Endangered Species Status Survey:

Polygala smallii Smith & Ward
Tiny polygala

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INTRODUCTION

Polygala smallii Smith & Ward is a short-lived herb of the Polygalaceae. It was listed as endangered by the U.S. Fish and Wildlife Service in 1985. Until recently it was thought to be a local endemic of pine rocklands and scrub in Dade and Broward counties, Florida (Smith & Ward 1976; DERM 1993; Austin et. al. 1980; Smith & Ward 1976). In late 1994 two new stations were found by the authors in northern Palm Beach and south-central Martin counties, extending its known range ca. 40 miles to the north. An examination of herbarium material from major United States and Florida herbaria showed that it might range as far north as Indian River or Brevard county. With this new data it was determined that the conservation and ecological status of *P. smallii* required a new assessment.

PURPOSE

Prior status surveys of *P. smallii* (Austin et. al. 1980; DERM 1993) were either preliminary or geographically restricted. While a detailed status survey had been completed in Dade (DERM 1993), none had been done further to the north. Surveys by Austin et. al. (1980) were very brief and were intended mainly to verify the presence or absence of *P. smallii* in areas where it had been previously reported, and to gather basic ecological data.

Under the current study a primary goal was to determine the range of *P. smallii* along the Atlantic coast of Florida from Broward County to Indian River County. Within this area the conservation status was to be determined. Once populations were discovered, preliminary ecological site characterizations were to be conducted to determine the ecological preferences of *P. smallii* and to establish baseline habitat references that could be continuously monitored to aid in habitat management.

METHODS

1. Herbarium Search & Taxonomy

Herbarium material was examined to aid in determining the range and habitat preferences of *P. smallii.* All herbarium material of *P. smallii* was borrowed from the New York Botanical Garden (NY), University of Florida (UF), University of South Florida (USF), and Florida State University (F). Specimens were also examined at Fairchild Tropical Garden (FTG), the Buswell Herbarium (BUS) at the University of Miami, and at Archbold Biological Station (ABS). All specimens of *Polygala nana* from south Florida were also examined from these herbaria in case some were misdetermined *P. smallii.*

P. smallii is very similar to its close relative *P. nana.* Specimens of *P. smallii* were differentiated from *P. nana* on the basis of seed size. Examination of the type specimen of *P. smallii* showed that existing identification keys (Smith & Ward 1976, Wunderlin 1982) were not consistently useful in determining specimens. Based upon examination of the type, and subsequently on examination of additional material of *P. smallii,* and material of *P. nana* from throughout Florida, the following seed criteria was determined to be of consistent value in determining specimens: length of seed body (not including the rostrum) of *P. smallii* is between 1.2 and 1.4 mm; length of seed body (not including the rostrum) of *P. nana* is between 0.6 and 0.8 mm (Bradley & Gann in prep.).

2. Identification of Potential Habitat

Prior to this survey *P. smallii* was known from four distinct but similar habitats: pine rockland, scrub, sandhill, and open coastal spoil. Each of these habitats is similar in that they are all relatively well-drained, high-light environments. The determination was made, therefore, to survey as many sites with these habitat characteristics as possible; including sites containing scrub, scrubby flatwoods, sandhill, beach dune, and coastal strand.

3. Site Surveys

Based on the determination of potential habitat, sites were selected in each of the five counties within the survey area. Sites were prioritized by size (large vs. small), ownership (public vs. private), habitat type (relatively dry, open habitats vs. other), and by presence or absence of *Polygala* cf. *nana* (all sites where *P. nana* had been previously recorded were surveyed). Information on potential sites in each county was obtained from at least one key individual in each county: Carol Morgenstern (Broward County, Department of Parks and Recreation); Steve Farnsworth (Palm

Beach County, Department of Environmental Resources Management); Gary Roderick (Martin County, Growth Management Department); Steve Fousek (St. Lucie County, Leisure Services); Roland DeBlois (Indian River, Department of Environmental Planning); Sally Black (Treasure Coast Regional Planning Council); and J.B. Miller (Florida Department of Environmental Protection, District 5 Parks). Based on information obtained on potential sites, and time allocated for site surveys, a total of 56 sites were surveyed.

4. Population Census

The total number of plants was determined in all *Polygala smallii* populations. Individual plants were counted by walking transects across each population.

5. GPS Survey Points

The latitude, longitude, and elevation of each *P. smallii* population was determined with a Motorola Geographic Positioning System (GPS) referenced to a base station in Dade county.

6. Habitat Assessment

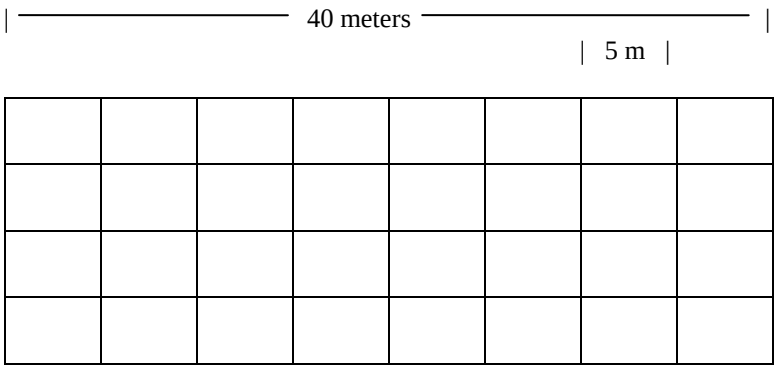
An ecological site characterization was performed to determine the habitat preferences of *P. smallii.* Permanent vegetation sampling plots were established at all populations following protocol established by Fairchild Tropical Garden (USFWS Grant Agreement #1448-009-94-974). This sampling design was chosen to be consistent with data collected at *P. smallii* population in Dade County by Fairchild Tropical Garden. Plots are 20 x 40 meters, with nested 5 x 5 m and 1 x 1 m sampling plots. The southwest corner of each plot was marked with a rebar. Data was collected on cover of tree canopy, subcanopy, and herb layers, and on organic litter depth. Data collection was as follows:

a. 20 x 40 meter plot: Vegetative cover of all plant taxa occurring over 2.5 meters from the ground was determined.

b. 5 x 5 meter plots: Three plots were randomly nested in the main 20 x 40 m plot. In each of these plots vegetative cover of all plant species between 0.5 and 2.5 m was determined. Cover of open soil and organic litter was also determined.

c. 1 x 1 meter plots: Three plots were randomly nested in each 5 x 5 m plot. In each of these plots vegetative cover of all plant species lower than 0.5 m was determined. Organic litter depth was measured at each corner of the plot. Cover of open soil and organic litter was also determined.

Plot Design:



7. Risk Assessment

Potential risks to each population were assessed. These risks included invasions of exotic pest plants, human impacts, improper management practices, grazing, etc.

8. Herbarium Vouchers

Voucher specimens of *P. smallii* were collected from each population and deposited at the herbarium of Fairchild Tropical Garden.

RESULTS

1. Herbarium search

Herbarium sheets showed that *Polygala smallii* historically occurred from the pine rocklands of Dade county northward to an unspecified location between northern Martin county and central Brevard county. Of 18 sheets that were examined 15 were from Dade County, and 2 from Broward County. The remaining specimen label reads "East Florida. Indian River." The Indian River is located between the eastern coastline of Florida and its barrier islands from the northern edge of Brevard County south to the St. Lucie inlet in Martin County. The Indian River Specimen was collected by E. Palmer in 1874 and was recently accessioned into the herbarium of the New York Botanical Garden. It is the oldest known specimen of *P. smallii.* Appendix 2 lists all *P. smallii* herbarium sheets that have been examined.

2. Potential Habitat Areas

Extensive surveys suggested that barrier island ecosystems do not provide suitable habitat for *Polygala smallii* or *P. nana*. No herbarium specimens of either taxa were found on any barrier island in southeast Florida.

Many areas that were surveyed may provide suitable habitat for *Polygala smallii* even though it was not found there during the survey. These areas are similar to other *P. smallii* stations in vegetation structure, soil type, and drainage. They are indicated by the designation "good habitat" in Appendix 2 and should be surveyed periodically.

3. Site Surveys

Fifty-six sites were surveyed between Broward and Indian River Counties. *Polygala smallii* was found at 2 new sites and 3 new stations from Broward county to St. Lucie County bringing the total number of sites outside of Dade to 4 and stations to 5.

4. Population Census

Population sizes of *Polygala smallii* exhibit annual fluctuations and may change several hundred percent within a year (from season to season) or between years (DERM 1993; Bradley, pers. obs). Censuses conducted during this study were made in the Fall, the time when the fewest number of plants are to be expected (DERM 1993). Thus, at other times of the year, such as late spring, population sizes at these sites may be considerably greater than that given below.

POPULATION NAME	POPULATION SIZE	SURVEY DATE
Ft. Lauderdale Executive Airport	21	19 November, 1995
Jupiter Ridge	84	16 November, 1995
Jonathan Dickinson - Campground Lake	64	16 November, 1995
Jonathan Dickinson - Square Lake Sandhill	141	03 December, 1995
Atlantic Gulf - Lyngate Site	23	03 December 1995
TOTAL	333	

5. GPS Survey Points

Survey stations were located at or near the center of each population. All data points were recorded for at least 30 minutes and then post processed to insure an accuracy to at least 1 meter.

POPULATION NAME	LATITUDE	LONGITUDE	EASTING	NORTHING	HEIGHT
Ft. Lauderdale Executive Airport	26 12 06.0177	-80 10 7.8197	582207.318	2898278.648	2.87 m
Jupiter Ridge	26 54 29.7168	-80 04 1.8727	591523.283	2976606.845	1.22 m
Jonathan Dickinson - Campground Lake	27 00 03.0916	-80 06 9.3889	588760.777	2986844.980	3.93 m
Jonathan Dickinson - Square Lk. Sandhill	26 59 49.4483	-80 08 43.2349	584799.013	2986397.718	1.21 m
Atlantic Gulf - Lyngate Site	27 17 11.0958	-80 08 32.349	568081.193	3018346.419	2m - 3m

6. Habitat Assessment

Ecological site characterizations were done at each *Polygala smallii* population. At Jupiter Ridge the standard sample design was not followed. Plants here occur in an area of less than 8 x 4 meters, surrounded by a dense area of shrubs. Using the standard 20 x 40 m plot with random subplots would not have accurately sampled the habitat of the plants at this site. Instead, the plot was reduced to two adjacent 5 x 5 meter plots, each with three 1 x 1 meter nested subplots. Similarly, the plot at Jonathan Dickinson Campground Lake population was reduced to 20 x 10 meters to prevent it from extending into the lake or into fire excluded sand pine scrub where *P. smallii* did not occur. Three 5 x 5 meter plots were still used in this sample.

7. Risk Assessment

Of the five new populations of *Polygala smallii* that are reported here, all but one (Atlantic Gulf) occur within publicly-owned preserves. These four preserves account for 93% of the total known population of *P. smallii* in the study area. This fifth private site is currently under consideration for acquisition by the St. Lucie County Environmentally Sensitive Lands program. If this site is acquired, then development is not a threat to any of these populations.

Exotic pest plant invasions pose a significant threat to *P. smallii.* Exotic pest plants occur in each of the *P. smallii* populations. Significant invaders of open sandy pinelands are natal grass (*Rhyncheletrum repens*), torpedo grass (*Panicum repens*), Brazilian-pepper (*Schinus terebinthifolius*), Queensland umbrella tree (*Schefflera actinophylla*), and earleaf acacia (*Acacia auriculiformis*).

The most serious threat to *P. smallii* is a lack of prescribed fire, which is critical in providing its open habitat requirements. Jonathan Dickinson State Park does have an active fire management program. Similar programs must be implemented at the other stations.

The Campground Lake population at Jonathan Dickinson is threatened by foot and bicycle traffic and erosion. This populations occurs on a steep sandy hillside next to a hiking trail. This hillside currently has wide areas of bare white sand where vegetation has been trampled by hikers, bicycles, and by playing children (and adults).

8. Herbarium Vouchers

A herbarium voucher was collected from each population of *Polygala smallii*. Permits were obtained from Florida Department of Agriculture, Division of Plant Industry for each station.

	Collection Number	Date Collected
Ft. Lauderdale Executive Airport	233	December 2, 1995
Jupiter Ridge Natural Area	239	December 3, 1995
Jonathan Dickinson Campground Lake	234	December 2, 1995
Jonathan Dickinson Square Lake Sandhill	238	December 3, 1995
Atlantic Gulf - Lyngate Site	236	December 3, 1995

SITE DESCRIPTIONS

Ft. Lauderdale Executive Airport Gopher Tortoise Preserve - Broward County

Property Location: south side of Cypress Creek Road ca. 0.8 miles east of NW 31st Ave.

This site is a sand pine/rosemary scrub community. *P. smallii* was found on this site, or somewhere extremely close to it, in 1973 by Donovan Correll, Helen Correll, and George Avery (H.B. & D.S. Correll # 40266, Fairchild Tropical Garden Herbarium). In the late 1970s this site was cleared during an airport expansion but has since regenerated. The soil is level, well drained St. Lucie Fine Sand at an elevation of ca. 3 meters.

The canopy is dominated by *Pinus clausa*. The understory is composed of scrub oaks (*Quercus geminata, Quercus myrtifolia*), fetterbush (*Lyonia fruticosa*), and rosemary (*Ceratiola ericoides*). The forb layer is dominated by *Polygonella ciliata, Andropogon virginicus* var. *virginicus, Selaginella arenicola, Aristida gyrans,* and *Cyperus*

nashii. The exotic pest plants *Panicum repens, Rhyncheletrum repens, Schinus terebinthifolius, Schefflera actinophylla,* and *Acacia auriculiformis* are common on the site.

Jupiter Ridge Natural Area - Palm Beach County

Property Location: west side of U.S. Highway-1 ca. 2.5 miles south of Indiantown Road.

This population occurs primarily within an 8 x 4 meter canopy gap between scrub oaks on a spoil mound, 35.5 meters east of the intracoastal waterway (Lake Worth Creek). This is in the southwestern corner of the site adjacent to the walking path that parallels the intracoastal. The soil is relatively well-drained gently sloping Quartzipsamment spoil at an elevation of ca. 1.2 meters. This spoil is derived from the dredging of the intracoastal waterway in the late 1940s.

The plant community on this spoil deposit is best described as xeric hammock, composed mostly of an canopy of *Quercus geminata, Ximenia americana, Pinus elliottii,* and *Pinus clausa.* The subcanopy is dominated by *Quercus myrtifolia, Chrysobalanus icaco, Serenoa repens, and Quercus geminata*. *P. smallii* is growing within an open gap dominated by herbs and graminoids. Dominant species of this layer are *Pityopsis graminifolia, Dichanthelium portoricense, Xyris sp., Polygala smallii,* and *Chamaecrista brachiata.* Extremely high tides associated with storm events are likely to periodically flood this population.

Jonathan Dickinson State Park, Campground Lake - Martin County

Property Location: West side of US Highway-1 ca. 5 miles north of the Palm Beach county line.

This population occurs on a north facing slope between sand pine scrub and a lake. This lake is southwest of the park entrance, and northwest of the park's main campground, on the west side of the road to the campground. The slope is steep. The soil is well drained St. Lucie Fine Sand at an elevation of ca. 1.2 m. Plants occur from the edge of scrub to within a few meters of the lakeshore. The overstory is composed of *Pinus clausa* and *Pinus elliottii*. The understory is very open, composed of only a few rosemary bushes (*Ceratiola ericoides*) and *Quercus myrtifolia.* The herbaceous layer is depauperate, dominated by *Pityopsis graminifolia* and the exotic *Rhyncheletrum repens*. Other common species are *Chamaesyce cumulicola, Polygonella ciliata,* and *Paspalum setaceum*.

Jonathan Dickinson State Park Sandhill - Martin County

Property Location: West side of US Highway-1 ca. 5 miles north of the Palm Beach county line.

This population occurs throughout the turkey oak sandhill areas at the southern end of the main park road near the river store and concessions and the park rental cabins. Almost all areas supporting turkey oak contain *P. smallii.* This turkey oak sandhill is formed on well drained Pomello sand represented by small, slightly elevated islands within wet pine flatwoods. The elevation of these areas is approximately 1.2 meters. The canopy is dominated by *Quercus laevis, Pinus elliottii,* and *Quercus myrtifolia*. The understory is dominated by *Serenoa repens, Quercus geminata, Befaria racemosa, Lyonia fruticosa,* and *Quercus myrtifolia.* The herb layer is dominated by *Aristida beyrichiana, Licania michauxii, Cladonia* spp., *Cladina* spp., and *Rhynchospora megalocarpa.*

Atlantic Gulf Communities, Lyngate Site - St. Lucie County

Property Location: west side of Midpoint Road ca. 1.3 miles north of Port St. Lucie Boulevard.

This population occurs in a small elevated area within a site that is composed mostly of mesic flatwoods and marshes. This elevated area seems to have formerly been scrubby flatwoods; It is now being invaded by sand pines. The soil is level to gently sloping Hobe Sand at an elevation of 2 - 3 meters determined using USGS topographic map. (The elevation could not be accurately determined with the GPS unit because of too great a distance from the base station in Dade County). The canopy is dominated by *Pinus clausa, Quercus geminata,* and *Pinus elliottii*. The understory is dominated by *Serenoa repens, Lyonia fruticosa, Quercus geminata,* and *Quercus myrtifolia.* The herb layer is dominated by *Aristida beyrichiana, Pityopsis graminifolia, Cladonia* spp., *Andropogon* spp., *Aristida gyrans,* and *Polygonella ciliata.*

CONCLUSIONS & RECOMMENDATIONS

In extensive searches of a variety of well drained open habitat types between southern Broward county and northern Indian River county five populations of *Polygala smallii* were found. All but one of these populations occur on public land that is being managed as a natural area. The one private site where *P. smallii* was found is under review for acquisition by St. Lucie County and should be acquired. Censuses of each population showed that at least 333 plants of *P. smallii* exist north of Dade County.

Since only public lands were emphasized during this study, it is likely that new populations will be found on private lands in the study area. It is also likely that populations were missed, despite our detailed surveys. In addition, the acquisition of upland sites in Broward, Palm Beach, Martin, St. Lucie, and Indian River counties should be of extremely high priority both to protect existing populations of *Polygala smallii* as well as to secure any potential sites for re-introduction. Finally, agencies administering stations where *P. smallii* occurs must develop and implement management plans that incorporate prescribed fire, exotic pest plant control, and control of recreational disturbance if these populations are to be protected.

LITERATURE CITED

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Wunderlin, R.P. 1982. Guide to the Vascular Plants of Central Florida. University Presses of Florida. Tampa.

Appendix 1

Polygala smallii Herbarium Sheets Examined

TYPE: J.K. Small, J.J. Carter 1276. Oct. 1st to Nov. 4th 1903. In pinelands near the unfinished railroad grade, between Cocoanut Grove and Cutler, Florida. (NYBG).

Edward Palmer, MD. s.n. 1874. East Florida. Indian River. (NYBG).

A.P. Garber, M.D. s.n. May 1877. Miami. (NYBG, UF).

N.L. Britton 149. March 23, 1904. Pinelands, Perrine. (NYBG).

S.C. Hood 72100. May 14, 1912. Dry rocky soil, Miami, FL. (UF).

J.K. Small, J.J. Carter 1011. Nov. 19th and 25th, 1903. In pinelands, Ft. Lauderdale, FL. (NYBG).

J.K. Small, C.A. Small, G.K. Small 6772. July 3, 1915. Pinelands about Arch Creek Prairie, Dade Co. (NYBG).

Roy Woodbury s.n. Dec. 5, 1939. Miami. (BUS).

Roy Woodbury s.n. April 14, 1947. South of Miami, FL. (BUS).

W.J. Spink 106. April 9, 1953. Cutler, Dade Co. (UF).

R.R. Smith, T. Myint 755. April 7, 1962. Infrequent in sandy areas in rocky pine-palmetto community, flowers yellow-green, along Coral Reef Dr., ca. 20 m. east of Jct. with Old Cutler Rd. South of Miami. S23, T55S, R40E. Dade Co. (UF).

R.R. Smith, T. Myint 818. March 1, 1963. Infrequent in palmetto-pine area, ca. 60 yds. back from road, on corner of Old Cutler Rd. & Red Rd., 12509, (S. of Montgomery Dr.) T55S, R40E. (UF).

R.R. Smith, T. Myint, A. Will 882. March 3, 1963. Rare in open palmetto area. Starting to flower. ca. 5.5 mi. N. of Homestead City limits, along Fla. 27, T56S, R39E. (UF).

O. Lakela 28350. March 22, 1965. Vicinity of the Fairchild Tropical Garden, Old Cutler Rd. Pineland with *Serenoa repens, Linum, Jacquemontia*. Plants barely above surface of white sand in depressions of oolite. (UF).

I.E. Lewis Jr. s.n. s.d Collected in a pine area one block east of Old Cutler Rd, on Coral Reef Dr., Miami, FL. (BUS).

G.N. Avery 622. May 8, 1969. Red. Rd. & SW 114 Terr. in sandy pineland. Flowers greenish yellow. (FTG).

D.S. & H.B. Correll 40266, and G.N. Avery. *Pinus clausa* area north of Fort Lauderdale Executive Airport. White sand. (FTG).

Carol Lippincott 40 with H. Kass. August 2, 1990. Dade County. Pine Shore Park, SW 128 St. & 110 Ave., Sect 18, Twshp 55, R. 40. In open sandy areas of pine rockland. Fl yellow. (FTG).

BUS = Buswell Herbarium, University of Miami; FTG = Fairchild Tropical Garden; NYBG = New York Botanical Garden; UF = University of Florida.