

# Survey for Egger's Nutrush at Okaloacoochee Slough State Forest, Hendry County, Florida

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Final Report to the Florida Fish and Wildlife Conservation Commission

August 2021



Florida Natural Areas Inventory  
Florida Resources and Environmental Assessment Center  
Institute of Science and Public Affairs  
Florida State University



Cover Photograph: Non-native plant species Egger's nutrush (*Scleria eggersiana*) invading a flooded pop ash (*Fraxinus caroliniana*) dome swamp (Dexter Sowell)

Report prepared by Dexter Sowell. A draft of this report was reviewed by Robert Gundy.

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## ABSTRACT

A survey for *Scleria eggersiana* (Egger's nutrush), an Early Detection-Rapid Response (EDRR) invasive plant species for Florida and the Southwest Florida Cooperative Invasive Species Management Area (SWF CISMA), was conducted at the Okaloacoochee Slough State Forest (OSSF) in Hendry County, FL on July 20-22, 2021. FNAI identified 27 new occurrences of Egger's nutrush under canopy cover in hydric and mesic plant communities encompassing about 0.4 gross acres of infestation in OSSF. The few points discovered, and the low cover classes typically seen suggests that these plants may be near the northerly leading edge of the species expansion.

## ACKNOWLEDGMENTS

We thank Linda King (FWC) for requesting this survey. Dexter Sowell and Pete Stango conducted the surveys. Dexter Sowell wrote the report. Frank Price and Robert Gundy (FNAI) reviewed an earlier draft of the report. Amy Knight (FNAI) proofed GIS data associated with this report for quality control and assuring metadata requirements were met.

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## INTRODUCTION

Okaloacoochee Slough State Forest (OSSF) is a 32,370-acre conservation area located in central Hendry County, FL. An unusual *Scleria* was discovered in the Okaloacoochee Slough State Forest (OSSF) in 2016 by Dexter Sowell when employed by the Florida Forest Service. Mr. Sowell assumed at the time that the plants were *Scleria lacustris* (Wright's nutrush) with unusual growth form in deep shade. A year later in 2017, Mr. Sowell, now employed with the Florida Natural Areas Inventory (FNAI), mentioned this unusual looking *Scleria* to South Florida Water Management District (SFWMD) personnel at an invasive plant species meeting and provided SFWMD personnel a location in OSSF to visit the *Scleria* occurrence. SFWMD visited the site, collected and submitted voucher specimens to the herbarium at the University of Florida (FLAS) for identification. The FLAS herbarium staff identified the nutrush as *Scleria eggersiana* (Egger's nutrush), a *Scleria* species new to the continental United States with a native range in Central and South America. Unbeknownst to the Invasive Species biologist at FNAI, two other FNAI biologist had observed an unusually tall *Scleria* at Dinner Island Ranch Wildlife Management Area (DIRWMA). A photograph of the specimen revealed this *Scleria* to be, in fact, Egger's nutrush observed in DIRWMA in January 2015, predating the OSSF discovery by 1-2 years.

With the knowledge that this non-native *Scleria* species exists on two adjacent public conservation lands, FNAI conducted invasive plant surveys in FY19 at DIRWMA and FY20 at OSSF to determine the range of Egger's nutrush within the public conservation lands. To supplement the prior two Egger's nutrush surveys, we surveyed for Egger's nutrush in FY21 at OSSF, focusing our search north of the known OSSF occurrences. We also conducted brief surveys west of and within the WC-212 treatment area. The WC-212 treatment area encompasses all known occurrences of Egger's nutrush as of April 2020. We are aware of four occurrences of Egger's nutrush on private property under conservation easement approximately 16 miles northeast of the OSSF-DIRWMA public conservation lands complex. The South Florida Water Management District and the US Department of Agriculture-Natural Resources Conservation Service are monitoring this population, and we do not discuss them further in this report.

## METHODS

### Identifying Habitat with High Probability of Occurrence

Little was known about the biology and ecology of Egger's nutrush in North America before we conducted the first survey for the species in FY19 at Dinner Island Ranch Wildlife Management Area (DIRWMA). We integrated a digital elevation model (DEM) and FNAI natural community plant layer, locating optimal elevations within closed canopy plant communities (see FNAI 2019, FNAI 2020 for details). By overlaying optimal elevation and natural plant community layers in GIS, we developed optimal areas to search within OSSF approximately 1-3 kilometers north of all prior known locations for Egger's nutrush (Figure 1).

We categorized viable habitat into three search area priorities. The highest priority search areas, Priority 1, were dome swamps and depressions in mesic hammock similar to the habitats occupied by Egger's

nutrush to the south, and were within 2 kilometers of the most northerly known plants. Priority 2 search areas were wet flatwoods experiencing long fire-return interval times. Though this is not ideal habitat for Egger’s nutrush, similar habitat was found to harbor the species in our FY20 surveys (‘northeast island’, FNAI 2020). Priority 3 were viable habitat similar to those of Priority 1 search areas, but occurred further north, up to 3 kilometers from the most northerly known plants.

## Field Surveys

We surveyed several areas over the course of three field days on July 20-22, 2021. We specifically searched areas north of the FWC-funded invasive plant treatment project WC-212 (Figure 1), which is proposed to begin in late September, 2021, with Egger’s nutrush as one of the target species. Egger’s nutrush, and other invasive plant species, we discovered in the field were recorded with Trimble Nomad GPS units, using the FNAI Invasive Plant Points (see Appendix A for data attributes collected).

## Data Analysis and Management

All editing of GPS data was conducted in GIS (ESRI ArcMap 10.6). All GPS data collected are provided in the Florida Albers projection (NAD\_1983\_HARN\_Florida\_GDL\_Albers, WKID: 3087, Authority: EPSG).

After surveys were completed, we summed the gross acreage (Acres attribute in the Invasive Plant Points feature, Appendix A) of each Egger’s nutrush occurrence to calculate the gross acreage of Egger’s nutrush discovered in FY21. For each Egger’s nutrush occurrence discovered in FY21, we calculated a net acreage by multiplying the gross acreage by the cover class mid-point (Table 1), per the formula below:

$$\text{Acres} \times \text{Cover Class Mid-point} = \text{Net Acres}$$

Table 1. Invasive plant cover classes and cover class mid-points.

Cover Class	Cover Class Mid-Point	Mid-Point for Calculation
<5%	2.5%	0.025
5-25%	15.0%	0.150
26-50%	37.5%	0.375
51-75%	62.5%	0.625
>75%	87.5%	0.875

We summed the net acreage of each Egger’s nutrush occurrence to generate the net acres of Egger’s nutrush encountered in FY21.

We include with this report a geodatabase (InvPlant\_Survey\_FY21) with the following layers:

- InvPlant\_SCLEGG\_FY21 (all Egger’s nutrush discovered in this survey)
- InvPlant\_allOthers\_FY21 (all other invasive plants discovered in this survey)
- InvPlant\_SCLEGG\_All\_Years (a point layer for all known Egger’s nutrush OSSF and DIRWMA)
- Rare\_Pla\_FY21 (rare plants discovered in this survey)
- Survey\_Route\_FY21 (a 10 meter buffered track of our survey route)

Overview of Egger's Nutrush Survey Area in FY21, North of WC-212 Treatment Area

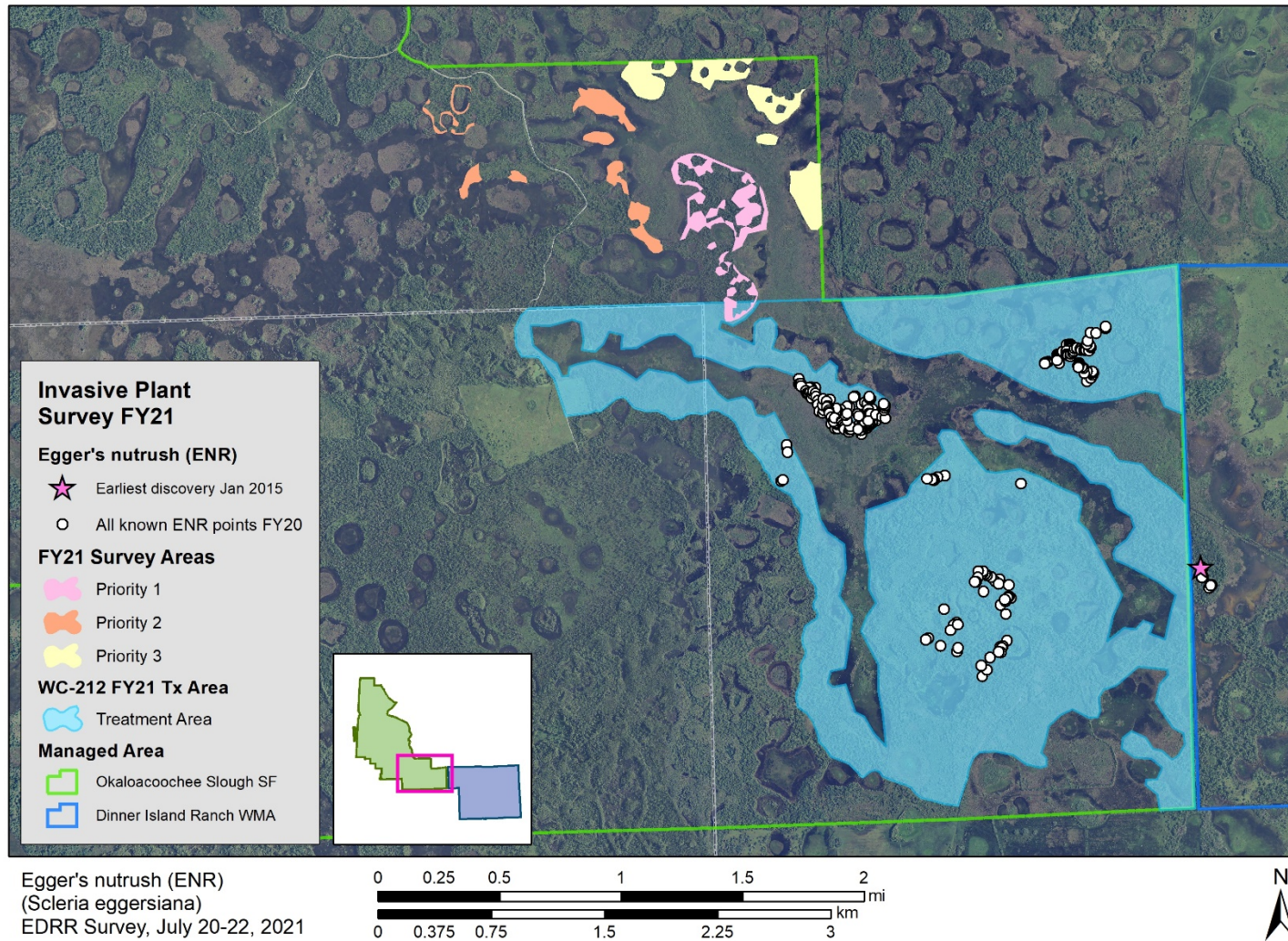


Figure 1. Overview of Egger's nutrush search area. All known occurrences of Egger's nutrush appear as white dots in the map. Search areas were planned north of the WC-212 treatment area (large blue polygon in bottom portion of figure).



## RESULTS

### Egger's nutrush

Four broad areas were searched over the course of three days. We found 27 occurrences of Egger's nutrush (Figures 2-4), all of which were small in extent, 0.1 gross acres or less (Table 2).

Table 2. Data table for all 27 Egger's nutrush occurrences observed in FY21.

ID	Surveyor	Scientific Name	Common Name	Gross Acreage	Cover Class	Net Ac	FNAI Natrual Community
1	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	5-25%	0.00015	dome swamp
2	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.01;2 car garage	<5%	0.00025	mesic hammock
3	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	51-75%	0.00063	slough marsh
4	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.01;2 car garage	<5%	0.00025	slough marsh
5	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	26-50%	0.00038	slough marsh
6	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	5-25%	0.00015	mesic hammock
7	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	26-50%	0.00038	mesic hammock
8	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.01;2 car garage	<5%	0.00025	dome swamp
9	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	5-25%	0.00015	dome swamp
10	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	5-25%	0.00015	dome swamp
11	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.01;2 car garage	5-25%	0.00150	dome swamp
12	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	26-50%	0.00038	dome swamp
13	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	5-25%	0.00015	dome swamp
14	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.1;bball ct	<5%	0.00250	mesic hammock
15	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	<5%	0.00003	mesic hammock
16	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	5-25%	0.00015	slough marsh
17	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	<5%	0.00003	slough marsh
18	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.1;bball ct	<5%	0.00250	slough marsh
19	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.01;2 car garage	<5%	0.00025	mesic hammock
20	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	<5%	0.00003	mesic hammock
21	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.01;2 car garage	<5%	0.00025	dome swamp
22	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	<5%	0.00003	dome swamp
23	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.01;2 car garage	5-25%	0.00150	dome swamp
24	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.01;2 car garage	<5%	0.00025	dome swamp
25	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.01;2 car garage	<5%	0.00025	mesic hammock
26	Stango, Pete	<i>Scleria eggersiana</i>	Egger's nutrush	0.001;2 lg desk	<5%	0.00003	mesic hammock
27	Sowell, Dexter	<i>Scleria eggersiana</i>	Egger's nutrush	0.1;bball ct	<5%	0.00250	dome swamp
<b>Total</b>				0.405		0.0150	

Four Main Survey Loops with Egger's Nutrush Found

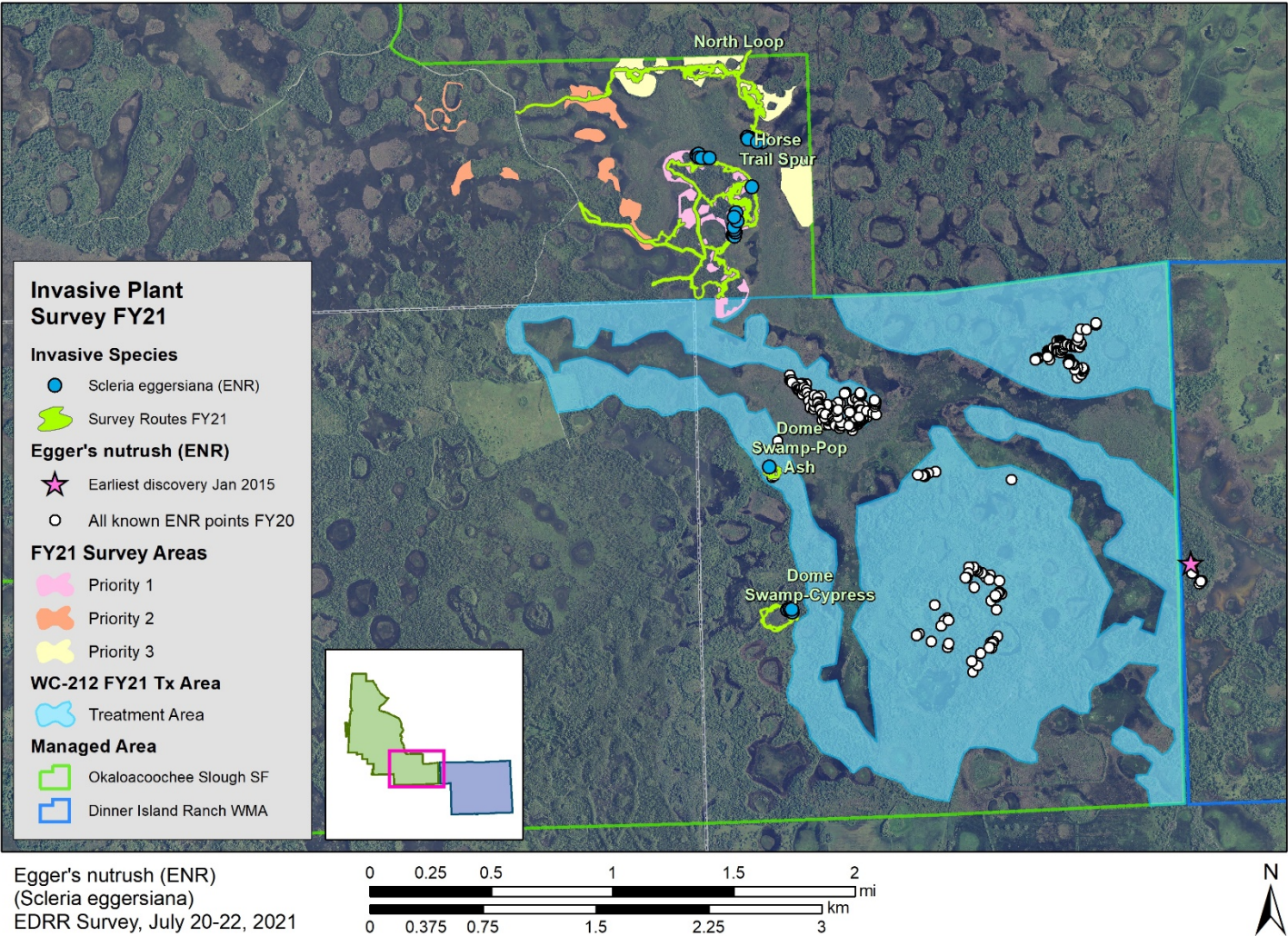


Figure 2. New occurrences of Egger's nutrush in FY21 search areas. New occurrences are labeled with blue dots.



### Two Northern Survey Loops

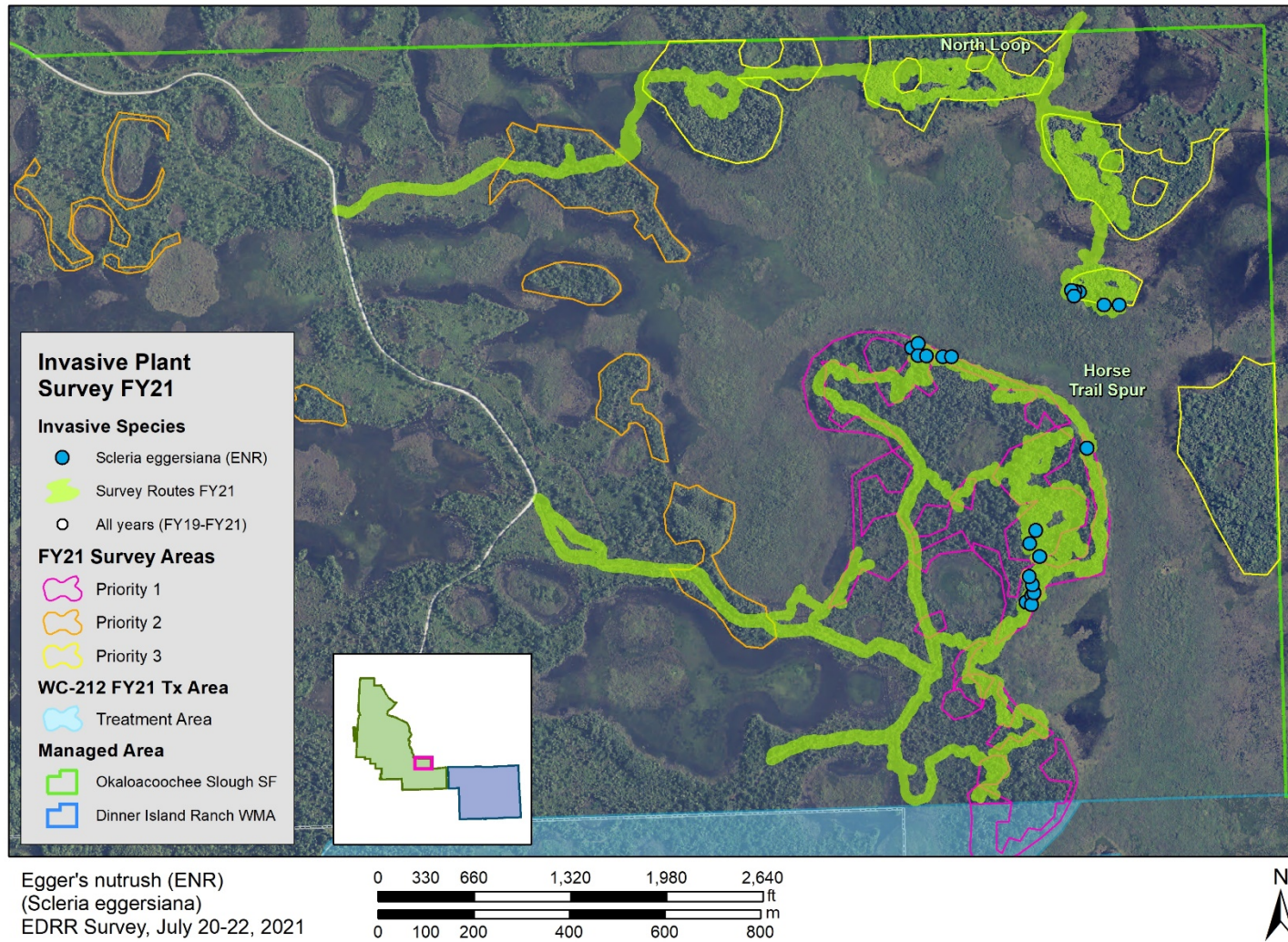


Figure 3. New occurrences of Egger's nutrush in the northern FY21 search areas. New occurrences are labeled with blue dots.



### Two Southern Survey Loops

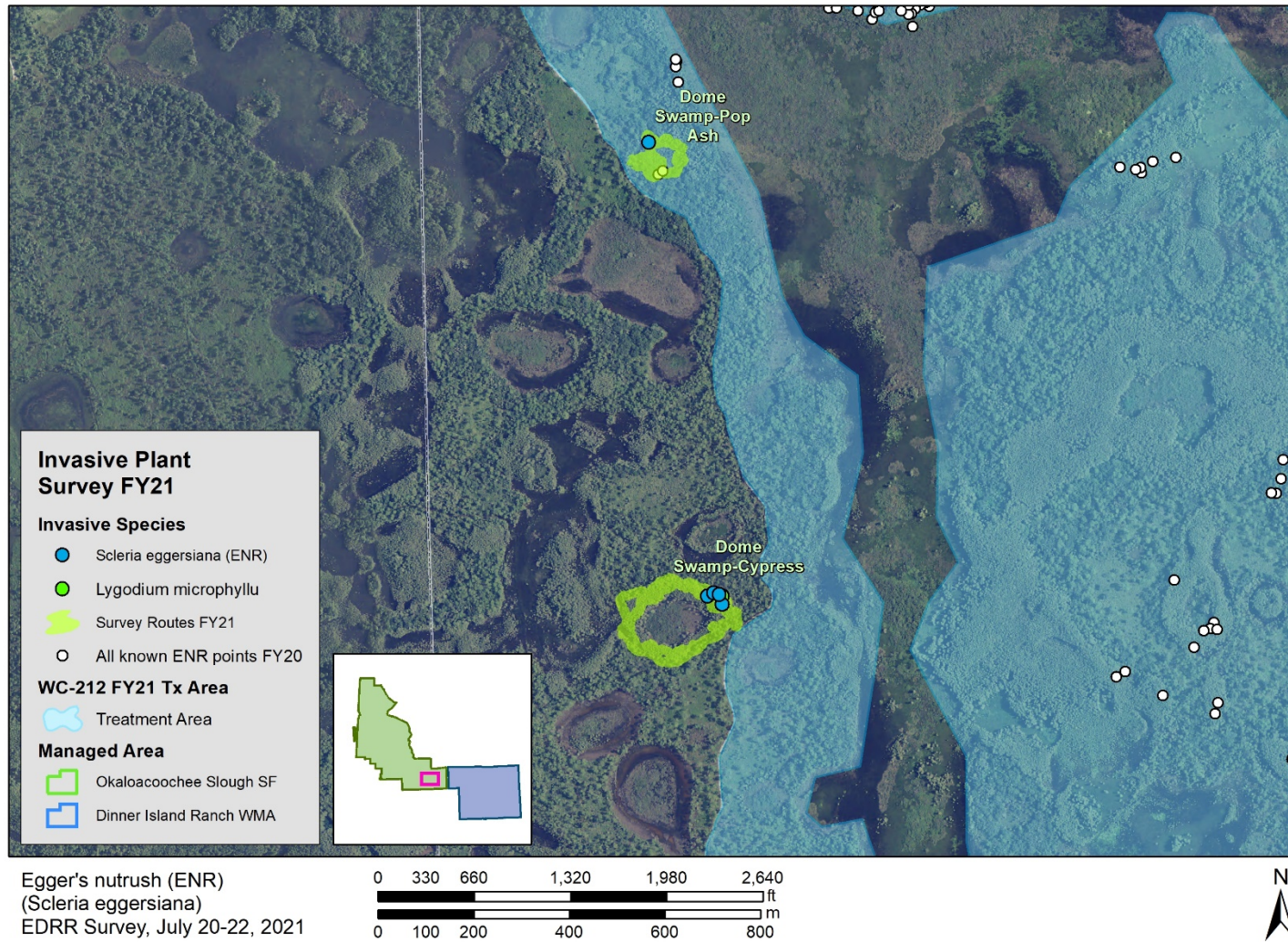


Figure 4. New occurrences of Egger's nutrush in southern FY21 search areas. New occurrences are labeled with blue dots.



Occurrences were generally small, three of which were 0.1 gross acres, and all others were 0.01 acres or less. Given the much smaller number of occurrences discovered this fiscal year, relative to the prior two surveys, and the lower cover classes typically encountered, we are likely near the northerly leading edge of the Egger's nutrush population.

We also searched two dome swamps south of the planned survey area that are close to forest roads. The first dome swamp we surveyed is within the WC-212 treatment area (survey loop labeled Dome Swamp-Pop Ash in Figures 2 and 4). We found two small Egger's nutrush occurrences at this dome swamp in the prior survey year. We searched this dome swamp again to assess the threat of Egger's nutrush on the rare epiphytic orchids within this dome swamp. The second dome swamp we surveyed is just west and outside of the WC-212 treatment area (survey loop labeled Dome Swamp-Cypress in Figures 2 and 4).

### **Other Invasive Plant Species**

We recorded 60 occurrences of five other invasive plant species while searching for Egger's nutrush (Figure 5), all within the northern search area. These invasive plant species yielded 1.401 gross acres of invasive plants, with a net acreage of 0.405 acres of invasive plants. We include with this report a geodatabase layer (InvPlant\_allOthers\_FY21) of five other invasive plants observed during the Egger's nutrush survey in FY21.

## **RECOMMENDATIONS**

### **New Egger's Nutrush Occurrences**

The new occurrences of Egger's nutrush identified in FY21 should be included as soon as possible in an invasive plant control project. Given that these occurrences were small in size, and of low cover class, control of these occurrences is feasible in this area. There were numerous occurrences of other invasive plant species in the northern search area, especially of Old World climbing fern in the upland plant communities, and Wright's nutrush in the slough marsh. These should all be treated as a single invasive plant treatment project to complement the WC-212 invasive plant treatment project just to the south.

### **Addition to the Okaloacoochee Slough Wildlife Management Area**

The property to the north and east of our search area was previously private property owned by the Atlantic Land Improvement Company (ALICO, Inc.). However, most of the adjacent private land was purchased by the state of Florida in September 2020 as part of the Devil's Garden Florida Forever Program (FDEP 2021), and the purchase has been added to the Okaloacoochee Slough Wildlife Management Area (OSWMA Addition, Figure 6). These lands should be searched for Egger's nutrush in the near future, due to the addition's proximity to known occurrences of Egger's nutrush in OSSF and DIRWMA.

A brief survey by FNAI biologists, who were ground-truthing natural plant community delineations within the OSWMA Addition land, did not lead to any discovery of Egger's nutrush. However, the FNAI

biologists were not focused on visiting areas with high likelihood for Egger's nutrush invasion. We suggest surveys for Egger's nutrush should be conducted in the dome swamps and mesic hammock-slough marsh ecotones within the OSWMA Addition lands to assess if Egger's nutrush has pushed further north and northeast from its previously known range. We also recommend surveys west and east of the known Egger's nutrush range occur within OSSF and DIRMWA, respectively, within the next 12 months as well.

### **Post-survey Discovery of New Egger's Nutrush Occurrence**

FNAI was nearing the completion of writing this FY21 survey report on July 29, 2021 when the Florida Forest Service Forester for OSSF, John McCormick, called the FNAI Invasive Species biologist. Mr. McCormick called to notify FNAI with the location of a new Egger's nutrush location he discovered that morning. It occurs 2.9 miles west of the known range in OSSF within depressions on a 15 acre mesic hammock island within the main arm of the Okaloacoochee Slough near the southern boundary of the state forest. FNAI did not map this occurrence with the other known occurrences, since we do not have any information about this occurrence, such as gross acreage or cover class, or how many distinct occurrences were observed at this location by Mr. McCormick. This occurrence represents a significant westward shift in the range of Egger's nutrush. FNAI will try to visit this remote occurrence during the next field visit to OSSF in conjunction with the WC-212 invasive plant treatment compliance inspection, likely to occur late in the fall of 2021.

All Other Invasive Plants Seen in FY21

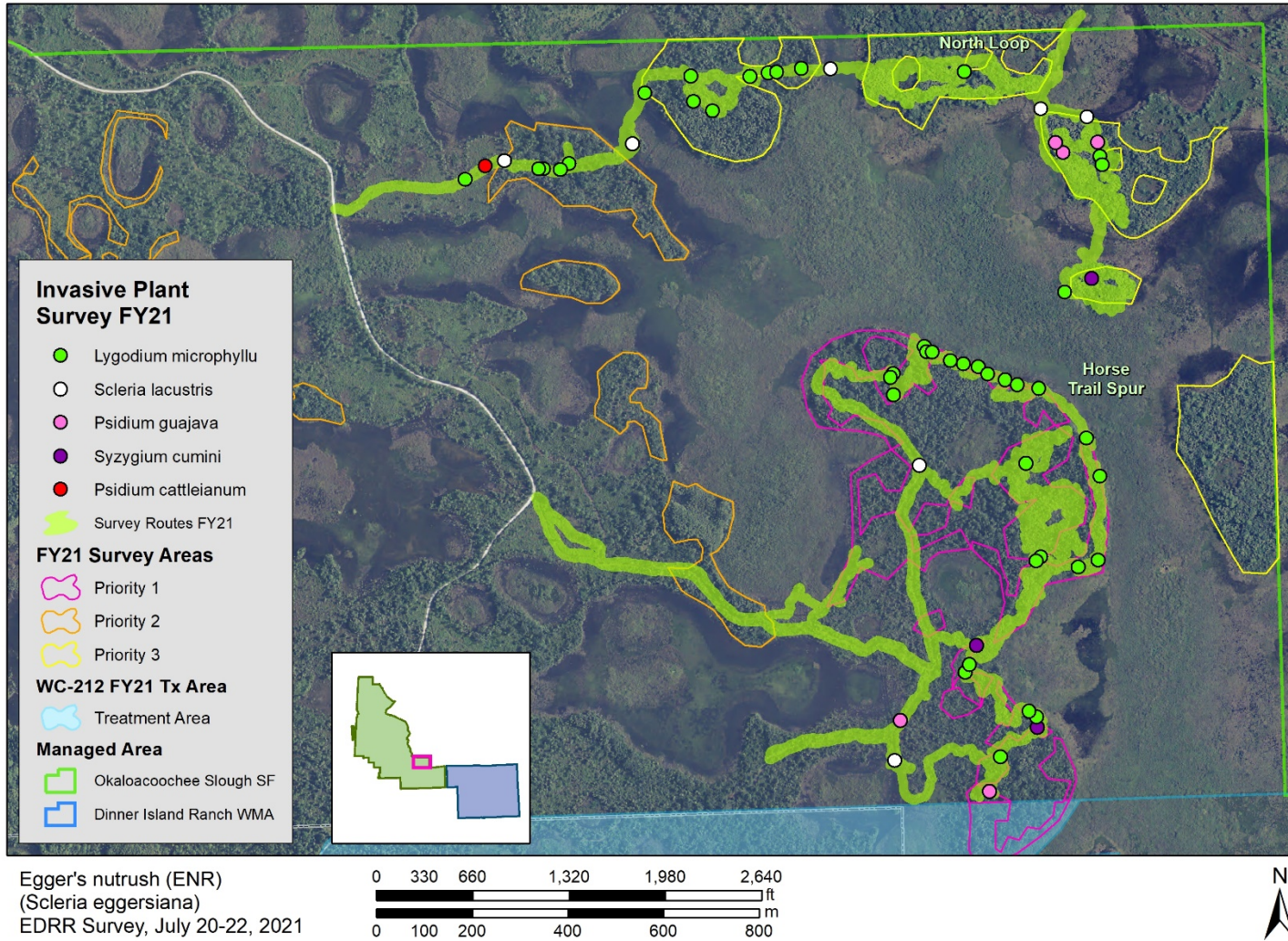


Figure 5. Location of 60 occurrences of five other invasive plant species observed in FY21. Old World climbing fern was the most commonly encountered invasive plant species observed during this survey.

### All Known Egger's Nutrush Occurrences and Surrounding Conservation Lands

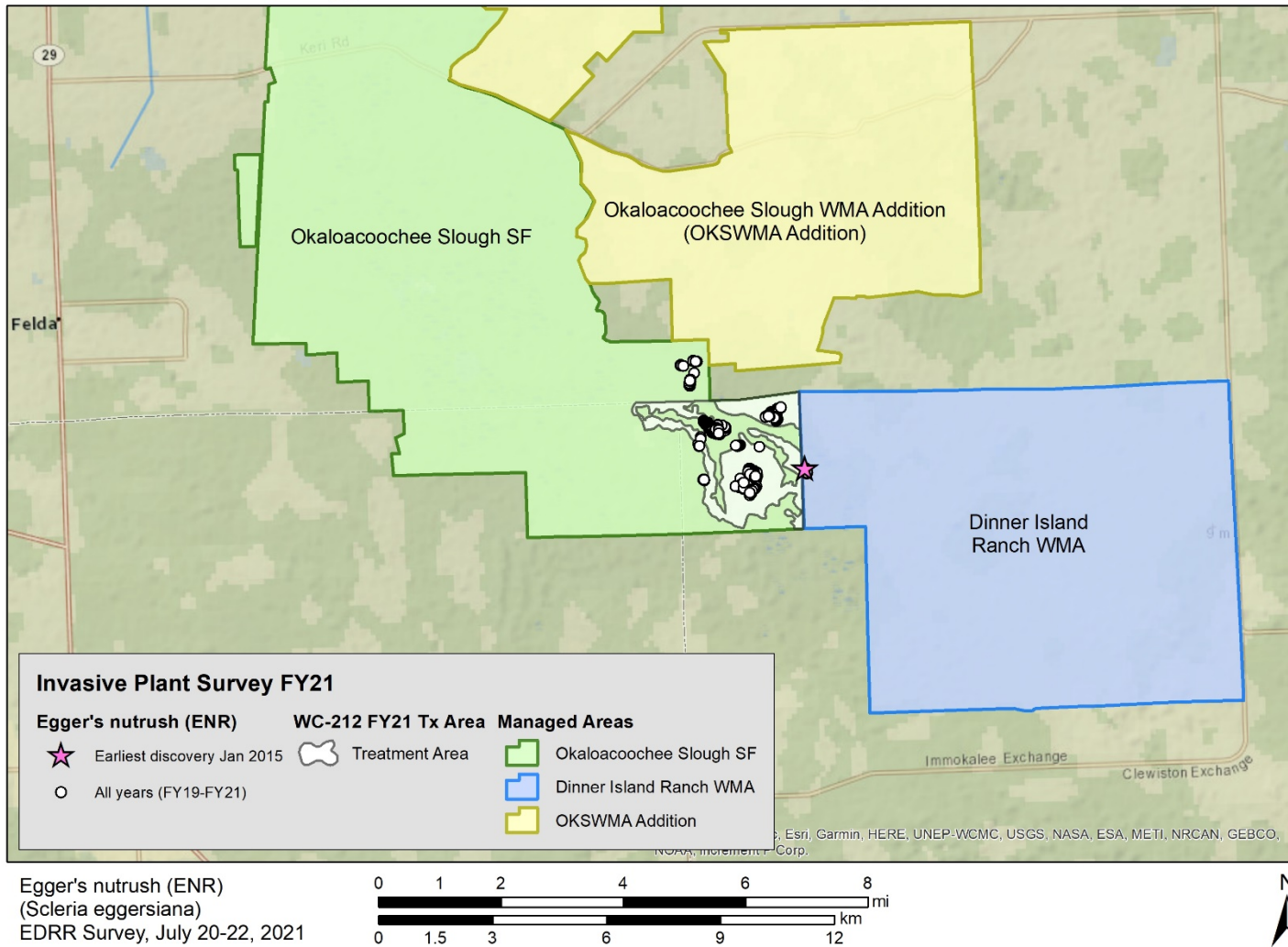


Figure 6. Locations of all known Egger's nutrush infestations on public conservation lands. Egger's nutrush occurrences appear as white dots in the map.

## LITERATURE CITED

Florida Department of Environmental Protection (FDEP). 2021. The 2021 Florida Forever Five-Year Plan- Devil's Garden: Summary of Recommendations and Status as of December 2020. Available online at [https://floridadep.gov/sites/default/files/FLDEP\\_DSL\\_OES\\_FF\\_BOT\\_DevilsGarden.pdf](https://floridadep.gov/sites/default/files/FLDEP_DSL_OES_FF_BOT_DevilsGarden.pdf) [accessed 27 July 2021]

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Florida Natural Areas Inventory (FNAI). 2020. Survey for *Scleria eggersiana* (Egger's nutrush) at Okaloacoochee Slough State Forest, Hendry County, Florida. Report to the Florida Fish and Wildlife Conservation Commission, Tallahassee, FL.



## Appendix A. Data Attributes, Definitions, and Values for Invasive Plant Points

ATTRIBUTE	VALUE
<b>SURVEYSITE</b>	Name of managed area or survey area.
<b>SURVEYDATE</b>	Date of data collection.
<b>SURVEYOR</b>	Name of FNAI field surveyor.
<b>EVAL_TYPE</b>	<p>Type of visit to site.</p> <p>Evaluation values:</p> <ul style="list-style-type: none"> <li>• <b>Initial:</b> first observation and assessment of a species.</li> <li>• <b>Revisit:</b> observations/assessments on subsequent visits.</li> <li>• <b>Pre-treatment:</b> only an observation /assessment taken directly before treatment is applied. <i>(Not applicable to this report)</i></li> <li>• <b>Post-treatment:</b> observation /assessment and evaluation of the targeted invasive species post-treatment. <i>(Not applicable to this report)</i></li> </ul>
<b>SPECIES</b>	Scientific name of exotic plant occurring at that point.
<b>COMMONNAME</b>	Common name of exotic plant occurring at that point.
<b>FLEPPC_CD</b>	<p>Category of exotic species as determined by the Exotic Pest Plant Council (FLEPPC 2019 List of Invasive Species).</p> <p>EPPC categories:</p> <ul style="list-style-type: none"> <li>• <b>Category I:</b> invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. <i>This definition does not relay on the economic severity or geographic range of the problem, but on the documented ecological damage caused.</i></li> <li>• <b>Category II:</b> invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species.</li> <li>• <b>Not listed:</b> non-native species not currently listed by FLEPPC.</li> </ul>
<b>DISTRIBUTN</b>	<p>Pattern of plant distribution within the gross acreage.</p> <p>Distribution values:</p> <ul style="list-style-type: none"> <li>• <b>Single plant or clump:</b> one individual plant or one small clump of a single species.</li> <li>• <b>Scattered plants or clumps:</b> multiple individual plants or small clumps of a single species scattered within the gross area infested.</li> <li>• <b>Scattered dense patches:</b> dense patches of a single species scattered within the gross area infested <i>(Invasive Plant waypoints only)</i>.</li> <li>• <b>Dominant cover:</b> multiple plants or clumps of a single species that occupy a majority of the gross area infested.</li> </ul>

ATTRIBUTE	VALUE
	<ul style="list-style-type: none"> <li>• <b>Dense monoculture:</b> generally a dense stand of a single dominant species that not only occupies more than a majority of the gross area infested, but also covers/excludes other plants (<i>Invasive Plant</i> waypoints only).</li> <li>• <b>Linearly scattered:</b> plants or clumps of a single species generally scattered along a linear feature, such as a road, trail, property line, ditch, ridge, slough, etc. within the gross area infested (<i>Invasive Plant</i> waypoints only).</li> <li>• <b>No live plants:</b> no live plants observed (<i>Invasive Plant</i> waypoints only).</li> </ul>
<b>SIZE</b>	<p>Estimated gross area (acres) of infestation with cues to help with visual estimation.</p> <p>Size values:</p> <ul style="list-style-type: none"> <li>• 0.00025 ac; sq meter (in <i>compliance inspection</i> points only)</li> <li>• 0.0005 ac; lg desk (in <i>compliance inspection</i> points only)</li> <li>• 0.001 ac; 2 lg desk</li> <li>• 0.01 ac; 2 car garage</li> <li>• 0.1 ac; bball ct</li> <li>• 0.25 ac; 4 tennis ct</li> <li>• 0.5 ac; half fball field</li> <li>• 1.0 ac; fball field</li> <li>• 2 ac, etc up to 10</li> <li>• Other (in Comments)</li> </ul>
<b>PCTCOVER</b>	<p><b>Invasive plants only.</b> A visual estimate of the percentage of the area infested that is actually covered by the canopy (or ground cover) of the plants, including <u>only</u> live foliage.</p> <p>Percent cover classes:</p> <ul style="list-style-type: none"> <li>• &lt;5%</li> <li>• 5-25%</li> <li>• 26-50%</li> <li>• 51-75%</li> <li>• &gt;75%</li> </ul>
<b>PCTCVR_L&amp;D</b>	<p><b>Compliance inspection only.</b> A visual estimate of area infested with the invasive species (SIZE) including live and dead foliage covering the canopy or ground cover. Must equal the invasive species cover before treatment. Percent cover classes match FWC Invasive Plant Management Section’s cover classes.</p> <p>Live and dead percent cover classes:</p> <ul style="list-style-type: none"> <li>• 0%</li> <li>• &lt;1%</li> <li>• 1-5%</li> </ul>

ATTRIBUTE	VALUE
	<ul style="list-style-type: none"> <li>• 6-25%</li> <li>• 26-50%</li> <li>• 51-75%</li> <li>• 76-95%</li> <li>• &gt;95%</li> </ul>
<b>PCTCVR_L</b>	<p><b>Compliance inspection only.</b> A visual estimate of area infested with the invasive species (SIZE) including only live foliage covering the canopy or ground cover. Must equal the invasive plant cover after treatment. Percent cover classes match FWC Invasive Plant Management Section’s coverage classes.</p> <p>Live percent cover classes:</p> <ul style="list-style-type: none"> <li>• &lt;1%</li> <li>• 1-5%</li> <li>• 6-25%</li> <li>• 26-50%</li> <li>• 51-75%</li> <li>• 76-95%</li> <li>• &gt;95%</li> </ul>
<b>MATURITY</b>	<p>Stage of plant development for the recorded infestation.</p> <p>Maturity values:</p> <ul style="list-style-type: none"> <li>• Mature</li> <li>• Immature</li> <li>• Both</li> </ul>
<b>PHENOLOGY</b>	<p>Characteristic phenology of the plants.</p> <p>Phenology values:</p> <ul style="list-style-type: none"> <li>• Flower/bud</li> <li>• Flower/fruit</li> <li>• Fruit</li> <li>• Sporulating</li> <li>• In leaf</li> <li>• Dormant</li> </ul>
<b>TREATEDB4</b>	<p><b>Invasive plant only.</b> Indication of whether or not plants were previously subject to management efforts.</p> <p>Management treatment values:</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Unknown</li> </ul>



ATTRIBUTE	VALUE
<b>TX_ATTEMPT</b>	<p><b>Compliance inspection only.</b> Indication of whether or not plants on the target treatment list for a particular compliance inspection were treated. Does not include past treatments from prior projects (e.g., climbing fern or cogon grass treated in past fiscal years under a different project and different contractor).</p> <p>Target treatment values:</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Unknown</li> </ul>
<b>FNAI_NC</b>	Natural community present in area of invasive plant occurrence.
<b>PHOTO_INFO</b>	Information concerning observation, assessment, or treatment photos.
<b>POLY_SEVER</b>	<p>Severity of the disturbance(s).</p> <p>Disturbance severity values:</p> <ul style="list-style-type: none"> <li>• None</li> <li>• Light</li> <li>• Moderate</li> <li>• Heavy</li> <li>• Severe</li> </ul>
<b>POLYDIST_1</b>	<p>Polygon disturbance 1 describes the primary, or most prevalent, disturbance observed anywhere in the natural community polygon, not just in the plot. This is one of the few attributes that describe conditions observed throughout the polygon, not just within the plot. All types of disturbance, hydrologic or otherwise, are recorded in POLYDIST_1, 2, or 3. If there is more than one type of disturbance, the most prevalent form of disturbance is entered here and lesser disturbances are entered in POLYDIST_2 and POLYDIST_3. If there are more than three disturbance types, they are entered in DISTURBCOM.</p> <p>Disturbance values are:</p> <ul style="list-style-type: none"> <li>• Not evident</li> <li>• Agriculture</li> <li>• Cattle disturbance</li> <li>• Clearing (includes dove fields, old fields, and food plots that are less than 0.5 acre, i.e. that are not delineated as ruderal polygons)</li> <li>• Ditch/canal</li> <li>• Exotics</li> <li>• Firebreaks</li> <li>• Fire suppression</li> </ul>

ATTRIBUTE	VALUE
	<ul style="list-style-type: none"> <li>• Forestry operations (e.g., logging, loading areas, bedding, equipment rutting, slash piles, and other mechanical disturbances; does not include burning.)</li> <li>• Hog digging</li> <li>• Impoundment (e.g. artificial ponds and lakes, borrow pits, dams, dikes)</li> <li>• Natural</li> <li>• ORV trail</li> <li>• Road</li> <li>• Trash dumping</li> <li>• Woody encroachment</li> <li>• Cause unknown</li> <li>• Other (details provided in the DISTURBCOM field)</li> </ul>
<b>POLYDIST_2</b>	Polygon disturbance 2 describes the secondary disturbance, if any, in the vicinity of the exotic plant record. Polygon disturbance values are the same as POLYDIST_1.
<b>POLYDIST_3</b>	Polygon disturbance 3 describes the tertiary disturbance, if any, in the vicinity of the exotic plant record. Polygon disturbance values are the same as POLYDIST_1.
<b>NATSPPEST</b>	<b>Compliance Inspection Only.</b> Quick estimate of the number of native plant species present in the Estimated Area of Infestation (SIZE). Include all native plant species as well as weedy and ruderal species. Do not include any non-native plant species regardless of whether they are categorized as FISC ranked or not. Include all species rooted and/or overhanging the SIZE plot chosen.
<b>DISTURBCOM</b>	Disturbances not included in POLYDIST_1, _2, or _3, or other information about disturbance in the polygon.
<b>COMMENTS</b>	Comments provide an optional field for additional information about the exotic pest plant population.

## Appendix B. Data Attributes, Definitions, and Values for Rare Plant and Animal Points

ATTRIBUTE	VALUE
<b>SITE</b>	Name of managed area or potential natural site.
<b>SURVEYDATE</b>	<b>REQUIRED.</b> Date of data collection.
<b>SURVEYOR</b>	<b>REQUIRED.</b> Name of the field surveyor. Required format “Last Name, First Name”
<b>FIELD_ID</b>	Number assigned to this point during field work; not necessarily unique.
<b>SPECIES</b>	Scientific name of rare plant or animal occurring at that point.
<b>ID_CONFIRM</b>	<p><b>REQUIRED.</b> Indicates whether taxonomic identification of the species has been confirmed by a reliable individual. Only use “no” if you have found a plant/animal with questionable ID (i.e. not reproductive). Do not use “no” if the plant was not found (in this case use “ZZ”).</p> <p>Identification confirmed values:</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>
<b>CONF_EXT</b>	<p><b>REQUIRED.</b> Indicates confidence that the full extent of the EO is known. This will only be applied to single source EOs.</p> <p>Confirmation extent values are:</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Unknown</li> </ul>
<b>COUNT**</b>	Number of individuals physically counted. Count should be a specific number. “Count” <b>OR</b> the following attribute, “estimate”, is <b>REQUIRED</b> , but do not fill out both.
<b>ESTIMATE**</b>	<p>Estimated number of individuals in the population.</p> <p>“Estimate” <b>OR</b> the previous attribute, “count”, is <b>REQUIRED</b>, but do not fill out both. Allowed characters in this field include the following: 0123456789-&lt;&gt;s. <b>OR</b> one of the following words: 'infrequent', 'occasional', 'common', or 'abundant'.</p> <p>For example:</p> <ul style="list-style-type: none"> <li>• 1000s</li> <li>• 10-15</li> <li>• &gt;100</li> <li>• &lt;500</li> <li>• 50</li> </ul>
<b>WHAT_CNTED</b>	<p><b>REQUIRED FOR PLANT ONLY.</b> Indicates what was counted in the COUNT or ESTIMATE field.</p> <p>What counted values:</p> <ul style="list-style-type: none"> <li>• Plant</li> <li>• Stem</li> <li>• Reproductive stem</li> <li>• Clump</li> </ul>

ATTRIBUTE	VALUE
	<ul style="list-style-type: none"> <li>• Patch</li> <li>• ZZ</li> </ul>
<b>OBS_AREA</b>	<p><b>Rare plant only.</b> Location area (acres) observed occupied by rare species.  NOTE: If you are recording an observation area &gt;9m in diameter (larger than the “0.01ac; 2 car garage” class below) the SF_TYPE must be ‘Polygon’ and a polygon must be digitized for inclusion in the final deliverables and upload to Biotics.  An alternative, if appropriate, is to record a smaller ‘Point’ observation of a smaller subset of the full observed area. If you do this, CONF_EXT has to be recorded as ‘no’.  Observation area values:</p> <ul style="list-style-type: none"> <li>• 0.001; 2 lg desk</li> <li>• 0.01; 2 car garage</li> <li>• 0.1; bball ct</li> <li>• 0.25; 4 tennis ct</li> <li>• 0.5; half fball field</li> <li>• 1.0; fball field</li> <li>• 2</li> <li>• 3</li> <li>• 4</li> <li>• 5</li> <li>• 6</li> <li>• 7</li> <li>• 8</li> <li>• 9</li> <li>• 10</li> <li>• Other (in Comments)</li> <li>• ZZ</li> </ul>
<b>PHENOLOGY</b>	<p><b>Rare plant only.</b> Characteristic phenology of the plants.  Phenology values:  Flower/bud  Flower/fruit  Fruit  Sporulating  In leaf  Dormant</p>
<b>OBS_ACTIV</b>	<p><b>Rare animal only.</b> Describes the activity of rare animal. If animal is doing more than one thing, the secondary activity is described in OTH_OBSDAT.  Observation activity values:</p> <ul style="list-style-type: none"> <li>• Nesting</li> <li>• Foraging</li> </ul>

ATTRIBUTE	VALUE
	<ul style="list-style-type: none"> <li>• Loafing (idling)</li> <li>• Commuting</li> <li>• Burrow</li> <li>• Other (described in OTH_OBSDAT)</li> </ul>
<b>LOC_USE</b>	<p><b>Migratory animal only.</b> Describes observed location area of migratory animal species that use geographically and seasonally disjunct locations. The location use class indicates which season or behavior is associated with a particular area. Ensures that different locations used by species throughout entire life cycle are identified and considered for protection.</p> <p>Location use values:</p> <ul style="list-style-type: none"> <li>• Not applicable</li> <li>• Breeding</li> <li>• Nonbreeding</li> <li>• Migratory stopover</li> <li>• Migratory corridor</li> <li>• Staging</li> <li>• Hibernaculum</li> <li>• Maternity colony</li> <li>• Bachelor colony</li> <li>• Non-migratory</li> <li>• Undetermined</li> <li>• Adult foraging area</li> <li>• Nesting area</li> <li>• Juvenile foraging area</li> <li>• Calving area</li> <li>• Nursery area</li> <li>• Wintering site</li> <li>• Roost</li> </ul>
<b>OTH_OBSDAT</b>	<p>Other observation data including any observations on the status, distribution, estimated occupied area, management needs, and viability of population. This is only for additional data directly related to the observation of the rare species; for interesting but not directly related comments, please use the Comments field. DO NOT repeat any information about count, phenology, observed activity, or any other field unless you are adding more specific information (ex. “7 seedlings and 2 mature plants” or “Most plants flowering, but some in fruit”). This statement should be correct in grammar and spelling. Do not put a period at the end of the statement. This entire field will be copied and concatenated, to the source feature visit notes field.</p>

ATTRIBUTE	VALUE
<b>FNAI_NC</b>	<b>REQUIRED.</b> Type of natural community, using the FNAI classification system (see FNAI website for natural community descriptions, <a href="http://www.fnai.org">www.fnai.org</a> ) plus disturbed and ruderal types. The value 'flatwoods' is also allowed.
<b>DISTURBSEV</b>	Severity of the disturbance(s). Disturbance severity values: <ul style="list-style-type: none"> <li>• Light</li> <li>• Moderate</li> <li>• Heavy</li> <li>• Severe</li> <li>• Not evident</li> </ul>
<b>DISTURB 1</b>	Describes the primary disturbance in the vicinity of the rare plant or animal population. If there is more than one type of disturbance, the most prevalent form of disturbance is entered here and secondary disturbance entered in DISTURB 2. Disturbance 1 values: <ul style="list-style-type: none"> <li>• Agriculture</li> <li>• Artificial pond/borrow pit</li> <li>• Cattle</li> <li>• Clearing (includes dove fields, old fields, and food plots)</li> <li>• Ditch/canal</li> <li>• Exotics</li> <li>• Firebreaks</li> <li>• Fire exclusion</li> <li>• Forestry operations (e.g., logging, loading areas, bedding, equipment rutting, slash piles, and other mechanical disturbances associated with planted tree areas; does not include burning.)</li> <li>• Hog digging</li> <li>• Impoundment (e.g. dams, dikes)</li> <li>• Natural causes</li> <li>• ORV trail</li> <li>• Road</li> <li>• Trash dumping</li> <li>• Utility corridor</li> <li>• Woody encroachment</li> <li>• Vehicle rutting</li> <li>• Cause unknown</li> <li>• Other (details provided in the OTH_DESC field)</li> </ul>
<b>DISTURB 2</b>	Describes the secondary disturbance, if any, in the vicinity of the rare plant population. Disturbance values are the same as DISTURB 1.

ATTRIBUTE	VALUE
<b>OTH_DESC</b>	A general description or "word picture" of the area where this occurrence is located (i.e., the physical setting and ecological context), including habitat, dominant plant species, topography, hydrology, soils, adjacent communities, and surrounding land use. Do not repeat NC or disturbances. This statement should be correct in grammar and spelling. This field will be copied in its entirety to the data field in the source observation.
<b>SF_RANK</b>	<b>REQUIRED.</b> Describes the present/absence status of the source feature. This field is used to record negative data. Source feature rank values: <ul style="list-style-type: none"> <li>• Extant</li> <li>• Failed to find</li> <li>• Extirpated</li> <li>• Possibly extirpated</li> </ul>
<b>SURVEY_EFF</b>	<b>REQUIRED.</b> Indicates the effort and thoroughness of the survey. Survey effort values: <ul style="list-style-type: none"> <li>• Thorough survey</li> <li>• Quick survey</li> </ul>
<b>COMMENTS</b>	Comments is an optional field to provide additional information about the FNAI-tracked population. Do not repeat information that has already been entered in other fields, such as Count, FNAI_NC, or OTH_DESC.
<b>SF_TYPE</b>	<b>REQUIRED.</b> This is a field to help remind you what type of feature this should be, remembering that we should be mapping polygons when appropriate and feasible. NOTE: If you are recording an observation of an area >9m in diameter (larger than the "0.01ac; 2 car garage" class below) the SF_TYPE must be 'Polygon' and a polygon must be digitized for inclusion in the final deliverables and upload to Biotics. An alternative, if appropriate, is to record a smaller 'Point' observation of a smaller subset of the full observed area. Source feature values: <ul style="list-style-type: none"> <li>• Point</li> <li>• Polygon</li> </ul>
<b>SFTYPECOM</b>	A personal note to self, used to help draw the line or polygon. Ex. "pop extends 50m to north" or "pop throughout depression marsh". Field will not be uploaded to EO. Use miscellaneous points or extra rare points to help delineate polygon when possible.
<b>DIRECTIONS</b>	Precise directions to the occurrence that use a readily locatable and relatively permanent landmark on or near the site (such as a road intersection, bridge, or natural landform) as the starting point. Include distances and directions from landmarks, as appropriate. Please note: neither directions nor coordinate information will be provided to general public if the data are to be considered sensitive.

ATTRIBUTE	VALUE
<b>SENSITIVE</b>	<p><b>REQUIRED.</b> Should the identification and location information of this population be protected (i.e. prevent disclosure to the general public)? This designation should only be used when the particular location is deemed sensitive. When recording data for an element that is considered sensitive by FNAI, it is not necessary to flag the location as sensitive unless the owner/manager specifically requests that you do so.</p> <p>Sensitive values:</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>
<b>SEN_REASON**</b>	<p>A brief description of why the EO is being classified as sensitive. In most cases, locations that are sensitive will not be given to the general public, but would be shared with public land managers. If this is not allowed by the owner, make sure to record that information here. **A reason is <b>REQUIRED</b> if “Sensitive: equals “yes”.</p>



## Appendix C. Ranking and Legal Status Definitions

### Global and State Ranks

Florida Natural Areas Inventory (FNAI) defines an **element** as any rare or exemplary component of the natural environment, such as a species, natural community, bird rookery, spring, sinkhole, cave, or other ecological feature. FNAI assigns two ranks to each element found in Florida: the **global rank**, which is based on an element's worldwide status, and the **state rank**, which is based on the status of the element within Florida. Element ranks are based on many factors, including estimated number of occurrences, estimated abundance (for species and populations) or area (for natural communities), estimated number of adequately protected occurrences, range, threats, and ecological fragility.

### Global Rank Definitions

- G1 Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or human factor.
- G2 Imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or human factor.
- G3 Either, very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals), or found locally in a restricted range, or vulnerable to extinction from other factors.
- G4 Apparently secure globally (may be rare in parts of range).
- G5 Demonstrably secure globally.
- GH Occurred historically throughout its range, but has not been observed for many years.
- GX Believed to be extinct throughout range.
- GXC Extirpated from the wild but still known from captivity or cultivation.
- GU Unrankable

### State Rank Definitions

State ranks (S#) follow the same system and have the same definitions as global ranks, except only apply to Florida, with the following additions:

- SA Accidental in Florida and not part of the established biota.
- SE Exotic species established in Florida (may be native elsewhere in North America).
- SX Believed to be extirpated from state.
- SNR Not ranked

## Federal and State Legal Status

Provided by FNAI for information only. For official definitions and lists of protected species, consult relevant state or federal agency.

### Federal Legal Status

Definitions derived from U.S. Endangered Species Act of 1973, Sec. 3. Note that the federal status given by FNAI refers only to Florida populations and that federal status may differ elsewhere.

- E Endangered: species in danger of extinction throughout all or a significant portion of its range.
- T Threatened: species likely to become Endangered within the foreseeable future throughout all or a significant portion of its range.
- E(S/A) Endangered due to similarity of appearance to a species which is federally listed such that enforcement personnel have difficulty in attempting to differentiate between the listed and unlisted species.
- T(S/A) Threatened due to similarity of appearance (see above).
- PE Proposed for listing as Endangered species.
- PT Proposed for listing as Threatened species.
- C Candidate species for which federal listing agencies have sufficient information on biological vulnerability and threats to support proposing to list the species as Endangered or Threatened.
- XN Non-essential experimental population.
- MC Not currently listed, but of management concern to USFWS.
- N Not currently listed, nor currently being considered for listing as Endangered or Threatened.

### Florida Legal Statuses

Plants: Definitions derived from Sections 581.011 and 581.185(2), Florida Statutes, and the Preservation of Native Flora of Florida Act, 5B-40.001. FNAI does not track all state-regulated plant species; for a complete list of state-regulated plant species, call Florida Division of Plant Industry, 352-372-3505.

- E Endangered: species of plants native to Florida that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue; includes all species determined to be endangered or threatened pursuant to the U.S. Endangered Species Act.
- T Threatened: species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in number as to cause them to be Endangered.
- CE Commercially exploited: species designated by Florida DOACS in paragraph 5B-40.0055(1)(c), F.A.C.
- N Not currently listed

Animals: Definitions derived from “Florida’s Endangered Species and Species of Special Concern, Official Lists” published by Florida Fish and Wildlife Conservation Commission (FWC), 1 August 1997, and subsequent updates.

- C Candidate for listing at the Federal level by the U. S. Fish and Wildlife Service
- FE Listed as Endangered Species at the Federal level by the U. S. Fish and Wildlife Service
- FT Listed as Threatened Species at the Federal level by the U. S. Fish and Wildlife Service
- FXN Federal listed as an experimental population in Florida
- FT(S/A) Federal Threatened due to similarity of appearance
- ST State population listed as Threatened by the FFWCC. Defined as a species, subspecies, or isolated population which is acutely vulnerable to environmental alteration, declining in number at a rapid rate, or whose range or habitat is decreasing in area at a rapid rate and as a consequence is destined or very likely to become an endangered species within the foreseeable future.
- SSC Listed as Species of Special Concern by the FFWCC. Defined as a population which warrants special protection, recognition, or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation which, in the foreseeable future, may result in its becoming a threatened species. (SSC\* for *Pandion haliaetus* (Osprey) indicates that this status applies in Monroe county only.)
- N Not currently listed, nor currently being considered for listing.

#### Species of Conservation Greatest Need

*The text below is from Chapter 4 (Florida’s Species of Greatest Conservation Need) of the FWC State Wildlife Action Plan (2019). The State Wildlife Action Plans is too large to include in this report as an appendix. However, the report is available online at <https://myfwc.com/media/22767/2019-action-plan.pdf>.*

The purpose of Florida’s Species of Greatest Conservation Need list is to identify species in decline or those at the greatest risk of becoming imperiled in the future. The State Wildlife Grant (SWG) Program was created to provide conservation funding for species not eligible for funding under the ESA or Wildlife and Sport Fish Restoration Programs.

The program’s intent is to proactively conduct conservation work to keep species from trending toward imperilment and listing under the ESA. The Action Plan guides the allocation of Florida’s State Wildlife Grants. The Action Plan identifies species, habitats, and threats and actions for conservation as well as monitoring components to gauge success (Chapter 5: Monitoring Florida’s SGCN and Habitats).

#### SGCN Criteria

The criteria used to identify SGCN were created by incorporating and grouping existing information from established species assessment systems, local natural history information, and expert input. The best

available data were used to determine if a species met selected criteria for inclusion on the Florida SGCN list. Only one of the criteria needs to be met for a species to be added to the SGCN list.

The criteria are compiled and summarized into four categories to succinctly present the information. A brief explanation of each category is presented below, along with references to additional information where appropriate. For more information on criteria development, see Appendix D: Road Map to the Eight Required Elements.

1. Florida federally listed taxa include species, subspecies, or isolated populations of species or subspecies of fish or wild animal life that are native to Florida and are classified as Endangered or Threatened by the U.S. Departments of Interior and Commerce under the federal Endangered Species Act.
2. State listed taxa are fish or wild animal life, subspecies, or isolated population of a species or subspecies that are native to Florida and are designated by FWC as Threatened or Species of Special Concern in accordance with Florida Administrative Code Rule Chapter 68A-27.
3. Biologically vulnerable taxa are vulnerable to extinction as determined by species ranking systems. Species were considered biologically vulnerable if they had a NatureServe conservation status rank statewide of S1, globally as G1, or had a combined score of S2G2; had an FWC Species Ranking System biological score of 27 or greater; or were categorized as Vulnerable or above using International Union for the Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species criteria. For information on the NatureServe Conservation Status Assessment methodology and the FWC Species Ranking System, see Chapter 5.
4. Taxa of concern are those that can be demonstrated to have at least a moderate risk of extinction in the future but did not meet other SGCN criteria. Species ranking systems provide the best available documented science and a solid foundation for building the SGCN list; however, it is understood that they are not uniformly comprehensive for all taxa. To address such gaps, the Taxa of Concern criteria have been designed as a method for adding species to the list that were not included based on scoring requirements or removing species that no longer meet the criteria. This category may include taxa that have at-risk populations or are likely to be significantly negatively impacted by an emerging issue.

Below we provide an abbreviated list of criteria for Florida's Species of Greatest Conservation Need

1. Florida Federally Listed Taxa
2. State Listed Taxa
3. Biologically Vulnerable Taxa:
  - A. Taxa with NatureServe conservation status ranks of S1, G1, or S2G2
  - B. Taxa with a FWC Species Ranking System biological score  $\geq 27$
  - C. Taxa on the IUCN list as "vulnerable" or above

4. Taxa of Concern:

- A. Newly described species within the last five years
- B. State delisted species within the last five years
- C. Species that are state listed in Alabama or Georgia
- D. U.S. Fish and Wildlife Service (USFWS) At-Risk species
- E. National Marine Fisheries Service (NMFS) Species of Concern
- F. Vulnerable to an emerging risk factor
  - i. Drastic decline in large parts of their range
  - ii. Devastating disease that may cause large declines in population

## Appendix D. Representative Photographs from the Survey Area



*Above:* Densely shaded mesic hammock-slough marsh ecotone frequently infested by Egger's nutrush. Lower in elevation than the mesic hammock, and higher in elevation than the slough marsh yields the optimal elevation and water levels. A lack of fire management within the slough marshes has allowed the ecotones of the fire-dependent slough marsh to be colonized with mesic and hydric tree species, providing the canopy cover preferred by Egger's nutrush.



*Above:* A single clump of Egger's nutrush at a mesic hammock-slough marsh ecotone. Note the ample hardwood trees colonizing the unburned slough marsh in the right-hand side photograph background.



### Dome Swamps-Pop Ash and/or Pond Apple



*Above left to right:* Egger's nutrush invading dome swamp canopied by pop ash (*Fraxinus caroliniana*) and/or pond apple (*Annona glabra*). Though typically shaded, the photograph on the right depicts Egger's nutrush at a dome swamp-slough marsh ecotone with more sunlight reaching the understory.



## Dome Swamp-Pond Cypress



Above left to right: Individual Egger's nutrush plants within a dome swamp canopied by pond cypress (*Taxodium ascendens*). These plants occurred throughout an area of 0.1 acres, but had a cover class of less than 5% within that gross acreage. Egger's nutrush colonization here has likely occurred only recently. Note how the habitat here has more sunlight reaching the understory, relative to mesic hammock-slough marsh ecotones and dome swamps.



## Mesic Hammock



*Above left:* Egger's nutrush (midground in photograph) colonizing shaded mesic hammock at an elevation without a flooded understory. Though this site is drier than typical Egger's nutrush habitat, there are hardly any competing native plant species in the immediate presence of Egger's nutrush, which is typical. *Above center:* A single-stemmed Egger's nutrush growing beside the trunk of a cabbage palm (*Sabal palmetto*) in a mesic hammock with numerous sedges (*Carex* sp.) in rosette form in close vicinity. This is not a common habitat for Egger's nutrush. *Above right:* Another occurrence of Egger's nutrush in mesic hammock. Though several native plant species are present, the understory is sparsely vegetated, typical of most Egger's nutrush colonization sites. At all Egger's nutrush occurrences within mesic hammocks, the occurrences tended to be small in gross acreage and of smaller cover classes. Usually, more hydric communities (dome swamp, slough marsh) with larger Egger's nutrush infestations were nearby.