GAME FOOD PLANTS IN SLASH-LONGLEAF FLATWOODS

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Representing some 8 million acres and extending from the coastal Carolinas to central Florida, the flatwoods—including the slash-longleaf type—are important in the production of timber, forage, and upland game. Within this acreage there are 2 to 3 million acres of ponds and pond margins and about a half million acres of upland (principally oak) ridges. Generally, the slash-longleaf type is not noted for high game productivity, but when the type is well interspersed with other types, these lands may be quite productive.

Although other flatwoods types are important, this paper deals only with analyses of plant frequencies in gallberry, saw-palmetto, and wiregrass understories of the slash-longleaf overstory.

Although much attention has been given to this type from the standpoint of its timber and forage production, and some work has been directed toward understanding its capacities for game food and cover production, not much is known about the occurrence and distribution of principal and important understory plants. Harlow's work (1959) indicated the flatwoods, generally, were fairly productive for white-tails. His concern, however, was with the total flatwoods, and floristic sampling was quite extensive. Although quail habitat in slash-longleaf flatwoods is less productive than in other nearby areas, it is important (Murray and Frye, 1957). Although turkeys occur in fair abundance locally, the importance of this major forest type for the species is not fully known. Generally, the flatwoods are considered less productive for turkeys than other sections of southern Georgia and western Florida.

The data reported here represent first findings from a long-term effort to assess the effect of site preparation (mechanical scarification and burning of the total site) on the total game habitat in Georgia and Florida flatwoods. The overall study which serves as a basis for habitat work is a cooperative effort between the Southeastern Forest Experiment Station, the Georgia Forest Research Council, the Georgia Forestry Commission, and five pulp and paper companies. The major objectives of this study are to assess the long-term effects of site preparation treatments on growth and survival of planted pines. This provides an excellent opportunity to examine these disturbances in terms of habitat changes. By the use of permanent plots and vegetal analyses, both before and after site treatment, and as pine stands develop, a detailed study of changes in lesser vegetation is being made. Work on the game habitat phases of the site preparation study was made possible by the continued efforts of the Forest Game Research Committee of the Southeastern Section of the Wildlife Society to coordinate planning and scheduling work in Florida and Georgia through direct participation by the Georgia Game and Fish Commission and the Florida Game and Fresh Water Fish Commission.

Over a two-year period, 100 sample plots uniformly distributed over most of the flatwoods of southeast Georgia and northeast Florida were installed. Every sample plot consisted of five 100-foot permanently located transects, each divided into 200 6-inch plane segments for frequency sampling. A recorded frequency constitutes the occurrence of some living part of a species or group (Table I) intercepted by the 6-inch plane (segment). The transects were measured by stretching a tape in position and establishing the vertical lines between the presence of plant species or groups was recorded. Frequencies for individual transects were summarized by plots, and five transects collectively made up a unit observation. For each such unit or plot the total number of 6-inch segments intercepting each species or species group was recorded. These frequencies were in turn distributed into food preference classes based on observed and documented food habits of quail, turkey, and deer in that area (Table I).

1 USDA, Forest Service, Southeastern Forest Experiment Station.
2 Georgia Game and Fish Commission.
3 Florida Game and Fresh Water Fish Commission.

TABLE I

IMPORTANT FLATWOODS FLORA SHOWING RANKED PREFERENCE AS FOODS FOR QUAIL, TURKEY, AND DEER

Species	Preference Rating [4] Quail	Turkey	Deer
Serenoa repens (Bartr.) Small	4	2	4
Ilex glabra (L.) Gray	3	2	3
Ilex coriacea (Pursh) Chapm.	3	2	2
Ilex sp.	3	2	2
Vaccinium sp.	2	2	2
Lyonia sp.	4	4	4
Quercus virginiana Mill.	1	1	3
Quercus minima (Sarg.) Small	1	1	3
Quercus sp.	1	1	3
Myrica sp.	2	2	4
Hypericum sp.	4	4	3
Rubus sp.	3	2	2
Kalmiella hirsuta (Walt.) Small	4	4	2
Smilax sp.	3	2	1
Pinus elliottii Engelm.	2	2	4
Pinus sp. (natural)	2	2	4
Pinus sp. (planted)	2	2	4
Rhus sp.	3	3	2
Gelsimium sempervirens (L.) Ait. f.	4	4	1
Vitis sp.	3	3	2
LEGUMINOSAE	1	2	2
Trilisa sp.	4	4	1
COMPOSITAE	3	3	3
Xyris sp.	4	2	4
Centella repanda (Pers.) Small	4	2	3
Ferns	4	3	2
Aristida sp. and *Sprobolus* sp.	4	4	4
Panicum sp. and *Paspalum* sp.	1	1	3
Andropogon sp.	3	3	3

[4] *Preference Classes:*
1. Preferred
2. Staple
3. Emergency
4. Stuffing

In order to examine differences in three major understory types, plant communities were sub-sampled as strata of the flatwoods type. All plots were classed as either saw-palmetto, gallberry, or wiregrass. Communities described here actually constitute typical flatwoods understory types found at the end of pulp rotations and prior to any major disturbance (burning, discing, etc.). Numerically, samples are not in proportion to area of understory types, but were taken purposively to provide adequate estimates of understory composition and density. In order to trace development of plant communities after site disturbances, sampling along permanent transects was designed to document frequencies at two levels: 0 to 4½ feet and 4½ feet and up. A level of 4½ feet was chosen because it probably represents the normal upper limit of browsing for whitetails. Two classes of ground density used in this report were based on presampling reconnaissance and determined as precentages of area occupied by gallberry, saw-palmetto, and wiregrass: *low,* corresponds to less than 55 percent; *high,* 55 percent or more of the area occupied by gallberry, saw-palmetto and wiregrass.

RESULTS AND DISCUSSION

Tables A, B, and C (in the Appendix) show the frequency occurrence of important flora by the three major understory types considered in this analysis, and a breakdown by assigned ground cover density values. Because this is a preliminary report and we did not wish to make a detailed examination of these understory types, we only used frequencies below 4½ feet, and we combined

counts for high and low densities. General reference, only, is made to detailed findings shown in Appendix tables.

In order to show the principal distinctions between the three major understory types considered in this study, Table II presents the summary of frequencies for each principal game species by food preference class, for vegetation sampled below 4½ feet, and for combined ground cover densities. These data are reported in detail in Appendix Tables A through F.

TABLE II

DIFFERENCES IN MAJOR FLATWOODS UNDERSTORY TYPES BY PREFERENCE GROUPINGS FOR QUAIL, TURKEYS, AND DEER BY FREQUENCIES PER 100-FOOT TRANSECT

	QUAIL			
	Flatwoods Understory Type			
Preference Class	*Wiregrass*	*Gallberry*	*Saw-Palmetto*	*Mean*
Preferred	82	12	62	59
Staple	25	32	25	26
Emergency	36	119	33	51
Stuffing	166	108	168	156
TOTAL	309	271	288	292
	TURKEY			
Preferred	56	7	55	46
Staple	109	181	130	132
Emergency	21	15	14	17
Stuffing	123	68	89	87
TOTAL	309	271	288	292
	DEER			
Preferred	3	1	1	2
Staple	52	45	34	42
Emergency	88	122	88	94
Stuffing	166	103	165	154
TOTAL	309	271	288	292

Multivariate significance tests were calculated from the frequency data to test the validity of the null hypothesis that preference distributions between understory types for each of three game species did not differ. The statistic T^2 was computed to test this hypothesis (Anderson, 1958). Results indicated that between-type differences were highly significant for all types and game species with on exception; quail preferencce frequency distributions in the wiregrass and saw-palmetto understory types did not differ significantly (Table III).

On the strength of these tests we have made some tentative observations concerning the relative value of these understory types for quail, turkeys, and deer in the slash-longleaf flatwoods of north Florida and south Georgia. In general, flatwoods understory communities probably favor quail and turkeys, but may be less productive as deer range. (Frequency data which we have gathered in other major types suggest that the flatwoods have a low proportion of preferred and staple browse.) Based on our assignment of preference and these analyses, it appears that thee gallberry understory type is least productive for quail, while the more favorable palmetto and wiregrass types display essentially equal productivity. It also appears that the flatwoods understory types all produce a fair amount of "staple" and "preferred" turkey foods but that both the wiregrass and palmetto types may be somewhat more productive because of a much higher preponderance of "preferred" foods. This condition results mainly from assigning all members of the genus *Ilex* encountered in this study as staple turkey foods.

TABLE III

RESULTS OF T^2 SIGNIFICANCE TESTS FOR DIFFERENCES IN PLANT FREQUENCIES IN WIREGRASS, GALLBERRY, AND SAW-PALMETTO UNDERSTORIES FOR PRINCIPAL GAME SPECIES

QUAIL

	Understory Type		
Understory Type	*Wiregrass*	*Gallberry*	*Saw-Palmetto*
Wiregrass	..	**	N. S.
Gallberry	..	..	**

TURKEY

Wiregrass	..	**	**
Gallberry	..	..	**

DEER

Wiregrass	..	**	**
Gallberry	..	..	**

N. S. Not significant
** Significant at 1-percent level

The legumes contributed importantly to all game species, but especially quail in the wiregrass and palmetto types. However, legumes were conspicuously reduced in the gallberry type. Less abundant in the gallberry understory type were representatives of *Panicum* and *Paspalum* genera and runner oak (*Quercus minima*), especially the latter. Broadleaf grasses were most abundant in the saw-palmetto type.

Representation of "preferred" deer browse plants in the flatwoods, generally, was extremely limited. Although fair quantities of "staple" and "emergency" foods were found in all types, collectively these were more abundant in the gallberry type, because of the contribution of the genus *Ilex*, including gallberry itself.

SUMMARY

A preliminary examination of plant frequency data collected from 500 transects on 100 plots and distributed fairly uniformly throughout the flatwoods of north Florida and south Georgia has provided some interesting observations on principal differences between three understory types (wiregrass, gallberry, and saw-palmetto) for quail, turkey, and deer. Generally, it appeared that flatwoods communities might be most productive for quail and turkeys, but less for deer. Of the subtypes examined for quail, it appeared that wiregrass and palmetto were about equally productive, and the gallberry type apparently was much less productive. A similar situation was seen for turkeys, except that the palmetto type appeared more productive for turkeys than the wiregrass type; and again, gallberry was the least productive. Though all types were apparently marginal for deer, there were significant differences in the three major understories, and the wiregrass and palmetto types appeared to be somewhat more productive.

LITERATURE CITED

(1) Anderson, T. W. 1958. An introduction to multivariate statistical analysis. Wiley & Sons, New York. 374 pp.

(2) Harlow, R. F. 1959. An evaluation of white-tailed deer habitat in Florida. Florida Game and Fresh Water Fish Commission. Tech. Bul. No. 5, 64 pp.

(3) Murray, R. W. and O. S. Frye, Jr. 1957. The bobwhite quail and its management in Florida. Florida Game and Fresh Water Fish Commission. Game Bul. No. 2, 56 pp.

APPENDIX

TABLE A

THE OCCURRENCE OF IMPORTANT FLORA (PER 100-FOOT TRANSECT) IN THE WIREGRASS UNDERSTORY TYPE OF SOUTHERN FLATWOODS

	Low Density		*High Density*	
	0'-4½'	*4½' & up*	*0'-4½'*	*4½' & up*
Species	Frequency			
Serenoa repens (Bartr.) Small	29.12	0.12	34.37	0.01
Ilex glabra (L.) Gray	10.33	0.17	9.80	0.02
Ilex coriacea (Pursh) Chapm.	0.05	0.00	0.01	0.00
Ilex sp.	0.12	0.00	0.00	0.00
Vaccinium sp.	28.50	0.00	13.43	0.07
Lyonia sp.	5.15	0.00	1.50	0.00
Quercus virginiana Mill.	0.70	0.20	1.57	0.10
Quercus minima (Sarg.) Small	39.25	0.00	23.66	0.00
Quercus sp.	7.82	0.47	8.21	0.10
Myrica sp.	4.88	0.07	1.24	0.00
Hypericum sp.	0.42	0.00	0.17	0.00
Rubus sp.	3.50	0.00	0.78	0.00
Kalmiella hirsuta (Walt.) Small	0.12	0.00	0.00	0.00
Smilax sp.	2.57	0.00	1.90	0.00
Pinus elliottii Engelm.	0.00	0.00	0.16	0.00
Pinus sp. (natural)	0.18	0.00	0.23	0.03
Pinus sp. (planted)	0.00	0.00	0.00	0.00
Rhus sp.	0.03	0.00	0.00	0.00
Gelsimium sempervirens (L.) Ait. f.	0.00	0.00	0.00	0.00
Vitis sp.	0.20	0.00	0.01	0.00
LEGUMINOSAE	21.50	0.00	20.88	0.00
Trilisa sp.	0.37	0.00	0.08	0.00
COMPOSITAE	23.83	0.00	2.53	0.00
Xyris sp.	1.57	0.00	0.23	0.00
Centella repanda (Pers.) Small	0.00	0.00	0.04	0.00
Ferns	1.60	0.00	2.05	0.00
Aristida sp. and *Sprobolus* sp.	86.66	0.00	101.28	0.00
Panicum sp. and *Paspalum* sp.	15.72	0.00	5.29	0.00
Andropogon sp.	16.23	0.00	3.28	0.00

TABLE B

THE OCCURRENCE OF IMPORTANT FLORA (PER 100-FOOT TRANSECT) IN THE GALLBERRY UNDERSTORY TYPE OF SOUTHERN FLATWOODS

	Low Density		*High Density*	
	0'-4½'	*4½' & up*	*0'-4½'*	*4½' & up*
Species	Frequency			
Serenoa repens (Bartr.) Small	26.24	0.00	48.42	0.00
Ilex glabra (L.) Gray	85.38	6.98	112.00	5.82
Ilex coriacea (Pursh) Chapm.	4.56	0.51	1.50	0.00
Ilex sp.	0.00	0.00	0.44	0.00
Vaccinium sp.	32.67	0.00	20.16	0.14
Lyonia sp.	15.04	0.20	9.50	0.10
Quercus virginiana Mill.	0.04	0.00	0.08	0.00
Quercus minima (Sarg.) Small	1.84	0.00	0.72	0.00
Quercus sp.	0.00	0.00	0.00	0.00
Myrica sp.	5.67	0.00	6.06	0.74
Hypericum sp.	3.13	0.00	0.76	0.00
Rubus sp.	2.49	0.00	0.90	0.00
Kalmiella hirsuta (Walt.) Small	11.07	0.00	3.80	0.00
Smilax sp.	1.51	0.02	0.80	0.00
Pinus elliottii Engelm.	0.04	0.00	0.04	0.00
Pinus sp. (natural)	0.67	0.00	0.44	0.70
Pinus sp. (planted)	0.00	0.00	0.00	0.00
Rhus sp.	0.09	0.00	0.04	0.00
Gelsimium sempervirens (L. Ait.	0.00	0.00	0.00	0.00
Vitis sp.	0.38	0.00	0.32	0.00
LEGUMINOSAE	1.73	0.00	6.58	0.00
Trilisa sp.	0.38	0.00	0.16	0.00
COMPOSITAE	1.96	0.00	1.00	0.00
Xyris sp.	1.58	0.00	0.62	0.00
Centella repanda (Pers.) Small	0.07	0.00	0.08	0.00
Ferns	2.64	0.00	1.34	0.00
Aristida sp. and *Sprobolus* sp.	57.00	0.00	35.94	0.00
Panicum sp. and *Paspalum* sp.	8.07	0.00	4.38	0.00
Andropogon sp.	19.13	0.00	4.88	0.00

TABLE C

THE OCCURRENCE OF IMPORTANT FLORA (PER 100-FOOT TRANSECT) IN THE SAW-PALMETTO UNDERSTORY TYPE OF SOUTHERN FLATWOODS

	Low Density		*High Density*	
	0'-4½'	*4½' & up*	*0'-4½'*	*4½' & up*
Species	Frequency			
Serenoa repens (Bartr.) Small	66.47	0.03	95.39	0.28
Ilex glabra (L.) Gray	20.70	0.05	19.20	0.21
Ilex coriacea (Pursh) Chapm.	0.00	0.00	0.03	0.00
Ilex sp.	0.01	0.00	0.00	0.00
Vaccinium sp.	22.77	0.02	18.92	0.00
Lyonia sp.	15.97	0.29	15.20	0.21
Quercus virginiana Mill.	2.21	0.23	0.57	0.49
Quercus minima (Sarg.) Small	22.59	0.00	27.01	0.00
Quercus sp.	14.29	3.86	4.95	0.58
Myrica sp.	3.35	0.03	2.89	0.00
Hypericum sp.	0.62	0.00	0.12	0.00
Rubus sp.	0.20	0.00	0.01	0.00
Kalmiella hirsuta (Walt.) Small	4.86	0.00	0.00	0.00
Smilax sp.	0.57	0.01	0.73	0.05
Pinus elliottii Engelm	0.03	0.00	0.35	0.17
Pinus sp. (natural)	0.18	0.01	0.07	0.12
Pinus sp. (planted)	0.00	0.00	0.04	0.00
Rhus sp.	0.02	0.00	0.00	0.00
Gelsimium sempervirens (L.) Ait. f.	0.00	0.00	0.00	0.00
Vitis sp.	0.00	0.00	0.00	0.00
LEGUMINOSAE	6.59	0.00	6.72	0.00
Trilisa sp.	0.10	0.00	0.13	0.00
COMPOSITAE	7.93	0.00	1.81	0.00
Xyris sp.	0.85	0.00	1.37	0.00
Centella repanda (Pers.) Small	0.01	0.00	0.04	0.00
Ferns	1.65	0.00	2.95	0.00
Aristida sp. and *Sprobolus* sp.	57.30	0.00	93.94	0.08
Panicum sp. and *Paspalum* sp.	18.63	0.00	15.79	0.00
Andropogon sp.	8.77	0.00	1.23	0.00

TABLE D.—THE FREQUENCY OCCURRENCE OF IMPORTANT FLATWOODS TAXA (PER 100-FOOT INTERCEPTS) BY QUAIL FOOD PREFFERENCE CLASSES.

Preference Class	*Wiregrass*				*Gallberry*				*Saw-palmetto*			
	Low Density		*High Density*		*Low Density*		*High Density*		*Low Density*		*High Density*	
	0'-4½'	*4½' & up*	*0'-4½'*	*4½' & up*	*0'-4½'*	*4½' & up*	*0'-4½'*	*4½' & up*	*0'-4½'*	*4½' & up*	*0'-4½'*	*4½' & up*
Preferred:												
Frequency	84.98	0.67	59.62	0.20	11.69	...	11.76	...	64.32	4.10	55.04	1.07
Percent	28	66	26	63	4	...	5	...	23	91	18	49
Staple:												
Frequency	33.57	0.07	15.06	0.10	39.04	...	26.70	1.58	26.33	0.06	22.27	0.29
Percent	11	7	6	29	14	...	10	21	10	1	7	14
Emergency:												
Frequency	56.87	0.17	18.30	0.02	115.49	7.51	121.88	5.82	38.20	0.06	23.01	0.27
Percent	19	16	8	6	41	97	47	78	14	1	7	12
Stuffing:												
Frequency	125.00	0.12	139.72	0.01	117.16	0.20	100.62	0.10	147.80	0.32	209.13	0.56
Percent	42	11	60	2	41	3	38	1	53	7	68	25
TOTAL:												
Frequency	300.42	1.03	232.70	0.33	283.38	7.71	260.96	7.50	276.65	4.54	309.45	2.19
Percent	100	100	100	100	100	100	100	100	100	100	100	100

TABLE E.—THE FREQUENCY OCCURRENCE OF IMPORTANT FLATWOODS TAXA (PER 100-FOOT INTERCEPT) BY TURKEY FOOD PREFERENCE CLASSES.

Preference Class	*Wiregrass*				*Gallberry*				*Saw-palmetto*			
	Low Density		*High Density*		*Low Density*		*High Density*		*Low Density*		*High Density*	
	0'-4½'	*4½' & up*	*0'-4½'*	*4½' & up*	*0'-4½'*	*4½' & up*	*0'-4½'*	*4½' & up*	*0'-4½'*	*4½' & up*	*0'-4½'*	*4½' & up*
Preferred:												
Frequency	63.48	.68	38.74	.21	9.96	...	5.18	...	57.72	4.09	48.32	1.07
Percent	21	66	17	63	3	...	2	...	21	90	16	49
Staple:												
Frequency	102.32	.35	83.07	.12	162.60	7.51	198.04	7.40	121.72	.15	145.77	.83
Percent	34	34	36	37	57	97	76	99	44	3	47	38
Emergency:												
Frequency	41.90	...	7.86	...	24.20	...	7.58	...	18.37	...	5.99	...
Percent	14	...	3	...	9	...	3	...	7	...	2	...
Stuffing:												
Frequency	92.72	...	103.03	...	86.62	.20	50.16	.10	78.84	.29	109.39	.29
Percent	31	...	44	...	31	3	19	1	28	7	35	13
TOTAL:												
Frequency	300.42	1.03	232.70	.33	283.38	7.71	260.96	7.50	276.65	4.53	309.46	2.19
Percent	100	100	100	100	100	100	100	100	100	100	100	100

TABLE F.—THE FREQUENCY OCCURRENCE OF IMPORTANT FLATWOODS TAXA (PER 100-FOOT TRANSECT) BY DEER BROWSE PREFERENCE CLASSES (FOR 6-INCH INTERCEPTS BELOW 4½ FEET ONLY).[5]

Preference Class	*Wiregrass*		*Gallberry*		*Saw-palmetto*	
	Low Density	*High Density*	*Low Density*	*High Density*	*Low Density*	*High Density*
Preferred:						
Frequency	2.93	1.98	1.89	.96	.68	.87
Percent	1	1	1	0	0	0
Staple:						
Frequency	55.62	37.15	55.62	35.08	36.10	28.63
Percent	19	16	20	13	13	9
Emergency:						
Frequency	114.30	54.55	119.63	123.90	95.75	70.72
Percent	38	23	42	48	35	23
Stuffing:						
Frequency	127.57	139.02	106.24	101.02	144.12	209.24
Percent	42	60	37	39	52	68
TOTAL:						
Frequency	300.42	232.70	283.38	260.96	276.65	309.46
Percent	100	100	100	100	100	100

[5] Approximate normal browsing height.