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Distribution and Abundance of Flora in Limestone Rockland Pine Forests of Southeastern Florida

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INTRODUCTION

The pine forests of the Miami Rock Ridge of extreme southeastern Florida form a highly distinctive vegetation type with the following characteristics: (1) a rough limestone (Miami oolite) substrate with abundant crevices and solution holes, but very little soil development; (2) an understory including a variety of West Indian hardwood species; and (3) a rather rich herbaceous flora, including South Florida endemics. The single overstory tree of these forests is Pinus elliottii var. densa.

These pine forests once extended from near Mahogany Hammock in the present Everglades National Park northeastward to the vicinity of North Miami. Prior to the establishment of Everglades National Park (ENP) most of the pine forest of that area (a large portion of which is known as Long Pine Key) was logged in the late 1930's and early 1940's, but has since undergone a high degree of recovery. Approximately 500 hectares (1200 acres) of ENP pine forests were obliterated by logging, "rock plowing," and farming within the so-called "Hole-in-the-Donut," a former privately owned enclave of farmland within ENP. Approximately 8000 hectares (19,840 acres) of pine forest remain in ENP and are maintained by a fire management program which involves periodic prescribed burning of segments of the pine forest (Hofstetter, 1973; Bancroft, 1976; Everglades National Park, 1978).

Outside ENP, pine forests of the Miami Rock Ridge formerly covered about 65,450 ha (161,660 acres), but have been largely removed by logging, farming, and urban expansion between 1900 and the present (Shaw, 1975). The most rapid destruction of this forest took place between 1940 and 1970. At present, only scattered remnants remain. A 1975 inventory (Shaw, 1975) located 268 isolated stands of 5 acres (2.1 ha) or more, totalling 5268 acres (2132 ha) in area. An inventory in 1978 (K. Daugherty, personal communication) shows a 25% reduction in the total area remaining due to stand destruction during the three-year period. Most of the small pine forest remnants have been invaded by the exotic tree, Schinus terebinthifolius (Brazilian pepper), or other hardwood species which results in an impoverishment of the species composition of the forest understory. A few remnants outside ENP are large enough and have had frequent enough fires that they still seem to provide a reasonable sample of the formerly extensive forest and its understory.

The National Park Service, which administers Everglades National Park, bears the responsibility for maintaining the pine forest ecosystem and other ecosystems of the Park in as natural a condition as possible (Houston, 1971). The Endangered Species Act of 1973 (Public Law 93-205) requires Federal agencies to give special consideration to protection of rare biota. Although no plant species of South Florida yet receive special protection under this Act, the Smithsonian Institution prepared a "Report on endangered and threatened plant species of the United States" (Smithsonian Institution, 1974) which includes a substantial number of species found in pine forests of ENP and adjacent southeastern Florida.

This study was carried out to yield information relevant to preservation of the pine forest vegetation and flora of Everglades National Park and adjacent southeastern Florida. It is intended to give a broad overview of the distribution and abundance of plant species of these pine forests, including documentation of which species are most widely distributed and most abundant and which species are rare and require special management attention. A special aim is to identify which pine forest species are not present as viable populations within Everglades National Park and are therefore in danger of elimination due to habitat destruction within Dade County, Florida, outside ENP.

PAST WORK

Robertson (1955) reviewed early accounts of South Florida pine forests, citing writings by Bessey (1911, p. 268), Harshberger (1914, pp. 87-98), Simpson (1920, Chapter 8), Harper (1927, pp. 90-92, 176-179), Davis (1943, pp. 160-166), and the many writings of Small (1911, p. 151), who made one of the earliest assessments of fire effects in South Florida pinelands, stating that "the vegetation of the burned areas is restored after the rains begin again and all the plants that grew there before seem to re-appear." Small (1929 and other writings) strongly felt, however, that South Florida vegetation, pine forests included, was being rapidly destroyed by repeated fires set first by Indians, later by white men, and that fire effects were becoming increasingly severe following installation of drainage canals. Beard (1938) believed it likely that before the introduction of fires to South Florida by man's activity, "the Everglades Keys were once all hammock growth with intervening sawgrass glade lands."

Robertson (1953, 1955) described South Florida pine forest vegetation in much greater detail than has been provided before or since and articulated the essential ecological role of fire in maintaining these forests. Robertson's work eventually led to implementation of prescribed burning of pine forests in Everglades National Park. Robertson recognized the presence of a considerable number of endemic taxa in the flora of South Florida pine forests as well as the strong similarities between the pine forest vegetation of the larger islands of the Bahamas and South Florida.

Craighead (1971, 1974) provided descriptions of pine forest vegetation and of the dynamics of the hardwood hammock/pine forest ecotone. Hofstetter (1973) made management recommendations for implementation of prescribed burning in Everglades National Park pine forests, including the recommendation that a burning frequency of three to seven years be utilized. The Everglades National Park Fire Management Plan (Everglades National Park, 1978) provides background on fire history and management and details the current fire management program, which involves prescribed burning, surveillance of certain lightning and man-caused fires, and suppression of all fires under specified drought conditions.

METHODS

Quantitative sampling was carried out at 13 sites, including 11 in rockland pine forest of Everglades National Park and adjacent Dade County, in July and August of 1977. At each site, one 40 m x 40 m macroplot was used, within which a

complete vascular plant species list was compiled. Along opposite margins of the 40 m x 40 m macroplots, ten 1 m^2 quadrats were placed at 4 m intervals, making a total of twenty 1 m^2 quadrats, in which all individuals of all vascular plant species were counted. Within the 40 m x 40 m macroplot, numbers of pines present were recorded by 5 cm diameter classes (0-5 cm, 5-10 cm, 10-15 cm, etc.).

Seven of the sites were chosen in the Long Pine Key pine forest of Everglades National Park, with a view toward obtaining a broad geographical representation of upland pine forest within the Park. Each of these macroplots is located with one side corresponding to one side of the 33 ft. x 132 ft. plots established by Robertson in 1960 to monitor long-term changes in tree and shrub vegetation of pine forests in relation to prescribed burning. (Locations of these plots in relation to the Long Pine Key network of fire access lanes is shown in Figure 1. The 40 m x 40 m macroplot includes the smaller, 33 ft. x 132 ft., plots.) Four sites were chosen in the so-called Biscayne pinelands of Dade County outside ENP. Within the few remaining relatively large pine forest areas which could be located, a site for placement of the 40 m x 40 m macroplot was subjectively chosen which appeared relatively undisturbed and somewhat representative of the area as a whole. Since previously collected information suggested that prescribed fire generally had little influence in changing species density when carried out at 5 year intervals or less, no attempt was made to locate plots in areas of the same post-fire age. Sites in advanced stages of succession toward dominance by tropical hardwoods were avoided since such sites were known to have reduced species richness.

Sites were also chosen at the "Tamiami pines" area east of Tamiami Airport at SW 137 Avenue and 136 Street, the largest remaining Dade County locality of pine forest with sandy substrate, and in rockland pine forest on the Key Deer Refuge on Big Pine Key in the lower Florida Keys (Monroe Co.) to allow quantitative comparisons with Miami Rock Ridge sites.

Descriptions of individual sites where macroplots were placed follow:

1. Long Pine Key - A4 (Robertson's plot designation) in management unit A of Long Pine Key, Everglades National Park, 7 km W of entrance to Long Pine Key Campground. Last previous burn (prescribed) prior to sampling in January 1975 (2-1/2 years post-fire).

2. Long Pine Key - B6, in management unit b, 5.4 km W of Long Pine Key Campground. Last previous burn prior to sampling in October, 1975 (2 years post-fire).

3. Long Pine Key - B12, in management unit b, 7 km W of Long Pine Key Campground. Last previous burn prior to sampling in October, 1975 (2 years post-fire).

4. Long Pine Key - C3, in management unit C, 7 km W of Long Pine Key Campground. Last previous burn prior to sampling in January 1975 (2-1/2 years post-fire).

5. Long Pine Key - E7, in management unit E, 3 km W of Long Pine Key Campground. Last previous burn prior to sampling in January 1975 (2-1/2 years post-fire).

6. Long Pine Key - I4, in management unit I, 2.3 km ESE of Long Pine Key Campground. Last previous burn prior to sampling in January 1977 (6 months post-fire).

7. Long Pine Key - J6, in management unit J, 3.7 km E of Long Pine Key Campground. Last previous burn prior to sampling in March 1974 (3-1/2 years post-fire).

8. Thompson Park (Larry and Penny Thompson Memorial Park), a Dade County park, adjacent to the new Dade County zoo site at SW 127th Avenue and 184th Street. Plot is located in south central portion of the park. Fire history not known.

9. Navy Wells site, with about 250 ha of pine forest surrounding pumping station for water to Florida Keys, SW of Florida City. Site of plot is approximately 400 m W of Fla. 27 and 100 m N of SW 360 Street. Fire history not known, but site appeared not to have burned for 5 years or more prior to sampling. Area was prescribed burned in November 1977, 4 months after sampling.

10. USDA site, a 2 ha tract of pineland at the SW corner of the Subtropical Horticulture Research Station, SW 67 Avenue and SW 144 Street. Plot is in the NW quarter of the tract, which totals 5 acres (2 ha) in size. Fire history of site unknown.

11. Camp Owaissa Bauer, a Dade County Park, just N of SW 264 Street (Bauer Drive) and E of SW 177 Avenue (Krome Avenue). Site of plots is 40 m N of Bauer Drive and 80 m W of park entrance. Fire history not known.

12. Tamiami Pines site, with about 100 ha of old growth pine forest, is located just east of Tamiami Airport at SW 137th Avenue and 136th Street. The plot was located in the west-central portion of the tract in an area of sandy soil (5-15 cm deep) overlying limestone. Area was burned by an incendiary fire about 3-4 months prior to sampling.

13. Big Pine Key site, on Key Deer Refuge, 3-1/2 km NW of U.S. 1 on S.R. 940. Plot located 40 m W of highway. Fire history not known.

Nomenclature largely follows that in Long and Lakela (1971), but diverges in cases where Avery has noted that recent taxonomic revisions and monographs and usage by specialists indicate that the nomenclature used by Long and Lakela is inappropriate. Nomenclature used for endemic taxa is given in Avery and Loope (1979). Voucher specimens are deposited in the herbarium of Everglades National Park.

RESULTS

Table 1 provides a synopsis of density, frequency, and presence data from the seven Long Pine Key study sites and the four Dade County limestone pineland sites outside ENP. It also provides comparison with the "Tamiami pines" site of Dade County (characterized by a sandy soil) and with pine forest of the Key Deer Refuge on Big Pine Key in Monroe County, Florida. It indicates which species occur exclusively in pineland habitats of South Florida.

Table 2 summarizes the data of Table 1 for species with a mean frequency of .05 or greater, providing evaluation of constancy (decimal fraction of study sites in which the species was found), mean frequency, and mean density, allowing comparisons of sites within ENP to the four similar sites outside ENP.

Table 3 gives numbers of species (excluding exotics) found in each study site, grouped as trees and shrubs, herbs, and graminoids.

Table 4 gives numbers of pines present for each macroplot by diameter classes.

DISCUSSION

Characterization of geographical affinities of flora of pine forests of southeastern Florida

A total of 186 native vascular plant species and 5 exotic plant species were recorded from the eleven 40 m x 40 m plots located in limestone pineland sites in Everglades National Park and Dade County (Table 1). Of these 186 native species, 76 species were present in 5% or more of the 220 "microplots" (1 m^2) sampled (Table 2). For purposes of this study, these 76 species are assumed to be the major species contributing to the Miami rock ridge pineland vegetation. The geographical distributions of these 76 species were analyzed, with the following results.

13 of the 76 major pineland species (17%) are taxa endemic to South Florida (Avery and Loope, 1979). Endemics play a major role in pineland vegetation, based on frequency and density measurements, with six endemic taxa ranking in the top 15 in both frequency and density. These 13 endemic taxa are as follows:

	Frequency Rank	Density Rank
Dyschoriste oblongifolia var. *angusta*	2	2
Phyllanthus pentaphyllus var. *floridanus*	3	5
Borreria terminalis	7	3
Tragia saxicola	9	14
Chamaesyce porteriana var. *porteriana*	11	15
Schizachyrium rhizomatum	12	8
Hyptis alata var. *stenophylla*	30	39
Chamaesyce pinetorum	34	38
Tripsacum floridanum	41	43
Jacquemontia curtissii	44	52
Poinsettia pinetorum	54	54

Melanthera parvifolia	57	48
Lantana depressa	73	73

In addition, the following pineland species encountered in this study are endemic to South Florida: Forestiera segregata var. pinetorum, Argythamnia blodgettii, Brickellia mosieri, Chamaesyce conferta, Chamaesyce deltoidea var. adhaerens, Chamaesyce deltoidea var. deltoidea, Chamaesyce deltoidea var. serpyllum (Big Pine Key only), Stillingia sylvatica ssp. tenuis, Galactia pinetorum, and Cassia keyensis (Big Pine Key only).

Other taxa endemic to pinelands of southeast peninsular Florida or the Florida Keys, but very rare and not encountered in the plots used in the study include Amorpha crenulata, Chamaesyce garberi, Chamaesyce porteriana var. keyensis (Florida Keys only), Chamaesyce porteriana var. scoparia (Florida Keys only), Tephrosia angustissima, Polygala smallii, and Aster concolor var. simulatus. The authors are not aware of sites where the three latter taxa can be found at present.

Five of the 76 (7%) major pineland species are taxa endemic to Florida. These include:

Cassia deeringiana
Coreopsis leavenworthii
Pinus elliottii var. densa
Andropogon cabanisii
Heterotheca graminifolia var. tracyi

The following species (33 of 76 or 44%) are widely distributed in the West Indies and are restricted to South Florida within the United States, generally not occurring north of Lake Okeechobee:

Chiococca parvifolia
Morinda royoc
Guettarda scabra
Passiflora suberosa (also Texas)
Acalypha chamaedrifolia
Schizachyrium semiberbe (Florida and West Indies)
Randia aculeata
Myrsine floridana
Angadenia sagraei
Ayenia euphrasiifolia
Pteridium aquilinum var. caudatum
Metopium toxiferum (north to Martin Co., Fla.)
Rhus copallina var. leucantha
Dodonea viscosa (pantropical)
Cassytha filiformis
Sachsia polycephala
Bumelia salicifolia
Pteris longifolia var. bahamensis
Croton linearis
Crotalaria pumila

Guettarda elliptica
Coccothrinax argentata
Heliotropium polyphyllum
Eupatorium villosum
Ardisia escallonioides
Echites umbellata
Ipomoea tenuissima
Crossopetalum ilicifolium
Zamia pumila (occurs farther north in Florida)
Psidium longipes
Byrsonima lucida
Dichromena floridensis
Anemia adiantifolia

The remaining species (25 of 76 or 33%) have a large portion of their distribution north of South Florida. Fourteen species (indicated by *) reach their southern limits in South Florida. Eleven species occur also in the American tropics. These species are as follows (approximate range limits taken from Long and Lakela, 1971):

* Muhlenbergia filipes (Tex., Miss., Ga., S.C.)
Paspalum setaceum (Tex., Nebr., N.H., Cuba)
* Sorghastrum secundum (Tex., S.C.)
Piriqueta caroliniana (N.C., West Indies, S. America)
Solidago stricta (Tex., N.J., West Indies)
* Hedyotis nigricans (Tex., Ga., Nebr.)
Physalis viscosa (Tex., Va., Tropical America)
Mikania scandens (Tex., Okla., Me., Tropical America)
* Serenoa repens (N.C.)
* Cynoctonum sessilifolium (Va., Tex.)
* Ruellia caroliniensis (Tex., N.J., Ind.)
Agalinis purpurea (Mexico, S. Dak., Nova Scotia)
Cladium jamaicensis (Tex., Va., West Indies)
* Polygala grandiflora (Miss., S.C.)
* Sabal palmetto (N.C.)
Smilax auriculata (Va., La., West Indies)
Samolus ebracteatus (Tex., N. Mex., West Indies)
* Aster dumosus (Fla., La., Mass., Wis.)
* Aster adnatus (Miss., Ga.)
Evolvulus sericeus (Ariz., Ga., Amer. tropics)
* Rhynchosia reniformis (La., Va.)
* Sporobolus junceus (Va., Tex.)
* Pluchea rosea (Miss., N.C.)
* Liatris gracilis (Miss., Ga.)
Phyllanthus caroliniensis (Pa., Ill., S. to Argentina)

Taxa confined to pineland habitats

Of the 186 native species recorded in quadrats in this study, 67 species (indicated by an asterisk in Table 1) occur more or less exclusively in pinelands of South Florida. The remainder of the pineland species are found in one or more other plant communities. Most tropical hardwood tree species (*Bumelia salicifolia*, *Bursera simaruba*, *Exothea paniculata*, *Lysiloma latisiliqua*, *Quercus virginiana*, etc.) are maintained in a shrub state by recurrent fire in pinelands and attain their potential tree stature only in tropical hardwood hammocks. Some herbs and graminoid species (*Muhlenbergia filipes*, *Schizachyrium rhizomatum*, *Solidago stricta*, etc.) which occur in pinelands are primarily prairie species. Numerous species occur in a wide range of habitats.

Interestingly, species which are confined to pineland habitats in South Florida may be found in other habitats elsewhere in their range. For example, *Crotalaria pumila* is confined to sandy banks in coastal areas of Jamaica (Adams, 1972).

Relative species richness of study sites

The data of Table 3 show that species numbers for the 1600 m^2 (40 m x 40 m) study areas ranged from 69 to 91 for the 11 Dade Co. rockland sites. The two richest sites (91 and 90 species) were located on the western end of Long Pine Key, Everglades National Park. One site outside ENP (Thompson Park) ranked third with 89 species. The two supplementary sites, the Tamiami site (50 species) and the Big Pine Key site (68 species), had fewer species.

Using a crude life form classification, the following approximate percentages of life forms are present: trees and shrubs, 25-35% of all species; herbs, 50-60%; and graminoids, 10-20%.

Relative sizes of pines

Table 4 shows that sites outside Everglades National Park generally had larger pines than the sites of Long Pine Key. This may be due partially to poor growing conditions and partially to the fact that extensive logging occurred on Long Pine Key in the 1930's and 1940's.

By far the largest pines sampled were at the Tamiami site, with the largest diameter recorded at 39 cm (15.4 inches). The smallest pines were at the Big Pine Key site, where few trees exceeded 15 cm (6 inches) in diameter.

What species are "rare," "threatened," or "endangered"?

The Endangered Species Act of 1973 has stimulated much interest in rare plant species. The Smithsonian Institution (1974) prepared a "Report on Endangered and Threatened Plant Species of the United States" for the U.S. Fish and Wildlife Service, which is in charge of administering the Endangered Species Act. This list

was published later in the Federal Register (Vol. 40, No. 127, Part V, 1975). Of about 20,000 species of vascular plants of continental U.S. plus Alaska, 761 were considered endangered (in danger of extinction throughout all or a significant portion of their ranges) and 1,238 were considered threatened (likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges). For Florida, the totals were 84 endangered and 128 threatened. Table 5 lists species of Southeastern Florida pinelands which are considered threatened or endangered in the 1974 Smithsonian Institution report.

A Florida Committee on Rare and Endangered Plants and Animals prepared a list of endangered, threatened, rare, and recently extirpated species in 1974 and slightly revised in 1976. Table 6 lists the species of Southeastern Florida pinelands which are considered threatened, endangered, or rare by the Florida Committee. Interestingly, only one species (Cassia keyensis) of South Florida pinelands is present on both the Florida Committee and Smithsonian lists. Data from this study should prove useful in eventually compiling a definitive categorization of rare plants of South Florida. Other South Florida pineland species for consideration for such a list are given in Table 7.

Fire impacts: need for further study

Because of the botanical richness of Southeastern Florida pine forests and because this plant community has been drastically reduced from an original area of about 75,000 ha to about 10,000 ha (of which 80% is in Everglades National Park), it is very important that the remaining portion be wisely managed to enable long-term preservation of the component flora. Virtually the entire pineland area outside ENP is severely threatened by development pressures and from invasion of the exotic Schinus terebinthifolius and by native hardwood species. Within ENP, much experience has been obtained in prescribed burning, and the prospects for long-term preservation through careful fire management appears excellent. Further research is needed, however, into impacts of fires burning under differing conditions upon the native flora - particularly upon rare species.

An experiment was started in a pine forest site of Long Pine Key of ENP in early 1977 which should provide the best information yet on this subject. Plots were burned (in an area burned 4 years previously) during the month of March under three different conditions of relative humidity and with three different fire types (head fire, flank fire, and back fire) for each humidity condition. Vegetation had been sampled prior to burning (Werner, 1977). Resampling of the vegetation by D. and S. Black in June-July 1977 showed very little or no change in numbers present of most species from pre-burn values. Followup on this study has been taken over by Taylor (Fire Ecologist, ENP).

During the summer of 1978, a project by Loope and Bruckbauer began aimed at monitoring populations of rare plant species in the pinelands of Long Pine Key. Individual plants of selected species are measured (height) and mapped in relation to permanent, labeled stakes.

Urgency for preservation of pinelands outside ENP

As documented above, substantial variation occurs from site to site within the limestone rockland pinelands of southeastern Florida. Much of this variation has already undoubtedly been lost through the destruction of about 80% of the original habitat. The islands of pineland that remain in Dade County outside Everglades National Park, both with rockland substrate and sandy soil over rockland, are extremely important to efforts aimed at preservation of biological diversity in South Florida. Survival of the following endemic plant taxa is entirely dependent upon preservation of this habitat: *Amorpha crenulata*, *Brickellia mosieri*, *Chamaesyce deltoidea* var. *deltoidea*, *Chamaesyce deltoidea* var. *adhaerens*, *Polygala smallii*, and *Tephrosia angustissima*. In addition, a major segment of the remaining United States populations of the following species are found in these pinelands: *Alvaradoa amorphoides*, *Argythamnia blodgettii*, *Bourreria cassinifolia*, *Ernodea littoralis* var. *angusta*, and *Verbena maritima*.

It cannot be overemphasized that preservation of this habitat requires two essential components: (1) prevention of obliteration through development, and (2) management of fire (through prescribed burning at proper intervals). The pineland sites sampled in this study (Tamiami Pines, Larry and Penny Thompson Park, Navy Wells, Camp Owissa Bauer, and the USDA site) are almost certainly the most important remaining sites for preservation. In several of these sites, lack of adequate fire management seriously threatens the long-term viability of the pineland habitat.

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Table 1. Density, frequency, and presence data from 40 m x 40 m macroplots, each with twenty 1 m^2 quadrats as described in text. Numerator in fraction denotes total number of individuals within the twenty 1 m^2 quadrats for each macroplot. Denominator in fraction denotes total number of quadrats (maximum of twenty) in which the species was found. The designation "P" indicates that the species was present in the macroplot, but not in the 20 quadrats. Data for additional species found at Tamiami and Big Pine Key sites are given at end of table. The designation "(EX)" denotes that the species is a naturalized exotic. An asterisk (*) indicates that the species is essentially confined to pineland habitats in South Florida.

		Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
		A4	B6	B12	C3	E7	I4	J6						
Herbs														
*	Acalypha chamaedrifolia	P	-	7/5	- -	1/1	10/7	14/11	29/9	60/19	28/8	5/3	-	-
	Agalinis purpurea	3/2	9/6	5/4	6/6	4/4	5/4	17/4	-	-	P	P	-	2/2
	Anemia adiantifolia	21/6	94/12	106/14	29/8	69/15	26/7	62/6	6/3	17/7	4/3	36/12	P	9/5
*	Angadenia sagraei	12/4	15/7	9/2	3/2	14/9	7/4	P	21/8	8/5	3/2	5/3	P	3/3
*	Argythamnia blodgettii	8/2	-	-	-	-	-	-	-	-	-	1/1	-	-
*	Asclepias tuberosa ssp. rolfsii	P	-	-	-	-	-	-	P	-	-	-	P	-
*	Aster adnatus	P	-	2/2	-	4/3	1/1	1/1	11/4	3/2	-	3/2	-	-
	Aster dumosus	P	13/3	17/5	17/10	-	-	-	1/1	-	-	-	25/1	-
*	Ayenia euphrasiifolia	131/17	-	19/7	-	25/3	5/1	-	8/3	32/11	-	4/3	-	1/1
	Blechnum serrulatum	-	P	-	-	-		-	-	-	-	-	-	-
	Borreria terminalis	199/16	79/11	111/14	87/14	-	94/11	-	124/8	8/4	6/4	22/6	-	30/8

		Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
		A4	B6	B12	C3	E7	I4	J6						
*	Brickellia mosieri	-	-	-	-	-	-	-	P	P	-	-	-	-
	Buchnera floridana	-	6/1	-	-	-	4/3	1/1	-	-	-	-	-	-
	Cassia aspera (EX)	-	-	-	-	-	-	18/6	-	-	P	-	-	-
*	Cassia deeringiana	5/3	8/2	14/4	P	P	47/11	7/2	21/8	6/4	-	P	-	-
	Cassytha filiformis	15/4	6/1	3/3	29/10	17/7	-	3/2	4/2	-	1/1	4/3	-	31/11
*	Centrosema virginianum	-	-	-	-	-	-	1/1	1/1	3/2	-	-	-	44/13
*	Chamaesyce adenoptera	-	-	-	-	-	P	-	-	-	-	-	-	3/2
*	Chamaesyce conferta	-	-	-	-	-	-	-	-	P	-	-	-	-
*	Chamaesyce deltoidea var. adhaerens	-	-	-	-	-	-	-	-	-	-	P	-	-
*	Chamaesyce deltoidea var. deltoidea	-	-	-	-	-	-	-	P	-	P	-	-	-
*	Chamaesyce pinetorum	1/1	-	11/4	-	12/4	34/14	17/5	2/1	11/4	-	-	-	-
*	Chamaesyce porteriana var. porteriana	62/13	63/18	61/16	85/17	3/2	-	-	1/1	2/1	-	-	-	-
*	Chaptalia dentata	-	P	-	-	-	-	1/1	-	4/3	-	7/3	-	-
	Chiococca alba	-	-	P	-	-	-	-	-	-	-	1/1	-	-
	Chiococca parvifolia	62/11	420/20	93/9	152/13	99/16	53/13	11/2	38/7	731/20	153/18	451/18	-	194/17

	Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
	A4	B6	B12	C3	E7	I4	J6						
Cirsium horridulum	P	P	1/1	-	1/1	1/1	4/2	P	-	-	-	-	P
Cnidoscolus stimulosus	-	-	-	-	-	-	-	18/9	P	-	-	-	-
Commelina erecta var. angustifolia	-	-	-	-	-	-	-	P	-	P	-	-	-
* Coreopsis leavenworthii	7/4	P	P	119/13	-	-	-	-	-	-	-	-	-
* Crossopetalum ilicifolium	2/1	-	-	-	-	-	2/1	-	3/2	6/4	21/5	-	-
* Crotalaria maritima	-	-	P	-	-	-	-	P	-	-	-	-	9/5
* Crotalaria pumila	4/2	P	6/3	P	8/4	21/12	P	-	4/2	-	P	-	10/9
Croton glandulosus var. glandulosus	-	-	-	-	-	-	-	3/1	-	P	-	1/1	-
Cynanchum blodgettii	P	-	P	-	-	1/1	-	P	1/1	P	-	-	2/2
Cynoctonum mitreola	P	P	-	P	2/1	-	-	-	-	-	-	-	-
Cynoctonum sessifolium	29/11	17/3	14/6	P	23/11	-	-	-	-	-	-	-	8/3
Desmodium canum (EX)	-	-	-	-	-	-	-	-	-	P	-	-	-
* Desmodium lineare	-	-	-	-	-	-	2/1	-	-	1/1	-	-	-
Desmodium tortuosum (EX)	-	-	-	-	-	-	-	P	-	-	-	-	-
Diodia virginiana	-	-	-	9/3	-	-	-	-	-	-	-	-	-
Dyschoriste oblongifolia var. angusta	95/14	782/20	139/19	159/20	127/20	62/17	16/9	50/14	2/2	8/4	4/4	40/11	-
* Echites umbellata	-	1/1	1/1	-	3/3	10/6	P	P	-	P	5/3	-	-

		Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
		A4	B6	B12	C3	E7	I4	J6						
*	Ernodea littoralis var. angusta	-	-	-	-	-	-	-	P	P	-	-	-	55/9
	Eupatorium capillifolium	-	-	2/2	P	-	-	-	-	-	-	-	-	-
	Eupatorium leptophyllum	P	-	P	-	-	-	-	-	-	-	1/1	-	-
	Eupatorium villosum	-	-	-	-	3/1	-	32/6	-	1/1	-	15/8	-	-
*	Euphorbia polyphylla	-	-	-	-	-	-	-	14/8	-	-	-	27/7	-
*	Evolvulus sericeus	-	-	-	54/16	-	-	-	-	-	1/1	-	23/8	1/1
	Galactia spp. (incl. G. pinetorum)	-	-	-	-	-	1/1	61/14	9/5	16/9	15/5	-	-	-
	Galium hispidulum	-	-	-	-	-	-	-	-	-	-	P	-	-
	Hedyotis nigricans var. filifolia	P	280/16	19/6	-	80/12	54/10	-	1/1	P	2/2	P	-	11/3
	Heliotropium polyphyllum	25/5	2/1	3/1	13/10	-	-	-	-	-	-	-	-	-
*	Heterotheca graminifolia var. tracyi	-	P	-	7/3	-	21/1	42/5	70/11	-	-	1/1	63/12	7/7
	Hypoxis sp.	-	-	-	-	-	-	-	-	-	6/1	-	-	1/1
	Hyptis alata var. stenophylla	27/10	10/5	25/11	21/10	2/1	2/1	-	-	-	-	-	-	-

		Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
		A4	B6	B12	C3	E7	I4	J6						
*	Ipomoea microdactyla	-	-	P	-	2/1	-	-	-	-	-	P	-	-
	Ipomoea sagittata	-	-	-	2/1	-	-	-	-	-	-	-	8/2	-
*	Ipomoea tenuissima	-	-	-	-	1/1	15/5	20/8	P	-	-	-	-	-
*	Jacquemontia curtissii	1/1	13/5	1/1	16/8	9/5	P	P	5/5	-	1/1	P	-	-
	Jasminum fluminense (EX)	-	-	-	-	-	-	-	-	-	P	-	-	-
*	Liatris gracilis	-	-	-	P	-	18/6	21/5	1/1	-	-	-	-	-
	Liatris spp.	-	-	-	16/7	1/1	-	-	5/3	-	-	-	1/1	1/1
*	Liatris tenuifolia	-	-	-	-	-	-	-	P	-	-	-	-	-
*	Licania michauxii	-	-	-	-	-	P	P	11/3	P	P	-	-	-
	Lobelia glandulosa	1/1	-	-	1/1	-	-	-	-	-	-	-	-	-
	Ludwigia microcarpa	-	-	2/1	32/8	-	-	-	-	-	-	-	-	-
	Mecardonia acuminata	1/1	-	-	37/6	-	-	-	-	-	-	-	-	-
*	Melanthera parvifolia	-	-	-	5/3	-	8/4	P	34/7	3/2	1/1	-	-	1/1
	Mikania scandens	22/13	67/5	119/15	25/9	11/4	-	-	-	-	-	-	1/1	-
	Morinda royoc	119/13	65/14	66/14	39/10	50/13	41/9	28/9	50/9	30/7	13/4	24/2	16/1	18/7
	Opuntia humifusa	-	-	-	-	-	-	-	1/1	-	1/1	-	-	-

	Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
	A4	B6	B12	C3	E7	I4	J6						
Parthenocissus quinquefolia	-	-	-	-	-	-	-	-	-	4/3	1/1	-	-
Passiflora suberosa	14/7	36/14	15/9	10/7	7/5	11/7	6/3	2/2	4/3	1/1	9/5	-	-
Petalostemon carneum	-	-	-	-	-	-	-	P	-	-	-	-	-
Phyllanthus caroliniensis	-	-	2/1	13/11	-	-	-	-	-	-	-	-	-
* Phyllanthus pentaphyllus var. floridanus	133/20	178/19	75/15	59/12	97/20	57/15	10/6	13/7	8/6	24/9	37/13	-	12/9
Physalis viscosa	18/10	6/4	18/8	10/8	21/5	15/3	5/3	14/2	2/2	5/2	-	113/17	-
Piriqueta caroliniana var. tomentosa	18/11	13/7	13/8	1/1	17/7	20/6	22/5	29/4	5/3	P	3/1	10/4	5/3
Pluchea rosea	P	-	3/1	31/9	-	-	-	-	-	-	-	5/2	-
* Poinsettia pinetorum	1/1	5/3	2/1	2/2	P	27/9	5/2	2/1	1/1	P		-	-
* Polygala boykinii var. sparsifolia	1/1	-	13/5	1/1	-	-	-	-	-	-	-	-	9/3
Polygala grandiflora	P	4/4	5/3	1/1	-	1/1	13/7	13/8	-	-	-	-	11/7
Proserpinaca palustris	-	-	P	P	-	-	-	-	-	-	-	P	-
Psilotum nudum	1/1	-	-	-	-	-	-	-	-	-	-	-	-

		Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
		A4	B6	B12	C3	E7	I4	J6						
	Pteridium aquilinum var. caudatum	-	P	-	-	P	75/9	48/10	10/7	10/7	5/3	4/1	-	-
	Pteris longifolia var. bahamensis	8/3	P	13/7	27/5	20/9	P	P	-	P	-	P	-	P
	Pterocaulon pycnostachyum	-	-	-	-	-	-	-	P	-	-	-	-	-
*	Rhynchosia cinerea	-	-	-	-	-	-	15/3	-	-	P	-	-	-
*	Rhynchosia reniformis	-	-	-	-	-	3/2	25/8	4/2	4/3	-	P	-	-
*	Ruellia caroliniensis ssp. ciliosa var. heteromorpha	9/6	P	11/3	12/4	14/6	7/4	6/5	10/3	1/1	3/1	P	10/4	10/7
*	Sachsia polycephala	29/12	1/1	64/7	1/1	20/3	5/2	1/1	-	P	-	9/4	-	-
	Samolus ebracteatus	2/2	41/6	47/7	18/6	1/1	-	-	-	-	-	-	-	-
*	Scutellaria havanensis	-	83/1	-	-	5/2	-	P	-	-	-	-	-	-
*	Sida elliottii	-	-	-	P	-	-	-	-	P	1/1	-	-	-
	Sisyrinchium miamiense	-	-	-	-	-	-	-	-	-	-	P	-	-
	Smilax auriculata	P	P	1/1	P	4/4	5/5	32/5	-	-	18/8	P	-	-
	Smilax bona-nox	-	-	P	-	-	-	P	-	-	-	-	-	-
	Smilax havanensis	-	-	-	-	-	-	-	-	P	P	-	-	13/6

	Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
	A4	B6	B12	C3	E7	I4	J6						
* Solidago chapmanii	-	-	-	-	-	7/4	6/4	2/1	P	-	-	-	-
Solidago stricta	18/10	37/16	42/13	21/10	3/3	-	-	1/1	-	-	-	26/4	-
Spiranthes sp.	1/1	-	1/1	-	-	-	-	-	-	-	-	-	-
* Stillingia sylvatica ssp. tenuis	-	P	-	3/3	-	-	P	5/3	-	-	-	2/1	-
* Tephrosia florida	-	-	-	-	-	-	1/1	4/3	-	-	-	-	-
Thelypteris kunthii	P	-	-	-	-	-	-	-	-	-	-	-	-
Tillandsia circinnata	1/1	-	P	P	-	-	-	-	-	-	-	-	-
Toxicodendron radicans	-	-	-	-	-	-	P	-	P	5/2	12/5	-	-
* Tragia saxicola	-	P	-	-	31/10	96/18	30/14	48/6	35/17	33/10	8/5	-	P
* Tragia urens var. linearis	-	-	-	-	-	-	-	5/3	-	-	-	-	-
Vernonia blodgettii	-	1/1	-	12/6	-	-	-	P	-	-	-	70/9	-
Vitis munsoniana	-	-	-	-	-	-	P	-	P	P	15/7	-	-
Zamia pumila	-	P	-	-	-	8/3	5/5	2/1	1/1	1/1	2/1	-	-
Graminoids													
* Andropogon cabanisii	45/11	111/19	77/17	3/2	125/19	202/17	52/10	-	1/1	-	-	-	-

		Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
		A4	B6	B12	C3	E7	I4	J6						
	Andropogon glomeratus	2/2	-	-	12/5	-	P	-	-	P	P	-	-	-
*	Andropogon longiberbis	-	-	-	-	-	-	-	-	-	-	1/1	4/3	-
	Andropogon spp.	4/2	-	3/3	9/3	-	2/1	-	1/1	-	-	5/1	-	3/2
	Andropogon virginicus	-	-	-	12/4	-	-	-	3/2	P	-	-	-	P
	Aristida spp.	14/4	7/3	14/8	53/14	4/2	5/3	P	1/1	1/1	P	1/1	-	1/1
	Bulbostylis ciliatifolia	-	-	-	-	-	-	-	P	-	-	-	-	-
*	Cenchrus gracillimus	p	p	p	p	p	p	p	P	p	p	p	31/2	-
	Chloris petraea	-	-	-	1/1	-	-	-	2/1	-	7/5	-	-	1/1
	Cladium jamaicensis	31/7	13/3	38/7	36/9	4/1	-	-	-	-	-	-	-	-
*	Dichromena floridensis	19/5	77/11	39/8	85/11	21/8	P	-	23/6	20/7	2/2	34/9	-	199/15
	Eragrostis elliottii	-	-	-	P	-	-	P	-	-	-	-	-	P
	Muhlenbergia capillaris	89/16	41/9	82/16	88/18	2/1	6/2	-	-	P	-	-	445/20	-
	Neyraudia reynaudiana (EX)	-	-	-	-	-	-	-	-	-	3/1	-	-	-
*	Panicum fusiforme	-	-	-	-	-	-	-	-	P	-	-	-	-
	Panicum spp.	1/1	-	2/1	-	-	-	1/1	2/2	-	-	-	2/2	-

	Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
	A4	B6	B12	C3	E7	I4	J6						
Paspalum caespitosum	-	-	-	-	-	-	-	1/1	-	-	22/7	-	-
Paspalum setaceum	33/12	8/4	22/10	28/8	6/2	8/6	9/6	22/7	5/4	9/3	18/4	-	1/1
Paspalum spp.	-	-	-	P	1/1	-	-	-	3/2	P	-	21/2	32/2
Rhynchospora globularis	-	-	-	-	-	-	-	2/1	-	-	-	-	-
Rhynchospora spp.	-	-	1/1	38/7	-	-	-	11/7	-	-	-	23/2	-
* Schizachyrium gracile	3/2	23/7	3/2	11/2	-	2/1	-	13/4	-	1/1	24/10	-	108/16
Schizachyrium rhizomatum	58/12	192/13	91/12	112/16	1/1	39/7	2/2	15/3	-	1/1	-	-	-
Schizachyrium semiberbe	65/12	68/15	28/8	2/2	11/3	14/4	160/12	8/5	27/7	9/4	13/5	-	35/8
* Scleria ciliata	-	-	-	-	-	2/1	1/1	1/1	-	-	-	3/1	-
* Sorghastrum secundum	58/10	19/5	60/9	-	3/2	4/3	P	28/9	7/5	3/2	36/12	-	31/9
* Sporobolus junceus	-	-	-	-	-	-	-	39/14	-	-	-	-	-
* Tripsacum floridanum	8/6	4/3	3/2	45/15	-	-	-	-	2/1	1/1	5/1	P	-
Trees and Shrubs													
* Acacia pinetorum	-	P	-	P	-	-	-	-	-	-	-	-	P
Alvaradoa amorphoides	-	-	-	-	-	-	-	-	-	-	3/3	-	-
Annona glabra	-	-	-	2/2	-	-	-	-	-	-	-	-	-

	Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
	A4	B6	B12	C3	E7	I4	J6						
Ardisia escallonioides	P	5/4	5/3	-	24/3	2/2	9/3	-	P	-	-	-	-
Baccharis glomeruliflora	P	1/1	-	P	-	-	-	-	-	-	-	-	-
* Bourreria cassinifolia	-	-	-	-	-	-	-	-	-	P	-	-	-
Bumelia reclinata var. reclinata	P	7/2	4/1	7/1	-	-	-	-	-	-	-	-	-
Bumelia salicifolia	5/2	4/1	5/5	3/1	10/8	10/4	P	-	-	3/3	3/3	-	-
Bursera simaruba	-	-	-	-	-	-	1/1	-	-	-	-	-	-
* Byrsonima lucida	2/2	1/1	4/2	1/1	2/2	P	P	1/1	P	P	2/1	-	10/4
Callicarpa americana	-	-	-	-	-	-	5/3	P	-	-	P	P	-
Cassia chapmanii	P	1/1	P	-	-	-	-	1/1	-	P	P	-	P
Chrysobalanus icaco	-	1/1	P	4/3	1/1	-	-	-	-	-	-	-	-
Chrysophyllum oliviforme	P	P	P	P	1/1	-	-	-	-	-	-	-	-
Citharexylum fruticosum	-	-	-	-	-	-	P	-	-	-	-	-	-
* Coccothrinax argentata	-	-	-	-	-	P	-	5/3	2/2	33/11	3/3	-	9/6
Crossopetalum rhacoma	-	-	-	-	-	-	-	-	P	-	-	-	1/1
* Croton linearis	11/8	-	7/7	-	-	P	-	7/5	5/2	2/2	P	-	2/2

	Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
	A4	B6	B12	C3	E7	I4	J6						
Dodonea viscosa	P	1/1	130/5	2/1	25/12	48/14	P	-	-	-	-	-	-
Eugenia axillaris	-	P	-	-	-	-	1/1	-	-	-	-	-	-
Ficus citrifolia	P	P	2/2	P	P	-	-	-	-	-	-	1/1	-
Exothea paniculata	-	-	-	-	-	-	-	-	-	-	2/1	-	-
* Forestiera segregata var. pinetorum	-	1/1	-	-	P	-	P	-	P	-	P	-	-
Guapira discolor	-	P	1/1	2/2	4/3	1/1	P	-	-	-	-	-	-
Guettarda elliptica	P	22/8	P	-	10/4	15/5	P	-	-	-	-	-	-
Guettarda scabra	-	P	-	-	151/18	157/20	130/18	56/9	196/17	-	15/2	-	2/1
Hypericum sp.	-	-	-	P	-	-	-	-	-	-	-	-	-
Ilex cassine	1/1	2/2	2/2	1/1	P	-	-	-	-	-	-	-	-
Ilex krugiana	-	-	-	-	-	-	P	-	-	-	P	-	-
Jacquinia keyensis	P	-	1/1	-	P	-	-	-	-	-	-	-	-
Lantana involucrata	-	-	-	-	-	P	P	-	-	4/2	P	-	-
* Lantana depressa	-	-	-	-	4/1	2/2	4/2	-	1/1	3/3	2/2	-	-
Lysiloma latisiliqua	P	-	-	-	-	-	P	-	-	-	P	-	-
Metopium toxiferum	P	P	P	-	18/1	8/5	P	1/1	23/9	53/11	36/11	-	2/2

		Long Pine Key, Everglades National Park							Thompson Park	Navy Wells	USDA Site	Camp Owissa Bauer	Tamiami Site Sandy Soil	Big Pine Key
		A4	B6	B12	C3	E7	I4	J6						
	Myrcianthes fragrans	-	-	-	-	-	-	-	-		-	P	-	-
	Myrica cerifera	P	1/1	2/2	4/3	P	P	5/1	-	-	-	P	P	-
	Myrsine floridana	20/6	12/4	23/10	16/3	15/5	12/7	2/1	-	P	P	14/10	-	P
	Persea borbonia	2/2	P	4/4	1/1	P	P	P	-	-	-	-	-	-
*	Pinus elliottii var. densa	1/1	3/3	5/4	2/2	6/5	P	4/3	P	1/1	3/3	2/2	1/1	2/2
*	Psidium longipes	2/2	2/2	8/3	P	4/3	P	-	P	-	P	-	-	32/8
	Psychotria nervosa	-	-	-	-	-	-	1/1	-	-	-	P	-	-
*	Quercus pumila	-	-	-	-	-	-	-	55/5	-	2/1	-	1/1	-
	Quercus virginiana	P	-	P	-	-	-	6/1	-	-	2/2	-	1/1	-
	Randia aculeata	27/5	38/10	21/5	19/5	19/9	14/5	9/3	10/3	29/3	20/5	14/2	P	44/2
	Rhus copallina	2/1	P	4/1	2/1	P	13/5	29/11	42/8	3/2	1/1	8/6	50/12	-
	Sabal palmetto	4/4	10/6	4/4	6/6	P	P	P	4/3	P	P	P	P	-
	Schinus terebinthifolius (EX)	-	-	-	-	-	-	1/1	-	P	5/3	2/1	-	-
	Serenoa repens	5/4	P	5/3	1/1	P	8/3	12/9	12/4	5/2	3/2	18/12	1/1	1/1
	Tetrazygia bicolor	P	P	P	1/1	6/2	1/1	3/2	-	P	-	3/1	-	-
	Trema micrantha	-	-	-	-	-	-	-	-	-	-	2/1	-	-

Additional species for Tamiami site: Trees and shrubs - Baccharis halimifolia (P); Graminoids - *Elyonurus tripsacoides (81/6); Panicum virgatum var. cubense (P); *Rhynchospora plumosa (P); Setaria geniculata (P); Sporobolus jacquemontii (P); Herbs - Aster tenuifolius (20/2); Clematis baldwinii (8/5); Eupatorium coelestinum (P); *Eupatorium compositifolium (P); Eupatorium mikanioides (2/2); Liatris (P); Ludwigia maritima (P); Physostegia denticulata (P); Portulaca pilosa (P).

Additional species for Big Pine Key site: Trees and shrubs - Catesbaea parviflora (P); Coccoloba diversifolia (P); Coccoloba uvifera (P); Pisonia rotundata (1/1); Pithecellobium guadalupense (3/1); Reynosia septentrionalis (18/2); Thrinax morrissii (2/2); Graminoids - *Abilgaardia ovata (P): Paspalum blodgettii (10/1); *Paspalum saugettii (2/2); Herbs - Bletia purpurea (2/1); *Cassia keyensis (112/17); *Chamaesyce deltoidea var. serpyllum (3/1); *Evolvulus grisebachii (12/2); Flavaria linearis (P).

Table 2. Summary of constancy, mean frequency, and mean density for species with .05 mean frequency or greater, comparing the 7 Long Pine Key ("LPK") sites of Everglades National Park with the limestone rockland pine sites of Dade County ("Dade") outside the park.

	Constancy		Frequency				Density (plants/100 m^2)			
Species	LPK	Dade	Mean 11 Sites	Rank	Mean LPK	Mean Dade	Mean 11 Sites	Mean Rank	Mean LPK	Mean Dade
Chiococca parvifolia	1.00	1.00	.67	1	.60	.79	1029	1	635	1720
Dyschoriste oblongifolia	1.00	1.00	.65	2	.85	.30	338	2	485	80
Phyllanthus pentaphyllus var. floridanus	1.00	1.00	.65	3	.76	.44	314	5	435	102
Morinda royoc	1.00	1.00	.47	4	.58	.27	238	7	291	146
Andropogon cabanisii	1.00	.25	.44	5	.68	.01	280	6	439	1
Anemia adiantifolia	1.00	1.00	.42	6	.49	.31	214	9	291	79
Borreria terminalis	.71	1.00	.40	7	.47	.27	332	3	406	200
Guettarda scabra	.57	.75	.39	8	.40	.36	320	4	312	334
Tragia saxicola	.57	1.00	.36	9	.30	.47	128	14	112	155
Schizachyrizum semiberbe	1.00	1.00	.35	10	.40	.26	184	11	248	71
Chamaesyce porteriana	.71	.50	.31	11	.47	.02	126	15	195	4
Dichromena floridensis	.86	1.00	.30	12	.31	.30	145	12	172	99
Schizachyrium rhizomatum	1.00	.50	.30	12	.45	.05	232	8	352	20
Paspalum setaceum	1.00	1.00	.30	14	.34	.22	76	21	81	67
Acalypha chamaedrifolia	.71	1.00	.29	15	.17	.49	70	22	23	153
Passiflora suberosa	1.00	1.00	.29	15	.37	.14	52	31	71	20
Muhlenbergia filipes	1.00	.25	.28	17	.44	0	140	13	220	0
Sorghastrum secundum	.86	1.00	.26	18	.21	.35	99	19	103	92
Randia aculeata	1.00	1.00	.25	19	.30	.16	100	18	105	91

Species	Constancy		Frequency				Density (plants/100 m^2)			
	LPK	Dade	Mean 11 Sites	Rank	Mean LPK	Mean Dade	Mean 11 Sites	Mean Rank	Mean LPK	Mean Dade
Piriqueta caroliniana	1.00	1.00	.25	20	.32	.11	64	24	74	46
Solidago stricta	.71	.25	.24	21	.37	.05	55	29	86	33
Hedyotis nigricans	.71	1.00	.21	22	.31	.04	198	10	309	4
Physalis viscosa	1.00	.75	.21	22	.29	.07	52	31	66	26
Mikania scadens	.71	0	.21	24	.33	0	111	16	160	0
Myrsine floridana	1.00	.75	.21	24	.26	.12	52	31	71	17
Angadenia sagrei	1.00	1.00	.21	24	.20	.22	44	37	43	46
Ayenia euphrasiifolia	.57	.75	.20	27	.20	.21	102	17	129	55
Serenoa repens	1.00	1.00	.18	28	.14	.25	31	43	22	48
Pteridium aquilinum var. caudatum	.57	1.00	.18	29	.14	.25	69	23	88	36
Metopium toxiferum	.86	1.00	.17	30	.04	.40	63	26	19	141
Hyptis alata var. stenophylla	.86	-	.17	30	.27	0	39	30	62	0
Aristida spp.	1.00	1.00	.17	-	.24	.04	45	-	69	4
Rhus copallina	1.00	1.00	.16	32	.14	21	47	36	36	67
Cassia deeringiana	1.00	.75	.15	33	.16	.15	49	35	58	34
Dodonea viscosa	1.00	-	.15	34	.24	0	94	20	147	0
Chamaesyce pinetorum	.86	.50	.15	34	.20	.06	40	38	54	16
Cassytha filiformis	.86	.75	.15	34	.19	.07	37	40	52	11
Ruellia caroliniensis	1.00	1.00	.15	34	.20	.16	33	41	42	17
Galactia (incl. G. pinetorum)	.28	.75	.15	-	.11	.24	46	-	44	50
Cynoctonum sessifolium	.71	-	.14	38	.22	0	33	41	52	0

Species	Constancy LPK	Constancy Dade	Frequency Mean 11 Sites	Frequency Rank	Frequency Mean LPK	Frequency Mean Dade	Density (plants/100 m^2) Mean 11 Sites	Density Mean Rank	Density Mean LPK	Density Mean Dade
Sachsia polycephala	1.00	.50	.14	38	.19	.02	59	26	86	11
Agalinis fasciculata	1.00	.50	.14	40	.21	0	22	50	35	0
Tripsacum floridanum	.57	.75	.13	41	.19	.04	31	43	42	10
Bumelia salicifolia	1.00	.50	.12	42	.15	.07	20	54	26	7
Cladium jamaicense	.86	-	.12	42	.19	0	55	29	87	0
Jacquemontia curtissii	1.00	.75	.12	44	.14	.07	21	52	28	7
Polygala grandiflora	.86	.25	.11	45	.11	.10	17	62	17	16
Pteris longifolia	1.00	.50	.11	45	.17	0	31	43	49	0
Croton linearis	.43	1.00	.11	45	.11	.11	15	65	13	18
Pinus elliottii var. densa	1.00	1.00	.11	45	.13	.07	12	69	15	7
Sabal palmetto	1.00	1.00	.10	49	.14	.04	13	68	17	5
Crotalaria pumila	1.00	.50	.10	49	.15	.02	20	54	28	5
Smilax auriculata	1.00	.50	.10	49	.11	.10	27	46	30	22
Samolus ebracteatus	.71	-	.10	52	.16	0	50	34	78	0
Heterotheca graminifolia var. tracyi	.57	.50	.10	53	.06	.15	64	24	50	89
Poinsettia pinetorum	1.00	.75	.09	54	.13	.02	20	54	30	4
Coccothrinax argentata	.14	1.00	.09	55	0	.24	20	54	0	54
Aster dumosus	.57	.25	.09	55	.13	.02	22	50	34	2
Coreopsis leavenworthii	.57	-	.08	57	.12	0	57	28	90	0
Guettarda elliptica	.86	-	.08	57	.12	0	21	52	34	0
Melanthera parvifolia	.43	.75	.08	57	.05	.12	23	48	9	48
Heliotropium polyphyllum	.57	-	.08	57	.12	0	20	54	31	0
Evolvulus sericeus	.14	.25	.08	57	.11	.01	25	47	39	2

Species	Constancy		Frequency				Density (plants/100 m^2)			
	LPK	Dade	Mean 11 Sites	Rank	Mean LPK	Mean Dade	Mean 11 Sites	Mean Rank	Mean LPK	Mean Dade
Eupatorium villosum	.29	.50	.07	62	.05	.11	23	48	25	20
Ardisia escallonioides	.86	.25	.07	63	.11	0	20	54	32	0
Aster adnatus	.71	.75	.07	63	.05	.10	11	70	6	21
Rhynchosia reniformus	.28	.75	.07	63	.07	.06	16	63	20	10
Rhynchospora spp.	.28	.25	.07	-	.06	.09	23	-	28	14
Sporobolus junceus	-	.25	.06	66	0	.18	18	60	0	49
Echites umbellata	.71	.75	.06	66	.08	.04	9	71	11	6
Ipomoea tenuissima	.43	.25	.06	66	.10	0	16	63	26	0
Crossopetalum ilicifolium	.28	.75	.06	69	.01	.14	15	65	3	38
Zamia pumila	.43	1.00	.05	70	.06	.02	9	71	9	7
Liatris gracilis	.43	.25	.05	70	.08	.01	18	60	28	1
Phyllanthus caroliniensis	.28	-	.05	70	.09	0	7	73	11	0
Lantana depressa	.43	.75	.05	73	.04	.07	7	73	7	7
Psidium longipes	.86	.50	.05	74	07	0	7	73	11	0
Byrsonima lucida	1.00	1.00	.05	74	.06	.02	6	76	7	4
Pluchea rosea	.43	-	.05	74	.07	0	15	65	24	0

Table 3. Species numbers (excluding exotics) for each macroplot (40 m x 40 m) subdivided by trees and shrubs, herbs, and graminoids.

Site	Tree and Shrub spp.	Herb spp.	Graminoid spp.	Total
LPK-A4	26	50	14	90
LPK-B6	28	44	11	73
LPK-B12	26	51	14	91
LPK-C3	23	50	17	80
LPK-E7	24	40	10	74
LPK-I4	22	42	12	76
LPK-J6	27	49	9	85
Thompson Park	14	57	18	89
Navy Wells	16	42	12	70
USDA Site	19	39	11	69
Camp Owissa Bauer	26	41	10	77
Tamiami	11	26	13	50
Big Pine Key	19	35	14	68

Table 4. Numbers of pines present in 40 m x 40 m plot at each site by diameter classes. Diameter classes are measured at breast height.

		0-5 cm 2 m tall	0-5 cm 2 m tall	5-10 cm	10-15 cm	15-20 cm	20-25 cm	25-30 cm	30-35 cm	35-40 cm
Navy Wells Site		14	2	10	17	19	9	1		
USDA Site		24	38	11	8	16	6	4		
Camp Owissa Bauer		2	11	31	32	17	5			
Thompson Park					1	8	10	8	2	
Long Pine Key,	I-4		3	3	26	31	18	5		
"	A4	1	23	87	26	26	2			
"	B6		12	33	13	43	5			
"	B12		8	21	13	41				
"	C3	1	29	34	37	24	7			
"	E7			62	56	10	3			
"	J6				14	22	12			
Big Pine Key		50	32	71	39	4				
Tamiami Pines					2	1	7	19	5	2

Table 5. Species of Southeastern Florida pinelands which are considered ENDANGERED or THREATENED in the 1974 Smithsonian Institution report.

Species	Comments
	ENDANGERED
Zamia integrifolia (= *Zamia pumila*)	Not uncommon in Dade Co. pinelands. Found at 7 of 11 sites in this study and ranked 70th in frequency.
Euphorbia garberi (= *Chamaesyce garberi*)	Not found at sites sampled in this study, but known to be present in one pineland locality of Long Pine Key, ENP.
Galactia pinetorum	Identification difficult without flowering material. In this study, lumped with *Galactia* spp.
Tephrosia angustissima	Not found in this study, although Small (1933) indicates it to be a species of South Florida pinelands.
Forestiera segregata var. *pinetorum*	Widespread, but not common in Dade Co. pinelands. In this study, found at 5 of 11 sites.
Schizachyrium rhizomatum	Abundant in pinelands and glades of Dade and Collier Cos. In this study, ranked 12th in frequency and 8th in density in pinelands.
Tripsacum floridanum	Common in pinelands of Dade Co. In this study, ranked 41st in frequency and 43rd in density.
Cassia keyensis	Present in Lower Florida Keys pinelands only. Abundant at Big Pine Key site sampled in this study.
Chamaesyce deltoidea ssp. *serpyllum*	Present in lower Florida Keys pinelands only. Present at Big Pine Key site sampled in this study.
	THREATENED
Melanthera parvifolia	Fairly common in Dade Co. pinelands. Found in 6 of 11 sites sampled in this study, but may have been partially confused with *Melanthera augustifolia*.

Species	Comments
Jacquemontia curtissii	Frequent in Dade Co. pinelands. Ranked 45th in frequency among pineland species in this study and was present at 10 of 11 sampling sites.
Argythamnia blodgettii	Rare in pinelands of Dade Co. Present at 2 of 11 sites sampled in this study.
Chamaesyce deltoidea ssp. deltoidea (includes var. deltoidea and var. adhaerens)	Rare and local in pinelands of Miami Rock Ridge north of Homestead. Not present in ENP.
Chamaesyce porteriana var. porteriana	Abundant in pinelands of Dade Co. Ranked 11th in frequency and 15th in density among pineland species in this study.
Phyllanthus pentaphyllus var. floridanus	Abundant in pinelands of Dade Co. In this study it ranked 3rd in frequency and 5th in density in pinelands.
Stillingia sylvatica ssp. tenuis	Local in pinelands of Dade Co. Found at 4 of 11 sites sampled in this study.
Tragia saxicola	Abundant in pinelands of Dade Co. In this study, it ranked 9th in frequency and 14th in density among pineland species.
Rhynchosia cinerea	Uncommon in Dade Co. pineland sites. Found at 2 of 11 sites sampled in this study.
Polygala boykinii var. sparsifolia	Local in pinelands of Dade Co. Found at 3 of 11 sites sampled in this study, all in ENP.
Verbena maritima	Not found at rockland sites sampled in this study, but known to be present at at least one pineland site of ENP. Present in Tamiami Pines area (but not in plot).

Table 6. Species of Southeastern Florida pinelands which are considered ENDANGERED, THREATENED, or RARE in the list compiled in 1974 (revised 1976) by the Florida Committee on Rare and Endangered Plants and Animals.

Species	Comments
	ENDANGERED
Sachsia bahamensis (= S. polycephala)	Very common in pinelands of Dade Co. Ranked 39th in frequency and 28th in density among pineland species in this study.
	THREATENED
Coccothrinax argentata	Uncommon within ENP, but very common in the four limestone pinelands of Dade Co. outside ENP sampled in this study.
Ernodea littoralis	Apparently very rare in Dade Co. pinelands. Present at 2 Dade Co. sites outside ENP sampled in this study. Not presently known to occur in ENP pinelands. Also present in coastal habitats.
Hypelate trifoliata	Very rare in South Florida. Not encountered in this study. Known to be present in one portion (near site A4) of ENP pinelands.
Ilex krugiana	Uncommon in South Florida hammocks and pinelands. Present at 2 of 11 sites sampled in this study.
	RARE
Cassia keyensis	Present in lower Florida Keys pinelands only. Abundant at Big Pine Key site sampled in this study.

Table 7. South Florida pineland species not appearing on threatened and endangered lists of Florida Committee and Smithsonian which probably should receive consideration for protected status.

Species	Comments
Brickellia mosieri	Very rare. Known from pinelands at Navy Wells and Thompson Park. Not known from Everglades National Park. Endemic to South Florida.
Euphorbia polyphylla	Very rare in South Florida pinelands (recorded from Thompson Park, Tamiami). Also present in prairies of Big Cypress National Preserve. Endemic to Florida.
Polygala smallii	Extremely rare or extirpated in pinelands with sandy soil in vicinity of Miami. Development has destroyed all sites known to the authors. Endemic to South Florida.
Acacia pinetorum	Uncommon in South Florida pinelands and associated open glades. Moderately common locally in Everglades National Park.
Alvaradoa amorphoides	Very rare and local in Everglades National Park (only one locality, near plot A-4) and remnant pinelands and hammock margins north of Homestead. Also in Mexico and West Indies.
Ipomoea microdactyla	Rare, but widespread in South Florida pinelands. Few individuals occur in any one locality. Encountered in three sampling plots of this study. Also in West Indies.
Bourreria cassinifolia	Appears to be one of the rarest plants in South Florida pinelands. Several dozen specimens known to occur in Everglades N.P. Present also at USDA sampling site end at Camp Owaissa Bauer. Also in West Indies.
Chamaesyce conferta	A South Florida endemic which may be very uncommon. Encountered only at Navy Wells near Homestead in this study. Known to be present in Everglades National Park.

Species	Comments
Colubrina cubensis	Extremely rare and local in pinelands and hammock margins of Dade Co. Not recorded in this study, but present near plot A-4 in Everglades N.P.
Amorpha crenulata	Very rare and localized in area immediately south of Miami which is undergoing last stages of complete suburban development. Occupies pinelands with shallow sandy soil over limestone.

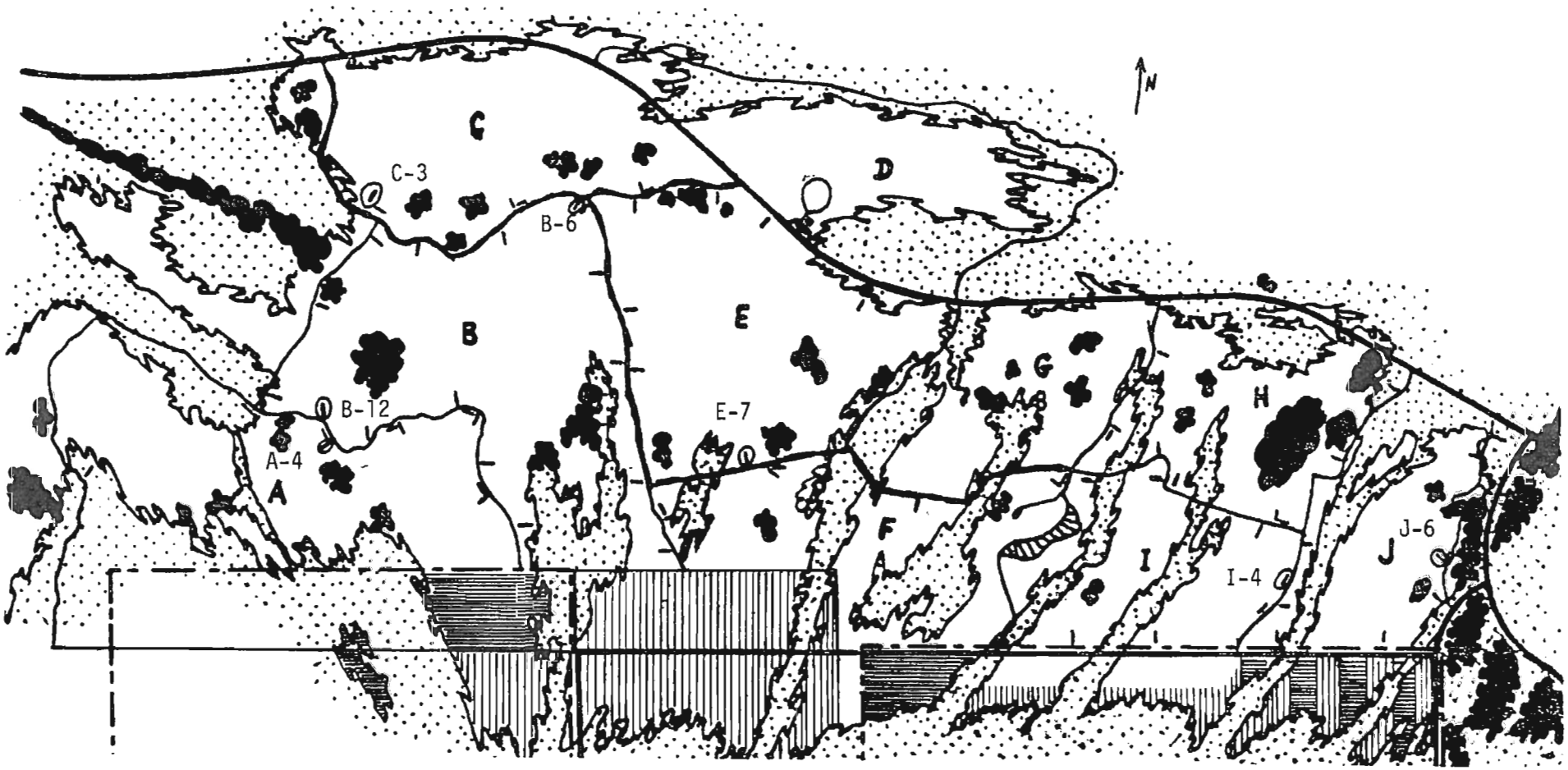

Figure 1. Location of sampling plots within Long Pine Key of Everglades National Park in relation to network of fire access lanes and fire management units.

*U.S. GOVERNMENT PRINTING OFFICE: 1980-645-159/5011. Region 4.