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Veneer Yields by Grade from Three Coastal Plain Hardwoods — Blackgum, Sweetgum, and Yellow-Poplar

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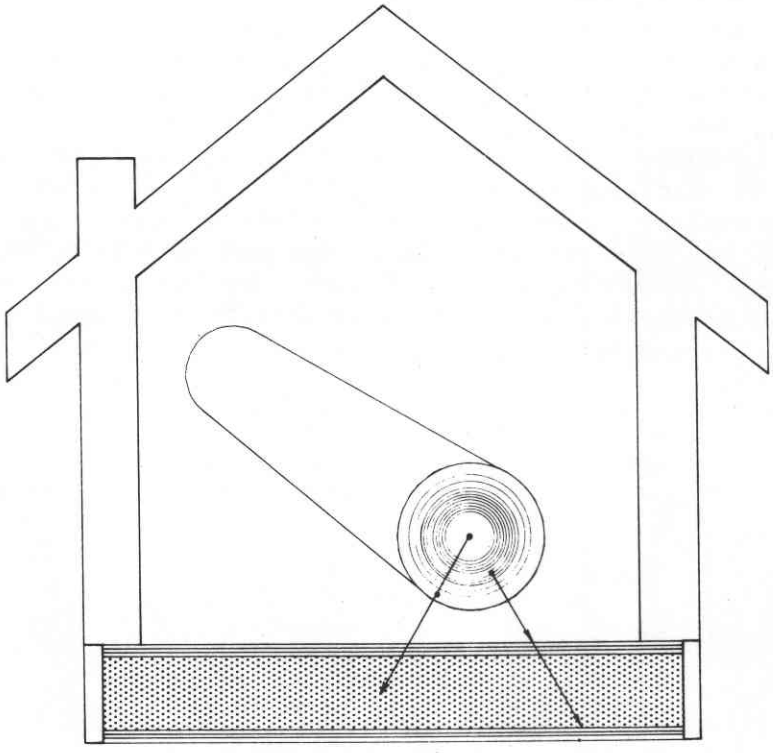

COM-PLY® Report 24

This report is one of a series on the possibilities of producing house framing and structural panels with flakeboard cores and veneer facings. These COM-PLY or composite materials were designed to be used interchangeably with conventional lumber and plywood in houses. Research on structural framing was initially limited to COM-PLY studs but has now been extended to include larger members such as floor joists and roof truss framing.

In 1973, the home-building industry faced a shortage of lumber and plywood and consequent rising prices. Both industry and government recognized that this situation was not a temporary problem and that long-range plans for better using the Nation's available forest resources would be necessary.

The Forest Service of the U.S. Department of Agriculture and the U.S. Department of Housing and Urban Development accelerated cooperative research on ways to utilize the whole tree. They concentrated on composite wood products made with flakeboard and veneer as a way of using not only more of the tree stem, but also using less desirable trees and a greater variety of tree species than would be used for conventional wood products. The flakeboard which constitutes a large portion of COM-PLY studs and joists, is made from flaked-up wood that comes from forest residues, mill residues, or low-quality timber. Thus, such composites could greatly increase the amount of lumber and plywood available for residential construction, our major use of wood, without eroding the Nation's timber supply.

Research on composite wall and floor framing was performed by the Wood Products Research Unit, Southeastern Forest Experiment Station, Athens, Ga. The American Plywood Association cooperated in these studies by designing and testing composite panel products that are interchangeable with plywood. Both types of products have been incorporated in demonstration houses.

Included in this series will be reports on structural properties, durability, dimensional stability, strength, and stiffness of composite studs and joists. Other reports will describe the overall project, compare the strength of composite and solid-wood lumber, suggest performance standards for composite lumber, and provide construction details on houses incorporating such lumber. Still others will explore the economic feasibility of manufacturing composite lumber and panels, and will estimate the amount and quality of veneer available from southern pines. These reports, called the COM-PLY series, will be available from the Southeastern Forest Experiment Station and the U.S. Department of Housing and Urban Development.

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Veneer Yields by Grade from Three Coastal Plain Hardwoods—Blackgum, Sweetgum, and Yellow-poplar

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Abstract

The dry volume and standard grades of veneer (PS-1-74) available from blackgum, sweetgum, and yellow-poplar from a Coastal Plain site are presented according to tree diameter class. Analyses of the yields of veneer and residues are made for the hardwood species and for mixed southern pine and hardwoods.

Keywords: Southern pine, diameter class, volume, blocks, residue, *Nyssa sylvatica, Liquidambar styraciflua, Liriodendron tulipifera*.

Nearly two-thirds of the annual timber harvest in the United States is used in construction. Traditionally, the construction market has preferred the softwood species--primarily pines, spruce, Douglas-fir, firs, and western hemlock. These species have been widely available and are relatively easy to dry, stable in use, and light in weight compared to many hardwoods. However, a shortage of commercial softwood timber is a real possibility in the next few years. The increasing demand for softwood timber is already creating a relative shortage (USDA FS 1973), which is reflected in increasing prices for softwood stumpage. Although there is a large volume of hardwood timber available, it is not fully utilized at present. Ninety percent of the hardwood sawtimber volume is found east of the Mississippi River (USDA FS 1978) close to the major construction markets. This hardwood resource must be used effectively if we are to meet future demands for construction lumber and panels at competitive prices. One method of hardwood utilization is in plywood or composite structural lumber.

Previous studies (McAlister 1979) have shown that composite lumber (COM-PLY) made from yellow-poplar (*Liriodendron tulipifera* L.), sweetgum (*Liquidambar styraciflua* L.), and white oak (*Quercus alba* L.) has structural properties comparable to COM-PLY lumber made from southern pine veneers. COM-PLY lumber made from both hardwood and softwood veneers compared favorably to dimension lumber of spruce or fir.

The concept of combining high-strength veneer (25 to 40 percent) with flakeboard (60 to 75 percent) made from forest or mill residues is well suited to the efficient use of available hardwood timber. Hardwoods and softwoods can be combined in the same composite product. Usually they can be combined in the same proportions that they occur in the timber stands. This offers potential economies in harvesting, manufacturing, and marketing composite lumber and panels. Removal of hardwoods and some low-grade trees would lower site preparation costs for replanting and improve resource utilization.

This report supplements published information on veneer yields from southern pine (McAlister and Taras 1978) and hardwoods (McAlister 1981) in the Southeast.

Procedures

Trees for this veneer-yield study were selected as part of a total tree (above-

ground) biomass study.[1] The site selected was the Honey Hill unit of the Francis Marion National Forest near McClellanville, S.C. The stand was located in a swampy area consisting of old rice fields. Sweetgum, yellow-poplar, and water oak were found in the better drained areas; blackgum (*Nyssa sylvatica* Marsh.) was found in poorly drained swamps with standing water. For each species, three trees were selected from each of the five even-inch (12, 14, ... 20) diameter classes from 12 to 20 inches diameter at breast height (d.b.h.). For example, the 14-inch d.b.h. class includes trees from 13.0 to 14.9 inches d.b.h. Within each diameter class we tried to sample the full range of diameters. The trees selected had no obvious defects such as lightning scars or visible decay, and were No. 1 or No. 2 sawtimber quality. The 12-inch trees were included although the top grades require a minimum d.b.h. of 13.0 inches.

Trees were felled and bucked into logs that were multiples of the 8.75-foot-long veneer blocks. Usually logs were cut to 17.5- or 26.3-foot lengths, which are easy to skid, handle, and load. Sample disks 1-inch thick were taken at each bucking cut. These disks were used to determine specific gravity, moisture content, bark thickness, and rate of growth along the stems.

More than half the water oak stems had severe butt rot extending from the stump upward 4 to 6 feet, so this species was eliminated from the veneer cutting phase.

Each log was weighed on a portable electronic scale. Logs were then trucked to a cooperating southern pine plywood plant and cut into peeler blocks 103 to 104 inches long. Each block was marked with the tree number and the block number in the stem (fig. 1). The end diameters of each block were recorded to the nearest 0.1 inch. All blocks were heated in 160°F water for 16 to 18 hours before peeling. The veneer lathe was set to produce veneer 1/6 inch thick (avg. 0.167). The peeler core diameter was recorded for each block. It averaged 5.4 inches.

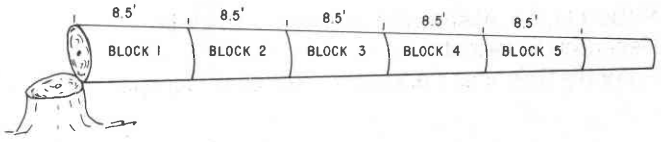

Figure 1.--Diagram of veneer blocks measured on stem.

Veneer from individual blocks was color-coded with stripes of water-soluble dye so that it could be related to the block from which it was peeled (Schroeder and Clark 1970). Veneer was clipped into full sheets, half sheets, and strips according to standard mill practice for softwood veneer-grade defect limitations. (This particular mill generally clipped to maximize the number of full sheets rather than to maximize grade. Also no strip less than 12 inches wide was saved.) The veneer was dried for 12 minutes at 385° F in a commercial four-deck steam-heated, jet-type veneer dryer to an average moisture content of less than 6 percent. Veneer was graded after drying as per softwood veneer grades (American Plywood Association 1974). Dry veneer volumes and grades were recorded for veneer 0.160 inch thick and for sizes as follows:

Full sheets	-- 50 by 102 inches
Half sheets	-- 26 by 102 inches
Strip	-- actual width by 102 inches
Fishtail	-- actual width by 54 inches

All strip and fishtail were graded as C- or D-grade veneer. Actual width for strip and fishtail ranged between 12 and 25 inches.

Results and Discussion

Summary data of veneer yields by species and grade are presented. The main body of the report contains data by tree diameter, species, and derived information for hardwood and mixed pine and hardwood stands on the South Carolina Coastal Plain. These data can be used

[1]Clark, Alexander, III. Multi-product weight volume factors and total tree weight and volume of the major southern hardwoods. Unpublished study plan on file at Southeastern Forest Experiment Station, Athens, Ga. 1977. 35 p.

to estimate yields of veneer, plywood, or composite products that could be produced from any given stand or mix of species available.

Table 1 shows veneer yield by grade for the three study species by diameter class. Yellow-poplar stems were taller and thus yielded more veneer blocks than sweetgum or blackgum. However, there is very little difference in green-block volume between yellow-poplar and sweetgum. There is very little difference in veneer recovery factors for the three species except for the 14-inch blackgum (low) and the 20-inch yellow-poplar (high). The small number of trees within each diameter class probably distorts some of the yield relationships.

Veneer yields by grade for the three species are also comparable for the C and better grades of veneer. Blackgum yields much less D-grade veneer than yellow-poplar or sweetgum. The principal use for the data in table 1 is in conjunction with timber stand cruise data or forest survey volume data to estimate the volume of veneer by grade that can be peeled from timber on a given stand.

For example, forest survey data (Craver 1978) is available for the South Carolina Coastal Plain. Table 13 of Craver's report shows the number of growing-stock trees by species and d.b.h. class on commercial forest land. Using Craver's report to obtain the percentage distribution of the three study species by diameter class, and table 1 for volume data, we can construct table 2. The data in table 2 assume that we will harvest only the three study species and ignore the pines, oaks, and soft maple which make up a significant volume of the stand. Table 2 is interesting in spite of these limitations.

Blackgum (and tupelo gum) makes up 56.7 percent of the total number of stems considered and 59.3 percent of the number of stems 16 inches d.b.h. and larger. This indicates that blackgum is probably an underutilized species. Blackgum yields 60 percent of the total C-grade and better veneer and only 30 percent of the D-grade veneer from the stand. . Sweetgum makes up 39 percent of the tree volume, yields 29 percent of the C-grade and better volume and 60 percent of the D-grade veneer. Yellow-poplar makes up about 10 percent of tree volume and of total veneer volume.

The relationship between species and veneer grade is somewhat clearer in table 3, where volume for veneer blocks, trees, and residues is on an ovendry volume basis. Green volumes were reduced by the volumetric shrinkage de-

Table 1.--Average dry cubic feet of veneer by grade and diameter class in yellow-poplar, sweetgum, and blackgum from the Coastal Plain

Species	Tree d.b.h. (inches)	Tree ht. (ft)	No. veneer blocks	Dry veneer volume				Green block volume	Green tree volume	Average veneer recovery factor
				AB	C	D	Fishtail			
				Cubic feet						*Percent*
Yellow-poplar	12	65.8	3	0.22	2.56	0.77	0.50	11.18	23.79	32.8
	14	73.1	5	2.66	4.68	1.30	.56	2 .98	38.64	48.1
	16	76.1	6	.15	8.91	6.90	.56	34.23	46.61	48.1
	18	85.0	7	.44	12.94	3.90	1.75	41.35	59.98	42.4
	20	82.7	5	1.33	15.95	6.39	1.46	42.39	67.30	58.1
Sweetgum	12	59.2	3	.15	1.40	2.01	.20	12.07	23.74	3 .0
	14	72.0	5	.44	4.78	4.14	.80	27.05	38.64	35.3
	16	66.8	5	2.24	7.34	6.08	.91	33.82	49.59	47.9
	18	74.4	5	1.68	8.58	11.20	.76	42.20	64.18	52.6
	20	77.4	5	1.90	13.91	12.05	1.04	56.11	77.17	51.2
Blackgum	12	6 .2	3	.15	3.13	.39	.40	1 .46	22.55	35.9
	14	6 .3	4	.60	4.08	1.24	.50	16.36	28.33	3 .9
	16	67.2	4	1.19	1 .18	2.10	.70	32.44	44.63	42.5
	18	78.4	5	2.12	1 .62	3.21	1.12	36.58	61.02	45.2
	20	83.0	5	.00	12.80	3.61	2.06	37.26	66.24	45.7

Table 2.--Average veneer yields per 100 stems from a typical mixture of yellow-poplar, sweetgum, and blackgum from a natural Coastal Plain timber stand

Tree diameter class (inches)	Species	No. of stems	Dry veneer volume				Green block volume	Green tree volume
			AB	C	D	Fish-tail		
			Cubic feet					
	Yellow-poplar	2.3	0.5	5.9	1.8	1.2	25.7	54.7
12	Sweetgum	16.7	2.5	23.4	33.6	3.3	201.6	396.5
	Blackgum	21.4	3.2	67.0	8.3	8.6	223.8	482.6
	Yellow-poplar	2.2	5.9	10.3	2.9	1.2	46.2	85.0
14	Sweetgum	9.4	4.1	44.9	38.9	7.5	253.3	362.2
	Blackgum	16.8	10.1	68.5	20.8	8.4	274.8	475.9
	Yellow-poplar	1.2	.2	1 .7	8.3	0.7	41.4	55.9
16	Sweetgum	5.5	12.3	40.4	33.4	5.0	186.0	272.8
	Blackgum	9.7	11.5	98.7	20.4	6.8	314.7	432.9
	Yellow-poplar	1.1	.5	14.2	4.3	1.9	45.5	66.0
18	Sweetgum	2.9	4.9	24.9	32.5	2.2	122.4	186.1
	Blackgum	5.7	12.1	60.5	18.3	6.4	208.5	347.8
	Yellow-poplar	.6	1.5	17.5	7.0	1.6	46.6	40.4
20	Sweetgum	1.4	2.7	19.5	16.9	1.5	73.6	180.0
	Blackgum	3.1	0	39.7	11.2	6.4	115.5	205.3
	Total	100.0	72.0	546.1	258.6	62.7	2184.3	3644.1
	Yellow-poplar	7.4	8.6	58.6	24.3	6.6	205.1	302.0
	Sweetgum	35.9	26.5	153.1	155.3	19.5	841.9	1397.6
	Blackgum	56.7	36.9	334.4	79.0	36.6	1137.3	1944.5

Table 3.--Average dry volume of veneer and residues from 100 stems of a typical mixture of yellow-poplar, sweetgum, and blackgum from a Coastal Plain hardwood stand in northern South Carolina

Item	Yellow-poplar	Sweet-gum	Black-gum	Total	Proportion of stand volume
	Cubic feet				*Percent*
A and B veneer	8.6	25.6	36.9	72.0	2
C veneer	58.6	153.1	334.4	546.1	17
D veneer	24.3	155.3	79.0	258.6	8
Total full-length veneer	91.5	334.9	450.3	876.7	27
Fishtail	6.6	19.5	36.6	62.7	2
Total veneer	98.1	354.4	486.9	939.4	29
Peeling residue	182.4	386.5	513.9	1982.8	31
Total block volume	180.5	740.9	1000.8	1922.2	60
Top log residue	85.3	489.0	710.4	1284.6	40
Total tree volume	265.8	1229.9	1711.2	3206.8	100

termined from the sample disks. (Volumetric shrinkage and other physical properties determined from disk samples are shown in table 4.) Note that the total volume of veneer recovered, 29 percent, was less than the volume of peeling residue, 31 percent. Also note that if the stem to a 4-inch top is taken out of the woods, there is a 40 percent increase in the total volume of wood material available. This is a significant source of residue suitable for uses such as pulpwood or fuelwood. About 70 percent of the veneer was of C and better grade. This is an excellent grade mix.

Table 5 is similar to table 2 except that southern pine is included in the volume data. Table 5 is constructed from the forest survey data (Craver 1978), pine veneer-yield data (McAlister and Taras 1978), and the hardwood volume data in table 1. Note that the 10-inch diameter class trees are included for the southern pine. Again the significant volume of oaks and soft maple is ignored.

Southern pine accounts for almost 28 percent of stems in the 10-inch d.b.h. class and 70 percent of total stems. It is obvious that when considering the mixed pine and hardwood volume, the pine volume is much greater. However, by including yellow-poplar, sweetgum, and blackgum, total wood volume harvested increased by almost 50 percent.

Table 6 shows the relationship between species and veneer grade for the mixed pine and hardwood stand. Note that the hardwood top-log residue, particularly the blackgum, contributes a tremendous volume of wood material to the total. In fact, blackgum makes up about 17 percent of the number of stems but yields 34 percent of the top-log residue volume. The southern pine yielded more veneer volume than peeling residue volume; the hardwoods less.

As an Appendix, information is given on veneer yields by block diameter (table 7) and a comparison of veneer yields for hardwoods from the three physiographic areas studied in the Southeast (table 8).

Table 4.--Selected physical properties of three Coastal Plain hardwoods

Physical property	Yellow-poplar	Sweetgum	Blackgum
Wood specific gravity $\frac{(\text{OD wt})}{(\text{OD vol})}$	0.42	0.47	0.48
Wood MC $\frac{(\text{G:W-OD wt} \times 100)}{\text{OD wt}}$ (%)	110	117	104
Volumetric shrinkage (Gri/OD) (%)	12.3	15.0	13.9
Bark specific gravity $\frac{(\text{OD wt})}{(\text{OD vol})}$	.36	.47	.43
Bark MC (%)	113	76	81
Weight of bark (percent of dry wood weight)	17	12	15

Table 5.--Average veneer yields by grade per 100 stems of mixed pine and hardwood, by species and tree d.b.h. class for typical timber stands in the northern Coastal Plain of South Carolina

Tree d.b.h. class (inches)	Species	No. of stems	Dry veneer volume				Green block volume	Green tree volume
			AB	C	D	Fish-tail		
			Cubic feet					
10	Pine	27.6	16.6	49.7	11.0	8.3	270.5	416.8
12	Pine	18.9	30.2	86.9	24.6	9.4	361.0	412.0
	Yellow-poplar	.8	.2	2.0	.6	.4	8.9	19.0
	Sweetgum	5.0	.8	7.0	10.0	1.0	60.4	118.7
	Blackgum	6.4	1.0	20.0	2.5	2.6	66.9	144.3
14	Pine	11.6	29.0	91.6	55.7	13.9	375.8	401.4
	Yellow-poplar	.7	1.9	3.3	.9	.4	14.7	27.0
	Sweetgum	2.8	1.2	13.4	11.6	2.2	75.7	108.2
	Blackgum	5.0	3.0	20.4	6.2	2.5	81.8	141.6
16	Pine	6.3	29.9	68.7	61.2	10.9	312.8	327.1
	Yellow-poplar	.4	.1	3.6	2.8	.2	13.7	18.6
	Sweetgum	1.6	3.6	11.7	9.7	1.5	54.1	79.3
	Blackgum	2.9	3.4	29.5	6.1	2.0	94.1	129.4
18	Pine	3.6	29.2	36.0	47.5	7.2	205.9	228.2
	Yellow-poplar	.3	.1	3.9	1.2	.5	12.4	18.0
	Sweetgum	.9	1.5	7.7	10.1	.7	38.0	57.8
	Blackgum	1.1	3.6	18.0	5.5	1.9	62.2	103.7
20	Pine	1.5	15.0	16.5	27.3	3.4	103.2	126.4
	Yellow-poplar	.2	.3	3.2	1.3	.3	8.5	11.6
	Sweetgum	.4	.8	5.6	4.8	.4	22.4	30.9
	Blackgum	1.5	0	11.5	3.2	1.8	33.5	59.6
	Total	100.0	171.4	509.3	303.8	71.5	2276.5	2979.6
	Pine	70.0	149.9	349.1	227.3	53.1	1629.2	1911.9
	Yellow-poplar	10.7	7.9	16.0	6.8	1.8	58.2	94.2
	Sweetgum	2.4	2.6	44.8	46.2	5.8	250.6	394.9
	Blackgum	16.9	11.0	99.4	23.5	10.8	338.5	578.6

Table 6.--Average dry volume of veneer and residues from 100 stems of mixed pine and hardwood for a typical timber stand in the northern Coastal Plain of South Carolina

Item	Pine	Yellow-poplar	Sweet-gum	Black-gum	Total	Proportion of stand (all species)	Total hardwood	Hardwood proportion of stand volume
	.....Cubic feet.....					Percent	Cubic feet	Percent
A and B veneer	149.9	2.7	7.9	11.0	171.5	7	21.6	1
C veneer	349.1	16.0	45.4	99.4	509.9	19	160.8	6
D veneer	227.3	6.8	46.2	23.5	303.8	12	76.5	3
Total full-length veneer	726.3	25.5	99.5	133.9	985.2	38	258.9	10
Fishtail	53.1	1.8	4.6	10.8	70.3	2	17.2	1
Total veneer	779.4	27.3	104.1	144.7	1055.5	40	276.1	11
Peeling residue	583.9	23.9	116.4	153.2	947.8	36	293.5	11
Total block volume	1433.7	51.2	220.5	297.9	2003.3	76	569.6	22
Top log residue	248.8	31.7	127.0	211.3	618.7	24	370.0	14
Total tree volume	1682.5	82.9	347.5	509.2	2622.0	100	939.6	36

Conclusions

The following conclusions may be drawn based from the data presented:

1. Yellow-poplar, sweetgum, and blackgum from the Coastal Plain give acceptable volume yields of veneer suitable for the manufacture of plywood or composite products.

2. Blackgum yields a high proportion of C and better grade veneer.

3. Although southern pine makes up more than two-thirds of the tree volume in Coastal Plain stands, the hardwoods can significantly increase the volume of veneer available when harvested and processed in conjunction with the pine.

Acknowledgment

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Appendix

Table 7.--Average veneer yield by grade and block diameter class for yellow-poplar, sweetgum, and blackgum from the Coastal Plain

Block diameter (inches)	Dry veneer volume				Green block volume	Residue	Veneer recovery factor
	AB	C	D	Fish-tail			
	Cubic feet						*Percent*
			YELLOW-POPLAR				
9	0.15	0.61	0.38	0.18	4.26	3.12	26.7
10	0	.87	.91	.22	5.38	3.60	32.6
11	.39	1.37	.49	.14	6.05	3.80	36.8
12	.22	2.16	.94	.29	7.39	4.07	44.6
13	.19	2.04	2.15	.22	8.90	4.52	49.3
14	.06	3.65	1.63	.32	10.58	5.23	50.8
15	0	4.96	1.03	.30	11.40	5.41	53.0
16	1.00	6.45	1.02	.33	13.93	5.45	61.0
			SWEETGUM				
9	.0	.36	.79	.12	4.42	3.27	27.2
10	0	.52	1.09	.11	5.09	3.48	31.6
11	.06	.89	1.53	.18	6.36	3.88	38.5
12	.11	1.14	1.47	.15	7.44	4.72	36.4
13	.58	1.86	1.63	.17	8.53	4.46	47.5
14	.85	2.20	2.56	.19	10.24	4.63	55.4
15	.16	3.18	2.45	.24	11.59	5.81	50.0
16	.34	2.65	3.62	.33	12.92	6.32	51.2
17	1.19	6.00	1.58	.24	15.56	6.78	56.7
			BLACKGUM				
9	0	1.05	.55	.21	4.25	2.65	37.5
10	.18	1.49	.35	.17	5.44	3.43	37.5
11	.20	1.38	.45	.26	6.37	4.34	32.4
12	.22	1.99	1.10	.16	7.49	4.17	44.6
13	.72	2.96	.37	.22	9.78	5.73	43.1
14	.64	3.99	.43	.37	10.46	5.40	49.4
15	.22	5.57	.47	.38	13.57	7.31	46.8

Table 8.--Comparison of veneer yields by species and tree diameter class for three physiographic areas in the Southeast

Tree d.b.h. (inches)	Coastal Plain						Piedmont						Mountain					
	Dry veneer volume				Green block volume	Green tree volume	Dry veneer volume				Green block volume	Green tree volume	Dry veneer volume				Green block volume	Green tree volume
	AB	C	D	Fish-tail			AB	C	D	Fish-tail			AB	C	D	Fish-tail		
	Cubic feet																	
	YELLOW-POPLAR																	
12	0.2	2.6	0.8	0.5	11.2	23.8	0.2	1.5	0.7	0.4	11.7	24.7	0	1.2	0.5	0.3	11.5	22.9
14	2.7	4.7	1.3	.6	21.0	38.6	0	6.4	2.6	.6	21.8	33.0	0	10.4	2.4	.8	31.8	44.0
16	.2	8.9	6.9	1.6	34.2	46.6	.2	10.1	3.9	1.3	34.0	45.4	0	15.5	10.4	1.3	51.8	57.9
18	.4	12.9	3.9	1.8	41.4	60.0	.5	15.3	7.7	1.4	52.6	61.5	0	16.4	12.8	2.5	64.8	77.4
20	1.3	16.0	6.4	1.5	42.4	67.3	1.9	14.5	9.1	1.4	56.5	73.4	0	18.3	18.8	1.7	76.9	96.8
	SWEETGUM																	
12	.2	1.4	2.0	.2	12.1	23.7	.2	2.2	.3	.3	7.0	19.3	--	--	--	--	--	--
14	.4	4.8	4.1	.8	27.0	38.6	.9	8.4	1.9	.9	24.2	34.4	--	--	--	--	--	--
16	2.2	7.3	6.1	.9	33.8	49.6	.2	5.9	4.5	1.4	31.9	42.8	--	--	--	--	--	--
18	1.7	8.6	11.2	.8	42.2	64.2	1.1	9.8	4.1	1.3	35.7	53.8	--	--	--	--	--	--
20	1.9	13.9	12.0	1.0	56.1	77.2	1.3	10.7	11.1	1.6	48.5	66.9	--	--	--	--	--	--
	WHITE OAK																	
12	--	--	--	--	--	--	0	.7	.5	.4	8.7	17.9	0	1.8	1.7	.8	16.9	23.5
14	--	--	--	--	--	--	0	2.2	2.4	.6	15.7	28.6	0	2.3	5.3	.8	28.5	36.2
16	--	--	--	--	--	--	0	3.2	5.3	1.2	27.6	41.9	0	3.4	8.4	.8	38.6	45.8
18	--	--	--	--	--	--	0	3.4	8.8	1.3	35.0	52.4	0	2.4	12.5	.6	40.8	66.6
20	--	--	--	--	--	--	0	5.9	9.0	.8	40.5	68.9	0	4.9	12.2	1.7	44.3	69.3
	BLACKGUM																	
12	.2	3.1	.4	.4	10.5	22.6	--	--	--	--	--	--	--	--	--	--	--	--
14	.6	4.1	1.2	.5	16.4	28.3	--	--	--	--	--	--	--	--	--	--	--	--
16	1.2	10.2	2.1	.7	32.4	44.6	--	--	--	--	--	--	--	--	--	--	--	--
18	2.1	10.6	3.2	1.1	36.6	61.0	--	--	--	--	--	--	--	--	--	--	--	--
20	0	12.8	3.6	2.1	37.3	66.2	--	--	--	--	--	--	--	--	--	--	--	--

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Data presented can be used to estimate yields of veneer, plywood, or composite products that could be produced from any given stand or mix of species available.

Keywords: Southern pine, diameter class, volume, blocks, residue, *Nyssa sylvatica, Liquidambar styraciflua, Liriodendron tulipifera*.

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