

Creating Economically and Ecologically Sustainable Pollinator Habitat

District 2 Demonstration Research Project

Updated for Site Visit in February 2019

*The PIs are most appreciative for identification assistance provided by:
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Investigators

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Cooperator

Rick Owen (Imperiled Butterflies of Florida Work Group – North)

Objective

Evaluate a cost-effective strategy for creating habitat for pollinators/beneficial insects in the ROW beyond the back-slope.

Rationale

- Will aid FDOT in developing a strategy to create pollinator habitat per the federal *BEE Act* and FDOT's Wildflower Program
- Will demonstrate that FDOT can simultaneously
 - Create sustainable pollinator habitat in an economical and ecological manner
 - Reduce mowing costs
- Part of national effort coordinated by IVM Partners, who has
 - Established or will establish similar projects on roadside or utility ROWS in Alabama, Arkansas, Maryland, New Mexico, Oklahoma, Idaho, Montana, Virginia, West Virginia, and Tennessee; studies previously conducted in Arizona, Delaware, Michigan, and New Jersey
 - Developed partnerships with US Fish & Wildlife Service, Army Corps of Engineers, US Geological Survey, New Jersey Institute of Technology, Rutgers University, Chesapeake Bay Foundation, Chesapeake Wildlife Heritage, The Navajo Nation, The Wildlife Habitat Council, The Pollinator Partnership, Progressive Solutions, Bayer Crop Sciences, Universities of Maryland, Ohio, West Virginia, and the EPA.

Potential Benefits

- Cost effective strategy for creating native pollinator habitat without expensive landscaping that could be evaluated and implemented statewide
- Pollination and beneficial insect services to ag crops adjacent to ROW
- Improved highway aesthetics
- Reduced mowing costs

Methods

Strategy to be Evaluated: Create habitat for pollinators/beneficial insects in the ROW area beyond the backslope by eliminating mowing (including fall cleanup mowing) and allowing germination of the seed bank, then selectively removing woody, invasive and undesirable species through periodic application of backpack directed herbicides.

In March 2016, three sites were selected by District 2 and clearly marked as such:

- **Site 1:** State Road 121; Raiford, Union County; approx. 3 miles north of SR-16; coordinates Lat. 30° 5' 8.98"N / Long. 82° 12' 57.19"W (30.085828, -82.215886)
Description (April 2016) – Moist soil; at wooded edge vegetation resembles a native community remnant, with a narrow transition area between remnant and >95% bahiagrass turf in remainder of site
- **Site 2:** State Road 25 (US-41); Lake City, Columbia County; approx. 10 miles north of Lake City / 3 miles south of Suwannee River; coordinates Lat. 30° 18' 52.54"N / Long. 82° 43' 0.39"W (30.31405, -82.71617)
Description (April 2016) – Mesic to upland; bahiagrass covered >95% of the area; most diversity was along and immediately adjacent to fence line
- **Site 3:** State Road 51 (US-41); Jasper, Hamilton County; approx. 15 miles north of Site 2; Coordinates Lat. 30° 27' 36.02"N / Long. 82° 53' 47.27"W (30.4600056, -82.8964639)
Description (April 2016) – Mesic; more species diversity than Site 2

Services Provided by IVM Partners

- Baseline and restored vegetation surveys
- One selective herbicide application (via subcontractor, Progressive Solutions) – however, was not needed during 2016 to 2018

Services Provided by FDOT

- District 2: Site selection and delineation; take appropriate measures to prevent mowing of sites
- Jeff Norcini: Seasonal site visits and species monitoring

Project Status

- March 2016: Sites selected
- April 2016: Site visits conducted by J. Norcini and IVM Partners – overview survey and site descriptions conducted by J. Norcini; formal vegetation survey conducted by IVM Partners
- August 2016: At request of District 2 and IVM Partners, J. Norcini visited sites to determine which woody and undesirable species were to be sprayed; recommendations conveyed to IVM Partners and District 2
NOTE – Site 1 was accidentally mowed sometime in summer 2016, consequently herbicide treatments postponed
- October 2016: Site visits conducted by J. Norcini, R. Johnstone, and J. Nettles – overview survey and site status update
- February 2017: Site visits by IVM Partners noting that herbicide treatments not yet necessary
- April 2017: Site visits conducted by J. Norcini; met with J. Nettles at Site 2 to discuss project

- July/August 2017: Rick Owen, a member of the Imperiled Butterflies of Florida Work Group – North, conducted a baseline butterfly/invertebrate survey of all sites. Results will be included in a future update.
- August 2017: Site visits conducted by J. Norcini; increased diversity at all sites
- October 2017: Site visits conducted by J. Norcini; increased diversity at all sites
- February 2018: Site visits conducted by J. Norcini to evaluate cool season vegetation. Site visits by Rick Owen to conduct butterfly/invertebrate survey. (NOTE: Rick plans to survey the sites several times in 2018.)
- April 2018: Site visits conducted by IVM Partners (all sites) and J. Norcini (Site 1; Site 2 – partial*; Site 3 – none*; *precluded by thunderstorms and heavy rain)
- August 2018: Site visits conducted by J. Norcini; increased diversity at all sites
- October 2018: Site visits conducted by IVM Partners and J. Norcini; Workshop (Oct. 16 – Lake City Office and Site 2)
- February 2019: Site visits conducted by J. Norcini to evaluate cool season vegetation

Results – General

1. Vegetation survey results, by site, start on page 8.
2. February 2018 – much less blooming than expected; sparse, but more, blooming in very early April compared to February.
3. February 2019 – *Lyonia* was blooming at Site 3, and *Corydalis* (new species) was blooming at Site 2.
4. Results for the butterfly/invertebrate surveys conducted in 2017 by Rick Owen were included in the updated report for October 2017.
<http://www.fdot.gov/designsupport/wildflowers/D2PollinatorHabitatDemoProjectSummary.pdf>
5. Results for the butterfly/invertebrate surveys conducted on February 17, 2018 by Rick Owen
Definitely observed fewer species and lower abundances. Many typical grasshoppers seen in October last year were not seen, but lots of grasshoppers in nymph stage. American grasshopper was dominant insect. Few butterflies, bees, wasps, damselflies and dragonflies. No beetles.
6. Results for the butterfly/invertebrate surveys conducted on April 22, 2018 by Rick Owen
Sites were actually pretty busy with inverts yesterday, tons of grasshopper nymphs, bumble bees, wasps, dragonflies, and several butterfly species. The new sighting was at the Union County site, a fresh Delaware skipper. It was a beauty!

Lots of things were enjoying the *Salvia lyrata* including skippers. The bumble bees were all over the *Stachys floridana*. The *Oclemena reticulata* [right] at the union site was popular with the beetles!



7. Mowing Costs – Information provided by Kevin Couey, FDOT Contracts Manager, August 2017)

- Regular Large Machine Mowing: \$14.66 per acre
5 cycles x 1 acre@\$14.66 = \$73.30
- Large Herbicide Mowing: \$32.00 per acre
1 cycle x 1 acre@\$32.00 = \$32.00 per year
- Total cost per acre/year = \$105.30

Site 1 = 0.5 acres x 2 years no mowing x \$105.30 = \$105.30

Site 2 = 1 acre x 2 years no mowing x \$105.30 = \$210.60

Site 3 = 1 acre x 2 years no mowing x \$105.30 = \$210.60

Total cost savings = \$526.50 over 2 years; or \$210.60 per acre per year

Site 1 – SR 121, Union County



Site 2 – US 41, Columbia County



Site 3 – US 41, Hamilton County



Site 1 – Updated for February 2019; species first observed in 2017, 2018, or 2019 are marked with asterisks.

Table 1. FDOT #1 NORTH Rte 121		30° 5' 8.98"N / 82° 12' 57.19"W (30.085828, -82.215886)		Year/month (blue = woody sp. presumed present)																		
Roadside, Raiford, Union Co., Florida				2016			2017			2018				2019				2020				
Trees/shrubs/herbs/VS/species		BASELINE	ITIS	Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	
Latin name		Common name	Code	VT	##																	
<i>TREES – TLa, TLg & TS</i>																						
<i>Acer rubrum</i> L.		Red maple	ACRU	TLa							x*											
<i>Magnolia virginiana</i> L.		Sweetbay magnolia	MAVI2	TSa							x*	x										
<i>Pinus taeda</i> L.		Loblolly pine	PITA	TLg	x	x	x	x	x	x	x	x	x	x								
<i>Prunus (serotina)</i> Ehrh.		(Black) cherry	PRSE2		x						x	x										
<i>SHRUBS – SL & SS</i>																						
<i>Aronia arbutifolia</i> (L.) Pers.		Red chokeberry	ARAR7	SS						x*	x			x								
<i>Baccharis</i> sp. L.		Baccharis	BACCH	SS				x*	x	x	x											
<i>Callicarpa americana</i> L.		American beautyberry	CAAM2	SL							x	x	x									
<i>Hypericum crux-andreae</i> (L.) Crantz		St. Peters-wort	HYCR3	SS	x		x	x	x	x	x	x		x								
<i>Hypericum hypericoides</i> (L.) Crantz		St. Andrew's-cross	HYHY	SS							x*	x		x								
<i>Ilex glabra</i> (L.) A. Gray		Inkberry holly	ILGL	SS							x*											
<i>Rubus cuneifolius</i> Pursh		Sand blackberry	RUCU	SS	x	x	x	x	x	x	x	x	x	x								
<i>Toxicodendron radicans</i> (L.) Kuntze		Eastern poison ivy	TORA2	SS	x		x		x													
<i>Vaccinium (corymbosum)</i> L.		(High bush) blueberry	VACO	SL	x						x											
<i>Vaccinium darrowii</i> Camp		Darrow's blueberry	VADA	SS	x																	
<i>Vaccinium myrsinites</i> Lam.		Shiny blueberry	VAMY3	SS	x						x											
<i>WOODY VINES – armed</i>																						
<i>Smilax (bona-nox)</i> L.		(Saw) greenbrier	SMBO2	VW	x	x	x	x	x	x	x	x	x	x								
<i>Smilax (auriculata)</i> Walter		(Earleaf) greenbrier	SMILA2	VH							x*	x	x	x								
<i>WOODY VINES – unarmed</i>																						
<i>Gelsemium sempervirens</i> (L.) W.T. Aiton		Carolina jessamine	GESE	VW						x*	x	x		x								
<i>Vitis rotundifolia</i> Michx.		Muscadine	VIR03	VW			x*	x	x		x	x	x	x								

Table 1 – continued				2016			2017			2018				2019				2020			
				Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc
<i>HERBACEOUS – forbs</i>																					
<i>Acalypha gracilens</i> A. Gray	Slender threeseed mercury	ACGR2	HF									x*									
<i>Achillea millefolium</i> L.	Common yarrow	ACMI2	HF	x																	
<i>Agalinis</i> sp. Raf.	False foxglove	AGALI	HF			x															
<i>Allium canadense</i> L.	Meadow garlic	ALCA3	HF				x*				x										
<i>Bidens alba</i> (L.) DC.	Beggarticks; Spanish needles	BIAL	HF						x*				x	x							
<i>Buchnera americana</i>	American bluehearts	BUAM	HF					x*													
<i>Campanula floridana</i> S. Watson ex A. Gray	Florida bellflower	CAFL18	HF				x*				x										
<i>Cantinoa mutabilis</i> (Rich.) Harley & J.F.B. Pastore	Tropical bushmint	CAMU2	HF										x*								
<i>Carphephorus paniculatus</i> (J.F. Gmel.) Herb.	Hairy chaffhead	CAPA53	HF					x*	x			x	x								
<i>Cerastium glomeratum</i> Thuill.	Mouse-ear chickweed	CEGL2	HF	x																	
<i>Chaptalia tomentosa</i> Vent.	Pineland daisy	CHTO	HF	x														x			
<i>Cirsium horridulum</i> Michx.	Yellow thistle	(CIHO2)	HF	x			x		x	x	x	x	x	x							
<i>Conyza canadensis</i> (L.) Cronquist	Canadian horseweed	COCA5	HF					x*													
<i>Coreopsis</i> sp. L.	Tickseed	COREO2	HF	x																	
<i>Diodia virginiana</i> L.	Virginia buttonweed	DIVI3	HF					x*													
<i>Elephantopus</i> sp. L.	Elephantsfoot	ELEPH	HF	x	x	x	x	x	x			x	x								
<i>Erigeron (quercifolius)</i> L.	(Oakleaf) fleabane	ERQU	HF	x			x		x		x										
<i>Eryngium yuccifolium</i> Michx.	Button rattlesnakemaster	ERYU	HF									x*									
<i>Eupatorium capillifolium</i> (Lam.) Small	Dogfennel	EUCA5	HF		x	x		x	x			x	x								
<i>Eupatorium pilosum</i> Walter	Rough boneset	EUPI2	HF			x		x	x			x	x								
<i>Euphorbia (pubentissima)</i> Michx.	False flowering spurge	EUPU7	HF	x																	
<i>Galium tinctorium</i> L.	Stiff Marsh Bedstraw	GATIL	HF	x						x	x							x			
<i>Gamochaeta</i> sp. Weddell	Cudweed	GAMOC	HF	x			x				x										
<i>Geranium carolinianum</i> L.	Carolina geranium, Cranesbill	GECA5	HF	x			x			x	x							x			
<i>Helianthus radula</i> (Pursh) Torr. & A. Gray	Rayless sunflower	HERA	HF	x	x	x			x		x										

Table 1 – continued				2016			2017			2018				2019			2020					
				Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	
<i>Helianthus angustifolius</i> L.	Swamp sunflower	HEAN2	HF						x*				x									
<i>Hieracium</i> sp. L.	Hawkweed	HIERA	HF			x			x													
<i>Hydrocotyle</i> sp. L.	Pennywort, dollarweed	HYDRO2	HF								x*	x		x								
<i>Hyptis alata</i> (Raf.) Shinnery	Clustered bushmint	HYAL	HF						x*				x									
<i>Krigia virginica</i> (L.) Willd.	Virginia dwarf dandelion	KRVI	HF	x			x				x											
<i>Lactuca graminifolia</i> Michx.	Grassleaf lettuce	LACTU	HF	x			x				x	x										
<i>Liatris</i> sp. Gaertn. ex Schreb.	Blazing star	LIATR	HF									x*										
<i>Lobelia glandulosa</i> Walter	Glade lobelia	LOGL	HF			x			x				x									
<i>Lobelia paludosa</i> Nutt.	White lobelia	LOPA3	HF				x*															
<i>Ludwigia</i> sp. L.	Primrosewillow	LUDWI	HF									x*	x									
<i>Lycopus</i> sp. L.	Waterhorehound	LYCOP4	HF								x*											
<i>Mitreola petiolata</i> (J. F. Gmel.) Torr. & A. Gray	Lax hornpod	MIPE3	HF					x*				x										
<i>Oclemena reticulata</i> (Pursh) G.L. Nesom (see Note 2a)	Whitetop aster	OCRE2	HF								x*											
<i>Oenothera (simulans)</i> (Small)W.L. Wagner & Hoch	(Southern) beeblossom	OESI	HF	x																		
<i>Oxalis corniculata</i> L.	Common yellow woodsorrel	OXCO	HF	x			x			x	x			x								
<i>Phyllanthus urinaria</i> L.	Chamberbitter	PHUR	HF	x	x	x		x	x			x	x									
<i>Physostegia (leptophylla)</i> Small	(Slender) false dragonhead	PHLE9	HF					x*														
<i>Pityopsis (graminifolia)</i> (Michx.) Nutt.	(Narrowleaf silkgrass)	PIGR4	HF	x	x	x			x				x									
<i>Plantago virginica</i> L.	Virginia plantain	PLVI	HF				x*				x											
<i>Polygala nana</i> (Michx.) DC.	Candyroot	PONA2	HF	x																		
<i>Portulaca</i> sp. L.	Purslane	PORTU	HF	x																		
<i>Pterocaulon pycnostachyum</i> (Michx.) Elliott	Blackroot	PTPY2	HF					x*			x											
<i>Pyrrhopappus carolinianus</i> (Walter) DC.	Carolina desertchicory	PYCA2	HF							x	x											
<i>Rhexia mariana</i> L.	Pale meadowbeauty	RHMA	HF		x	x		x				x	x									
<i>Rumex hastatulus</i> Baldw.	Heart-wing sorrel	RUHA2	HF	x																		
<i>Salvia lyrata</i> L.	Lyreleaf sage	SALY2	HF	x			x			x	x	x										

Table 1 – continued				2016			2017			2018				2019			2020					
				Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	
<i>Scutellaria integrifolia</i> L.	Helmet-flowered skullcap	SCIN2	HF	x							x		x	x								
<i>Sisyrinchium (angustifolium)</i> Mill. or <i>Sisyrinchium (nashii)</i> E.P. Bicknell	(Narrowleaf) blue-eyed grass (Nash's) blue-eyed grass	SIAN3 SINA	HF	x			x				x			x								
<i>Solidago canadensis</i> L.	Canada goldenrod	SOCA6	HF						x*		x	x	x									
<i>Solidago stricta</i> Aiton	Wand goldenrod	SOST	HF			x							x									
<i>Spermolepis (divaricata)</i> (Walter) Raf. ex Ser.	(Rough fruit) scale seed	SPDI2	HF	x																		
<i>Stachys floridana</i> Shuttlw. ex Benth.	Florida betony	STFL4	HF	x			x			x	x			x								
<i>Valerianella radiata</i> (L.) Dufr.	Beaked cornsalad	VARA	HF				x*				x											
<i>Symphotrichum</i> sp. Nees	Aster	SYMPH4	HF										x*									
<i>Veronica</i> sp. L.	Speedwell	VERON	HF	x																		
<i>Viola</i> sp. L.	Violet	VIOLA	HF	x						x				x								
<i>Xyris</i> sp. L.	Yellow-eyed grass	XYRIS	HF		x	x						x										
<i>Youngia japonica</i> (L.) DC.	Oriental False Hawksbeard	YOJAE	HF											x*								
<i>Zephyranthes atamasca</i> (L.) Herb.	Atamasco lily	ZEAT	HF								x*											
<i>HERBACEOUS – Fabaceae</i>																						
<i>Chamaecrista fasciculata</i> (Michx.) Greene	Partridge pea	CHFA2	HFf		x	x		x				x	x									
<i>Desmodium incanum</i> DC.	Zarabacoa comun	DEIN#	HFf											x*								
<i>Trifolium campestre</i> Schreb.	Hop clover	TRCA5	HFf	x			x			x	x											
<i>Trifolium repens</i> L.	White clover	TRRE3	HFf	x			x			x	x		x									
<i>Vicia</i> sp. L.	Vetch	VICIA	HFf							x*	x			x								
<i>HERBACEOUS – vines</i>																						
<i>Bignonia sempervirens</i> L.	Trumpet honeysuckle	BISE3	VH								x*											
<i>Centrosema virginianum</i> (L.) Benth.	Spurred butterfly pea	CEVI2	VH					x*														
<i>GRASSES – graminoid MOs</i>																						
(<i>Alopecurus</i> sp.) L.	(Foxtail)	ALOPE	GR	x																		

Table 1 – continued				2016			2017			2018			2019			2020					
				Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc
<i>Andropogon glomeratus</i> (Walter) Britton, Sterns & Poggenb.	Bushy bluestem	ANGL2	GR			x		x	x		x	x	x								
<i>Andropogon virginicus</i> L.	Broomsedge bluestem	ANVI2	GR	x	x	x	x		x	x	x	x	x								
<i>Briza minor</i> L.	Little quakinggrass	BRMI2	GR	x																	
<i>Coleataenia anceps</i> (Michx.) Soreng	Beaked panicum	COAn2	GR						x*				x								
<i>Eragrostis</i> sp. von Wolf	Lovegrass	ERAGR	GR			x			x		x										
<i>Dichanthelium</i> sp. (Hitchc. & Chase) Gould	Rosette or deer tongue grass	DICHA2	GR	x																	
<i>Paspalum notatum</i> Flueggé	Bahiagrass	PANO2	GR	x	x	x	x	x	x	x	x	x	x	x							
<i>Paspalum urvillei</i> Steud.	Vaseygrass	PAUR2	GR			x		x	x	x	x	x	x	x							
<i>Setaria</i> sp. P. Beauv.	Foxtail	SETAR	GR		x	x		x	x			x	x								
<i>(Sorghum halepense)</i> L. Purs.	(Johnsongrass)	SOHA	GR					x*													
<i>Sphenopholis obtusata</i> (Michx.) Scribn.	Prairie wedgescale	SPOB	GR								x*										
<i>Tripsacum dactyloides</i> (L.) L.	Eastern gamagrass	TRDA3	GR									x*	x								
RUSHES & SEDGES																					
<i>Cyperus esculentus</i> L.	Yellow nutsedge	CYES	SG	x				x			x			x							
<i>Scleria reticularis</i> Michx.	Netted nutrush	SCRE	SG									x*	x								
Total all sp. #				46	13	26	29	28	32	25	52	40	43	30							

NOTES:

- Species observed not based on a formal survey; does not include “standing dead” (like brown shoots of native grasses).
- Species in bold font were observed only by J. Norcini; all others were observed by J. Norcini and R. Haggie/ R. Johnstone.
 - Oclemena reticulata* – observed by Rick Owen on April 22, 2018.
- Most natives at back edge of plot at wooded edge, with a small transition zone between area where most natives occurred and the wide area where bahiagrass predominated (>95%, by area).
- Site mowed sometime during July to early August 2016.
- Sisyrinchium angustifolia* = *Sisyrinchium atlanticum*
- April 2017
 - Two pine seedlings occurred about midway between edge of pavement and edge of woods; should be removed, which can be easily done by hand.
 - 6 new species, all of which are native to Florida; however, fewer species than in April 2016.
 - Bahia turf dense
 - Trifolium* spp. and *Geranium* were predominant near edge of pavement

7. August 2017
 - a. 10 new species, 9 of which are native to Florida
 - b. Species diversity increased from August 2016 (13 vs 28)
 - c. Bahia turf dense
 - d. *Buchnera americana* occurred throughout
 - e. *Phyllanthus urinaria* mainly observed at north and south ends where bahiagrass density was less dense
 - f. Long broken row of *Paspalum urvillei* at bottom of front slope; parallel to road
8. October 2017
 - a. Compared to October 2016, 5 new species observed, all of which are native to Florida
 - b. Species diversity increased from October 2016 (26 vs 32)
 - c. Bahia turf remains dense
 - d. *Lobelia glandulosa* occurred throughout
9. February 2018
 - a. The *Trifolium* spp. and *Salvia* were only blooming in the mowed safety strip
 - b. The showiest species was *Aronia* (pictured); it occurred along the wooded edge
 - c. 25 species – 20 native, 5 non-native; 2 new species, both native; *Vicia* probably non-native but was not blooming so could not ID
 - d. Bahia turf remains dense; just starting to green up
 - e. *Pinus* becoming more prevalent along back edge
 - f. Much litter
10. April 2018
 - a. The *Trifolium* spp. were most prevalent in the mowed safety strip
 - b. The "showiest" species was *Campanula*; one very dense population in north end
 - c. 52 species – At least 43 native, at least 8 non-native; 11 new species of which at least 10 were native
 - 1) *Vicia* probably non-native but was not blooming so could not ID
 - 2) *Hydrocotyle* probably native but was not blooming so could not ID
 - d. Bahia turf remains dense
 - e. Only site that will require eradication of some woody species; *Pinus* and *Baccharis* seedlings occur too close to road and will pose a safety issue in the future
 - f. Much less litter (there was also a crew picking up litter)



11. August 2018
 - a. Site was very wet; isolated pockets of standing water
 - b. *Scleria* was widespread; *Phyllanthus* more widespread
 - c. *Baccharis* no longer occurs because it was in an area that was accidentally mowed
 - 1) Wider mowing of site sometime between April and August visits
 - d. 40 species – 35 to 37 native; 5 new species of which at least 4 were native; substantial increase in diversity compared to 2017 (28 vs. 40)
 - 1) *Hydrocotyle* probably native but was not blooming so could not ID
 - e. Bahia turf remains dense
 - f. *Pinus* seedlings occur too close to road and will pose a safety issue in the future; need to eradicate
12. October 2018
 - a. Site not as wet as in August
 - b. 43 species; 39 native, 4 non-native; 3 new species, 2 native
 - c. More diversity compared to October 2017 (32 vs 43)
 - d. Natives
 - 1) *Lobelia glandulosa* and *Solidago canadensis* more frequent and widespread
 - e. Non-natives
 - 1) Bahiagrass remains dense
 - 2) *Paspalum urvillei* and *Phyllanthus urinaria* more frequent and widespread
 - f. Eradication of some *Pinus* seedlings required; occur too close to road and will pose a safety issue in the future
 - g. On a whim, conducted a brief survey of mow zone to the edge of pavement
 - 1) Dominant broadleaf species were *Trifolium repens* and *Desmodium incanum*, both non-native
 - 2) Also observed *Aeschynomene (americana)*, *Amaranthus* sp., *Calyptocarpus vialis*, *Commelina* sp., *Sida* sp., *Euphorbia hirta*, *Euphorbia hyssopifolia*, and *Spermacoce (prostrata)*
13. February 2019
 - a. Many green broadleaf seedlings (or emerging perennials) toward wooded edge
 - b. *Trifolium repens* widespread and abundant in mowed area but none observed in un-mowed area
 - c. Bahiagrass thick; starting to green up
 - d. *Paspalum urvillei* – mainly in lowest area of ROW, and running parallel to road (see photo on right)
 - e. Flowering – *Aronia* (widespread); limited – *Scutellaria*, *Sisyrinchium*, *Galium*
 - f. 30 species; at least 23 native, at least 6 non-native; 2 new species, both non-native
 - g. Slightly more diversity than February 2018 (25 vs 30)
 - h. No *Baccharis* near road; a few *Pinus* seedlings in unmowed area may need to be eradicated



Site 2 – Updated for February 2019; species first observed in 2017, 2018 or 2019 are marked with asterisks.

Table 2. FDOT #2, BAHIA plot, US 41		30° 18' 52.54"N / 82° 43' 4"W (30.31405, -82.71617)		Year/month (blue = woody sp. presumed present)																			
BAHIA plot, Columbia County, Florida (south of White Springs, which is in Hamilton County)				2016			2017			2018			2019			2020							
Trees/shrubs/herbs/VS/species		BASELINE		ITIS		Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc
Latin name		Common name		Code		VT	##																
<i>TREES – TLa, TLg & TS</i>																							
<i>Diospyros virginiana</i> L.		Common persimmon		DIVI5		TLa	x	x	x	x	x			x	x								
<i>Quercus (nigra)</i> L.		(Water) oak		QUNI		TLa					x*	x	x	x									
<i>Quercus virginiana</i> L.		Live oak		QUERC		TLa	x	x	x	x	x	x	x	x									
<i>(Prunus angustifolia)</i> Marshall		(Chickasaw plum)		PRAN3		TSa					x*			x									
<i>Rhus copallinum</i> L.		Winged sumac		RHUS		TSa				x*	x	x		x	x	x							
<i>SHRUBS – SL & SS</i>																							
<i>Asimina incana</i> (W. Bartram) Exell		Wooly pawpaw		ASIN12		SS		x	x	x	x												
<i>Asimina angustifolia</i> Raf.		Slimleaf pawpaw		ASAN6		SS		x	x	x	x			x	x								
<i>Hypericum</i> sp.		St. Johnswort		HYPER		SS								x*									
<i>Rubus cuneifolius</i> Pursh		Sand blackberry		RUCU		SS		x	x	x	x	x	x	x	x								
<i>Serenoa repens</i> (W. Bartram) Small		Saw palmetto		SERE2		SS		x	x	x	x	x	x	x									
<i>Vaccinium stamineum</i> L.		Deerberry		VAST		SS				x*	x	x	x	x	x								
Unknown – see 10 g						SS								x*									
<i>WOODY VINES – armed</i>																							
<i>Rubus pensilvanicus</i> Poir. or <i>Rubus trivalis</i> Michx.		Sawtooth dewberry Southern dewberry		RUPE5 RUTR		VW	x																
<i>Smilax</i> sp. L.		Greenbrier		SMILA2		VW	x			x				x	x	x							
<i>WOODY VINES – unarmed</i>																							
<i>Vitis</i> sp. L.		Grape		VITIS		VW				x*	x												

Table 2 – continued				2016			2017			2018			2019			2020					
				Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc
<i>HERBACEOUS – forbs</i>																					
<i>Ambrosia artemisiifolia</i> L.	Common ragweed	AMAR2	HF	x	x	x		x	x		x	x	x								
<i>Bidens alba</i> (L.) DC.	Beggarticks; Spanish needles	BIAL	HF									x*	x								
<i>Cantinoa mutabilis</i> (Rich.) Harley & J.F.B. Pastore	Tropical bushmint	CAMU2	HF						x*	x	x	x	x								
<i>Cnidoscolus stimulosus</i> (Michx.) Engelm. & A. Gray	Tread softly	CNURS	HF	x	x	x	x	x	x			x	x								
<i>Conyza canadensis</i> (L.) Cronquist	Canadian horseweed	COCA5	HF			x			x			x	x								
<i>Coreopsis basalis</i> (A. Dietr.) S.F. Blake	Goldenmane tickseed	COBA2	HF	x			x			x	x	x		x							
<i>Crocanthemum corymbosum</i> (Michx.) Britton	Pinebarren frostweed	CRCO28	HF						x*			x	x								
<i>Coreopsis lanceolata</i>	Lanceleaf tickseed	COLA	HF										x*	x							
<i>Corydalis micrantha</i> (Engelm.ex A. Gray) A. Gray subsp. australis (Chapm.) G.B. Ownbey	Smallflower Fumewort	COMIA2	HF												x*						
<i>Croptilon divaricatum</i> (Nutt.) Raf.	Slender scratchdaisy	CRDI17	HF			x							x								
<i>Croton glandulosus var. septentrionalis</i> Müll. Arg.	Vente conmigo	CRGLS	HF		x								x								
<i>Descurainia pinnata</i> (Walter) Britton	Western tansymustard	DEPI	HF				x*				x										
<i>Diodia virginiana</i> L.	Virginia buttonweed	DIVI3	HF									x*	x								
<i>Elephantopus elatus</i> Bertol. or <i>Elephantopus nudatus</i> A. Gray	Tall elephantsfoot Smooth elephantsfoot	ELEL3 ELNU	HF									x*	x								
<i>Erigeron sp.</i> L.	Fleabane	ERIGE2	HF		x			x	x			x									
<i>Eupatorium capillifolium</i> (Lam.) Small	Dogfennel	EUCA5	HF		x	x	x	x	x			x	x	x							
<i>Eupatorium compositifolium</i> Walter	Yankeeweed	EUCO7	HF						x*			x	x								
<i>Froelichia floridana</i> (Nutt.) Moq.	Cottonweed	FRFL	HF		x	x			x			x	x								
<i>Euthamia caroliniana</i> (L.) Greene ex Porter & Britton	Slender flattop goldenrod	EUCA26	HF										x*								
<i>Galium sp.</i> L.	Bedstraw	GALIU	HF	x																	

Table 2 – continued				2016			2017			2018				2019			2020					
				Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	
<i>Krigia virginica</i> (L.) Willd.	Virginia dwarfdandelion	KRVI	HF	x																		
<i>Lactuca (graminifolia)</i> Michx.	(Grassleaf) lettuce	LACTU	HF	x							x	x		x								
<i>Ludwigia (maritima)</i> Harper	(Seaside) primrosewillow	LUMA4	HF		x			x														
<i>Ludwigia suffruticosa</i> Walter	Shrubby primrosewillow	LUSU11	HF		x			x	x			x	x									
<i>Monarda punctata</i> L.	Spotted beebalm	MOPU	HF	x	x	x			x				x									
<i>Oenothera</i> sp. L.	Evening primrose	OENOT	HF	x	x							x										
<i>Oenothera (simulans)</i> (Small)W.L. Wagner & Hoch	(Southern beeblossom)	OESI	HF	x				x				x										
<i>Opuntia</i> sp. Mill.	Pricklypear	OPUNT	HF	x	x	x		x	x		x		x	x								
<i>Oxalis</i> sp. L.	Woodsorrel	OXCO	HF	x				x	x	x	x		x	x	x							
<i>Paronychia americana</i>	American nailwort	PAAM3	HF									x*	x									
<i>Penstemon multiflorus</i> Chapm. ex Benth.	Manyflower beardtongue	PEMU9	HF		x			x	x	x		x	x	x								
<i>Phlox drummondii</i> Hook.	Drummond phlox	PHDR	HF	x			x	x		x	x	x		x								
<i>Physalis arenicola</i> Kearney	Cypresshead groundcherry	PHAR14	HF		x	x	x	x	x			x	x	x								
<i>Piriqueta cissoids</i> (L.) Grebe.	Pitted stripeeed	PICI	HF	x	x		x					x										
<i>Pityopsis graminifolia</i> (Michx.) Nutt.	Narrowleaf silkgrass	PIGR4	HF	x	x	x	x	x	x			x	x	x								
<i>Plantago</i> sp. L.	Plantain	PLANT	HF	x																		
<i>Pseudognaphalium obtusifolium</i> (L.) Hilliard & B.L. Burt	Rabbit tobacco	PSOB3	HF			x			x			x										
<i>Pyrrhopappus carolinianus</i> (Walter) DC.	Carolina desertchicory	PYCA2	HF	x																		
<i>Rhexia mariana</i>	Pale meadowbeauty	RHMA	HF									x*										
<i>Richardia brasiliensis</i> Gomes and/or <i>Richardia scabra</i> L.	Tropical Mexican clover Rough Mexican clover	RIBR2 RISC	HF	x	x			x	x			x	x									

Table 2 – continued				2016			2017			2018			2019			2020						
				Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	
<i>Rumex hastatulus</i> Baldw.	Heartwing dock	RUHA2	HF	x			x			x	x			x								
<i>Salvia lyrata</i> L.	Lyreleaf sage	SALY2	HF	x																		
<i>Spermolepis (divaricata)</i> (Walter) Raf. ex Ser.	(Rough fruit) scaleseed	SPDI2	HF	x																		
<i>Symphotrichum</i> sp. Nees	Aster	SYMPH4	HF									x*										
<i>Tradescantia ohiensis</i> Raf.	Ohio spiderwort	TROH	HF											x*								
<i>Trichostema dichotomum</i> L.	Forked bluecurls	TRID2	HF						x*				x									
<i>Triodanis perfoliata</i> (L.) Nieuwl.	Clasping Venus' looking-glass	TRPE4	HF								x											
<i>Verbena officinalis</i> subsp. <i>halei</i> (Small) Barber	Texas vervain	VEOFH	HF		x							x										
<i>Wahlenbergia marginata</i> (Thunb.) A. DC.	Southern rockbell	WAMA	HF		x			x				x										
<i>HERBACEOUS – Fabaceae</i>																						
<i>Chamaecrista fasciculata</i> (Michx.) Greene	Partridge pea	CHFA2	HFf		x	x		x	x			x										
(<i>Desmodium</i> sp. Desv.)	(Ticktrefoil)	DESMO	HFf	x							x	x										
<i>Indigofera hirsuta</i> L.	Hairy indigo	INHI	HFf						x*		x	x	x									
<i>Lespedeza angustifolia</i> (Pursh) Elliott	Narrowleaf lespedeza	LEAN	HFf					x*	x				x									
<i>Lespedeza hirta</i> (L.) Hornem.	Hairy lespedeza	LEHI2	HFf					x*	x			x	x									
<i>Macroptilium lathyroides</i> (L.) Urb.	Wild bushbean	MALA9	HFf									x*										
<i>Zornia bracteata</i> J.F. Gmel.	Viperina	ZOBR	HFf					x*														
<i>HERBACEOUS VINES</i>																						
<i>Ipomoea</i> sp. L. (white flowers)	Morning-glory	IPAL	VH					x*				x										
<i>Passiflora incarnata</i> L.	Purple passionflower	PAIN6	VH					x*				x										
<i>Mimosa quadrivalvis</i> L.	Sensitive brier	MIQU2	VH					x*														
<i>GRASSES – graminoid MOs</i>																						
<i>Andropogon virginicus</i> L.	Broomsedge bluestem	ANVI2	GR		x	x		x	x	x	x	x	x									

Table 2 – continued				2016			2017			2018				2019			2020					
				Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	
<i>Andropogon L. virginicus var. glaucus</i> Hack.	Chalky bluestem	ANVIG2	GR					x*	x	x		x	x									
<i>Cynodon dactylon</i> (L.) Pers.	Bermudagrass	CYDA	GR										x*									
<i>Paspalum notatum</i> Flueggé	Bahiagrass	PANO2	GR	x	x	x	x	x	x	x	x	x	x	x								
<i>Paspalum urvillei</i> Steud.	Vaseygrass	PAUR2	GR		x	x			x		x	x	x									
<i>Piptochaetium avenaceum</i> (L.) Parodi	Blackseed needlegrass	PIAV	GR				x*							x								
RUSHES & SEDGES																						
<i>Cyperus ovatus</i> Baldw.	Pinebarren flatsedge	CYOV3	SG					x*		x		x										
<i>Juncus</i> sp. L.	Rush	JUNCU	RJ	x																		
Total all sp. #				27	28	22	20	36	36	17	22	53	42	15								

NOTES:

1. Species observed not based on a formal survey; does not include “standing dead” (like brown shoots of native grasses).
2. Species in bold font were observed only by J. Norcini; all others were observed by J. Norcini and R. Haggie/ R. Johnstone.
3. High concentration of natives along the fence line
4. The unknown Asteraceae observed by J. Norcini in October 2016 probably was not the same unknown observed by R. Haggie in April 2016 as the one J. Norcini observed did not flower until fall.
5. April 2017
 - a. Fence line (underneath powerline) is now separated from demo plot by 10-ft mowed strip created by power company between October 2016 and April 2017.
 - b. Much less diversity than in April 2016, which is at least partially due to mowed strip created by power company.
 - c. 5 new species, all of which are native to Florida; *Asimina* spp. identified.
 - d. Bahia turf dense
 - e. *Quercus* near edge of clear zone may need to be eradicated (see image).
 - f. As of April 2017, no longer including powerline ROW in survey, which may reduce the number of species observed.



6. August 2017
 - a. *Ipomoea* – white flowers; probably native
 - b. *Physalis arenicola* widespread
 - c. 36 species; 32 of which are native
 - d. 8 new species; all of which are native
 - e. Despite not including powerline ROW in survey, species diversity increased from August 2016 (28 vs 36)
 - f. Bahia turf dense
7. October 2017
 - a. 36 species; 32 of which are native
 - b. 7 new species, 5 of which are native
 - c. Despite not including powerline ROW in survey, species diversity increased from October 2016 (22 vs 36)
 - d. Bahia turf remains dense
 - e. *Indigofera hirsuta* – species of concern

From: Nettles, John [mailto:John.Nettles@dot.state.fl.us]
 Sent: Wednesday, November 08, 2017 1:52 PM
 Jeff, I have visited sites #2 and #3. I have removed (by hand) all the Hairy indigo I could find and disposed of it off site. I know I probably left some at site #2. The indigo was growing off FDOT R/W on adjacent property, and there was some further down the property line as well. I did try to get all of it that was within the limits of our test plot site.
8. February 2018
 - a. Nothing blooming except one Oxalis
 - b. 17 species – 14 native
 - c. Bahia turf – very dense in southern half to two thirds of site, except southeast corner, which had been mowed
 - According to mowing contractor, it was not them that mowed within the plot
9. April 2018
 - a. Slight increase in diversity compared to 2017 (20 vs 22); no new species
 - b. Dead bahiagrass still very dense except where it had been mowed in southeast corner
10. August 2018
 - a. 53 species; at least 45 native
 - b. 8 new species of which at least 7 were native
 - c. Substantial increase in diversity compared to August 2017 (36 vs. 53)
 - d. Bahiagrass thick
 - e. *Physalis* very widespread; *Ludwigia* much more widespread than previously
 - f. Observed at least 4 butterfly species
 - g. Unknown woody – broadleaf plant with *Juncus*-like fruit; approx. location is 30.314378, -82.716645



11. October 2018
 - a. 42 species – 36 native; 3 new species, 2 native. However, the *Coreopsis lanceolata* observed clearly appeared to be the common garden variety.
 - b. Slight increase in diversity compared to October 2017 (36 vs. 42)
 - c. Found *Vaccinium stamineum*
 - d. Could not find species shown in Note 10f
 - e. Could not find *Serenoa repens*
 - f. Bahiagrass remain dense
 - g. A few *Diospyros* must be eradicated; too close to road
 - h. Eradicate *Eupatorium capillifolium* – becoming more widespread; its aggressive nature and size could limit diversity
 - i. Should eradicate the few *Indigofera hirsuta* that occur; may take several years because of seed bank
 - j. *Physalis* very widespread; *Pityopsis* becoming more frequent and widespread
12. February 2019
 - a. At least one *Quercus* cut back; will check on presence of all *Quercus*, *Prunus*, and *Diospyros* in April
 - b. Locally abundant seedlings/perennials emerging
 - c. Bahiagrass dense
 - d. *Oxalis* mainly in southeast corner that had been mowed previously, much of that blooming; southeast corner much more open canopy allowing broadleaves to develop faster
 - e. About same diversity as in February 2018 (17 vs. 15)
 - f. 15 species – 13 native; 2 new species, both native (*Corydalis* was blooming)

Site 3 – Updated for February 2019; species first observed in 2017, 2018 or 2019 are marked with asterisks.

Table 3. FDOT #3 HOP CLOVER plot, US 41		30° 27' 37"N/82° 53' 49"W (30.4600056, -82.8964639)		Year/month (blue = woody sp. presumed present)																												
Hop clover TRCA5 plot, Jasper, Hamilton County, Florida				2016			2017			2018			2019			2020																
Trees/shrubs/herbs/VS/species		BASELINE		ITIS		Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc									
Latin name		Common name		Code		VT		##																								
<i>TREES – TLa, TLg & TS</i>																																
<i>SHRUBS – SL & SS</i>																																
<i>Hypericum sp. L.</i>		St. Johnswort		HYPER		SS				x*																						
<i>Lyonia fruticosa</i> (Michx.) G.S. Torr.		Coastal plain staggerbush		LYFR3		SS				x*		x		x		x		?		?				x								
<i>Rubus cuneifolius</i> Pursh		Sand blackberry		RUCU		SS		x		x		x		x		x		x		x		x		x								
<i>Sabal etonia</i> Swingle ex Nash or <i>Serenoa repens</i> (W. Bartram) Small		Scrub palmetto OR Saw palmetto		SAET SERE2		PA								x*																		
<i>Toxicodendron (pubescens)</i> Mill. or <i>Toxicodendron (radicans)</i> (L.) Kuntze		(Atlantic) poison oak (Eastern) poison ivy		TOPU2 TORA2		SS		x																								
<i>WOODY VINES – armed</i>																																
<i>Rubus (pensilvanicus)</i> Poir. or <i>Rubus (trivalis)</i> Michx.		(Sawtooth) dewberry (Southern) dewberry		RUPE5 RUTR		VW		x								x		x		x		x										
<i>WOODY VINES – unarmed</i>																																
<i>(Campsis radicans)</i> (L.) Seem. ex Bureau or <i>(Ampelopsis arborea)</i> (L.) Koehne		(Trumpet creeper) (Peppervine)		CARA2 AMAR5		VW				x*		x				x																
<i>HERBACEOUS – forbs</i>																																
<i>Acalypha gracilens</i> A. Gray		Slender threeseed mercury		ACGR2		HF						x*				x		x														
<i>Agalinis sp.</i> Raf.		False foxglove		AGALI		HF				x								x														
<i>Allium canadense</i> L.		Meadow garlic		ALCA3		HF		x				x				x		x														
<i>Ambrosia artemisiifolia</i> L.		Common ragweed		AMAR2		HF				x		x		x		x		x		x		x		x								

Table 3 – continued				2016			2017			2018			2019			2020						
				Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	
<i>Artemisia vulgaris</i> L.	Mugwort; wormwood	ARVU	HF										x*									
<i>Bidens pilosa</i> L.	Spanish needles	BIPI	HF										x*									
<i>Buchnera americana</i> L.	American bluehearts	BUAM	HF		x			x				x										
<i>Cantinoa mutabilis</i> (Rich.) Harley & J.F.B. Pastore	Tropical bushmint	CAMU2	HF										x*									
<i>Cerastium (glomeratum)</i> Thuill.	(Sticky) mouse-eared chickweed	CEGL2	HF	x																		
<i>Cirsium horridulum</i> Michx.	Purple or Scottish thistle	CIHO2	HF	x			x	x	x	x	x				x							
<i>Conyza canadensis</i> (L.) Cronquist	Canadian horseweed	COCA5	HF			x	x	x	x	x		x	x									
<i>Coreopsis basalis</i> (A. Dietr.) S.F. Blake	Goldenmane tickseed	COBA2	HF	x			x															
<i>Diodia virginiana</i> L.	Virginia buttonweed	DIVI3	HF					x*				x										
<i>Erigeron quercifolius</i> Lam.	Oakleaf fleabane	ERQU	HF	x	x			x				x										
<i>Eupatorium capillifolium</i> (Lam.) Small	Dogfennel	EUCA5	HF				x*	x	x			x	x									
<i>Eupatorium</i> sp. L.	Thoroughwort	EUPAT	HF									x*	x									
<i>Euthamia caroliniana</i> (L.) Greene ex Porter & Britton	Slender flattop goldenrod	EUCA26	HF						x*				x									
<i>Gamochaeta</i> sp. Weddell	Cudweed	GAMOC	HF	x																		
<i>Geranium carolinianum</i> L.	Carolina geranium, Cranesbill	GECA5	HF	x						x	x				x							
<i>Helianthus angustifolius</i> L.	Swamp sunflower	HEAN2	HF					x*	x			x	x									
<i>Heterotheca subaxillaris</i> (Lam.) Britton & Rusby	Camphorweed	HESU3	HF		x	x		x	x	x		x	x	x								
<i>Hydrocotyle</i> sp. L.	Pennywort, dollarweed	HYDRO2	HF									x*										
<i>Hyptis alata</i> (Raf.) Shinnery	Clustered bushmint	HYAL	HF																			x*
<i>Krigia virginica</i> (L.) Willd.	Virginia dwarf dandelion	KRVI	HF	x																		
<i>Lactuca graminifolia</i> Michx.	Grassleaf lettuce	LAGR	HF	x							x	x			x							
<i>Ludwigia maritima</i> Harper	Seaside primrosewillow	LUMA4	HF		x			x				x										
<i>Monarda punctata</i> L.	Spotted beebalm	MOPU	HF		x							x										
<i>Oenothera biennis</i> L.	Common eveningprimrose	OEBI	HF																			x*
<i>Oenothera (simulans)</i> (Small)W.L. Wagner & Hoch	(Southern beeblossom)	OESI	HF		x						x	x										
<i>Oxalis corniculata</i> L.	Common yellow woodsorrel	OXCO	HF																			x*
<i>Plantago major</i> L.	Common plantain	PLMA2	HF	x							x											

Table 3 – continued				2016			2017			2018			2019			2020						
				Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	
<i>Phyla nodiflora</i> (L.) Greene	Fog fruit	PHNO2	HF					x*				x										
<i>Plantago</i> sp. L.	Plantain	PLANT	HF		x																	
<i>Pseudognaphalium obtusifolium</i> (L.) Hilliard & B.L. Burtt	Rabbit tobacco	PSOB3	HF			x																
<i>Pyrrhopappus carolinianus</i> (Walter) DC.	Carolina desertchicory	PYCA2	HF	x																		
<i>Rhexia mariana</i> L.	Pale meadowbeauty	RHMA	HF		x			x				x	x									
<i>Rumex hastatulus</i> Baldw.	Heartwing dock	RUHA2	HF	x							x											
<i>Salvia lyrata</i> L.	Lyreleaf sage	SALY2	HF	x			x				x											
<i>Sisyrinchium (angustifolium)</i> Mill. or <i>Sisyrinchium (nashii)</i> E.P. Bicknell	(Narrowleaf) blue-eyed grass (Nash's) blue-eyed grass	SIAN3 SINA	HF	x							x											
<i>Solidago canadensis</i> . L.	Canada goldenrod	SOCA6	HF			x			x		x	x	x									
<i>Spermolepis</i> sp. Raff.	Scaleseed	SPERM2	HF	x			x				x											
<i>Stachys floridana</i> Shuttlw. ex Benth.	Florida betony	STFL4	HF	x			x		x	x	x		x	x								
<i>Symphotrichum (dumosum)</i> (L.) G.L. Nesom	(Button) aster	SYDU2	HF	x		x			x				x									
<i>Tradescantia ohiensis</i> Raf.	Ohio spiderwort	TROH	HF	x			x	x	x	x	x	x	x	x								
<i>Trichostema dichotomum</i> L.	Forked bluecurls	TRID2	HF						x*													
<i>Valerianella radiata</i> (L.) Dufr.	Beaked cornsalad	VARA	HF				x*															
<i>Verbena brasiliensis</i> Vell.	Brazilian vervain	VEBR2	HF	x	x	x	x	x	x	x	x	x	x									
<i>Viola</i> sp. L.	Violet	VIOLA	HF							x												
<i>Wahlenbergia marginata</i> (Thunb.) A. DC.	Southern rockbell	WAMA	HF			x			x													
<i>HERBACEOUS – Fabaceae</i>																						
<i>Chamaecrista fasciculata</i> (Michx.) Greene	Partridge pea	CHFA2	HFf									x*										
<i>Crotalaria lanceolata</i> E. Mey.	Lanceleaf rattlebox	CRLA7	HFf		x							x	x									
<i>Indigofera hirsuta</i> L.	Hairy indigo	INHI	HFf			x			x			x	x									
<i>Desmodium paniculatum</i> (L.) DC.	Panicled ticktrefoil	DEPA6	HFf					x*	x			x	?									
<i>Desmodium tortuosum</i> (Sw.) DC.	Dixie ticktrefoil	DETO	HFf					x*				x	?									
<i>Lespedeza hirta</i> (L.) Hornem.	Hairy lespedeza	LEHI2	HFf		x			x														
<i>Trifolium campestre</i> Schreb.	Hop clover	TRCA5	HFf	x			x				x											
<i>Vicia</i> sp. L.	Vetch	VICIA	HFf	x						x	x			x								

Table 3 – continued				2016			2017			2018				2019				2020			
				Ap	Au	Oc	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc	Fb	Ap	Au	Oc
<i>HERBACEOUS VINES</i>																					
<i>Ipomoea cordatotriloba</i> Dennst.	Tievine	IPCO8	VH						x*			x	x								
<i>Ipomoea hederifolia</i> L.	Scarletcreeper	IPHE2	VH			x			x				x								
<i>Ipomoea</i> sp. L. (white flowers)	Morning-glory	IPAL	VH					x*													
<i>GRASSES – graminoid MOs</i>																					
<i>(Amphicarpum muehlenbergianum)</i> (Schult.) Hitchc.	(Blue maidencane)	AMMU2	GR						x*			x	x								
<i>Andropogon glomeratus</i> (Walter) Britton, Sterns & Poggenb.	Bushy bluestem	ANGL2	GR			x		x	x		x	x	x								
<i>Andropogon virginicus</i> L.	Broomsedge bluestem	ANVI2	GR	x	x	x		x	x	x	x	x	x								
<i>Lolium arundinaceum</i> (Schreb.) Darbysh.	Tall fescue	SCAR7	GR								x										
<i>Paspalum notatum</i> Flueggé	Bahiagrass	PANO2	GR	x	x	x	x	x	x	x	x	x	x	x							
<i>Paspalum urvillei</i> Steud.	Vaseygrass	PAUR2	GR						x*	x	x	x	x								
<i>(Sorghum halepense)</i> L. Pers.	(Johnsongrass)	SOHA	GR					x*													
<i>RUSHES & SEDGES</i>																					
<i>Cyperus</i> sp. 1 L.	Flatsedge	CYPER	SG					x*				x	x								
<i>Cyperus</i> sp. 2 L.	Flatsedge	CYPER	SG					x*				x	x								
<i>Rhynchospora colorata</i> (L.) H. Pfeiffer	Starrush whitetop	RHCO7	SG									x*	x								
Total all sp. #				26	18	15	19	28	27	16	24	38	36	12							

NOTES:

1. Species observed not based on a formal survey; does not include “standing dead” (like brown shoots of native grasses).
2. Species in bold font were observed only by J. Norcini; all others were observed by J. Norcini and R. Haggie/ R. Johnstone.
3. *Sisyrinchium angustifolium* = *Sisyrinchium atlanticum*

4. April 2017

- a. Less diversity than in April 2016
- b. 5 new species, all of which are native to Florida
- c. *Campsis/Ampelopsis* mainly near back edge of clear zone; locally abundant
 - *Ampelopsis arborea* now *Nekemias arborea* per USDA (but not Florida Plant Atlas [<http://florida.plantatlas.usf.edu>])
- d. Bahia turf locally dense

5. August 2017

- a. Species diversity increased from August 2016 (18 vs 28)
- b. 8 new species; at least 5 are native to Florida
- c. *Ambrosia* and *Verbena* widespread and are the two most prevalent species (not including bahiagrass)
- d. New *Ipomoea* sp. – same species as Site 2
- e. Bahia turf locally dense
- f. Unknown observed August 2016/2017 – later ID'd as *Lespedeza hirta*



6. October 2017

- a. Species diversity increased from October 2016 (15 vs 27)
- b. 6 new species; 5 are native to Florida
- c. Nearly all *Verbena* had senesced
- d. *Ambrosia* and *Heterotheca* were the most widespread, non-senesced species
- e. Did not observe white-flowered *Ipomoea* sp. (same species as Site 2)

f. Bahia turf remains locally dense, unlike other two sites where bahia turf was dense nearly throughout

g. *Indigofera hirsuta* – species of concern; occurs mainly in northern half of plot

From: Nettles, John [mailto:John.Nettles@dot.state.fl.us]

Sent: Wednesday, November 08, 2017 1:52 PM

Jeff, I have visited sites #2 and #3. I have removed (by hand) all the Hairy indigo I could find and disposed of it off site. I know I probably left some at site #2. The indigo was growing off FDOT R/W on adjacent property, and there was some further down the property line as well. I did try to get all of it that was within the limits of our test plot site.

7. February 2018

a. 16 species – 13 native; *Vicia* probably non-native but not blooming so could not ID; 1 unknown broadleaf species (not included in the 15) was not developed enough to even ID to genus

b. *Stachys* was widespread, locally abundant, and clearly the dominant species; the spring blooming *Allium canadense*, was locally abundant in the demo area as well in the mowed area (see image)

c. The bahia and *Paspalum urvillei* were beginning to green up

8. April 2018

a. 24 species – At least 18 native; at least 4 non-native

b. 1 new species – native

c. More diversity than in 2017 but less than 2016 (27 vs 19 vs 24)

9. August 2018

a. 38 species – At least 29 native; at least 7 non-native

b. 4 new species – at least 3 native

c. More diversity than in 2017 (28 vs 38)

d. *Heterotheca* and *Verbena* were dominant

10. October 2018

a. 36 species; at least 9 non-native

b. 6 new species; 3 native

c. Species diversity increased from October 2017 (27 vs 36)

d. (Observed one of the *Desmodium* sp.; not sure which one)

e. *Heterotheca* remains widespread; frequency of *Verbena* may be declining a bit

f. Bahia turf locally dense



11. February 2019

- a. 12 species (no new ones observed) – At least 10 native; *Vicia* probably non-native but not blooming so could not ID
- b. Like 2018, *Stachys* was widespread, locally abundant, and clearly the dominant species; *Allium canadense*, was locally abundant in the demo area as well in the mowed area
- c. The bahiagrass was beginning to green up
- d. There was a dead deer along edge of demo plot; probably a DVC