Vegetation Monitoring at Perdido River Northwest Florida Water Management District Mitigation Site

Fall 2024

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Funding for this project was provided by the Northwest Florida Water Management District under the Purchase Order #00250061-000 with the Florida Natural Areas Inventory
Florida State University

Perdido River Water Management Area – Phase II Mitigation Site
Qualitative and Quantitative Monitoring
November 2024

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 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 2). The HPF and PF were converted to loblolly pine plantation in 2002. We used quantitative and qualitative monitoring to document the current plant species composition and vegetation structure of these targeted communities. FNAI biologists have previously monitored the site's vegetation every fall from 2012 to 2023.

METHODS

For the quantitative monitoring, we utilized 150-foot-long permanent transect lines; these were permanently marked during the 2012 survey with metal t-posts at each end. There are 2 transects in each targeted natural community type: Hydric Savanna, Wetland Forest Mixed, and Hydric Pine Flatwoods (Figure 2). We placed eight 1m x 1m quadrats spaced every 20 feet along the left side of each transect, beginning at 0. In each quadrat, we recorded the visually estimated percent cover of each plant species, including individuals rooted in the quadrat as well as overhanging. We excluded canopy over 2 m in height from cover estimates and counted only the lower 2 m portions of taller individuals as cover, including the lower portions of tree trunks rooted in quadrats. We estimated open ground in each quadrat as the percentage of ground not obscured by plant cover or large woody debris up to 2 m. We converted plant cover estimates to mid-point values and averaged them across each transect. We also calculated relative cover (in which all plant cover and open ground is given as a proportion of 100 percent cover); this is reported in separate pie charts.

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. FNAI botanists Kelly Anderson and Ethan Hughes performed all field surveys on November 6, 2024.

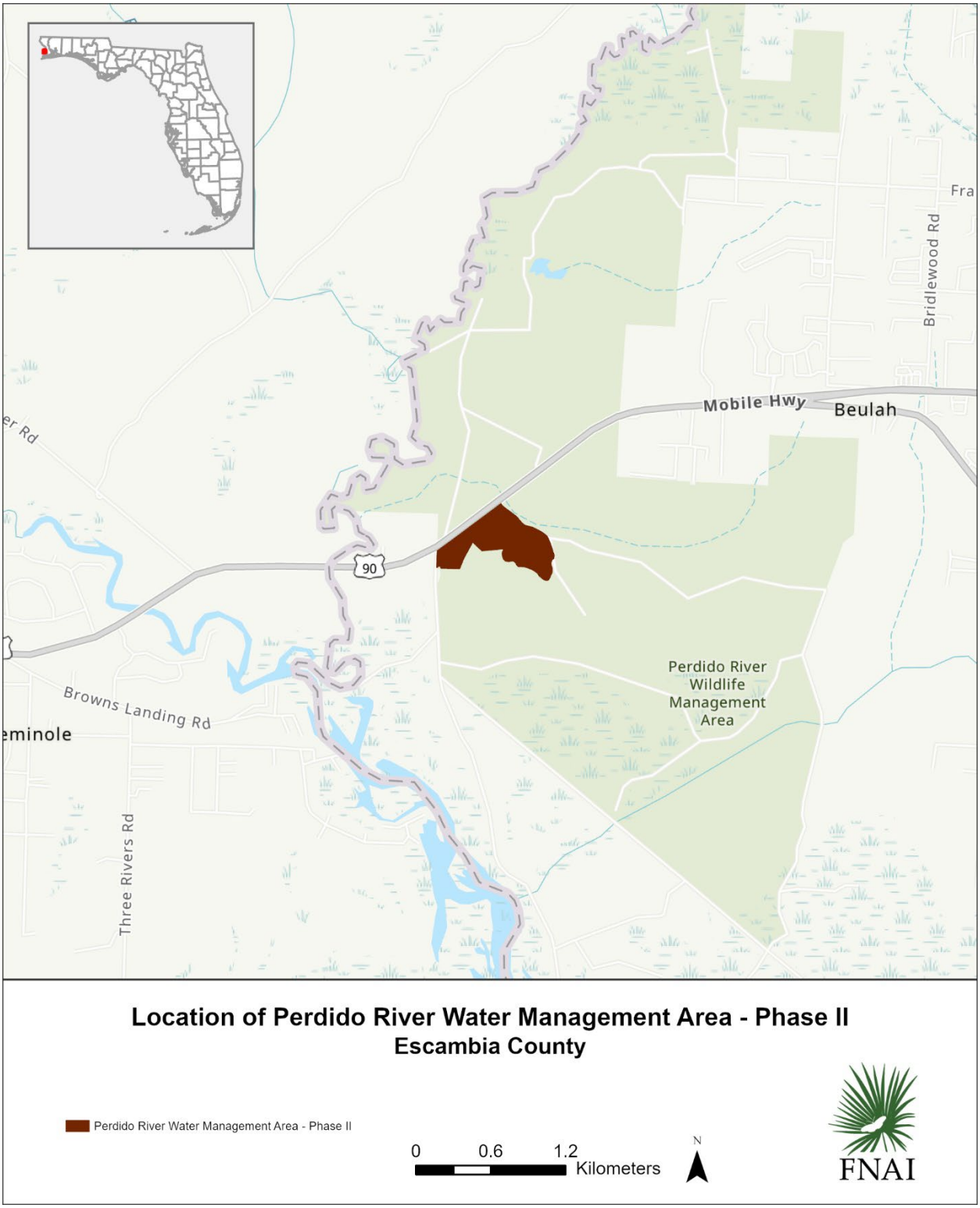

Figure 1. Location map of Perdido River Water Management Area – Phase II Mitigation Site monitored by FNAI.

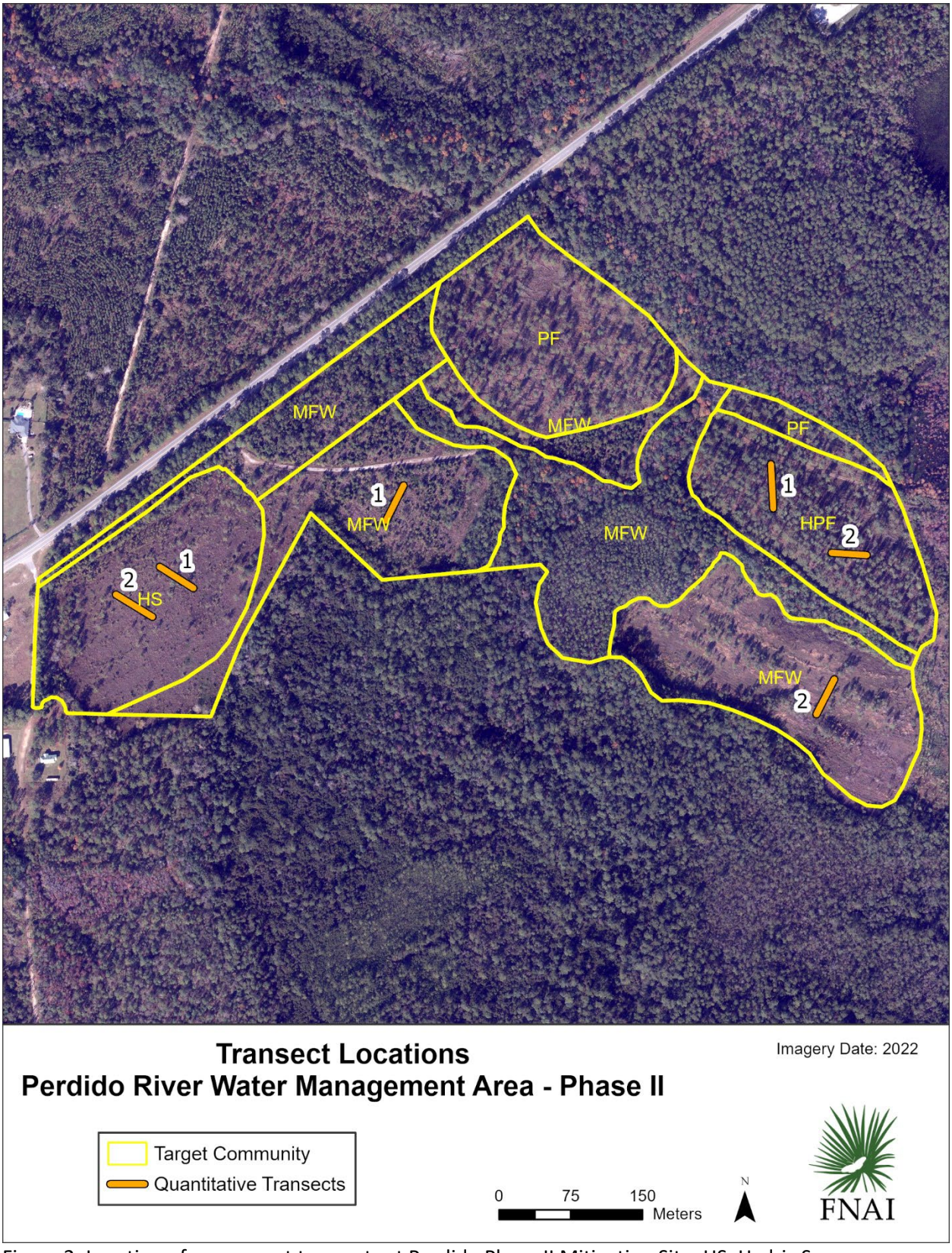

Figure 2. Location of permanent transects at Perdido Phase II Mitigation Site. HS=Hydric Savanna, HPF=Hydric Pine Flatwoods, MFW= Forested Wetland Mixed, PF=Pine Flatwoods.

RESULTS AND DISCUSSION

We observed a total of 179 plant taxa during the 2024 monitoring of the target communities at Perdido River Phase II (Table 1). We documented 3 new taxa, i.e. species or varieties not observed in any previous survey.

Taxonomy follows Weakley, A.S., and Southeastern Flora Team. 2023. Flora of the southeastern United States: Florida. University of North Carolina Herbarium, North Carolina Botanical Garden, Chapel Hill, U.S.A. This is a change from the previous FNAI monitoring reports, which followed 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.

Table 1. Species observed in target communities at Perdido River WMA – Phase II Mitigation Site on November 6, 2024. (bold name = new species; bold X = new observation in community type; * = state-listed endangered or threatened; † = non-native invasive)

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
Acer rubrum	red maple	X	X	X	X	4
Aletris lutea	yellow colic-root				X	1
Anchistea virginica	Virginia chain fern	X	X		X	3
**Andropogon arctatus*	pinewoods bluestem	X				1
Andropogon capillipes	dryland white bluestem	X				1
Andropogon cretaceus	purple bluestem	X	X	X	X	4
Andropogon dealbatus	wetland white bluestem				X	1
Andropogon glomeratus	bushy bluestem	X			X	2
Andropogon glomeratus	bushy bluestem	X		X	X	3
Andropogon hirsutior	hairy bluestem	X				1
Andropogon sp.	bluestem	X	X		X	3
Andropogon virginicus	**broomsedge bluestem**	**X**			**X**	2
Anthenantia rufa	purple silkyscale	X			X	2
Aristida beyrichiana	Southern wiregrass	X		X		2
Aristida spiciformis var. *spiciformis*	bottlebrush threeawn				X	1
Aristida virgata	arrowfeather threeawn			X		1
Aronia arbutifolia	red chokeberry	X	X	X	X	4
Arundinaria tecta	small cane	X		X		2
Axonopus fissifolius	common carpetgrass				X	1
Baccharis halimifolia	groundsel tree			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
Carex sp.	sedge		X			1
Castanea pumila	chinquapin			X		1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
Centella erecta	spadeleaf	X	X		X	3
Chamaecyparis thyoides	Atlantic white cedar		X		X	2
Clethra tomentosa	downy sweet pepperbush			X		1
Cliftonia monophylla	black titi	X	X		X	3
Coleataenia anceps ssp. *anceps*	beaked panicum	X	X	X		3
Coleataenia longifolia	ciliate redtop panicum	X	X		X	3
Ctenium aromaticum	toothache grass	X				1
Cyrilla racemiflora	titi	X		X	X	3
Dichanthelium acuminatum var. *acuminatum*	tapered witchgrass	X				1
Dichanthelium chamaelonche	carpet witchgrass				X	1
Dichanthelium consanguineum	Kunth's witchgrass				X	1
Dichanthelium ensifolium	small-leaved witchgrass	X			X	2
Dichanthelium longiligulatum	long-ligule witchgrass				X	1
Dichanthelium portoricense	Puerto Rican witchgrass	**X**			X	2
Dichanthelium scabriusculum	woolly witchgrass	X	X		X	3
Dichanthelium sp.	witchgrass	X				1
Dichanthelium strigosum var. *glabrescens*	roughhair witchgrass			X		1
Dichanthelium tenue	white-edged witchgrass				X	1
Diodia virginiana	Virginia buttonweed			X		1
Drosera brevifolia	dwarf sundew				X	1
Drosera capillaris	pink sundew				X	1
Edrastima uniflora	oldenlandia	X		X	X	3
Eleocharis tuberculosa	conecup spikerush		X			1
Eleocharis vivipara	viviparous spikerush		X			1
Elephantopus elatus	tall elephantsfoot	X		X		2
Eragrostis elliottii	Elliott's lovegrass				X	1
Erianthus giganteus	sugarcane plumegrass		X		X	2
Eriocaulon compressum	flattened pipewort				X	1
Eriocaulon decangulare	tenangle pipewort				X	1
Eupatorium anomalum	anomalous thoroughwort		X	X	**X**	3
Eupatorium capillifolium	dogfennel	X		X		2
Eupatorium mohrii	Mohr's thoroughwort	X	X	X	X	4
Eupatorium pilosum	rough boneset	X	X	X	X	4
Eupatorium rotundifolium	roundleaf thoroughwort	X		X	X	3
Eupatorium semiserratum	smallflower thoroughwort			X		1
Eupatorium sp.	thoroughwort				X	1
Euthamia caroliniana	slender flattop goldenrod	X	X	X	X	4
Euthamia scabra	Gulf Coast goldenrod			X		1
Fuirena breviseta	saltmarsh umbrellasedge		X			1
Fuirena squarrosa	hairy umbrellasedge		X			1
Gaylussacia dumosa	dwarf huckleberry				X	1
Gaylussacia mosieri	woolly huckleberry	X			X	2

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
Helianthus angustifolius	narrowleaf sunflower	X				1
Hydrocotyle umbellata	manyflower marshpennywort		X			1
Hypericum brachyphyllum	coastalplain St. John's wort	X			X	2
Hypericum cistifolium	roundpod St. John's wort			X	X	2
Hypericum crux-andreae	St. Peter's wort	X	X		X	3
Hypericum hypericoides	St. Andrew's cross			X	X	2
Hypericum setosum	hairy St. John's wort			X		1
Hyptis alata var. *alata*	clustered bushmint	X	X	X	X	4
Ilex cassine	dahoon				X	1
Ilex coriacea	large gallberry	X	X		X	3
Ilex glabra	gallberry	X	X		X	3
Ilex myrtifolia	myrtle-leaved holly	X			X	2
Ilex vomitoria	yaupon	X		X	X	3
Juncus marginatus	grassleaf rush		X		X	2
Juncus sp.	rush	X				1
Kalmia hirsuta	hairy wicky				X	1
Kellochloa verrucosa	warty panicgrass	X	X	X	X	4
Lachnanthes caroliniana	Carolina redroot		X		X	2
Lachnocaulon anceps	whitehead bogbutton	X		X	X	3
Lobelia brevifolia	shortleaf lobelia				X	1
Lophiola aurea	golden crest				X	1
Lorinseria areolata	netted chain fern	X	X	X	X	4
Ludwigia linearis var. *puberula*	Western narrowleaf primrosewillow				X	1
Ludwigia pilosa	hairy primrosewillow	X	X		X	3
Lycopodiella alopecuroides	foxtail club-moss	X	X	X	X	4
Lycopodiella appressa	Southern club-moss				X	1
Lycopus rubellus	taperleaf waterhorehound		X		**X**	2
†*Lygodium japonicum*	Japanese climbing fern			X		1
Lyonia lucida	fetterbush		X		X	2
Magnolia virginiana var. *australis*	sweetbay	X	X	X	X	4
Mitchella repens	partridgeberry			X		1
Morella caroliniensis	evergreen bayberry	X			X	2
Morella cerifera	Southern bayberry	X	X	X	X	4
Bryophyta	moss	**X**	X		X	3
Muhlenbergia expansa	cutover muhly	X				1
Muscadinia rotundifolia	muscadine	X	X	X	X	4
Osmunda spectabilis	royal fern	X	X			2
Osmundastrum cinnamomeum	cinnamon fern	X	X		X	3
Persicaria hydropiperoides	mild waterpepper		X			1
Pinus elliottii	slash pine		X		X	2
Pinus glabra	spruce pine				X	1
Pinus sp.	pine				X	1
Pinus taeda	loblolly pine	X	X	X	X	4

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
Pluchea foetida	stinking camphorweed	X		X		2
Polygala lutea	orange milkwort				X	1
Polygala sp.	milkwort				X	1
Proserpinaca palustris	**marsh mermaidweed**		**X**			1
Proserpinaca pectinata	combleaf mermaidweed		X			1
Pseudolycopodiella caroliniana	slender club-moss				X	1
Pteridium pseudocaudatum	tailed bracken				X	1
Quercus hemisphaerica	laurel oak			X		1
Quercus michauxii	swamp chestnut oak				X	1
Quercus nigra	water oak	X		X		2
Quercus virginiana	live oak			X	X	2
Rhexia alifanus	savannah meadowbeauty				X	1
Rhexia mariana	pale meadowbeauty				X	1
Rhexia petiolata	fringed meadowbeauty				X	1
Rhexia virginica	handsome harry	X	X	X	X	4
Rhus copallinum var. *copallinum*	winged sumac	X		X	X	3
Rhynchospora baldwinii	Baldwin's beaksedge				X	1
Rhynchospora careyana	Cary's horned beaksedge				**X**	1
Rhynchospora cephalantha var. *cephalantha*	bunched beaksedge		X		X	2
Rhynchospora chalarocephala	loosehead beaksedge				X	1
Rhynchospora chapmanii	Chapman's beaksedge				X	1
Rhynchospora ciliaris	fringed beaksedge				X	1
Rhynchospora corniculata	shortbristle horned beaksedge		X			1
Rhynchospora fascicularis	fascicled beaksedge		X		X	2
Rhynchospora gracilenta	slender beaksedge	X			X	2
Rhynchospora inexpansa	nodding beaksedge				X	1
Rhynchospora inundata	narrowfruit horned beaksedge				X	1
Rhynchospora plumosa	plumed beaksedge				X	1
Rhynchospora sp.	beaksedge	X	X			2
Rubus cuneifolius	sand blackberry	X				1
Rubus pensilvanicus	sawtooth blackberry	X	X	X	X	4
Rubus sp.	blackberry		X			1
Sagittaria graminea	grassy arrowhead		X			1
Schizachyrium stoloniferum	creeping little bluestem			X		1
Scirpus cyperinus	woolgrass		X			1
Scleria ciliata	fringed nutrush	X			X	2
Scleria ciliata var. *ciliata*	hairy nutrush				X	1
Scleria ciliata var. *glabra*	smooth nutrush				X	1
Scleria ciliata var. *elliottii*	broad-leaved hairy nutrush	X			X	2
Scleria triglomerata	whip nutrush	X				1
Serenoa repens	saw palmetto				X	1
Smilax auriculata	earleaf greenbriar	X				1

Scientific Name	Common Name	Hydric Pine Flatwoods	Hydric Savanna	Pine Flatwoods	Wetland Forest Mixed	Grand Total
Smilax glauca	cat greenbriar	X		X	X	3
Smilax laurifolia	laurel greenbriar				X	1
Smilax walteri	coral greenbriar		X			1
Solidago fistulosa	pinebarren goldenrod	X	X	X	X	4
Sphagnum sp.	sphagnum moss	X	X		X	3
Symphyotrichum dumosum	rice button aster	X				1
Symphyotrichum lanceolatum var. *latifolium*	white panicle aster	X		X	X	3
Syngonanthus flavidulus	yellow hatpins				X	1
Tamala palustris	swamp bay	X	X	X	X	4
Taxodium ascendens	pond cypress		X		X	2
Taxodium distichum	bald cypress		X			1
Toxicodendron radicans var. *radicans*	Eastern poison ivy	X	X	X	X	4
†*Triadica sebifera*	Chinese tallow tree			X		1
Trilisa odoratissima	vanillaleaf				X	1
Vaccinium elliottii	Elliott's blueberry	X		X	X	3
Vaccinium fuscatum	hairy highbush blueberry	X	X	X		3
Viola lanceolata	bog white violet				X	1
Viola primulifolia	primroseleaf violet	X		X	X	3
Viola sp.	violet	X				1
Viola vittata	**Southern water violet**	**X**				1
Xyris ambigua	coastalplain yellow-eyed grass	X		X	X	3
Xyris baldwiniana	Baldwin's yellow-eyed grass				X	1
Xyris caroliniana	Carolina 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	X		X	3
Total number of taxa: 179		85	66	60	123	334

Hydric Savanna

Qualitative sampling. The target community of Hydric Savanna (Figure 2) had a total of 66 observed plant taxa (Table 1). The groundcover was dominated by a dense cover of sphagnum moss and a diversity of predominantly weedy herbaceous species, primarily purple bluestem and pinebarren goldenrod. Pinewoods bluestem, state-listed as threatened, was seen in this community in 2020 and 2021 along the qualitative meandering transect. It has not been detected since then in hydric savanna, although it is still present in the hydric pine flatwoods. Shrubs were mostly 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. There appeared to have been some recent brush cutting on the site.

Quantitative sampling. Transect 1 (Figure 3, Table 2) had a total of 28 taxa. 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, other unidentified mosses, Virginia chain fern, hairy primrosewillow, and smallfruit beggarticks. Purple bluestem has markedly decreased compared to last year. Woody species made up around 5% average cover per quadrat, a decrease from last year. Other species also shifted in dominance, but composition was roughly the same.

Transect 2 (Figure 4, Table 3) had a total of 34 taxa which covered over 100% of the area. The dominant species were sphagnum moss, viviparous spikerush, purple bluestem, slash pine, and smallfruit beggarticks. Woody species made up about 14% average cover per quadrat, an increase from last year attributable to more pine cover. Viviparous spikerush is also increasing, probably in response to wetter conditions this year. Otherwise, vegetation along the transect was very similar in composition to the previous year.

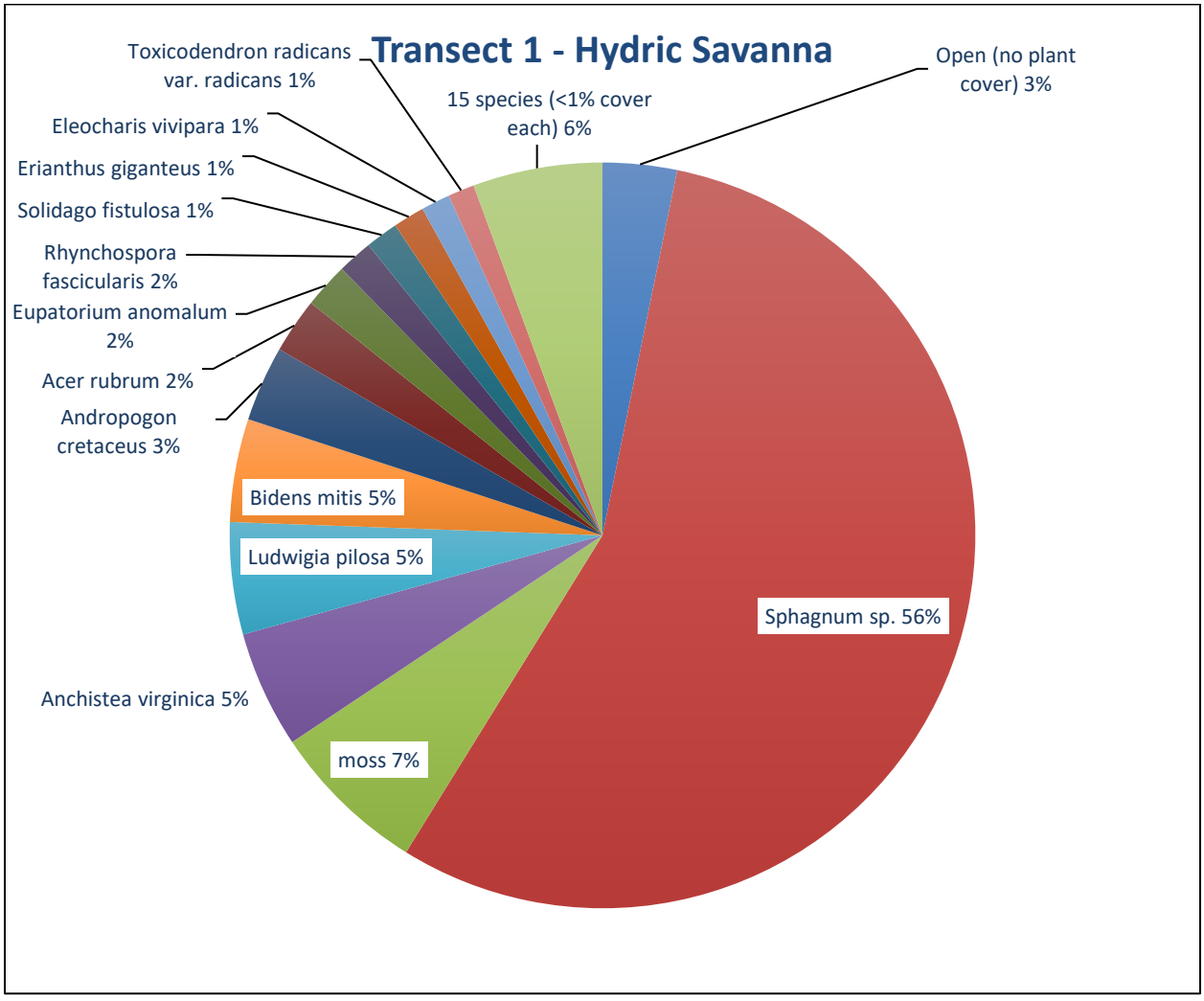

Figure 3. Percent relative cover of plant species in Hydric Savanna Transect 1.

Table 2. Percent cover of plant species in Hydric Savanna Transect 1 sampled on November 6, 2024.

Scientific name	Common name	Average percent cover per quadrat
Acer rubrum	red maple	2.75
Anchistea virginica	Virginia chain fern	5.81
Andropogon cretaceus	purple bluestem	3.75
Aronia arbutifolia	red chokeberry	0.06
Bidens mitis	smallfruit beggarticks	5.13
Centella erecta	spadeleaf	0.06
Coleataenia longifolia	ciliate redtop panicum	0.88
Eleocharis vivipara	viviparous spikerush	1.44
Erianthus giganteus	sugarcane plumegrass	1.56
Eupatorium anomalum	anomalous thoroughwort	2.25
Eupatorium mohrii	Mohr's thoroughwort	0.94
Hydrocotyle umbellata	manyflower marshpennywort	0.94
Ilex coriacea	large gallberry	0.06
Kellochloa verrucosa	warty panicgrass	0.81
Lachnanthes caroliniana	Carolina redroot	0.81
Ludwigia pilosa	hairy primrosewillow	5.56
Bryophyta	moss	7.81
Muscadinia rotundifolia	muscadine	0.44
Pinus elliottii	slash pine	0.44
Rhexia virginica	handsome harry	0.19
Rhynchospora cephalantha* var. *cephalantha	bunched beaksedge	0.06
Rhynchospora fascicularis	fascicled beaksedge	1.75
***Rhynchospora* sp.**	beaksedge	0.44
Solidago fistulosa	pinebarren goldenrod	1.63
***Sphagnum* sp.**	sphagnum moss	63.75
Tamala palustris	swamp bay	0.06
Toxicodendron radicans* var. *radicans	eastern poison ivy	1.31
Xyris fimbriata	fringed yellow-eyed grass	0.25
Open (no plant cover)		3.69

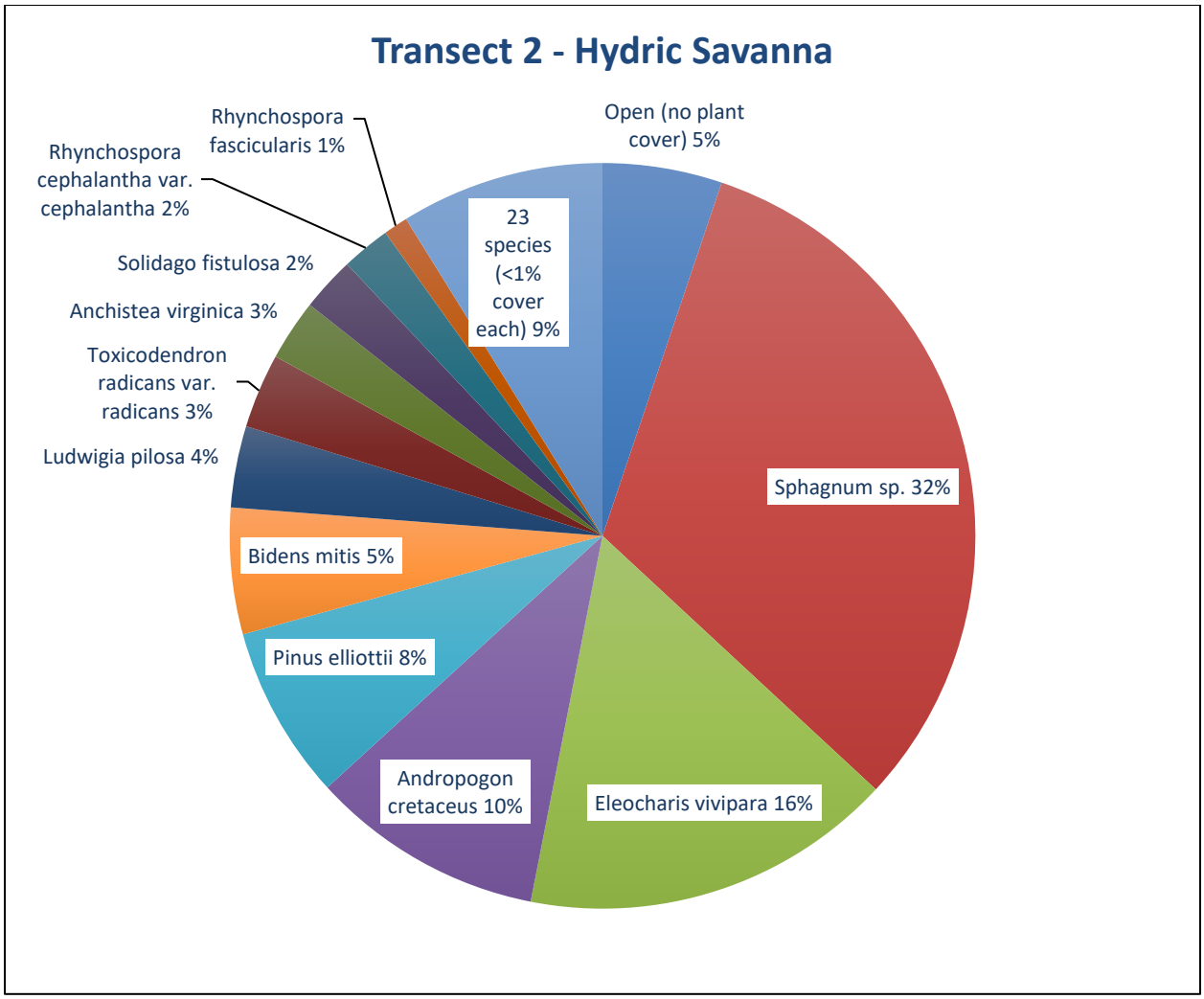

Figure 4. Percent relative cover of plant species in Hydric Savanna Transect 2.

Table 3. Percent cover of plant species in Hydric Savanna Transect 2 sampled on November 6, 2024.

Scientific name	Common name	Average percent cover per quadrat
Acer rubrum	red maple	0.69
Anchistea virginica	Virginia chain fern	2.81
Andropogon cretaceus	purple bluestem	10.75
***Andropogon* sp.**	bluestem	0.88
Aronia arbutifolia	red chokeberry	0.19
Bidens mitis	smallfruit beggarticks	5.81
***Carex* sp.**	sedge	0.19
Centella erecta	spadeleaf	0.63
Eleocharis vivipara	viviparous spikerush	17.19
Erianthus giganteus	sugarcane plumegrass	0.44
Eupatorium anomalum	anomalous thoroughwort	0.19
Euthamia caroliniana	slender flattop goldenrod	0.19

Hydrocotyle umbellata	manyflower marshpennywort	0.88
Hypericum crux-andreae	St. Peter's wort	0.19
Ilex coriacea	large gallberry	0.44
Kellochloa verrucosa	warty panicgrass	0.19
Lachnanthes caroliniana	Carolina redroot	0.44
Lorinseria areolata	netted chain fern	0.38
Ludwigia pilosa	hairy primrosewillow	3.75
Lycopus rubellus	taperleaf waterhorehound	0.19
Pinus elliottii	slash pine	8.00
Proserpinaca palustris	marsh mermaidweed	0.19
Proserpinaca pectinata	combleaf mermaidweed	0.06
Rhexia virginica	handsome harry	0.63
Rhynchospora cephalantha* var. *cephalantha	bunched beaksedge	2.25
Rhynchospora fascicularis	fascicled beaksedge	1.13
***Rhynchospora* sp.**	beaksedge	0.94
Rubus pensilvanicus	sawtooth blackberry	0.94
***Rubus* sp.**	blackberry	0.19
Solidago fistulosa	pinebarren goldenrod	2.50
***Sphagnum* sp.**	sphagnum moss	33.69
Taxodium ascendens	pond cypress	0.19
Toxicodendron radicans* var. *radicans	eastern poison ivy	3.44
Vaccinium fuscatum	hairy highbush blueberry	0.19
Open (no plant cover)		5.50

Wetland Forest Mixed

Qualitative sampling. The target community of Wetland Forest Mixed (Figure 2) had a total of 123 observed plant species (Table 1). The vegetative cover in the western area was a mixed stand of various hardwoods and pine. Sphagnum moss and large Atlantic white cedars were common. The growing cedars are creating dense shade with little herbaceous cover underneath. In the eastern area, woody species, such as black titi, large gallberry, dahoon, sweetbay, fetterbush, and St. John's wort, have been reduced in recent years but are quickly growing. Young slash and loblolly pines were widely scattered throughout. There were patches of more mesic vegetation and also wetter pond cypress depressions and prairies. The state-listed endangered white-top pitcherplant and state-listed threatened Gulf purple pitcherplant were both found in this community for the first time in 2023, but were not observed this year.

Quantitative sampling. Transect 1 had a total of 40 species and 24% open ground (Figure 5, Table 4). The dominant species were Atlantic white cedar, sphagnum moss, black titi, and purple bluestem. The pines and other woody species are starting to form a shrubbier, more closed habitat in this area. Woody species made up around 42% average cover per quadrat, continuing to increase since 2022, owing in part to an increase in Atlantic white cedar. Purple bluestem cover was half of last year's value.

Transect 2 (Figure 6, Table 5) had a total of 53 species with 16% open ground. The overall aspect was more open than Transect 1 and had less woody cover. Black titi, foxtail club-moss, and purple bluestem were dominants. Woody species made up around 28% average cover per quadrat, an increase from last year owing in part to a continued increase in black titi.

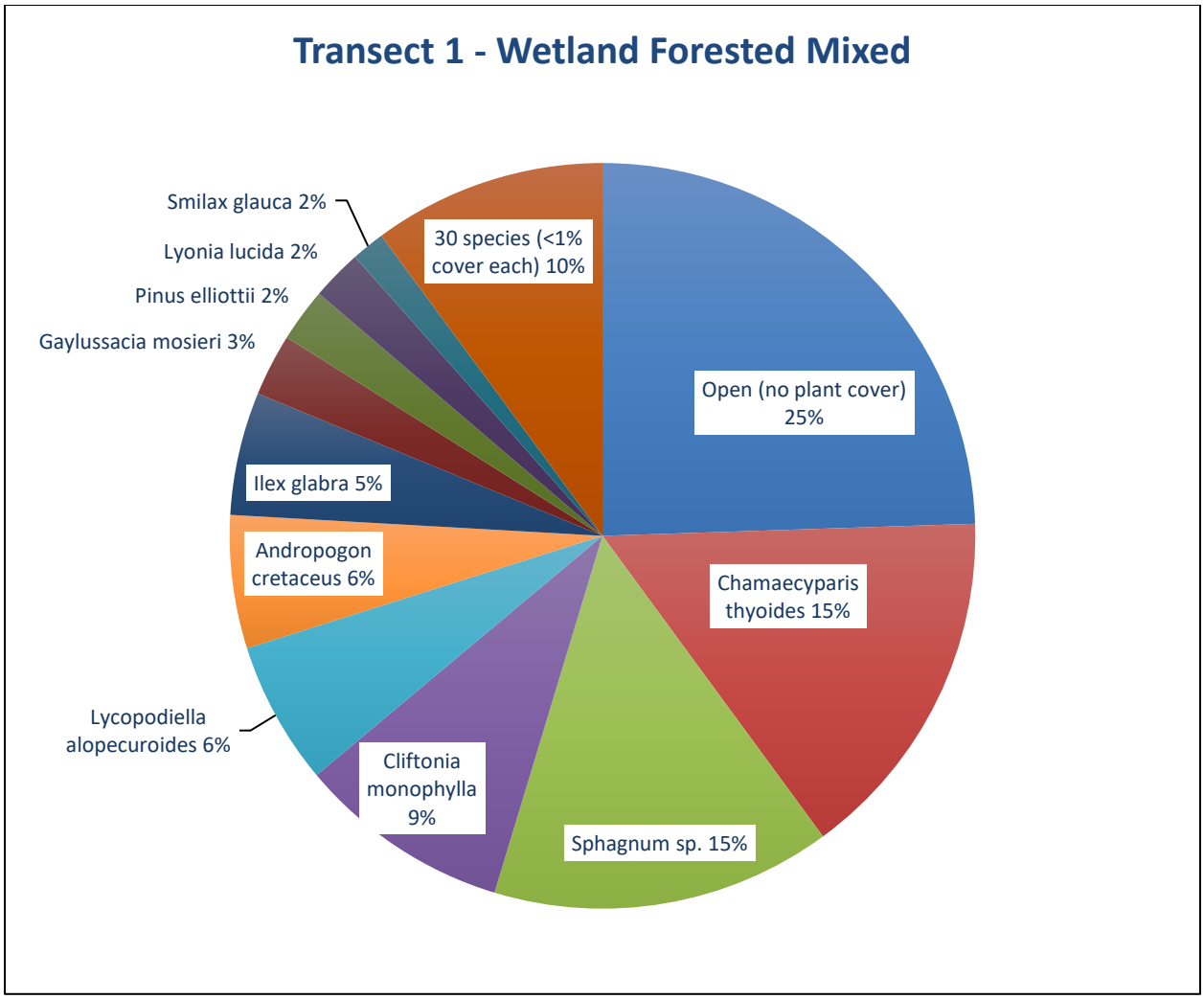

Figure 5. Percent relative cover of plant species in Mixed Forested Wetland Transect 1.

Table 4. Percent cover of plant species in Mixed Forested Wetland Transect 1 sampled on November 6, 2024.

Scientific name	Common name	Average percent cover per quadrat
Acer rubrum	red maple	0.06
Anchistea virginica	Virginia chain fern	0.06
Andropogon cretaceus	purple bluestem	5.75
***Andropogon* sp.**	bluestem	0.94
Aronia arbutifolia	red chokeberry	0.19
Chamaecyparis thyoides	Atlantic white cedar	15.38
Cliftonia monophylla	black titi	9.19
Coleataenia longifolia	ciliate redtop panicum	0.19
Dichanthelium longiligulatum	long-ligule witchgrass	0.94
Eriocaulon decangulare	tenangle pipewort	0.19
Gaylussacia mosieri	woolly huckleberry	2.69
Hypericum brachyphyllum	coastalplain St. John's wort	0.06

Scientific name	Common name	Average percent cover per quadrat
Hypericum cistifolium	roundpod St. John's wort	0.19
Hypericum hypericoides	St. Andrew's cross	0.44
Ilex coriacea	large gallberry	0.44
Ilex glabra	gallberry	5.31
Juncus marginatus	grassleaf rush	0.06
Kellochloa verrucosa	warty panicgrass	0.94
Lachnocaulon anceps	whitehead bogbutton	0.44
Lophiola aurea	golden crest	0.63
Lorinseria areolata	netted chain fern	0.13
Lycopodiella alopecuroides	foxtail club-moss	6.19
Lyonia lucida	fetterbush	2.19
Magnolia virginiana* var. *australis	sweetbay	0.50
Morella cerifera	southern bayberry	0.94
Bryophyta	moss	0.13
Muscadinia rotundifolia	muscadine	0.44
Pinus elliottii	slash pine	2.31
***Pinus* sp.**	pine	0.06
Rhexia virginica	handsome harry	0.06
Rhynchospora baldwinii	Baldwin's beaksedge	0.19
Rhynchospora cephalantha* var. *cephalantha	bunched beaksedge	0.19
Rhynchospora fascicularis	fascicled beaksedge	0.31
Scleria ciliata	hairy nutrush	0.06
Smilax glauca	cat greenbrier	1.44
Smilax laurifolia	laurel greenbrier	0.19
Solidago fistulosa	pinebarren goldenrod	0.19
***Sphagnum* sp.**	sphagnum moss	14.69
Taxodium ascendens	pond cypress	0.44
Xyris baldwiniana	Baldwin's yellow-eyed grass	0.50
Open (no plant cover)		24.38

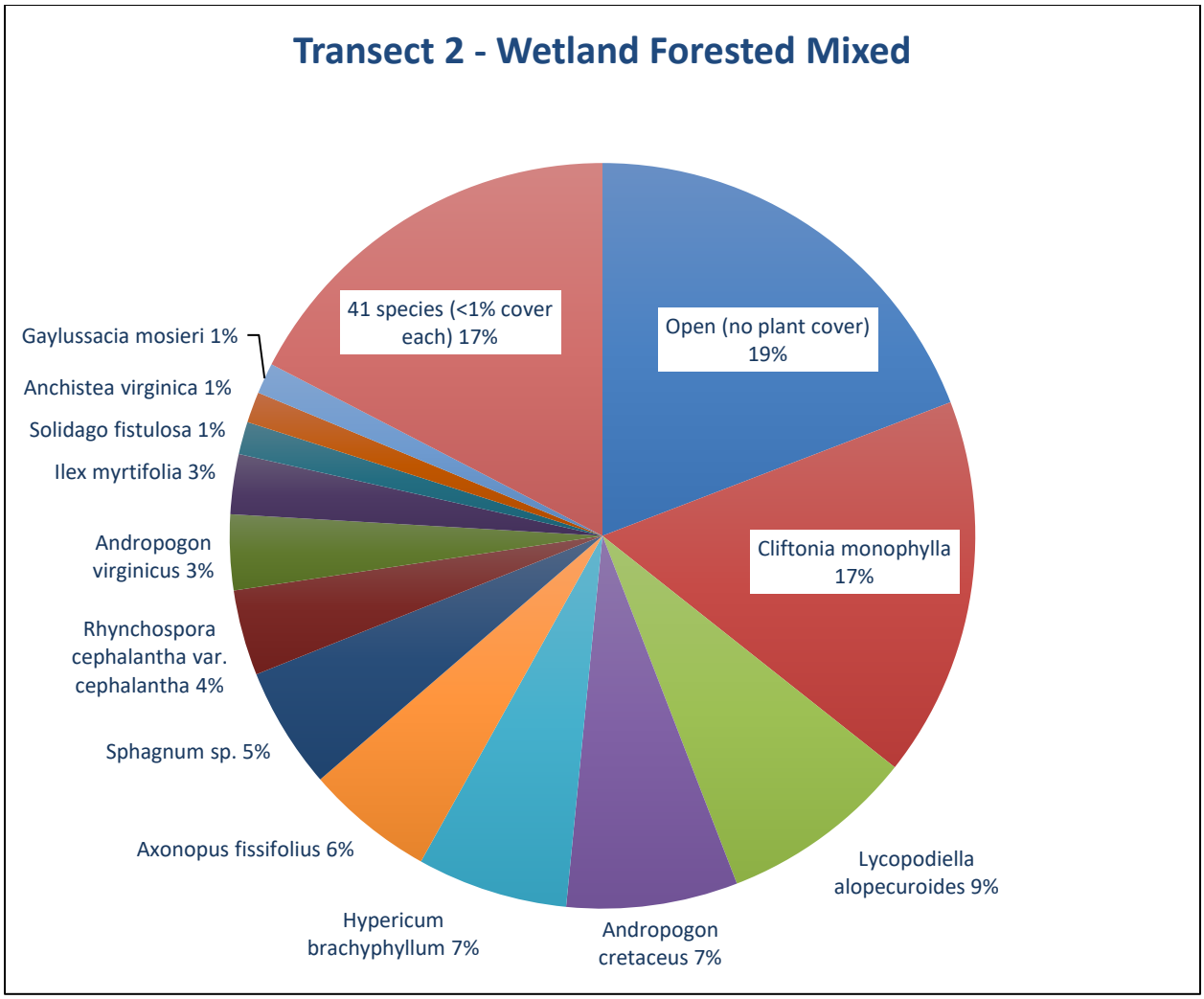

Figure 6. Percent relative cover of plant species in Mixed Forested Wetland Transect 2.

Table 5. Percent cover of plant species in Mixed Forested Wetland Transect 2 sampled on November 6, 2024.

Scientific name	Common name	Average percent cover per quadrat
Acer rubrum	red maple	0.19
Aletris lutea	yellow colic-root	0.06
Anchistea virginica	Virginia chain fern	1.13
Andropogon cretaceus	purple bluestem	6.25
Andropogon virginicus	broomsedge bluestem	2.75
Axonopus fissifolius	common carpetgrass	4.69
Bidens mitis	smallfruit beggarticks	0.38
Cliftonia monophylla	black titi	13.88
Coleataenia longifolia	ciliate redtop panicum	0.19
Dichanthelium ensifolium	small-leaved witchgrass	0.56
Dichanthelium scabriusculum	woolly witchgrass	0.44

Scientific name	Common name	Average percent cover per quadrat
Drosera brevifolia	dwarf sundew	0.06
Drosera capillaris	pink sundew	0.06
Edrastima uniflora	oldenlandia	0.38
Eragrostis elliottii	Elliott's lovegrass	0.13
Eriocaulon compressum	flattened pipewort	0.25
Eupatorium mohrii	Mohr's thoroughwort	0.06
Eupatorium pilosum	rough boneset	0.63
***Eupatorium* sp.**	thoroughwort	0.06
Euthamia caroliniana	slender flattop goldenrod	0.88
Gaylussacia mosieri	woolly huckleberry	1.13
Hypericum brachyphyllum	coastalplain St. John's wort	5.50
Hypericum crux-andreae	St. Peter's wort	0.06
Ilex coriacea	large gallberry	0.13
Ilex myrtifolia	myrtle-leaved holly	2.19
Juncus marginatus	grassleaf rush	0.19
Kellochloa verrucosa	warty panicgrass	0.19
Lachnocaulon anceps	whitehead bogbutton	0.06
Lorinseria areolata	netted chain fern	0.44
Ludwigia pilosa	hairy primrosewillow	0.44
Lycopodiella alopecuroides	foxtail club-moss	7.13
Lycopus rubellus	taperleaf waterhorehound	0.06
Magnolia virginiana* var. *australis	sweetbay	0.94
Bryophyta	moss	0.25
Muscadinia rotundifolia	muscadine	0.38
Osmundastrum cinnamomeum	cinnamon fern	0.44
Pinus elliottii	slash pine	0.19
Pinus taeda	loblolly pine	0.69
***Polygala* sp.**	milkwort	0.06
Rhexia virginica	handsome harry	0.63
Rhynchospora cephalantha* var. *cephalantha	bunched beaksedge	3.13
Rhynchospora chalarocephala	loosehead beaksedge	0.88
Rhynchospora ciliaris	fringed beaksedge	0.19
Rubus pensilvanicus	sawtooth blackberry	0.44
Scleria ciliata	hairy nutrush	0.25
Smilax glauca	cat greenbrier	0.44
Smilax laurifolia	laurel greenbrier	0.38
Solidago fistulosa	pinebarren goldenrod	1.19
***Sphagnum* sp.**	sphagnum moss	4.44
Tamala palustris	swamp bay	0.88
Taxodium ascendens	pond cypress	0.44
Viola lanceolata	bog white violet	0.44
Xyris ambigua	coastalplain yellow-eyed grass	0.88
Open (no plant cover)		16.13

Hydric Pine Flatwoods

Qualitative monitoring. The target community of hydric pine flatwoods had a total of 85 plant taxa observed in 2024 (Table 1). The 60-100-foot planted loblolly pines were thinned in 2017 by cutting

selected rows of trees near ground level. The resulting logs were left where they fell on the ground. Recent tropical storms have felled additional trees. During the 2024 sampling effort, these logs were continuing to decompose. Vines of muscadine grape were common and often dense. These vine thickets are steadily taking over this stand in the absence of fire. Much of the ground was covered by a thick layer of pine needle litter. The herbaceous layer was dominated by wiregrass, cinnamon fern, hairy bluestem, and broomsedge bluestem, as well as many weedy species. Curtiss' sandgrass (*Calamovilfa curtissii*) and pinewoods bluestem (*Andropogon arctatus*), both state-listed as threatened, are known from this community and were confirmed present this year. Two non-native invasive species, Japanese climbing fern and Chinese tallow tree, have been noted in this community in prior years, but were not detected this year.

Quantitative monitoring. Where branches of the felled pines lay across the quadrats, they were moved aside to view the plants beneath. This woody debris is continuing to decompose. Transect 1 had a total of 33 species with 71% open ground (Figure 7, Table 6). The dominant species were loblolly pine, wiregrass, and muscadine. Woody species (including muscadine) made up around 19% average cover per quadrat, an increase from last year owing to an increase in pine, muscadine, and red maple cover.

Transect 2 (Figure 8, Table 7) had a total of 45 species with 53% open ground. The dominant species were wiregrass, loblolly pine, and cinnamon fern. Weedy grasses such as bluestem and warty panicum were somewhat reduced this year. Woody species made up around 14% average cover per quadrat, similar to last year. A large, downed pine tree (present since 2020) at the beginning of the transect is continuing to decompose, but still creates difficulties for sampling.

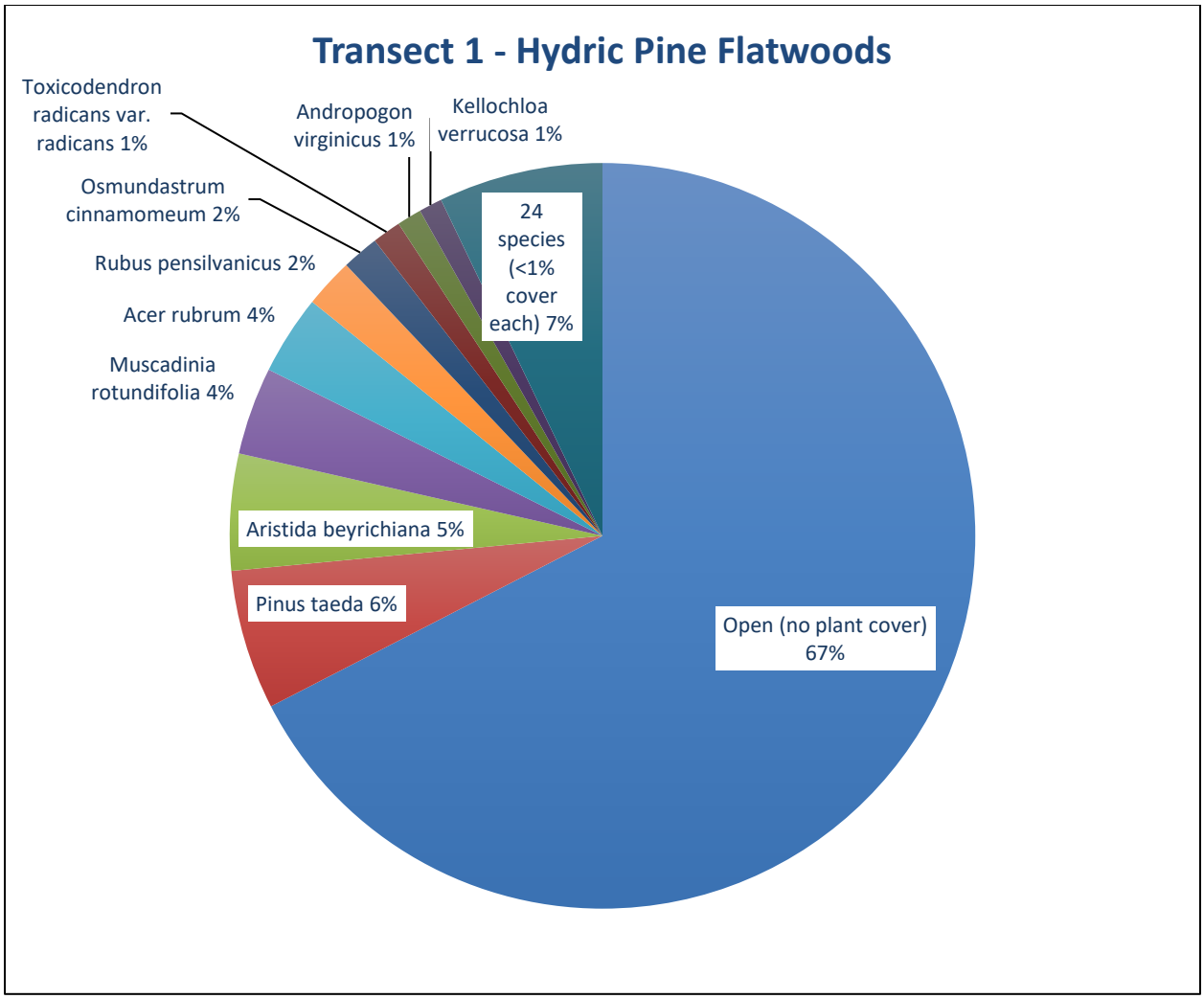

Figure 7. Percent relative cover of plant species in Hydric Pine Flatwoods Transect 1.

Table 6. Percent cover of species in Hydric Pine Flatwoods Transect 1 sampled on November 6, 2024.

Scientific name	Common name	Average percent cover per quadrat
Acer rubrum	red maple	3.63
Anchistea virginica	Virginia chain fern	0.19
Andropogon glomeratus	bushy bluestem	0.94
***Andropogon* sp.**	bluestem	0.38
Andropogon virginicus	broomsedge bluestem	1.13
Aristida beyrichiana	Southern wiregrass	5.31
Calamovilfa curtissii	Curtiss' sandgrass	0.06
Centella erecta	spadeleaf	0.06
Coleataenia longifolia	ciliate redtop panicum	0.44
Ctenium aromaticum	toothache grass	0.44
Dichanthelium acuminatum* var. *acuminatum	tapered witchgrass	0.06
Dichanthelium portoricense	Puerto Rican witchgrass	0.19

Scientific name	Common name	Average percent cover per quadrat
Edrastima uniflora	oldenlandia	0.13
Elephantopus elatus	tall elephantsfoot	0.94
Eupatorium capillifolium	dogfennel	0.44
Eupatorium pilosum	rough boneset	0.19
Euthamia caroliniana	slender flattop goldenrod	0.56
Kellochloa verrucosa	warty panicgrass	1.06
Magnolia virginiana* var. *australis	sweetbay	0.25
Morella cerifera	southern bayberry	0.06
Muscadinia rotundifolia	muscadine	4.00
Osmunda spectabilis	royal fern	0.44
Osmundastrum cinnamomeum	cinnamon fern	1.69
Pinus taeda	loblolly pine	6.38
Rubus cuneifolius	sand blackberry	0.44
Rubus pensilvanicus	sawtooth blackberry	2.25
Scleria ciliata	hairy nutrush	0.19
Smilax auriculata	earleaf greenbrier	0.06
Smilax glauca	cat greenbrier	0.19
Solidago fistulosa	pinebarren goldenrod	0.56
Symphyotrichum dumosum* var. *dumosum	long-stalked aster	0.25
Toxicodendron radicans* var. *radicans	eastern poison ivy	1.31
Xyris platylepis	tall yellow-eyed grass	0.06
Open (no plant cover)		70.94

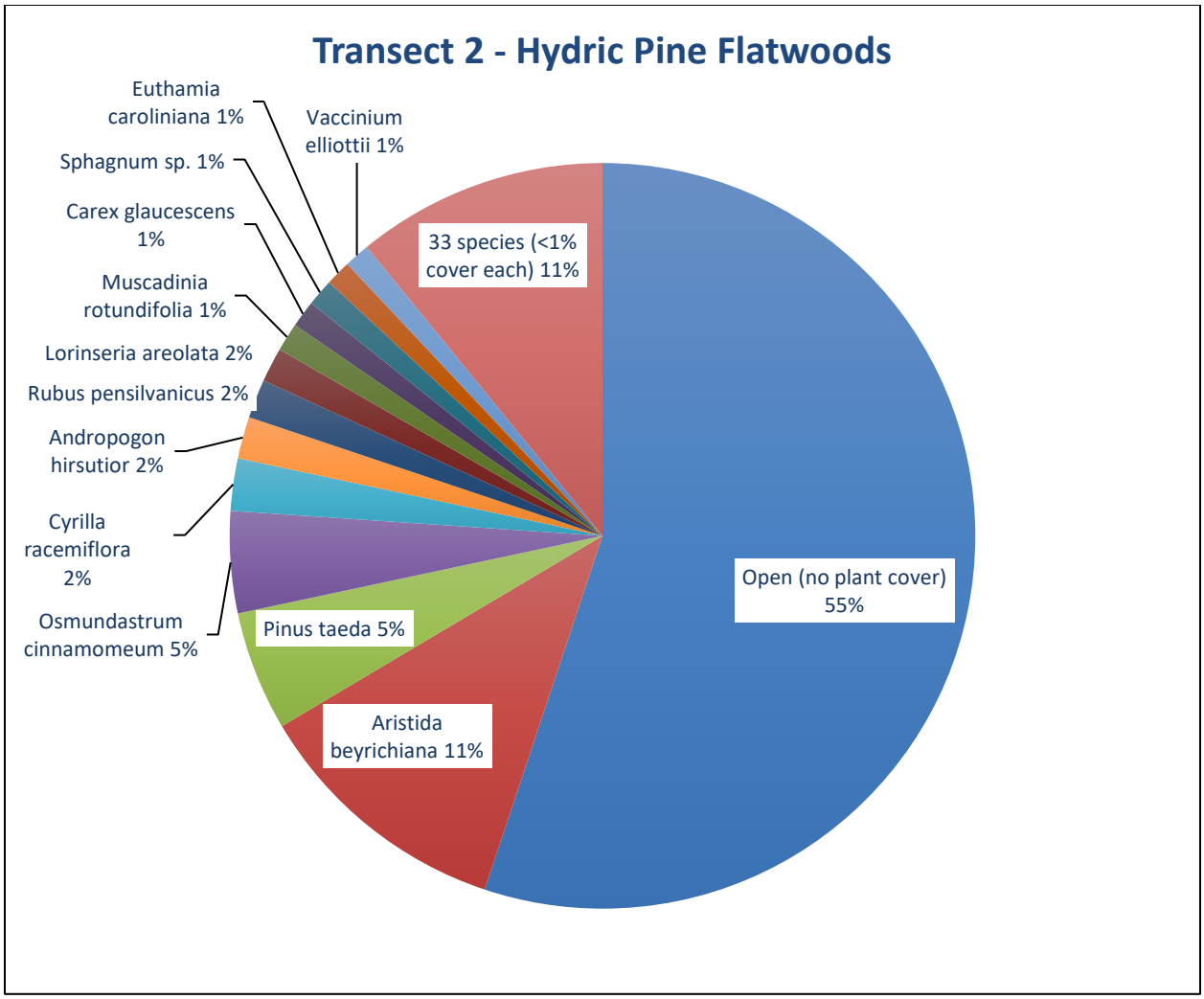

Figure 8. Percent relative cover of plant species in Hydric Pine Flatwoods Transect 2.

Table 7. Percent cover of plant species in Hydric Pine Flatwoods Transect 2 sampled on November 6, 2024.

Scientific name	Common name	Average percent cover per quadrat
Acer rubrum	red maple	0.88
Anchistea virginica	Virginia chain fern	0.25
Andropogon cretaceus	purple bluestem	0.63
Andropogon hirsutior	hairy bluestem	1.75
Andropogon virginicus	broomsedge bluestem	0.19
Aristida beyrichiana	Southern wiregrass	10.94
Bidens mitis	smallfruit beggarticks	0.19
Calamovilfa curtissii	Curtiss' sandgrass	0.06
Carex glaucescens	clustered sedge	1.13
Ctenium aromaticum	toothache grass	0.06
Cyrilla racemiflora	titi	2.19
Dichanthelium scabriusculum	woolly witchgrass	0.06

***Dichanthelium* sp.**	witchgrass	0.38
Edrastima uniflora	oldenlandia	0.13
Elephantopus elatus	tall elephantsfoot	0.44
Euthamia caroliniana	slender flattop goldenrod	1.06
Helianthus angustifolius	narrowleaf sunflower	0.06
Hypericum crux-andreae	St. Peter's wort	0.25
Ilex myrtifolia	myrtle-leaved holly	0.19
***Juncus* sp.**	rush	0.44
Kellochloa verrucosa	warty panicgrass	0.69
Lachnocaulon anceps	whitehead bogbutton	0.19
Lorinseria areolata	netted chain fern	1.44
Ludwigia pilosa	hairy primrosewillow	0.06
Lycopodiella alopecuroides	foxtail club-moss	0.38
Magnolia virginiana* var. *australis	sweetbay	0.06
Bryophyta	moss	0.06
Muscadinia rotundifolia	muscadine	1.19
Osmunda spectabilis	royal fern	0.94
Osmundastrum cinnamomeum	cinnamon fern	4.25
Pinus taeda	loblolly pine	5.00
Rhexia virginica	handsome harry	0.19
Rhynchospora gracilenta	slender beaksedge	0.06
***Rhynchospora* sp.**	beaksedge	0.44
Rubus pensilvanicus	sawtooth blackberry	1.63
Smilax glauca	cat greenbrier	0.63
Solidago fistulosa	pinebarren goldenrod	0.56
***Sphagnum* sp.**	sphagnum moss	1.13
Symphyotrichum dumosum* var. *dumosum	long-stalked aster	0.44
Tamala palustris	swamp bay	0.06
Toxicodendron radicans* var. *radicans	eastern poison ivy	0.50
Vaccinium elliottii	Elliott's blueberry	1.06
Viola primulifolia	primroseleaf violet	0.94
***Viola* sp.**	violet	0.06
Viola vittata	Southern water violet	0.06
Open (no plant cover)		53.13

Pine Flatwoods

Qualitative monitoring. The mature pines were thinned in 2017 by cutting selected rows of trees 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 have re-sprouted. Muscadine vine was abundant, scrambling over and obscuring much of the remaining groundcover. There was a diverse shrub layer dominated by sweetbay, swamp bay, St. John's worts, southern bayberry, sawtooth blackberry and young loblolly pines. This woody vegetation – particularly pine seedlings – was quickly overtaking the groundcover. In the herbaceous layer were scattered clumps of wiregrass, with abundant bluestem and pinebarren goldenrod. The non-native invasive Japanese climbing fern and Chinese tallow tree, both found in prior years' surveys, were observed this year. We observed a total of 60 plant taxa (Table 1) in this habitat.