

**Vegetation Monitoring at Bayport
Northwest Florida Water Management District
Non-FDOT Mitigation Site**

Fall 2023

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Bayport Mitigation Site
Bay County
USACE Permit #SAJ-1997-07427 (SP-SWA)
Qualitative and Quantitative Monitoring
November 2023

INTRODUCTION

The Bayport Mitigation Site project compensates for impacts to 6.55 acres of jurisdictional wetlands (hydric pine flatwoods) associated with a commercial development on CR 3280 in Freeport, Florida (DJFO, Inc.). The goal of this mitigation is to restore 55.6 acres of hydric pine flatwoods / mixed forested wetlands at Devils Swamp, an area in Bay County that is owned and managed for ecological integrity by the Northwest Florida Water Management District (NFWFMD) and is part of the Choctawhatchee River Water Management Area. The offsite mitigation area is located approximately six miles southeast of the impact along an unnamed dirt road east of the unincorporated community of Bunker. The site is adjacent to Sacred Heart Mitigation Site which was monitored at the same time (Figure 1). Prior to NFWFMD acquisition in 1992, the Devils Swamp site had been converted to slash pine plantation.

As described in the USACE permit, the mitigation area is divided into four management polygons (A – D). The permit describes Polygons A, C and D as wet prairie, and Polygon B as hydric pine flatwoods. However, NFWFMD considers the correct community composition to be hydric pine flatwoods for Polygons A, B and D; mixed forested wetlands with hydric pine flatwood inclusions for Polygon C. During field visits in 2021 and 2022, FNAI found wet prairie remnant vegetation in Polygon A. Polygon B appeared to be a mix of mesic and hydric pine flatwoods.

According to NFWFMD, mitigation activities implemented to date include baseline monitoring (August 2017), shrub and tree density reduction, prescribed fire, repeat panoramic photography, herbicide treatments to reduce shrub regrowth, and post-baseline quantitative vegetation monitoring.

Quantitative and qualitative monitoring was used to document the current plant species composition and vegetation structure of these targeted areas. The site vegetation was previously monitored by FNAI biologists in Fall 2022.

METHODS

Percent vegetation cover was measured in 1-m² quadrats at 10-foot intervals along eight 150-foot transects in November 2023. Two transects were set up in each area of the mitigation site (Figure 2). Along each transect line, eight 1m x 1m quadrats were placed along the left side, beginning at 10 feet and then spaced every 10 feet thereafter. 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 up to 2 m tall. Plant cover estimates were converted to mid-point values and averaged across each transect. Relative cover (in which all plant cover and bare ground is given as a proportion of 100 percent cover) was also calculated and is reported in separate pie charts.

Rooted shrub stem density was monitored within each mitigation polygon using five 1 m² quadrats established at random (Figure 11, Figure 11).

The qualitative monitoring consisted of recording the species and vegetation structure observed along meandering pedestrian transects through each of the four target areas. Field surveys were performed by FNAI botanists Jenna Annis, Kelly Anderson, and Ethan Hughes on November 15, 29, and 30, 2023. This was significantly later in the season than the 2022 sampling, so some decrease in detectable species diversity is to be expected.

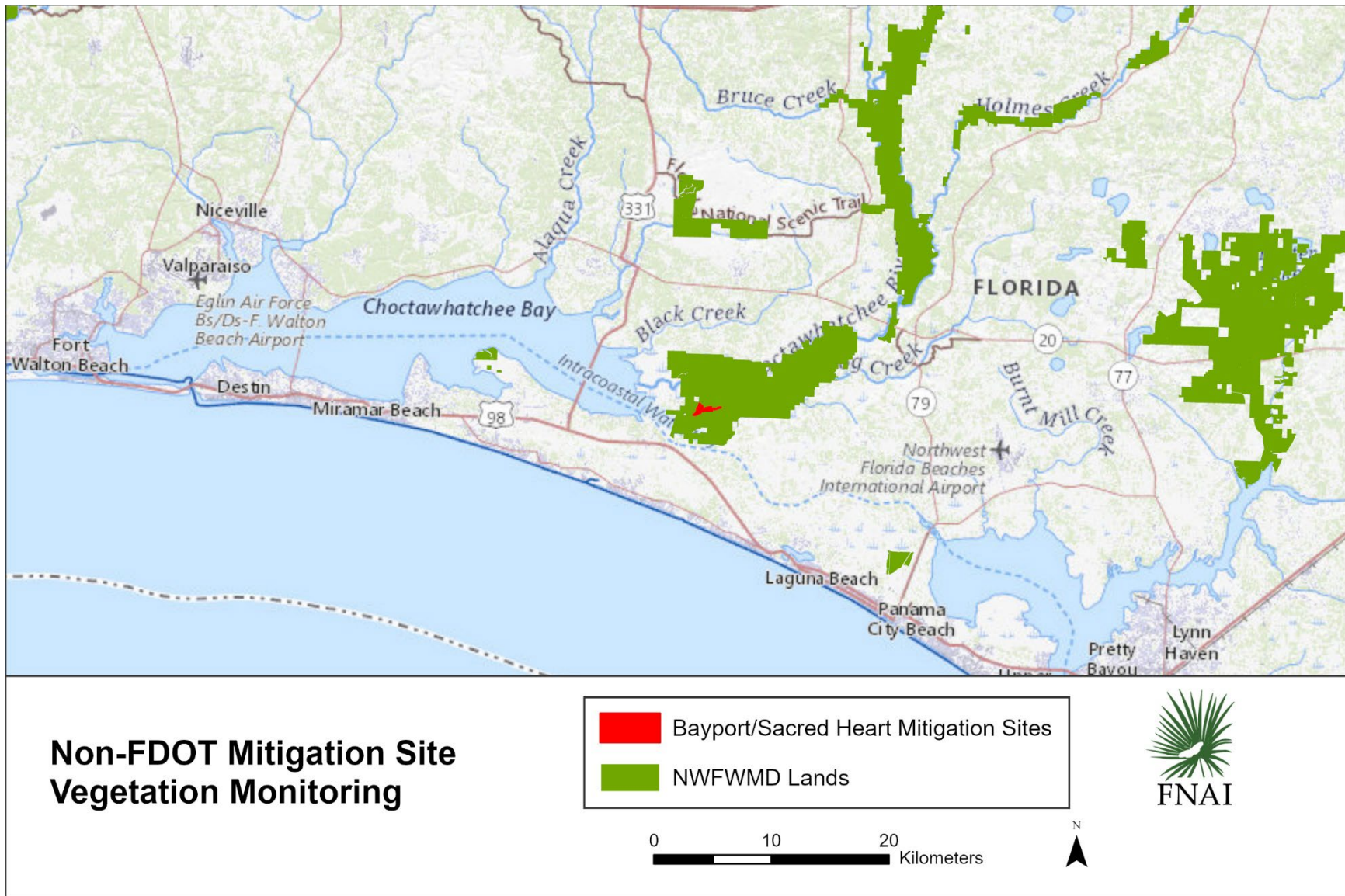


Figure 1. Location map of Devils Swamp non-FDOT NFWMD mitigation sites monitored by FNAI.

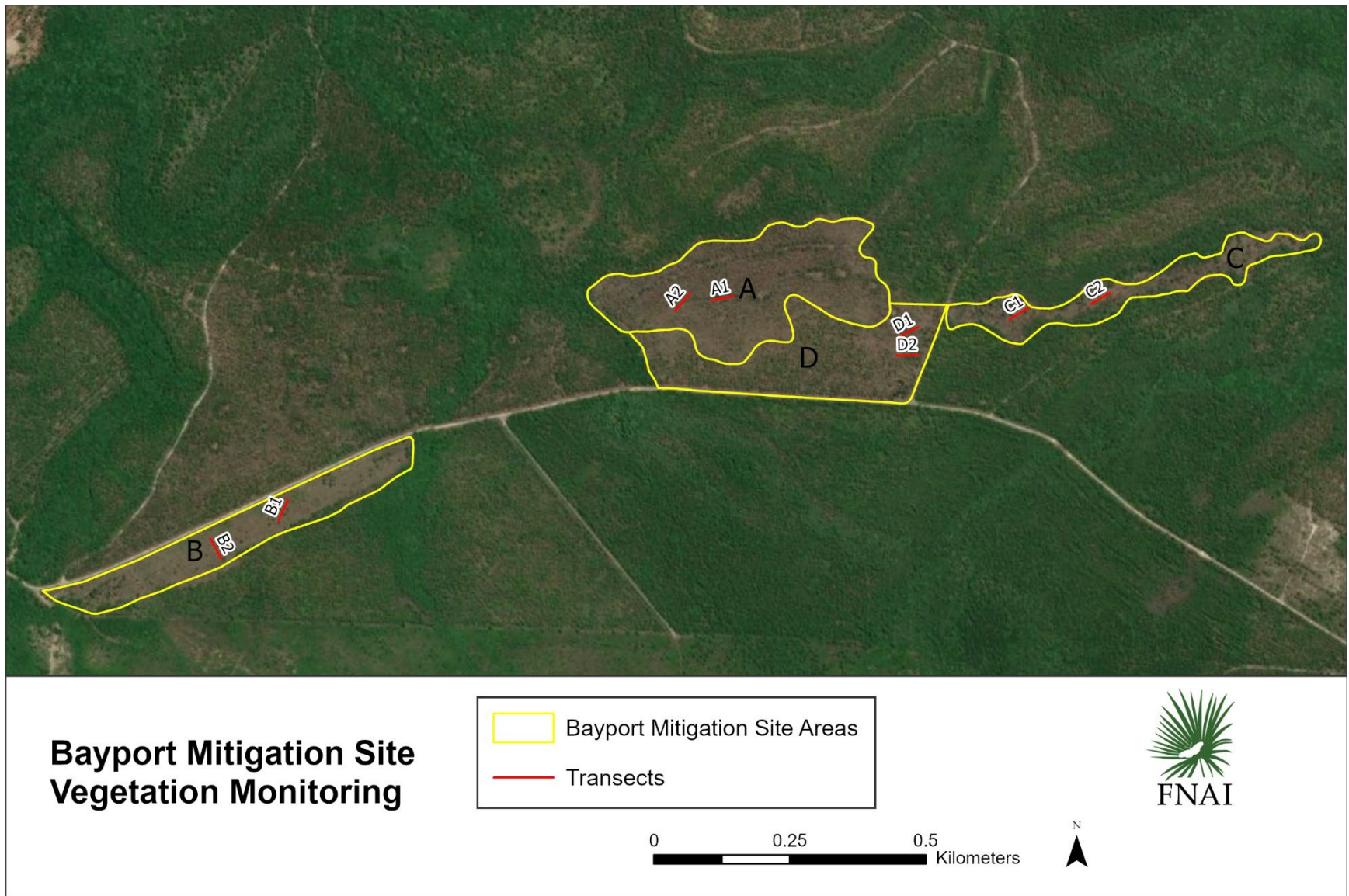


Figure 2. Location of quantitative transects at Bayport Mitigation Site.

RESULTS AND DISCUSSION

A total of 170 plant taxa were observed during the 2023 monitoring of all four sections of the Bayport Mitigation Site (Table 1). Thirty-eight new taxa were noted (i.e., species or varieties not observed during 2021 or 2022 site visits). Taxonomy follows Wunderlin, R. P., B.F. Hansen, A.R. Franck, and F.B. Essig. 2017. Atlas of Florida Plants (<http://florida.plantatlas.usf.edu/>), Institute for Systematic Botany, University of South Florida, Tampa.

Table 1. Species observed in target sections of Bayport Mitigation Site on November 15, 29, and 30, 2023 (bold name = new species, * = state-listed threatened or endangered, † = non-native invasive).

Scientific Name	Common Name	Section A	Section B	Section C	Section D	Grand Total
<i>Acer rubrum</i>	red maple	X			X	2
<i>Aletris lutea</i>	yellow colic-root	X?	X			2
* <i>Andropogon arctatus</i>	pinewoods bluestem	X	X	X	X	4
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	purple bluestem	X	X	X	X	4
<i>Andropogon glomeratus</i> var. <i>glomeratus</i>	bushy bluestem		X	X	X	3
<i>Andropogon gyrans</i> var. <i>stenophyllus</i>	Elliott's bluestem		X			1
<i>Andropogon liebmannii</i> var. <i>pungensis</i>	bluestem	X				1
<i>Andropogon</i> sp.	bluestem	X	X			2
<i>Andropogon virginicus</i>	broomsedge bluestem	X	X	X	X	4
<i>Andropogon virginicus</i> var. <i>glaucus</i>	chalky bluestem	X	X		X	3
<i>Anthaenantia rufa</i>	purple silkyscale	X			X	2
<i>Aristida palustris</i>	longleaf threeawn	X	X	X	X	4
<i>Aristida purpurascens</i>	arrowfeather threeawn		X			1
<i>Aristida stricta</i>	wiregrass	X	X	X	X	4
<i>Aronia arbutifolia</i>	red chokeberry		X			1
<i>Axonopus furcatus</i>	big carpetgrass		X			1
<i>Balduina uniflora</i>	oneflower honeycomb-head		X		X	2
<i>Bartonia paniculata</i>	twining screwstem	X			X	2
<i>Bidens laevis</i>	smooth beggarticks	X				1
<i>Bigelovia nudata</i> ssp. <i>nudata</i>	pineland rayless goldenrod		X			1
* <i>Calamovilfa curtissii</i>	Curtiss' sandgrass			X	X	2
<i>Carex glaucescens</i>	clustered sedge			X		1
<i>Carphephorus odoratissimus</i>	vanillaleaf		X		X	2
<i>Carphephorus pseudoliatris</i>	bristleleaf chaffhead		X			1
<i>Centella asiatica</i>	spadeleaf	X		X		2
<i>Clethra alnifolia</i>	sweet pepperbush	X		X	X	3
<i>Cliftonia monophylla</i>	black titi	X	X	X	X	4
<i>Coleataenia longifolia</i>	ciliate redtop panicum	X	X	X	X	4
<i>Coleataenia tenera</i>	bluejoint panicum	X				1
<i>Coreopsis linifolia</i>	Texas tickseed	X				1
<i>Croton</i> sp.	croton				X	1

Scientific Name	Common Name	Section A	Section B	Section C	Section D	Grand Total
<i>Ctenium aromaticum</i>	toothache grass	X	X	X	X	4
<i>Cyrilla racemiflora</i>	titi	X	X	X	X	4
<i>Dichantherium aciculare</i>	needleleaf witchgrass		X		X	2
<i>Dichantherium acuminatum</i>	tapered witchgrass	X	X	X		3
<i>Dichantherium ensifolium</i> var. <i>ensifolium</i>	cypress witchgrass	X	X	X	X	4
<i>Dichantherium ensifolium</i> var. <i>unciphylum</i>	cypress witchgrass				X	1
<i>Dichantherium erectifolium</i>	erectleaf witchgrass		X			1
<i>Dichantherium leucothrix</i>	rough witchgrass	X	X	X	X	4
<i>Dichantherium ovale</i>	eggleaf witchgrass		X		X	2
<i>Dichantherium scabriusculum</i>	woolly witchgrass	X	X	X	X	4
<i>Dichantherium strigosum</i>	roughhair witchgrass	X	X		X	3
<i>Drosera brevifolia</i>	dwarf sundew		X			1
<i>Drosera capillaris</i>	pink sundew		X	X	X	3
<i>Eleocharis tuberculosa</i>	conecup spikerush	X				1
<i>Erigeron vernus</i>	early whitetop fleabane		X			1
<i>Eriocaulon compressum</i>	flattened pipewort	X	X	X		3
<i>Eriocaulon decangulare</i>	tenangle pipewort	X	X	X	X	4
<i>Eryngium yuccifolium</i>	button rattlesnakemaster				X	1
<i>Eupatorium capillifolium</i>	dogfennel				X	1
<i>Eupatorium compositifolium</i>	yankeeweed		X		X	2
<i>Eupatorium mohrii</i>	Mohr's thoroughwort		X		X	2
<i>Eupatorium pilosum</i>	rough boneset		X			1
<i>Eurybia eryngiifolia</i>	thistleleaf aster		X			1
<i>Euthamia caroliniana</i>	slender flattop goldenrod	X	X		X	3
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	X			X	2
<i>Gaylussacia dumosa</i>	dwarf huckleberry		X	X	X	3
<i>Gaylussacia frondosa</i> var. <i>tomentosa</i>	blue huckleberry				X	1
<i>Gaylussacia mosieri</i>	woolly huckleberry		X	X	X	3
<i>Gelsemium sempervirens</i>	yellow jessamine	X			X	2
<i>Geobalanus oblongifolius</i>	gopher apple				X	1
<i>Gymnopogon brevifolius</i>	shortleaf skeletongrass		X		X	2
<i>Helianthus heterophyllus</i>	variableleaf sunflower		X			1
<i>Helianthus radula</i>	stiff sunflower		X			1
<i>Houstonia procumbens</i>	roundleaf bluet				X	1
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	X	X	X	X	4
<i>Hypericum cistifolium</i>	roundpod St. John's wort	X	X		X	3
<i>Hypericum crux-andreae</i>	St. Peter's wort	X	X		X	3
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	X	X	X	X	4
<i>Hypericum gentianoides</i>	orangegrass		X		X	2
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	X	X	X	X	4
<i>Hypericum myrtifolium</i>	myrtleleaf St. John's wort			X		1
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	X	X	X	X	4

Scientific Name	Common Name	Section A	Section B	Section C	Section D	Grand Total
<i>Ilex coriacea</i>	large gallberry	X	X	X	X	4
<i>Ilex glabra</i>	gallberry	X	X	X	X	4
<i>Ilex vomitoria</i>	yaupon		X		X	2
<i>Juncus scirpoides</i>	needlepod rush		X		X	2
<i>Kalmia hirsuta</i>	hairy wicky				X	1
<i>Kellochloa verrucosa</i>	warty panicgrass	X	X		X	3
<i>Lachnanthes caroliniana</i>	Carolina redroot	X	X	X	X	4
<i>Lachnocaulon anceps</i>	whitehead bogbutton	X	X		X	3
<i>Liatris spicata</i>	dense gayfeather	X	X			2
<i>Linum sp.</i>	flax		X			1
<i>Lobelia brevifolia</i>	shortleaf lobelia	X	X		X	3
<i>Lophiola aurea</i>	golden crest	X	X	X	X	4
<i>Ludwigia linearis</i>	narrowleaf primrosewillow				X	1
<i>Ludwigia virgata</i>	savannah primrosewillow		X			1
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	X	X	X		3
<i>Lycopodiella appressa</i>	southern club-moss		X			1
<i>Lycopodiella caroliniana</i>	slender club-moss		X		X	2
<i>Lyonia lucida</i>	fetterbush			X		1
<i>Magnolia virginiana</i>	sweetbay	X	X	X	X	4
<i>Marshallia graminifolia</i>	grassleaf Barbara's buttons				X	1
<i>Morella caroliniensis</i>	evergreen bayberry		X		X	2
<i>Morella cerifera</i>	southern bayberry		X	X	X	3
<i>Muhlenbergia capillaris</i> var. <i>trichopodes</i>	cutover muhly	X?	X			2
<i>Nyssa ursina?</i>	bog tupelo	X		X		2
<i>Oldenlandia uniflora</i>	clustered mille graines				X	1
<i>Osmunda cinnamomea</i>	cinnamon fern				X	1
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	X			X	2
<i>Oxypolis ternata</i>	Piedmont cowbane	X				1
<i>Panicum hemitomon</i>	maidencane			X		1
<i>Panicum virgatum</i>	switchgrass		X	X	X	3
<i>Persea palustris</i>	swamp bay				X	1
<i>Pinus elliotii</i>	slash pine	X	X	X	X	4
<i>Pityopsis sp.</i>	silkgrass		X			1
<i>Pluchea foetida</i>	stinking camphorweed	X				1
<i>Polygala lutea</i>	orange milkwort			X	X	2
<i>Proserpinaca pectinata</i>	combleaf mermaidweed	X	X	X		3
<i>Pteridium aquilinum</i>	bracken fern		X		X	2
<i>Quercus hemisphaerica</i>	laurel oak		X			1
<i>Quercus minima</i>	dwarf live oak		X		X	2
<i>Quercus virginiana</i>	live oak		X			1
<i>Rhexia alifanus</i>	savannah meadowbeauty		X		X	2
<i>Rhexia lutea</i>	yellow meadowbeauty		X			1
<i>Rhexia mariana</i>	pale meadowbeauty	X			X	2

Scientific Name	Common Name	Section A	Section B	Section C	Section D	Grand Total
<i>Rhexia petiolata</i>	fringed meadowbeauty	X	X		X	3
<i>Rhynchospora baldwinii</i>	Baldwin's beaksedge	X	X		X	3
<i>Rhynchospora cephalantha</i>	bunched beaksedge	X		X	X	3
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge			X		1
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	X	X	X	X	4
<i>Rhynchospora ciliaris</i>	fringed beaksedge				X	1
<i>Rhynchospora fascicularis</i>	fascicled beaksedge		X		X	2
<i>Rhynchospora filifolia</i>	threadleaf beaksedge	X	X	X	X	4
<i>Rhynchospora glomerata</i>	clustered beaksedge	X		X	X	3
<i>Rhynchospora gracilentata</i>	slender beaksedge	X	X	X	X	4
<i>Rhynchospora harperi</i>	Harper's beaksedge	X				1
<i>Rhynchospora inundata</i>	narrowfruit horned beaksedge			X	X	2
<i>Rhynchospora latifolia</i>	white-top sedge	X				1
<i>Rhynchospora microcarpa</i>	southern beaksedge	X				1
<i>Rhynchospora plumosa</i>	plumed beaksedge	X	X		X	3
<i>Rhynchospora sp.</i>	beaksedge	X				1
<i>Rubus pensilvanicus</i>	sawtooth blackberry		X			1
<i>Saccharum giganteum</i>	sugarcane plumegrass			X	X	2
<i>Sarracenia flava</i>	yellow pitcherplant	X		X		2
<i>Schizachyrium stoloniferum</i>	creeping little bluestem		X		X	2
<i>Schizachyrium tenerum</i>	slender bluestem		X		X	2
<i>Scleria baldwinii</i>	Baldwin's nutrush			X	X	2
<i>Scleria ciliata</i>	fringed nutrush				X	1
<i>Scleria reticularis</i>	netted nutrush	X	X		X	3
<i>Serenoa repens</i>	saw palmetto		X		X	2
<i>Sericocarpus tortifolius</i>	whitetop aster				X	1
<i>Seymeria cassioides</i>	yaupon blacksenna		X			1
<i>Smilax auriculata</i>	earleaf greenbrier		X		X	2
<i>Smilax glauca</i>	cat greenbrier	X	X		X	3
<i>Smilax laurifolia</i>	laurel greenbrier	X	X	X	X	4
<i>Smilax walteri</i>	coral greenbrier	X		X		2
<i>Solidago fistulosa</i>	pinebarren goldenrod	X			X	2
<i>Solidago odora</i>	sweet goldenrod				X	1
<i>Spermacoce sp.</i>	buttonweed				X	1
<i>Sphagnum sp.</i>	sphagnum moss	X	X	X	X	4
<i>Symphotrichum adnatum</i>	scaleleaf aster		X			1
<i>Symphotrichum chapmanii</i>	savannah aster	X		X		2
<i>Taxodium ascendens</i>	pond cypress			X		1
<i>Tiedemannia filiformis ssp. filiformis</i>	water cowbane	X		X		2
<i>Tridens ambiguus</i>	pinebarren fluffgrass		X			1
<i>Utricularia juncea</i>	southern bladderwort			X		1
<i>Vaccinium arboreum</i>	sparkleberry				X	1
<i>Vaccinium corymbosum</i>	highbush blueberry	X		X	X	3

Scientific Name	Common Name	Section A	Section B	Section C	Section D	Grand Total
<i>Vaccinium elliotii</i>	Elliott's blueberry		X		X	2
<i>Vaccinium myrsinites</i>	shiny blueberry		X		X	2
<i>Viola lanceolata</i>	bog white violet	X	X		X	3
<i>Woodwardia virginica</i>	Virginia chain fern			X		1
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	X	X	X	X	4
<i>Xyris baldwiniana</i>	Baldwin's yellow-eyed grass				X	1
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass	X	X		X	3
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass		X			1
<i>Xyris serotina</i>	acid swamp yellow-eyed grass	X	X	X	X	4
<i>Xyris stricta</i>	pineland yellow-eyed grass	X		X	X	3
<i>Zigadenus glaberrimus</i>	sandbog deathcamas				X	1
Total number of taxa: 170		83	106	64	112	365

Section A

Qualitative sampling. Section A (Figure 2) had a total of 83 observed plant taxa (Table 1). Species include the state-listed threatened pinewoods bluestem. This is a thinned pine plantation dominated by slash pines with a basal area of around 50 ft² per acre. Much of the groundcover is open and herbaceous, but large areas are covered by abundant titi shrubs and laurel greenbrier. Most shrubs are low, but with scattered individuals over 2 meter tall. Coarse woody debris is abundant. This section has areas of remnant wet prairie vegetation. In Fall 2021, the rare state-endangered wiregrass gentian (*Gentiana pennelliana*) was observed just south of Transect A1 but was not detected this year.

Quantitative sampling.

- Transect A1 (Table 2, Figure 3) had a total of 47 taxa with 7% average bare ground cover. Woody species made up around 23% average cover per quadrat. Compared to 2022, this represents no change in species diversity, a decrease in bare ground (42% in 2022) and a small increase in woody cover (13% in 2022).
- Transect A2 (Table 3, Figure 4) had a total of 43 taxa with 8% average bare ground cover. Woody species made up around 34% average cover per quadrat. Compared to 2022, this represents a small decrease in species diversity (51 in 2022), a small decrease in bare ground (20% in 2022) and a small increase in woody cover (21% in 2022).

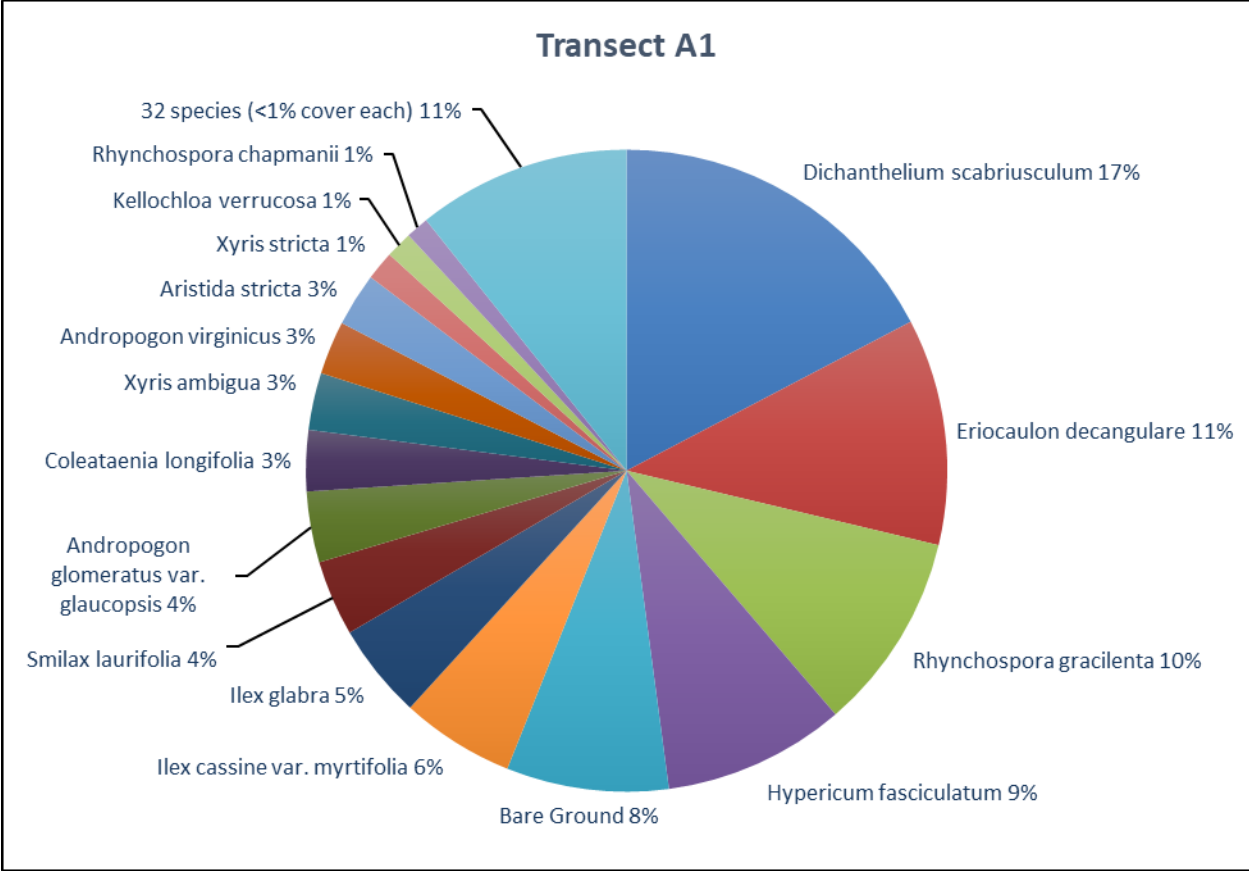


Figure 3. Percent relative cover of plant species in Transect A1.

Table 2. Percent cover of plant species in Transect A1 sampled on November 29, 2023.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon arctatus</i>	pinewoods bluestem	0.73
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	3.10
<i>Andropogon virginicus</i>	broomsedge bluestem	2.33
<i>Andropogon virginicus var. glaucus</i>	chalky bluestem	0.10
<i>Anthaenantia rufa</i>	purple silkyscale	0.03
<i>Aristida palustris</i>	longleaf threeawn	0.27
<i>Aristida stricta</i>	wiregrass	2.33
<i>Bartonia paniculata</i>	twining screwstem	0.10
<i>Coleataenia longifolia</i>	ciliate redtop panicum	2.67
<i>Coreopsis linifolia</i>	Texas tickseed	0.07
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.70
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	15.03
<i>Eriocaulon compressum</i>	flattened pipewort	0.23
<i>Eriocaulon decangulare</i>	tenangle pipewort	9.90
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	0.10
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	0.60
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.03

<i>Hypericum fasciculatum</i>	peelbark St. John's wort	7.97
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	0.03
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	4.97
<i>Ilex coriacea</i>	large gallberry	0.83
<i>Ilex glabra</i>	gallberry	4.17
<i>Kelochloa verrucosa</i>	warty panicgrass	1.17
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.03
<i>Liatris spicata</i>	dense gayfeather	0.03
<i>Lophiola aurea</i>	golden crest	0.60
<i>Magnolia virginiana</i>	sweetbay	0.03
<i>Pinus elliottii</i>	slash pine	0.53
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.03
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	1.00
<i>Rhynchospora filifolia</i>	threadleaf beaksedge	0.57
<i>Rhynchospora glomerata</i>	clustered beaksedge	0.83
<i>Rhynchospora gracilentata</i>	slender beaksedge	8.67
<i>Rhynchospora harperi</i>	Harper's beaksedge	0.23
<i>Rhynchospora latifolia</i>	white-top sedge	0.03
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.10
<i>Sarracenia flava</i>	yellow pitcherplant	0.03
<i>Scleria reticularis</i>	netted nutrush	0.63
<i>Smilax laurifolia</i>	laurel greenbrier	3.30
<i>Smilax walteri</i>	coral greenbrier	0.57
<i>Sphagnum</i> sp.	sphagnum moss	0.10
<i>Tiedemannia filiformis</i> ssp. <i>filiformis</i>	water cowbane	0.53
<i>Viola lanceolata</i>	bog white violet	0.07
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	2.50
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass	0.03
<i>Xyris serotina</i>	acid swamp yellow-eyed grass	0.50
<i>Xyris stricta</i>	pineland yellow-eyed grass	1.27
Bare Ground		7.10

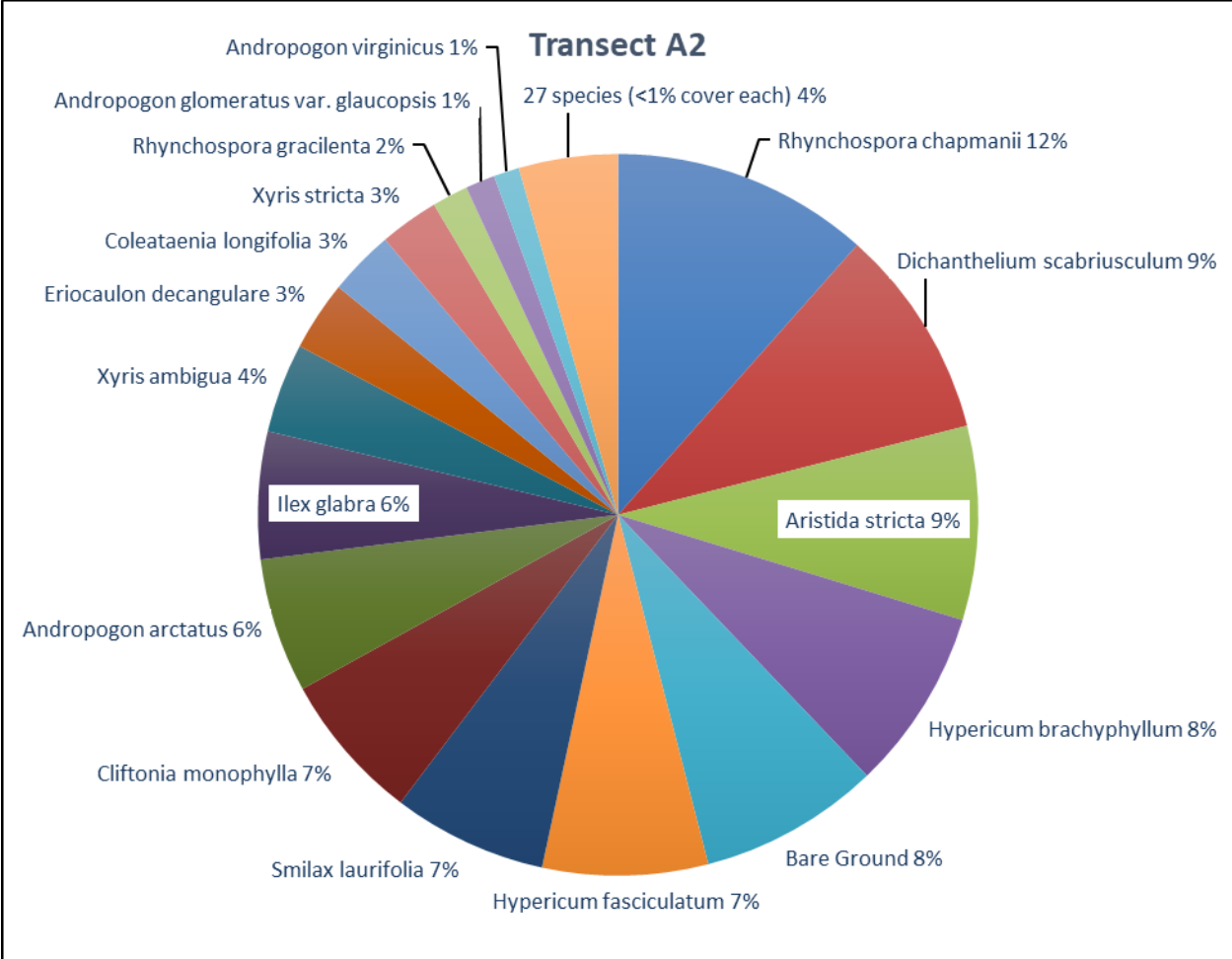


Figure 4. Percent relative cover of plant species in Transect A2.

Table 3. Percent cover of plant species in Transect A2 sampled on November 29, 2023.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon arctatus</i>	pinewoods bluestem	5.60
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	1.23
<i>Andropogon sp.</i>	bluestem	0.03
<i>Andropogon virginicus</i>	broomsedge bluestem	1.07
<i>Anthaenaria rufa</i>	purple silkyscale	0.03
<i>Aristida stricta</i>	wiregrass	8.07
<i>Bidens laevis</i>	smooth beggarticks	0.03
<i>Centella asiatica</i>	spadeleaf	0.10
<i>Clethra alnifolia</i>	sweet pepperbush	0.23
<i>Cliftonia monophylla</i>	black titi	6.20
<i>Coleataenia longifolia</i>	ciliate redtop panicum	2.73
<i>Coreopsis linifolia</i>	Texas tickseed	0.07
<i>Cyrilla racemiflora</i>	titi	0.23
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.50

<i>Dichantheium leucothrix</i>	rough witchgrass	0.33
<i>Dichantheium scabriusculum</i>	woolly witchgrass	8.80
<i>Eriocaulon decangulare</i>	tenangle pipewort	2.90
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.23
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	0.10
<i>Gelsemium sempervirens</i>	yellow jessamine	0.03
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	7.57
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	6.90
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	0.13
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	0.73
<i>Ilex glabra</i>	gallberry	5.30
<i>Kelloggloa verrucosa</i>	warty panicgrass	0.03
<i>Lobelia brevifolia</i>	shortleaf lobelia	0.03
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.33
<i>Rhexia mariana</i>	pale meadowbeauty	0.10
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.03
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	10.73
<i>Rhynchospora filifolia</i>	threadleaf beaksedge	0.10
<i>Rhynchospora gracilentia</i>	slender beaksedge	1.50
<i>Sarracenia flava</i>	yellow pitcherplant	0.07
<i>Smilax glauca</i>	cat greenbrier	0.03
<i>Smilax laurifolia</i>	laurel greenbrier	6.43
<i>Smilax walteri</i>	coral greenbrier	0.03
<i>Sphagnum</i> sp.	sphagnum moss	0.33
<i>Tiedemannia filiformis</i> ssp. <i>filiformis</i>	water cowbane	0.13
Unknown herb		0.07
<i>Viola lanceolata</i>	bog white violet	0.03
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	3.73
<i>Xyris stricta</i>	pineland yellow-eyed grass	2.47
Bare Ground		7.53

Section B

Qualitative sampling. Section B (Figure 2) had a total of 106 observed plant taxa (Table 1). Species include the state-listed threatened pinewoods bluestem. The area is a thinned pine plantation dominated by young slash pines with a basal area of around 10 ft² per acre, although a few mature trees are scattered. The shrubby understory is made up mostly of gallberry with St. Johns wort and saw palmetto common. Shrubs are around 1 meter tall. Herbs are mostly weedy bluestems, but with wiry sedges and some wiregrass. Prior bedding from silviculture activities is still apparent, with the soil disturbances creating alternating wet and dry habitats throughout the area. The area has components of both hydric and mesic pine flatwoods.

Quantitative sampling.

- Transect B1 (Table 4, Figure 5) had a total of 50 taxa with 16% average bare ground cover. Woody species made up around 18% average cover per quadrat. Compared to 2022, this represents a small decrease in species diversity (59 in 2022), little change in bare ground (19% in 2022) and a slight decrease in woody cover (23% in 2022).

- Transect B2 (Table 5, Figure 6) had a total of 43 taxa with 8% average bare ground cover. Woody species made up around 23% average cover per quadrat. Compared to 2022, this represents an increase in species diversity (30 in 2022), a small decrease in bare ground (18% in 2022) and a decrease in woody cover (43% in 2022).

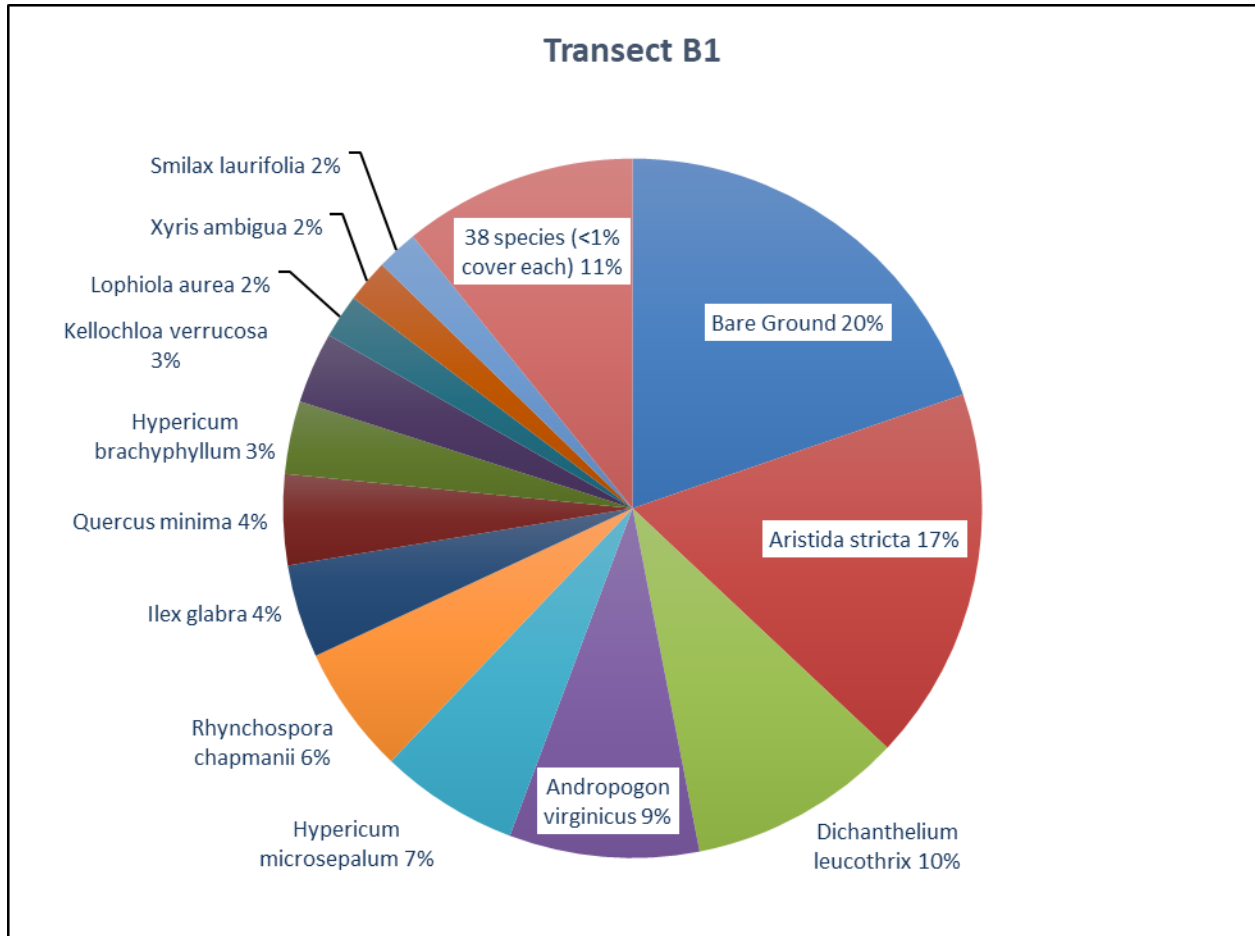


Figure 5 Percent relative cover of plant species in Transect B1.

Table 4. Percent cover of plant species in Transect B1 sampled on November 29, 2023.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	0.87
<i>Andropogon sp.</i>	bluestem	0.23
<i>Andropogon virginicus</i>	broomsedge bluestem	7.20
<i>Aristida stricta</i>	wiregrass	14.17
<i>Bigelovia nudata</i>	pineland rayless goldenrod	0.03
<i>Carphephorus pseudoliatris</i>	bristleleaf chaffhead	0.33
<i>Coreopsis sp.</i>	tickseed	0.03
<i>Dichanthelium ensifolium</i>	cypress witchgrass	0.70
<i>Dichanthelium leucothrix</i>	rough witchgrass	8.13
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	0.47

Scientific name	Common name	Average percent cover per quadrat
<i>Dichanthelium</i> sp.	witchgrass	0.13
<i>Dichanthelium strigosum</i>	roughhair witchgrass	0.13
<i>Drosera brevifolia</i>	dwarf sundew	0.07
<i>Drosera capillaris</i>	pink sundew	0.07
<i>Eriocaulon compressum</i>	flattened pipewort	0.17
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.23
<i>Eurybia eryngiifolia</i>	thistleleaf aster	0.40
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.23
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.13
<i>Helianthus radula</i>	stiff sunflower	0.53
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	2.77
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.10
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	0.23
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	5.27
<i>Ilex glabra</i>	gallberry	3.53
<i>Kelochloa verrucosa</i>	warty panicgrass	2.70
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.13
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.33
<i>Liatris spicata</i>	dense gayfeather	0.13
<i>Lophiola aurea</i>	golden crest	1.67
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.87
<i>Lycopodiella caroliniana</i>	slender club-moss	0.53
<i>Muhlenbergia capillaris</i>	hairawn muhly	0.23
<i>Pinus elliotii</i>	slash pine	0.07
<i>Polygala</i> sp.	milkwort	0.07
<i>Quercus minima</i>	dwarf live oak	3.43
<i>Rhexia alifanus</i>	savannah meadowbeauty	0.03
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.07
<i>Rhynchospora baldwinii</i>	Baldwin's beaksedge	0.40
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	4.87
<i>Rhynchospora gracilentata</i>	slender beaksedge	0.03
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.30
<i>Rhynchospora</i> sp.	beaksedge	0.07
<i>Scleria reticularis</i>	netted nutrush	0.10
<i>Serenoa repens</i>	saw palmetto	0.10
<i>Smilax glauca</i>	cat greenbrier	0.23
<i>Smilax laurifolia</i>	laurel greenbrier	1.57
<i>Viola lanceolata</i>	bog white violet	0.03
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	1.63
<i>Xyris</i> sp.	yellow-eyed grass	0.03
Bare Ground		16.17

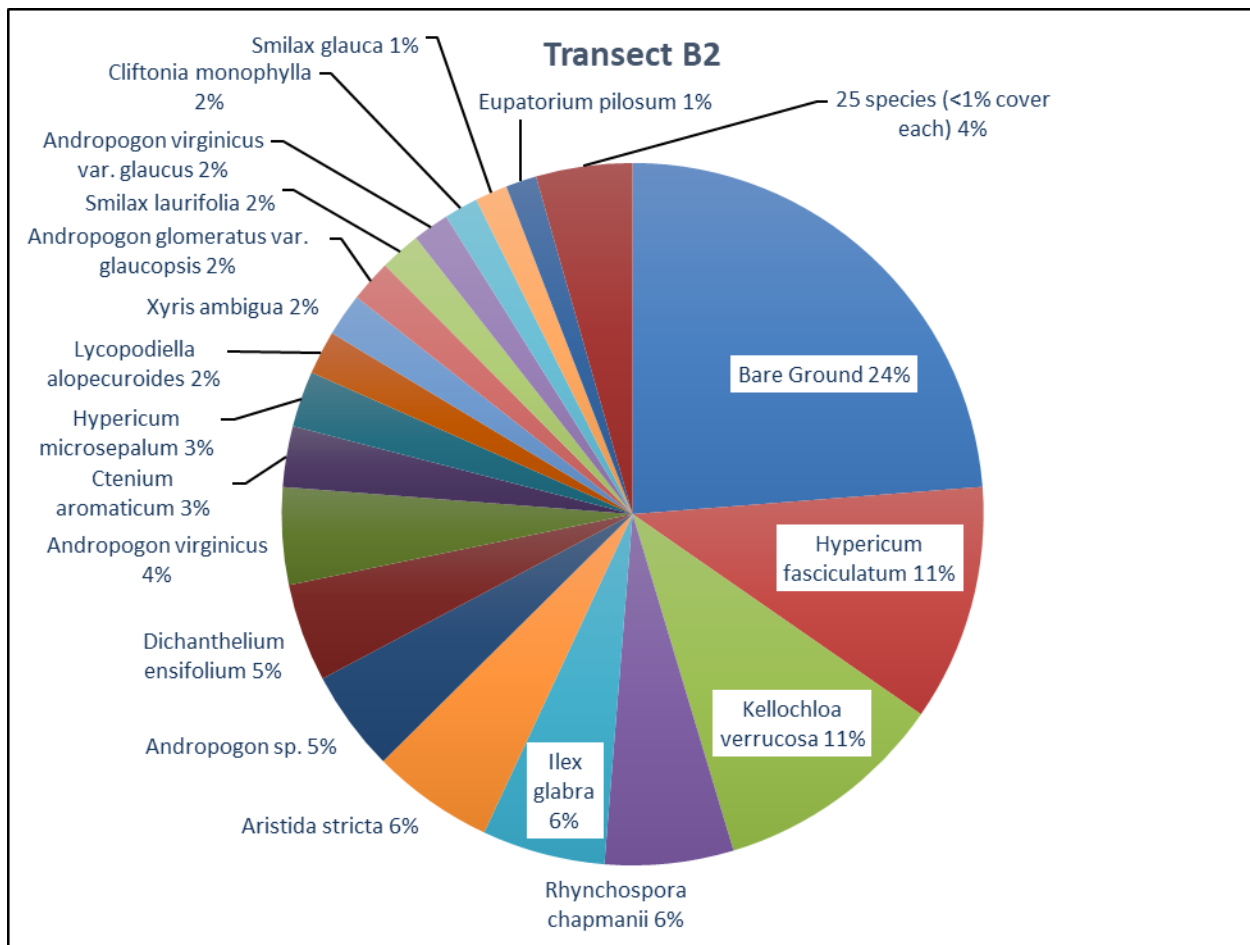


Figure 6. Percent relative cover of plant species in Transect B2.

Table 5. Percent cover of plant species in Transect B2 sampled on November 29, 2023.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	1.73
<i>Andropogon sp.</i>	bluestem	4.17
<i>Andropogon virginicus</i>	broomsedge bluestem	4.00
<i>Andropogon virginicus var. glaucus</i>	chalky bluestem	1.50
<i>Aristida palustris</i>	longleaf threeawn	0.03
<i>Aristida stricta</i>	wiregrass	5.03
<i>Aronia arbutifolia</i>	red chokeberry	0.03
<i>Cliftonia monophylla</i>	black titi	1.40
<i>Coleataenia longifolia</i>	ciliate redtop panicum	0.20
<i>Ctenium aromaticum</i>	toothache grass	2.50
<i>Dichanthelium ensifolium</i>	cypress witchgrass	4.03
<i>Dichanthelium sp.</i>	witchgrass	0.10
<i>Drosera capillaris</i>	pink sundew	0.03
<i>Eupatorium pilosum</i>	rough boneset	1.27
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.03

Scientific name	Common name	Average percent cover per quadrat
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	9.73
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	2.30
<i>Ilex coriacea</i>	large gallberry	0.50
<i>Ilex glabra</i>	gallberry	5.07
<i>Kelochloa verrucosa</i>	warty panicgrass	9.57
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.03
<i>Lachnocaulon anceps</i>	whitehead bogbutton	0.03
<i>Liatris spicata</i>	dense gayfeather	0.20
<i>Linum</i> sp.	flax	0.03
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	1.80
<i>Lycopodiella caroliniana</i>	slender club-moss	0.13
<i>Pinus elliotii</i>	slash pine	0.10
<i>Pteridium aquilinum</i>	bracken	0.23
<i>Quercus hemisphaerica</i>	laurel oak	0.27
<i>Rhynchospora baldwinii</i>	Baldwin's beaksedge	0.27
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	5.30
<i>Rhynchospora fascicularis</i>	fascicled beaksedge	0.03
<i>Rhynchospora plumosa</i>	plumed beaksedge	0.73
<i>Rhynchospora</i> sp.	beaksedge	0.43
<i>Smilax auriculata</i>	earleaf greenbrier	0.10
<i>Smilax glauca</i>	cat greenbrier	1.33
<i>Smilax laurifolia</i>	laurel greenbrier	1.67
<i>Sphagnum</i> sp.	sphagnum moss	0.10
<i>Vaccinium elliotii</i>	Elliott's blueberry	0.10
<i>Vaccinium myrsinites</i>	shiny blueberry	0.10
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	1.77
<i>Xyris caroliniana</i>	Carolina yellow-eyed grass	0.10
<i>Xyris flabelliformis</i>	savannah yellow-eyed grass	0.03
Bare Ground		21.23

Section C

Qualitative monitoring. Section C had a total of 64 plant taxa (Table 1). Species include two state-listed threatened species (Curtiss' sandgrass and pinewoods bluestem). This area is a mix of dense grassy areas and thickets of dense titi and laurel greenbrier under a 30- to 40-foot-tall canopy of young, planted slash pines that have been thinned in recent years. A few taller live oaks, myrtle-leaved hollies, swamp tupelos, and sweetbays are scattered throughout. Coarse woody debris is abundant. The rare state-threatened Curtiss' sandgrass is a dominant grass in parts of this area.

Quantitative monitoring.

- Transect C1 (Figure 7, Table 6) had a total of 41 taxa with 12% average bare ground cover. Woody species made up around 16% average cover per quadrat. Compared to 2022, this represents little change in species diversity (40 in 2022), a decrease in bare ground (30% in 2022) and a slight increase in woody cover (10% in 2022).

- Transect C2 (Figure 8, Table 7) had a total of 27 taxa with 14% average bare ground cover. Woody species made up around 7% average cover per quadrat. Compared to 2022, this represents a small decrease in species diversity (34 in 2022), a decrease in bare ground (35% in 2022) and little change in woody cover (8% in 2022).

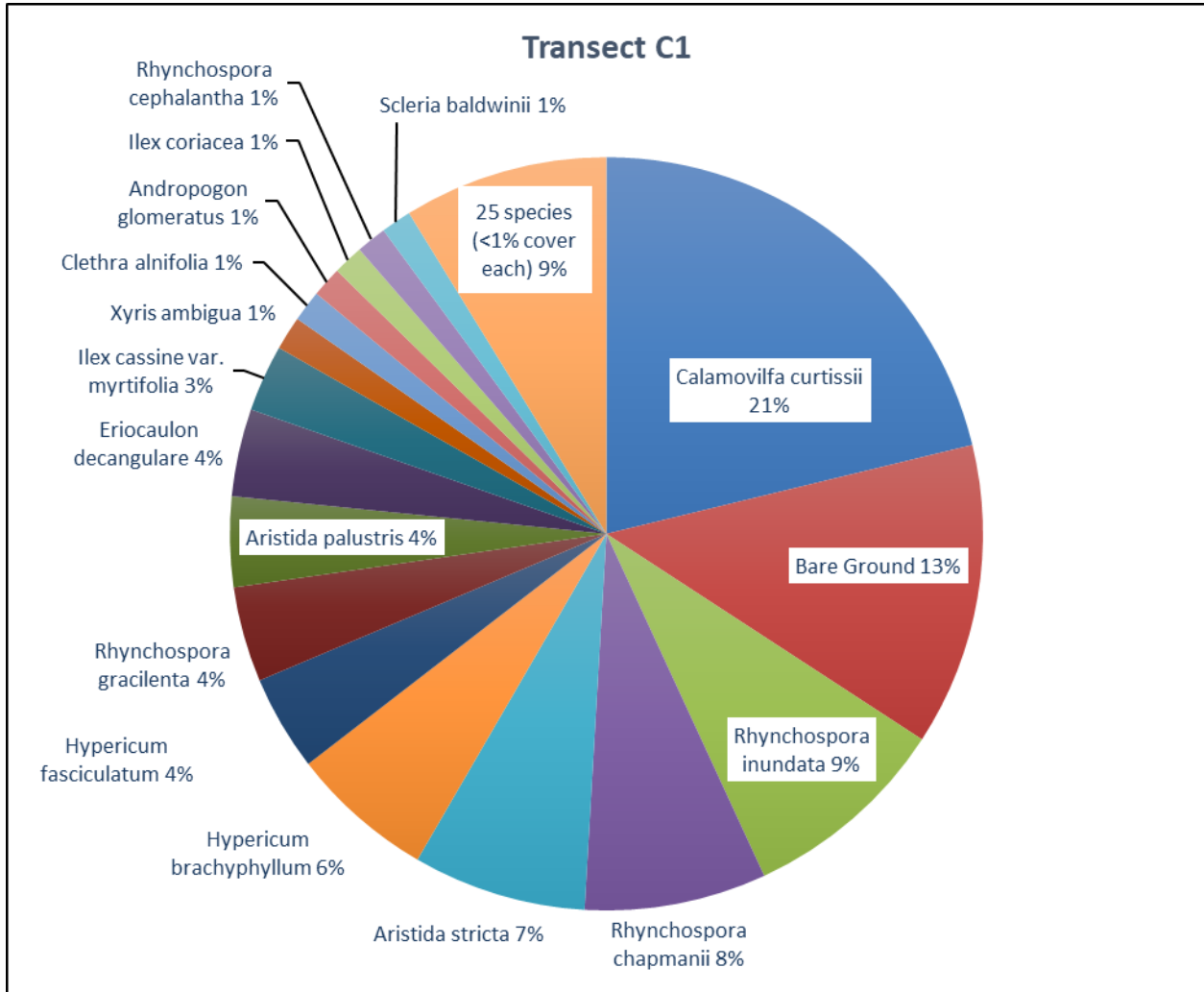


Figure 7. Percent relative cover of plant species in Transect C1.

Table 6. Percent cover of plant species in Transect C1 sampled on November 30, 2023.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i>	bushy bluestem	1.17
<i>Andropogon glomeratus</i> var. <i>glaucoptis</i>	purple bluestem	0.50
<i>Andropogon virginicus</i>	broomsedge bluestem	0.33
<i>Aristida palustris</i>	longleaf threeawn	3.47
<i>Aristida stricta</i>	wiregrass	6.67
<i>Calamovilfa curtissii</i>	Curtiss' sandgrass	19.00
<i>Clethra alnifolia</i>	sweet pepperbush	1.20

Scientific name	Common name	Average percent cover per quadrat
<i>Cliftonia monophylla</i>	black titi	0.03
<i>Cyrtia racemiflora</i>	titi	0.60
<i>Dichantherium leucothrix</i>	rough witchgrass	0.10
<i>Dichantherium scabriusculum</i>	woolly witchgrass	0.33
<i>Drosera capillaris</i>	pink sundew	0.03
<i>Eriocaulon compressum</i>	flattened pipewort	0.50
<i>Eriocaulon decangulare</i>	tenangle pipewort	3.37
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	5.53
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	3.67
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	2.57
<i>Ilex coriacea</i>	large gallberry	1.17
<i>Ilex glabra</i>	gallberry	0.23
<i>Lachnanthes caroliniana</i>	Carolina redroot	0.37
<i>Lophiola aurea</i>	golden crest	0.23
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.37
<i>Pinus elliotii</i>	slash pine	0.13
<i>Polygala lutea</i>	orange milkwort	0.03
<i>Rhynchospora cephalantha</i>	bunched beaksedge	1.17
<i>Rhynchospora chalarocephala</i>	loosehead beaksedge	0.10
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	7.00
<i>Rhynchospora filifolia</i>	threadleaf beaksedge	0.10
<i>Rhynchospora glomerata</i>	clustered beaksedge	0.73
<i>Rhynchospora gracilentata</i>	slender beaksedge	3.67
<i>Rhynchospora inundata</i>	narrowfruit horned beaksedge	8.00
<i>Saccharum giganteum</i>	sugarcane plume grass	0.50
<i>Sarracenia flava</i>	yellow pitcherplant	0.50
<i>Scleria baldwinii</i>	Baldwin's nutrush	1.17
<i>Smilax laurifolia</i>	laurel greenbrier	0.43
<i>Sphagnum</i> sp.	sphagnum moss	0.20
<i>Taxodium ascendens</i>	pond cypress	0.50
<i>Utricularia juncea</i>	southern bladderwort	0.03
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	1.30
<i>Xyris serotina</i>	acid swamp yellow-eyed grass	0.73
<i>Xyris stricta</i>	pineland yellow-eyed grass	0.23
Bare Ground		11.63

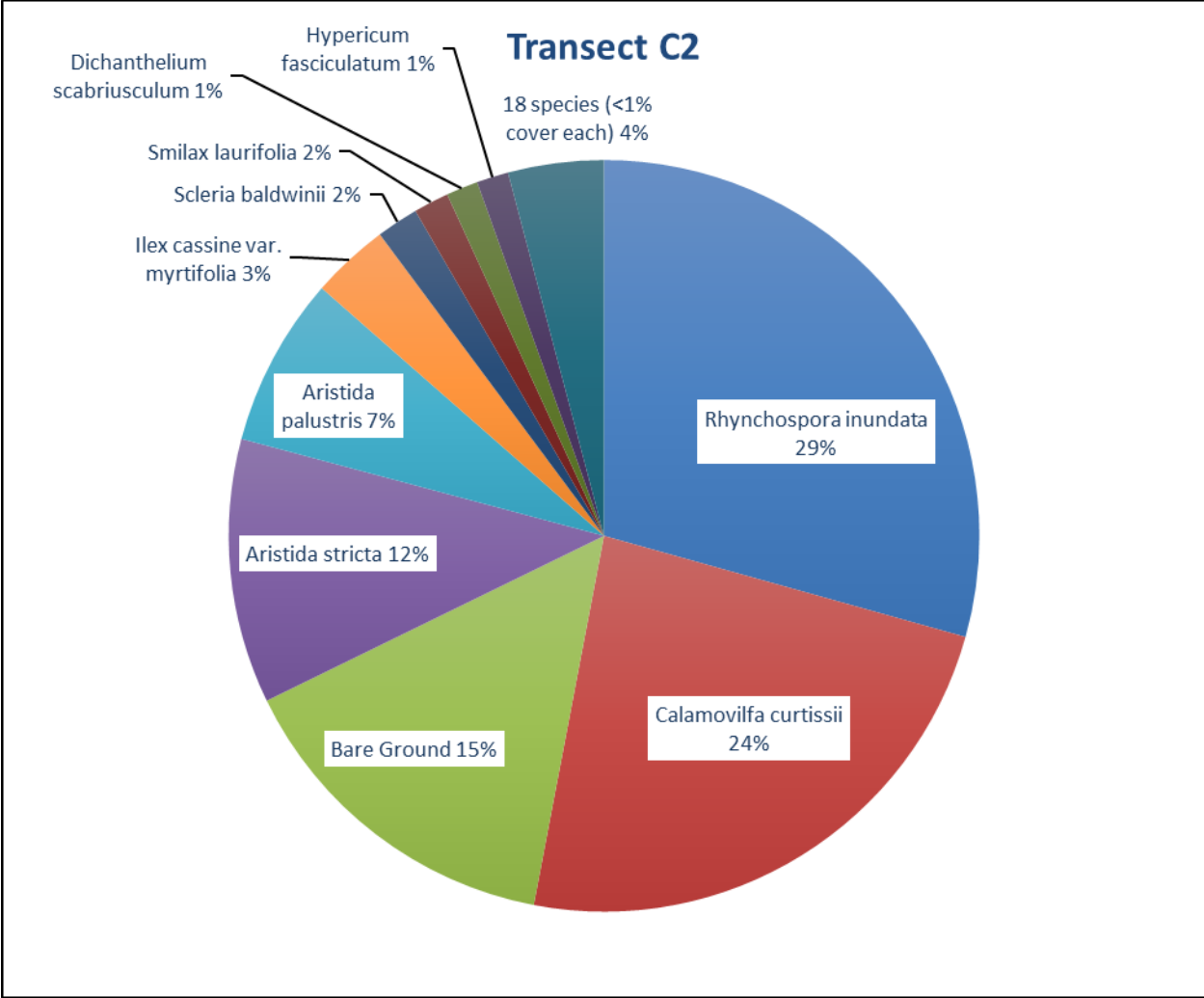


Figure 8. Percent relative cover of plant species in Transect C2.

Table 7. Percent cover of plant species in Transect C2 sampled on November 30, 2023.

Scientific name	Common name	Average percent cover per quadrat
<i>Aristida palustris</i>	longleaf threeawn	6.73
<i>Aristida stricta</i>	wiregrass	10.50
<i>Calamovilfa curtissii</i>	Curtiss' sandgrass	21.83
<i>Carex glaucescens</i>	clustered sedge	0.23
<i>Cliftonia monophylla</i>	black titi	0.03
<i>Coleataenia longifolia</i>	ciliate redtop panicum	0.13
<i>Dichantherium scabriusculum</i>	woolly witchgrass	1.27
<i>Eriocaulon compressum</i>	flattened pipewort	0.27
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.60
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	0.60
<i>Hypericum fasciculatum</i>	peelbark St. John's wort	1.27
<i>Hypericum myrtifolium</i>	myrtleleaf St. John's wort	0.17
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	3.10
<i>Ilex glabra</i>	gallberry	0.10
<i>Lophiola aurea</i>	golden crest	0.10
<i>Lycopodiella alopecuroides</i>	foxtail club-moss	0.20
<i>Nyssa ursina</i>	bog tupelo	0.03
<i>Panicum hemitomom</i>	maidencane	0.10
<i>Pinus elliotii</i>	slash pine	0.17
<i>Rhynchospora cephalantha</i>	bunched beaksedge	0.20
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	0.23
<i>Rhynchospora inundata</i>	narrowfruit horned beaksedge	27.07
<i>Rhynchospora</i> sp.	beaksedge	0.33
<i>Scleria baldwinii</i>	Baldwin's nutrush	1.67
<i>Smilax laurifolia</i>	laurel greenbrier	1.40
<i>Xyris ambigua</i>	coastalplain yellow-eyed grass	0.20
<i>Xyris serotina</i>	acid swamp yellow-eyed grass	0.10
Bare Ground		13.63

Section D

Qualitative monitoring. Section D had a total of 112 plant taxa (Table 1). Species include two state-listed threatened species (Curtiss' sandgrass and pinewoods bluestem). This is a thinned pine plantation dominated by slash pines with a basal area of around 50 ft² per acre. Much of the groundcover is open and herbaceous, but large areas are covered by abundant titi shrubs and laurel greenbrier. Most shrubs are low, but with scattered individuals over 2 meters tall. Coarse woody debris is abundant. Vegetation is mostly remnant hydric pine flatwoods indicators, but plants typical of more mesic flatwoods are found near the road along the south side of the area.

Quantitative monitoring.

- Transect D1 (Figure 9, Table 8) had a total of 37 taxa with 8% average bare ground cover. Woody species made up around 43% average cover per quadrat. Compared to 2022, this represents little change in species diversity (41 in 2022), a decrease in bare ground (18% in 2022) and a slight increase in woody cover (38% in 2022).
- Transect D2 (Figure 10, Table 9) had a total of 36 taxa with 22% average bare ground cover. Woody species made up around 51% average cover per quadrat. Compared to 2022, this represents little change in species diversity (37 in 2022), little change in bare ground (18% in 2022) and a small increase in woody cover (43% in 2022).

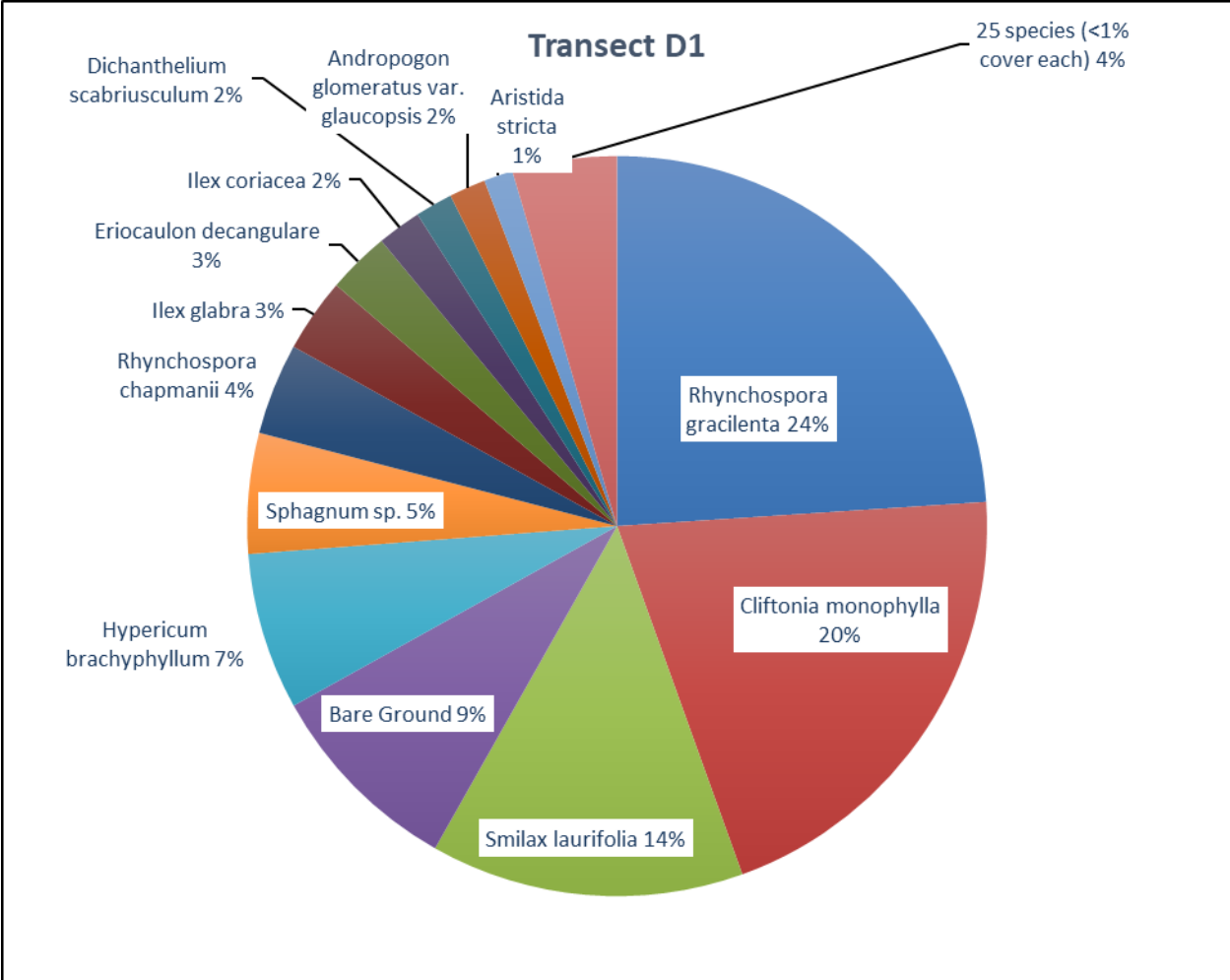


Figure 9. Percent relative cover of plant species in Transect D1.

Table 8. Percent cover of plant species in Transect D1 sampled on November 29, 2023.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	1.47
<i>Andropogon sp.</i>	bluestem	0.57
<i>Andropogon virginicus</i>	broomsedge bluestem	0.73
<i>Anthraentia rufa</i>	purple silkyscale	0.03
<i>Aristida stricta</i>	wiregrass	1.17
<i>Bartonia paniculata</i>	twining screwstem	0.07
<i>Cliftonia monophylla</i>	black titi	18.87
<i>Dichantherium leucothrix</i>	rough witchgrass	0.33
<i>Dichantherium scabriusculum</i>	woolly witchgrass	1.50
<i>Dichantherium sp.</i>	witchgrass	0.10
<i>Drosera capillaris</i>	pink sundew	0.03
<i>Eriocaulon decangulare</i>	tenangle pipewort	2.50
<i>Fuirena breviseta</i>	saltmarsh umbrellasedge	0.03
<i>Gaylussacia dumosa</i>	dwarf huckleberry	0.03

Scientific name	Common name	Average percent cover per quadrat
<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	6.30
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.03
<i>Hypericum gentianoides</i>	orangegrass	0.27
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	0.03
<i>Ilex coriacea</i>	large gallberry	1.77
<i>Ilex glabra</i>	gallberry	2.97
<i>Kelochloa verrucosa</i>	warty panicgrass	0.10
<i>Lycopodiella caroliniana</i>	slender club-moss	0.23
<i>Morella cerifera</i>	southern bayberry	0.23
<i>Oldenlandia uniflora</i>	clustered mille grains	0.03
<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	0.13
<i>Pinus elliotii</i>	slash pine	0.40
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.07
<i>Rhynchospora cephalantha</i>	bunched beaksedge	0.27
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	3.67
<i>Rhynchospora glomerata</i>	clustered beaksedge	0.10
<i>Rhynchospora gracilentata</i>	slender beaksedge	22.00
<i>Scleria reticularis</i>	netted nutrush	0.03
<i>Smilax laurifolia</i>	laurel greenbrier	12.57
<i>Sphagnum</i> sp.	sphagnum moss	4.83
<i>Vaccinium corymbosum</i>	highbush blueberry	0.03
<i>Xyris serotina</i>	acid swamp yellow-eyed grass	0.20
<i>Xyris stricta</i>	pineland yellow-eyed grass	0.10
Bare Ground		8.03

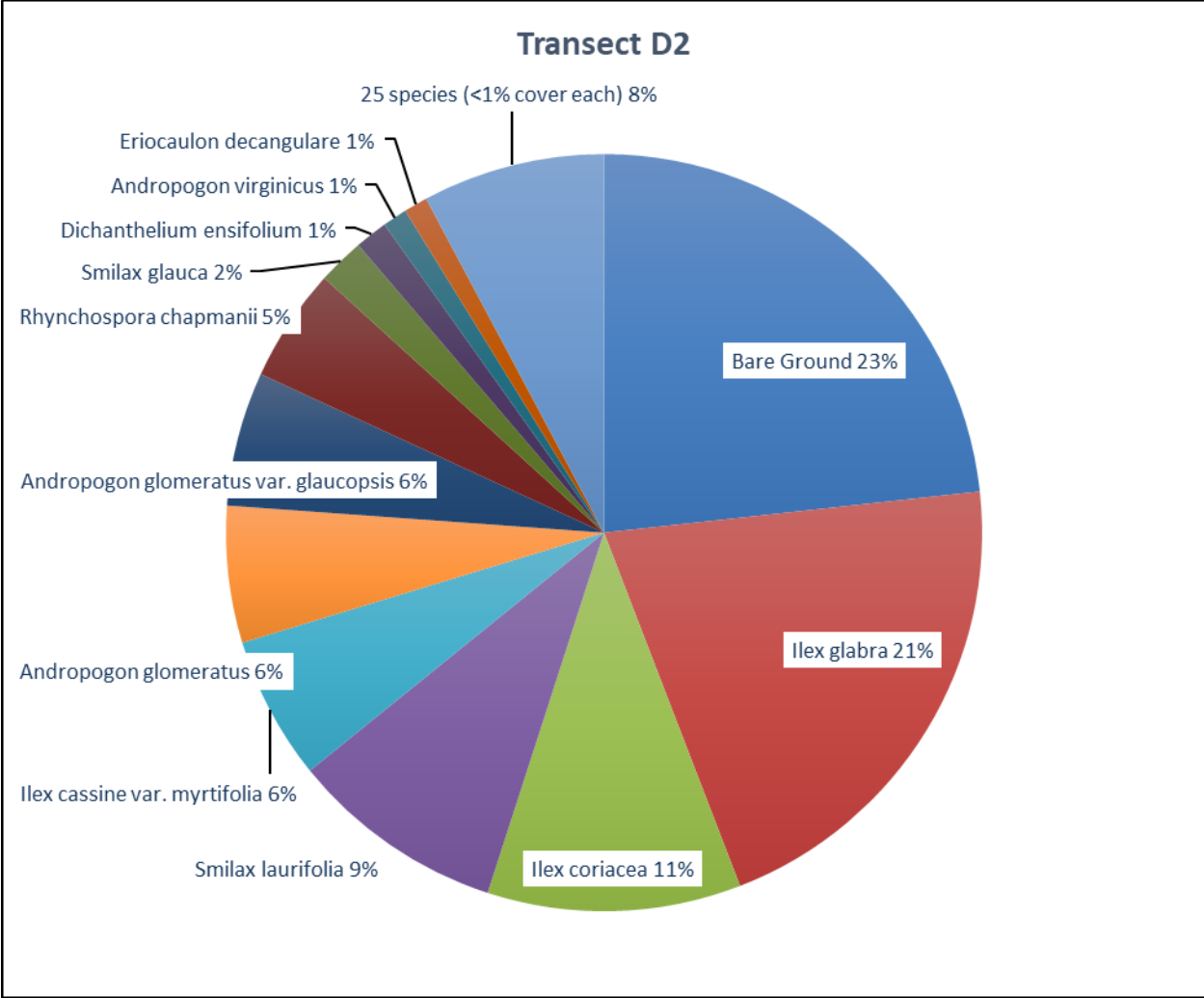


Figure 10. Percent relative cover of plant species in Transect D2.

Table 9. Percent cover of plant species in Transect D2 sampled on November 30, 2023.

Scientific name	Common name	Average percent cover per quadrat
<i>Andropogon glomeratus</i>	bushy bluestem	5.57
<i>Andropogon glomeratus var. glaucopsis</i>	purple bluestem	5.47
<i>Andropogon virginicus</i>	broomsedge bluestem	1.00
<i>Clethra alnifolia</i>	sweet pepperbush	0.43
<i>Coleataenia longifolia</i>	ciliate redtop panicum	0.10
<i>Cyrilla racemiflora</i>	titi	0.23
<i>Dichanthelium ensifolium</i>	cypress witchgrass	1.33
<i>Dichanthelium scabriusculum</i>	woolly witchgrass	0.23
<i>Eriocaulon decangulare</i>	tenangle pipewort	0.97
<i>Eupatorium sp.</i>	thoroughwort	0.03
<i>Euthamia caroliniana</i>	slender flattop goldenrod	0.03
<i>Gaylussacia mosieri</i>	woolly huckleberry	0.57

<i>Hypericum brachyphyllum</i>	coastalplain St. John's wort	0.53
<i>Hypericum cistifolium</i>	roundpod St. John's wort	0.27
<i>Hypericum microsepalum</i>	flatwoods St. John's wort	0.57
<i>Ilex cassine</i> var. <i>myrtifolia</i>	myrtle-leaved holly	5.83
<i>Ilex coriacea</i>	large gallberry	10.33
<i>Ilex glabra</i>	gallberry	19.90
<i>Kelochloa verrucosa</i>	warty panicgrass	0.70
<i>Lophiola aurea</i>	golden crest	0.73
<i>Morella caroliniensis</i>	evergreen bayberry	0.23
<i>Morella cerifera</i>	southern bayberry	0.33
<i>Persea palustris</i>	swamp bay	0.50
<i>Pinus elliotii</i>	slash pine	0.03
<i>Polygala lutea</i>	orange milkwort	0.03
<i>Pteridium aquilinum</i>	bracken	0.93
<i>Rhexia petiolata</i>	fringed meadowbeauty	0.13
<i>Rhynchospora chapmanii</i>	Chapman's beaksedge	4.63
<i>Rhynchospora ciliaris</i>	fringed beaksedge	0.03
<i>Rhynchospora gracilentata</i>	slender beaksedge	0.50
<i>Scleria reticularis</i>	netted nutrush	0.10
<i>Smilax glauca</i>	cat greenbrier	1.90
<i>Smilax laurifolia</i>	laurel greenbrier	8.77
<i>Spermacoce</i> sp.	false buttonweed	0.03
<i>Vaccinium elliotii</i>	Elliott's blueberry	0.10
<i>Viola lanceolata</i>	bog white violet	0.03
Bare Ground		22.17

Shrub Quadrats

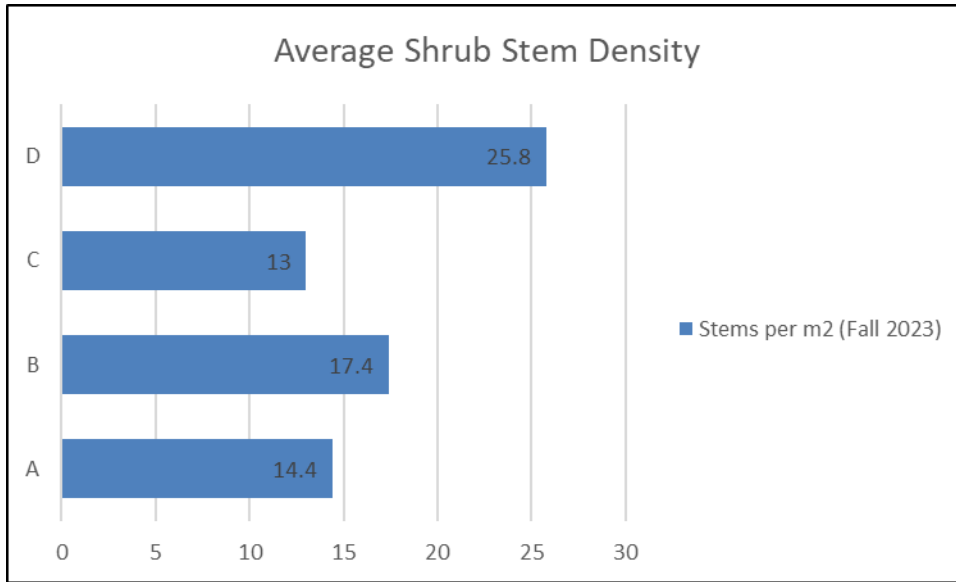


Figure 11. Average Rooted Shrub Stems per Square Meter (Fall 2023)

Table 10. Rooted Shrub Stems per Square Meter (Fall 2023)

Polygon A		Polygon B		Polygon C		Polygon D	
Shrub Quadrat	Shrub Stems per m ²	Shrub Quadrat	Shrub Stems per m ²	Shrub Quadrat	Shrub Stems per m ²	Shrub Quadrat	Shrub Stems per m ²
1	16	1	10	1	38	1	53
2	14	2	21	2	18	2	25
3	27	3	24	3	2	3	24
4	6	4	17	4	4	4	17
5	9	5	15	5	3	5	10
AVG Stems per m ²	14.4	AVG Stems per m ²	17.4	AVG Stems per m ²	13	AVG Stems per m ²	25.8