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Multiresource Inventories--A Technique for Determining the Distribution and Extent of Honeysuckle on Commercial Forest Land in South Carolina

by Gerald C. Craver [1]

Abstract.--Procedures for evaluating the extent and distribution of honeysuckle in South Carolina are presented. A multiresource inventory of South Carolina's forest resources, conducted by the Renewable Resources Evaluation Work Unit (RRE), provides the necessary data. Timber stand classifications and a vegetative profile study are used for evaluation. Honeysuckle was found on over 36 percent of the total forest land in the State and in every county. Other estimates of the distribution, extent, and timber stand relations are presented.

Keywords: Vegetative profile study, vegetative inventories, *Lonicera* spp.

In 1976, South Carolina was selected as one of six pilot study areas in the United States to be highlighted in the 1980 Resources Planning Act Assessment. A major goal in the study was to quantify and describe all the vegetation in South Carolina's forests. Data to evaluate the occurrence and extent of lesser vegetation were collected by U.S. Forest Service, Renewable Resources Evaluation (RRE) field crews throughout South Carolina during 1977 and 1978. This study is part of the continuing forest inventory authorized by the Forest and Rangeland Renewable Resources Research Act of 1978. More detailed information on the history and purpose of the inventories is reported by McClure and others (1979).

Honeysuckle was chosen for this study because of its relative abundance in the State, and to show that it is possible to make an evaluation of the distribution and extent of any major plant species by using the multiresource data collected.

A group of vines that vary somewhat in their composition are generally referred to as "honeysuckle." This plant was introduced from Asia for horticultural purposes before 1860 (Patterson 1976). During the 1930's it was planted extensively for erosion control, and it escaped from cultivation. In South Carolina, the most common of the group is Japanese honeysuckle (*Lonicera japonica* Thunb.). Other species include coral or trumpet honeysuckle (*Lonicera sempervirens*), sweet breath of spring (*Lonicera fragrantissima*), and *Lonicera flava* (Radford and others 1964). Honeysuckle was considered a pest by many, and the range

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of control measures extended from herbicide treatment (Brender 1960) to establishment of forest plantations on areas occupied by the plant (Shipman 1962). Bruner and Shearin (1964) finally concluded that, from a practical viewpoint, the landowner should abandon the idea of eradicating honeysuckle and plan to control it after tree species grow over and shade it, thus holding it in check.

Although honeysuckle has caused considerable damage to timber producers in South Carolina, there are nontimber attributes associated with the species. Martin and others (1951) list 14 wildlife species in the United States that use honeysuckle as a food item. For three of these species, honeysuckle makes up from 2 to 5 percent of the total diet. It is so favored as food by the white-tailed deer in the mountains that game managers have planted it (Nelson 1953). Food value may be secondary to its value as cover for birds and small mammals. One must also consider that honeysuckle still provides erosion control in some areas. Esthetically, the beauty and fragrance of its flowers in spring should be considered as a benefit.

Radford and others (1964) found that Japanese honeysuckle and coral honeysuckle occurred in all but four counties in South Carolina, but a review of the literature shows that little can be found about its extent or quantification. In 1953, Nelson estimated that honeysuckle occurred in varying densities on about 10 percent of the forest land in the Piedmont of Georgia. Halls and Goodrum (1961) estimated that it competes with young timber in 10 percent of the forest land from Georgia to Maryland.

This Note describes the distribution of honeysuckle on commercial forest land in South Carolina and, in some cases, its density in terms of ft^3/acre. It should be pointed out that all results herein deal only with the acreage of honeysuckle on commercial forest land. Many acres that are considered nonforest by RRE standards are occupied by honeysuckle.

METHODS

The multiresource data were collected at 4,038 sample plots established on commercial forest land throughout South Carolina. The commercial forest acreage totals 12.5 million acres, representing a broad range of forest conditions (Sheffield 1979). The State contains a small portion of the southern Appalachian Mountains, a large area of rolling piedmont laced with narrow flood plains, an extensive belt of sandhills, and a broad expanse of flat coastal plain interspersed with swamps and broad flood plains. For inventory purposes, the State is divided into three Survey Units: (1) Southern Coastal Plain, (2) Northern Coastal Plain, and (3) Piedmont.

The data were collected at randomly selected and systematically spaced permanent plots previously used exclusively for collection of timber data. Many of the timber-related data are useful for evaluating lesser vegetation. For example, stand age, forest type, physiographic class, stand size, stand origin, and tree stocking can be related to the presence or absence of honeysuckle.

A vegetative profile study (Cost 1979; McClure and others 1979) was incorporated into the inventory process to provide data on the lesser vegetation. Lesser vegetation is defined as the foliage, flowers, berries, and woody stems of tree seedlings, shrubs and vines, and the leaves and stems of grasses, grasslike plants, and forbs. A description of the lesser vegetation was obtained to determine its horizontal and vertical distribution, density, diversity, and composition. Because the study was tied to a permanent plot sample, trends in vegetation cover can be measured over time.

At three permanent points around the plot sample, a 35-foot radius was examined to define height zones of vegetation and the stocking percent for broad classes of plants that occurred within the zones. The top of the tallest tree defined the vertical limit of the cylinder. Stocking percent was

expressed in terms of cubic feet of space occupied. To estimate space occupancy, each height zone was visually divided into individual cubic feet of space and the proportion of those cubes containing vegetation was estimated. A cubic foot of space was considered to be fully stocked with a species if any portion of the cubic foot contained a single sprig of that species. Therefore, when ft^3/acre of honeysuckle is discussed later, it does not necessarily mean solid cubic feet.

After the measurements were taken, recorded, and punched into cards, the cubic feet of space occupied by honeysuckle for each sample were calculated by computer and per-acre estimates were generated. Also, some comparisons of the results were made against individual RRE Unit reports for the Piedmont, Northern Coastal Plain, and the Southern Coastal Plain.

RESULTS

Honeysuckle was found on 4.5 million acres of commercial forest land in South Carolina, and in every county in the State (table 1). A pattern develops when the percentage of this land occupied by honeysuckle is examined geographically (fig. 1).

The Piedmont region has 72 percent of the total commercial forest base occupied by honeysuckle. Assuming that the original honeysuckle planting for erosion control was primarily on abandoned cropland, and that such land is more likely to be invaded by the species, explains its high occurrence in the Piedmont (table 2). Most of the abandoned cropland is reverting to the forest base as pine type, and the Piedmont clearly has a much higher proportion of its total pine type occupied by honeysuckle (table 3).

Statewide, another characteristic that correlates with the establishment of honeysuckle is moisture content of the soil, with a definite species preference for rolling uplands (table 4). RRE defines rolling uplands as well-drained lands with level areas broken by gentle slopes and numerous small drains, but excluding deep sands.

The percentage of tree stocking per acre of all live trees proved to have little effect on the occurrence of honeysuckle, but does have a direct effect on density level (table 5). The sharp upward trend in density of honeysuckle in stands over 80 years is attributable to a lessening of competition for light, moisture, and nutrients. This has been proved in preliminary analyses of lesser vegetation (McClure and others 1979). The average density of honeysuckle per acre for the State is 12,813 ft^3/acre (table 5, fig. 2). These averages range from a high of 26,176 ft^3/acre for Laurens County to a low of 1,422 ft^3/acre for Bamberg County (table 6). These two counties also represent the third highest and the lowest occurrence level, respectively.

When comparisons were made with findings of other RRE reports (Craver 1978; Sheffield 1978; Snyder 1977), the more important results indicated that:

- Honeysuckle shows a preference for the better sites. Ninety percent of the total acreage supporting honeysuckle was classified as medium or good sites (sites capable of producing 50 or more ft^3/acre annually).
- The loam-associated soils appear to favor the establishment of honeysuckle. Sandy-loam, loam, and clay-loam textures account for 73 percent of the total honeysuckle acreage.

Planted acres are only slightly more likely to be occupied by honeysuckle than any other acreage.

- Over one-half of the honeysuckle acreage had been disturbed during the 10 years prior to the inventory. More than 65 percent of this disturbance was the result of logging and related activities.

Table 1.--Counties ranked by percentage of commercial forest land occupied by honeysuckle, South Carolina, 1978

County	Total commercial forest	Honeysuckle	
		Area	Percent
	Acres		
Greenwood	205,672	193,091	93.9
Fairfield	386,015	359,301	93.1
Laurens	305,701	258,615	84.6
Union	272,352	229,204	84.2
Lancaster	235,604	195,268	82.9
York	264,752	219,310	82.8
Chester	290,619	235,929	81.2
Cherokee	154,802	124,212	80.2
Spartanburg	271,227	216,284	79.7
Abbeville	219,883	169,726	77.2
Saluda	187,758	139,145	74.1
Anderson	208,201	140,027	67.3
Newberry	315,829	208,607	66.1
McCormick	206,778	131,958	63.8
Edgefield	234,637	141,296	60.2
Greenville	278,448	160,244	57.5
Sumter	231,926	77,221	33.3
Lee	118,996	37,002	31.1
Marlboro	172,181	53,062	30.8
Aiken	488,900	149,576	30.6
Kershaw	394,680	115,483	29.3
Pickens	209,464	59,500	28.4
Allendale	158,504	39,441	24.9
Oconee	280,294	68,784	24.5
Richland	327,160	74,643	22.8
Darlington	169,683	37,930	22.4
Clarendon	217,210	47,588	21.9
Chesterfield	337,976	68,905	20.4
Calhoun	130,243	24,688	19.0
Colleton	476,667	86,158	18.1
Hampton	245,589	40,274	16.4
Williamsburg	388,860	62,093	16.0
Lexington	267,942	41,266	15.4
Barnwell	226,228	34,603	15.3
Florence	287,280	39,068	13.6
Dillon	144,331	18,144	12.6
Marion	215,743	24,782	11.5
Dorchester	271,334	29,880	11.0
Beaufort	140,531	14,834	10.6
Georgetown	374,248	39,570	10.6
Charleston	304,245	22,457	7.4
Horry	489,560	34,420	7.0
Jasper	299,706	17,423	5.8
Berkeley	577,407	32,810	5.7
Orangeburg	369,300	19,057	5.2
Bamberg	148,440	5,094	3.4
State total	12,502,906	4,537,973	36.3

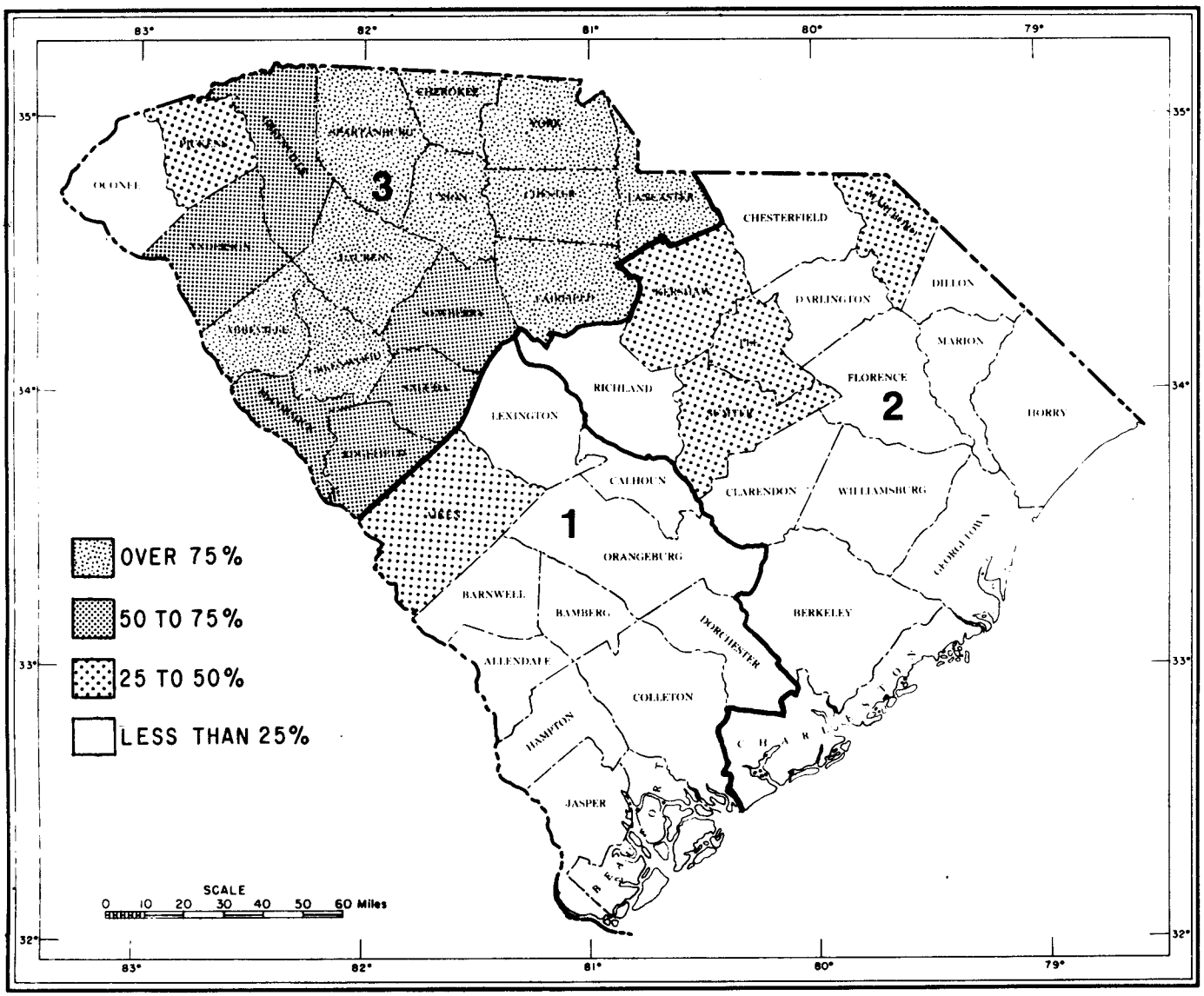

Figure 1.--Percentage of total commercial forest land occupied by honeysuckle, South Carolina, 1978.

Table 2.--Trends in acreage of cropland in South Carolina, by Forest Survey Unit

Year	State	Southern Coastal Plain	Northern Coastal Plain	Piedmont
	- - - - - - Thousand acres - - - - - -			
1936	7,280.7	1,826.7	2,453.8	3,000.2
1947	5,895.8	1,703.2	1,966.2	2,226.4
1958	5,259.0	1,387.7	2,062.4	1,808.9
1968	4,032.1	1,129.3	1,881.3	1,021.5
1978	3,607.0	1,156.2	1,709.1	741.7

Table 3.--Percentage of commercial forest by forest-type groups and percentage occupied by honeysuckle, South Carolina, 1978

Forest-type groups	Survey units		
	Southern Coastal Plain	Northern Coastal Plain	Piedmont
Pine type:			
Acres	1,358,689	1,956,378	2,255,853
Commercial forest (%)	42.2	41.2	49.8
Acres with honeysuckle (%)	47.1	36.4	55.8
Oak-pine type:			
Acres	400,727	644,217	673,600
Commercial forest (%)	12.4	13.5	14.9
Acres with honeysuckle (%)	8.3	15.4	13.8
Upland hardwood type:			
Acres	579,078	896,120	1,470,056
Commercial forest (%)	18.0	18.9	32.5
Acres with honeysuckle (%)	20.0	23.5	27.2
Lowland hardwood type:			
Acres	884,890	1,254,771	128,527
Commercial forest (%)	27.5	26.4	2.8
Acres with honeysuckle (%)	24.6	24.7	3.2
All types:			
Total acreage	3,223,384	4,751,486	4,528,036

Table 4.--Percentage of commercial forest by physiographic class and percentage occupied by honeysuckle, South Carolina, 1978

Physiographic class	State		Southern Coastal Plain		Northern Coastal Plain		Piedmont	
	Commercial forest	Acres with honeysuckle	Commercial forest	Acres with honeysuckle	Commercial forest	Acres with honeysuckle	Commercial forest	Acres with honeysuckle
	Percent							
Deep swamps	3.2	0.4	3.4	2.4	6.1	0.9	--	--
Broad stream margins	2.9	1.5	3.9	4.3	4.8	4.8	0.3	0.2
Narrow stream margins	9.8	13.0	12.7	15.7	9.1	21.6	8.3	10.5
Mountaintops & slopes	1.5	.7	--	--	--	--	4.0	1.0
Flatwoods	31.1	11.9	45.0	37.4	51.4	44.7	--	--
Bays and pocosins	3.5	.4	2.9	.5	7.3	1.9	--	--
Rolling uplands	37.5	68.9	9.6	17.8	10.1	22.7	86.2	88.0
Sandhills	8.8	2.9	20.2	20.8	9.4	3.4	.1	--
Other	1.7	.3	2.3	1.1	1.8	--	1.1	.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 5.--Weighted average density of honeysuckle on commercial forest land, by stand age and tree-stocking class, South Carolina, 1978

Stand age (years)	All classes	Tree-stocking class[a]		
		Fully or overstocked	Medium stocked	Poorly or nonstocked
	Average ft^3/acre			
0-19	13,155	12,409	13,397	21,001
20-39	12,437	12,295	12,141	15,957
40-59	13,190	11,735	15,322	27,249
60-79	10,108	7,725	14,361	13,466
80+	18,340	15,938	25,544	b
All classes	12,813	11,968	14,023	19,883

[a] Stocking standards used: overstocked--over 130 percent; fully stocked--100 to 130 percent; medium stocked--60 to 99 percent; poorly stocked--16.7 to 59 percent; nonstocked--less than 16.7 percent.

[b] No samples were found in this class.

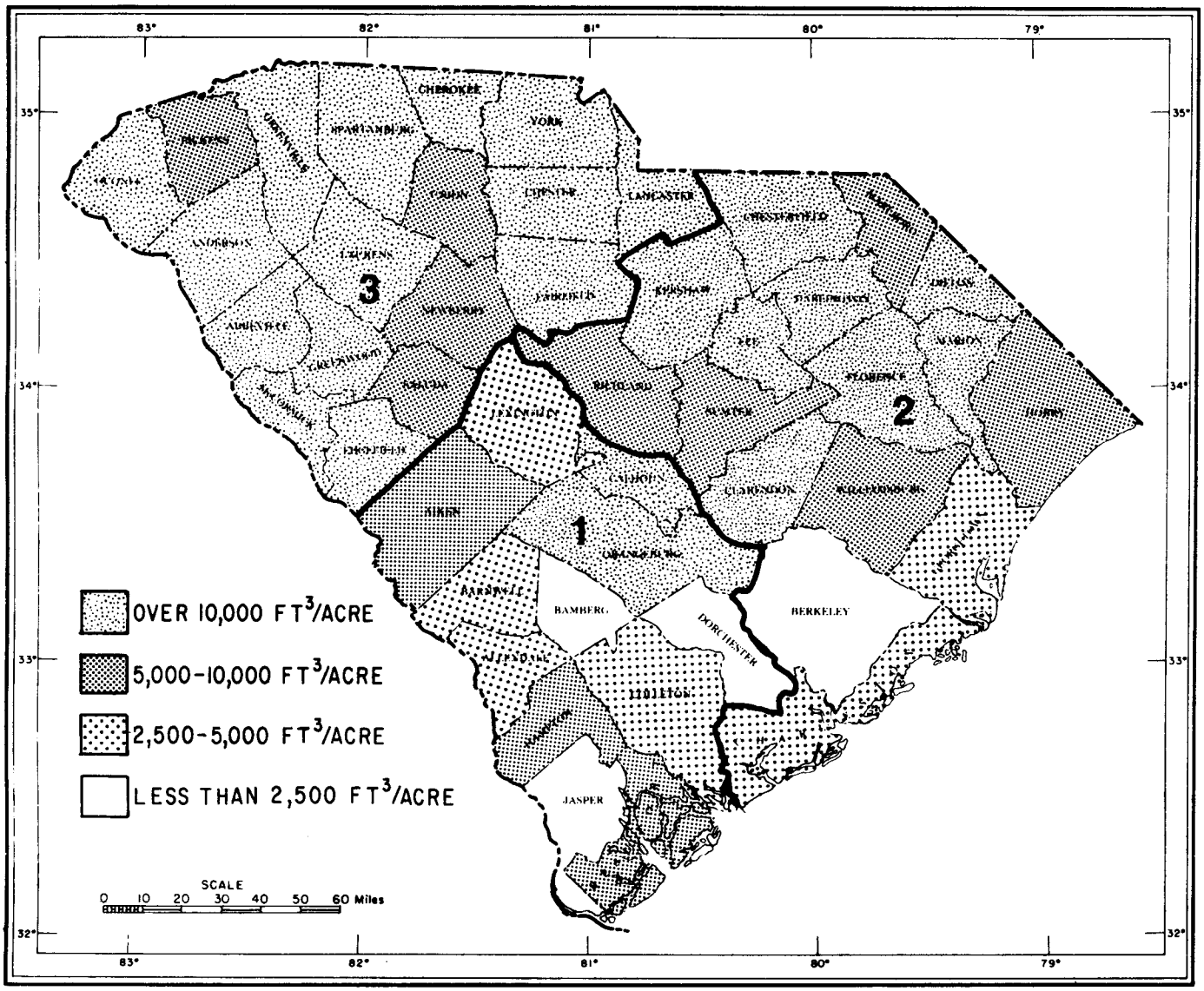

Figure 2.--Average density of honeysuckle, South Carolina, 1978.

Table 6.--Counties ranked by average density of honeysuckle, South Carolina, 1978

County	Average density
	ft^3/acre
Laurens	26,176
Chester	24,941
York	23,526
Calhoun	22,317
Marion	22,091
Dillon	19,924
Orangeburg	19,611
Anderson	19,202
McCormick	18,796
Clarendon	17,923
Spartanburg	17,312
Greenville	17,078
Kershaw	15,138
Lee	14,725
Greenwood	14,580
Oconee	14,381
Florence	13,193
Abbeville	13,132
Fairfield	12,469
Darlington	12,060
Cherokee	11,964
Chesterfield	11,745
Edgefield	11,076
Lancaster	10,606
Marlboro	9,815
Horry	9,653
Pickens	9,493
Beaufort	9,370
Aiken	8,442
Newberry	8,399
Richland	7,633
Union	6,631
Sumter	6,317
Hampton	5,468
Saluda	5,440
Williamsburg	5,168
Colleton	4,428
Georgetown	3,722
Charleston	3,713
Allendale	3,627
Lexington	3,423
Barnwell	2,727
Berkeley	2,214
Jasper	1,993
Dorchester	1,958
Bamberg	1,422

LITERATURE CITED

Brender, E. V. Progress report on control of honeysuckle and kudzu. In: Proceedings of the thirteenth annual meeting of the Southern Weed Conference, 1960 January; Biloxi, MS: Southern Weed Conference, Biloxi, Mississippi; 13:187-192; 1960.

Bruner, Marlin H.; Shearin, A. T. Planting loblolly pine on sites infested with honeysuckle. For. Res. Ser. 12. Clemson, SC: South Carolina Agriculture Experiment Station; 1964. 8 p.

Cost, Noel D. Ecological structure of forest vegetation. In: Forest resource inventory workshop proceedings. vol. 1. Fort Collins, CO: Colorado State University; 1979: 29-37.

Craver, Gerald C. Forest statistics for the northern coastal plain of South Carolina. Resour. Bull. SE-47. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1978. 33 p.

Halls, Lowell K.; Goodrum, Phil D. Japanese honeysuckle. In: Halls, Lowell K.; Ripley, Thomas H., eds. Deer browse plants of southern forests. New Orleans, LA, and Asheville, NC: Southern and Southeastern Forest Experiment Stations; 1961: 38-39. Available from: Southern Forest Experiment Station, New Orleans, LA.

McClure, Joe P.; Cost, Noel D.; Knight, Herbert A. Multiresource inventories--a new concept for forest survey. Res. Pap. SE-191. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1979. 68 p.

Martin, Alexander C.; Zim, Herbert S.; Nelson, Arnold L. American wildlife and plants--a guide to wildlife food habits. New York: Dover Publications, Inc.; 1951: 365-366.

Nelson, Thomas C. Honeysuckle is a serious problem. Res. Note SE-41. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1953. 2 p.

Patterson, David T. The history and distribution of five exotic weeds in North Carolina. Castenea 41(1): 177-180; 1976.

Radford, Albert E.; Ahles, Harry E.; Bell, C. Richie. Manual of the vascular flora of the Carolinas. Chapel Hill, NC: University of North Carolina Press; 1964: 989-990.

Sheffield, Raymond M. Forest statistics for South Carolina, 1978. Resour. Bull. SE-50. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1979. 34 p.

Shipman, R. D. Establishing forest plantations on areas occupied by kudzu and honeysuckle. For. Res. Ser. 5. Clemson, SC: South Carolina Agriculture Experiment Station; 1962. 19 p.

Snyder, Nolan L. Forest statistics for the Piedmont of South Carolina. Resour. Bull. SE-45. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1977. 33 p.

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