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Structural Comparisons of Sand Pine Scrubs of East-Central Florida

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STRUCTURAL COMPARISONS OF SAND PINE SCRUBS OF EAST-CENTRAL FLORIDA

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THESIS

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INTRODUCTION

Although sand pine scrub is perhaps the oldest and most stable plant community in Florida, it is virtually limited to the peninsular area. The community's parochial existence was noted by Vignoles in 1823 (Laessle, 1942), but nearly a century passed before Harper (1914) provided additional qualitative information regarding sand pine scrub.

The maintenance of characteristic species in sand pine scrub appears to be contingent upon fires which occur at intervals of 30 years or longer (Monk, 1968; Laessle, 1967; Richardson, 1977). Other factors affecting the species composition are soil moisture, fertility (Monk, 1968) and possibly allelopathy (Richardson, Pers. comm.). Veno (1976) and Richardson (1977) suggest the scrub may be the oldest type of plant community in Florida. This is supported by Watts' (1980) study of pollen in the sediment of Lake Annie, Highlands County, Florida, which indicated the presence of sand pine scrub as early as the Wisconsin period, about 13,500 B.C.

A limited literature exists on the ecology of the scrub. Harper (1914, 1921, 1927) observed not only the

relatively poor nutrient composition of the interior scrub soils of north, central, and south Florida, but also the well-defined boundaries separating the scrub from adjacent communities. Kurz (1942) and Laessle (1942) discussed the extreme contrast in vegetation composition between scrubs and neighboring communities, and suggested that these differences might be due to physical and/or chemical variations in the soil. Kalisz and Stone (1984) were unable to support this hypothesis based on a study of soils and plant distributions in the Ocala National Florest, Florida.

Mulvania (1931) published the first numerical survey of a Florida scrub. He reported qualitative and quantitative differences in the vegetation of a sand pine scrub and the vegetation of an adjacent lake margin. More recently, Veno (1976) observed P. clausa as the only tree "of any stature" in the scrub and included quantitative data and importance values as measures of stand characteristics. Her research complemented Laessle's (1942) earlier succesional studies and suggested that xeric communities under continued fire suppression would eventually become similar to mesic communities.

From the literature cited, two important observations emerge: 1) similarities between plant species of scrubs

origins and successional relationships of the scrub, and 2) the occurrence of scrub appears to be restricted to ancient sand dunes along Pleistocene shorelines (Kurz, 1942; Laessle, 1958, 1967).

This study provides a quantitative analysis of selected sand pine scrubs of east-central Florida with an emphasis on structural comparisons within tree, shrub and ground level plant layers.

METHODS

Study Area.-Potential scrub sites, based on the occurrence of St. Lucie fine sand, were identified on soil maps and county road maps. The study sites were limited to Polk, Orange, Seminole, Volusia, Indian River and Brevard counties, which included interior and coastal sites.

The potential study sites were further narrowed by site visits. Sample sites had to occupy more than 2 ha. and be relatively uniform in physiognamy throughout the tree, shrub, and ground layers. Sites with obvious disturbances (e.g., fire damage, tree removal, or grazing histories) were rejected and the nearest undisturbed site was used. Final site locations are shown in Fig. 1. Descriptive information on the sites is given in Table 1. Geological formations associated with the sites are summarized in Table 2.

Sampling.-Trees were woody plants with a diameter breast height (dbh) of greater than or equal to 2.54 cm; shrubs were woody plants greater than or equal to 50 cm in height with a dbh less than 2.54 cm; plants less than 50 cm in height were classed as ground layer species (herbs and woody seedlings and/or root sprouts).

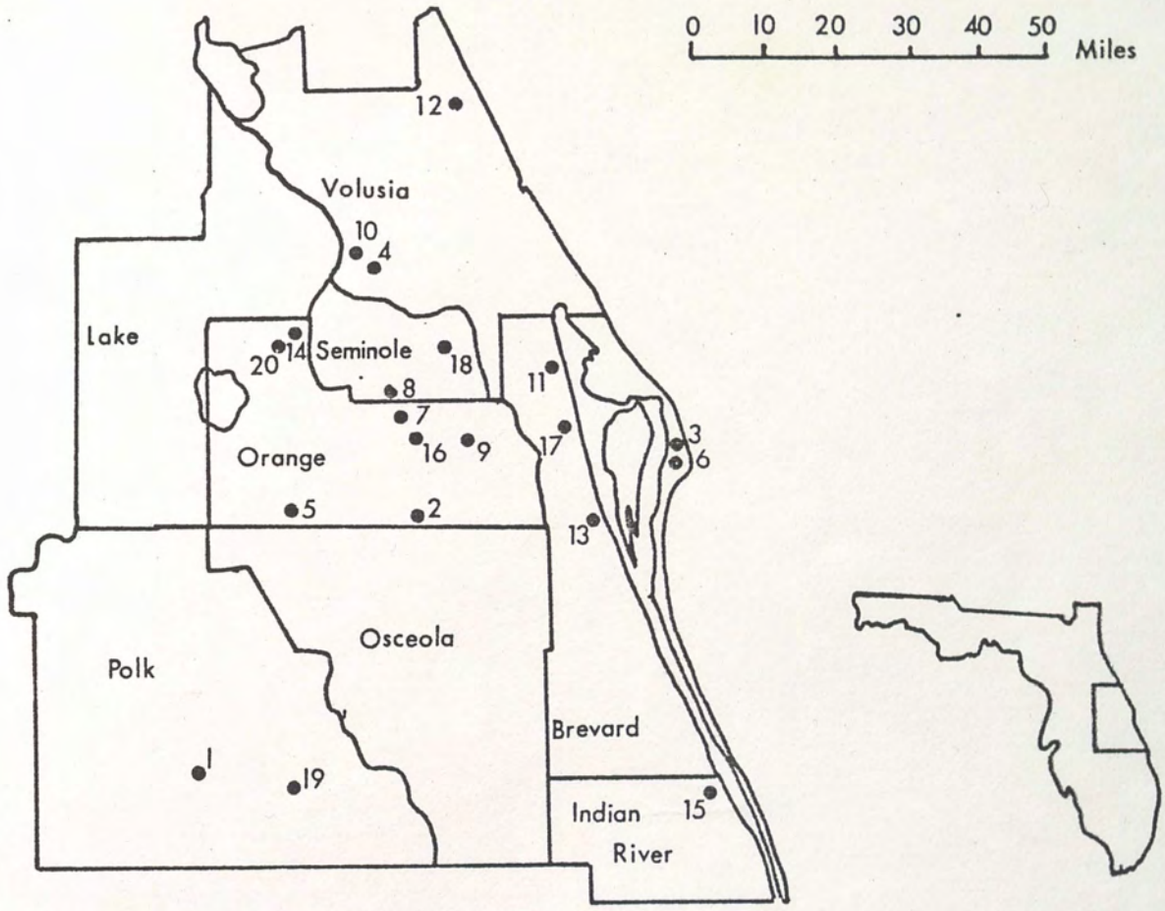

Fig. 1.-Location of study sites in east-central Florida

Table 1.-Location and soil type of sand pine scrub study sites in east-central Florida

Stand	Local name	County	Range: Township: Section	Soil Type[2]
1	Alturus	Polk	R 26E: T 30S: S 27	St. Lucie fine sand
2	Boggy Creek	Orange-Osceola[1]	R 31E: T 24S: S 31	St. Lucie fine sand
3	Cape Rosemary	Brevard	R 37E: T 22S: S 25	Pomello sand
4	Debary	Volusia	R 30E: T 18S: S 36	Paola fine sand
5	Disney	Orange	R 28E: T 24S: S 27	St. Lucie fine sand
6	Dune Scrub	Brevard	R 37E: T 22S: S 25	Pomello sand
7	FTU Scrub	Orange	R 31E: T 22S: S 3	St. Lucie fine sand
8	Iron Bridge	Seminole	R 31E: T 21S: S 33	St. Lucie fine sand
9	Jingle Road	Orange	R 32E: T 22S: S 7	St. Lucie fine sand
10	Our Lady of the Lake	Volusia	R 30E: T 18S: S 32	St. Lucie fine sand
11	Mims	Brevard	R 35E: T 21S: S 31	Paola fine sand
12	Port Orange	Volusia	R E: T S: S[3]	Paola fine sand
13	Rockledge	Brevard	R 36E: T 24S: S 33	Paola fine sand
14	Rock Springs Run	Orange	R E: T S: S[3]	St. Lucie fine sand
15	Roseland	Indian River	R 38E: T 30S: S 25	Paola fine sand
16	Rt. 50 Scrub	Orange	R 31E: T 22S: S 22	St. Lucie fine sand
17	Rt. 405	Brevard	R 35E: T 22S: S NA	Paola fine sand
18	Seminole Woods	Seminole	R 32E: T 20S: S 21	St. Lucie fine sand
19	Tiger Creek	Polk	R 29E: T 30S: S 3	St. Lucie fine sand
20	Wekiva	Seminole	R 29E: T 21S: S 5	St. Lucie fine sand

1/ Site on Orange and Osceola county line
2/ Classification based on county soil surveys: Baldwin, et. al., 1980; Furman, et. al., 1966; Huckle, et. al., 1974; Leighty, et. al., 1960; Readle et. al., 1979
3/ undetermined range, township and section

Table 2.-The relationship of sand pine scrub study sites in east-central Florida to geological formations (Vernon and Puri, 1964). Further details on stands are give in Table

	Stand numbers by geologic series, formation and member				
	Recent and Pleistocene		Pleistocene	Miocene	
County	Lower marine and estuarine terrace deposits	Lake Flint	Anastasia	Bone Valley	Fort Preston
Volusia	12				4,10
Seminole					3,18
Orange	2,5,9,14,16				7,20
Brevard		3,6	11,13,17		
Polk				1	19
Indian River			15		

The "Point Centered Quarter", PCQ, method was the sampling technique employed for trees and shrubs (Cottam and Curtis, 1956). Data were collected at 30 points located at regular intervals along compass lines within each stand. At each point, four quarters were established by placing two, 1-meter sticks at right angles to one another. Recorded at each point and quarter were: 1) the distance to the nearest tree and shrub, 2) species identification, and 3) the dbh (at 137 cm height) of the nearest tree.

The PCQ method was not used to sample the ground layer vegetation owing to the fact that distance methods are useful only in communities with random distributions. Ground layer distributions are commonly clumped or contagious (Mueller-Dombois and Ellenberg, 1974). Consequently, the ground layer data were sampled by centering a plot (2.0 m x 0.5 m) over each sample point and counting the number of rooted stems for each species.

Plants were identified and named according to Wunderlin (1982). Persea borbonia within the text refers to the variety humilis.

Data Analysis.-Calculations were performed with a program written in Applesoft Basic for use on an Apple II Plus and Apple IIe.

The parameters obtained by the PCQ method included density, basal area and frequency by species. These values were calculated as described by Mueller-Dombois and Ellenberg (1974). Absolute values of density, basal area and frequency were converted to relative values.

The formulas used to determine these values were:

$$\text{Rel. density} = \frac{\text{no. individuals of species}}{\text{total individuals of all species}} \times 100$$

$$\text{Rel. frequency} = \frac{\text{frequency of species}}{\text{sum of freq. values for all species}} \times 100$$

$$\text{Rel. dominance} = \frac{\text{basal area of species}}{\text{total basal area of all species}} \times 100$$

These parameters were used to calculate an "Importance Value" (IV) upon the tree, shrub, and ground layer species at each sample site. IV for trees was the sum of Relative Frequency + Relative Density + Relative Dominance, and could reach a maximum of 300. IV for shrubs and herbs was calculated as the sum of the Relative Frequency and Relative Density with a possible maximum of 200.

Community similarity among stands was evaluated for the tree, shrub and ground layer vegetation. Sorenson's index of similarity was computed as follows:

$$I_s = [2c/ (a + b)] \times 100$$

where a= total number of species in sample a; b= total

number of species in sample b; and c= number of species common to both a and b (Mueller-Dombois and Ellenberg, 1974).

RESULTS

Tree layer.-Summary statistics for 7 species designated as trees and having importance values equal to or greater than 1.0 are in Table 3. Pinus clausa was the dominant species (IV = 158.41) and the following four species shared similar mean IV values: Quercus geminata (28.46), Lyonia ferruginea (28.30), Quercus myrtifolia (24.66) and Q. chapmanii (23.12). Carya floridana (2.00) and Q. laevis (1.48) were minor elements in the tree layer. Species that were present in the tree layer with IV values less that 1.0 included Q. inopina, L. fruticosa, Persea borbonia, Ilex ambigua, Osmanthus americana, Pinus elliottii, and Chionanthus pygmaea. Trees were absent from sites 3 and 18 on the Canaveral Peninsula of Brevard County. Individual stand data for the tree layer are given in Appendix tables 1-18 and include density, frequency and basal area by species.

Pinus clausa had an average density of 6.72/100 m^2 with an average basal area of 2526.48 cm2/100 m^2 (Table 3). Pinus clausa ranged in density from 1.18 (site 16) to 15.09 (site 4) (Appendices 14 and 3). The highest basal area (10389.98 cm2/100 m^2) was recorded at site 10

Table 3.-Mean absolute and relative values of density, frequency, and basal area of tree layer plants (dbh > 2.54cm) in sand pine scrub (n=20) of Central Florida. Species with importance values < 1 are not listed.

Species	Mean no./100m^2	Mean frequency	Mean basal area (cm/100m^2)	Relative density	Relative frequency	Relative dominance	Mean IV	IV rank
Pinus clausa	6.72	0.69	2526.48	43.83	35.28	79.28	158.41	1
Quercus geminata	1.39	0.29	56.24	19.50	12.78	4.05	28.46	2
Lyonia ferruginea	2.37	0.33	58.62	12.08	14.66	1.56	28.30	3
Quercus myrtifolia	2.33	0.27	67.69	10.91	11.49	2.25	24.66	4
Quercus chapmanii	1.56	0.27	66.47	9.04	11.88	2.19	23.12	5
Carya floridana	0.13	0.02	3.62	0.83	0.99	0.17	2.00	6
Quercus laevis	0.06	0.01	7.08	0.41	0.79	0.27	1.48	7

in Volusia County. Density and basal area of P. clausa were significantly correlated (r = 89.58; p. 001).

Chionanthus pygmaea occurred at site 1 in Polk county with a density of .14/100 m^2 and a basal area of .83 cm2/100 m^2 (Appendix 1). The average density and basal area for C. paygmaea were .01 and .04, respectively. Chionanthus pygmaea is under review for listing under the Endangered Species Act by the Office of Endangered Species, US Fish and Wildlife Service. It is not listed by Laessle (1958) as a characteristic scrub species and appears to be limited to Highland and Polk counties.

Quercus laevis, typically listed as a sandhill dominant, occurred at sites 2 and 19. The average density was .06/100 m^2 and the average basal area was 7.08 cm2/100 m^2 (Table 3). The species' IV averaged 1.48 and was never an important component of the sand pine scrubs sampled.

Quercus inopina has only recently been confirmed as a species (Johnson and Abrahamson, 1982). It occurred at sites 1 (IV = 12.84) and 8(IV = 2.25) and had an overall average IV of .75. Regarding IV, Q. inopina ranked fifth among 10 species at site 1, fifth among seven species at site 8, and ninth overall.

Carya floridana occurred in sites 13, 17, and 19, with respective IVs of 24.06, 13.2, and 2.71. The

average IV for C. floridana was 2.02 and it ranked sixth among the tree species (Table 3). Carya floridana (mean basal area = 3.62 cm2/100 m^2, density = .13/100 m^2) is described as a "white sand" species by Wunderlin (1982), though C. glabra is listed as a sand pine scrub species by Laessle (1958) and Veno (1976).

Pinus elliottii occurred at site 15 in Indian River County (Appendix 13); however, the species is typically found in pine flatwoods rather than sand pine scrub. The pine's density was .06/100 m^2 and the basal area was 31.52 cm2/100 m^2. It ranked thirteenth of the fourteen tree species (IV = 5.55).

Basal area accounted for 80.0% (r = .894) of the variation in IV of P. clausa and 88.7% (r = .942) of the IV variation in the tree layer as a whole. Density accounted for 95.3% (frequency, 97.4%) of the variation in IV of the tree layer vegetation. Basal area was not highly correlated with density or frequency in a comparison of stands. The phenomenon of self-thinning (Daubenmire, 1968) was not apparent given the positive slope (.778) of the regression of tree density on basal area.

Species that occurred in 80% or more of the stands of a given plant community may be considered "constants" (Daubenmire, 1968). By this standard the constants of

Table 4.-Constancy of plant species in tree layer of sand pine scrubs in Central Florida (n=20)

Species	No. sites	Constancy (%)
Pinus clausa	18	90
Quercus geminata	18	90
Quercus chapmanii	16	80
Quercus myrtifolia	16	80
Lyonia ferruginea	15	75
Ilex ambigua	4	20
Persea borbonia	3	15
Carya floridana	3	15
Lyonia fruticosa	2	10
Quercus inopina	2	10
Quercus laevis	2	10
Osmanthus americana	2	10
Chionanthus pygmaea	1	5.0
Pinus elliottii	1	5.0

Rable 5.-Percent similarity among stands of sand pine scrub in east-central Florida based on the tree layer vegetation (dbh > 2.54cm)

Stand No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1																			
2	70.6																		
3																			
4	82.4	85.7																	
5	57.1	72.7		7.27															
6																			
7	66.7	83.3		83.3	88.8														
8	70.6	71.4		71.4	72.7		83.3												
9	66.7	83.3		83.3	88.8		100	83.3											
10	62.5	76.9		76.9	80.0		90.0	92.3	90.9										
11	57.1	72.7		72.7	75.0		88.8	72.7	88.8	80.0									
12	66.7	83.3		83.3	88.8		100	83.3	100	90.9	88.8								
13	53.3	66.7		66.7	66.7		80.0	66.7	80.0	72.7	55.7	80.0							
14	66.7	66.7		83.3	66.7		80.0	66.3	80.0	72.7	88.8	80.0	60.0						
15	53.3	50.0		50.0	66.7		60.0	50.0	60.0	54.5	44.4	60.0	60.0	40.0					
16	66.7	83.3		83.3	88.8		100	83.3	100	90.9	88.8	100	100	80.0	60.0				
17	62.5	76.9		76.9	80.0		90.9	76.9	90.9	83.3	80.9	90.9	90.9	36.4	54.5	7.27			
18	66.7	83.3		83.3	88.8		100	83.3	100	90.9	88.8	100	80.0	80.0	60.0	100	90.9		
19	50.0	79.9		61.5	60.0		72.7	61.5	72.7	66.7	60.0	72.7	90.9	54.5	54.5	72.7	66.7	72.7	
20	75.0	92.3		92.3	80.0		90.9	76.9	90.9	83.3	80.0	90.9	72.6	72.7	54.5	90.9	83.3	90.9	66.7

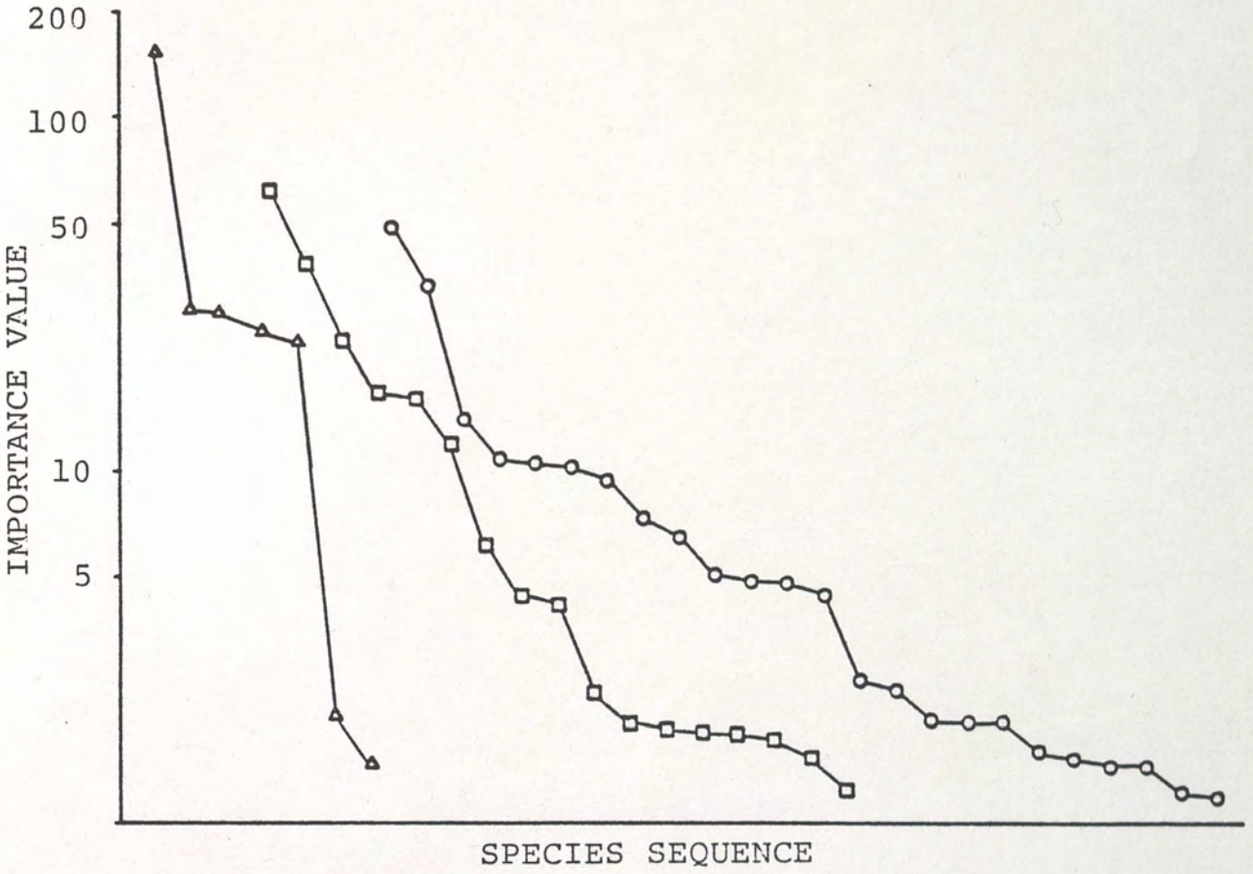

Fig. 2.- Dominance-diversity curves for trees (dbh 2.54 çm), shrubs (50 cm in height and 2.54 cm), and ground-level plants (50 cm in height) in sand pine scrubs of central Florida (n=20). Symbols are triangle for trees, square for shrubs, and circle for ground-layer

the 20 study sites were P. clausa, Q. geminata, Q. chapmanii, and Q. myrtifolia (Table 4). Lyonia ferruginea was present at 75% of the sites and the remaining nine species occurred at less than 20% of the sites. No species occurred at all 20 sites, although there was 14.3% similarity among the 18 sites at which trees were present. All tree-layer species were represented in the shrub layer as seedlings or root sprouts.

Similarity among stands based on tree layer vegetation was evaluated with the Sorensen's index (Mueller-Dombois and Ellenberg, 1974). The mean similarity was 76.47 with a variance of 13.91 (Table 5). Thirty (19.6%) of the pairwise comparisons yielded similarity values of 90% or greater.

Relative importance of tree layer species is plotted against increasing rank in Fig. 2. A semi-log graph (Whittaker, 1965) indicates the separation of the species into three distinct classes. Pinus clausa was the single most dominant. Quercus myrtifolia, Q. geminata and Q. chapmanii were intermediate co-dominants, and C. floridana and Q. laevis comprised the minor dominants. The slope of the exponential curve is steep.

Shrub layer.-Among the 20 sample sites, 32 species were recorded in the shrub layer. Of these species, 17 had IVs greater than 1.0 (Table 6). Data for individual stands are given in Appendices 19-38.

The most dominant species in the shrub layer was Q. myrtifolia (IV = 62.88) (Table 16). Other dominants included Serenoa repens, Q. geminata, Q. chapmanii, Lyonia ferruginea, and Ceratiola ericoides. Of these species, only S. repens and C. ericoides did not appear in the tree layer. Examples of species with IVs less than 1.0 were Pinus clausa, Ilex ambigua, Quercus laevis and Asimina obovata.

Constancy of plants in the shrub layer is summarized in Table 7. Those species with a constancy of 80% or more were Quercus geminata, Q. chapmanii, Q. myrtifolia, Serenoa repens and Lyonia ferruginea. These five species were also highly ranked based on IVs (Table 6).

Ceratiola ericoides, widely regarded as a sand pine scrub indicator, occurred at nine sites with a mean IV of 11.91 and a mean density of 9.36 plants/100 m^2 (Table 6). The lowest density value was at stand 7 in Orange County (2.84), while stand 6 in Brevard County had the highest density (84.74) and lacked trees completely.

Carya floridana occurred in the shrub and tree layers at three sites and only in the shrub layers at two other

Table 6.-Mean absolute and relative values of density and frequency, mean importance value, and rank of plants (> 50.0cm in height and < 2.54cm dbh) from the shrub layer in sand pine scrubs (n=20) of Central Florida. Species with importance values < 1.0 are not listed

Species	Mean no. per 100m^2	Mean frequency	Mean rel. density	Mean rel. frequency	Mean IV	Rank
Quercus myrtifolia	84.23	.61	34.87	27.41	62.88	1
Serenoa repens	34.69	.42	17.58	18.23	35.77	2
Quercus geminata	20.50	.27	10.67	11.79	22.62	3
Quercus chapmanii	17.43	.21	7.63	9.30	16.90	4
Lyonia ferruginea	17.34	.20	7.58	8.73	16.31	5
Ceratiola ericoides	9.36	.14	6.25	5.66	11.91	6
Lyonia lucida	4.59	.06	3.26	2.40	6.16	7
Vaccinium stamineum	4.94	.05	1.88	2.58	4.45	8
Quercus inopina	3.51	.05	2.17	2.05	4.21	9
Gaylussacia frondosa	2.21	.03	1.21	1.14	2.34	10
Osmanthus americana	1.97	.03	.79	1.14	1.93	11
Palafoxia feayi	.88	.03	.75	1.12	1.86	12
Vaccinium myrsinites	1.66	.02	.75	1.08	1.83	13
Ximenia americana	1.33	.02	.67	1.07	1.82	14
Garberia heterophylla	1.12	.02	.75	.98	1.73	15
Persea borbonia	1.67	.02	.63	.90	1.52	16
Carya floridana	.68	.01	.29	.56	1.24	17

Table 7.-Constancy of plants in shrub layer of sand pine scrubs in Central Florida (n=20)

Species	No. sites	Constancy (%)
Quercus geminata	20	100
Quercus chapmanii	20	100
Quercus myrtifolia	20	100
Serenoa repens	20	100
Lyonia ferruginea	18	90
Ceratiola ericoides	9	45
Vaccinium stamineum	7	35
Carya floridana	6	30
Osmanthus americana	6	30
Ximenia americana	6	30
Lyonia lucida	6	30
Vaccinium myrsinites	6	30
Pinus clausa	5	25
Ilex ambigua	4	20
Palafoxia feayi	4	20
Garberia heterophylla	4	20
Quercus inopina	4	20
Persea borbonia	2	10
Quercus laevis	2	10
Asiminia obovata	2	10
Befaria racemosa	2	10
Gaylussacia dumosa	2	10
Lyonia fruticosa	2	10
Chionanthus pygmaea	1	5
Myrica cerifera	1	5
Polygonella polygama	1	5
Sabal etonia	1	5
Castanea pumila	1	5
Gaylussacia frondosa	1	5
Bumelia tenax	1	5
Conradina grandiflora	1	5
Opuntia compressa	1	5

sites. The mean IV for C. floridana was 1.24 and mean density was .68/100 m^2 (Table 6). Carya floridana occurred at 30% of the sites and ranked seventeenth based on IV.

Garberia heterophylla had a mean IV of 1.73 and a mean density of 1.12 (Table 6). This species ranked from fifth to ninth out of 10 species at the four sites where it was found.

Pinus clausa, the dominant tree layer species, occurred at five sites in the shrub layer and ranked eighteenth of 28 species based on IV. Its absolute density ranged from .85/100 m^2 (site 19) to 10.1/100 m^2 (stand 17) and its mean density and iv were .74/100 m^2 and .89/100 m^2, respectively.

Persea borbonia was found at sites 4 (density = 28.77/100 m^2) and 14 (density = 4.58/100 m^2). Mean density for the species was 1.67/100 m^2 and mean iv was 1.52, with a ranking of 16 (Table 6).

Some species, though having IVs less than 1.0 (and therefore excluded from Table 6) should be mentioned. Sabal etonia occurred at only site 4, with a density of 2.4/100 m^2 and an iv of 2.33. Both the mean density and IV were .12. Conradina grandiflora occurred in site 15 and ranked sixth of the 12 shrub species. Its mean IV was .48 and its mean density was .25/100 m^2. Bumelia

tenax was found in site 19 where it ranked 8 out of 14 species. Its mean IV was .11 and its mean density was .933.

Percent similarity among stands based on the shrub layer vegetation is in Table 8. The mean similarity was 62.31 with a variance of 10.76. Only 3 (15%) pairwise comparisons showed a similarity of 90% or greater.

Within each stand the relationships between density and iv ($r = .986$), frequency ($r = .975$) and density and frequency ($r = .953$) were highly correlated. No correlation was found between sites.

The dominance-diversity curve for the shrub layer indicates the presence of a greater number of species and less clearly defined classes of dominant species (Fig. 2). The curve has a lesser slope than did the tree layer.

Ground layer.-Forty-five species were identified in the ground-layer vegetation. Twenty-eight species were woody and 17 were herbaceous. Data for the stands are listed in Appendices 39-58 and summary statistics on species with IVs equal to or greater than 1.0 are in Table 9.

Based on density, woody species made up 82.32% of the ground layer plants, while 17.68% of the ground layer was composed of herbaceous species. The ground layer

Table 8.-Percent similarity among stands of sand pine scrub in east-central Florida based on the shrub layer vegetation (> 50cm in height and dbh < 2.54cm)

Stand no.																		
1																		
2	40.0																	
3	52.6	61.5																
4	64.0	63.2	44.4															
5	63.6	50.0	66.6	47.6														
6	60.0	57.1	92.3	52.6	75.0													
7	60.9	47.1	62.5	52.6	63.2	70.6												
8	52.2	58.8	62.5	63.6	73.7	70.6	80.0											
9	50.0	57.1	61.5	63.2	62.5	71.4	70.6	82.4										
10	60.9	58.8	62.5	63.6	63.2	70.6	70.0	70.0	58.8									
11	57.1	66.7	57.1	60.0	58.8	80.0	55.6	55.6	66.7	66.7								
12	52.6	61.5	66.7	55.6	66.7	76.9	75.0	75.9	92.3	62.5	71.4							
13	54.5	50.9	66.7	47.6	55.6	75.9	63.2	63.2	75.0	52.6	82.4	80.0						
14	41.7	55.6	47.1	78.3	50.9	55.6	57.1	57.1	66.7	76.2	63.2	58.8	50.0					
15	64.0	42.1	66.7	41.7	66.7	73.7	63.6	63.6	63.2	54.5	60.0	55.6	66.7	43.5				
16	54.5	62.5	66.7	66.7	66.7	75.9	84.2	84.2	75.0	73.7	70.6	80.9	63.2	70.9	66.7			
17	63.6	62.5	66.7	57.1	55.6	62.5	52.6	52.6	62.5	63.2	94.1	66.7	77.8	60.0	66.7	66.7		
18	50.0	71.4	61.5	73.7	62.5	71.4	58.8	58.8	71.4	82.4	80.0	76.9	37.5	77.8	52.6	75.0	62.5	
19	59.3	47.6	40.0	38.5	50.9	47.6	58.3	58.3	57.1	41.7	54.5	60.0	50.9	40.0	69.2	41.7	60.9	47.6
20	52.2	70.6	50.0	54.5	52.6	58.8	60.0	60.0	58.8	60.0	77.8	62.5	52.6	57.1	54.5	63.2	73.7	70.6 58.3

made up 2.82% of the total density for all vegetation and the herbaceous portion of the ground layer made up .52% of the total vegetation density.

Quercus myrtifolia was the dominant plant in the ground layer vegetation (Table 9). Woody plants were more numerous in the ground-layer, but herbaceous plants such as Smilax auriculata and Rhynchospora megalocarpa were well represented.

Quercus geminata and Q. myrtifolia occurred at all sites (Table 10). Q. chapmanii had a constancy value of 90.0% and Lyonia ferruginea occurred at 85.0% of the sample sites (Table 6). Smilax auriculata (85.0% constancy) was the only dominant herbaceous species.

Seedlings of Pinus clausa were observed at 55.0% of the sites, with a mean density of .84 plants/m^2.

The lowest IVs were those of Asimina obovata (IV = .05) and Cnidosculus stimulosus (IV = .05), both which occurred at stand 18 with densities of .003 plants/m^2.

Seedlings of Ceratiola ericoides were observed at stands 3 in Brevard County and 8 in Orange County. The overall mean IV and density was 0.805 and 0.003 plants/m^2, respectively.

Carya floridana (IV = 1.19) and Persea borbonia (IV = .999) ranked twenty-fourth and twenty-fifth among the 25 ground layer species with IVs greater than or equal to

1. Carya floridana had a density of .13 plants/m^2 and was present at two sites. Persea borbonia had a density of .06/m^2 and was found at four sites.

Quercus inopina had a density of .13 plants/m^2 and an IV of 1.51. It ranked nineteenth among the 25 ground layer species.

The percent constancy of the ground layer species ranged from 5.0 (occurred at one site) to 100.0% (present at twenty sites), with species in each percentage and no clear delineation into upper- and lower- range species (Table 10). In the herb layer, density and frequency were highly correlated (r = .976). Frequency and IV (r = .989) as well as density and IV (r = .986) were also highly correlated.

The herbaceous ground layer vegetation had a mean similarity index of 40.15 (Table 11) and a variance of 26.50. One pair-wise comparison (stand 7 vs. 8) exceeded 90% in similarity.

The dominance-diversity curve for the ground layer has the smallest slope value among the three vegetation layers and like the shrub layer, the ground layer is not separated into distinct classes as was the tree layer (Fig. 2). The mean similarity index was much lower for the ground layer species than that for both the tree and shrub layer plants though the variance was much

Table 9.-Mean absolute and relative values of density and frequency, mean importance value, and rank of plants (< 50.0cm in height) from the ground layer in sand pine scrubs (n=20) of Central Florida. Species with importance values < 1.0 are not listed

Growth form species	Mean no. per m^2	Mean frequency	Mean rel. density	Mean rel. frequency	Mean IV	Rank
Woody						
Quercus myrtifolia	4.61	.62	28.19	22.10	48.64	1
Quercus geminata	2.46	.39	17.94	15.08	32.89	2
Quercus chapmanii	.96	.19	6.43	7.31	13.84	3
Vaccinium myrsinites	.76	.15	3.21	5.27	10.45	5
Lyonia ferruginea	.80	.12	3.86	5.24	10.25	6
Pinus clausa	.84	.08	4.48	4.0	9.36	7
Gaylussacia dumosa	.77	.1	4.31	3.14	7.27	8
Licania michauxii	.68	.12	3.96	2.84	6.46	9
Serenoa repens	.19	.09	1.60	2.99	4.41	13
Lyonia lucida	.18	.08	1.11	1.41	2.52	14
Vaccinium stamineum	.14	.04	.77	1.73	2.38	15
Palafoxia feayi	.12	.05	.92	1.06	1.94	16
Gaylussacia frondosa	.12	.04	.76	1.18	1.94	16
Quercus inopina	.13	.03	.91	.58	1.45	20
Ximenia americana	.31	.04	.41	.80	1.45	20
Carya floridana	.13	.02	.80	.39	1.19	21
Herbaceous						
Smilax auriculata	.70	.19	4.49	6.09	10.59	4
Rhynchospora megalocarpa	.68	.08	2.49	2.62	5.02	5
Galactia elliotii	.36	.09	2.07	2.72	4.83	11
Panicum sp.	.35	.08	2.04	2.79	4.81	12
Selaginella arenicola	.17	.01	.93	1.00	1.93	17
Aristada stricta	.18	.04	.76	1.01	1.87	18
Smilax pumila	.10	.06	.61	1.02	1.60	19
Galactia regularis	.08	.03	.54	.79	1.45	20

Table 10.-Constancy of plants in the ground layer of sand pine scrubs in Central Florida (n=20)

Species	No. sites	Constancy (%)
Quercus geminata	20	100
Quercus myrtifolia	20	100
Quercus chapmanii	18	90
Lyonia ferruginea	17	85
Smilax auriculata	17	85
Serenoa repens	16	80
Panicum sp.	15	75
Galactia elliotii	13	65
Rhynchospora megalocarpa	13	65
Pinus clausa	11	55
Vaccinium stamineum	10	50
Vaccinium myrsinites	10	50
Licania michauxii	10	50
Lyonia lucida	8	40
Gaylussacia dumosa	8	40
Palafoxia feayi	6	30
Aristida stricta	6	30
Ximenia americana	5	25
Selaginella arenicola	5	25
Persea borbonia	4	20
Smilax pumila	4	20
Galactia regularis	4	20
Quercus inopina	3	15
Gaylussacia frondosa	3	15
Carya floridana	2	10

Table 11.-Percent similarity among stands of sand pine scrub in east-central Florida based on the ground-layer vegetation (< 50cm in height)

stand no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1																			
2	50.0																		
3	16.7	0.0																	
4	16.7	66.7	25.0																
5	37.5	22.2	40.0	44.4															
6																			
7	53.3	72.7	28.6	72.7	50.0														
8	53.3	72.7	28.6	72.7	50.0		100												
9	47.1	46.2	22.2	61.5	40.0		66.7	66.7											
10	44.4	71.4	20.0	71.4	36.4		76.9	76.9	66.7										
11	50.0	50.0	25.0	66.7	44.4		72.7	72.7	76.9	71.4									
12	63.2	53.3	18.2	43.3	33.3		71.4	71.4	75.0	82.4	80.0								
13	28.6	40.0	33.3	60.0	57.1		67.7	67.7	72.7	66.7	60.0	61.5							
14	28.6	80.0	0.0	60.0	28.6		44.4	44.4	36.4	50.0	40.0	30.8	50.0						
15	44.4	42.9	20.0	71.4	54.5		61.5	61.5	66.7	75.0	57.1	70.6	66.7	33.3					
16	57.1	47.1	15.4	58.8	28.6		62.5	62.5	55.6	63.2	70.6	80.0	40.0	26.7	63.2				
17																			
18	18.2	28.6	20.0	28.6	50.0		33.3	33.3	25.0	22.2	28.6	20.0	40.0	40.0	22.2	16.7			
19	66.7	42.9	20.0	57.1	36.4		61.5	61.5	66.7	50.0	71.4	70.6	50.0	33.3	62.5	63.2		22.2	
20	47.1	76.9	0.0	46.2	20.0		66.7	66.7	71.4	66.7	46.2	62.5	54.5	54.5	53.3	44.4		25.0	40.0

greater. No ground layer vegetation occurred in the sample plots at sites 3 and 17, and site 3 lacked tree layer vegetation as well. The ground layer vegetation is responsible for the species richness at the sites (Whittaker 1968).

DISCUSSION

Sand pine scrubs of east-central Florida typically have a tree canopy dominated by P. clausa. Another pine, P. elliotii var. densa, may occur rarely in ecotonal areas between scrub and pine flatwoods. Pinus clausa dominated the stands as to basal area and to a lesser extent in stems per unit area. In stands that were free of fire for 25-75 years, oaks (e.g., Q. geminata, Q. myrtifolia, and Q. chapmanii) achieved tree size. Lyonia ferruginea also contributed to basal area and ranked third in mean IV. Collectively, 14 species were sampled with dbh's equal to or greater than 2.54 cm at a height of 137 cm.

Pinus clausa is consistently listed throughout the literature as the dominant scrub tree. Veno (1976) and Webber (1935) described it as the only tree species of any consequence; however, Veno assigned an importance value to P. clausa that was much less than the other dominants in the tree layer. In my study, P. clausa had the largest importance value. Species identified in the tree layer in my study, but not listed by Veno or Laessle (1942), include Q. laevis, Q. inopina, L. fruticosa and C. pygmaea. Carya floridana's low relative

dominance in east-central Florida in contrast with its abundance in sand pine scrubs of other regions (Laessle, 1967; Myers, 1984).

Density and basal area of trees in east-central Florida scrubs exceeded the published values. The average tree density in my study was 1417 per ha in my study. In contrast, Veno (1976) reported 645 per ha on the Welaka Preserve, Putnam County. Lugo and Zucca (1983) gave the tree density in a sand pine forest in the Ocala National Forest, Marion County as 1218 per ha. Basal area in my study averaged 28.05 m^2 per ha, Veno (1976) reported 10.11 m^2 per ha, and Lugo and Zucca reported 11.93 m^2 per ha. My density and basal area reflected the variation of site potential and stand age among twenty sites, whereas Veno and Lugo and Zucca each studied a single site.

The absence of pine from two sample sites is unclear. Sites 3 and 6 were located on Canaveral Peninsula of Merrit Island in Brevard County and were the only sites occuring on Lake Flirt Marls of the Recent and Pleistocene series (Table 2). A single sand pine has been located between the stands; however, no seedlings are present (Stout, pers. comm.). The growth form of the pine suggests a recent change in sand depth. Kurtz (1942) described a similar growth form from a shifting

dune line in coastal west Florida. The presence of sand pine near the salt spray zone excludes salt intolerance as an explanation for the absence of the species on the Canaveral sites (Laessle, 1967). Fires may occur at intervals frequent enough to eliminate the sand pine, with a subsequent increase in the density of shrubs (Garren, 1943; Myers, in press). However, neither similarity indices nor density data suggested that the Canaveral sites had diverged from inland sites with a tree layer.

Thirty-two species of woody plants were encountered in the shrub layer. The dominant shrub was Q. myrtifolia. It occurred in every stand and achieved the highest average density and frequency among the species. Quercus geminata, Q. chapmanii, and Serenoa repens were also found in all sites. In contrast, nine species were encountered only in a single site.

Sand pine scrubs are relatively depauperate of species on either a local or regional scale. Laessle (1942) listed 50 species of vascular plants, exclusive of epiphytes and cryptogams, on the Welaka preserve, Putnam County. Only two species, Polygonella polygama and Persea borbonia var. humilis were limited to the sand pine scrub habitat. Abrahamson et. al. (1984) listed 29 species from their study plots at the Archbold

Biological Station, Highlands County. I found 53 species in sample plots among the 20 sites in central Florida. Among these species, 31 were recorded by Laessle (1942) and 26 by Abrahamson, et. al. (1984). Those species present in the southern Lake Wales Ridge sand pine scrub and absent in central Florida were Commelina erecta, Lechea cernua, and Tradescantia sp. Of these later species, only Tradescantia sp. has not been reported in central Florida sand pine scrubs (Connery, 1984). Collectively, Laessle (1942), Abrahamson et. al. (1984) and my study recorded 67 species from sample plots. Connery (1984) listed 82 species from 30 sand pine scrub sites in central Florida based on species lists accumulated by searching entire stands.

Abrahamson et. al. (1984) considered the sand pine scrub association to have two phases in the southern Lake Wales Ridge: 1) oak and 2) rosemary. The data from my study supported this classification. Eighteen sites were oak-dominated in the shrub layer, whereas two stands on Cape Canaveral were densely populated with rosemary (C. ericoides). Historically, the rosemary phase may never have been very common in east-central Florida; however, the phase does occur following severe disturbance of the scrub. For example, areas cleared or

scraped along Highway 512 opposite the University of Central Florida supported nearly solid stands of Ceratiola ericoides. These examples suggest, but do not prove, that C. ericoides may dominate local situations following extreme disturbance. Under natural circumstances, the disturbances might be in the form of a severe (hot) fire or hurricane driven sand movement. The sites on Cape Canaveral (sites 19 and 20) might very well be examples of the latter disturbance. A lack of C. ericoides may also result from frequent fires because of the 10-15 years required for the species to reach maturity (Johnson and Abrahamson, 1982).

Ground layer vegetation is poorly developed in sand pine scrubs relative to the shrub and tree layers. Most of the plants represented root sprouts or seedlings of species also well represented in the shrub and tree layers (Abrahamson et. al. 1984). Among the woody plants, Licania michauxii is an exception and occurred only in the ground-layer. Herbaceous species that appeared in more than half the stands included Smilax auriculata, Rhynchospora megalocarpa, and Galactia elliotii. Laessle (1942) listed these plants as well as Panicum patentifolium (= Dichanthelium sabulorum in Wunderlin, 1982) as characteristic of sand pine scrubs in the Welaka Area. Abrahamson et. al. (1984) reported

the same species assemblage in the oak understory phase of the Southern Lake Wales Ridge and added Dicerandra frutescens. Herbaceous plants found in east-central Florida sand pine scrubs with importance values less than 1.0 include: Andropogon floridanus, A. virginicus, Opuntia compressa, Liatris tenuifolia, Chapmannia floridana, Monotropa brittonii, Vitus rotundifolia and Cnidosculus stimulosus. Southern Lake Wales Ridge endemics absent from east-central Florida sand pine scrubs include Liatris ohlingerae, Eryngium cuneifolium, and Hypericum cumulicola (Abrahamson et. al., 1984). Other ridge endemics, viz., Lechea cernua and Stipulicida setacea have been observed in central Florida scrubs (Connery, 1984) but did not occur in sample plots.

Florida sand pine scrub is a disturbance-dependent community. Fire started by lightning is typically the disturbance that initiates the recovery process. Recovery of sand pine scrub vegetation following a fire does not follow the Clementsian paradigm of secondary succession (Clements, 1916). This traditional model requires one or more distinctive seral stages to precede the stage that is self-maintaining. A contrasting view of secondary succession was taken by Egler (1954) when he suggested that two fundamental patterns of recovery

were evident. The first pattern he called relay floristics. In this case, a series of seral stages with distinctive plant species compositions would lead to the self-maintaining community-- the Clementsian model. Egler referred to the second pattern as initial floristics. This pattern derives from the fact that all of the plant species that will appear in the recovery stages are present at the outset of succession. Sere stages become distinctive because species are lost, not added, as recovery procedes. Both the Clementsian and Egler models of succession assume distinctive seral stages to be present. Sand pine scrub appears to be exceptional in that neither model really captures the events that occur in the recovery process that follows a fire.

Succession in sand pine scrub communities is less complicated than the traditional models would suggest. In fact, it could be claimed that sand pine scrub recovers after a fire, but succession does not occur. This view is supported by the fact that plant species composition is not altered by the fire. The scrub plants simply reappear from underground roots, stems, etc. Abrahamson (1984) has experimentally confirmed these generalizations at the Archbold Biological Station. Within the scrub, however, sand pine (P.

clausa) and rosemary (C. ericoides) are exceptions in that both regenerate from seeds. Most sand pine cones in Central Florida are serotinous and open after a fire. Seeds of rosemary tend to yield seedlings after a fire, but the seeds are already present in the soil (Johnson, 1982). Regrowth of scrub in general is predictable--the pre-fire species composition reappears.

The time since the last fire in the study sites ranged from 20 to 60 years (Connery, 1984). Species composition of the sites, as measured by Sorensen's similarity index, was remarkably uniform in the tree and shrub layers with more inter-stand variation in the ground layer vegetation. These data do not suggest successional divergence into discrete seral stages as predicted by the Clementsian model of succession, but rather, support the initial floristics successional model proposed by Egler (1954). Furthermore, examination of quantitative data from individual sites does not provide any evidence of invasion of sand pine scrub community by plant species that might achieve future dominance. To the contrary, plants already present in the shrub layer, but with the potential to achieve tree stature, viz. Q. geminata, Q. myrtifolia, Q. chapmanii, and L. ferruginea, become more important in terms of basal area as the fire-free recovery period

continues. Historically, fires destroy the above ground vegetation after 30-60 years and sand pine scrub growth and development begins anew.

The initial floristics pattern of growth and development in sand pine scrub is the result of adaptation by the plants to recurring fires. Chaparral vegetation of California has also evolved the capacity for rapid recovery after fire (Keeley and Zedler, 1978). Keeley and Zedler (1978) showed that chaparral plants may sprout after a fire, reproduce from seed stored in the soil, or more rarely, combine the two modes of reproduction. Plants of the sand pine scrub tend to propagate from underground root crowns or rhizomes (Abrahamson, 1984). Sprouting plants have the advantage of nutrient reserves in storage organs, whereas obligate seeders must germinate and survive under more harsh conditions. Two exceptions to the modal dependency on sprouting among sand pine scrub dominants are P. clausa and C. ericoides. Abrahamson (1984) claims that sand pine scrubs subjected to less frequent fires tend to be dominated by these species; conversely, more frequent fires would favor sprouters.

In the absence of fire, P. clausa becomes senescent after approximately 70 years (Laessle, 1968). Thus oaks, principally Q. geminata, eventually dominate the

stand. Succession, defined as a change in species composition (Daubenmire, 1967), would occur gradually with the loss of P. clausa from the overstory. The sand scrub community following this scenario gives rise to a xeric hammock (Laessle, 1958; Monk, 1965; Veno, 1976).

CONCLUSIONS

1. Stands of sand pine scrub characterized by high similarity in plant species composition occurred on St. Lucie fine sand, Pomello sand, and Paola sand.

2. Sand pine scrubs on 3 major geological series (Recent and Pleistocene, Pleistocene, and Miocene) appeared to be structurally similar in terms of species composition and physiognamy.

3. The tree layer of 18 of 20 sites was dominated by P. clausa, Six subordinate tree species were significant in terms of density and basal area.

4. The shrub layer was dominated by Q. myrtifolia. Sixteen other shrubs had importance values greater than or equal to 1.0.

5. The ground layer was characterized by 16 woody and 8 herbaceous species. A majority of the ground layer plants were sprouts or seedlings of species found in the shrub or tree layer.

6. Similarity among sites, based on Sorensen's index, averaged 76.47% for the tree layer, 62.31% for the shrub layer, and 40.15% for the ground layer plants.

7. Dominance-diversity curves suggest the greatest niche differentiation in the ground layer and shrub layer with dominance clearly expressed in the tree layer.

8. Sand pine scrubs of east-central Florida are generally of the oak phase. The rosemary phase occurs on certain coastal sites.

9. Growth and development of plants, as opposed to succession, takes place between fire events in east-central Florida sand pine scrubs. Succession follows Egler's initial floristics model. Absence of fire, in time, would allow an alteration of dominance in the tree layer and progression toward a xeric hammock community.

LITERATURE CITED

Abrahamson, W.G., A.F. Johnson, J.N. Layne and P.A. Peroni. 1984. Vegetation of the Archbold Biological Station, Floridia: an example of the Southern Lake Wales Ridge, Florida. 47:209-250.

Abrahamson, W.G. 1984. Species responses to fire on the Florida Lake Wales Ridge. Amer. J. Bot. 71:35-43.

Baldwin, R., C.L. Bush, R.B. Hinton, H.F. Huckle, P. Nichols, F.C. Watts, and J.A. Wolfe. 1980. Soil survey of Volusia County, Florida. U.S.D.A. Soil Conservation Service. 207 p.

Clements, F.E. 1916. Plant succession: an analysis of the development of vegetation. Carnegie institution of Washington Publ. 242. Washington, D.C.

Cottam, G. and J.T. Curtis. 1956. The use of distance measures in phytosociological sampling. Ecology. 37:451-460.

Daubenmire, R. 1968. Plant communities: a textbook of plant synecology. Harper and Row, New York. 300 p.

Egler, F.E. 1954. Vegetational science concepts.I. Initial floristic composition, a factor in old-field vegetation development. Vegetatio. 412-417.

Fowler, E.D., A.E. Taylor, E.W. Knobel, S.W. Phillips, F.R. Lesh, A.L. Gray, A.T. Sweet, J.K. Edwards, H.M. Smith, R.E. Devereux, A.H. Hasty and R. Wildermuth, 1927. Soil survey of Polk County, Florida. U.S.D.A. Soil Conservation Service. 67 p.

Furman, A.L. and H.O. White. 1966. Soil Survey of Seminole County, Florida. U.S.D.A. Soil Conservation Service. 81 p.

Garren, K.H. 1943. Effects of fire on vegetation of the southeastern United States. Botanical Review. 9:617-654.

Givens, K.T., J.N. Layne, W.G. Abrahamson and S.C. White-Schuler. 1984. Structural changes and successional relationships of five Florida Lake Wales Ridge plant communities. Buil. of the Torrey Bot. Club. 111:8-18.

Harper, R.M. 1914. The geography and vegetation of northern Florida. Fla. Geol. Survey, 6th annual report. 163-437.

Harper, R.M. 1921. Geography of central Florida. 13th annual report of Florida State Geol. Survey, Tallahassee. 71-307.

Harper, R.M. 1927. Natural resources of South Florida. Florida State Geological Survey, eighteenth annual report. 27-192.

Huckle, H.F., H.D. Dollar and R.F. Pendelton. 1974. Soil survey of Brevard county, Florida. U.S.D.A. Soil Conservation Service. 123 p.

Johnson, A.F. and W.G. Abrahamson. 1982. Quercus inopina: a species to be recognized from south-central Florida. Bull. of the Torrey Botanical

Club. 109:392-395.

Kalisz, P.J. and E.L. Stone. 1984. The long-leaf pine islands of the Ocala National Forest, Florida: a soil study. Ecology. 65(6):1743-1754.

Keeley, J.E. and P.H. Zedler. 1978. Reproduction of chaparral shrubs after fire; a comparison of sprouting and seeding strategies. American Midland Naturalist. 99:142-161.

Kurz, H. 1942. Florida dunes and scrub, vegetation and geology. Florida geological survey. 23:15-159.

Laessle, A.M. 1942. The plant communities of the Welaka area. University of Florida Biological Series. IV:27-108.

Laessle, A.M. 1958. Origin and successional relationship of sandhill vegetation and sandpine scrub. Ecological Monographs. 28:361-387.

Laessle, A.M.. 1967. Relationship of sandpine scrub to former shorelines. Quarterly Journal of the Florida Academy of Sciences. 30:269-286.

Leighty, R.G., D.T. Brewer and W.R. Smith. 1960. Soil survey of Orange County, Florida. U.S.D.A. Soil Conservation Service. 63 p.

Lugo, A.E. and C.P. Zucca. 1983. Comparison of litter fall and turnover in two Florida ecosystems. Florida Scientist. 46:101-110.

Monk, C.D. 1968. Successional and environmental relationships of forest vegetation of North Central Florida. The American Midland Naturalist. 79(2):441-447.

Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley and Sons, Inc. 517 p.

Mulvania, M. 1931. Ecological survey of a Florida scrub Ecology. 12:528-540.

Myers, R.L. 1984. Fire and the dynamic relationship between Florida sandhill and sand pine scrub vegetation. In press, Bull. of the Torrey Botanical Club.

Richardson, D.R. 1977. Vegetation of the Atlantic Coastal Ridge of Palm Beach County, Florida. Florida Scientist. 40:281-330.

Readle, E.L., A.L. Moore, and W.B. Warmack. 1979. Soil survey of Osceola County area, Florida. U.S.D.A. Soil Conservation Service. 151 p.

Veno, P.A. 1976. Successional Relationships of five Florida plant communities. Ecology. 57:498-503.

Vernon, R.O. and H.S. Puri. 1964. Geologic map of Florida. Florida Board of Conservation, Division of Geology.

Whittaker, R.H. 1965. Dominance and diversity in land plant communities. Science. 147:250-260.

Webber, H.J. 1935. The Florida scrub, a firefighting association. American Journal of Botany. 22:344-361.

Appendix 1.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 1

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	1.29	15.83	.43	18.57	573.07	70.04	104.45	1
Quercus geminata	3.68	45.00	.77	32.86	189.49	23.16	101.02	2
Quercus chapmanii	1.70	20.83	.53	22.86	37.33	4.56	48.25	3
Lyonia ferruginea	.48	5.83	.17	7.14	4.43	.54	13.52	4
Quercus inopina	.41	5.00	.17	7.14	5.68	.69	12.84	5
Quercus myrtifolia	.20	2.50	.10	4.29	1.34	.16	6.95	6
Lyonia fruticosa	.14	1.67	.07	2.86	3.19	.39	4.91	7
Chionianthus pygmaea	.14	1.67	.03	1.43	.83	.10	3.2	8
Persea borbonia	.07	.83	.03	1.43	1.8	.22	2.48	9
Ilex ambigua	.07	.83	.03	1.43	1.04	.13	2.39	10

Appendix 2.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 2

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	4.36	27.50	.53	22.22	2295.89	83.56	133.28	1
Quercus chapmanii	3.70	23.33	.67	27.78	183.53	6.68	57.79	2
Quercus geminata	3.04	19.17	.43	18.06	133.63	4.86	42.09	3
Lyonia ferruginea	2.38	15.00	.37	15.28	39.22	1.43	31.71	4
Quercus myrtifolia	1.98	12.50	.30	12.50	54.11	1.97	26.97	5
Ilex ambigua	.26	1.67	.07	2.78	2.19	.08	4.52	6
Quercus laevis	.13	.83	.03	1.39	39.07	1.42	3.64	7

Appendix 3.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 4

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	15.09	58.33	.93	41.79	3919.73	96.08	196.21	1
Quercus myrtifolia	4.31	16.67	.43	19.40	91.95	2.25	38.32	2
Lyonia ferruginea	2.80	10.83	.37	16.42	32.40	.79	28.05	3
Quercus chapmanii	2.80	10.83	.37	16.42	28.14	.69	27.94	4
Persea borbonia	.43	1.67	.07	2.99	4.55	.11	4.76	5
Quercus geminata	.22	.83	.03	1.49	1.84	.05	2.37	6
Ilex ambigua	.22	.83	.03	1.49	.86	.02	2.35	7

Appendix 4.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 5

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	5.86	63.33	1.00	50.00	9129.47	99.51	212.84	1
Lyonia ferruginea	1.85	20.00	.57	28.33	14.63	.16	48.49	2
Quercus geminata	1.31	14.17	.33	16.67	25.95	.28	31.12	3
Quercus myrtifolia	.23	2.50	.10	5.00	4.71	.05	7.55	4

Appendix 5.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh $>$ 2.54 cm) at stand 7

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	1.94	43.33	.87	33.77	372.46	89.44	166.54	1
Lyonia ferruginea	1.01	22.5	.67	25.97	7.15	1.72	50.19	2
Quercus myrtifolia	.93	20.83	.53	20.78	9.50	2.28	43.89	3
Quercus geminata	.45	10.00	.37	14.29	26.22	6.30	30.58	4
Quercus chapmanii	.15	3.33	.13	5.19	1.11	.27	8.79	5

Appendix 6.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 8

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	3.75	27.5	.67	25.32	821.06	84.75	137.56	1
Quercus geminata	4.43	32.5	.73	27.85	78.64	8.12	68.46	2
Lyonia ferruginea	2.16	15.83	.53	20.25	21.31	2.20	38.29	3
Quercus chapmanii	1.48	10.83	.33	12.66	21.28	2.20	25.69	4
Quercus myrtifolia	1.59	11.67	.30	11.39	24.03	2.48	25.54	5
Quercus inopina	.11	.83	.03	1.27	1.50	.15	2.25	6
Osmanthus americana	.11	.83	.03	1.27	1.03	.11	2.21	7

Appendix 7.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 9

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	2.76	28.33	.60	23.38	1526.82	84.45	136.16	1
Lyonia ferruginea	2.03	20.83	.57	22.03	27.30	1.51	44.42	2
Quercus geminata	1.87	19.17	.43	16.88	110.13	6.09	42.14	3
Quercus myrtifolia	1.70	17.50	.50	19.48	41.16	2.28	39.26	4
Quercus chapmanii	1.38	14.17	.47	18.18	102.44	5.67	38.01	5

Appendix 8.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 10

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	7.26	41.67	.80	33.33	10389.98	87.21	162.21	1
Lyonia ferruginea	4.50	25.83	.57	23.61	480.40	4.03	53.48	2
Quercus chapmanii	2.90	16.67	.50	20.83	464.91	3.90	41.40	3
Quercus myrtifolia	1.45	8.33	.27	11.11	420.93	3.53	22.98	4
Quercus geminata	.87	5.00	.17	6.94	134.88	1.13	13.08	5
Osmanthus americana	.44	2.50	.10	4.17	22.53	.19	6.86	6

Appendix 9.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 11

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	8.00	75.83	.93	56.00	2549.79	98.75	230.58	1
Lyonia ferruginea	1.41	13.33	.37	22.00	15.95	.62	35.95	2
Quercus chapmanii	.79	7.5	.27	16.00	7.71	.30	23.80	3
Quercus geminata	.35	3.33	.10	6.00	8.60	.33	9.67	4

Appendix 10.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 12

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	9.10	65.83	1.00	49.18	1788.69	96.10	211.11	1
Lyonia ferruginea	2.42	17.50	.50	24.59	31.44	1.69	43.78	2
Quercus geminata	1.96	14.17	.47	22.95	37.89	2.04	39.15	3
Quercus myrtifolia	.23	1.67	.03	1.64	2.28	.12	3.43	4
Quercus chapmanii	.12	.83	.03	1.64	.99	.05	2.53	5

Appendix 11.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 13

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	6.24	58.33	.93	45.90	2237.59	95.14	199.38	1
Quercus geminata	1.87	17.50	.50	24.59	65.86	2.80	44.89	2
Quercus myrtifolia	1.07	10.00	.27	13.11	22.73	.97	24.08	3
Carya floridana	1.25	11.67	.23	11.48	21.56	.92	24.06	4
Quercus chapmanii	.27	2.50	.10	4.92	4.05	.17	7.59	5

Appendix 12.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 14

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	14.26	80.83	1.00	61.22	3610.34	92.67	234.73	1
Lyonia ferruginea	1.62	9.17	.27	16.33	21.99	.56	26.06	2
Quercus chapmanii	1.03	5.83	.20	12.24	257.61	6.61	24.69	3
Quercus geminata	.44	2.5	.10	6.12	4.27	.11	8.73	4
Persea borbonia	.29	1.67	.07	4.03	1.49	.04	5.79	5

Appendix 13.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 15

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	6.29	91.67	1.00	81.08	1528.62	97.51	270.25	1
Lyonia fruticosa	.23	3.33	.07	5.41	2.09	.13	8.87	2
Quercus geminata	.17	2.5	.07	5.41	1.96	.12	8.03	3
Quercus myrtifolia	.11	1.67	.07	5.41	3.54	.23	7.30	4
Pinus elliotii	.06	.83	.03	2.70	31.52	2.01	5.55	5

Appendix 14.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 16

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	1.18	14.17	.47	15.73	240.48	66.85	96.75	1
Quercus myrtifolia	2.29	27.50	.77	25.84	27.29	7.59	60.93	2
Quercus geminata	1.87	20.22	.60	20.22	55.65	15.47	58.20	3
Quercus chapmanii	1.53	18.33	.57	19.10	21.78	6.06	43.49	4
Lyonia ferruginea	1.46	17.50	.57	19.10	14.50	4.03	40.63	5

Appendix 15.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 17

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	25.30	8.25	1.00	65.22	1874.46	95.54	243.25	1
Lyonia ferruginea	1.79	5.83	.17	10.87	15.33	.78	17.48	2
Quercus chapmanii	1.28	4.17	.13	8.7	9.13	.47	13.33	3
Carya floridana	1.28	4.17	.10	6.52	49.37	2.52	13.20	4
Quercus myrtifolia	1.28	2.50	.10	6.52	11.68	.60	9.62	5
Quercus geminata	.26	.83	.03	2.17	2.06	.10	3.11	6

Appendix 16.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 18

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	9.10	15.83	.37	16.42	3502.14	80.54	112.80	1
Quercus myrtifolia	20.60	35.83	.73	32.84	339.55	7.81	76.48	2
Lyonia ferruginea	20.12	35.00	.70	31.34	404.49	9.30	75.65	3
Quercus chapmanii	6.23	10.83	.33	14.93	90.14	2.07	27.83	4
Quercus geminata	1.44	2.50	.10	4.48	11.77	.27	7.25	5

Appendix 17.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 19

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	9.91	72.50	.97	52.73	2439.93	93.98	219.20	1
Quercus laevis	1.03	7.50	.27	14.55	102.66	3.95	26.00	2
Quercus geminata	1.25	9.17	.27	14.55	34.27	1.32	25.03	3
Quercus chapmanii	.91	6.67	.20	10.91	9.6	.37	17.95	4
Quercus myrtifolia	.46	3.33	.10	5.45	8.27	.32	9.11	5
Carya floridana	.11	.83	.03	1.82	1.58	.06	2.71	6

Appendix 18.-Absolute and relative values of density, frequency and basal area, importance value (IV), and rank of woody plants (dbh > 2.54 cm) at stand 20

Species	No./100m^2	Relative density	Freq.	Relative freq.	Basal area, cm^2/100m^2	Relative dom.	IV	IV rank
Pinus clausa	2.70	13.33	.33	14.08	1729.15	73.44	100.85	1
Quercus myrtifolia	8.79	43.33	.83	25.21	290.82	12.35	90.90	2
Quercus chapmanii	4.90	24.17	.60	25.35	89.66	3.81	53.33	3
Quercus geminata	2.37	11.67	.33	14.08	201.70	8.57	34.32	4
Lyonia ferruginea	1.35	6.67	.23	9.86	41.91	1.78	18.31	5
Ilex ambigua	.17	.83	.03	1.41	1.36	.06	2.30	6

Appendix 19.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 1.

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus inopina	45.70	25.83	.57	24.64	50.47	1
Serenoa repens	47.18	26.67	.50	21.74	48.41	2
Quercus myrtifolia	29.49	16.67	.27	11.59	28.26	3
Ceratiola ericoides	10.32	5.83	.23	10.14	15.98	4
Asimina obovata	8.85	5.00	.17	7.25	12.25	5
Quercus geminata	11.79	6.67	.10	4.35	11.01	6
Quercus chapmanii	5.90	3.33	.10	4.35	7.68	7
Polygonella polygama	5.90	3.33	.10	4.35	7.68	8
Palafoxia feayi	4.42	2.50	.10	4.35	6.85	9
Chionanthus pygmaea	2.95	1.67	.07	2.90	4.57	10
Lyonia ferruginea	1.47	.83	.03	1.45	2.28	11
Pinus clausa	1.47	.83	.03	1.45	2.28	12
Carya floridana	1.47	.83	.03	1.45	2.28	13

Appendix 20.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 2

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	112.36	36.67	.57	28.33	65.00	1
Serenoa repens	91.93	30.00	.63	31.67	61.67	2
Ouuercus geminata	48.52	15.83	.33	16.67	32.50	3
Vaccinium stamineum	25.54	8.33	.20	10.00	18.33	4
Quercus chapmanii	22.98	7.50	.20	10.00	17.50	5
Quercus laevis	2.55	.83	.03	1.67	2.50	6
Ilex ambigua	2.55	.83	.03	1.67	2.50	7

Appendix 21.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 3

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Ceratiola ericoides	44.87	59.17	.93	42.42	101.59	1
Quercus myrtifolia	15.17	20.00	.60	27.27	47.27	2
Quuercus geminata	7.58	10.00	.33	15.15	25.15	3
Serenoa repens	3.16	4.17	.13	6.06	10.23	4
Ximenia americana	3.16	4.17	.13	6.06	10.23	5
Quercus chapmanii	1.90	2.50	.07	3.03	5.53	6

Appendix 22.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 4

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	179.80	62.50	.93	41.79	104.29	1
Persea borbonia	28.77	10.00	.30	13.43	23.43	2
Serenoa repens	21.58	7.50	.27	11.94	19.44	3
Quercus chapmanii	11.99	4.17	.17	7.46	11.63	4
Lyonia ferruginea	11.99	4.17	.13	5.97	10.14	5
Quercus geminata	11.99	4.17	.13	5.97	10.14	6
Vaccinium stamineum	4.79	1.67	.07	2.99	4.65	7
Ilex ambigua	4.79	1.67	.07	2.99	4.65	8
Osmanthus americana	4.79	1.67	.07	2.99	4.65	9
Sabal etonia	2.40	.83	.03	1.49	2.33	10
Vaccinium myrsinites	2.40	.83	.03	1.49	2.33	11
Asimina obovata	2.40	.83	.03	1.49	2.33	12

Appendix 23.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 5

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Serenoa repens	43.52	35.83	.73	29.73	65.56	1
Quercus geminata	23.28	19.17	.43	17.57	36.73	2
Ceratiola ericoides	19.23	15.83	.37	14.86	30.70	3
Lyonia ferruginea	13.16	10.83	.33	13.51	24.35	4
Quercus inopina	10.12	8.33	.27	10.81	19.14	5
Quercus chapmanii	6.07	5.00	.17	6.76	11.76	6
Quercus myrtifolia	4.05	3.33	.10	4.05	7.39	7
Palafoxia feayi	1.01	.83	.03	1.35	2.18	8
Opuntia compressa	1.01	.83	.03	1.35	2.18	9

Appendix 24.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 6

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Ceratiola ericoides	84.74	28.33	.73	26.19	54.52	1
Quercus myrtifolia	84.74	28.33	.67	23.81	52.14	2
Serenoa repens	57.32	19.17	.60	21.43	40.60	3
Lyonia ferruginea	42.37	14.17	.40	14.29	28.45	4
Quercus geminata	22.43	7.50	.30	10.71	18.21	5
Quercus chapmanii	4.98	1.67	.07	2.38	4.05	6
Ximenia americana	2.49	.83	.03	1.19	2.02	7

Appendix 25.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 7

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	150.30	44.17	.77	33.33	77.50	1
Serenoa repens	45.37	13.33	.43	18.84	32.17	2
Lyonia ferruginea	51.05	15.00	.30	13.04	28.04	3
Quercus chapmanii	36.87	10.83	.27	11.59	22.43	4
Quercus geminata	28.36	8.33	.23	10.14	18.48	5
Osmanthus americana	14.18	4.17	.17	7.25	11.41	6
Befaria racemosa	5.67	1.67	.03	1.45	3.12	7
Lyonia lucida	2.84	.83	.03	1.45	2.28	8
Garberia heterophylla	2.84	.83	.03	1.45	2.28	9
Ceratiola ericoides	2.84	.83	.03	1.45	2.28	10

Appendix 26.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants >50 cm in height and < 2.54 cm dbh at stand 8

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus geminata	49.02	24.17	.53	21.92	46.08	1
Quercus myrtifolia	43.95	21.67	.47	19.18	40.84	2
Lyonia ferruginea	28.73	14.17	.40	16.44	30.61	3
Serenoa repens	21.97	10.83	.30	12.33	23.16	4
Quercus chapmanii	13.52	6.67	.23	9.59	16.26	5
Osmanthus americana	15.21	7.50	.20	8.22	15.72	6
Ceratolia ericoides	11.83	5.83	.13	5.48	11.31	7
Quercus inopina	10.14	5.00	.07	2.74	7.74	8
Lyonia lucida	6.76	3.33	.07	2.74	6.07	9
Ilex ambigua	1.69	.83	.03	1.37	2.2	10

Appendix 27.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 9

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Serenoa repens	79.37	32.50	.80	32.88	65.38	1
Quercus myrtifolia	77.33	31.67	.60	24.66	56.32	2
Lyonia ferruginea	28.49	11.67	.33	13.70	25.37	3
Quercus chapmanii	26.46	10.83	.33	13.70	24.53	4
Quercus geminata	20.35	8.33	.23	9.59	17.92	5
Lyonia lucida	10.18	4.17	.10	4.11	8.28	6
Osmanthus americana	2.04	0.83	.03	1.37	2.20	7

Appendix 28.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 10

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	103.06	57.50	.87	40.00	97.50	1
Quercus chapmanii	14.94	8.33	.23	10.77	19.10	2
Quercus geminata	11.95	6.67	.27	12.31	18.97	3
Serenoa repens	11.95	6.67	.17	7.69	14.36	4
Lyonia ferruginea	8.96	5.00	.17	7.69	12.69	5
Vaccinium myrsinites	8.96	5.00	.17	7.69	12.69	6
Vaccinium stamineum	8.96	5.00	.13	6.15	11.15	7
Garberia heterophylla	5.97	3.33	.07	3.08	6.41	8
Ceratiola ericoides	2.99	1.67	.07	3.08	4.74	9
Gaylussacia dumosa	1.49	.83	.03	1.54	2.37	10

Appendix 29.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants >50 cm in height and < 2.54 cm dbh at stand 11

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	192.07	61.66	.90	46.55	108.22	1
Quercus chapmanii	51.91	16.67	.40	20.69	37.36	2
Quercus geminata	25.96	8.33	.23	12.07	20.40	3
Serenoa repens	15.57	5.00	.13	6.90	11.90	4
Lyonia ferruginea	12.98	4.17	.13	6.90	11.06	5
Ximenia americana	7.79	2.50	.07	3.45	5.95	6
Vaccinium stamineum	2.60	.83	.03	1.72	2.56	7
Carya floridana	2.60	.83	.03	1.72	2.56	8

Appendix 30.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 12

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Serenoa repens	51.07	36.67	.67	33.33	70.00	1
Quercus myrtifolia	31.34	22.5	.40	20.00	42.50	2
Quercus geminata	26.70	19.17	.40	20.00	39.17	3
Lyonia lucida	22.05	15.83	.33	16.67	32.50	4
Lyonia ferruginea	4.64	3.33	.10	5.00	8.33	5
Quercus chapmanii	3.48	2.5	.10	5.00	7.50	6

Appendix 31.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 13

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	74.34	35.00	.63	28.36	63.36	1
Quercus geminata	63.72	30.00	.63	28.36	58.36	2
Quercus chapmanii	24.78	11.67	.23	10.45	22.11	3
Serenoa repens	15.93	7.50	.23	10.45	17.95	4
Lyonia ferruginea	15.93	7.50	.20	8.96	16.46	5
Ximenia americana	7.08	3.33	.13	5.97	9.30	6
Lyonia lucida	5.31	2.50	.07	2.99	5.49	7
Carya floridana	3.54	1.67	.07	2.99	4.65	8
Myrica cerifera	1.77	.83	.03	1.49	2.33	9

Appendix 32.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 14

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Gaylussacia frondosa	44.26	24.17	.50	22.73	46.89	1
Quercus myrtifolia	44.26	24.17	.47	21.21	45.38	2
Serenoa repens	39.68	21.67	.43	19.70	41.36	3
Lyonia ferruginea	29.00	15.83	.37	16.67	32.50	4
Vaccinium stamineum	9.16	5.00	.10	4.55	9.55	5
Persea borbonia	4.58	2.50	.10	4.55	7.05	6
Vaccinium myrsinites	4.58	2.50	.07	3.03	5.53	7
Quercus geminata	3.05	1.67	.07	3.03	4.70	8
Gaylussacia dumosa	1.53	.83	.03	1.52	2.35	9
Quercus chapmanii	1.53	.83	.03	1.52	2.35	10
Osmanthus americana	1.53	.83	.03	1.52	2.35	11

Appendix 33.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 15

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Serenoa repens	33.63	28.33	.70	28.38	56.71	1
Quercus myrtifolia	22.75	19.17	.40	16.22	35.38	2
Lyonia lucida	22.75	19.17	.37	14.86	34.03	3
Quercus geminata	13.85	11.67	.30	12.16	23.83	4
Ceratiola ericoides	6.92	5.83	.17	6.76	12.59	5
Conradina grandiflora	4.95	4.17	.13	5.41	9.57	6
Lyonia ferruginea	3.96	3.33	.13	5.41	8.74	7
Lyonia fruticosa	3.96	3.33	.10	4.05	7.39	8
Palafoxia feayi	1.98	1.67	.07	2.70	4.37	9
Quercus chapmanii	1.98	1.67	.03	1.35	3.02	10
Pinus clausa	.99	.83	.03	1.35	2.18	11
Ximenia americana	.99	.83	.03	1.35	2.18	12

Appendix 34.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 16

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	86.10	43.33	.90	37.50	80.83	1
Lyonia ferruginea	39.74	20.00	.50	20.83	40.83	2
Serenoa repens	29.80	15.00	.43	18.06	33.06	3
Quercus chapmanii	21.53	10.83	.27	11.11	21.94	4
Quercus geminata	9.93	5.00	.13	5.56	10.56	5
Ceratiola ericoides	3.31	1.67	.07	2.78	4.44	6
Lyonia lucida	4.97	2.50	.03	1.39	3.89	7
Osmanthus americana	1.66	.83	.03	1.39	2.22	8
Vaccinium stamineum	1.66	.83	.03	1.39	2.22	9

Appendix 35.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 17

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	166.69	55.00	.77	41.82	96.82	1
Lyonia ferruginea	37.88	12.50	.27	14.55	27.05	2
Quercus chapmanii	37.88	12.50	.27	14.55	27.05	3
Quercus geminata	20.20	6.67	.13	7.27	13.94	4
Vaccinium stamineum	12.63	4.17	.10	5.45	9.62	5
Pinus clausa	10.10	3.33	.10	5.45	8.79	6
Serenoa repens	7.58	2.50	.07	3.64	6.14	7
Carya floridana	5.05	1.67	.07	3.64	5.30	8
Ximenia americana	5.05	1.67	.07	3.64	5.30	9

Appendix 36.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 18

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	190.92	61.67	.9	45.00	106.67	1
Vaccinium stamineum	30.96	10.00	.33	16.67	26.67	2
Quercus chapmanii	25.80	8.33	.27	13.33	21.67	3
Serenoa repens	30.96	10.00	.20	10.00	20.00	4
Quercus geminata	12.90	4.17	.13	6.67	10.83	5
Vaccinium myrsinites	10.32	3.33	.10	5.00	8.33	6
Lyonia ferruginea	7.74	2.50	.07	3.33	5.83	7

Appendix 37.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 19

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Serenoa repens	22.96	22.50	.47	19.44	41.94	1
Lyonia lucida	17.01	16.67	.33	13.89	30.56	2
Palafoxia feayi	10.21	10.00	.33	13.89	23.89	3
Quercus chapmanii	11.91	11.67	.23	9.72	21.39	4
Quercus geminata	11.06	10.83	.20	8.33	19.17	5
Garberia heterophylla	5.95	5.83	.20	8.33	14.17	6
Quercus laevis	4.25	4.17	.17	6.94	11.11	7
Bumelia tenax	4.25	4.17	.13	5.56	9.72	8
Quercus inopina	4.25	4.17	.07	2.78	6.94	9
Quercus myrtifolia	3.40	3.33	.07	2.78	6.11	10
Lyonia ferruginea	2.55	2.50	.07	2.78	5.28	11
Lyonia fruticosa	2.55	2.50	.07	2.78	5.28	12
Pinus clausa	.85	.83	.03	1.39	2.22	13
Carya floridana	.85	.83	.03	1.39	2.22	14

Appendix 38.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants > 50 cm in height and < 2.54 cm dbh at stand 20

Species	No./100m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	72.43	.87	49.17	34.67	83.83	1
Serenoa repens	23.32	15.83	.50	20.00	35.83	2
Quercus chapmanii	22.10	15.00	.47	18.67	33.67	3
Quercus geminata	7.37	5.00	.20	8.00	13.00	4
Garberia heterophylla	7.37	5.00	.17	6.67	11.67	5
Lyonia ferruginea	6.14	4.17	.10	4.00	8.17	6
Ilex ambigua	3.68	2.50	.07	2.67	5.17	7
Vaccinium stamineum	2.46	1.67	.07	2.67	4.33	8
Pinus clausa	1.23	.83	.03	1.33	2.17	9
Castanea pumila	1.23	.83	.03	1.33	2.17	10

Appendix 39.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 1

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Licania michauxii	3.07	15.8	.23	7.7	39.1	1
Gaylussacia dumosa	4.67	24.1	.13	4.4	28.5	2
Quercus geminata	2.60	13.4	.37	12.1	25.5	3
Quercus myrtifolia	1.40	7.2	.27	8.8	16.0	4
Chapmannia floridana	1.00	5.2	.30	9.9	15.1	5
Aristida stricta	.93	4.8	.30	9.9	14.7	6
Andropogon floridanus	.93	4.8	.20	6.6	11.4	7
Smilax auriculata	.87	4.5	.20	6.6	11.1	8
Querus inopina	1.07	5.5	.17	5.5	11.0	9
Opuntia compressa	.60	3.1	.17	5.5	8.6	10
Panicum patentifolium	.47	2.4	.17	5.5	7.9	11
Selaginella arenicola	.47	2.4	.13	4.4	6.8	12
Rhynchospora megalocarpa	.53	2.7	.10	3.3	6.0	13
Polygonella polygama	.27	1.4	.13	4.4	5.8	14
Palafoxia feayi	.40	2.1	.10	3.3	5.4	15
Liatris tenuifolia	.07	.4	.03	1.1	3.7	16
Ximenia americana	.07	.4	.03	1.1	1.5	17

Appendix 40.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 2

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	6.47	39.8	1.13	36.9	76.7	1
Quercus geminata	5.73	35.2	.57	18.5	53.7	2
Quercus chapmanii	1.07	6.6	.23	7.6	14.2	3
Smilax auriculata	.60	3.7	.27	8.7	12.4	4
Vaccinium stamineum	.60	3.7	.17	5.4	9.1	5
Rhynchospora megalocarpa	.40	2.5	.17	5.4	7.9	6
Serenoa repens	.33	2.0	.17	5.4	7.4	7
Gaylussacia dumosa	.27	1.6	.10	3.2	11.6	8
Panicum patentifolium	.13	.8	.03	1.1	4.1	9
Vaccinium myrsinites	.20	1.2	.07	2.2	3.4	10
Ilex ambigua	.20	1.2	.07	2.2	3.4	10
Smilax pumila	.13	.8	.03	1.1	1.9	11
Chapmannia floridana	.07	.4	.03	1.1	1.5	12
Gaylussacia frondosa	.07	.4	.03	1.1	1.5	12

Appendix 41.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 3

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Vaccinium myrsinites	5.07	42.9	.53	29.6	72.5	1
Lyonia ferruginea	2.67	22.6	.13	7.4	30.0	2
Quercus geminata	1.33	11.3	.33	18.5	29.8	3
Quercus myrtifolia	0.67	5.7	.17	9.3	15.0	4
Ceratiola ericoides	0.60	5.1	.17	9.3	14.4	5
Quercus chapmanii	0.47	4.0	.13	7.4	11.4	6
Serenoa repens	0.40	3.4	.13	7.4	10.8	7
Ximenia americana	0.40	3.4	.10	5.6	9.0	8
Galactia elliotii	0.13	1.1	.07	3.7	4.8	9
Licania michauxii	0.07	0.6	.03	1.8	2.4	10

Appendix 42.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants <50 cm in height at stand 4

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	9.80	51.2	.93	35.9	87.1	1
Licania michauxii	1.80	9.4	.10	3.8	13.2	2
Galactia elliotii	1.53	8.0	.13	5.1	13.1	3
Lyonia ferruginea	1.07	5.6	.17	6.4	12.0	4
Persea borbonia	.93	4.9	.17	6.4	11.3	5
Andropogon virginica	.87	4.5	.13	5.1	9.6	6
Quercus chapmanii	.60	3.1	.17	6.4	9.5	7
Quercus geminata	.60	3.1	.17	6.4	9.5	7
Vaccinium stamineum	.40	2.1	.17	6.4	8.5	8
Smilax auriculata	.40	2.1	.10	3.8	5.9	9
Serenoa repens	.20	1.0	.10	3.8	4.8	10
Smilax pumila	.33	1.7	.07	2.6	4.3	11
Ilex ambigua	.27	1.4	.07	2.6	4.0	12
Panicum patentifolium	.20	1.0	.07	2.6	3.6	13
Rhynchospora megalocarpa	.13	.7	.07	2.6	3.3	14

Appendix 43.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 5

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus geminata	3.67	57.3	.43	46.5	103.8	1
Unknown herb	.33	5.2	.17	17.9	23.1	2
Quercus chapmanii	.53	8.3	.07	7.2	15.5	3
Smilax auriculata	.27	4.2	.07	7.2	11.4	4
Quercus mytifolia	.47	7.3	.03	3.5	10.8	5
Lyonia ferruginea	.20	3.1	.07	7.2	10.3	6
Palafoxia feayi	.40	6.2	.13	3.5	9.7	7
Quercus inopina	.33	5.2	.03	3.5	8.7	8
Sereona repens	.07	1.0	.03	3.5	4.5	9
Pinus clausa	.07	1.0	.03	3.5	4.5	9
Galactia elliotii	.07	1.0	.03	3.5	4.5	9

Appendix 44.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 6

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	5.07	35.9	.73	28.6	6.5	1
Quercus geminata	3.87	27.4	.53	20.8	4.8	2
Lyonia ferruginea	2.00	14.1	.27	10.4	2.5	3
Licania michauxii	1.00	7.1	.07	2.6	9.7	4
Ximenia americana	.40	2.8	.17	6.5	9.3	5
Quercus chapmanii	.47	3.3	.13	5.2	8.5	6
Serenoa repens	.13	.9	.07	2.6	3.5	7
Vaccinium myrsinites	1.20	8.5	.60	23.4	3.2	8

Appendix 45.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 7

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	7.20	40.1	.70	22.1	62.2	1
Galactia elliotii	1.67	9.3	.53	16.8	26.1	2
Quercus geminata	2.33	13.0	.40	12.6	25.6	3
Quercus chapmanii	1.47	8.2	.27	8.4	16.6	4
Gaylussacia dumosa	1.00	5.6	.30	9.5	15.1	5
Lyonia ferruginea	1.47	8.2	.20	6.3	14.5	6
Palafoxia feayi	.47	2.6	.20	6.3	8.9	7
Rhynchospora megalocarpa	.60	3.3	.10	3.2	6.5	8
Bumelia tenax	.67	3.7	.07	2.1	5.8	9
Vaccinium stamineum	.33	1.8	.07	2.1	3.9	10
Osmanthus americana	.20	1.1	.07	2.1	3.2	11
Persea borbonia	.13	.7	.07	2.1	5.8	12
Smilax auriculata	.07	.4	.03	1.0	1.4	13
Vaccinium myrsinites	.07	.4	.03	1.0	1.4	13
Licania michauxii	.07	.4	.03	1.0	1.4	13
Opuntia compressa	.07	.4	.03	1.0	1.4	13
Panicum patentifolium	.07	.4	.03	1.0	1.4	13
Lyonia lucida	.07	.4	.03	1.0	1.4	13

Appendix 46.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants <50 cm in height at stand 8

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus geminata	5.2	32.4	.57	22.1	54.5	1
Quercus myrtifolia	3.4	21.2	.37	14.3	35.5	2
Smilax auriculata	1.27	7.9	.37	14.3	22.2	3
Galactia elliotii	1.00	6.2	.27	10.4	16.6	4
Gaylussacia dumosa	.93	5.8	.20	7.8	13.6	5
Quercus inopina	1.25	7.8	.07	2.6	10.4	6
Quercus chapmanii	.47	2.9	.13	5.2	8.1	7
Lyonia ferruginea	1.33	.8	.20	7.8	8.6	8
Serenoa repens	.27	3.9	.10	1.7	5.6	9
Lyonia lucida	.33	2.1	.07	2.6	4.7	10
Ilex ambigua	.13	.8	.07	2.6	3.4	11
Rhynchospora megalocarpa	.13	.8	.03	1.3	2.1	12
Panicum patentifolium	.13	.8	.03	1.3	2.1	12
Persea borbonia	.07	.4	.03	1.3	1.7	13
Ceratiola ericoides	.07	.4	.03	1.3	1.7	13
Osmanthus americana	.07	.4	.03	1.3	1.7	13

Appendix 47.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants <50 cm in height at stand 9

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus geminata	4.53	33.8	.50	20.8	54.6	1
Quercus myrtifolia	2.60	19.4	.33	13.9	33.3	2
Quercus chapmanii	2.07	15.4	.37	15.3	30.7	3
Lyonia ferruginea	1.20	8.9	.13	5.5	14.5	4
Sereona repens	.47	3.5	.20	8.3	11.8	5
Lyonia lucida	.60	4.5	.17	7.0	11.5	6
Smilax auriculata	.33	2.5	.17	7.0	9.5	7
Galactia elliotii	.40	3.0	.13	5.5	8.5	8
Pinus clausa	.20	1.5	.10	4.2	5.7	9
Monotropa brittonii	.33	2.5	.03	1.4	3.9	10
Panicum patentifolium	.13	1.0	.07	2.8	3.8	11
Rhynchospora megalocarpa	.13	1.0	.07	2.8	3.8	11
Osmanthus americana	.13	1.0	.03	1.4	2.4	12
Vaccinium stamineum	.13	1.0	.03	1.4	2.4	12
Aristida stricta	.07	.5	.03	1.4	1.9	13
Calamintha coccinea	.07	.5	.03	1.4	1.9	13

Appendix 48.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 10

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	6.60	34.9	1.80	41.6	76.6	1
Gaylussacia dumosa	3.33	17.7	.70	16.2	33.9	2
Vaccinium myrsinites	2.07	10.9	.47	10.8	21.8	3
Licania michauxii	1.60	8.5	.17	3.9	12.4	4
Smilax auriculata	1.67	8.9	.33	.7	9.6	5
Quercus chapmanii	1.13	6.0	.13	3.1	9.1	6
Quercus geminata	.53	2.8	.17	3.9	6.7	7
Galactia regularis	.47	2.5	.13	3.1	5.6	8
Rhynchospora megalocarpa	.40	2.1	.07	1.6	3.7	9
Galactia elliotii	.20	1.1	.10	2.3	3.4	10
Lyonia ferruginea	.20	1.1	.07	1.6	2.7	11
Panicum patentifolium	.27	1.4	.03	.8	2.2	12
Smilax pumila	.13	.7	1.03	.8	1.5	13
Pinus clausa	.07	.4	.03	.8	1.2	14
Vaccinium stamineum	.07	.4	.03	.8	1.2	14
Liatris tenuifolia	.07	.4	.03	.8	.8	15
Lyonia fruticosa	.07	.4	.03	.8	.8	15

Appendix 49.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 11

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	6.73	33.6	.70	20.8	54.4	1
Pinus clausa	3.53	17.6	.57	16.9	34.5	2
Quercus chapmanii	1.93	9.6	.43	12.9	22.5	3
Quercus geminata	2.07	10.3	.33	9.9	20.2	4
Licania michauxii	1.93	9.6	.23	6.9	16.5	5
Panicum patentifolium	.80	4.0	.17	5.0	9.0	6
Vaccinium myrsinites	.80	4.0	.17	5.0	9.0	6
Smilax auriculata	.33	1.7	.17	5.0	6.7	7
Lyonia ferruginea	.33	1.7	.17	5.0	6.7	7
Rhynchospora megalocarpa	.60	3.0	.10	3.0	6.0	8
Galactia elliotii	.27	1.3	.10	3.0	4.3	9
Aristida stricta	.20	1.0	.07	2.0	3.0	10
Vaccinium stamineum	.33	1.7	.10	3.0	2.0	11
Liatris tenuifolia	.13	.7	.03	1.0	1.7	12
Serenoa repens	.07	.3	.03	1.0	1.3	13

Appendix 50.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 12

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus geminata	4.00	29.1	.67	25.9	55.1	1
Quercus myrtifolia	3.67	26.7	.27	10.4	37.1	2
Pinus clausa	1.73	12.6	.43	16.9	29.5	3
Smilax auriculata	1.13	8.2	.37	14.3	22.5	4
Panicum patentifolium	.93	6.8	.27	10.4	17.2	5
Gaylussacia dumosa	.60	4.5	.07	2.6	7.0	6
Lyonia lucida	.33	2.4	.10	3.9	6.3	7
Serenoa repens	.20	1.5	.10	3.9	5.4	8
Aristida stricta	.27	1.9	.07	2.6	4.5	9
Rhynchospora megalocarpa	.20	1.5	.07	2.6	4.1	10
Selaginella arenicola	.33	2.4	.03	1.3	3.7	11
Vaccinium myrsinites	.13	1.0	.03	1.3	2.3	12
Galactia regularis	.07	.5	.03	1.3	1.8	13
Liatris tenuifolia	.07	.5	.03	1.3	1.8	13
Galactia elliotii	.07	.5	.03	1.3	1.8	13

Appendix 51.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 13

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus geminata	4.33	34.6	.70	28.8	63.4	1
Quercus myrtifolia	3.47	27.7	.50	20.6	48.3	2
Quercus chapmanii	.87	6.9	.30	12.3	19.2	3
Lyonia ferruginea	1.33	10.6	.10	4.1	14.7	4
Pinus clausa	.60	4.8	.13	5.5	10.3	5
Serenoa repens	.20	1.6	.10	4.1	5.7	6
Smilax auriculata	.20	1.6	.10	4.1	5.7	6
Lyonia lucida	.33	2.6	.07	2.8	5.4	7
Panicum patentifolium	.13	1.0	.07	2.8	3.8	8
Galactia regularis	.13	1.0	.07	2.8	3.8	8
Ximenia americana	.13	1.0	.07	2.8	3.8	8
Palafoxia feayi	.07	.6	.03	1.4	2.0	9
Vitus rotundifolia	.07	.6	.03	1.4	2.0	9
Galactia elliotii	.07	.6	.03	1.4	2.0	9

Appendix 52.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 14

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	4.00	25.0	.43	20.6	45.6	1
Gaylussacia frondosa	1.93	12.1	.40	19.0	31.1	2
Quercus geminata	2.27	14.2	.23	11.1	25.3	3
Lyonia ferruginea	1.33	8.3	.33	15.9	24.2	4
Smilax pumila	1.33	8.3	.33	15.9	24.2	4
Vaccinium myrsinites	1.27	7.9	.33	15.9	23.8	5
Pinus clausa	1.33	8.3	.30	14.3	22.6	6
Smilax auriculata	.80	5.0	.30	14.3	19.3	7
Serenoa repens	.47	2.9	.13	6.3	10.2	8
Panicum patentifolium	.60	3.8	.10	4.8	8.6	9
Lyonia lucida	.27	1.7	.07	3.2	4.9	10
Persea borbonia	.13	.8	.07	3.2	4.0	11
Vaccinium stamineum	.13	.8	.07	3.2	4.0	11
Quercus chapmanii	.13	.8	.07	3.2	4.0	11

Appendix 53.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 15

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Pinus clausa	8.80	42.3	.70	24.41	66.7	1
Quercus myrtifolia	2.40	11.5	.30	10.5	22.0	2
Panicum patentifolium	1.47	7.1	.33	11.16	18.7	3
Rhynchospora megalocarpa	1.93	9.3	.20	6.97	16.3	4
Smilax auriculata	1.27	6.1	.27	9.42	15.5	5
Quercus geminata	1.13	5.4	.23	8.12	13.5	6
Vaccinium stamineum	.07	.3	.03	1.16	11.9	7
Lyonia lucida	.93	4.5	.17	5.80	10.3	8
Selaginella arenicola	.80	3.8	.13	4.64	8.4	9
Quercus chapmanii	.40	1.9	.10	3.50	5.4	10
Lyonia ferruginea	.33	1.6	.07	2.34	3.9	11
Andropogon floridanus	.20	1.0	.07	2.34	3.3	12
Unknown herb	.33	.6	.07	2.34	3.0	13
Serenoa repens	.40	1.9	.07	2.34	2.9	14
Galactia regularis	.07	.3	.03	1.16	1.5	15
Galactia elliotii	.07	.3	.03	1.16	1.5	15
Palafoxia feayi	.07	.3	.03	1.16	.5	16

Appendix 54.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 16

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	3.53	20.2	.60	21.7	49.1	1
Gaylussacia dumosa	4.60	26.3	.40	14.5	40.8	2
Quercus chapmanii	1.40	8.0	.23	8.4	16.4	3
Selaginella arenicola	1.33	7.6	.23	8.4	16.0	4
Quercus geminata	.87	5.0	.27	9.6	14.6	5
Panicum patentifolium	1.33	7.6	.07	2.4	10.0	6
Galactia elliotii	1.33	7.6	.07	2.4	10.0	6
Serenoa repens	.47	2.7	.20	7.2	9.9	7
Lyonia ferruginea	.47	2.7	.17	6.0	8.7	8
Vaccinium myrsinites	.67	3.8	.03	1.2	5.0	9
Euphorbia polyphylla	.40	2.3	.07	2.4	4.7	10
Palafoxia feayi	.40	2.3	.07	2.4	4.7	10
Aristida stricta	.27	1.5	.07	2.4	3.9	11
Liatris tenuifolia	.20	1.1	.07	2.4	3.4	12
Andropogon floridanus	.13	.7	.07	2.4	3.1	13
Heterotheca graminifolia	.07	.4	.03	1.2	1.6	14
Rhynchospora megalocarpa	.07	.4	.03	1.2	1.6	14
Licania michauxii	.07	.4	.03	1.2	1.6	14
Smilax auriculata	.07	.4	.03	1.2	1.6	14

Appendix 55.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 17

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	166.45	55.0	.77	41.8	96.8	1
Quercus chapmanii	37.83	12.5	.27	14.5	27.0	2
Lyonia ferruginea	37.83	12.5	.27	14.5	27.0	2
Quercus geminata	20.28	6.7	.13	7.3	14.0	3
Vaccinium stamineum	12.71	4.2	.10	5.5	9.7	4
Pinus clausa	9.99	3.3	.10	5.5	8.8	5
Serenoa repens	7.57	2.5	.07	3.6	6.1	6
Carya floridana	5.14	1.7	.07	3.6	5.3	7
Ximenia americana	5.14	1.7	.07	3.6	5.3	7

Appendix 56.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 18

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	9.27	54.1	.77	38.5	94.0	1
Vaccinium myrsinites	3.80	22.1	.30	15.1	37.8	2
Quercus chapmanii	1.80	10.2	.30	15.1	25.2	3
Quercus geminata	1.00	5.8	.20	10.1	16.0	4
Vaccinium stamineum	.47	2.7	.13	6.5	8.3	5
Smilax auriculata	.27	1.6	.13	6.5	8.3	5
Lyonia ferruginea	.40	2.3	.10	5.0	7.4	6
Sereona repens	.07	.4	.03	1.5	2.1	7
Ilex arenicola	.07	.4	.03	1.5	2.1	7

Appendix 57.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 19

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Licania michauxii	3.33	19.6	1.30	24.5	44.1	1
Carya floridana	2.67	16.0	.40	7.8	23.8	2
Smilax auriculata	2.27	13.4	.43	7.8	21.2	3
Quercus chapmanii	1.67	9.8	.13	2.5	12.3	4
Rhynchospora megalocarpa	1.27	7.6	.13	2.5	10.1	5
Aristida stricta	.93	5.5	.20	3.9	9.4	6
Palafoxia feayi	.73	4.3	.17	3.2	7.5	7
Pinus clausa	.47	2.8	.23	4.4	7.2	8
Quercus myrtifolia	.67	4.0	.13	2.5	6.5	9
Lyonia lucida	.67	3.9	.10	1.9	5.9	10
Selaginella arenicola	.40	2.4	.07	1.3	3.7	11
Panicum patentifolium	.27	1.6	.10	1.9	3.5	12
Galactia elliotii	.33	2.0	.07	1.3	3.3	13
Andropogon floridanus	.20	1.2	.10	1.9	3.1	14
Lyonia fruticosa	.27	1.6	.07	1.3	2.9	15
Lyonia ferruginea	.27	1.6	.03	.6	2.2	16
Quercus geminata	.13	.8	.07	1.3	2.1	17
Opuntia compressa	.13	.8	.07	1.3	2.1	18
Cnidosculus stimulosus	.07	.4	.03	.6	1.0	19
Serenoa repens	.07	.4	.03	.6	1.0	19
Asimina obovata	.07	.4	.03	.6	1.0	19
Ilex ambigua	.07	.4	.03	.6	1.0	19

Appendix 58.-Absolute and relative values of density and frequency, importance value (IV), and rank of plants < 50 cm in height at stand 20

Species	No./m^2	Relative density	Frequency	Relative frequency	IV	IV rank
Quercus myrtifolia	3.60	29.2	.57	19.3	48.5	1
Smilax auriculata	2.20	17.8	.53	18.2	38.0	2
Rhynchospora megalocarpa	1.60	13.0	.47	15.9	28.9	3
Quercus geminata	1.60	13.0	.23	7.9	20.9	4
Quercus chapmanii	1.00	8.1	.33	11.4	19.5	5
Galactia regularis	.80	6.5	.30	10.2	16.7	6
Gaylussacia frondosa	.33	2.7	.10	3.4	6.1	7
Pinus clausa	.20	1.6	.10	3.4	5.0	8
Licania michauxii	.40	3.2	.03	1.1	4.3	9
Panicum patentifolium	.13	1.1	.07	2.3	3.4	10
Lyonia ferruginea	.13	1.1	.07	2.3	3.4	10
Ilex ambigua	.13	1.1	.03	1.1	2.2	11
Garberia heterophylla	.07	.6	.03	1.1	1.7	12
Gaylussacia dumosa	.07	.6	.03	1.1	1.7	12
Unknown herb	.07	.6	.03	1.1	1.7	12