elliottii	Elliott's lovegrass				X	1
Eragrostis sp.	lovegrass	X				1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
Erechtites hieraciifolius	fireweed	X		X		2
Eriocaulon decangulare	tenangle pipewort				X	1
Eupatorium capillifolium	dogfennel	X	X	X	X	4
Eupatorium mohrii	Mohr's thoroughwort	X	X	X	X	4
Eupatorium pilosum	rough boneset		**X**		X	2
Eupatorium rotundifolium	roundleaf thoroughwort	X	**X**	X	X	4
Euthamia caroliniana	slender flattop goldenrod	X	X	X	X	4
Fuirena breviseta	saltmarsh umbrellasedge		X	**X**		2
Gaylussacia mosieri	woolly huckleberry				X	1
Gelsemium sempervirens	**yellow jessamine**	**X**				1
Helianthus angustifolius	narrowleaf sunflower	X	**X**			2
Hydrocotyle umbellata	manyflower marshpennywort		X			1
Hypericum brachyphyllum	coastalplain St. John's wort		X	**X**	X	3
Hypericum cistifolium	roundpod St. John's wort	X		X	X	3
Hypericum crux-andreae	St. Peter's wort	X	X	**X**	X	4
Hypericum hypericoides	St. Andrew's cross	X		X		2
Hyptis alata	clustered bushmint	X	**X**	X		3
Ilex cassine	dahoon				X	1
Ilex cassine var. *myrtifolia*	myrtle-leaved holly	**X**	X	X	X	4
Ilex coriacea	large gallberry	X	X	X	X	4
Ilex glabra	gallberry	X	X	X	X	4
Ilex vomitoria	yaupon		**X**			1
Juncus dichotomus	forked rush	X	X		X	3
Juncus marginatus	grassleaf rush				X	1
Juncus megacephalus	**bighead rush**			**X**		1
Kalmia hirsuta	hairy wicky	**X**			X	2
Kellochloa verrucosa	warty panicgrass	X	X	X	X	4
Lachnanthes caroliana	Carolina redroot	X	X		X	3
Lachnocaulon anceps	whitehead bogbutton	X			X	2
Lobelia brevifolia	shortleaf lobelia			X	X	2
Lobelia glandulosa	**glade lobelia**	**X**				1
Ludwigia maritima	seaside primrosewillow	X			**X**	2
Ludwigia pilosa	**hairy primrosewillow**		**X**		**X**	2
Lycopodiella alopecuroides	foxtail club-moss	X	X	X	X	4
Lycopodiella appressa	southern club-moss				X	1
Lycopus rubellus	taperleaf waterhorehound		X	X		2
Lyonia lucida	fetterbush	X	X		X	3
Magnolia virginiana	sweetbay	X	X	X	X	4
Mitreola sessilifolia	swamp hornpod				X	1
Morella caroliniensis	evergreen bayberry		**X**	X		2
Morella cerifera	southern bayberry	X	X	X	X	4
Oldenlandia uniflora	clustered mille graines	X	X	X	X	4
Osmunda cinnamomea	cinnamon fern	X	X	X	X	4

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
Osmunda regalis var. *spectabilis*	royal fern	X	X	X		3
Paspalum setaceum	thin paspalum				X	1
Persea palustris	swamp bay	X	X	X		3
Pinus elliottii	slash pine		X		X	2
Pinus taeda	loblolly pine	X	X	X	X	4
Pluchea foetida	stinking camphorweed	X				1
Pluchea baccharis	rosy camphorweed		X	**X**	**X**	3
Polygala cruciata	drumheads				X	1
Polygala lutea	orange milkwort				X	1
Proserpinaca pectinata	combleaf mermaidweed		X			1
Pteridium aquilinum	bracken fern			X	X	2
Quercus hemisphaerica	laurel oak			X		1
Quercus nigra	water oak	X	X	X		3
Rhexia mariana	**pale meadowbeauty**	**X**	**X**		**X**	3
Rhexia nuttallii	Nuttall's meadowbeauty	X				1
Rhexia petiolata	fringed meadowbeauty		X		**X**	2
Rhexia virginica	handsome harry	X	X	X	X	4
Rhus copallinum	winged sumac				X	1
Rhynchospora cephalantha	bunched beaksedge		X	**X**	X	3
Rhynchospora chalarocephala	loosehead beaksedge	**X**	**X**		X	3
Rhynchospora fascicularis	fascicled beaksedge	X	X	**X**	X	4
Rhynchospora gracilenta	slender beaksedge				X	1
Rhynchospora microcephala	bunched beaksedge		X			1
Rhynchospora pusilla	**fairy beaksedge**				**X**	1
Rubus cuneifolius	**sand blackberry**	**X**				1
Rubus pensilvanicus	sawtooth blackberry	X	X	X	X	4
Sabatia brevifolia	shortleaf rosegentian				X	1
Saccharum giganteum	sugarcane plumegrass		X		X	2
Scleria ciliata	fringed nutrush	X			X	2
Scleria reticularis	**netted nutrush**			**X**		1
Scleria triglomerata	whip nutrush	X				1
Serenoa repens	saw palmetto				X	1
Smilax auriculata	earleaf greenbrier	X				1
Smilax glauca	cat greenbrier	X	X	X	X	4
Smilax laurifolia	laurel greenbrier	**X**	X		X	3
Solidago fistulosa	pinebarren goldenrod	X	X	X	X	4
Sphagnum sp.	sphagnum moss	X	X	X	X	4
Symphyotrichum dumosum	rice button aster	X	**X**	X		3
Symplocos tinctoria	horse sugar			X		1
Taxodium ascendens	pond cypress		X		X	2
Taxodium distichum	bald cypress				X	1
Toxicodendron radicans	eastern poison ivy	X	X	X	X	4
Tridens ambiguus	**pinebarren fluffgrass**	**X**				1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
Vaccinium corymbosum	highbush blueberry	X	X	X	**X**	4
Viola primulifolia	primroseleaf violet				X	1
Vitis rotundifolia	muscadine	X	X	X	X	4
Woodwardia areolata	netted chain fern	X	X	X	X	4
Woodwardia virginica	Virginia chain fern	X	X	X	X	4
Xyris ambigua	coastalplain yellow-eyed grass	X	X	X	X	4
Xyris baldwiniana	**Baldwin's yellow-eyed grass**				**X**	1
Xyris brevifolia	shortleaf yellow-eyed grass				X	1
Xyris fimbriata	fringed yellow-eyed grass		X		X	2
Xyris flabelliformis	savannah yellow-eyed grass				X	1
Xyris platylepis	**tall yellow-eyed grass**		**X**			1
Total number of taxa: 131		75	73	60	88	296

Hydric Savanna

Qualitative sampling. The target community of Hydric Savanna (Figure PR-1) had a total of 73 observed plant species (Table PR-1). The groundcover was dominated by a dense cover of sphagnum moss and a diversity of herbaceous species with mostly weedy species, primarily smallfruit beggarticks, pinebarren goldenrod, handsome harry, and purple bluestem. A small patch of wiregrass was observed in this community for the first time during the 2019 monitoring, located about 70 m southwest of Hydric Savanna Transect 2. Shrubs formed less than 5% cover, primarily limited to the slightly elevated windrows formed when the land was cleared for silviculture, and consisted mainly of sweetbay, myrtle-leaved holly, and large gallberry. Occasional slash pine and red maple saplings were widely scattered.

Quantitative sampling. Transect 1 (Table PR-2, Figure PR-2) had a total of 28 species. Their total cover made up more than 100% of the area since a large amount of sphagnum moss underlay the other species. The dominant species were sphagnum moss, smallfruit beggarticks, pinebarren goldenrod, handsome harry, and purple bluestem. Woody species made up less than 3% average cover per quadrat.

Transect 2 (Table PR-3, Figure PR-3) had a total of 24 species which also covered more than 100% of the area. The dominant species were sphagnum moss, smallfruit beggarticks, purple bluestem, Virginia chainfern, Carolina redroot, and pinebarren goldenrod. Woody species made up about 3% average cover per quadrat.

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

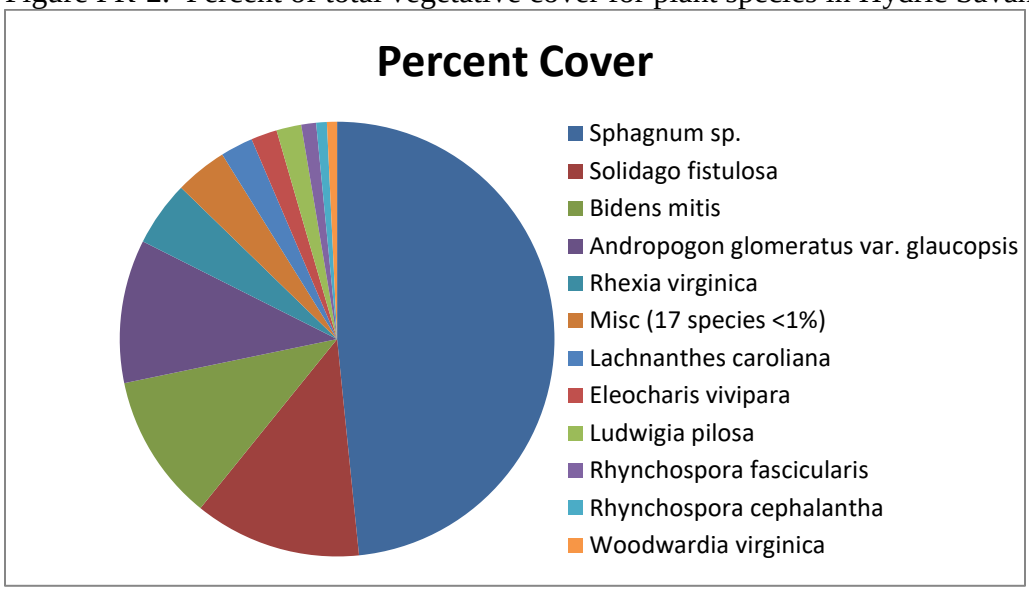


Table PR-2. Percent total vegetative cover of plant species in Hydric Savanna Transect 1 sampled on October 8, 2019.

Scientific name	Common name	Average percent cover per quadrat
Sphagnum sp.	sphagnum moss	68.63
Solidago fistulosa	pinebarren goldenrod	17.63
Bidens mitis	smallfruit beggarticks	15.50
Andropogon glomeratus var. *glaucopsis*	purple bluestem	15.13
Rhexia virginica	handsome harry	6.88
Lachnanthes caroliana	Carolina redroot	3.44
Eleocharis vivipara	viviparous spikerush	2.75
Ludwigia pilosa	hairy primrosewillow	2.63
Rhynchospora fascicularis	fascicled beaksedge	1.56
Rhynchospora cephalantha	bunched beaksedge	1.13
Woodwardia virginica	Virginia chain fern	1.06
Toxicodendron radicans	eastern poison ivy	0.94
Acer rubrum	red maple	0.69
Pinus taeda	loblolly pine	0.63
Hydrocotyle umbellata	manyflower marshpennywort	0.56
Saccharum giganteum	sugarcane plumegrass	0.56
Eupatorium mohrii	Mohr's thoroughwort	0.50
Hypericum brachyphyllum	coastalplain St. John's wort	0.44
Kellochloa verrucosa	warty panicgrass	0.31
Oldenlandia uniflora	clustered mille graines	0.19
Vitis rotundifolia	muscadine	0.19
Rhexia petiolata	fringed meadowbeauty	0.13
Andropogon virginicus	broomsedge bluestem	0.06
Aronia arbutifolia	red chokeberry	0.06
Persea palustris	swamp bay	0.06

Scientific name	Common name	Average percent cover per quadrat
Pinus elliottii	slash pine	0.06
Rhynchospora microcephala	bunched beaksedge	0.06
Rubus pensilvanicus	sawtooth blackberry	0.06
Bare Ground		0.44

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

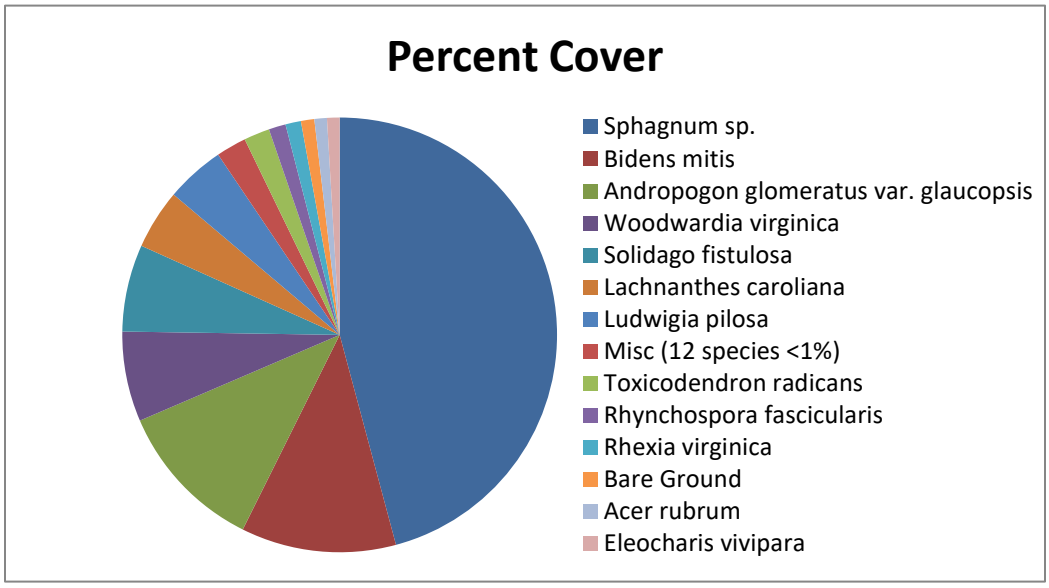


Table PR-3. Percent cover of plant species in Hydric Savanna Transect 2 sampled on October 8, 2019.

Scientific name	Common name	Average percent cover per quadrat
Sphagnum sp.	sphagnum moss	52.19
Bidens mitis	smallfruit beggarticks	13.13
Andropogon glomeratus var. *glaucopsis*	purple bluestem	12.75
Woodwardia virginica	Virginia chain fern	7.63
Solidago fistulosa	pinebarren goldenrod	7.38
Lachnanthes caroliana	Carolina redroot	5.06
Ludwigia pilosa	hairy primrosewillow	5.00
Toxicodendron radicans	eastern poison ivy	2.19
Rhynchospora fascicularis	fascicled beaksedge	1.44
Rhexia virginica	handsome harry	1.31
Acer rubrum	red maple	1.06
Eleocharis vivipara	viviparous spikerush	1.06
Kellochloa verrucosa	warty panicgrass	0.56
Hydrocotyle umbellata	manyflower marshpennywort	0.50
Andropogon virginicus	broomsedge bluestem	0.44
Rhynchospora cephalantha	bunched beaksedge	0.31

Scientific name	Common name	Average percent cover per quadrat
Woodwardia areolata	netted chain fern	0.25
Carex glaucescens	clustered sedge	0.13
Eupatorium mohrii	Mohr's thoroughwort	0.06
Eupatorium pilosum	rough boneset	0.06
Euthamia caroliniana	slender flattop goldenrod	0.06
Juncus dichotomus	forked rush	0.06
Proserpinaca pectinata	combleaf mermaidweed	0.06
Xyris platylepis	tall yellow-eyed grass	0.06
Bare Ground		1.13

Wetland Forest Mixed

Qualitative sampling. The target community of Wetland Forest Mixed (Figure PR-1) had a total of 88 observed plant species (Table PR-1). The vegetative cover was dominated by tall clumps of purple bluestem. Smalltooth beggerticks, bottlebrush threeawn, sphagnum moss, pinebarren goldenrod, and fascicled beakrush were common. In the vicinity of the eastern transect woody species, such as black titi, large gallberry, dahoon, sweetbay, fetterbush, and St. John's wort, were mainly on slightly elevated windrows from past silviculture activities, generally short and forming about 16 to 25% cover. Dense patches of muscadine were observed scattered in this community. In the vicinity of the western transect, shrubs were taller and denser. Young slash and loblolly pines were widely scattered throughout.

Quantitative sampling. Transect 1 had a total of 35 species and 28% bare ground (Table PR-4, Figure PR-4). The dominant species was purple bluestem, with sphagnum moss, and Atlantic white cedar also contributing significant cover. The pines and other woody species are starting to form a shrubbier, more closed habitat in this area. Woody species made up around 17% average cover per quadrat.

Transect 2 (Table PR-5, Figure PR-5) had a total of 44 species with 4% bare ground. The overall aspect was more open than Transect 1, but it had a similar amount of purple bluestem, with sphagnum moss, black titi, foxtail club-moss, and pinebarren goldenrod also dominant. During sampling, some shrubs and surrounding vegetation were observed to be browned and dying as though sprayed with herbicide. Woody species made up around 12% average cover per quadrat.

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

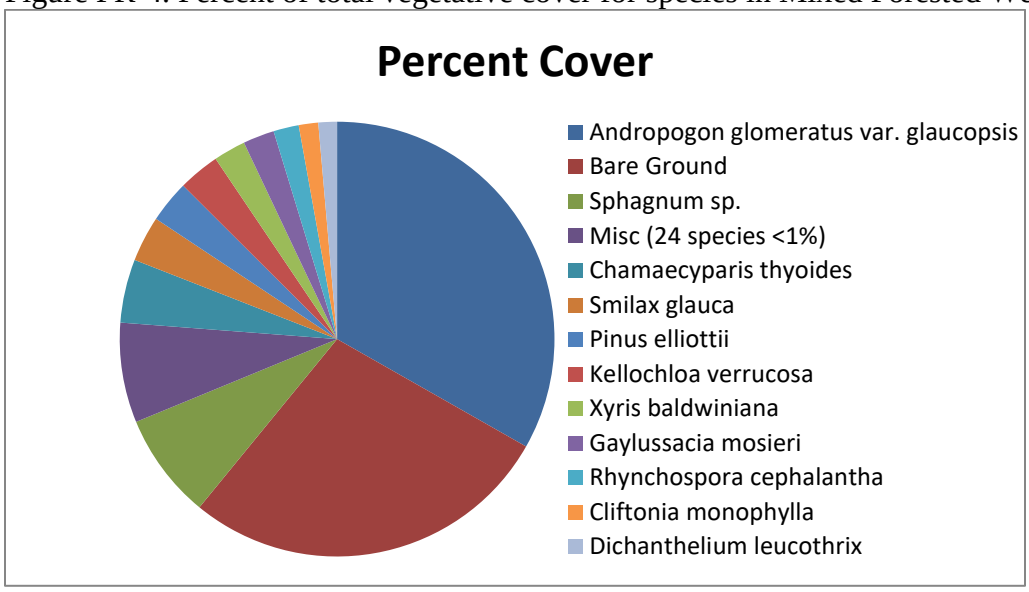


Table PR-4. Percent cover of plant species in Mixed Forested Wetland Transect 1 sampled on October 9, 2019.

Scientific name	Common name	Average percent cover per quadrat
Andropogon glomeratus var. *glaucopsis*	purple bluestem	33.00
Sphagnum sp.	sphagnum moss	7.81
Chamaecyparis thyoides	Atlantic white cedar	4.69
Smilax glauca	cat greenbrier	3.38
Pinus elliottii	slash pine	3.13
Kellochloa verrucosa	warty panicgrass	3.06
Xyris baldwiniana	Baldwin's yellow-eyed grass	2.38
Gaylussacia mosieri	woolly huckleberry	2.31
Rhynchospora cephalantha	bunched beaksedge	1.88
Cliftonia monophylla	black titi	1.44
Dichanthelium leucothrix	rough witchgrass	1.38
Ilex glabra	gallberry	0.94
Eupatorium pilosum	rough boneset	0.81
Lycopodiella alopecuroides	foxtail club-moss	0.81
Lyonia lucida	fetterbush	0.63
Lachnocaulon anceps	whitehead bogbutton	0.56
Eriocaulon decangulare	tenangle pipewort	0.50
Euthamia caroliniana	slender flattop goldenrod	0.44
Woodwardia areolata	netted chain fern	0.44
Woodwardia virginica	Virginia chain fern	0.44
Solidago fistulosa	pinebarren goldenrod	0.38
Osmunda cinnamomea	cinnamon fern	0.19
Rhexia virginica	handsome harry	0.19
Rhynchospora fascicularis	fascicled beaksedge	0.19
Aronia arbutifolia	red chokeberry	0.13

Scientific name	Common name	Average percent cover per quadrat
Hypericum crux-andreae	St. Peter's wort	0.13
Xyris ambigua	coastalplain yellow-eyed grass	0.13
Acer rubrum	red maple	0.06
Andropogon virginicus	broomsedge bluestem	0.06
Juncus marginatus	grassleaf rush	0.06
Oldenlandia uniflora	clustered mille graines	0.06
Rhexia petiolata	fringed meadowbeauty	0.06
Rhynchospora gracilenta	slender beaksedge	0.06
Rubus pensilvanicus	sawtooth blackberry	0.06
Taxodium ascendens	pond cypress	0.06
Bare Ground		27.50

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

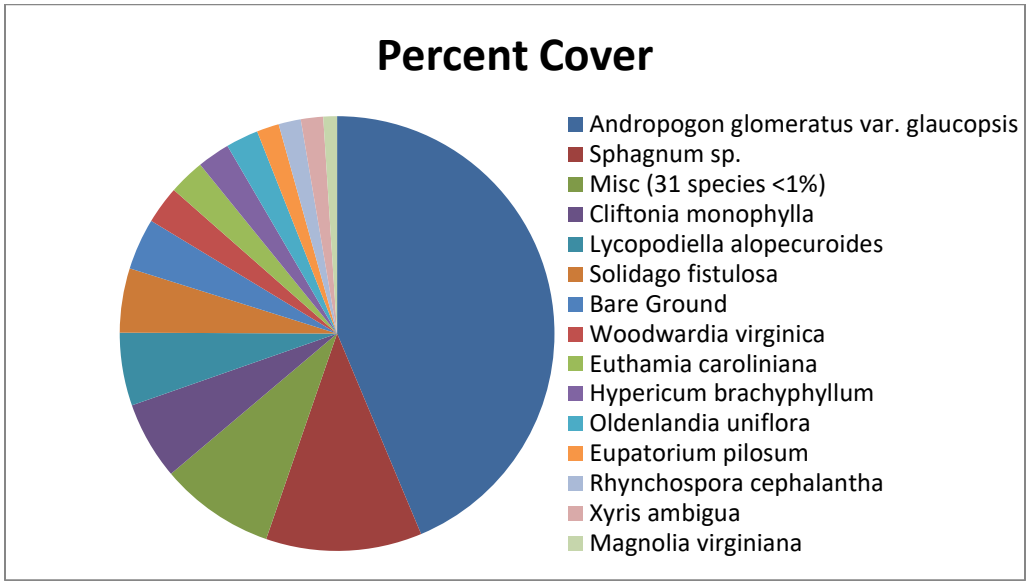


Table PR-5. Percent cover of plant species in Mixed Forested Wetland Transect 2 sampled on October 9, 2019.

Scientific name	Common name	Average percent cover per quadrat
Andropogon glomeratus var. *glaucopsis*	purple bluestem	42.81
Sphagnum sp.	sphagnum moss	11.38
Cliftonia monophylla	black titi	5.69
Lycopodiella alopecuroides	foxtail club-moss	5.31
Solidago fistulosa	pinebarren goldenrod	4.69
Woodwardia virginica	Virginia chain fern	2.75
Euthamia caroliniana	slender flattop goldenrod	2.63
Hypericum brachyphyllum	coastalplain St. John's wort	2.38

Scientific name	Common name	Average percent cover per quadrat
Oldenlandia uniflora	clustered mille graines	2.38
Eupatorium pilosum	rough boneset	1.63
Rhynchospora cephalantha	bunched beaksedge	1.63
Xyris ambigua	coastalplain yellow-eyed grass	1.63
Magnolia virginiana	sweetbay	1.00
Ilex cassine var. myrtifolia	myrtle-leaved holly	0.94
Rhynchospora gracilenta	slender beaksedge	0.94
Woodwardia areolata	netted chain fern	0.94
Rubus pensilvanicus	sawtooth blackberry	0.88
Andropogon virginicus	broomsedge bluestem	0.63
Paspalum setaceum	thin paspalum	0.44
Kellochloa verrucosa	warty panicgrass	0.38
Hypericum crux-andreae	St. Peter's wort	0.31
Juncus dichotomus	forked rush	0.31
Xyris brevifolia	shortleaf yellow-eyed grass	0.31
Eragrostis elliottii	Elliott's lovegrass	0.25
Rhexia mariana	pale meadowbeauty	0.25
Rhexia virginica	handsome harry	0.25
Acer rubrum	red maple	0.19
Pinus elliottii	slash pine	0.19
Smilax laurifolia	laurel greenbrier	0.19
Eupatorium mohrii	Mohr's thoroughwort	0.13
Aronia arbutifolia	red chokeberry	0.06
Dichanthelium ensifolium var. *ensifolium*	cypress witchgrass	0.06
Drosera capillaris	pink sundew	0.06
Eriocaulon decangulare	tenangle pipewort	0.06
Gaylussacia mosieri	woolly huckleberry	0.06
Ludwigia maritima	seaside primrosewillow	0.06
Pinus taeda	loblolly pine	0.06
Polygala cruciata	drumheads	0.06
Rhexia petiolata	fringed meadowbeauty	0.06
Rhynchospora chalarocephala	loosehead beaksedge	0.06
Rhynchospora pusilla	fairy beaksedge	0.06
Scleria ciliata	fringed nutrush	0.06
Viola primulifolia	primroseleaf violet	0.06
Xyris fimbriata	fringed yellow-eyed grass	0.06
Bare Ground		3.75

Hydric Pine Flatwoods

Qualitative monitoring. The target community of hydric pine flatwoods had a total of 75 plant species (Table PR-1). The 60-100 foot planted loblolly pines were thinned in 2017 by cutting selected rows of trees off near ground level. The resulting logs were left where they fell on the ground. The remaining canopy forms about 60% cover. Vines of muscadine grape were common and often dense. Much of the ground was covered by a thick layer of pine needle litter. The herbaceous layer was dominated cinnamon fern, toothache grass with occasional wiregrass,

as well as many weedy species. Curtiss' sandgrass (*Calamovilfa curtissii*), state listed as threatened, was noted in this community.

Quantitative monitoring. Where branches of the felled pines lay across the quadrats, they were removed in order to view the plants beneath. Transect 1 had a total of 28 species with 38% bare ground (Figure PR-6, Table PR-6). The dominant species was muscadine with other species much more sparse. Woody species (including muscadine) made up around 36% average cover per quadrat.

Transect 2 (Figure PR-7, Table PR-7) had a total of 36 species with 38% bare ground. The dominant species were muscadine and wiregrass. Woody species made up around 21% average cover per quadrat.

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

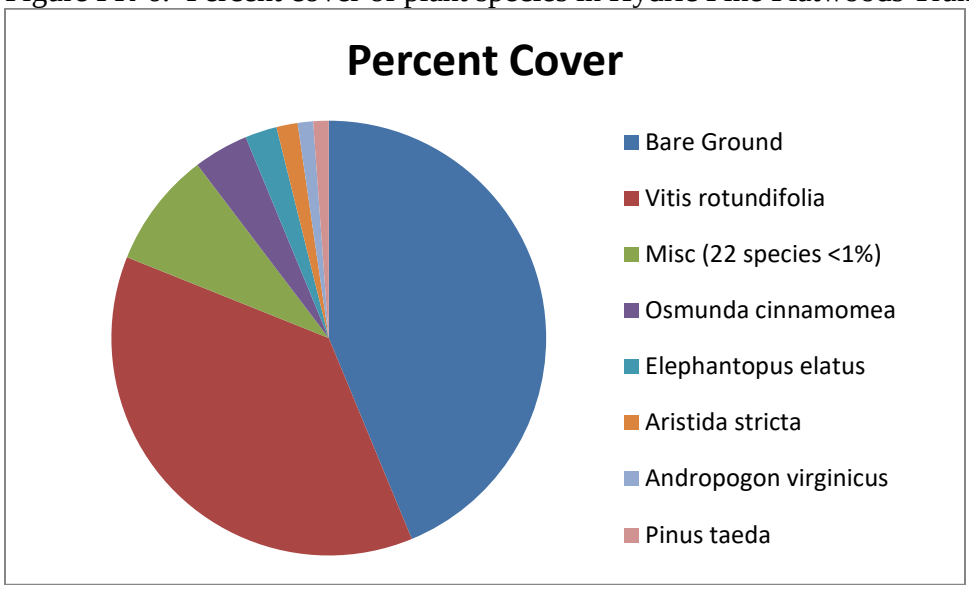


Table PR-6. Percent cover of species in Hydric Pine Flatwoods Transect 1 sampled on October 8, 2019.

Scientific name	Common name	Average percent cover per quadrat
Vitis rotundifolia	muscadine	32.50
Osmunda cinnamomea	cinnamon fern	3.56
Elephantopus elatus	tall elephantsfoot	2.06
Aristida stricta	wiregrass	1.38
Andropogon virginicus	broomsedge bluestem	1.00
Pinus taeda	loblolly pine	1.00
Oldenlandia uniflora	clustered mille graines	0.88
Rubus cuneifolius	sand blackberry	0.88
Solidago fistulosa	pinebarren goldenrod	0.88
Rubus pensilvanicus	sawtooth blackberry	0.69
Eupatorium mohrii	Mohr's thoroughwort	0.50

Scientific name	Common name	Average percent cover per quadrat
Toxicodendron radicans	eastern poison ivy	0.50
Ctenium aromaticum	toothache grass	0.44
Kellochloa verrucosa	warty panicgrass	0.44
Rhynchospora fascicularis	fascicled beaksedge	0.44
Smilax auriculata	earleaf greenbrier	0.44
Euthamia caroliniana	slender flattop goldenrod	0.31
Eleocharis vivipara	viviparous spikerush	0.19
Scleria ciliata	fringed nutrush	0.19
Smilax glauca	cat greenbrier	0.19
Juncus dichotomus	forked rush	0.13
Cyperus croceus	Baldwin's flatsedge	0.06
Hypericum cistifolium	roundpod St. John's wort	0.06
Hypericum crux-andreae	St. Peter's wort	0.06
Ludwigia maritima	seaside primrosewillow	0.06
Rhexia mariana	pale meadowbeauty	0.06
Symphyotrichum dumosum	rice button aster	0.06
Xyris ambigua	coastalplain yellow-eyed grass	0.06
Bare Ground		38.13

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

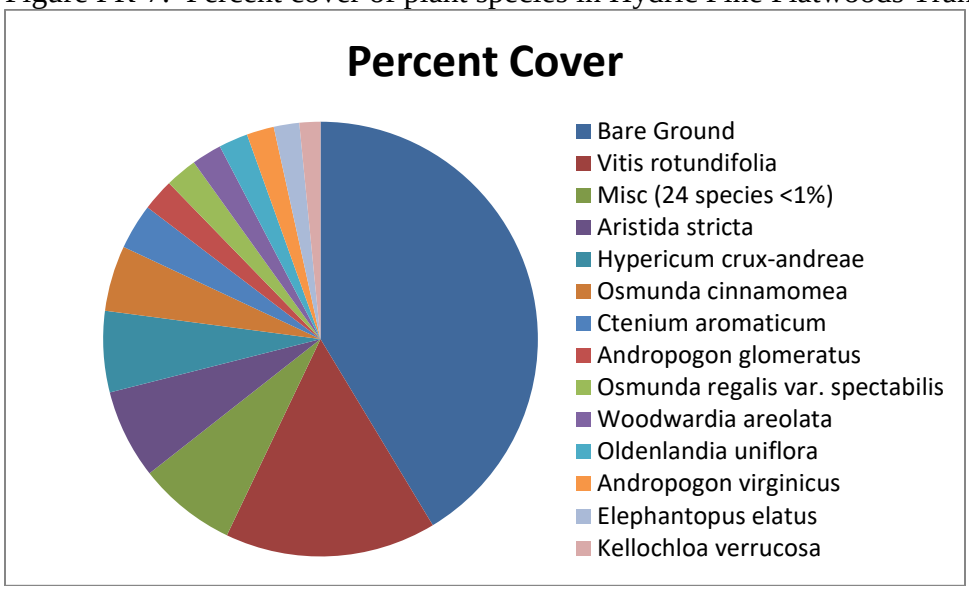


Table PR-7. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 sampled on October 8, 2019.

Scientific name	Common name	Average percent cover per quadrat
Vitis rotundifolia	muscadine	14.50
Aristida stricta	wiregrass	6.13
Hypericum crux-andreae	St. Peter's wort	5.56
Osmunda cinnamomea	cinnamon fern	4.50
Ctenium aromaticum	toothache grass	3.13
Andropogon glomeratus	bushy bluestem	2.19
Osmunda regalis var. *spectabilis*	royal fern	2.19
Woodwardia areolata	netted chain fern	2.06
Oldenlandia uniflora	clustered mille graines	2.00
Andropogon virginicus	broomsedge bluestem	1.88
Elephantopus elatus	tall elephantsfoot	1.75
Kellochloa verrucosa	warty panicgrass	1.44
Woodwardia virginica	Virginia chain fern	0.88
Sphagnum sp.	sphagnum moss	0.81
Solidago fistulosa	pinebarren goldenrod	0.56
Andropogon glomeratus var. *glaucopsis*	purple bluestem	0.44
Cliftonia monophylla	black titi	0.44
Lachnocaulon anceps	whitehead bogbutton	0.44
Rhynchospora chalarocephala	loosehead beaksedge	0.44
Euthamia caroliniana	slender flattop goldenrod	0.38
Pinus taeda	loblolly pine	0.25
Smilax glauca	cat greenbrier	0.25
Toxicodendron radicans	eastern poison ivy	0.25
Centella asiatica	spadeleaf	0.19
Eupatorium mohrii	Mohr's thoroughwort	0.19

Scientific name	Common name	Average percent cover per quadrat
Juncus dichotomus	forked rush	0.19
Lycopodiella alopecuroides	foxtail club-moss	0.19
Rhynchospora fascicularis	fascicled beaksedge	0.19
Symphyotrichum dumosum	rice button aster	0.19
Rhexia mariana	pale meadowbeauty	0.13
Acer rubrum	red maple	0.06
Eupatorium capillifolium	dogfennel	0.06
Hypericum cistifolium	roundpod St. John's wort	0.06
Quercus nigra	water oak	0.06
Rubus pensilvanicus	sawtooth blackberry	0.06
Scleria ciliata	fringed nutrush	0.06
Bare Ground		38.13

Pine Flatwoods

Qualitative monitoring. The mature pines were thinned in 2017 by cutting selected rows of trees off near ground level. The resulting logs were left where they fell on the ground. The hardwoods in the subcanopy had been cut down in 2014 and some stumps had re-sprouted. Muscadine vine was abundant, scrambling over and obscuring much of the remaining groundcover. At least one patch of muscadine appeared to have been treated with herbicide. The diverse shrub layer formed up to 25% cover and was dominated by sweetbay, swamp bay, St. John's worts, southern bayberry, sawtooth blackberry and young loblolly pines. In the herbaceous layer were scattered clumps of wiregrass, with abundant broomsedge bluestem, smallfruit beggarsticks, and pinebarren goldenrod. A total of 60 species (Table PR-1) were observed in this habitat.

Lafayette Creek – Phase I Mitigation Site

Qualitative and Quantitative Monitoring

October 2019

Lafayette Creek – Phase I Mitigation Site
Qualitative and Quantitative Monitoring
October 2019

INTRODUCTION

The Lafayette Creek Phase I Mitigation Site of 509 acres was obtained to compensate for the loss of wetland function from the impacts associated with re-alignment of highway US331 in Freeport. The site is located north of SR 20 and Lafayette Creek. Access to the site is via Hollington Road, which is located 4.5 miles east of US 331. The gate to the site is at the north end of Hollington Road. The Phase I Mitigation Project aims to restore Sandhill (SA) to areas formerly planted with sand pine plantation and Hydric Savanna (HS) to areas formerly covered by wetland shrubs (Figure LC-1). Quantitative and qualitative monitoring documented the current plant species composition and vegetation structure of these targeted communities. Qualitative monitoring was used to document areas of slash pine plantation being restored to High Pine (HP) as well as the intact Bay Swamp (BS) and Stream Swamp (SS). The site vegetation was previously monitored by FNAI biologists every fall from 2012 to 2018.

METHODS

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

The qualitative monitoring consisted of recording species and vegetation structure observed along meandering pedestrian transects through the two target communities plus High Pine (HP), Bay Swamp (BS), and Stream Swamp (SS). Field surveys were performed by FNAI botanists Kim Alexander and Jenna Annis on October 14-16, 2019.

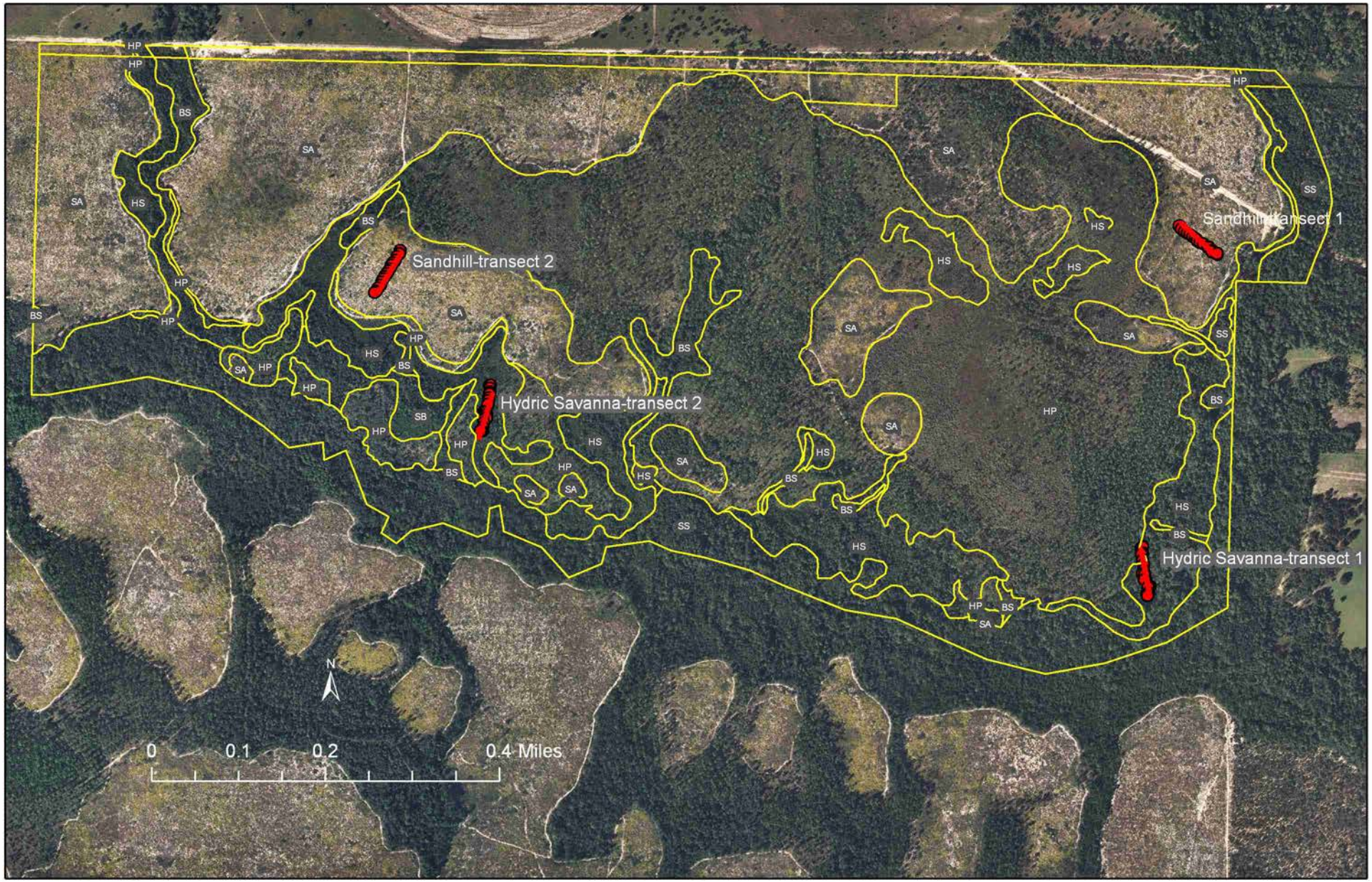


Figure LC-1. Location of permanent transects at Lafayette Creek – Phase I Mitigation Site. SA=Sandhill, HS=Hydric Savanna, HP=High Pine, BS=Bay Swamp, SS=Stream Swamp, SB=Shrub Bog.

RESULTS AND DISCUSSION

A total of 275 plant species were recorded in the surveyed areas of Lafayette Creek during the 2019 monitoring period (Table LC-1). Twenty-five new species were found during the 2019 monitoring, including one new invasive exotic species, Peruvian primrosewillow (*Ludwigia peruviana*).

Table LC-1. Species observed in target communities at Lafayette Creek – Phase I Mitigation Site, October 14-16, 2019. (bold name = new species; bold X = new observation in community)

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Acer rubrum	red maple					X	1
Agalinis fasciculata	beach false foxglove		X	X	X		3
Agalinis purpurea	**purple false foxglove**				**X**		1
Aletris lutea	yellow colic-root		X	X			2
Alnus serrulata	hazel alder	X					1
Ambrosia artemisiifolia	**common ragweed**	**X**					1
Amsonia ciliata	fringed bluestar				X		1
Andropogon glomeratus	bushy bluestem		X	X			2
Andropogon glomeratus var. *glaucopsis*	purple bluestem		X	X			2
Andropogon gyrans	Elliott's bluestem				X		1
Andropogon virginicus	broomsedge bluestem		X	X	X		3
Andropogon virginicus var. *glaucus*	chalky bluestem		X	X	X		3
Aristida purpurascens	arrowfeather threeawn			**X**	X		2
Aristida stricta	wiregrass		X	X	X		3
Arnoglossum sulcatum	Georgia Indian-plantain			X			1
Aronia arbutifolia	red chokeberry	**X**		X			2
Arundinaria gigantea	switchcane			X			1
Asclepias obovata	**pineland milkweed**		**X**				1
Asclepias sp.	milkweed		X				1
Aureolaria pectinata	fernleaf yellow false foxglove		X				1
Balduina angustifolia	coastalplain honeycomb-head		X		X		2
Baptisia lanceolata	gopherweed				X		1
Berlandiera pumila	soft greeneyes				X		1
Bidens mitis	smallfruit beggarticks	X		X			2
Bigelowia nudata	pineland rayless goldenrod		X	X			2
Boehmeria cylindrica	**false nettle**	**X**					1
Bulbostylis ciliatifolia	capillary hairsedge		X		X		2
Callicarpa americana	American beautyberry	X	X	**X**	X	X	5
Carex glaucescens	clustered sedge	X					1
Carphephorus odoratissimus	vanillaleaf		X		X		2
Carphephorus pseudoliatris	bristleleaf chaffhead		**X**				1
Cartrema americanum	wild olive				X		1
Ceanothus microphyllus	littleleaf buckbrush				X		1

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Centella asiatica	spadeleaf			X			1
Centrosema virginianum	**spurred butterfly pea**		**X**				1
Chaptalia tomentosa	pineland daisy			X			1
Chasmanthium laxum var. *sessiliflorum*	longleaf woodoats					X	1
Chrysoma pauciflosculosa	woody goldenrod				X		1
Chrysopsis gossypina ssp. *hyssopifolia*	cottony goldenaster		X		X		2
Chrysopsis lanuginosa	Lynn Haven goldenaster		X		X		2
Chrysopsis linearifolia	narrowleaf goldenaster				X		1
Chrysopsis mariana	Maryland goldenaster		X		X		2
Cladina evansii	Evans' reindeer lichen				X		1
Clematis reticulata	**netleaf leather flower**		**X**				1
Clethra alnifolia	sweet pepperbush	X		X		X	3
Cliftonia monophylla	black titi	X		X		X	3
Cnidoscolus stimulosus	tread softly				X		1
Coleataenia longifolia	ciliate redtop panicum			X			1
Coreopsis linifolia	Texas tickseed			X			1
Croptilon divaricatum	slender scratchdaisy				X		1
Croton argyranthemus	silver croton		X		X		2
Ctenium aromaticum	toothache grass		X	X			2
Cyperus polystachyos	**manyspike flatsedge**				**X**		1
Cyrilla racemiflora	titi	X				X	2
Dalea pinnata	summer farewell				X		1
Desmodium sp.	tick-trefoil				X		1
Dichanthelium aciculare	needleleaf witchgrass				X		1
Dichanthelium acuminatum	tapered witchgrass			X	X		2
Dichanthelium ensifolium	cypress witchgrass		X	X	X		3
Dichanthelium portoricense	hemlock witchgrass				**X**		1
Dichanthelium scabriusculum	woolly witchgrass	**X**		X			2
Dichanthelium sp.	witchgrass			X			1
Dichanthelium sphaerocarpon	roundseed witchgrass			X			1
Dichanthelium strigosum	roughhair witchgrass		X	X	X		3
Diodia teres	poor joe		X		X		2
Diodia virginiana	Virginia buttonweed		X	X			2
Dioscorea floridana	**Florida yam**			**X**			1
Diospyros virginiana	common persimmon		X		X	**X**	3
Drosera capillaris	pink sundew			X			1
Dulichium arundinaceum	threeway sedge	**X**					1
Elephantopus elatus	tall elephantsfoot		X			**X**	2
Eragrostis elliottii	Elliott's lovegrass		X		X		2
Eragrostis pectinacea	tufted lovegrass				X		1
Eragrostis sp.	lovegrass	**X**					1
Eragrostis virginica	coastal lovegrass				X		1

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Erigeron vernus	early whitetop fleabane			X			1
Eriocaulon compressum	flattened pipewort		X	X			2
Eriocaulon decangulare	tenangle pipewort	X		X			2
Eriogonum tomentosum	dogtongue wild buckwheat				X		1
Eryngium yuccifolium	button rattlesnakemaster		X				1
Eupatorium capillifolium	dogfennel	X		X			2
Eupatorium compositifolium	yankeeweed		X	X	X		3
Eupatorium mohrii	Mohr's thoroughwort		X	X			2
Eupatorium pilosum	rough boneset		X	X			2
Eupatorium rotundifolium	roundleaf thoroughwort		X	X			2
Euphorbia discoidalis	summer spurge		X		X		2
Euphorbia floridana	greater Florida spurge				X		1
Eurybia eryngiifolia	thistleleaf aster		X				1
Euthamia caroliniana	slender flattop goldenrod		X	X	X		3
Froelichia floridana	cottonweed				X		1
Fuirena breviseta	saltmarsh umbrellasedge	**X**		X			2
Galactia minor	leafy milkpea				X		1
Gaylussacia dumosa	dwarf huckleberry		X	X	X		3
Gaylussacia frondosa var. *tomentosa*	blue huckleberry		X	X		X	3
Gaylussacia mosieri	woolly huckleberry	X	X	X			3
Gelsemium sempervirens	yellow jessamine		X		X	X	3
Geobalanus oblongifolius	gopher apple		X		X		2
Helianthus angustifolius	narrowleaf sunflower	X	X	X			3
Helianthus heterophyllus	variableleaf sunflower		X				1
Helianthus radula	stiff sunflower		X		X		2
Hibiscus aculeatus	comfortroot		X	**X**	X		3
Hypericum brachyphyllum	coastalplain St. John's wort	X		X			2
Hypericum chapmanii	Chapman's St. John's wort					X	1
Hypericum cistifolium	roundpod St. John's wort			X			1
Hypericum crux-andreae	St. Peter's wort		X	X		**X**	3
Hypericum fasciculatum	peelbark St. John's wort	X		X			2
Hypericum gentianoides	orangegrass				X		1
Hypericum hypericoides	St. Andrew's cross				X	X	2
Hypericum suffruticosum	pineland St. John's wort				X		1
Hypericum tetrapetalum	fourpetal St. John's wort		X				1
Ilex cassine	dahoon	X					1
Ilex coriacea	large gallberry	X	X	X		X	4
Ilex glabra	gallberry	X	X	X	X		4
Ilex opaca	American holly		X				1
Ilex vomitoria	yaupon	**X**	X		X	X	4
Itea virginica	Virginia willow	**X**				X	2
Juncus scirpoides	**needlepod rush**	**X**					1

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Juncus trigonocarpus	redpod rush	**X**		X			2
Kellochloa verrucosa	warty panicgrass	**X**	X	X			3
Lachnanthes caroliana	Carolina redroot	**X**		X			2
Lachnocaulon anceps	whitehead bogbutton		X	X			2
Lechea sessiliflora	pineland pinweed				X		1
Lespedeza cuneata	**Chinese lespedeza**					**X**	1
Lespedeza hirta	**hairy lespedeza**				**X**		1
Leucothoe axillaris	coastal doghobble	X				X	2
Liatris chapmanii	Chapman's gayfeather		X				1
Liatris elegans	pinkscale gayfeather				X		1
Liatris gracilis	slender gayfeather		X		X		2
Liatris pauciflora var. *secunda*	Piedmont gayfeather				X		1
Liatris spicata	dense gayfeather		X	X			2
Liatris tenuifolia	shortleaf gayfeather				X		1
Linum sp.	flax		X				1
Liriodendron tulipifera	tuliptree	X		X			2
Lobelia brevifolia	shortleaf lobelia			X			1
Lobelia georgiana	**southern lobelia**					**X**	1
Lobelia glandulosa	glade lobelia		X	X			2
Lophiola aurea	golden crest			X			1
Ludwigia octovalvis	Mexican primrosewillow	**X**					1
Ludwigia peruviana	**Peruvian primrosewillow**	**X**					1
Ludwigia pilosa	hairy primrosewillow	**X**					1
Lycopodiella alopecuroides	foxtail club-moss			X			1
Lycopodiella appressa	southern club-moss			**X**			1
Lycopodiella caroliniana	slender club-moss			X			1
Lycopus rubellus	**taperleaf waterhorehound**	**X**					1
Lygodium japonicum	Japanese climbing fern			X		X	2
Lyonia lucida	fetterbush	X		X		X	3
Magnolia grandiflora	southern magnolia		X				1
Magnolia virginiana	sweetbay	X	X	X		X	4
Mayaca fluviatilis	stream bogmoss	X					1
Mikania scandens	climbing hempvine					X	1
Mimosa quadrivalvis	sensitive briar				X		1
Mitchella repens	partridgeberry					X	1
Mitreola sessilifolia	swamp hornpod		X	**X**			2
Morella caroliniensis	evergreen bayberry	X					1
Morella cerifera	southern bayberry	X					1
Morella inodora	odorless bayberry	X				X	2
Nyssa biflora	swamp tupelo	X		X		X	3
Oldenlandia corymbosa	flattop mille graines			X			1
Oldenlandia uniflora	clustered mille graines	**X**		X			2

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Opuntia humifusa	pricklypear		X		X		2
Osmunda cinnamomea	cinnamon fern	X		X		X	3
Osmunda regalis var. *spectabilis*	royal fern	X		X			2
Panicum virgatum	switchgrass				X		1
Paronychia patula	pineland nailwort				X		1
Paspalum setaceum	thin paspalum				X		1
Peltandra sagittifolia	spoon-flower	**X**		X			2
Persea palustris	swamp bay	X				X	2
Phytolacca americana	**American pokeweed**		**X**				1
Pinus clausa	sand pine				X		1
Pinus elliottii	slash pine	X	X	X		X	4
Pinus palustris	longleaf pine				X		1
Pinus serotina	pond pine	X		X			2
Pinus taeda	loblolly pine					X	1
Pityopsis aspera	pineland silkgrass		X		X		2
Pityopsis graminifolia	narrowleaf silkgrass		X		X		2
Polygala lutea	orange milkwort		**X**	X			2
Polygala nana	**candyroot**		**X**				1
Polygonella gracilis	tall jointweed				X		1
Polypremum procumbens	rustweed				X		1
Pseudognaphalium obtusifolium	sweet everlasting				X		1
Pteridium aquilinum	bracken fern		X	X	X	**X**	4
Pterocaulon pycnostachyum	blackroot		X		X		2
Quercus geminata	sand live oak		X		X		2
Quercus hemisphaerica	laurel oak		X		X		2
Quercus incana	bluejack oak				X		1
Quercus laevis	turkey oak				X		1
Quercus laurifolia	swamp laurel oak	X					1
Quercus margarettae	sand post oak		X				1
Quercus minima	dwarf live oak		X		X		2
Quercus nigra	water oak		X			X	2
Quercus pumila	runner oak		X				1
Rhexia alifanus	savannah meadowbeauty		X	X			2
Rhexia mariana	pale meadowbeauty		**X**				1
Rhexia nuttallii	Nuttall's meadowbeauty		X				1
Rhexia petiolata	fringed meadowbeauty			X			1
Rhexia virginica	handsome harry					**X**	1
Rhododendron canescens	mountain azalea					X	1
Rhododendron viscosum	swamp azalea	X					1
Rhus copallinum	winged sumac		X		X		2
Rhynchosia cytisoides	royal snoutbean				X		1
Rhynchosia minima	**least snoutbean**		**X**				1

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Rhynchospora cephalantha	bunched beaksedge	**X**		X		**X**	3
Rhynchospora chalarocephala	loosehead beaksedge			X			1
Rhynchospora chapmanii	Chapman's beaksedge			X			1
Rhynchospora ciliaris	fringed beaksedge			X			1
Rhynchospora fascicularis	fascicled beaksedge	**X**	**X**	X			3
Rhynchospora gracilenta	slender beaksedge			X			1
Rhynchospora inundata	**narrowfruit horned beaksedge**	**X**					1
Rhynchospora nitens	**shortbeak beaksedge**	**X**					1
Rhynchospora plumosa	plumed beaksedge			X			1
Rhynchospora sp.	beaksedge				X		1
Rubus cuneifolius	sand blackberry		X		X		2
Rubus pensilvanicus	sawtooth blackberry	X		X		X	3
Sabatia brevifolia	shortleaf rosegentian		X				1
Saccharum giganteum	sugarcane plumegrass	X					1
Sagittaria lancifolia	**bulltongue arrowhead**	**X**					1
Salvia azurea	azure blue sage		X		**X**		2
Sarracenia leucophylla	white-top pitcherplant	X		X			2
Schizachyrium sanguineum	crimson bluestem				**X**		1
Schizachyrium stoloniferum	creeping little bluestem		X	X	X		3
Schizachyrium tenerum	slender bluestem				X		1
Scleria ciliata	fringed nutrush		**X**	**X**			2
Scleria reticularis	netted nutrush			X			1
Scleria sp.	nutrush					X	1
Scleria triglomerata	whip nutrush		X		X		2
Serenoa repens	saw palmetto		X	X	X	X	4
Sericocarpus tortifolius	whitetop aster		X		X		2
Seymeria cassioides	yaupon blacksenna		X	X			2
Seymeria pectinata	Piedmont blacksenna				X		1
Smilax auriculata	earleaf greenbrier		X	X	X		3
Smilax bona-nox	saw greenbrier		X	**X**			2
Smilax glauca	cat greenbrier		X	X		X	3
Smilax laurifolia	laurel greenbrier	X		X		X	3
Solidago fistulosa	pinebarren goldenrod	X		X			2
Solidago odora	sweet goldenrod		X		X		2
Solidago stricta	wand goldenrod		**X**	X			2
Sorghastrum nutans	yellow indiangrass		X				1
Sorghum halepense	**johnsongrass**		**X**				1
Sphagnum sp.	sphagnum moss	X				X	2
Sporobolus junceus	pineywoods dropseed				X		1
Stillingia sylvatica	queen's delight				X		1
Stipulicida setacea	**pineland scalypink**				**X**		1
Stylisma sp.	dawnflower				X		1

Scientific Name	Common Name	Bay Swamp	High Pine	Hydric Savanna	Sandhill	Stream Swamp	Grand Total
Symphyotrichum adnatum	scaleleaf aster		X		X		2
Symphyotrichum concolor	eastern silver aster		X		X		2
Symphyotrichum dumosum	rice button aster		X	X	X		3
Symplocos tinctoria	horse sugar					X	1
Syngonanthus flavidulus	yellow hatpins			X			1
Tephrosia chrysophylla	scurf hoary-pea				X		1
Tephrosia florida	Florida hoary-pea		X				1
Tephrosia mohrii	pineland hoary-pea				X		1
Toxicodendron radicans	eastern poison ivy	X					1
Tragia smallii	Small's noseburn		X				1
Triadenum virginicum	**Virginia marsh St. John's wort**	**X**					1
Trichostema dichotomum	forked bluecurls				X		1
Triplasis americana	perennial sandgrass				X		1
Utricularia juncea	southern bladderwort			X			1
Vaccinium arboreum	sparkleberry		X		X		2
Vaccinium corymbosum	highbush blueberry		X			X	2
Vaccinium elliottii	Elliott's blueberry					X	1
Vaccinium myrsinites	shiny blueberry		X	X	X		3
Vernonia angustifolia	**tall ironweed**				**X**		1
Viburnum nudum	possumhaw	X		**X**			2
Viola palmata	**early blue violet**			**X**			1
Viola primulifolia	primroseleaf violet			X			1
Vitis rotundifolia	muscadine	X	X	X	X	X	5
Woodwardia areolata	netted chain fern					X	1
Woodwardia virginica	Virginia chain fern	X					1
Xyris ambigua	coastalplain yellow-eyed grass			X			1
Xyris elliottii	Elliott's yellow-eyed grass			X			1
Xyris fimbriata	fringed yellow-eyed grass	**X**		X			2
Xyris flabelliformis	savannah yellow-eyed grass			X			1
Xyris sp.	yellow-eyed grass			X			1
Xyris stricta	pineland yellow-eyed grass		X	**X**			2
Yucca filamentosa	Adam's needle		X		X		2
Total number of taxa: 275		68	112	113	110	46	449

Sandhill

Qualitative sampling. The sandhill natural community has been degraded by past silviculture activities but retains many characteristic species. The diverse but somewhat sparse groundcover was dominated by wiregrass, with Piedmont gayfeather, Lynn Haven goldenaster and yankeeweed also frequent. Scattered shrubs and small trees include saw palmetto, sand live oak, and turkey oak. Characteristic sandhill species, such as summer farewell, sandhill sedge, and soft greeneyes were also noted in small numbers. Planted longleaf pines were frequent, ranging

from 1 to 15 feet tall. The state-listed threatened pineland hoary-pea (*Tephrosia mohrii*) was observed in both the eastern and far northwestern sections of sandhill. A total of 110 plant species were identified in this community (Table LC-1).

Quantitative sampling. The eastern Transect 1 (Figure LC-2, Table LC-2) was located on an east-facing slope. This area appeared to have burned within the past year. It had a total of 45 species with 45% bare ground. Species cover was just under 2/3 herbaceous. Wiregrass was the most abundant species, with saw palmetto and sand live oak about equally abundant. Woody species made up around 18% average cover per quadrat.

The western Transect 2 (Table LC-3, Figure LC-3) was situated near the top of a ridge. This area appeared to have burned within the past year. It had a total of 30 species with 64% bare ground. Dominant species were almost entirely herbaceous. Wiregrass and broomsedge bluestem were the dominant herbs. The open shrub stratum was composed mainly of gopher apple, and seedlings and saplings of turkey oak and longleaf pine. Woody species made up around 5% average cover per quadrat. Although not recorded in cover, fruticose lichens were observed in two quadrats.

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

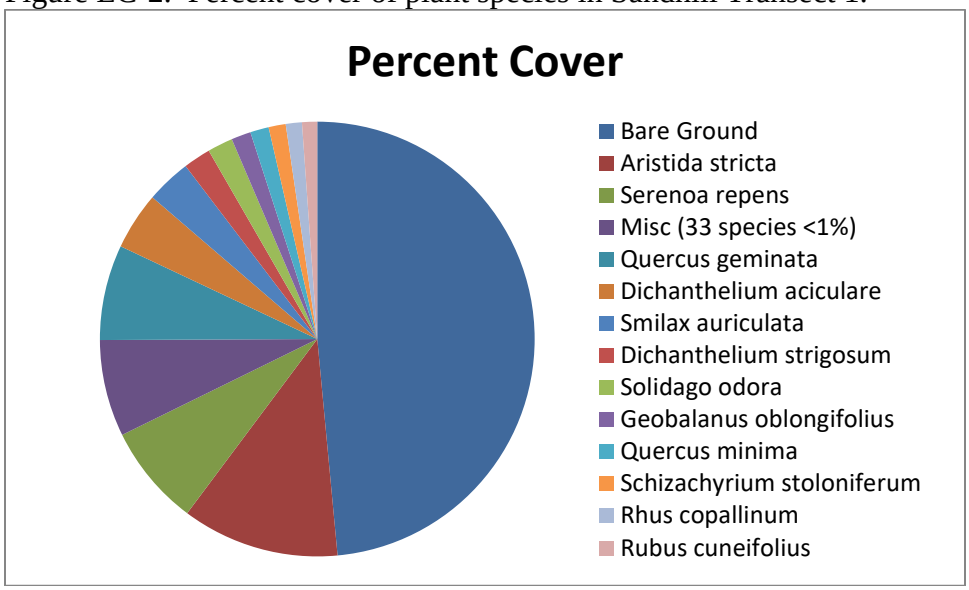


Table LC-2. Percent cover of plant species in Sandhill Transect 1 sampled on October 14, 2019.

Scientific name	Common name	Average percent cover per quadrat
Aristida stricta	wiregrass	10.73
Serenoa repens	saw palmetto	6.90
Quercus geminata	sand live oak	6.50
Dichanthelium aciculare	needleleaf witchgrass	3.93
Smilax auriculata	earleaf greenbrier	3.07
Dichanthelium strigosum	roughhair witchgrass	1.87

Scientific name	Common name	Average percent cover per quadrat
Solidago odora	sweet goldenrod	1.73
Geobalanus oblongifolius	gopher apple	1.33
Quercus minima	dwarf live oak	1.27
Schizachyrium stoloniferum	creeping little bluestem	1.17
Rhus copallinum	winged sumac	1.10
Rubus cuneifolius	sand blackberry	1.03
Aristida purpurascens	arrowfeather threeawn	0.73
Eragrostis elliottii	Elliott's lovegrass	0.67
Liatris pauciflora var. secunda	Piedmont gayfeather	0.63
Schizachyrium tenerum	slender bluestem	0.60
Andropogon virginicus	broomsedge bluestem	0.57
Pityopsis aspera	pineland silkgrass	0.57
Eupatorium compositifolium	yankeeweed	0.37
Paspalum setaceum	thin paspalum	0.37
Chrysoma pauciflosculosa	woody goldenrod	0.23
Scleria triglomerata	whip nutrush	0.23
Mimosa quadrivalvis	sensitive briar	0.17
Bulbostylis ciliatifolia	capillary hairsedge	0.13
Chrysopsis lanuginosa	Lynn Haven goldenaster	0.13
Liatris gracilis	slender gayfeather	0.13
Rhynchosia cytisoides	royal snoutbean	0.13
Eragrostis virginica	coastal lovegrass	0.10
Euthamia caroliniana	slender flattop goldenrod	0.10
Liatris tenuifolia	shortleaf gayfeather	0.10
Schizachyrium sanguineum	crimson bluestem	0.10
Panicum virgatum	switchgrass	0.07
Polygonella gracilis	tall jointweed	0.07
Cnidoscolus stimulosus	tread softly	0.03
Croton argyranthemus	silver croton	0.03
Eriogonum tomentosum	dogtongue wild buckwheat	0.03
Galactia minor	leafy milkpea	0.03
Gaylussacia dumosa	dwarf huckleberry	0.03
Hypericum gentianoides	orangegrass	0.03
Ilex vomitoria	yaupon	0.03
Quercus hemisphaerica	laurel oak	0.03
Rhynchospora sp.	beaksedge	0.03
Solidago odora var. odora	anisescented goldenrod	0.03
Stylisma sp.	dawnflower	0.03
Tephrosia chrysophylla	scurf hoary-pea	0.03
Bare Ground		44.50

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

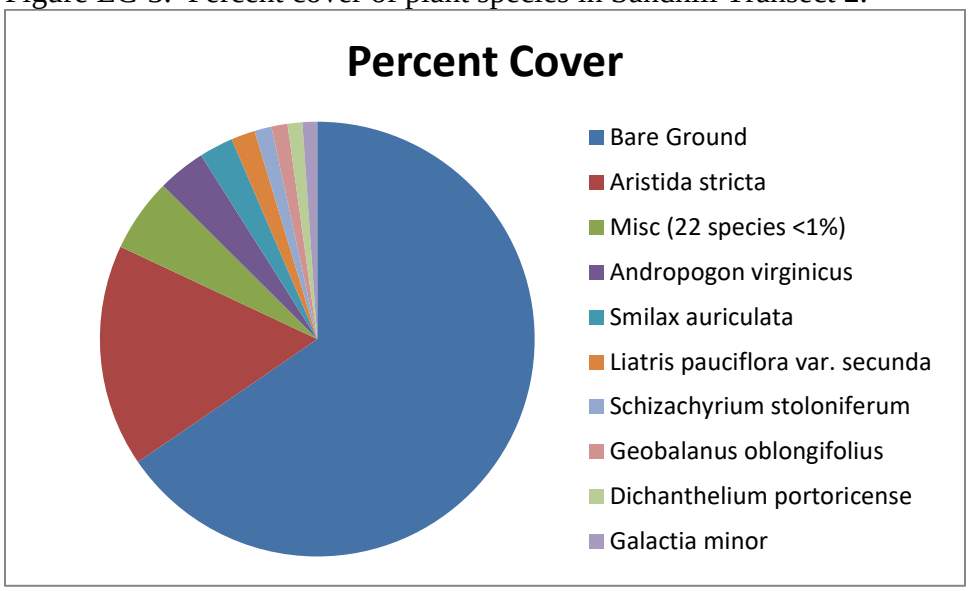


Table LC-3. Percent cover of plant species in Sandhill Transect 2 sampled on October 14, 2019.

Scientific name	Common name	Average percent cover per quadrat
Aristida stricta	wiregrass	16.10
Andropogon virginicus	broomsedge bluestem	3.47
Smilax auriculata	earleaf greenbrier	2.47
Liatris pauciflora var. *secunda*	Piedmont gayfeather	1.73
Schizachyrium stoloniferum	creeping little bluestem	1.23
Geobalanus oblongifolius	gopher apple	1.17
Dichanthelium portoricense	hemlock witchgrass	1.07
Galactia minor	leafy milkpea	1.07
Bulbostylis ciliatifolia	capillary hairsedge	0.77
Dichanthelium aciculare	needleleaf witchgrass	0.73
Dichanthelium strigosum	roughhair witchgrass	0.63
Dichanthelium acuminatum	tapered witchgrass	0.47
Eupatorium compositifolium	yankeeweed	0.47
Aristida purpurascens	arrowfeather threeawn	0.40
Pinus palustris	longleaf pine	0.33
Quercus laevis	turkey oak	0.23
Rubus cuneifolius	sand blackberry	0.23
Schizachyrium sanguineum	crimson bluestem	0.23
Schizachyrium sp.	bluestem	0.23
Eriogonum tomentosum	dogtongue wild buckwheat	0.20
Cyperus polystachyos	manyspike flatssedge	0.07
Euphorbia floridana	greater Florida spurge	0.07
Chrysoma pauciflosculosa	woody goldenrod	0.03
Croton argyranthemus	silver croton	0.03
Dalea pinnata	summer farewell	0.03
Mimosa quadrivalvis	sensitive briar	0.03

Scientific name	Common name	Average percent cover per quadrat
Rhynchosia cytisoides	royal snoutbean	0.03
Serenoa repens	saw palmetto	0.03
Solidago odora	sweet goldenrod	0.03
Triplasis americana	perennial sandgrass	0.03
Bare Ground		63.67

Hydric Savanna

Qualitative sampling. The restoration of the fire-suppressed hydric savanna was begun in 2010 by mowing down the often dense shrubs with a Gyro-Trac machine. Follow-up prescribed burning further reduced the shrub strata. As a result, much of the ground was bare or sparsely vegetated and there was some disturbance by vehicle tracks in the two sampling periods prior to 2014. Fires and hog rooting have created continual shifts in the herbaceous vegetation. A wide variety of herbs have been observed colonizing the area, with mainly beaksedges and warty panicum dominating in the wetter sections and wiregrass in the drier parts. Scattered shrubs included black titi, large gallberry, sweet pepperbush, and gallberry. A total of 113 species were recorded from this community (Table LC-1).

Quantitative sampling. The eastern Transect 1 (Table LC-4, Figure LC-4) was on a south-facing slope and had a total of 52 species with 12% bare ground. Herbaceous species made up most of the transect cover, although the southern end of the transect remained heavily damaged from hog rooting. Wiregrass cover increased slightly from the 2018 sample. Weedy bluestem cover appeared to be much reduced, but warty panicum increased significantly. Woody species made up around 3% average cover per quadrat.

The western Transect 2 (Table LC-5, Figure LC-5) was also on a south facing slope. It had a total of 49 species with 36% bare ground. The drier north end had abundant purple bluestem and wiregrass and was shaded by pond pine, while the wetter and more open south end was more disturbed from hog rooting and largely dominated by beaksedges. As with Transect 1, bluestem cover showed some decrease compared to the 2018 sample, but warty panicum increased. Woody species made up around 5% average cover per quadrat.

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

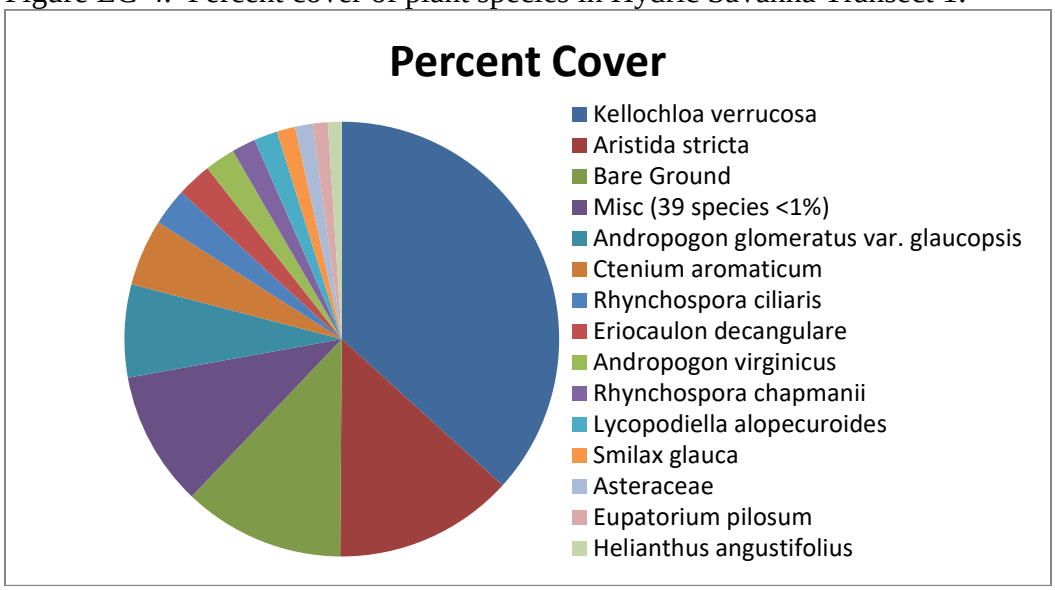


Table LC-4. Percent cover of plant species in Hydric Savanna Transect 1 sampled on October 16, 2019.

Scientific name	Common name	Average percent cover per quadrat
Kellochloa verrucosa	warty panicgrass	35.80
Aristida stricta	wiregrass	13.03
Andropogon glomeratus var. *glaucopsis*	purple bluestem	6.73
Ctenium aromaticum	toothache grass	4.83
Rhynchospora ciliaris	fringed beaksedge	2.70
Eriocaulon decangulare	tenangle pipewort	2.53
Andropogon virginicus	broomsedge bluestem	2.20
Rhynchospora chapmanii	Chapman's beaksedge	1.73
Lycopodiella alopecuroides	foxtail club-moss	1.70
Smilax glauca	cat greenbrier	1.33
Asteraceae		1.27
Eupatorium pilosum	rough boneset	1.10
Helianthus angustifolius	narrowleaf sunflower	1.00
Liatris spicata	dense gayfeather	0.87
Dichanthelium scabriusculum	woolly witchgrass	0.83
Dichanthelium strigosum	roughhair witchgrass	0.83
Dichanthelium ensifolium	cypress witchgrass	0.67
Rhynchospora cephalantha	bunched beaksedge	0.60
Scleria ciliata	fringed nutrush	0.60
Aletris lutea	yellow colic-root	0.53
Cliftonia monophylla	black titi	0.50
Lachnocaulon anceps	whitehead bogbutton	0.47
Seymeria cassioides	yaupon blacksenna	0.43
Rhexia alifanus	savannah meadowbeauty	0.27
Rhynchospora gracilenta	slender beaksedge	0.27

Scientific name	Common name	Average percent cover per quadrat
Bigelowia nudata	pineland rayless goldenrod	0.23
Centella asiatica	spadeleaf	0.23
Eupatorium rotundifolium	roundleaf thoroughwort	0.23
Rubus pensilvanicus	sawtooth blackberry	0.23
Diodia virginiana	Virginia buttonweed	0.20
Hypericum crux-andreae	St. Peter's wort	0.20
Rhynchospora plumosa	plumed beaksedge	0.20
Hypericum fasciculatum	peelbark St. John's wort	0.13
Scleria reticularis	netted nutrush	0.13
Arundinaria gigantea	switchcane	0.10
Dichanthelium ensifolium var. *ensifolium*	cypress witchgrass	0.10
Euthamia caroliniana	slender flattop goldenrod	0.10
Gaylussacia dumosa	dwarf huckleberry	0.10
Ilex coriacea	large gallberry	0.10
Ilex glabra	gallberry	0.10
Fuirena breviseta	saltmarsh umbrellasedge	0.07
Gaylussacia mosieri	woolly huckleberry	0.07
Xyris ambigua	coastalplain yellow-eyed grass	0.07
Eupatorium mohrii	Mohr's thoroughwort	0.03
Lachnanthes caroliana	Carolina redroot	0.03
Lophiola aurea	golden crest	0.03
Lycopodiella caroliniana	slender club-moss	0.03
Polygala lutea	orange milkwort	0.03
Rhexia petiolata	fringed meadowbeauty	0.03
Viburnum nudum	possumhaw	0.03
Viola primulifolia	primroseleaf violet	0.03
Xyris stricta	pineland yellow-eyed grass	0.03
Bare Ground		11.70

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

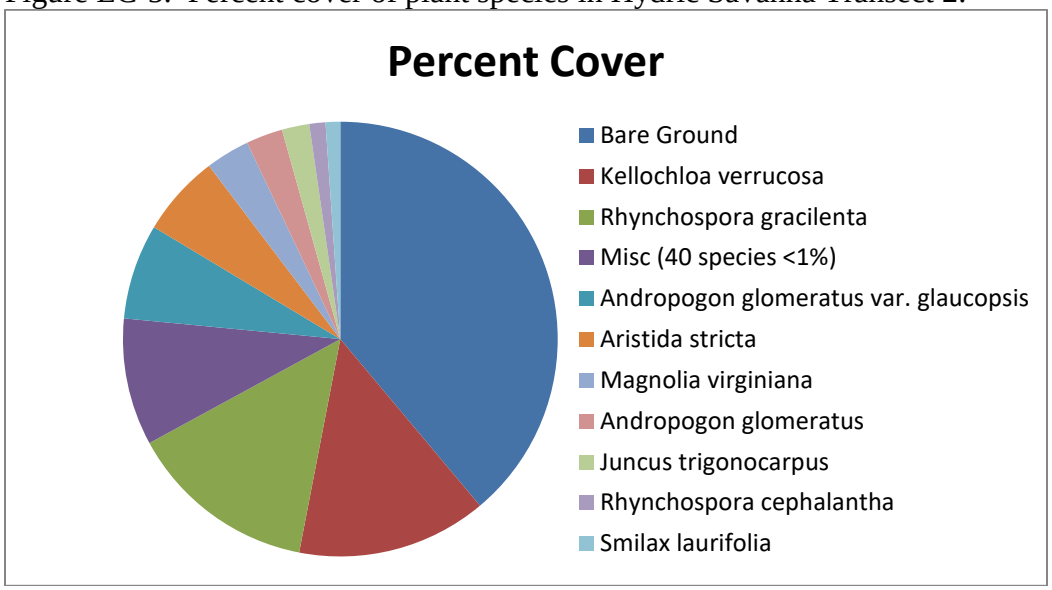


Table LC-5. Percent cover of plant species in Hydric Savanna Transect 2 sampled on October 16, 2019.

Scientific name	Common name	Average percent cover per quadrat
Kellochloa verrucosa	warty panicgrass	12.97
Rhynchospora gracilenta	slender beaksedge	12.87
Andropogon glomeratus var. *glaucopsis*	purple bluestem	6.50
Aristida stricta	wiregrass	5.57
Magnolia virginiana	sweetbay	3.00
Andropogon glomeratus	bushy bluestem	2.50
Juncus trigonocarpus	redpod rush	1.87
Rhynchospora cephalantha	bunched beaksedge	1.10
Smilax laurifolia	laurel greenbrier	1.00
Pteridium aquilinum	bracken fern	0.83
Rhynchospora ciliaris	fringed beaksedge	0.83
Smilax glauca	cat greenbrier	0.67
Rhynchospora chapmanii	Chapman's beaksedge	0.57
Eupatorium pilosum	rough boneset	0.53
Dichanthelium ensifolium var. *ensifolium*	cypress witchgrass	0.50
Eriocaulon compressum	flattened pipewort	0.50
Rhexia alifanus	savannah meadowbeauty	0.37
Viola primulifolia	primroseleaf violet	0.33
Andropogon virginicus	broomsedge bluestem	0.30
Xyris fimbriata	fringed yellow-eyed grass	0.30
Dichanthelium sp.	witchgrass	0.27
Hypericum fasciculatum	peelbark St. John's wort	0.27
Andropogon virginicus var. *glaucus*	chalky bluestem	0.23
Clethra alnifolia	sweet pepperbush	0.23
Dichanthelium strigosum	roughhair witchgrass	0.23

Scientific name	Common name	Average percent cover per quadrat
Pinus serotina	pond pine	0.13
Xyris ambigua	coastalplain yellow-eyed grass	0.13
Aristida purpurascens	arrowfeather threeawn	0.10
Dichanthelium scabriusculum	woolly witchgrass	0.10
Eriocaulon decangulare	tenangle pipewort	0.10
Eupatorium capillifolium	dogfennel	0.10
Eupatorium compositifolium	yankeeweed	0.10
Lycopodiella alopecuroides	foxtail club-moss	0.10
Nyssa biflora	swamp tupelo	0.10
Drosera capillaris	pink sundew	0.07
Lophiola aurea	golden crest	0.07
Oldenlandia uniflora	clustered mille graines	0.07
Polygala lutea	orange milkwort	0.07
Utricularia juncea	southern bladderwort	0.07
Xyris flabelliformis	savannah yellow-eyed grass	0.07
Xyris sp.	yellow-eyed grass	0.07
Callicarpa americana	American beautyberry	0.03
Centella asiatica	spadeleaf	0.03
Cliftonia monophylla	black titi	0.03
Coleataenia longifolia	ciliate redtop panicum	0.03
Dichanthelium sphaerocarpon	roundseed witchgrass	0.03
Fuirena breviseta	saltmarsh umbrellasedge	0.03
Lachnocaulon anceps	whitehead bogbutton	0.03
Lyonia lucida	fetterbush	0.03
Bare Ground		35.67

High Pine

Qualitative sampling. Mature slash pine plantation still covers most of the area being restored to high pine. Thinning of the pines and prescribed fire have opened up the canopy in some sections. The understory may be either a dense shrub layer dominated by yaupon or an open grassy groundlayer of wiregrass with scattered saw palmetto and gallberry. Nearer the ecotone with hydric savanna and also in open, flat areas of the community, many other herbs are found with the wiregrass, including pinkscale gayfeather, narrowleaf silkgrass, sweet goldenrod, scaleleaf aster, and rough boneset. The total number of species observed in this community was 112 (Table LC-1).

Bay Swamp

Qualitative sampling. This relatively undisturbed natural community occurs as a narrow band along the small stream tributaries to Lafayette Creek. The open to dense canopy consisted of sweetbay, titi, and swamp tupelo. The frequently dense and tall shrub layers were primarily composed of fetterbush, dahoon holly, large gallberry, and black titi. The herb stratum is relatively sparse in more shaded areas with clustered sedge and cinnamon fern seen most ferquestly. However, cleared areas of bay swamp along road crossings contain many more herb

species that tend to be weedy. In the northwest corner of the property, Peruvian primrosewillow, a FLEPPC Category I invasive exotic plant species, was observed growing on the west side of the stream not far from the road. Laurel greenbrier was a common vine. The total number of species observed in this community was 68 (Table LC-1).

Stream Swamp

Qualitative sampling. This relatively undisturbed natural community occurred along the narrow floodplain of Lafayette Creek and its major tributary, Wolf Creek. On the west side of the site, the closed canopy was composed of mature red maple, swamp tupelo, water oak, and sweetbay. The often dense shrubs consisted of coastal doghobble, yaupon holly, sweet pepperbush, titi, black titi, and large gallberry. Sphagnum moss, cinnamon fern, and netted chainfern made up most of the sparse groundcover. The total number of species observed in this community was 46 (Table LC-1).

Plum Creek at Holmes Creek Mitigation Site

Qualitative and Quantitative Monitoring

October 2019

Plum Creek at Holmes Creek Mitigation Site
Qualitative and Quantitative Monitoring
October 2019

INTRODUCTION

The Plum Creek at Holmes Creek Mitigation Site compensates for the loss of wetland function due to the impact of the SR 79 Open Creek Bridge in Washington County, Florida. The 130-acre tract lies just north of Holmes Creek and is contiguous with other Northwest Florida Water Management District holdings along the creek. Access is by going south on SR 79 for 6.3 miles from I-10 to Johnson Road. Head east on Johnson Road to the gate on the south side of the winding road. The Plum Creek Mitigation project aims to restore Sandhill (SA) from pine plantation and Wetland Forest Mixed (MFW) from a wetland impacted by a beaver pond (Figure PC-1). Quantitative and qualitative monitoring documented the current plant species composition and vegetation structure of the communities targeted for restoration as well as an intact mixed forested wetland community. The site vegetation was previously monitored by FNAI biologists every fall from 2012 to 2018.

METHODS

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

The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through each of these communities. The field surveys were performed by FNAI botanists Kim Alexander, Jenna Annis, Amy Jenkins, and retired FNAI botanist Ann Johnson on October 15, 2019.

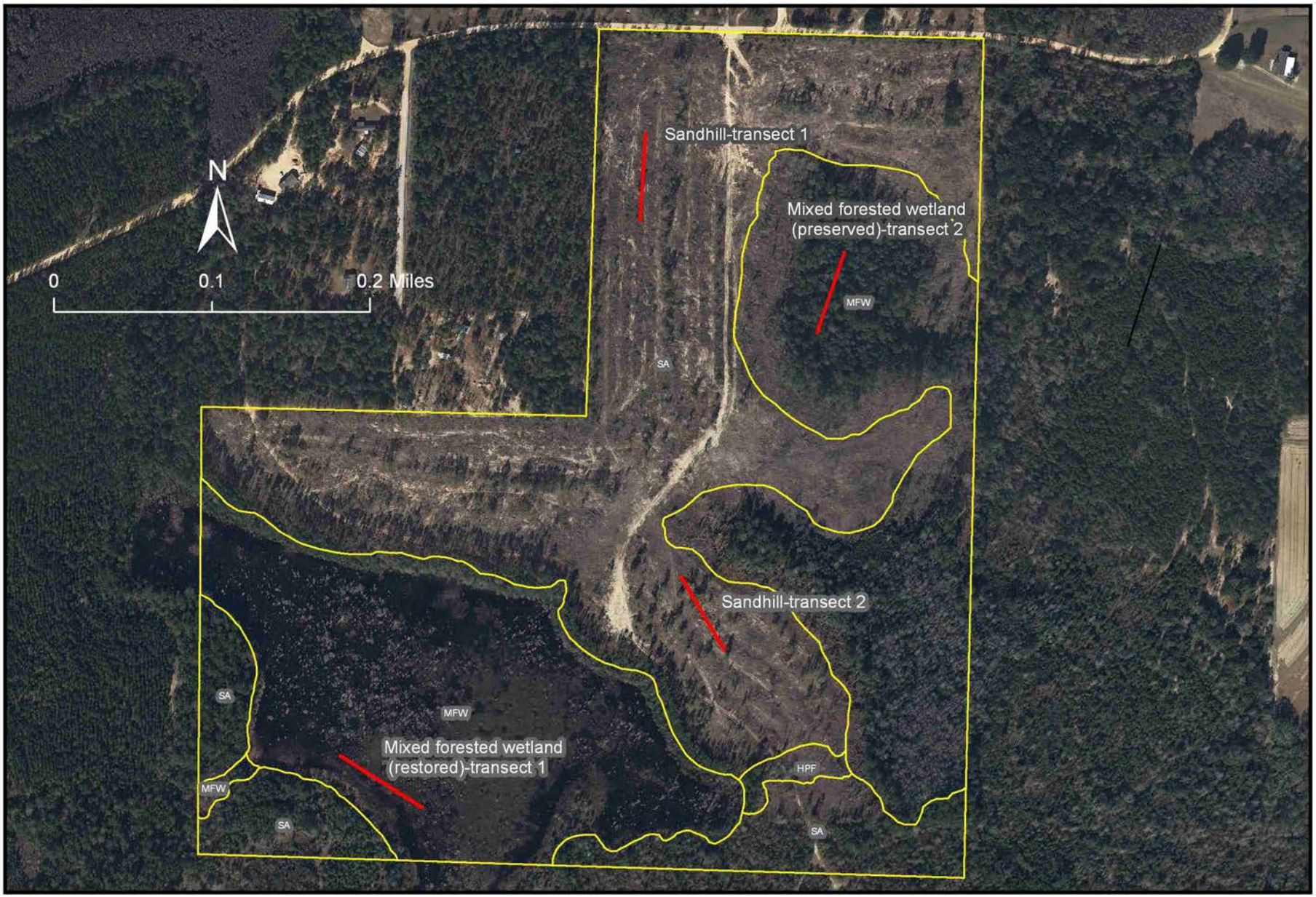


Figure PC-1. Location of permanent transects at Plum Creek at Holmes Creek Mitigation Site in Sandhill and Mixed Forested Wetland.

RESULTS AND DISCUSSION

A total of 190 plant species were observed during the 2019 monitoring period in the target communities at Plum Creek at Holmes Creek Mitigation Site (Table PC-1). Twenty-one new species were found during the 2019 monitoring.

Table PC-1. Plant species observed in target communities at Plum Creek at Holmes Creek Mitigation Site on October 15, 2019 (bold name = new species; bold X = new observation in community type)

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
Acer rubrum	red maple		X		1
Agalinis fasciculata	beach false foxglove	X			1
Agalinis obtusifolia	tenlobe false foxglove	X			1
Agalinis plukenetii	**Plukenet's false foxglove**	**X**			1
Ambrosia artemisiifolia	common ragweed	X			1
Andropogon glomeratus var. *glaucopsis*	purple bluestem		X	**X**	2
Andropogon ternarius	splitbeard bluestem	X		X	2
Andropogon virginicus	broomsedge bluestem	X	X		2
Andropogon virginicus var. *glaucus*	chalky bluestem	X			1
Apteria aphylla	nodding nixie			X	1
Aristida purpurascens	arrowfeather threeawn	X			1
Aristida stricta	wiregrass	X			1
Aronia arbutifolia	red chokeberry		X	**X**	2
Asimina spatulata	paw paw	X			1
Baptisia lanceolata	gopherweed	X			1
Berlandiera pumila	soft greeneyes	X			1
Bidens mitis	smallfruit beggarticks		X		1
Boehmeria cylindrica	**false nettle**		**X**		1
Bulbostylis ciliatifolia	capillary hairsedge	X			1
Callicarpa americana	American beautyberry	X			1
Carex striata	Walter's sedge		**X**	X	2
Carphephorus odoratissimus	vanillaleaf	X			1
Cartrema americanum	wild olive	X		X	2
Chamaecrista fasciculata	partridge pea	X			1
Chrysoma pauciflosculosa	woody goldenrod	X			1
Chrysopsis lanuginosa	Lynn Haven goldenaster	X			1
Cladina evansii	Evans' reindeer lichen	X			1
Cladonia leporina	cup lichen	X			1
Clethra alnifolia	sweet pepperbush		X	X	2
Cliftonia monophylla	black titi			X	1
Cnidoscolus stimulosus	tread softly	X			1
Conyza canadensis	Canadian horseweed	X			1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
Coreopsis tripteris	**tall tickseed**		**X**		1
Crocanthemum carolinianum	Carolina frostweed	X			1
Croptilon divaricatum	slender scratchdaisy	X			1
Crotalaria rotundifolia	rabbitbells	X			1
Croton argyranthemus	silver croton	X			1
Croton glandulosus	vente conmigo	X			1
Cyperus ovatus	pinebarren flatsedge	X			1
Cyperus sp.	flatsedge	X			1
Cyrilla racemiflora	titi		X	X	2
Dalea pinnata	summer farewell	X			1
Decodon verticillatus	willow herb		X		1
Dichanthelium aciculare	needleleaf witchgrass	X			1
Dichanthelium acuminatum	tapered witchgrass	X			1
Dichanthelium clandestinum	**deertongue witchgrass**	**X**			1
Dichanthelium laxiflorum	openflower witchgrass	X			1
Dichanthelium sphaerocarpon	roundseed witchgrass	X			1
Dichanthelium strigosum	roughhair witchgrass	X			1
Diodia teres	poor joe	X			1
Diodia virginiana	Virginia buttonweed	X			1
Diospyros virginiana	common persimmon	X	**X**		2
Dulichium arundinaceum	threeway sedge		X		1
Eleocharis equisetoides	jointed spikerush		X		1
Elephantopus elatus	tall elephantsfoot	X			1
Eragrostis elliottii	Elliott's lovegrass	X			1
Eragrostis virginica	coastal lovegrass	X			1
Eremochloa ophiuroides	centipede grass	X			1
Eriogonum tomentosum	dogtongue wild buckwheat	X			1
Eryngium yuccifolium	button rattlesnakemaster	X			1
Eubotrys racemosus	swamp doghobble		X		1
Eupatorium capillifolium	dogfennel	X			1
Eupatorium compositifolium	yankeeweed	X			1
Eupatorium mohrii	Mohr's thoroughwort		X		1
Eupatorium rotundifolium	roundleaf thoroughwort	X			1
Euphorbia curtisii	**Curtis' spurge**	**X**			1
Euphorbia discoidalis	summer spurge	X			1
Euphorbia floridana	greater Florida spurge	X			1
Euthamia caroliniana	slender flattop goldenrod	X	X		2
Fuirena breviseta	**saltmarsh umbrellasedge**		**X**		1
Galactia minor	leafy milkpea	X			1
Galium hispidulum	coastal bedstraw	X			1
Gelsemium sempervirens	yellow jessamine	X	**X**		2

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
Geobalanus oblongifolius	gopher apple	X			1
Gymnopogon ambiguus	bearded skeletongrass	X			1
Hibiscus aculeatus	comfortroot	X			1
Hypericum brachyphyllum	coastalplain St. John's wort		X		1
Hypericum gentianoides	orangegrass	X			1
Hypericum hypericoides	St. Andrew's cross	X			1
Hypericum microsepalum	**flatwoods St. John's wort**	**X**			1
Hypericum suffruticosum	**pineland St. John's wort**	**X**			1
Hypericum tetrapetalum	fourpetal St. John's wort	X			1
Ilex cassine var. *myrtifolia*	myrtle-leaved holly		X	X	2
Ilex coriacea	large gallberry			X	1
Ilex glabra	gallberry	X	X		2
Ilex opaca	American holly	X			1
Ilex vomitoria	yaupon	X			1
Juncus canadensis	Canadian rush		X		1
Juniperus virginiana	red cedar	X			1
Kellochloa verrucosa	warty panicgrass		X		1
Kosteletzkya pentacarpos	**Virginia saltmarsh mallow**	**X**			1
Lachnanthes caroliana	Carolina redroot		X		1
Lechea sessiliflora	pineland pinweed	X			1
Lespedeza hirta	hairy lespedeza	X			1
Liatris elegans	pinkscale gayfeather	X			1
Liatris gracilis	slender gayfeather	X			1
Liatris pauciflora var. *secunda*	Piedmont gayfeather	X			1
Ludwigia linearis	narrowleaf primrosewillow		X		1
Ludwigia pilosa	hairy primrosewillow		X		1
Ludwigia suffruticosa	shrubby primrosewillow		X		1
Lycopus rubellus	taperleaf waterhorehound		X	**X**	2
Lyonia lucida	fetterbush	**X**		X	2
Magnolia virginiana	sweetbay		X	X	2
Mimosa quadrivalvis	**sensitive briar**	**X**			1
Morella caroliniensis	evergreen bayberry			X	1
Morella cerifera	southern bayberry		X	X	2
Morella inodora	odorless bayberry			X	1
Nymphaea odorata	white waterlily		X		1
Nyssa biflora	swamp tupelo		X	X	2
Oenothera simulans	southern beeblossom	X			1
Oldenlandia uniflora	**clustered mille graines**		**X**		1
Opuntia humifusa	**pricklypear**	**X**			1
Panicum hemitomon	maidencane		X		1
Panicum virgatum	switchgrass	X			1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
Paronychia patula	pineland nailwort	X			1
Passiflora incarnata	**purple passion-flower**	**X**			1
Persea palustris	swamp bay			X	1
Phytolacca americana	American pokeweed	X			1
Pieris phyllyreifolia	climbing fetterbush			X	1
Pinus elliottii	slash pine	X		X	2
Pinus palustris	longleaf pine	X			1
Pityopsis aspera	pineland silkgrass	X			1
Pityopsis graminifolia	narrowleaf silkgrass	X			1
Pluchea odorata	sweetscent		X		1
Polygala nana	candyroot	X			1
Polygonella gracilis	tall jointweed	X			1
Polygonella polygama	**october flower**	**X**			1
Polypremum procumbens	rustweed	X			1
Pseudognaphalium obtusifolium	sweet everlasting	X			1
Pteridium aquilinum	bracken fern	X			1
Quercus falcata	southern red oak	X			1
Quercus hemisphaerica	laurel oak	X			1
Quercus incana	bluejack oak	X			1
Quercus laevis	turkey oak	X			1
Quercus margarettae	sand post oak	X			1
Rhexia mariana	pale meadowbeauty		X		1
Rhexia petiolata	fringed meadowbeauty		X		1
Rhexia virginica	**handsome harry**		**X**		1
Rhododendron canescens	mountain azalea			X	1
Rhus copallinum	winged sumac	X			1
Rhynchosia cytisoides	royal snoutbean	X			1
Rhynchosia reniformis	dollarleaf	X			1
Rhynchospora cephalantha	bunched beaksedge		X		1
Rhynchospora chalarocephala	loosehead beaksedge		X		1
Rhynchospora glomerata	clustered beaksedge			X	1
Rhynchospora leptocarpa	**brownish beaksedge**			**X**	1
Rhynchospora megalocarpa	sandyfield beaksedge	X			1
Rhynchospora scirpoides	**longbeak beaksedge**		**X**		1
Rubus cuneifolius	sand blackberry	X			1
Rubus pensilvanicus	sawtooth blackberry	**X**		X	2
Saccharum giganteum	sugarcane plumegrass	**X**	X		2
Schizachyrium stoloniferum	creeping little bluestem	X			1
Scleria ciliata	fringed nutrush	X			1
Scleria triglomerata	whip nutrush	X			1
Serenoa repens	saw palmetto	X			1

Scientific Name	Common Name	Sandhill	Wetland Forest Mixed - restoration	Wetland Forest Mixed - preserved	Grand Total
Sericocarpus tortifolius	whitetop aster	X			1
Smilax auriculata	earleaf greenbrier	X			1
Smilax bona-nox	saw greenbrier	X			1
Smilax glauca	cat greenbrier	X			1
Smilax laurifolia	laurel greenbrier			X	1
Smilax pumila	sarsaparilla vine	X			1
Smilax tamnoides	**bristly greenbrier**		**X**		1
Smilax walteri	coral greenbrier			X	1
Solidago fistulosa	pinebarren goldenrod	X	X	**X**	3
Solidago odora	sweet goldenrod	X			1
Solidago petiolaris	**downy ragged goldenrod**	**X**		**X**	2
Sorghastrum secundum	lopsided indiangrass	X			1
Sphagnum sp.	sphagnum moss		X	X	2
Stylisma patens	coastalplain dawnflower	X			1
Symphyotrichum dumosum	rice button aster	X			1
Taxodium ascendens	pond cypress		X		1
Tephrosia chrysophylla	scurf hoary-pea	X			1
Tephrosia spicata	spiked hoary-pea	X			1
Toxicodendron radicans	**eastern poison ivy**			**X**	1
Tragia smallii	Small's noseburn	X			1
Tragia urens	wavyleaf noseburn	X			1
Tragia urticifolia	**nettleleaf noseburn**	**X**			1
Triadenum virginicum	Virginia marsh St. John's wort		X		1
Trichostema dichotomum	forked bluecurls	X			1
Vaccinium arboreum	sparkleberry	X			1
Vaccinium corymbosum	highbush blueberry		X	X	2
Vaccinium elliottii	Elliott's blueberry	X		X	2
Vaccinium stamineum	deerberry	X			1
Viburnum nudum	possumhaw			X	1
Vitis rotundifolia	muscadine	X	**X**	X	3
Woodwardia areolata	netted chain fern			X	1
Woodwardia virginica	Virginia chain fern			X	1
Xyris ambigua	coastalplain yellow-eyed grass		X		1
Xyris fimbriata	fringed yellow-eyed grass		X	X	2
Xyris flabelliformis	savannah yellow-eyed grass		X		1
Total number of taxa: 190		129	53	38	220

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 sandhill had been burned within the last year. The diverse but somewhat sparse groundcover included Lynn Haven goldenaster, broomsedge bluestem, little bluestem, and needleleaf witchgrass. Wiregrass was very sparse and native weedy species constituted most of the herb layer. The occasional shrubs were mainly yaupon, turkey oak, sparkleberry, and sand blackberry. The earleaf greenbriar vine was common. Several gopher tortoise burrows were observed during sampling. A total of 129 plant species were identified in this community (Table PC-1).

Quantitative sampling. The northern Transect 1 (Table PC-2, Figure PC-2) was located midslope on an east-facing hill. It had a total of 58 species with 35% bare ground. The ground layer consisted of mainly herbaceous species with scattered shrubs, principally yaupon. Broomsedge bluestem had the the highest percent cover by followed by yaupon, earleaf greenbrier, tapered witchgrass, and yankeeweed. Wiregrass was present at around 2% cover. Woody species made up around 15% average cover per quadrat. There were more species observed during the 2019 sampling compared to last year, but less Lynn Haven goldenaster was detected, likely due to fire effects.

The southern Transect 2 (Table PC-3, Figure PC-3) was situated near the top of a low ridge. It had a total of 47 species with 43% bare ground. The vegetation was about 70% herbaceous/30% woody species cover. Among the herbs, narrowleaf silkgrass and Lynn Haven goldenaster had the highest covers. Saw palmetto, earleaf greenbrier, and sand blackberry formed most of the woody cover which made up around 14% average cover per quadrat. Although not recorded as cover, fruticose lichens were observed in several quadrats. As with Transect 1, less Lynn Haven goldenaster was observed compared with last year. There were noticeable decreases in yellow jessamine and blackberry covers.

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

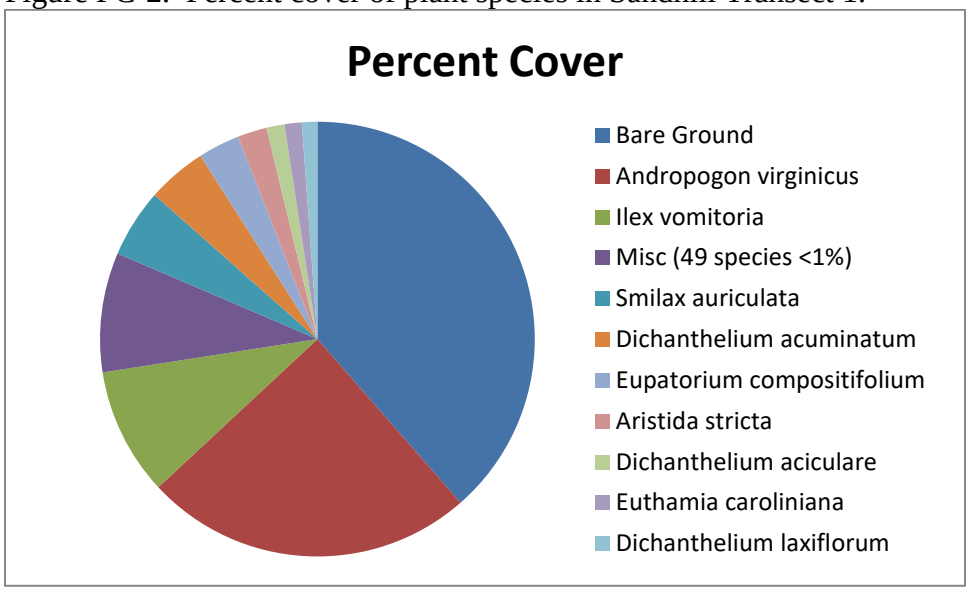


Table PC-2. Percent cover of plant species in Sandhill Transect 1 sampled on October 15, 2019.

Scientific name	Common name	Average percent cover per quadrat
Andropogon virginicus	broomsedge bluestem	22.13
Ilex vomitoria	yaupon	8.57
Smilax auriculata	earleaf greenbrier	4.60
Dichanthelium acuminatum	tapered witchgrass	4.00
Eupatorium compositifolium	yankeeweed	2.80
Aristida stricta	wiregrass	1.97
Dichanthelium aciculare	needleleaf witchgrass	1.20
Euthamia caroliniana	slender flattop goldenrod	1.17
Dichanthelium laxiflorum	openflower witchgrass	1.03
Chrysopsis lanuginosa	Lynn Haven goldenaster	0.73
Scleria triglomerata	whip nutrush	0.67
Gelsemium sempervirens	yellow jessamine	0.60
Smilax glauca	cat greenbrier	0.57
Solidago odora	sweet goldenrod	0.50
Aristida purpurascens	arrowfeather threeawn	0.43
Hypericum gentianoides	orangegrass	0.43
Croptilon divaricatum	slender scratchdaisy	0.37
Andropogon ternarius	splitbeard bluestem	0.33
Hypericum hypericoides	St. Andrew's cross	0.23
Rubus pensilvanicus	sawtooth blackberry	0.23
Symphyotrichum dumosum	rice button aster	0.23
Bulbostylis ciliatifolia	capillary hairsedge	0.17
Dalea pinnata	summer farewell	0.17
Cnidoscolus stimulosus	tread softly	0.13
Dichanthelium sphaerocarpon	roundseed witchgrass	0.13

Scientific name	Common name	Average percent cover per quadrat
Liatris gracilis	slender gayfeather	0.13
Pityopsis aspera	pineland silkgrass	0.13
Agalinis fasciculata	beach false foxglove	0.10
Diospyros virginiana	common persimmon	0.10
Galactia minor	leafy milkpea	0.10
Hibiscus aculeatus	comfortroot	0.10
Pseudognaphalium obtusifolium	sweet everlasting	0.10
Quercus margarettae	sand post oak	0.10
Scleria ciliata	fringed nutrush	0.10
Vaccinium stamineum	deerberry	0.10
Vitis rotundifolia	muscadine	0.10
Conyza canadensis	Canadian horseweed	0.07
Galium hispidulum	coastal bedstraw	0.07
Polygonella gracilis	tall jointweed	0.07
Rhynchosia cytisoides	royal snoutbean	0.07
Tragia urticifolia	nettleleaf noseburn	0.07
Trichostema dichotomum	forked bluecurls	0.07
Baptisia lanceolata	gopherweed	0.03
Croton argyranthemus	silver croton	0.03
Eragrostis elliottii	Elliott's lovegrass	0.03
Eriogonum tomentosum	dogtongue wild buckwheat	0.03
Geobalanus oblongifolius	gopher apple	0.03
Lechea sessiliflora	pineland pinweed	0.03
Oenothera simulans	southern beeblossom	0.03
Panicum virgatum	switchgrass	0.03
Polypremum procumbens	rustweed	0.03
Rhynchosia reniformis	dollarleaf	0.03
Rubus cuneifolius	sand blackberry	0.03
Schizachyrium stoloniferum	creeping little bluestem	0.03
Smilax pumila	sarsaparilla vine	0.03
Solidago fistulosa	pinebarren goldenrod	0.03
Stylisma patens	coastalplain dawnflower	0.03
Vaccinium arboreum	sparkleberry	0.03
Bare Ground		34.83

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

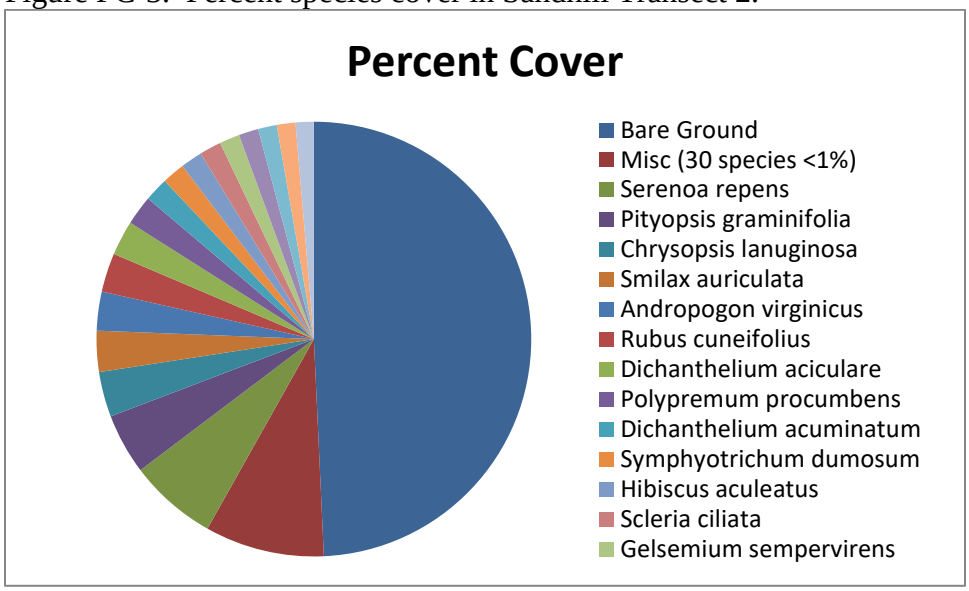


Table PC-3. Percent cover of plant species in Sandhill Transect 2 sampled on October 15, 2019.

Scientific name	Common name	Average percent cover per quadrat
Serenoa repens	saw palmetto	5.67
Pityopsis graminifolia	narrowleaf silkgrass	3.90
Chrysopsis lanuginosa	Lynn Haven goldenaster	2.90
Smilax auriculata	earleaf greenbrier	2.63
Andropogon virginicus	broomsedge bluestem	2.50
Rubus cuneifolius	sand blackberry	2.50
Dichanthelium aciculare	needleleaf witchgrass	2.23
Polypremum procumbens	rustweed	1.90
Dichanthelium acuminatum	tapered witchgrass	1.53
Symphyotrichum dumosum	rice button aster	1.47
Hibiscus aculeatus	comfortroot	1.40
Scleria ciliata	fringed nutrush	1.40
Gelsemium sempervirens	yellow jessamine	1.30
Cyperus ovatus	pinebarren flatsedge	1.27
Aristida purpurascens	arrowfeather threeawn	1.20
Solidago odora	sweet goldenrod	1.20
Pityopsis aspera	pineland silkgrass	1.17
Andropogon ternarius	splitbeard bluestem	0.83
Pteridium aquilinum	bracken fern	0.77
Quercus hemisphaerica	laurel oak	0.73
Lechea sessiliflora	pineland pinweed	0.53
Diospyros virginiana	common persimmon	0.50
Pinus palustris	longleaf pine	0.50
Smilax bona-nox	saw greenbrier	0.47
Euthamia caroliniana	slender flattop goldenrod	0.37
Dichanthelium strigosum	roughhair witchgrass	0.33

Scientific name	Common name	Average percent cover per quadrat
Cyperus sp.	flatsedge	0.30
Eupatorium compositifolium	yankeeweed	0.30
Hypericum gentianoides	orangegrass	0.30
unknown		0.30
Andropogon virginicus var. *glaucus*	chalky bluestem	0.23
Liatris gracilis	slender gayfeather	0.20
Aristida stricta	wiregrass	0.17
Tragia urens	wavyleaf noseburn	0.17
Croton glandulosus var. *septentrionalis*	vente conmigo	0.10
Eupatorium capillifolium	dogfennel	0.10
Smilax glauca	cat greenbrier	0.10
Rhynchospora megalocarpa	sandyfield beaksedge	0.07
Asimina spatulata	paw paw	0.03
Crocanthemum carolinianum	Carolina frostweed	0.03
Diodia virginiana	Virginia buttonweed	0.03
Polygala nana	candyroot	0.03
Polygonella polygama	october flower	0.03
Pseudognaphalium obtusifolium	sweet everlasting	0.03
Tragia smallii	Small's noseburn	0.03
Tragia sp.	noseburn	0.03
Vaccinium arboreum	sparkleberry	0.03
Bare Ground		42.57

Wetland Forest Mixed (Restoration)

Qualitative sampling. The Wetland Forest Mixed Restoration area (Figure PC-1) resembled a marsh due to its sparse tree cover. The muck soil of the former beaver pond was partially inundated at the time of the survey. The vegetative cover consisted primarily of willow herb, a low shrub with woody base and herbaceous stems that arch over to form a nearly impenetrable interlacing thicket. Interspersed with the willow herb were patches of young cypress with occasional swamp tupelo, sweetbay, and red maple. Shallower areas near the shore were lined with a diverse set of wetland herbs, including taperleaf waterhorehound, loosehead beaksedge, and maidencane. Shrubs and small trees dominated the ecotone to the adjacent uplands. The total number of species observed in this community was 53 (Table PC-1).

Quantitative sampling. Transect 1 (Table PC-4, Figure PC-4) had a total of 21 species with 35% bare ground (including water). The transect was mostly flooded, although water levels were down compared to the 2018 sample. In general, the western end of the transect was shallower than the eastern end where hummocks were common. The highest percent cover was by willow herb followed by taperleaf waterhorehound, loosehead beaksedge, and coastalplain yelloweyed grass. White waterlily and humped bladderwort, dominant species last year, were drastically reduced in cover, probably owing to the difference in water levels. Woody species made around 25% average cover per quadrat.

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

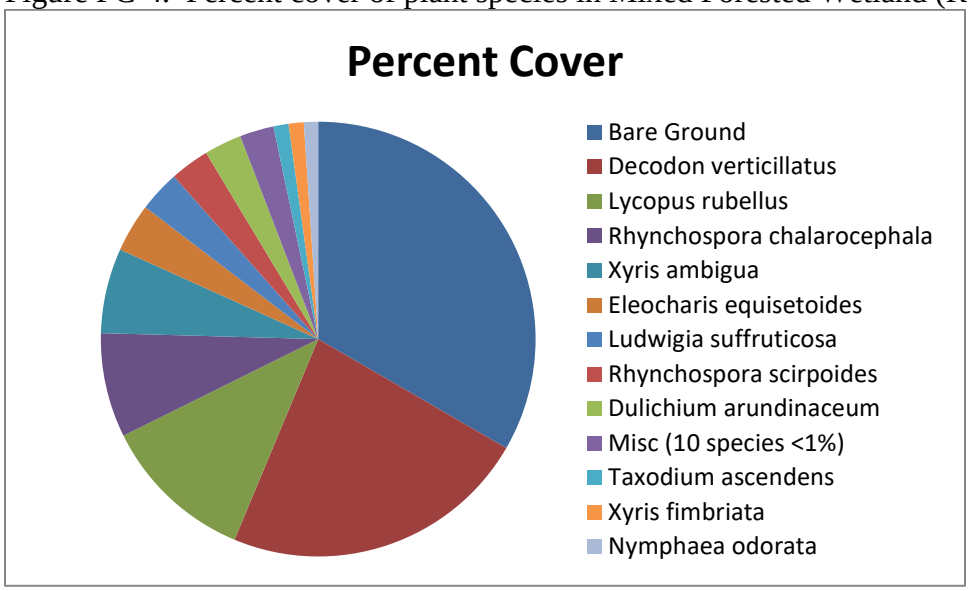


Table PC-4. Percent cover of plant species in Mixed Forested Wetland (Restored) Transect 1 sampled on October 15, 2019.

Scientific name	Common name	Average percent cover per quadrat
Decodon verticillatus	willow herb	23.83
Lycopus rubellus	taperleaf waterhorehound	11.83
Rhynchospora chalarocephala	loosehead beaksedge	8.07
Xyris ambigua	coastalplain yellow-eyed grass	6.57
Eleocharis equisetoides	jointed spikerush	3.77
Ludwigia suffruticosa	shrubby primrosewillow	3.20
Rhynchospora scirpoides	longbeak beaksedge	3.03
Dulichium arundinaceum	threeway sedge	2.90
Taxodium ascendens	pond cypress	1.17
Xyris fimbriata	fringed yellow-eyed grass	1.17
Nymphaea odorata	white waterlily	1.10
Juncus canadensis	Canadian rush	0.70
Panicum hemitomon	maidencane	0.70
Triadenum virginicum	Virginia marsh St. John's wort	0.37
Cyperaceae		0.23
Lachnanthes caroliana	Carolina redroot	0.23
Xyris flabelliformis	savannah yellow-eyed grass	0.13
Magnolia virginiana	sweetbay	0.10
Nyssa biflora	swamp tupelo	0.10
Oldenlandia uniflora	clustered mille graines	0.03
Sphagnum sp.	sphagnum moss	0.03
Bare Ground		34.67

Wetland Forest Mixed (Preserved)

Qualitative sampling. The Preserved Wetland Forest Mixed (Figure PC-1) was a relatively undisturbed mature baygall forest. The tall canopy of large trees formed dense shade with occasional openings. Following Hurricane Michael in 2018, many trees and limbs were down in this community. Dominant species were sweetbay, swamp tupelo, and Virginia live oak. The dense subcanopy was formed primarily by tree-size black titi, and swamp bay. The moderately dense shrub layer consisted mainly of large gallberry, fetterbush, and sweet pepperbush. The sparse herb layer was primarily sphagnum moss. The muck soil was saturated, but no standing water was present at the time of sampling. The total number of species observed in this community was 38, a notable increase from the 2018 sample of just 27 species immediately following Hurricane Michael (Table PC-1).

Quantitative sampling. Transect 2 (Table PC-5, Figure PC-5) had a total of 23 species with 68% bare ground. The dominant shrubs were fetterbush, large gallberry, sweet pepperbush, and black titi. Woody species made around 28% average cover per quadrat, accounting for around ¾ of the total cover observed. Sphagnum moss formed most of the sparse herbaceous cover.

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

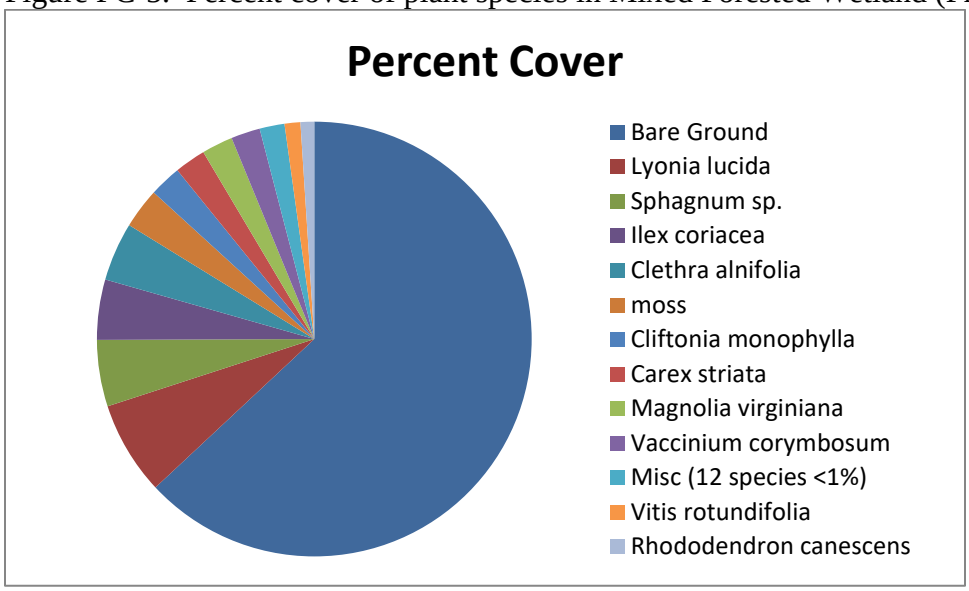


Table PC-5. Percent cover of plant species in Mixed Forested Wetland (Preserved) Transect 2 sampled on October 15, 2019.

Scientific name	Common name	Average percent cover per quadrat
Lyonia lucida	fetterbush	7.50
Sphagnum sp.	sphagnum moss	5.33
Ilex coriacea	large gallberry	4.83
Clethra alnifolia	sweet pepperbush	4.70
moss		3.23

Scientific name	Common name	Average percent cover per quadrat
Cliftonia monophylla	black titi	2.57
Carex striata	Walter's sedge	2.50
Magnolia virginiana	sweetbay	2.50
Vaccinium corymbosum	highbush blueberry	2.33
Vitis rotundifolia	muscadine	1.27
Rhododendron canescens	mountain azalea	1.10
Woodwardia virginica	Virginia chain fern	0.50
Rhynchospora leptocarpa	brownish beaksedge	0.37
Morella inodora	odorless bayberry	0.23
Persea palustris	swamp bay	0.23
Smilax laurifolia	laurel greenbrier	0.20
Andropogon ternarius	splitbeard bluestem	0.10
Solidago fistulosa	pinebarren goldenrod	0.10
Viburnum nudum	possumhaw	0.10
Vaccinium elliottii	Elliott's blueberry	0.07
Aronia arbutifolia	red chokeberry	0.03
Poaceae		0.03
Rubus pensilvanicus	sawtooth blackberry	0.03
Bare Ground		68.00

Ward Creek West Mitigation Site

Qualitative and Quantitative Monitoring

October 2019

Ward Creek West Mitigation Site
Qualitative and Quantitative Monitoring
October 2019

INTRODUCTION

The Ward Creek West Mitigation Site consists of 724 acres in Bay County managed by the Northwest Florida Water Management District. It is located 0.5 mile west of SR 79 and 2.5 miles north of the junction of SR 79 and US 98. The Ward Creek West Mitigation Project aims to restore hydric pine flatwoods (HPF) and hydric pine savanna (HPS) which had been converted to slash pine plantation, as well as to convert portions of the mixed forested wetlands to cypress (CY; Figure WC-1). Quantitative and qualitative monitoring was used to document the current plant species composition and vegetation structure of these targeted communities. The site vegetation was previously monitored by FNAI biologists during the fall from 2012 through 2018.

METHODS

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

The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through each of the two target communities plus the Cypress area. The field surveys were performed by FNAI botanists Amy Jenkins and Brenda Herring on October 28-29, 2019.

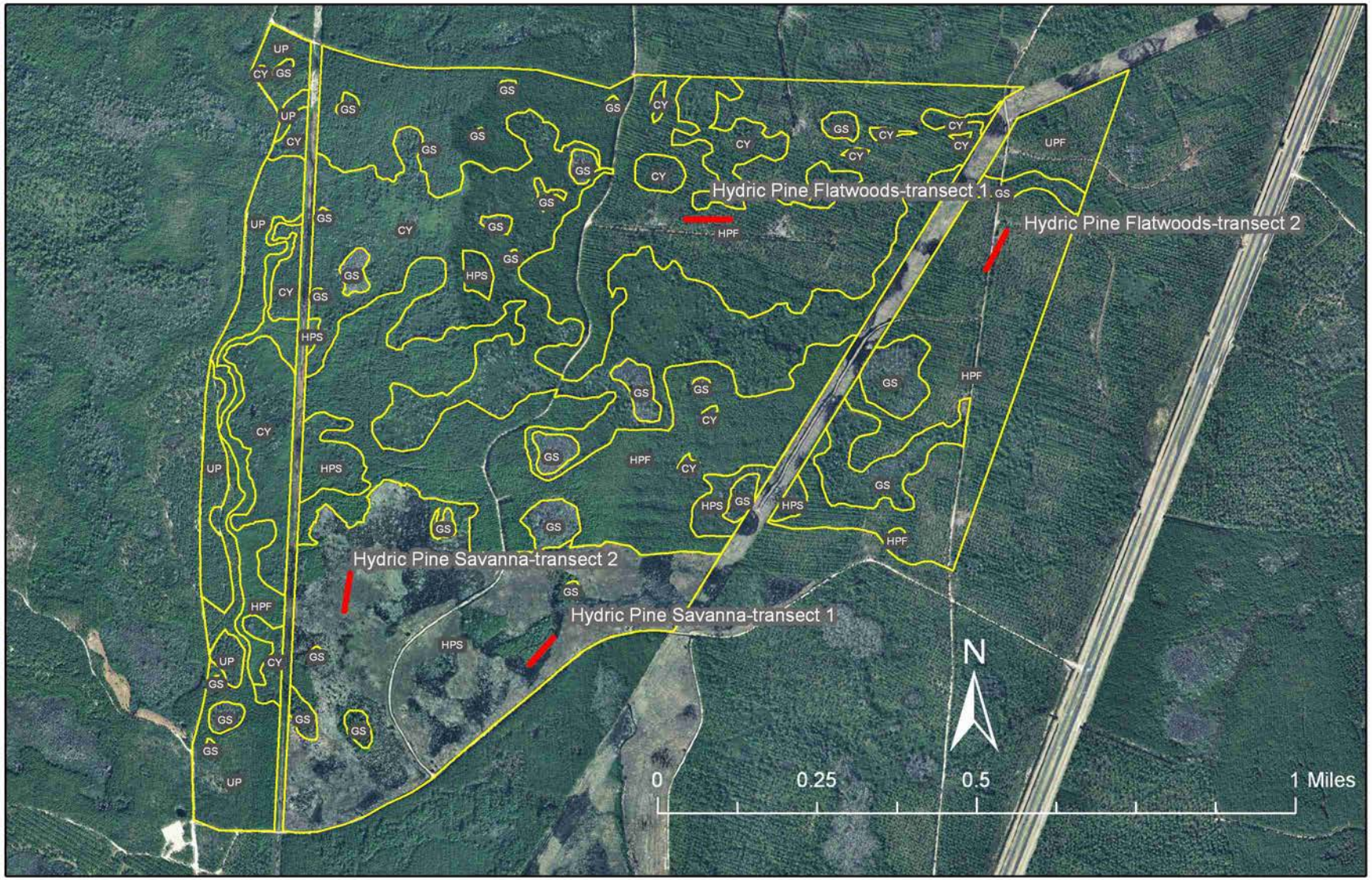


Figure WC-1. Location of permanent transects at Ward Creek West Mitigation Site. CY=Cypress, UP=Upland Pine, HPF=Hydric Pine Flatwoods, HPS=Hydric Pine Savanna, GS=Gum Swamp.

RESULTS AND DISCUSSION

A total of 132 plant species were recorded during 2019 monitoring session in the target communities at Ward Creek West (Table WC-1). Four new species were recorded during the 2019 monitoring.

Table WC-1. Plant species observed in the target communities at Ward Creek West Mitigation Site on October 28-29, 2019. (bold name = new species; bold X = new observation in community type)

Scientific Name	Common Name	Cypress	Hydric Pine Flatwoods	Hydric Pine Savanna	Grand Total
Andropogon glomeratus	bushy bluestem		X	X	2
Andropogon glomeratus var. *glaucopsis*	purple bluestem	**X**	X	X	3
Andropogon sp.	bluestem			X	1
Andropogon virginicus	broomsedge bluestem		X	X	2
Andropogon virginicus var. *glaucus*	chalky bluestem	X			1
Aristida spiciformis	bottlebrush threeawn		X	X	2
Aristida stricta	wiregrass		X	X	2
Bidens mitis	smallfruit beggarticks	**X**			1
Carex glaucescens	clustered sedge	**X**			1
Carex striata	Walter's sedge			X	1
Carphephorus odoratissimus	vanillaleaf		X	X	2
Centella asiatica	spadeleaf			X	1
Chamaecrista fasciculata	partridge pea		X		1
Chrysopsis lanuginosa	Lynn Haven goldenaster		X		1
Clethra alnifolia	sweet pepperbush	X	X		2
Cliftonia monophylla	black titi	X	X	X	3
Coleataenia anceps	beaked panicum		X		1
Coreopsis floridana	Florida tickseed		X		1
Ctenium aromaticum	toothache grass			X	1
Cyperus croceus	**Baldwin's flatsedge**		**X**		1
Cyperus haspan	haspan flatsedge			**X**	1
Cyrilla racemiflora	titi	X	X	X	3
Dichanthelium ensifolium	cypress witchgrass	**X**	X	X	3
Dichanthelium scabriusculum	woolly witchgrass	X	X	X	3
Dichanthelium sp.	witchgrass		X	X	2
Dichanthelium sphaerocarpon	roundseed witchgrass		X		1
Diodia virginiana	Virginia buttonweed			**X**	1
Drosera capillaris	pink sundew			X	1
Eragrostis elliottii	**Elliott's lovegrass**			**X**	1
Erechtites hieraciifolius	fireweed		**X**		1
Eriocaulon decangulare	tenangle pipewort	X	X	X	3
Eupatorium capillifolium	dogfennel	**X**	X		2
Eupatorium leucolepis	justiceweed			X	1
Eupatorium mohrii	Mohr's thoroughwort		X	X	2

Scientific Name	Common Name	Cypress	Hydric Pine Flatwoods	Hydric Pine Savanna	Grand Total
Euthamia caroliniana	slender flattop goldenrod		X	X	2
Fuirena breviseta	saltmarsh umbrellasedge			X	1
Gaylussacia dumosa	dwarf huckleberry		X	**X**	2
Gaylussacia frondosa var. *tomentosa*	blue huckleberry		X		1
Gaylussacia mosieri	woolly huckleberry			X	1
Helianthus angustifolius	narrowleaf sunflower			X	1
Hypericum brachyphyllum	coastalplain St. John's wort			X	1
Hypericum cistifolium	roundpod St. John's wort	X	X	X	3
Hypericum fasciculatum	peelbark St. John's wort		X	X	2
Hypericum gentianoides	orangegrass		X		1
Hypericum microsepalum	flatwoods St. John's wort		X	X	2
Hypericum tetrapetalum	fourpetal St. John's wort		X	X	2
Ilex coriacea	large gallberry		X	X	2
Ilex glabra	gallberry	X	X	X	3
Ilex vomitoria	yaupon			X	1
Juncus marginatus	grassleaf rush		X	X	2
Juncus pelocarpus	**annual rush**		**X**	**X**	2
Juncus scirpoides	needlepod rush			X	1
Kalmia hirsuta	hairy wicky		X	X	2
Kellochloa verrucosa	warty panicgrass		X	X	2
Lachnanthes caroliana	Carolina redroot		X	X	2
Lachnocaulon anceps	whitehead bogbutton		X	X	2
Liatris spicata	dense gayfeather		X	X	2
Lophiola aurea	golden crest	X	X	X	3
Lycopodiella alopecuroides	foxtail club-moss		X	X	2
Lyonia ferruginea	rusty staggerbush		X	X	2
Lyonia fruticosa	coastalplain staggerbush		**X**		1
Lyonia lucida	fetterbush	X	X	X	3
Magnolia virginiana	sweetbay	X	X	X	3
Morella caroliniensis	evergreen bayberry	X		X	2
Morella cerifera	southern bayberry	X			1
moss			X		1
Nyssa biflora	swamp tupelo	X			1
Nyssa ursina	bog tupelo			X	1
Oldenlandia uniflora	clustered mille graines		X	X	2
Osmunda cinnamomea	cinnamon fern	X			1
Panicum repens	torpedo grass		X	X	2
Panicum virgatum	switchgrass		X		1
Paspalum setaceum	thin paspalum		**X**		1
Persea palustris	swamp bay	X			1
Pieris phyllyreifolia	climbing fetterbush	X			1
Pinus elliottii	slash pine	X	X	X	3
Pityopsis graminifolia	narrowleaf silkgrass		X		1

Scientific Name	Common Name	Cypress	Hydric Pine Flatwoods	Hydric Pine Savanna	Grand Total
Polygala cruciata	drumheads			X	1
Polygala cymosa	tall pinebarren milkwort			X	1
Polygala lutea	orange milkwort		X		1
Proserpinaca pectinata	combleaf mermaidweed			X	1
Pteridium aquilinum	bracken fern		X	X	2
Quercus minima	dwarf live oak		X	**X**	2
Quercus virginiana	**live oak**			**X**	1
Rhexia mariana	pale meadowbeauty		X	X	2
Rhexia nuttallii	Nuttall's meadowbeauty		**X**	X	2
Rhexia petiolata	fringed meadowbeauty		X	X	2
Rhexia virginica	handsome harry		X	X	2
Rhus copallinum	winged sumac		X		1
Rhynchospora baldwinii	Baldwin's beaksedge		X		1
Rhynchospora cephalantha	bunched beaksedge	X	X	X	3
Rhynchospora chalarocephala	loosehead beaksedge		X	X	2
Rhynchospora chapmanii	Chapman's beaksedge		X	X	2
Rhynchospora ciliaris	fringed beaksedge		X	X	2
Rhynchospora corniculata	shortbristle horned beaksedge	X		X	2
Rhynchospora fascicularis	fascicled beaksedge	X	X	X	3
Rhynchospora gracilenta	slender beaksedge		X	X	2
Rhynchospora microcephala	bunched beaksedge	**X**	X		2
Rhynchospora plumosa	plumed beaksedge		X	X	2
Rhynchospora sp.	beaksedge		X		1
Rubus pensilvanicus	sawtooth blackberry		X	X	2
Sabatia brevifolia	shortleaf rosegentian		X	X	2
Saccharum giganteum	sugarcane plumegrass		X	X	2
Sarracenia flava	yellow pitcherplant			X	1
Scleria ciliata	fringed nutrush		X		1
Scleria reticularis	netted nutrush		X		1
Serenoa repens	saw palmetto	X	X	X	3
Smilax auriculata	earleaf greenbrier		X		1
Smilax bona-nox	saw greenbrier			**X**	1
Smilax glauca	cat greenbrier	X			1
Smilax laurifolia	laurel greenbrier	X	X	X	3
Smilax pumila	sarsaparilla vine		X	X	2
Smilax walteri	coral greenbrier	X	X	X	3
Solidago fistulosa	pinebarren goldenrod		X	X	2
Solidago odora	sweet goldenrod			X	1
Sphagnum sp.	sphagnum moss	X	X	X	3
Syngonanthus flavidulus	yellow hatpins			X	1
Taxodium ascendens	pond cypress	X		X	2
Tillandsia usneoides	Spanish moss	**X**			1
Vaccinium corymbosum	highbush blueberry	X	X		2

Scientific Name	Common Name	Cypress	Hydric Pine Flatwoods	Hydric Pine Savanna	Grand Total
Vaccinium darrowii	Darrow's blueberry		X		1
Vaccinium myrsinites	shiny blueberry			**X**	1
Vitis rotundifolia	muscadine	X	X	X	3
Woodwardia areolata	netted chain fern	X		**X**	2
Woodwardia virginica	Virginia chain fern	**X**	X	**X**	3
Xyris ambigua	coastalplain yellow-eyed grass	X	X	X	3
Xyris brevifolia	shortleaf yellow-eyed grass		X	X	2
Xyris caroliniana	Carolina yellow-eyed grass		X		1
Xyris elliottii	Elliott's yellow-eyed grass		X	X	2
Xyris fimbriata	fringed yellow-eyed grass			X	1
Xyris flabelliformis	savannah yellow-eyed grass		X	X	2
Xyris platylepis	tall yellow-eyed grass		X		1
Total number of taxa: 132		39	92	94	225

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. There were numerous pine trees blown down by the recent hurricane in early October 2018, but these were mostly concentrated in the more densely planted stand immediately north of the large Hydric Pine Savanna. The open canopy of mature slash pines covered a variously dense shrub layer. The area near Transect 1 (western transect) had been bedded years ago when the pines were planted. This area had a moderately dense shrub stratum and an herbaceous layer composed primarily of purple bluestem. The eastern section near Transect 2 had more saw palmetto and gallberry and a diverse herbaceous cover with scattered patches of wiregrass and beaksedges. This area was recently burned. The total number of species observed in this community was 92 (Table WC-1).

Quantitative sampling. The western Transect 1 (Table WC-2, Figure WC-2) had a total of 23 species with 26% bare ground. Numerous slash pines had fallen in the area of the transect due to past storms. Purple bluestem contributed the most cover, followed by woody species (large gallberry, black titi, saw palmetto, and sweet pepperbush). Woody species made up well over half of the total cover, around 43% average cover per quadrat. This transect was largely unchanged from last year.

The eastern Transect 2 (Table WC-3, Figure WC-3) had a total of 36 species with 52% bare ground. Shrubby species, primarily saw palmetto, dwarf live oak, and gallberry, contributed a little less than half of the total cover. Woody species made around 13% average cover per quadrat. Shortleaf yellow-eyed grass, broomsedge bluestem, purple bluestem, sphagnum moss, and fascicled beaksedge made up most of the sparse herbaceous cover. There was an overall reduction of total plant cover, which averaged 30% per quad, compared the cover measured in 2018, which averaged 52% per quad.

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

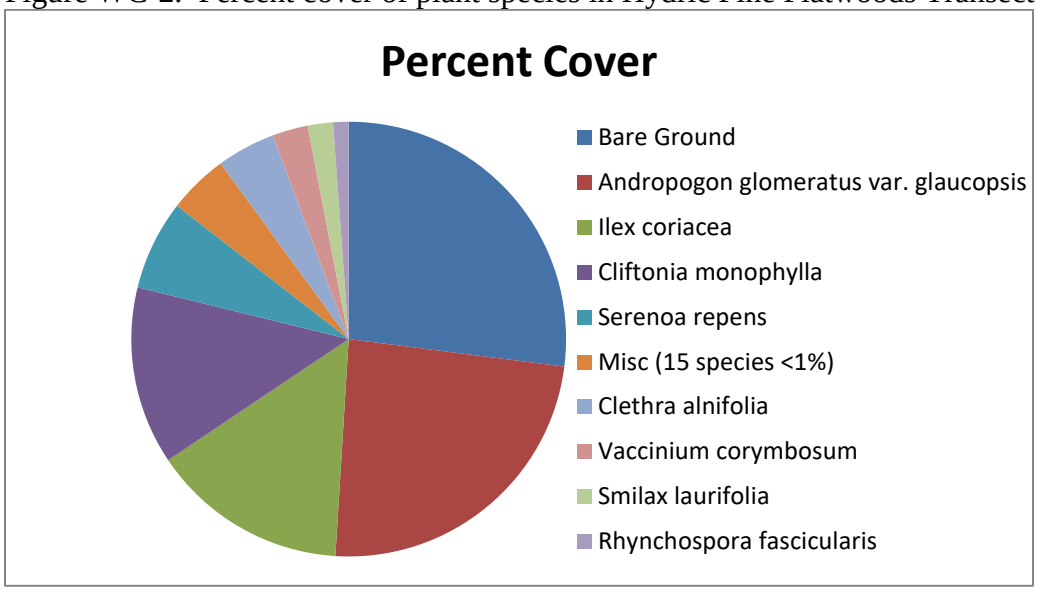


Table WC-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1 sampled on October 28, 2019.

Scientific name	Common name	Average percent cover per quadrat
Andropogon glomeratus var. *glaucopsis*	purple bluestem	22.93
Ilex coriacea	large gallberry	14.00
Cliftonia monophylla	black titi	12.67
Serenoa repens	saw palmetto	6.40
Clethra alnifolia	sweet pepperbush	4.17
Vaccinium corymbosum	highbush blueberry	2.53
Smilax laurifolia	laurel greenbrier	1.80
Rhynchospora fascicularis	fascicled beaksedge	1.10
Hypericum microsepalum	flatwoods St. John's wort	0.73
Lyonia ferruginea	rusty staggerbush	0.73
Dichanthelium ensifolium	cypress witchgrass	0.53
Rhynchospora plumosa	plumed beaksedge	0.53
Xyris flabelliformis	savannah yellow-eyed grass	0.50
Lachnanthes caroliana	Carolina redroot	0.37
Polygala lutea	orange milkwort	0.27
Dichanthelium sphaerocarpon	roundseed witchgrass	0.10
Rhynchospora chalarocephala	loosehead beaksedge	0.10
Rhynchospora ciliaris	fringed beaksedge	0.10
Rubus pensilvanicus	sawtooth blackberry	0.10
Vitis rotundifolia	muscadine	0.10
Oldenlandia uniflora	clustered mille graines	0.03
Scleria ciliata	fringed nutrush	0.03
Xyris brevifolia	shortleaf yellow-eyed grass	0.03
Bare Ground		25.87

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

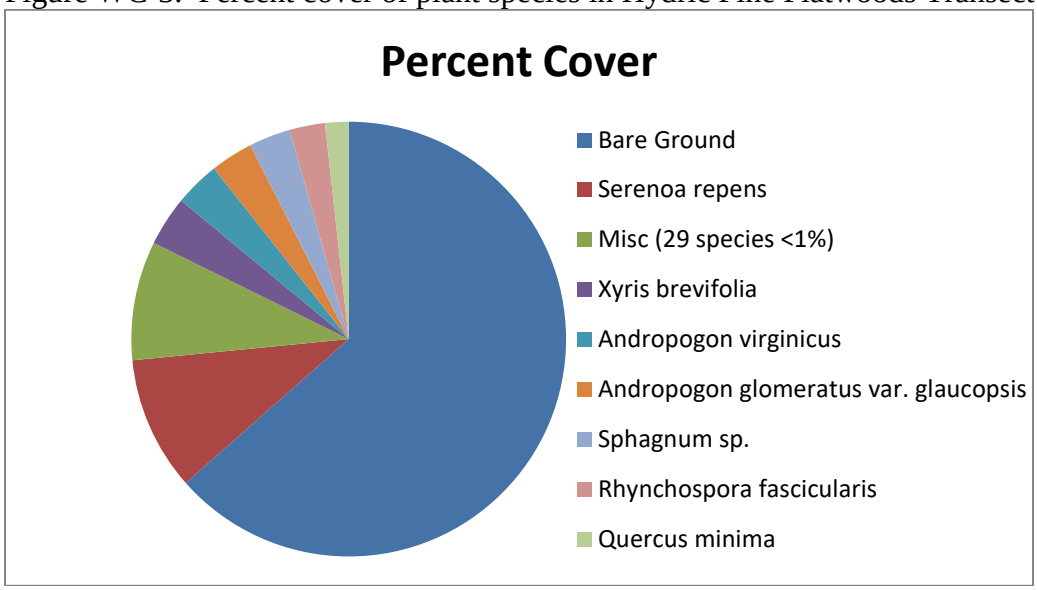


Table WC-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 sampled on October 28, 2019.

Scientific name	Common name	Average percent cover per quadrat
Serenoa repens	saw palmetto	8.17
Xyris brevifolia	shortleaf yellow-eyed grass	3.03
Andropogon virginicus	broomsedge bluestem	2.77
Andropogon glomeratus var. *glaucopsis*	purple bluestem	2.60
Sphagnum sp.	sphagnum moss	2.53
Rhynchospora fascicularis	fascicled beaksedge	2.17
Quercus minima	dwarf live oak	1.43
Ilex glabra	gallberry	0.83
Cliftonia monophylla	black titi	0.60
Cyrilla racemiflora	titi	0.60
Kellochloa verrucosa	warty panicgrass	0.60
Rhynchospora cephalantha	bunched beaksedge	0.50
Rhynchospora plumosa	plumed beaksedge	0.50
Xyris platylepis	tall yellow-eyed grass	0.50
Coleataenia anceps	beaked panicum	0.37
Xyris caroliniana	Carolina yellow-eyed grass	0.33
Dichanthelium ensifolium	cypress witchgrass	0.30
Gaylussacia frondosa var. *tomentosa*	blue huckleberry	0.30
Hypericum microsepalum	flatwoods St. John's wort	0.23
Kalmia hirsuta	hairy wicky	0.23
Lyonia lucida	fetterbush	0.23
Aristida spiciformis	bottlebrush threeawn	0.13
Lachnocaulon anceps	whitehead bogbutton	0.13
Aristida stricta	wiregrass	0.10
Carphephorus odoratissimus	vanillaleaf	0.10

Scientific name	Common name	Average percent cover per quadrat
Dichanthelium sp.	witchgrass	0.10
Vaccinium darrowii	Darrow's blueberry	0.10
Xyris ambigua	coastalplain yellow-eyed grass	0.10
Dichanthelium sphaerocarpon	roundseed witchgrass	0.07
Pinus elliottii	slash pine	0.07
Rhynchospora sp.	beaksedge	0.07
Ilex coriacea	large gallberry	0.03
Lachnanthes caroliana	Carolina redroot	0.03
Rhexia petiolata	fringed meadowbeauty	0.03
Smilax auriculata	earleaf greenbrier	0.03
Woodwardia virginica	Virginia chain fern	0.03
Bare Ground		52.13

Hydric Pine Savanna

Qualitative sampling. The hydric pine savanna restoration area was highly disturbed by past silviculture operations. The pines have been harvested and the vegetative cover currently consists of a dense, tall stand of purple bluestem intermixed with widely scattered clumps of wiregrass. Widely scattered young slash pine and pond cypress and shrub clumps of fetterbush, titi and black titi occur throughout. Three state-listed species are known from this community, the threatened Curtiss' sandgrass (*Calamovilfa curtissii*) and red-flowered pitcher plant (*Sarracenia rubra*), plus the endangered upland spreading pogonia (*Cleistes bifaria*). However, none of these were located during the 2019 survey. The total number of plant species observed in this community was 94 (Table WC-1).

Quantitative sampling. Transect 1 (Table WC-4, Figure WC-4) had a total of 35 species and 18% bare ground. This site had burned recently. Groundcover was heavily dominated by purple bluestem, followed by the shrub fetterbush. Fascicled beaksedge, Carolina redroot, and black titi also contributed significant cover. Woody species made up about a third of the overall plant cover, around 21% average cover per quadrat. There was less total plant cover per quad compared with last year, but relative cover by species was roughly the same.

Transect 2 (Table WC-5, Figure WC-5) had a total of 30 species and 21% bare ground. The vegetation was dominated by purple bluestem followed by black titi shrubs. The next most abundant species, all herbs, totalling around 13% percent of cover, were tenangle pipewort, plumed beaksedge, fascicled beaksedge, Carolina redroot, and wiregrass. Woody species made up around one quarter of the overall plant cover, around 18% average cover per quadrat. Only the south marker of this transect was re-located. All other flagging and the north stake were missing and had to be re-established.

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

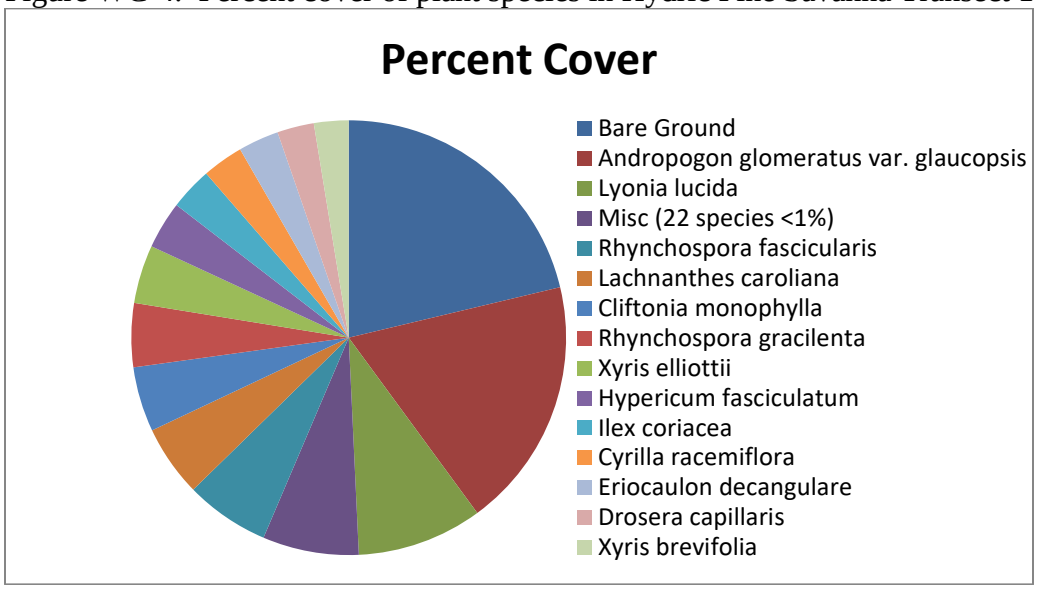


Table WC-4. Percent cover of species in Hydric Pine Savanna Transect 1 sampled on October 28, 2019.

Scientific name	Common name	Average percent cover per quadrat
Andropogon glomeratus var. *glaucopsis*	purple bluestem	15.47
Lyonia lucida	fetterbush	7.73
Rhynchospora fascicularis	fascicled beaksedge	5.20
Lachnanthes caroliana	Carolina redroot	4.40
Cliftonia monophylla	black titi	4.00
Rhynchospora gracilenta	slender beaksedge	3.93
Xyris elliottii	Elliott's yellow-eyed grass	3.60
Hypericum fasciculatum	peelbark St. John's wort	2.93
Ilex coriacea	large gallberry	2.63
Cyrilla racemiflora	titi	2.53
Eriocaulon decangulare	tenangle pipewort	2.50
Drosera capillaris	pink sundew	2.27
Xyris brevifolia	shortleaf yellow-eyed grass	2.13
Smilax laurifolia	laurel greenbrier	0.83
Rhynchospora ciliaris	fringed beaksedge	0.73
Sarracenia flava	yellow pitcherplant	0.50
Rhynchospora corniculata	shortbristle horned beaksedge	0.47
Xyris flabelliformis	savannah yellow-eyed grass	0.43
Euthamia caroliniana	slender flattop goldenrod	0.40
Rhexia petiolata	fringed meadowbeauty	0.37

Scientific name	Common name	Average percent cover per quadrat
Kellochloa verrucosa	warty panicgrass	0.33
Xyris ambigua	coastalplain yellow-eyed grass	0.30
Andropogon glomeratus	bushy bluestem	0.23
Rhynchospora chapmanii	Chapman's beaksedge	0.23
Solidago fistulosa	pinebarren goldenrod	0.23
Rhexia nuttallii	Nuttall's meadowbeauty	0.17
Sphagnum sp.	sphagnum moss	0.13
Xyris fimbriata	fringed yellow-eyed grass	0.13
Dichanthelium sp.	witchgrass	0.10
Gaylussacia mosieri	woolly huckleberry	0.10
Dichanthelium ensifolium var. *unciphyllum*	cypress witchgrass	0.07
Eupatorium mohrii	Mohr's thoroughwort	0.07
Aristida stricta	wiregrass	0.03
Cyperaceae		0.03
Hypericum microsepalum	flatwoods St. John's wort	0.03
Bare Ground		17.63

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

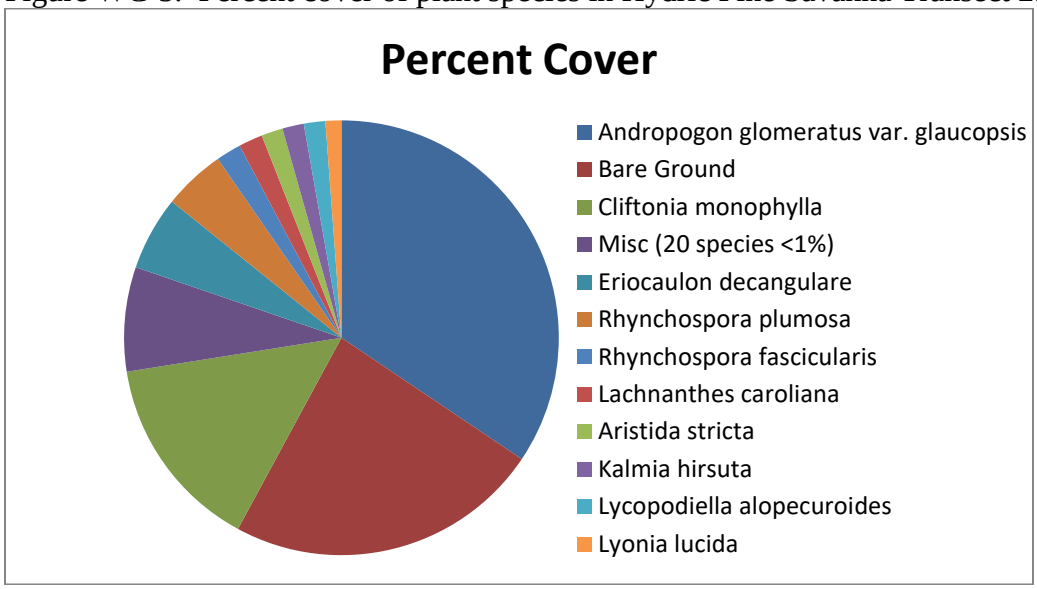


Table WC-5. Percent cover of plant species in Hydric Pine Savanna Transect 2 sampled on October 28, 2019.

Scientific name	Common name	Average percent cover per quadrat
Andropogon glomeratus var. *glaucopsis*	purple bluestem	30.17
Cliftonia monophylla	black titi	12.80
Eriocaulon decangulare	tenangle pipewort	4.83
Rhynchospora plumosa	plumed beaksedge	4.03
Rhynchospora fascicularis	fascicled beaksedge	1.63

Scientific name	Common name	Average percent cover per quadrat
Lachnanthes caroliana	Carolina redroot	1.57
Aristida stricta	wiregrass	1.40
Kalmia hirsuta	hairy wicky	1.40
Lycopodiella alopecuroides	foxtail club-moss	1.40
Lyonia lucida	fetterbush	1.03
Cyrilla racemiflora	titi	0.77
Rhynchospora cephalantha	bunched beaksedge	0.73
Hypericum brachyphyllum	coastalplain St. John's wort	0.70
Xyris brevifolia	shortleaf yellow-eyed grass	0.67
Pinus elliottii	slash pine	0.60
Andropogon virginicus	broomsedge bluestem	0.50
Pteridium aquilinum	bracken fern	0.47
Xyris ambigua	coastalplain yellow-eyed grass	0.37
Eupatorium mohrii	Mohr's thoroughwort	0.33
Euthamia caroliniana	slender flattop goldenrod	0.27
Rhexia petiolata	fringed meadowbeauty	0.27
Smilax laurifolia	laurel greenbrier	0.23
Xyris flabelliformis	savannah yellow-eyed grass	0.20
Dichanthelium ensifolium	cypress witchgrass	0.17
Polygala cruciata	drumheads	0.13
Ctenium aromaticum	toothache grass	0.10
Ilex coriacea	large gallberry	0.10
Rhynchospora ciliaris	fringed beaksedge	0.10
Rhynchospora gracilenta	slender beaksedge	0.07
Sphagnum sp.	sphagnum moss	0.03
Bare Ground		20.57

Cypress

Qualitative sampling. The cypress target community was visited at three sites, two just west of and one just east of the main north/south road through the center of the property (Figure WC-1). Many trees were down from Hurricane Michael in 2018. The canopy was around 45-60 feet tall and dominated by pond cypress and sweetbay, with smaller sweetbay, titi, and swamp bay in the subcanopy and tall shrub layers. Shorter shrubs included sweet pepperbush, swamp bay, sweetbay, and climbing fetterbush. Laurel greenbrier and muscadine vines were dense. Herbaceous species including shortbristle horned beaksedge, clustered sedge, and smallfruit beggarticks formed up to 25% cover. In many areas of mapped cypress on the Ward Creek project, the original community was likely wet flatwoods rather than cypress, making this community difficult to sample. The total number of species observed in this community was 39 (Table WC-1).

Dutex West Restoration Site

Qualitative and Quantitative Monitoring

October 2019

Dutex West Restoration Site
Qualitative and Quantitative Monitoring
October 2019

INTRODUCTION

The Dutex Restoration Site consists of 820 acres in Escambia County managed by the Northwest Florida Water Management District. It is located on Perdido Bay, just to the southwest of Saufley Field. This site mitigates current and future Florida Department of Transportation (FDOT) wetland impacts. Only the western tract was monitored in 2019. This tract is accessed by taking Saufley Pines Road west from North Blue Angel Parkway and then turning south onto Wyndotte Road. The NWFWMD goal is to return the Dutex Restoration Site to pre-disturbance conditions. Target communities include Hydric Pine Flatwoods (HPF), Hydric Pine Savanna (HPS), Bay Swamp (BS), Mesic Flatwoods (MF), Freshwater Marsh (FM), and Salt Marsh. (Figure DW-1). Quantitative and qualitative monitoring was used to document the current plant species composition and vegetation structure of these targeted communities. FNAI began monitoring in October 2018. Prior to 2018, the site vegetation was monitored by Ecological Resource Consultants, Inc. (ERC).

METHODS

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

The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through each of the two target communities plus Bay Swamp, Mesic Flatwoods, Freshwater Marsh, and Salt Marsh. The field surveys were performed by FNAI botanists Kim Alexander, Jenna Annis, and Amy Jenkins on October 7-8, 2019.

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

RESULTS AND DISCUSSION

A total of 167 plant species were recorded during 2019 monitoring session in the target communities at Dutex West (Table DW-1). Twenty-seven new species were recorded during the 2019 monitoring.

Table DW-1. Plant species observed in the target communities at Dutex West Mitigation Site on October 7-8, 2019. (bold name = new species; bold X = new observation in community type)

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
Acer rubrum	red maple	X	X	X	X	X	X	6
Aletris lutea	yellow colic-root		X					1
Amphicarpum muehlenbergianum	blue maidencane	X						1
Andropogon glomeratus	bushy bluestem	X	X	X		X		4
Andropogon glomeratus* var. *glaucopsis	**purple bluestem**	**X**	**X**		**X**			3
Andropogon gyrans var. *stenophyllus*	Elliott's bluestem				**X**			1
Andropogon virginicus	broomsedge bluestem	X	X		X			3
Anthaenantia rufa	purple silkyscale		X					1
Aristida palustris	longleaf threeawn		X					1
Aristida stricta	wiregrass		X		X			2
Aronia arbutifolia	red chokeberry		X					1
Arundinaria gigantea	switchcane		**X**					1
Baccharis halimifolia	groundsel tree		X			X		2
Bartonia paniculata	twining screwstem		X					1
Bidens mitis	smallfruit beggarticks	X	X	X		**X**	**X**	5
Carex glaucescens	clustered sedge	X	X	**X**				3
Carphephorus odoratissimus	vanillaleaf				X			1
Centella asiatica	spadeleaf	X		X				2
***Chamaecrista* sp.**	**sensitive pea**				**X**			1
Cladium jamaicense	sawgrass	X		X		X	X	4
Clethra alnifolia	sweet pepperbush		X	**X**	X			3
Cliftonia monophylla	black titi	X	X	X	**X**			4
Coelorachis rugosa	wrinkled jointgrass		X					1
Coleataenia anceps	beaked panicum	X	X					2
Conoclinium coelestinum	**blue mistflower**		**X**					1
Coreopsis linifolia	Texas tickseed		X					1
Cyperus haspan	haspan flatsedge		X					1
Cyperus ovatus	**pinebarren flatsedge**				**X**			1
Cyrilla racemiflora	titi		X	X				2
Dichanthelium ensifolium	cypress witchgrass	X	X	X				3
Dichanthelium portoricense	hemlock witchgrass				X			1
Dichanthelium scabriusculum	woolly witchgrass	X	X	X			X	4
Dichanthelium sp.	witchgrass		X					1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
Diospyros virginiana	common persimmon					X		1
Drosera capillaris	pink sundew	X	X					2
Eleocharis tuberculosa	**conecup spikerush**	**X**	**X**					2
Elymus virginicus	**Virginia wildrye**					**X**		1
Eragrostis sp.	lovegrass		X					1
Erechtites hieraciifolius	fireweed		**X**		X	**X**		3
Eriocaulon decangulare	tenangle pipewort	X	X					2
Eupatorium capillifolium	**dogfennel**		**X**		**X**			2
Eupatorium compositifolium	yankeeweed				X			1
Eupatorium mohrii	Mohr's thoroughwort		X					1
Eupatorium rotundifolium	**roundleaf thoroughwort**				**X**			1
Eupatorium serotinum	lateflowering thoroughwort					X		1
Euthamia caroliniana	slender flattop goldenrod	X	X		X			3
Euthamia graminifolia	flattop goldenrod					X	X	2
Fuirena breviseta	saltmarsh umbrellasedge		X	X				2
Fuirena scirpoidea	southern umbrellasedge			X				1
Gaylussacia dumosa	dwarf huckleberry				X			1
Gaylussacia mosieri	woolly huckleberry	X	X		X			3
Gelsemium sempervirens	**yellow jessamine**			**X**				1
Hamamelis virginiana	**American witchhazel**				**X**			1
Helianthus angustifolius	narrowleaf sunflower		X					1
Hypericum brachyphyllum	coastalplain St. John's wort	X	X	**X**				3
Hypericum cistifolium	roundpod St. John's wort	X						1
Hypericum crux-andreae	St. Peter's wort	**X**	X	**X**				3
Hypericum hypericoides	**St. Andrew's cross**	**X**			**X**			2
Hypericum tetrapetalum	fourpetal St. John's wort				X			1
Hyptis alata	**clustered bushmint**						**X**	1
Ilex cassine	dahoon	X	**X**	X		X	X	5
Ilex cassine var. *myrtifolia*	myrtle-leaved holly	X	X	X		X	X	5
Ilex coriacea	large gallberry	X	X	X	X			4
Ilex glabra	gallberry	X	X	X	X		X	5
Ilex vomitoria	yaupon	X	**X**		**X**	**X**	X	5
Ipomoea sagittata	saltmarsh morning glory					**X**	X	2
Iva microcephala	**Piedmont marshelder**					**X**		1
Juncus roemerianus	needle rush					X	X	2
Juncus trigonocarpus	**redpod rush**		**X**					1
Kalmia hirsuta	hairy wicky				X			1
Kellochloa verrucosa	warty panicgrass	X	X	**X**				3
Kosteletzkya pentacarpos	**Virginia saltmarsh mallow**					**X**		1
Lachnanthes caroliana	Carolina redroot	X	X	X				3
Liatris spicata	dense gayfeather		X					1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
Lilium iridollae	Panhandle lily			X				1
Lobelia brevifolia	shortleaf lobelia		X					1
Lobelia glandulosa	glade lobelia		X					1
Lobelia nuttallii	**Nuttall's lobelia**				**X**			1
Ludwigia linifolia	southeastern primrosewillow		X					1
Ludwigia pilosa	hairy primrosewillow	X	X					2
Ludwigia sp.	primrosewillow		X					1
Lycopodiella alopecuroides	foxtail club-moss	X	X					2
Lycopus rubellus	taperleaf waterhorehound		X					1
Lyonia lucida	fetterbush	X	X	X	X			4
Magnolia grandiflora	southern magnolia				X			1
Magnolia virginiana	sweetbay	X	X	X	X			4
Mikania scandens	climbing hempvine		X	**X**			X	3
Morella cerifera	southern bayberry	X	X	X		X	X	5
Morella inodora	odorless bayberry		X					1
Nymphaea odorata	white waterlily			X				1
Nyssa biflora	swamp tupelo	X	X	X			X	4
Nyssa ursina	bog tupelo		X					1
Oldenlandia uniflora	clustered mille graines	X	X		X			3
Osmunda cinnamomea	cinnamon fern	X	X	X	**X**		X	5
Osmunda regalis var. *spectabilis*	royal fern	X	X	X		X	X	5
Panicum repens	torpedo grass					X		1
Panicum virgatum	switchgrass	X		X	**X**			3
Paspalum floridanum	Florida paspalum	X	X					2
Paspalum praecox	**early paspalum**	**X**						1
Paspalum urvillei	**vaseygrass**					**X**		1
Persea palustris	swamp bay	X	X	X	**X**	X	X	6
Persicaria hydropiperoides	mild waterpepper					**X**		1
Phragmites berlandieri	**common reed**					**X**		1
Pieris phyllyreifolia	climbing fetterbush	**X**	X					2
Pinus elliottii	slash pine	X	X	X	X	X	X	6
Pluchea foetida	stinking camphorweed		X					1
Polygala cruciata	drumheads	X			**X**			2
Polygala lutea	orange milkwort	X						1
Proserpinaca pectinata	combleaf mermaidweed		X					1
Pteridium aquilinum	bracken fern	**X**			X	X		3
Quercus geminata	**sand live oak**				**X**			1
Quercus hemisphaerica	laurel oak				X			1
Quercus virginiana	live oak				X			1
Rhexia mariana	pale meadowbeauty	X						1
Rhexia petiolata	fringed meadowbeauty	X	X					2

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
Rhexia virginica	handsome harry	X	X		**X**			3
Rhus copallinum	winged sumac				**X**	**X**		2
Rhynchospora cephalantha	bunched beaksedge	X	X					2
Rhynchospora colorata	**starrush white-top**		**X**					1
Rhynchospora fascicularis	fascicled beaksedge	X	X					2
Rhynchospora filifolia	threadleaf beaksedge		X					1
Rhynchospora glomerata	**clustered beaksedge**		**X**	**X**				2
Rhynchospora gracilenta	slender beaksedge	X	X	**X**				3
Rhynchospora inundata	narrowfruit horned beaksedge	X		**X**				2
Rhynchospora microcarpa	southern beaksedge		X					1
Rhynchospora rariflora	fewflower beaksedge	**X**	X					2
Rhynchospora sp.	beaksedge		X					1
Rubus pensilvanicus	sawtooth blackberry	X	X	X	X	X	X	6
Rubus trivialis	southern dewberry	X			**X**			2
Sabal minor	bluestem palmetto	X						1
Sabatia brevifolia	shortleaf rosegentian				X			1
Sacciolepis striata	American cupscale					X		1
Sarracenia leucophylla	white-top pitcherplant		X					1
Scleria reticularis	netted nutrush	**X**						1
Scleria sp.	nutrush	X	X					2
Scutellaria integrifolia	helmet skullcap	X						1
Serenoa repens	saw palmetto				X			1
Sesbania punicea	purple sesban					X		1
Smilax auriculata	earleaf greenbrier				X			1
Smilax bona-nox	saw greenbrier					X		1
Smilax glauca	**cat greenbrier**	**X**			**X**			2
Smilax laurifolia	laurel greenbrier	X	X	X	X		X	5
Smilax tamnoides	bristly greenbrier	X	X			X		3
Smilax walteri	coral greenbrier		**X**					1
Solidago fistulosa	pinebarren goldenrod	X	X		**X**			3
Solidago sempervirens	**seaside goldenrod**					**X**		1
Spartina patens	saltmeadow cordgrass	X				**X**	X	3
Sphagnum sp.	sphagnum moss	X	X	X				3
Symphyotrichum dumosum	rice button aster		**X**					1
Symplocos tinctoria	horse sugar				X			1
Taxodium ascendens	pond cypress	X	X	X			X	4
Toxicodendron radicans	eastern poison ivy	X	X	X		X	X	5
Triadica sebifera	Chinese tallow tree		X			X	**X**	3
Tripsacum dactyloides	**eastern gamagrass**					**X**		1
Typha latifolia	broadleaf cattail					X		1
Vaccinium corymbosum	highbush blueberry	X	X	X	X			4

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Pine Savanna	Bay Swamp	Mesic Flatwoods	Freshwater Marsh	Salt Marsh	Grand Total
Vaccinium darrowii	**Darrow's blueberry**				**X**			1
Vaccinium myrsinites	shiny blueberry				X			1
Vitis rotundifolia	muscadine	X	X	X	X			4
Woodwardia areolata	netted chain fern	X	X	X				3
Woodwardia virginica	Virginia chain fern	X	X	X				3
Xyris brevifolia	shortleaf yellow-eyed grass		X					1
Xyris caroliniana	Carolina yellow-eyed grass	X			**X**			2
Xyris fimbriata	fringed yellow-eyed grass	X	X					2
Xyris flabelliformis	savannah yellow-eyed grass	X	X					2
Xyris floridana	**Florida yellow-eyed grass**	**X**						1
Xyris sp.	yellow-eyed grass		X					1
Total number of taxa: 167		77	101	46	55	38	25	342

Hydric Pine Flatwoods

Qualitative sampling. The eastern area of Hydric Pine Flatwoods in the vicinity of Transect 1 was accessed to create a species list (Figure DW-1). This area had an open canopy (26-35% cover) of mature slash pines. The ground layer was mainly herbaceous, although short shrubs and sprawling laurel greenbrier vines were dense in many areas and made estimating herb/shrub covers difficult. Purple bluestem and Carolina redroot were dominant along with a mix of other, mostly weedy species. Shrubs were mostly black titi, but also included large gallberry, coastalplain St. John's wort, sweetbay, and highbush blueberry. The total number of species observed in this community was 77 (Table DW-1).

Quantitative sampling. The eastern Transect 1 (Table DW-2, Figure DW-2) had a total of 26 species with 24% bare ground. Carolina redroot, purple bluestem, laurel greenbrier, black titi, and slender beaksedge contributed the most cover. Woody species made up about 29% average cover per quadrat. This transect was largely unchanged from last year.

The western Transect 4 (Table DW-3, Figure DW-3) had a total of 34 species with 53% bare ground. Swamp bay, southern bayberry, and slash pine contributed the most cover. Woody species made up about 24% average cover per quadrat. This transect was largely unchanged from last year.

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

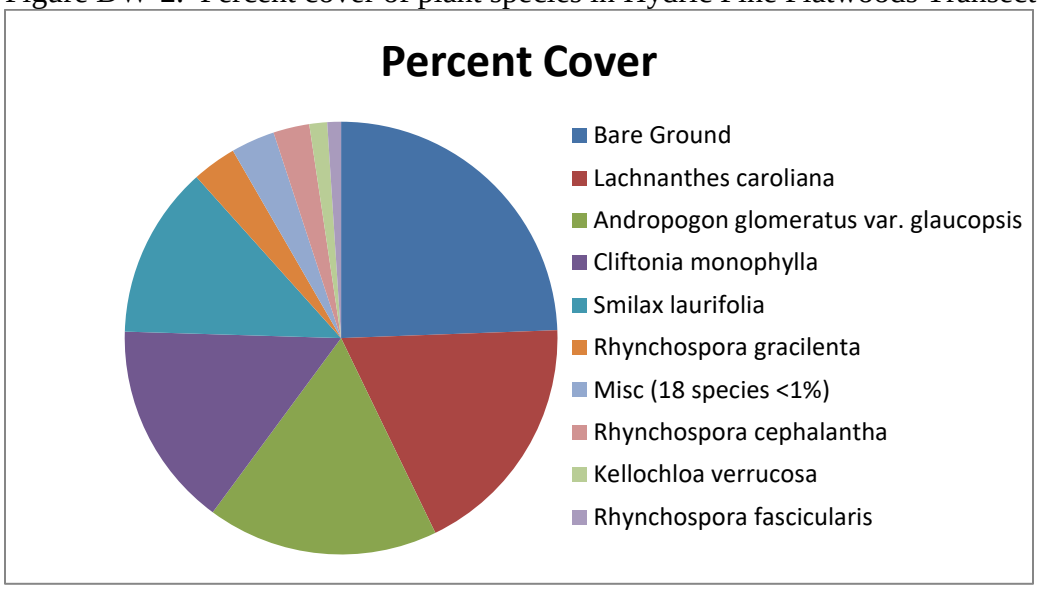


Table DW-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1 sampled on October 7, 2019.

Scientific name	Common name	Average percent cover per quadrat
Lachnanthes caroliana	Carolina redroot	17.97
Andropogon glomeratus var. *glaucopsis*	purple bluestem	16.87
Cliftonia monophylla	black titi	15.00
Smilax laurifolia	laurel greenbrier	12.57
Rhynchospora gracilenta	slender beaksedge	3.23
Rhynchospora cephalantha	bunched beaksedge	2.63
Kellochloa verrucosa	warty panicgrass	1.30
Rhynchospora fascicularis	fascicled beaksedge	1.00
Woodwardia virginica	Virginia chain fern	0.60
Lyonia lucida	fetterbush	0.50
Carex glaucescens	clustered sedge	0.43
Rhexia virginica	handsome harry	0.37
Pinus elliottii	slash pine	0.30
Rhexia petiolata	fringed meadowbeauty	0.27
Sphagnum sp.	sphagnum moss	0.23
Euthamia caroliniana	slender flattop goldenrod	0.10
Hypericum cistifolium	roundpod St. John's wort	0.07
Hypericum hypericoides	St. Andrew's cross	0.07
Bidens mitis	smallfruit beggarticks	0.03
Dichanthelium ensifolium	cypress witchgrass	0.03
Hypericum brachyphyllum	coastalplain St. John's wort	0.03
Oldenlandia uniflora	clustered mille graines	0.03
Rhynchospora rariflora	fewflower beaksedge	0.03
Rubus pensilvanicus	sawtooth blackberry	0.03
Scleria sp.	nutrush	0.03

Xyris floridana	Florida yellow-eyed grass	0.03
Bare Ground		23.83

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

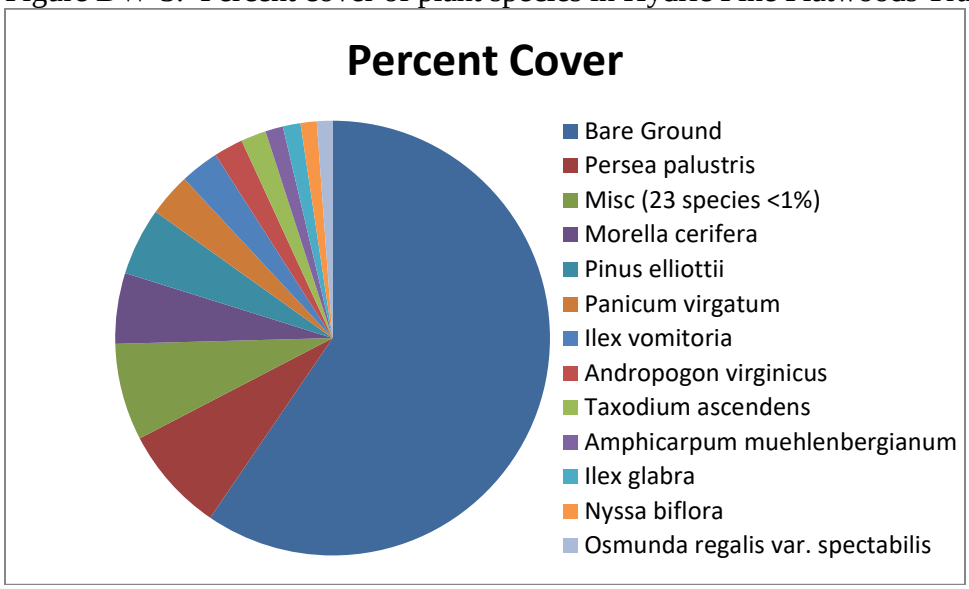


Table DW-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 4 sampled on October 8, 2019.

Scientific name	Common name	Average percent cover per quadrat
Persea palustris	swamp bay	6.97
Morella cerifera	southern bayberry	4.67
Pinus elliottii	slash pine	4.47
Panicum virgatum	switchgrass	2.83
Ilex vomitoria	yaupon	2.57
Andropogon virginicus	broomsedge bluestem	1.93
Taxodium ascendens	pond cypress	1.67
Amphicarpum muehlenbergianum	blue maidencane	1.17
Ilex glabra	gallberry	1.17
Nyssa biflora	swamp tupelo	1.07
Osmunda regalis var. *spectabilis*	royal fern	1.03
Paspalum floridanum	Florida paspalum	0.97
Toxicodendron radicans	eastern poison ivy	0.97
Carex glaucescens	clustered sedge	0.90
Andropogon glomeratus var. *glaucopsis*	purple bluestem	0.67
Cladium jamaicense	sawgrass	0.53
Osmunda cinnamomea	cinnamon fern	0.47
Centella asiatica	spadeleaf	0.33
Spartina patens	saltmeadow cordgrass	0.27
Coleataenia anceps	beaked panicum	0.23

Scientific name	Common name	Average percent cover per quadrat
Eleocharis tuberculosa	conecup spikerush	0.23
Woodwardia virginica	Virginia chain fern	0.13
Acer rubrum	red maple	0.10
Lachnanthes caroliana	Carolina redroot	0.10
Scutellaria integrifolia	helmet skullcap	0.10
Smilax glauca	cat greenbrier	0.10
Bidens mitis	smallfruit beggarticks	0.07
Paspalum praecox	early paspalum	0.03
Pieris phyllyreifolia	climbing fetterbush	0.03
Rhynchospora cephalantha	bunched beaksedge	0.03
Rhynchospora gracilenta	slender beaksedge	0.03
Rubus trivialis	southern dewberry	0.03
Sabal minor	bluestem palmetto	0.03
unknown-seedling		0.03
Bare Ground		52.83

Hydric Pine Savanna

Qualitative sampling. Hydric Pine Savanna was accessed in the vicinity of Transect 3 to create a species list (Figure DW-1). This area had an open canopy (16-25% cover) of mature slash pines. The ground layer was mostly herbaceous with woolly witchgrass dominant along with a mix of other species including various beaksedges, tenangle pipewort, yellow-eyed grass, slender flattop goldenrod, and wiregrass. Shrubs formed around 50% cover and were mainly 3-6 feet tall. These included coastalplain St. John's wort, titi, gallberry, sweet pepperbush, and southern bayberry. The invasive exotic Chinese tallow tree occurred occasionally in this area of hydric pine savanna. The state-listed endangered whitetop pitcherplant was also observed during this survey. The total number of plant species observed in this community was 101 (Table DW-1).

Quantitative sampling. The southern Transect 2 (Table DW-4, Figure DW-4) had a total of 13 species and 96% bare ground. Until recently, Transect 2 was dominated by a thicket of tall, woody species. In 2019, the area was mechanically treated to reduce shrubs. The survey was conducted not long after and shows the immediate impact of this treatment. All shrubs had been mowed to the ground which was covered in the resulting mulch. Herbs had not had time to recover and formed only a miniscule cover. Woody species made up about 2% average cover per quadrat (total cover was only 2.5% average per quadrat).

The northern Transect 3 (Table DW-5, Figure DW-5) had a total of 56 species and 12% bare ground. Woolly witchgrass, tenangle pipewort, laurel greenbrier, and coastalplain St. John's wort contributed the most cover. Woody species made up about 28% average cover per quadrat. The state listed endangered whitetop pitcher plant was seen in the quadrat located at 100 feet along this transect.

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

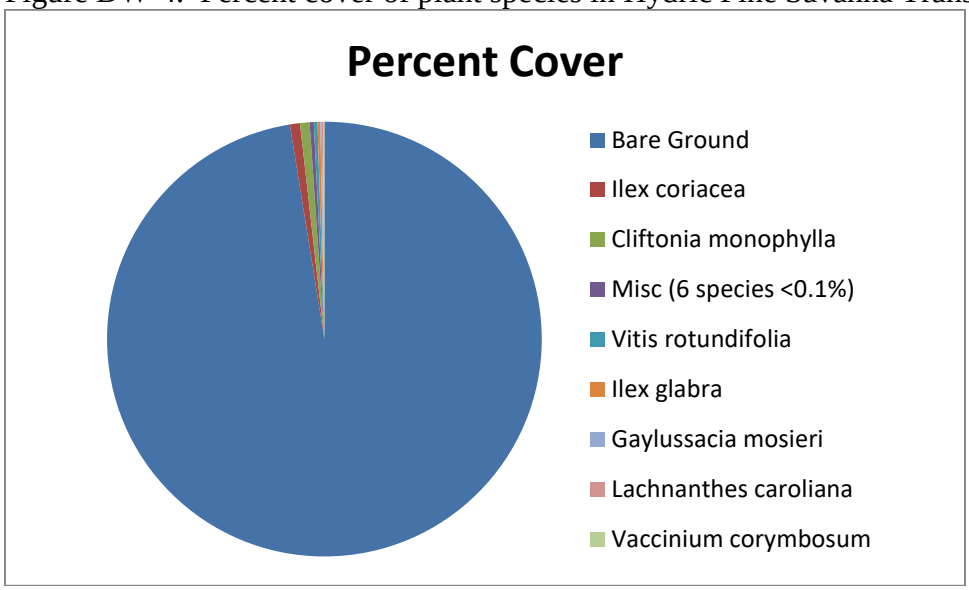


Table DW-4. Percent cover of species in Hydric Pine Savanna Transect 2 sampled on October 7, 2019.

Scientific name	Common name	Average percent cover per quadrat
Ilex coriacea	large gallberry	0.73
Cliftonia monophylla	black titi	0.70
Vitis rotundifolia	muscadine	0.27
Ilex glabra	gallberry	0.20
Gaylussacia mosieri	woolly huckleberry	0.10
Lachnanthes caroliana	Carolina redroot	0.10
Vaccinium corymbosum	highbush blueberry	0.10
Andropogon glomeratus var. *glaucopsis*	purple bluestem	0.07
Aristida stricta	wiregrass	0.07
Cyrilla racemiflora	titi	0.07
Coleataenia anceps	beaked panicum	0.03
Eriocaulon decangulare	tenangle pipewort	0.03
Lyonia lucida	fetterbush	0.03
Bare Ground		95.83

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

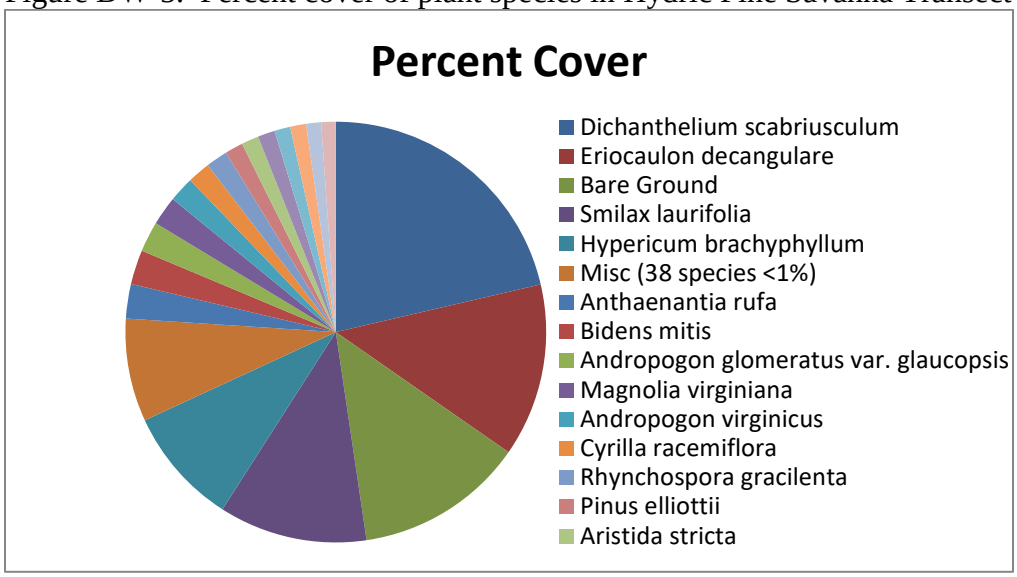


Table DW-5. Percent cover of plant species in Hydric Pine Savanna Transect 3 sampled on October 7, 2019.

Scientific name	Common name	Average percent cover per quadrat
Dichanthelium scabriusculum	woolly witchgrass	20.43
Eriocaulon decangulare	tenangle pipewort	12.73
Smilax laurifolia	laurel greenbrier	10.90
Hypericum brachyphyllum	coastalplain St. John's wort	8.67
Anthaenantia rufa	purple silkyscale	2.53
Bidens mitis	smallfruit beggarticks	2.53
Andropogon glomeratus var. glaucopsis	purple bluestem	2.23
Magnolia virginiana	sweetbay	2.13
Andropogon virginicus	broomsedge bluestem	1.87
Cyrilla racemiflora	titi	1.67
Rhynchospora gracilenta	slender beaksedge	1.60
Pinus elliottii	slash pine	1.33
Aristida stricta	wiregrass	1.27
Lycopus rubellus	taperleaf waterhorehound	1.27
Rubus pensilvanicus	sawtooth blackberry	1.17
Taxodium ascendens	pond cypress	1.17
Rhynchospora rariflora	fewflower beaksedge	1.10
Euthamia caroliniana	slender flattop goldenrod	1.07
Ludwigia pilosa	hairy primrosewillow	0.93
Coleataenia anceps	beaked panicum	0.90
Dichanthelium ensifolium	cypress witchgrass	0.60
Rhynchospora glomerata	clustered beaksedge	0.53
Ilex cassine	dahoon	0.50
Ilex coriacea	large gallberry	0.50
Lachnanthes caroliana	Carolina redroot	0.37
Ludwigia linifolia	southeastern primrosewillow	0.33

Scientific name	Common name	Average percent cover per quadrat
Mikania scandens	climbing hempvine	0.33
Woodwardia areolata	netted chain fern	0.27
Sphagnum sp.	sphagnum moss	0.23
Pluchea foetida	stinking camphorweed	0.20
Rhynchospora cephalantha	bunched beaksedge	0.20
Oldenlandia uniflora	clustered mille graines	0.17
Aristida palustris	longleaf threeawn	0.13
Dichanthelium sp.	witchgrass	0.13
Eupatorium mohrii	Mohr's thoroughwort	0.13
Sarracenia leucophylla	white-top pitcherplant	0.13
Xyris fimbriata	fringed yellow-eyed grass	0.13
Acer rubrum	red maple	0.10
Scleria sp.	nutrush	0.10
Eleocharis tuberculosa	conecup spikerush	0.07
Vaccinium corymbosum	highbush blueberry	0.07
Aronia arbutifolia	red chokeberry	0.03
Carex glaucescens	clustered sedge	0.03
Cliftonia monophylla	black titi	0.03
Cyperus haspan	haspan flatsedge	0.03
Drosera capillaris	pink sundew	0.03
Fuirena breviseta	saltmarsh umbrellasedge	0.03
Ilex glabra	gallberry	0.03
Lobelia glandulosa	glade lobelia	0.03
Lyonia lucida	fetterbush	0.03
Pieris phyllyreifolia	climbing fetterbush	0.03
Rhexia petiolata	fringed meadowbeauty	0.03
Rhynchospora sp.	beaksedge	0.03
Smilax walteri	coral greenbrier	0.03
Xyris brevifolia	shortleaf yellow-eyed grass	0.03
Xyris sp.	yellow-eyed grass	0.03
Bare Ground		12.43

Bay Swamp

Qualitative sampling. An area of Bay Swamp south of the Hydric Pine Savanna Transect 2 was sampled in Fall 2019. Species were also noted while walking across the restored bay swamp that separates the two main areas of pine flatwoods (Figure DW-1). This community is more similar to a freshwater tidal swamp or basin marsh than a typical bay swamp. The seepy ecotone to the Hydric Pine Savanna was more herbaceous with wiregrass. However, the majority of the community was more of a mix of trees and shrubs with patches of herbs typical of marshes. The ground was mucky with pools of ankle deep water, large patches of sphagnum moss, and numerous hummocks. The stunted canopy was around 25% cover and composed of slash pine, pond cypress, and swamp tupelo to about 45 feet tall. A subcanopy and tall shrub layer mostly around 15 feet tall made up about 45% cover and was composed of canopy species plus red maple, sweetbay, southern bayberry, and swamp bay. The short shrub (under 6 feet tall) layer made up around 25% cover and was composed of black titi, southern bayberry, and swamp bay.

The patchy herbaceous layer was around 50% cover and consisted mostly of sawgrass, cinnamon fern, and clustered sedge. While walking across the area of bay swamp where an old road was removed for hydrology restoration, a few stems of the state-listed endangered Panhandle lily were seen in fruit. The total number of species observed in this community was 46 (Table DW-1).

Mesic Flatwoods

Qualitative sampling. An area of Mesic Flatwoods was sampled on the eastern side of the property just northeast and southwest of the main road through the Dutex West property (Figure DW-1). These areas had an open canopy (around 25% cover) of mature slash pine and an open layer of short shrubs intermixed with patches of herbaceous species and open ground. Shrubs were mainly saw palmetto, shiny blueberry, and dwarf huckleberry with a diversity of other species present. Wiregrass was common, along with weedy species, such as purple bluestem, and typical flatwoods species. Flatwoods on the southwest side of the road had recently been chopped, and thus had little herbaceous cover and a dense cover of woody debris. The total number of species observed in this community was 55 (Table DW-1).

Freshwater Marsh

Qualitative sampling. The Freshwater Marsh target community was accessed from the southeast corner of the property by walking northwest along the shoreline (Figure DW-1). A few scattered slash pines were present, but the community was mostly an open, solid stand of sawgrass with patches of other herbs such as black needle rush and royal fern. Shrubs covered up to around 15% of the area. These were mainly tall individuals of swamp bay, southern bayberry, and groundsel tree. Three invasive exotic species were observed along the shoreline – purple sesban (*Sesbania punicea*), Chinese tallow tree (*Triadica sebifera*), and torpedo grass (*Panicum repens*). The total number of species observed in this community was 38 (Table DW-1).

Salt Marsh

Qualitative sampling. The Salt Marsh target community was accessed by walking south from the Hydric Pine Flatwoods Transect 4 (Figure DW-1). The community was largely herbaceous, dominated by sawgrass or saltmarsh cordgrass with patches of black needle grass. Small patches of shrubs throughout formed about 10% cover with most shrubs up to around 9 feet tall. These consisted of dahoon holly, southern bayberry, red maple, and swamp bay. The invasive exotic species Japanese climbing fern (*Lygodium japonicum*) was observed in 2018, but was not seen this year. However, Chinese tallow tree was observed invading in the ecotone between the hydric pine flatwoods and the salt marsh. The total number of species observed in this community was 25 (Table DW-1).

Yellow River Ranch

Qualitative and Quantitative Monitoring

October 2019

Yellow River Ranch
Qualitative and Quantitative Monitoring
October 2019

INTRODUCTION

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

METHODS

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

The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through Hydric Pine Flatwoods. The field surveys were performed by FNAI botanists Kim Alexander, Jenna Annis, and Amy Jenkins on October 9, 2019.

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

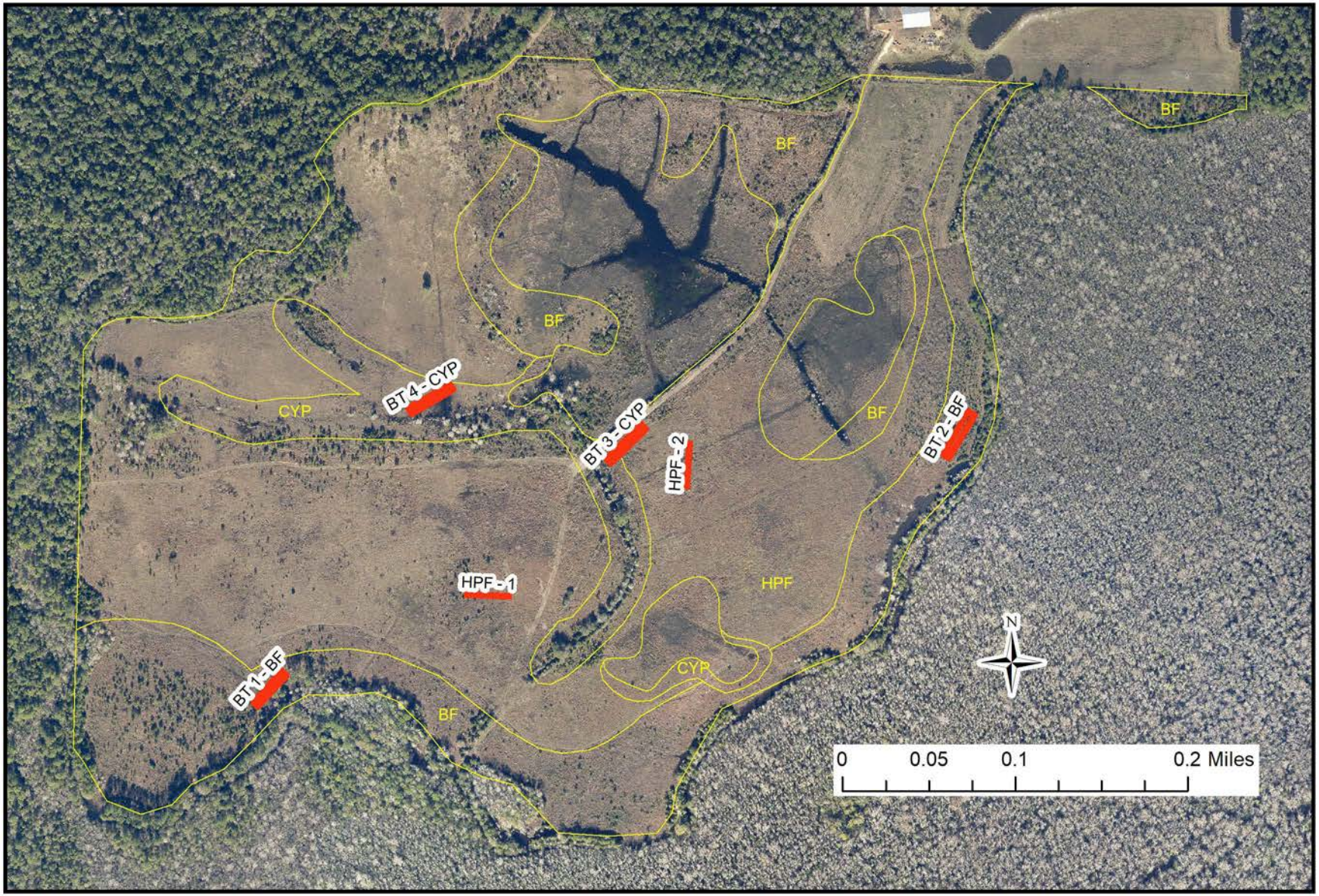


Figure YRR-1. Location of permanent transects at Yellow River Ranch. HPF=Hydric Pine Flatwoods, CYP=Cypress, BF=Bottomland Forest, BT=Belt Transect.

RESULTS AND DISCUSSION

A total of 73 plant species were recorded during the Fall 2019 monitoring in Hydric Pine Flatwoods at Yellow River Ranch (Table YRR-1). Nine new species were recorded during the 2019 monitoring.

Table YRR-1. Plant species observed in Hydric Pine Flatwoods at Yellow River Ranch Mitigation Site on October 9, 2019. (bold name = new species)

Scientific Name	Common Name
Acer rubrum	red maple
Agalinis fasciculata	beach false foxglove
Ambrosia artemisiifolia	common ragweed
Amphicarpum muehlenbergianum	**blue maidencane**
Andropogon glomeratus var. *glaucopsis*	purple bluestem
Andropogon virginicus	broomsedge bluestem
Aristida stricta	wiregrass
Baccharis halimifolia	groundsel tree
Bidens mitis	smallfruit beggarticks
Centella asiatica	spadeleaf
Chamaecrista fasciculata	**partridge pea**
Chamaecyparis thyoides	Atlantic white cedar
Coleataenia anceps	beaked panicum
Coleataenia longifolia	**ciliate redtop panicum**
Cuphea carthagenensis	Colombian waxweed
Cyrilla racemiflora	titi
Dichanthelium ensifolium	cypress witchgrass
Dichanthelium scabriusculum	woolly witchgrass
Diodia virginiana	Virginia buttonweed
Eleocharis tuberculosa	**conecup spikerush**
Eragrostis elliottii	**Elliott's lovegrass**
Eragrostis pectinata* var. *pectinata	**tufted lovegrass**
Erechtites hieraciifolius	fireweed
Eriocaulon decangulare	tenangle pipewort
Eupatorium capillifolium	dogfennel
Eupatorium mohrii	Mohr's thoroughwort
Euthamia caroliniana	slender flattop goldenrod
Euthamia graminifolia	flattop goldenrod
Fuirena breviseta	saltmarsh umbrellasedge
Hydrocotyle umbellata	**manyflower marshpennywort**
Hypericum cistifolium	roundpod St. John's wort
Hypericum crux-andreae	St. Peter's wort
Hypericum fasciculatum	peelbark St. John's wort
Hypericum mutilum	**dwarf St. John's wort**
Hyptis alata	clustered bushmint

Scientific Name	Common Name
Ilex cassine var. *myrtifolia*	myrtle-leaved holly
Ilex glabra	gallberry
Ilex opaca	American holly
Ilex vomitoria	yaupon
Juncus marginatus	grassleaf rush
Juniperus virginiana	red cedar
Kellochloa verrucosa	warty panicgrass
Lachnanthes caroliana	Carolina redroot
Lobelia brevifolia	shortleaf lobelia
Ludwigia linifolia	southeastern primrosewillow
Ludwigia pilosa	hairy primrosewillow
Lycopus rubellus	taperleaf waterhorehound
Magnolia virginiana	sweetbay
Morella cerifera	southern bayberry
Nyssa biflora	swamp tupelo
Oldenlandia uniflora	clustered mille graines
Persea palustris	swamp bay
Pinus elliottii	slash pine
Pluchea baccharis	rosy camphorweed
Proserpinaca pectinata	combleaf mermaidweed
Rhexia mariana	pale meadowbeauty
Rhexia virginica	handsome harry
Rhynchospora cephalantha	bunched beaksedge
Rhynchospora chalarocephala	loosehead beaksedge
Rhynchospora elliottii	Elliott's beaksedge
Rhynchospora fascicularis	fascicled beaksedge
Rhynchospora filifolia	threadleaf beaksedge
Rhynchospora plumosa	plumed beaksedge
Rhynchospora rariflora	fewflower beaksedge
Rubus pensilvanicus	sawtooth blackberry
Saccharum giganteum	sugarcane plumegrass
Scoparia dulcis	licoriceweed
Solidago fistulosa	pinebarren goldenrod
Symphyotrichum dumosum	rice button aster
Taxodium ascendens	pond cypress
Triadica sebifera	Chinese tallow tree
Viola lanceolata	bog white violet
Viola primulifolia	primroseleaf violet
Total number of taxa: 73	

Hydric Pine Flatwoods

Qualitative sampling. The Hydric Pine Flatwoods in the vicinity of Transect 2 was accessed to create a species list (Figure YRR-1). This area had a very sparse canopy of young slash pines around 30 feet high. Shrubs have been growing quickly since the last fire. This layer formed about 6 to 20% cover with individuals mostly 6 to 9 feet tall. Species included sawtooth blackberry, groundsel tree, southern bayberry, myrtle holly, gallberry, young slash pine, and swamp tupelo. The ground layer was mostly herbaceous and weedy with rice button aster, dogfennel, slender flattop goldenrod, Carolina redroot, pinebarren goldenrod, and broomsedge bluestem. Wiregrass was present, but very sparse. The total number of species observed in this community was 73 (Table YRR-1).

Quantitative sampling. The western Transect 1 (Table YRR-2, Figure YRR-2) had a total of 39 species with 25% bare ground. Sawtooth blackberry, southern bayberry, rice button aster, Chinese tallow tree, and broomsedge bluestem contributed the most cover. Woody species made up about 49% average cover per quadrat. Chinese tallow tree was recorded the quadrats at 100 and 140 feet.

The eastern Transect 2 (Table YRR-3, Figure YRR-3) had a total of 30 species with 9% bare ground. Woolly witchgrass, rice button aster, and southern bayberry contributed the most cover. Woody species made up only about 17% average cover per quadrat.

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

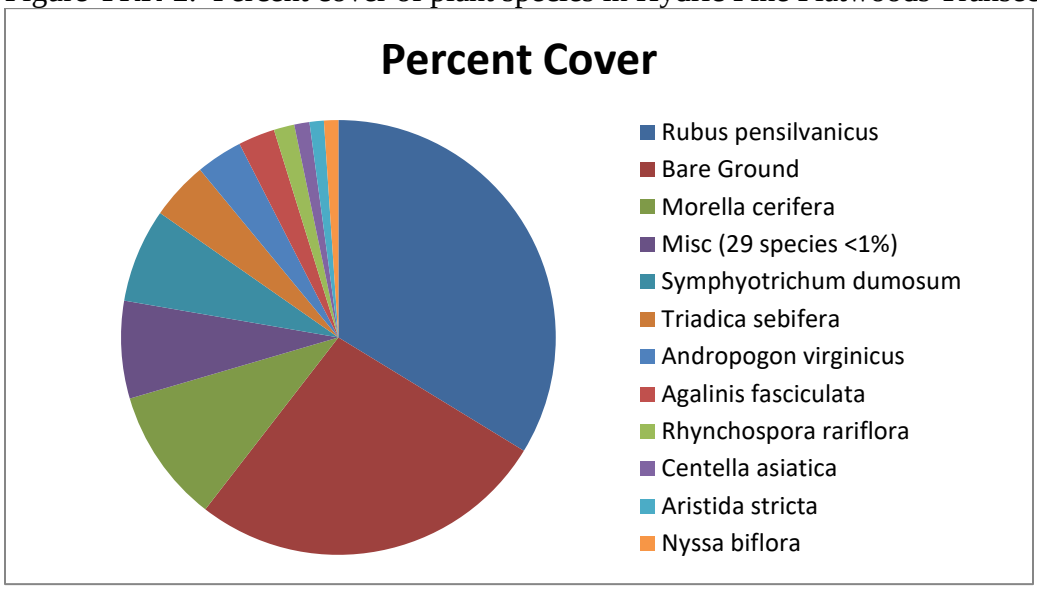


Table YRR-2. Percent cover of plant species in Hydric Pine Flatwoods Transect 1 sampled on October 9, 2019.

Scientific name	Common name	Average percent cover per quadrat
Rubus pensilvanicus	sawtooth blackberry	31.69
Morella cerifera	southern bayberry	9.38
Symphyotrichum dumosum	rice button aster	6.56
Triadica sebifera	Chinese tallow tree	4.06
Andropogon virginicus	broomsedge bluestem	3.25
Agalinis fasciculata	beach false foxglove	2.56
Rhynchospora rariflora	fewflower beaksedge	1.44
Centella asiatica	spadeleaf	1.06
Aristida stricta	wiregrass	1.00
Nyssa biflora	swamp tupelo	1.00
Acer rubrum	red maple	0.75
Pinus elliottii	slash pine	0.50
Baccharis halimifolia	groundsel tree	0.44
Bidens mitis	smallfruit beggarticks	0.44
Coleataenia anceps	beaked panicum	0.44
Cuphea carthagenensis	Colombian waxweed	0.44
Lachnanthes caroliana	Carolina redroot	0.44
Persea palustris	swamp bay	0.44
Euthamia caroliniana	slender flattop goldenrod	0.38
Rhexia mariana	pale meadowbeauty	0.31
Solidago fistulosa	pinebarren goldenrod	0.25
Andropogon glomeratus var. *glaucopsis*	purple bluestem	0.19
Euthamia graminifolia	flattop goldenrod	0.19
Juncus marginatus	grassleaf rush	0.19
Kellochloa verrucosa	warty panicgrass	0.19
Rhynchospora plumosa	plumed beaksedge	0.19
Amphicarpum muehlenbergianum	blue maidencane	0.13
Hypericum cistifolium	roundpod St. John's wort	0.13
Oldenlandia uniflora	clustered mille graines	0.13
Viola lanceolata	bog white violet	0.13
Chamaecyparis thyoides	Atlantic white cedar	0.06
Cyperaceae		0.06
Diodia virginiana	Virginia buttonweed	0.06
Eleocharis tuberculosa	conecup spikerush	0.06
Hypericum crux-andreae	St. Peter's wort	0.06
Hypericum mutilum	dwarf St. John's wort	0.06
Ilex vomitoria	yaupon	0.06
Proserpinaca pectinata	combleaf mermaidweed	0.06
Rhexia virginica	handsome harry	0.06
Bare Ground		25.13

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

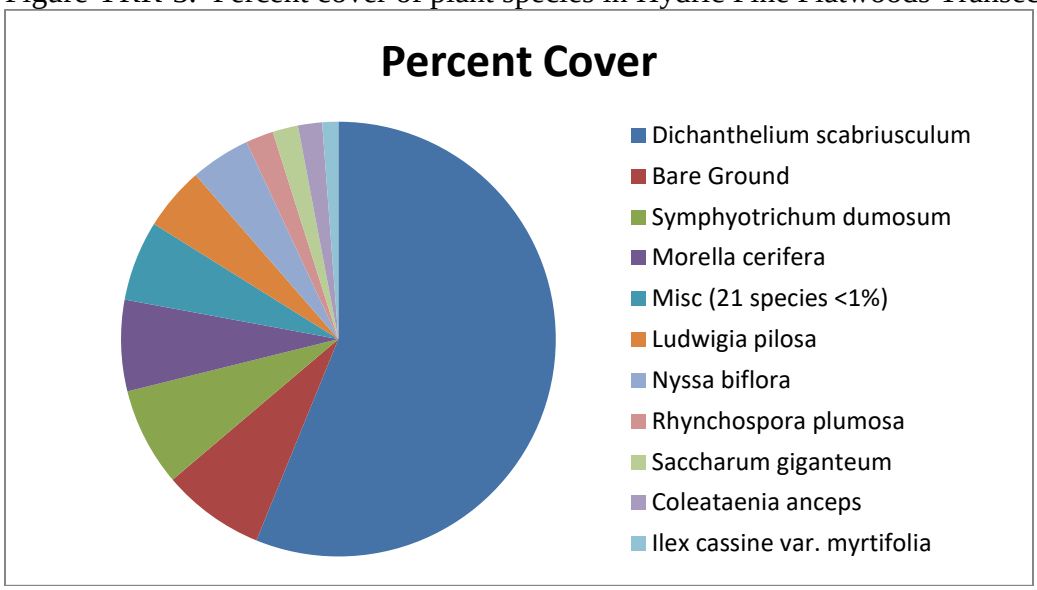


Table YRR-3. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 sampled on October 9, 2019.

Scientific name	Common name	Average percent cover per quadrat
Dichanthelium scabriusculum	woolly witchgrass	64.69
Symphyotrichum dumosum	rice button aster	8.44
Morella cerifera	southern bayberry	7.81
Ludwigia pilosa	hairy primrosewillow	5.44
Nyssa biflora	swamp tupelo	5.13
Rhynchospora plumosa	plumed beaksedge	2.38
Saccharum giganteum	sugarcane plumegrass	2.19
Coleataenia anceps	beaked panicum	2.06
Ilex cassine var. *myrtifolia*	myrtle-leaved holly	1.38
Andropogon glomeratus var. *glaucopsis*	purple bluestem	0.94
Pinus elliottii	slash pine	0.94
Rubus pensilvanicus	sawtooth blackberry	0.94
Centella asiatica	spadeleaf	0.56
Bidens mitis	smallfruit beggarticks	0.50
Lachnanthes caroliana	Carolina redroot	0.50
Rhynchospora rariflora	fewflower beaksedge	0.50
Triadica sebifera	Chinese tallow tree	0.44
Andropogon virginicus	broomsedge bluestem	0.31
Ilex glabra	gallberry	0.25
Euthamia caroliniana	slender flattop goldenrod	0.19
Lycopus rubellus	taperleaf waterhorehound	0.19
Eragrostis elliottii	Elliott's lovegrass	0.13
Acer rubrum	red maple	0.06
Ludwigia linifolia	southeastern primrosewillow	0.06
Pluchea baccharis	rosy camphorweed	0.06
Rhexia virginica	handsome harry	0.06
Rhynchospora elliottii	Elliott's beaksedge	0.06

Scientific name	Common name	Average percent cover per quadrat
Rhynchospora filifolia	threadleaf beaksedge	0.06
Viola lanceolata	bog white violet	0.06
Viola primulifolia	primroseleaf violet	0.06
Bare Ground		8.81

Bottomland Forest

Quantitative sampling. Belt transect 1 contained a mix of mostly red maple, slash pine, and pond cypress, with a few additional species occurring only occasionally (Table YRR-4). While slash pines and pond cypress were mostly taller, red maples in the transect were mostly small, regenerating saplings. Belt Transect 2 consisted of a mix of larger Atlantic white cedars with many small, regenerating red maples (Table YRR-5). This transect has a dense thicket of sawtooth blackberry, and was difficult to traverse and spot saplings.

Cypress

Quantitative sampling. Belt transect 3 was moved to a new location based on information provided by project manager David Clayton (NWFWMD). This transect is now adjacent to the elevated road through the site in an area that was previously planted with native trees. Trees consisted of mainly larger swamp tupelo and pond cypress with a fair number of Atlantic white cedars and a mix of other species (Table YRR-6). Belt Transect 4 was quite open and contained almost exclusively young pond cypress with only a single slash pine (Table YRR-7).

Table YRR-4. Belt Transect Summary for Bottomland Forest Transect 1 sampled on October 9, 2019.

Belt Transect Summary for Bottomland Forest Transect 1 (YYR-BT1-630)									
		Height Scale (feet)							
Species	**Total Number**	**0-1'**	**>1'-2'**	**>2'-3'**	**>3'-4'**	**>4'-5'**	**>5'-6'**	**>6'**	**Condition**
Acer rubrum	243	62	36	68	31	8	2	36	
Cephalanthus occidentalis	17	4	2					11	
Chamaecyparis thyoides	5		1		1			3	
Ilex myrtifolia	2				1			1	
Nyssa biflora	17			6	8		3		
Pinus elliottii	117			1	7	8	16	85	
Styrax americana	5					2		3	
Taxodium ascendens	25		1	1			1	22	
Ilex verticillata	1				1				
Total Number All Species	432								
Number of Trees per Acre	6169								

Table YRR-5. Belt Transect Summary for Bottomland Forest Transect 2 sampled on October 9, 2019.

Belt Transect Summary for Bottomland Forest Transect 2 (YYR-BT2-630)									
		Height Scale (feet)							
Species	**Total Number**	**0-1'**	**>1'-2'**	**>2'-3'**	**>3'-4'**	**>4'-5'**	**>5'-6'**	**>6'**	**Condition**
Acer rubrum	50	12	5	10	10	4	5	4	
Chamaecyparis thyoides	36		2	1				33	
Ilex opaca	2							2	
Magnolia virginiana	2							2	
Nyssa biflora	0								
Pinus palustris	1							1	
Quercus laurifolia	4							4	
Sapium sebiferum	4					1	1	2	
Taxodium ascendens	1				1				
Persea palustris	1			1					
Fraxinus caroliniana	1					1			
Total Number All Species	102								
Number of Trees per Acre	1457								

Table YRR-6. Belt Transect Summary for Cypress Transect 3 sampled on October 9, 2019.

Belt Transect Summary for Cypress Transect 3 (YYR-BT3-621)									
		Height Scale (feet)							
Species	**Total Number**	**0-1'**	**>1'-2'**	**>2'-3'**	**>3'-4'**	**>4'-5'**	**>5'-6'**	**>6'**	**Condition**
Acer rubrum	14			5	6	1	1	1	
Chamaecyparis thyoides	51		2	5	8	11	10	15	
Ilex myrtifolifa	24					2	4	18	
Ilex verticillata	2				1		1		
Magnolia virginiana	8							8	
Nyssa biflora	222					1	5	216	
Pinus elliottii	19				4		4	11	
Taxodium ascendens	62						1	61	
Triadica sebifera	1							1	
Total Number All Species	403								
Number of Trees per Acre	5755								

Table YRR-7. Belt Transect Summary for Cypress Transect 4 sampled on October 9, 2019.

Belt Transect Summary for Cypress Transect 4 (YYR-BT4-621)									
		Height Scale (feet)							
Species	**Total Number**	**0-1'**	**>1'-2'**	**>2'-3'**	**>3'-4'**	**>4'-5'**	**>5'-6'**	**>6'**	**Condition**
Magnolia virginiana	1			1					
Nyssa biflora	10			1		3	3	3	
Pinus elliottii	1							1	
Taxodium ascendens	120			9	13	17	11	70	
Chamaecyparis thyoides	2				1	1			
Total Number All Species	134								
Number of Trees per Acre	1914								