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Georgia Harvest and Utilization Study, 2004

James W. Bentley and Richard A. Harper

Southern Research Station

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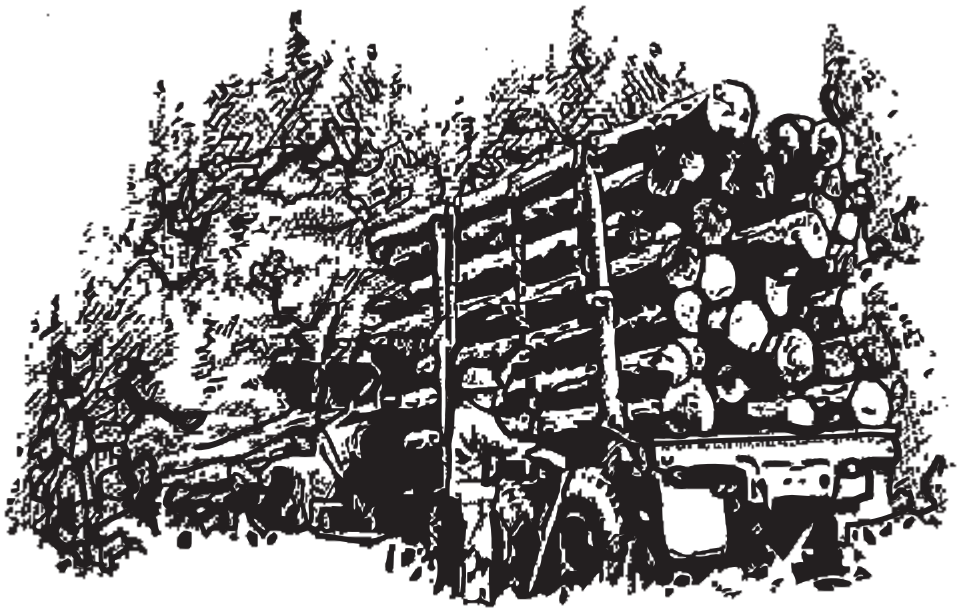

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Foreword

This resource bulletin describes the principal findings of a harvest and utilization study conducted during the eighth inventory of Georgia's forest resources and compares those findings with data from the sixth and seventh inventories. Inventory crews sampled and measured trees harvested in a variety of logging operations, and analysts calculated wood volume and percent of wood utilization. Harvest volume data and factors for growing-stock and nongrowing-stock logging residue are described and interpreted.

Annual inventories of America's forest resources are mandated by the Forest and Rangeland Act of 1978. Forest inventories and utilization studies are part of a continuing, nationwide undertaking by regional experiment stations of the Forest Service, U.S. Department of Agriculture. Inventories and utilization studies of the 13 Southern States (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia) and the Commonwealth of Puerto Rico are conducted by the Southern Research Station, Forest Inventory and Analysis (FIA) Research Work Unit. Unit headquarters is in Knoxville, TN, and FIA has operational offices in Asheville, NC, and Starkville, MS.

The primary objective of these appraisals is to develop and maintain resource information needed to formulate sound forest policies and programs. More information about Forest Service resource inventories is available in "Forest Service Resource Inventories: An Overview" (U.S. Department of Agriculture Forest Service 1992).

Tabular data included in FIA resource bulletins present a comprehensive array of forest resource statistics, but additional information is available to those who require more specific information. Access to data for the Southern States can be found at www.ncrs.fs.fed.us/tools-data/mapping-tools.

Acknowledgments

The authors thank Nathan McClure and Tony G. Johnson for their review and comments; Carolyn Steppleton for keypunching and processing preliminary data; Anne Jenkins, Janet Griffin, and Sharon Johnson for the map, tables, graphs, and statistical checking; and Louise Wilde for editorial review, styling, and publication of this report.

Contents

[a] All tables in this report are available in Microsoft® Excel workbook files. Upon request, these files will be supplied in the format the customer requests.

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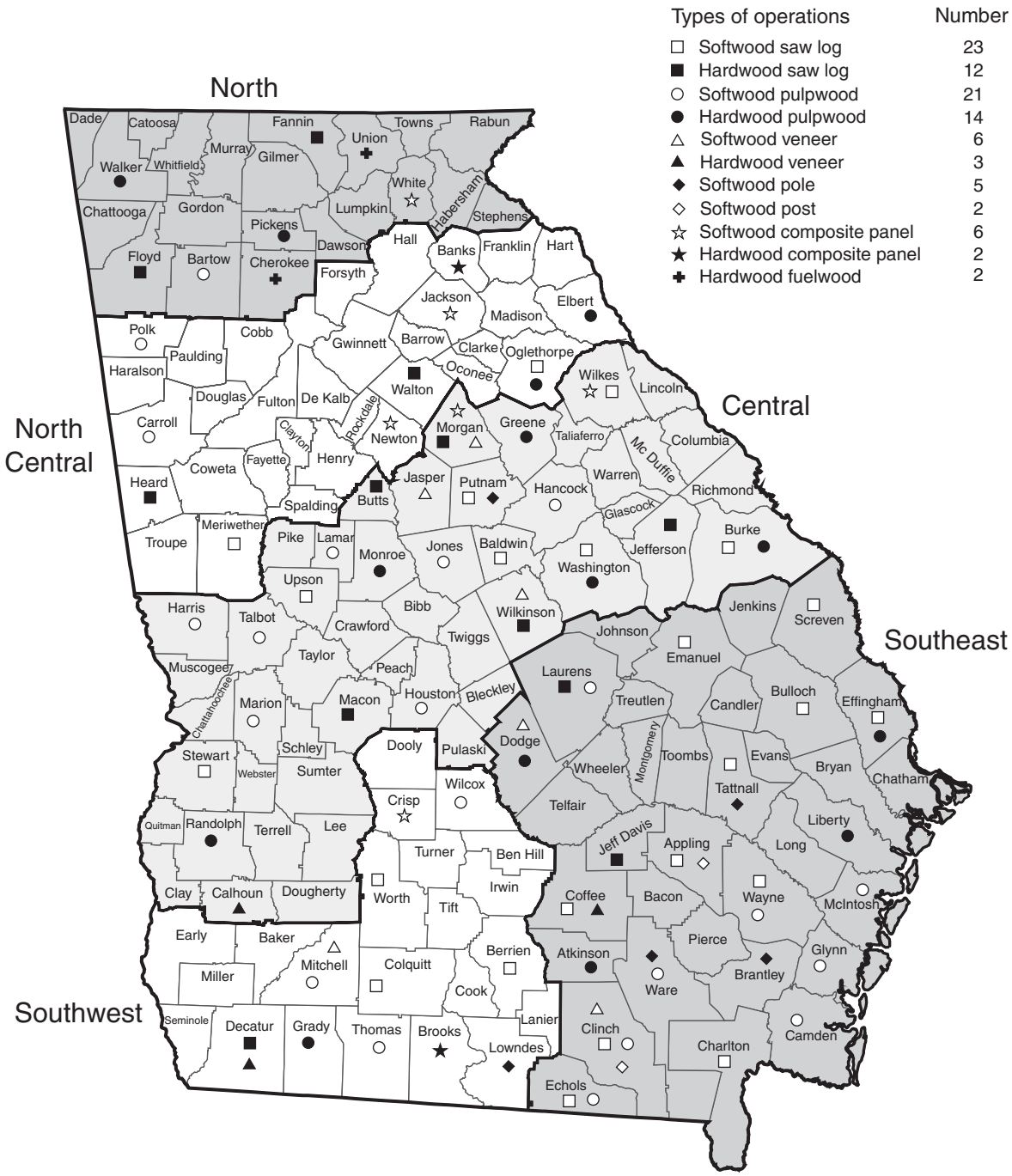

Figure 1—Harvest operations, Georgia, 2004.

Georgia Harvest and Utilization Study, 2004

James W. Bentley and Richard A. Harper

Introduction

Forest planners and managers have a continuing need for information about the timber resource, and the general public is expressing increasing interest in the effects of logging. Therefore, current data on the Nation's forests—and how they are changing—are essential to well-informed decisionmaking. Information about the condition of and changes in the timber resource of Georgia comes from three primary sources: (1) inventory plots, which describe current conditions and quantify changes due to mortality, growth, removals, and land use; (2) mill surveys, which quantify timber volume harvested and delivered to primary wood products facilities, i.e., sawmills, pulpmills, veneer mills, composite panel mills, and pole mills; and (3) logging utilization studies, which characterize harvest operations and quantify the timber volume that is cut and utilized, as well as that portion that is left in the forest during the harvesting of timber.

This bulletin presents the findings of a 2004 harvest and utilization study in Georgia and compares them to findings of 1989 and 1997 studies. The main goal was to provide an estimate of softwood and hardwood volume used for wood products, and the volume left in the woods as logging residue. Crews randomly selected and measured felled trees on 96 active harvest operations throughout Georgia (fig. 1). This bulletin also provides information on logging in Georgia and some general characteristics of trees harvested for various products, which includes average diameter at breast height (d.b.h.) by product, average bole length by product, average heights of residual stumps, and average diameter outside bark (d.o.b.) at the end of utilization of the main stem.

Some standard Forest Inventory and Analysis (FIA) Research Work Unit terms are used in this study. Two that are particularly important for understanding and interpreting study results are growing stock and nongrowing stock. A growing-stock tree is a live tree of commercial species that either contains or is capable of producing at least one 12-foot or two 8-foot logs in the saw-log portion of the bole. A nongrowing-stock tree is one that does not meet the requirements of growing stock due to poor form or rot. For growing-stock trees, the growing-stock portion of a tree (5-inches d.b.h. or larger) includes the volume of sound wood between a 1-foot stump and a 4-inch top, d.o.b. Volume in the 1-foot stump, volume in the main stem from 4 inches d.o.b. to the growing top of the tree, and the volume of any limbs 4 inches d.o.b. or larger with at least one 5-foot section are considered nongrowing-stock volume by FIA standards. Rough or rotten trees were also sampled and make up another piece of nongrowing stock (cull). Figure 2 illustrates a poletimber tree and a sawtimber tree and the growing-stock section of each.

Methods

Site Stratification and Selection

Producing a complete list of Georgia's timber-harvesting operations and ownerships is problematic. Because the industry is so complex, it is impossible to list the names and locations of all the harvest operations during the timeframe considered in this resource bulletin. Many uncontrolled factors affect how, when, and where harvesting operations will take place, but the most common events that affect harvesting operations are weather and timber markets. A random sample provides a reasonably accurate estimate of utilization.

Sites selected for study were stratified by species group and product using the most recent data available from the publication "Georgia's Timber Industry—An Assessment of Timber Product Output and Use, 1999" (Johnson 2002), which provides county-level output of timber products harvested in Georgia by species group. Using those proportions, we designated 63 of the 96 selected sites as softwood operations, and the remaining 33 as hardwood operations. Harvest operations by product were based along these same general guidelines, although some flexibility was given to field crews for substitution due to the difficulty of locating harvesting operations for some specific products. Table 1 shows the number of harvest operations and trees by species group and product.

After harvest operations were stratified by major species group and product, the operations were placed in the appropriate region and county in the State. Using county-level product output data from the "Georgia's Timber Industry—An Assessment of Timber Product Output and Use, 1999" (Johnson 2002) and a map that showed current mill locations, prospective utilization sites were selected based on a high probability of being able to locate a harvesting operation for the particular product and species group assigned. Figure 1 shows the location of harvest operations for this study.

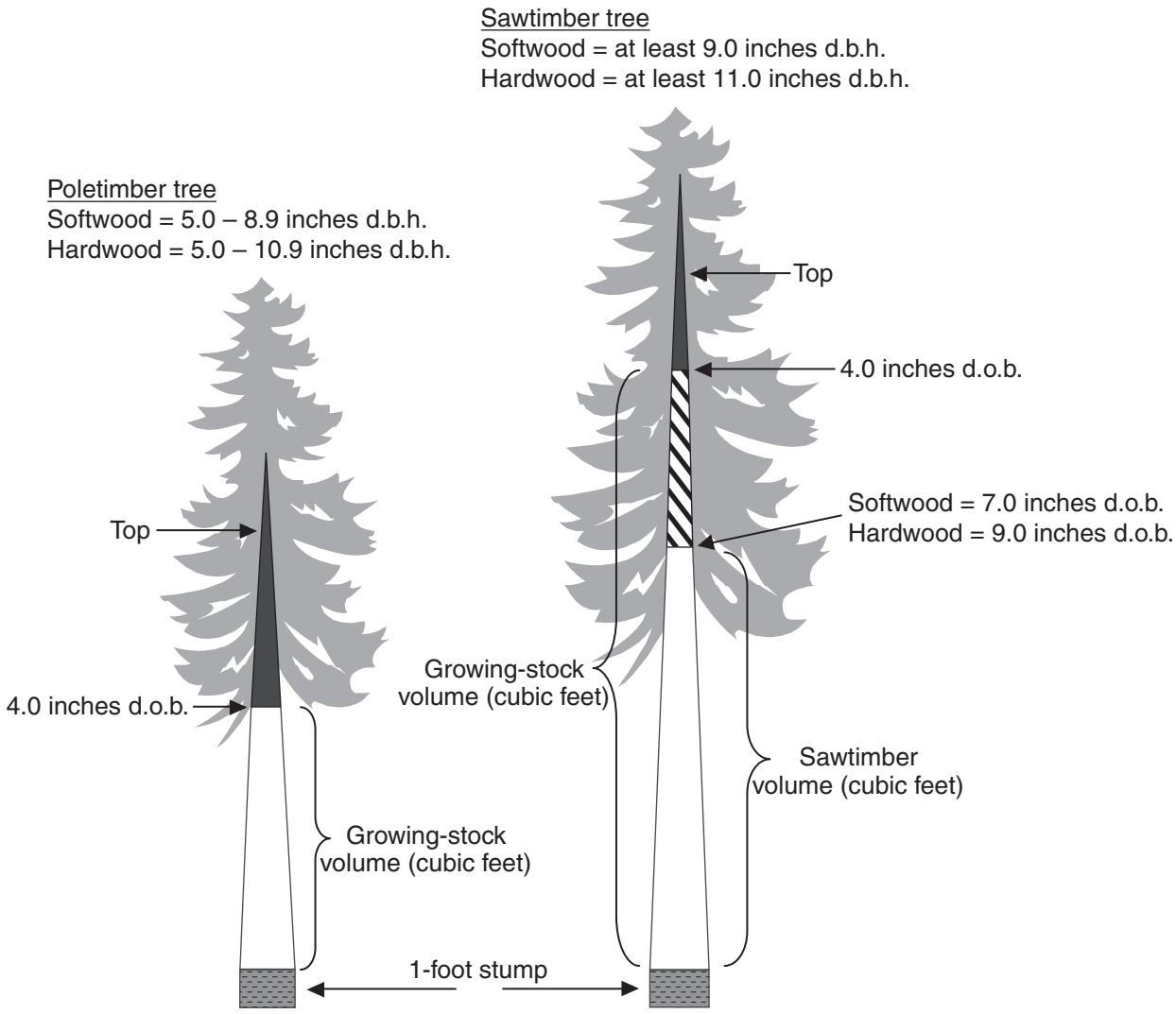

Figure 2—Stem sections of poletimber and sawtimber trees.

Data Collection

During the eighth inventory, field crews were trained to collect data on felled trees at harvest locations. Using the list of operations and a map of sites, crews visited local mills and talked to county personnel to help locate active harvest sites. From January 2000 to August 2004 they visited active harvesting operations and collected data by county for the particular species group and designated product(s).

At each harvest operation site, crew members talked to the logger or the person in charge of operations. Those contacts provided vital information about product(s) utilized, specific diameters, and log lengths the receiving mill(s) would accept, along with minimum diameters at the cutoff points for specific products. Crews also noted the type of logging equipment being used. This information was used to determine the level of mechanization for each harvesting operation.

On each harvest operation site, the crew's goal was to measure 25 to 30 trees for each product to ensure an adequate representation of overutilization and underutilization for a given type of harvest operation. Trees were randomly selected and had to be at least 5-inches d.b.h. and alive prior to harvest. Although they often had been bucked, limbed, and topped, the main bole of each tree selected for measurement had to be intact to be measured for utilization. The State, unit, county, and location number were recorded for each site. Each tree was assigned a number and identified by species, d.b.h., tree class, product, bole length, and percent cull if rot was detected. Each tree was measured from the

Table 1—Number of operations and trees by product and species group, Georgia, 2004

Product and species group	Operations	Trees
	number	
Saw logs		
Softwood	23	611
Hardwood	12	244
Total	35	855
Veneer logs		
Softwood	6	124
Hardwood	3	45
Total	9	169
Composite panels		
Softwood	6	143
Hardwood	2	47
Total	8	190
Pulpwood		
Softwood	21	546
Hardwood	14	412
Total	35	958
Poles		
Softwood	5	108
Hardwood	0	0
Total	5	108
Posts		
Softwood	2	49
Hardwood	0	0
Total	2	49
Fuelwood		
Softwood	0	0
Hardwood	2	39
Total	2	39
All products		
Softwood	61	1,581
Hardwood	35	787
Total	96	2,368

top of the cut stump to the end of utilization. Measurements were made along the main stem in sections no longer than 16 feet until the end of utilization. The end of utilization usually is determined by the sawyer, according to particular specifications set by the receiving mill(s). These specifications rarely match the FIA growing-stock standard of a 1-foot stump to a 4-inch d.o.b. top. Therefore, trees that are cut off above a 1-foot stump and/or below 4-inches d.o.b. would be considered underutilized, and that volume not utilized would be considered growing-stock residue. On the other hand, by FIA standards, trees cut below a 1-foot stump and/or above a 4-inch d.o.b. top are considered 100-percent utilized, and those portions below and above are considered overutilization. A myriad of combinations actually occurs on active harvest operations. The aggregated volume from measured trees provide overutilization and underutilization factors that can be applied to statewide inventory results for an estimate of growing-stock and nongrowing-stock logging residues. Other required measurements, besides d.b.h and the end of utilization of the main stem, are the top of the sawtimber portion (7.0 inches in softwoods and 9.0 inches in hardwoods). Those measurements allow calculation of the sawtimber and poletimber portion of the growing-stock section.

Highlights

Characteristics of Harvested Trees in Georgia

Results of this study have identified several key characteristics of trees harvested, which cannot be obtained from a typical field inventory or a forest industry survey that supplies product output data only. Characteristics such as average d.b.h. by product, average bole length by product, average residual stump height, and average d.o.b. at the end of utilization contribute important information. The integration of this data with FIA inventory and timber product output mill surveys offers a better understanding of the complex nature of timber removals based on the level of harvest mechanization, stand species and product mix, and other unforeseen variables. Averages discussed in this section are based on the measurement of 2,368 trees. Of those, 1,581 (67 percent) were softwood, and 787 (33 percent) were hardwood.

Softwood and hardwood saw-log volume together accounted for 41 percent of the total product output for the State (Johnson 2002). This utilization study classified 611 trees as softwood saw log averaging 11.6 inches d.b.h., down slightly from previous studies in 1989 (12.0 inches d.b.h.) and 1997 (12.4 inches d.b.h.). It classified 244 hardwood trees as saw log averaging 14.9 inches d.b.h., down from an average d.b.h of 15.2 inches in 1997. Veneer and plywood constitute another important component of the product mix

for Georgia. Based on 124 trees measured for softwood veneer, the average d.b.h. was 14.0 inches, a drop from 14.9 inches d.b.h. in 1997. Of 546 softwood trees measured for pulpwood, the average d.b.h. was 7.0 inches, down from an average d.b.h of 7.4 inches in 1997. The study classified 412 trees measured for hardwood pulpwood, the average d.b.h. was 7.9 inches, a slight decrease from the average d.b.h. of 8.6 inches in 1997. Table 2 shows the breakdown of average d.b.h. for each product by species group and survey year.

Bole length is the distance between a 1-foot stump and a 4-inch d.o.b. top. Trees harvested for solid wood products tend to have longer average bole lengths than trees harvested for pulpwood or composite panel products. The average bole length for both softwood and hardwood trees measured for saw logs was 58 feet. In comparison, trees measured for pulpwood had average bole lengths of 32 and 35 feet for softwoods and hardwoods, respectively. Softwood veneer trees had an average bole length of 63 feet, while hardwood veneer trees had an average bole length of 61 feet. Average bole lengths by product are comparable to the average bole lengths by product from the two previous surveys. Table 3 shows the average bole length by species group and survey year.

Planted sites constituted a subset of the total number of trees measured. Trees measured in planted stands, with the exception for softwood veneer, tend to have shorter bole lengths than those measured in the natural stands. Table 4 shows the average bole length for each product by species group and stand origin.

Residual stump height is a key component in determining utilization rates for harvested trees. By FIA standards,

Table 2—Average diameter at breast height by product, species group, and survey year, Georgia, 1989 to 2004

Product and species group	Year		
	1989	1997	2004
	inches		
Saw logs			
Softwood	12.02	12.35	11.63
Hardwood	14.25	15.22	14.85
Veneer logs			
Softwood	13.66	14.94	13.99
Hardwood	15.99	17.71	16.73
Composite panels			
Softwood	—	9.33	7.64
Hardwood	—	10.10	9.09
Pulpwood			
Softwood	7.26	7.35	7.04
Hardwood	9.24	8.64	7.88
Poles			
Softwood	11.35	15.29	12.85
Hardwood	—	—	—
Posts			
Softwood	6.53	7.21	6.11
Hardwood	—	—	—
Fuelwood			
Softwood	—	—	—
Hardwood	—	10.80	7.41

— = no sample for the cell.

Table 3—Average bole length by product, species group, and survey year, Georgia, 1989 to 2004

Product and species group	Year		
	1989	1997	2004
	feet		
Saw logs			
Softwood	59.06	59.94	58.37
Hardwood	57.38	60.92	57.81
Veneer logs			
Softwood	65.00	70.00	63.00
Hardwood	81.00	76.00	61.00
Composite panels			
Softwood	—	46.14	35.95
Hardwood	—	38.50	34.94
Pulpwood			
Softwood	36.88	34.93	32.21
Hardwood	39.84	36.10	34.65
Poles			
Softwood	55.88	71.63	66.98
Hardwood	—	—	—
Posts			
Softwood	27.69	34.28	24.43
Hardwood	—	—	—
Fuelwood			
Softwood	—	—	—
Hardwood	—	40.07	33.21

— = no sample for the cell.

Table 4—Average bole length by species group, stand origin, and product, Georgia, 2004

Species group and stand origin	Product					
	Saw logs	Composite panels	Pulp-wood	Poles	Posts	Fuel-wood
	feet					
Softwood						
Natural	61.58	43.37	34.64	66.98	—	—
Planted	53.88	28.21	31.37	—	24.43	—
Hardwood						
Natural	57.86	43.48	34.76	—	—	33.21
Planted	53.67	28.04	33.77	—	—	—

— = no sample for the cell.

the stump is that portion of the tree measured at ground level from the uphill side of the tree to 1 foot up the bole. Loggers try to maximize volume harvested by cutting the tree as close to the ground as possible. Residual stump heights across the products ranged from 0.28 to 0.71 feet; however, most softwood trees harvested had an average residual stump height of about 0.4 of a foot, while hardwood trees harvested averaged slightly higher residual stumps. In softwoods and across all products, this accounted for about 52 percent of the 1-foot stump volume being used. In hardwoods and across all products, about 27 percent of stump volume was used. Stump volume for both hardwood and softwood contributed to utilization of the nongrowing-stock portion of trees, i.e., overutilization. The average residual stump heights across all products since the 1997 survey have decreased slightly. Table 5 shows the average residual stump heights for each product by species group.

The final component used to determine use rates was diameter outside bark at the end of utilization. Tops and limbs constitute most of the nongrowing-stock volume, although they accounted for 32 percent of the nongrowing-stock portion that was utilized. The average end of utilization for softwood saw logs was 5.6 inches, and for hardwood saw logs 9.5 inches. For veneer logs it was 5.9 and 9.0 inches for softwood and hardwood, respectively. Average end of utilization for pulpwood products averaged 3.0 and 4.1 inches for softwoods and hardwoods, respectively. Average end of utilization by product is comparable to the average end of utilization by product from the two previous surveys. Table 6 shows the average end of utilization by the different products and species group.

Table 5—Average stump height by product, species group, and survey year, Georgia, 1989 to 2004

Product and species group	Year		
	1989	1997	2004
	feet		
Saw logs			
Softwood	0.51	0.57	0.43
Hardwood	0.90	0.78	0.71
Veneer logs			
Softwood	0.51	0.59	0.51
Hardwood	0.98	0.84	0.68
Composite panels			
Softwood	—	0.53	0.38
Hardwood	—	0.50	0.46
Pulpwood			
Softwood	0.46	0.52	0.36
Hardwood	0.72	0.61	0.47
Poles			
Softwood	0.53	0.90	0.35
Hardwood	—	—	—
Posts			
Softwood	0.41	1.00	0.28
Hardwood	—	—	—
Fuelwood			
Softwood	—	—	—
Hardwood	—	0.58	0.40

— = no sample for the cell.

Table 6—Average end of utilization by product, species group, and survey year, Georgia, 1989 to 2004

Product and species group	Year		
	1989	1997	2004
	inches		
Saw logs			
Softwood	5.49	4.60	5.64
Hardwood	9.01	8.61	9.46
Veneer logs			
Softwood	6.17	4.81	5.85
Hardwood	9.01	8.89	8.98
Composite panels			
Softwood	—	3.33	3.08
Hardwood	—	4.88	4.59
Pulpwood			
Softwood	3.12	2.68	2.92
Hardwood	5.25	4.30	4.08
Poles			
Softwood	5.28	4.16	5.35
Hardwood	—	—	—
Posts			
Softwood	3.33	2.92	4.17
Hardwood	—	—	—
Fuelwood			
Softwood	—	—	—
Hardwood	—	6.03	5.00

— = no sample for the cell.

Softwood Removals

Results from this study document 30,359 cubic feet of softwood volume, of which 26,021 cubic feet, or 86 percent, was used for product(s). Fourteen percent, or 4,338 cubic feet, was left onsite as logging residue (fig. 3). Thirty-four percent of the residue volume came from the growing-stock portion of the tree, while 66 percent, 2,870 cubic feet, came from the nongrowing-stock portion (stumps, tops, and limbs) (fig. 4) (table A.1).

The total softwood growing-stock volume measured was 26,487 cubic feet. Of that total, 94 percent was utilized, and 6 percent was logging residue (fig. 5). By FIA merchantability standards, the logging residue generated from growing-stock trees is underutilized volume. Of the total utilized volume, 1,002 cubic feet, or 3.9 percent, was from the non-

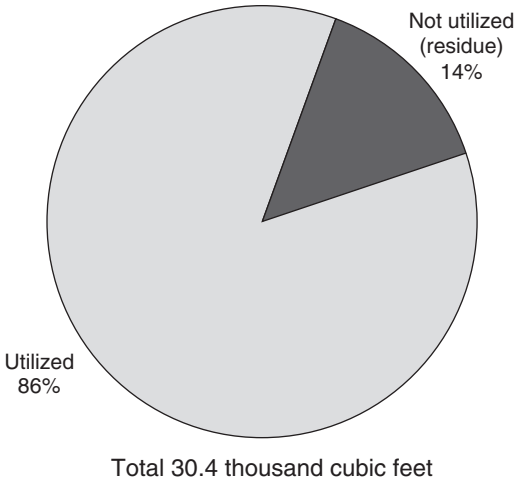

Figure 3—Disposition of total softwood harvest volume, 2004.

growing-stock portion of trees. By the same merchantability standards, that volume is considered overutilization (tables A.2 and A.3).

Softwood volumes and percentages are broken down further by poletimber and sawtimber, and by the various products measured (tables A.2 through A.7). Trees harvested for pulpwood had above average rates of utilization for the merchantable portion of the tree (98 percent) and the highest rates of overutilization (11.3 percent). This means that more of the nongrowing-stock portion of the tree was being used for product(s) and less was left as logging residue.

Softwood percentages and volumes presented in these tables represent just trees measured in this study of 96 active harvest operations. However, it is possible to apply the percentages to inventory data from Georgia's eighth survey[1] to estimate total softwood logging residues for the State. From FIA inventory data annual softwood removals from all live trees was 1,159 million cubic feet. Softwood growing-stock removals were 1,154 million cubic feet, or 99.6 percent of the live tree total. Applying the factors from this study to total utilized softwood removals, in addition to volume from whole trees cut and left on site, provide an estimate of 229.2 million cubic feet of total annual softwood residue. Of the total residue, 77.6 million cubic feet, or 34 percent, was considered growing-stock residue. The remaining 66 percent, or 151.6 million cubic feet, was nongrowing-stock residue from stumps, tops, and limbs, and cull trees not used.

[1] Harper, Richard A., Forester. Georgia's forests, 2004. Manuscript in preparation. Author can be reached at U.S. Department of Agriculture Forest Service, Southern Research Station, Forest Inventory and Analysis, 4700 Old Kingston Pike, Knoxville, TN 37919.

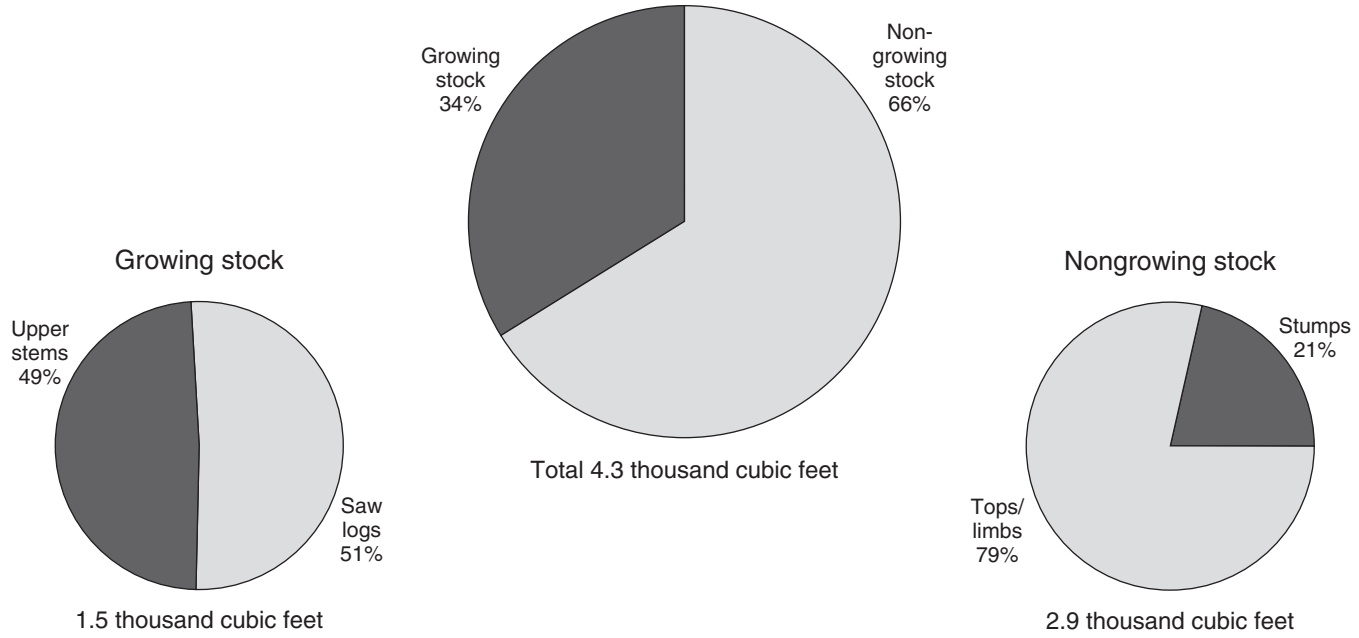

Figure 4—Softwood residue by volume type, 2004.

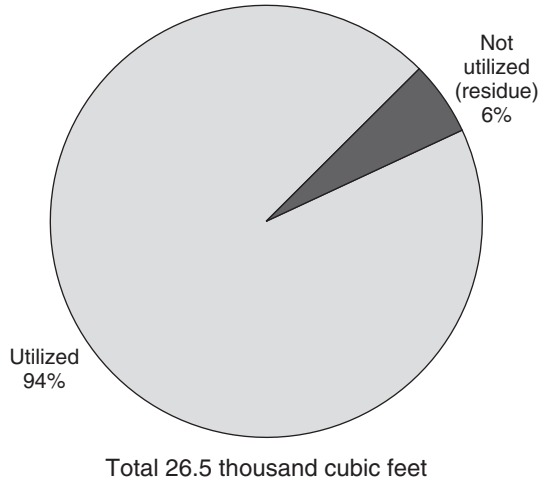

Figure 5—Disposition of softwood growing-stock volume, 2004.

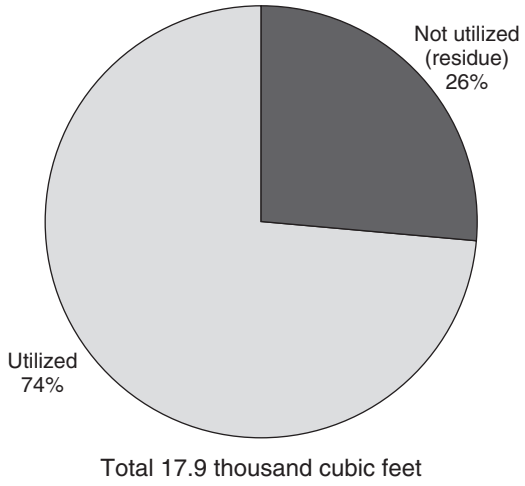

Figure 6—Disposition of total hardwood harvest volume, 2004.

Hardwood Removals

Results from this study document 17,859 cubic feet of hardwood volume, of which 13,144 cubic feet, or 74 percent, was utilized for product(s). Twenty-six percent, or 4,715 cubic feet, was left onsite as logging residue (fig. 6). Forty-two percent of residue volume came from the growing-stock portion of trees, and 58 percent came from the nongrowing-stock portion (stumps, tops, and limbs) (fig. 7) (table A.1).

The total hardwood growing-stock volume measured was 14,764 cubic feet. Of that total, 87 percent was used, and 13 percent was logging residue (fig. 8). By FIA merchantability standards, the logging residue portion is underutilized volume. Of the total utilized volume, 345 cubic feet, or 2.6 percent, was from the nongrowing-stock portion of trees. By the same merchantability standards, that volume is considered overutilization (tables A.10 and A.11).

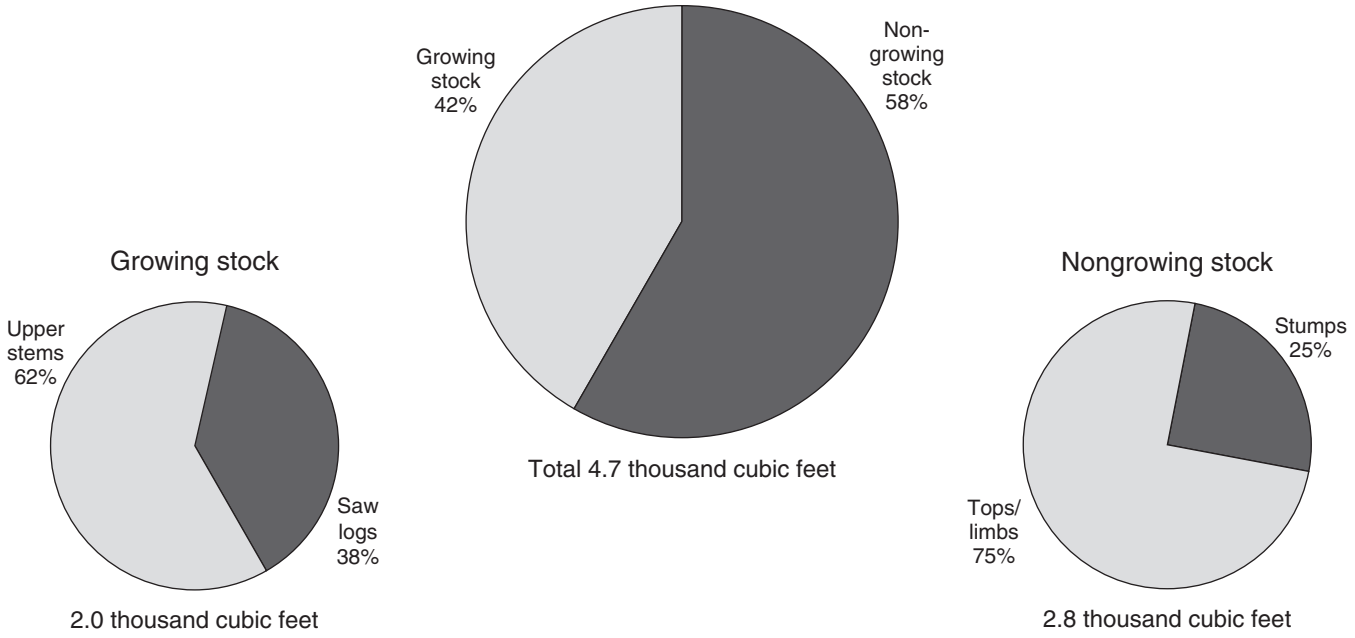

Figure 7—Hardwood residue by volume type, 2004.

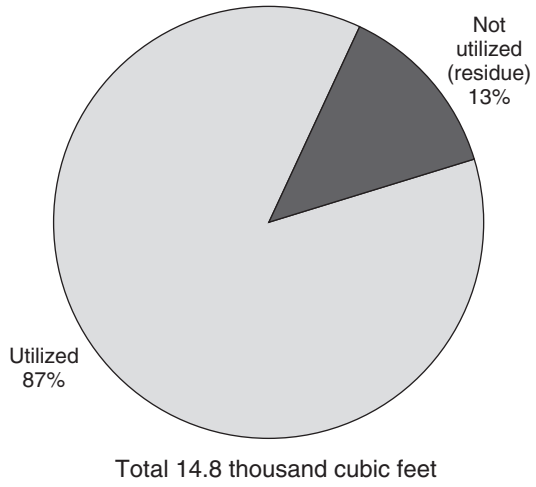

Figure 8—Disposition of hardwood growing-stock volume, 2004.

Hardwood volumes and percentages also were measured for poletimber and sawtimber, and differentiated by the various products they provided (tables A.10 through A.15). Those trees measured for pulpwood were more fully utilized at 93 percent. Also, 6.5 percent of the nongrowing-stock portion of pulpwood trees was used. Trees measured for hardwood saw logs and veneer were the least utilized of all, although they have the most nongrowing-stock material.

Hardwood percentages and volumes presented in the tables represent just trees measured in this study of 96 active harvest operations. However, it is possible to apply the percentages to inventory data from Georgia's eighth survey (see footnote 1) to provide an estimate of total hardwood logging residue for the State. From FIA inventory data, annual hardwood removals from all live trees totaled 453.7 million cubic feet. Hardwood growing-stock removals totaled 418.9 million cubic feet, or 92 percent of that total. Applying the factors from this study to total utilized hardwood removals in addition to volume from whole trees cut and left on site provides an estimate of 184.0 million cubic feet total of annual hardwood residue. Of that total, 76.6 million cubic feet, or 42 percent, was considered growing-stock residue. The remaining 58 percent, or 107.3 million cubic feet, was nongrowing-stock residue from stumps, tops, and limbs, and rough or rotten trees that were not used.

Georgia's Logging Workforce

In 2004, the Bureau of Labor Statistics reported 5,185 loggers working in 664 Georgia logging firms (Georgia Department of Labor, Workforce 2001–2004). This represents a decline from 2001 (fig. 9). There has been a general trend of increasing productivity (tons per worker) in logging, as a result of industry's focus on increased cost efficiency. This trend is supported by data presented in this bulletin. Only 3 of the 96 sites visited were considered low

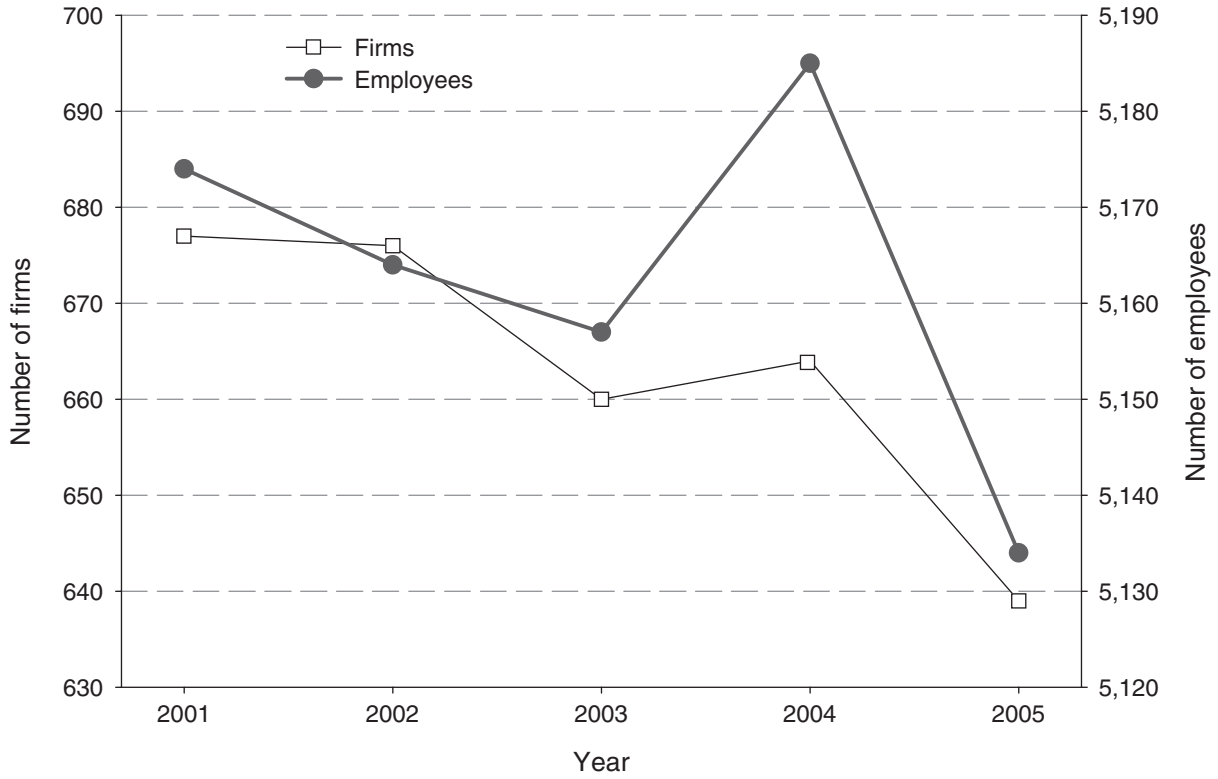

Figure 9—Employment in logging, Georgia, 2004.

mechanization; i.e., those on which logging crews were using chainsaws to fell trees. Although chainsaws are used on high-mechanization sites for bucking and limbing, they typically are not used there for felling. Improved productivity has come from increasing mechanization and improved equipment capabilities. The most common logging system in the South is currently a feller buncher working with two grapple skidders, which is capable of producing about 10 loads per day of tree-length wood (Rummer 2002).

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Glossary

Board foot. Unit of measure applied to roundwood. It relates to lumber that is 1-foot long, 1-foot wide, and 1-inch thick (or its equivalent).

Composite products. Roundwood products manufactured into chips, wafers, strands, flakes, shavings, or sawdust and then reconstituted into a variety of panel and engineered lumber products.

Drain. The volume of roundwood removed from any geographic area where timber is grown.

Growing-stock removals. The growing-stock volume removed from poletimber and sawtimber trees in the timberland inventory. (Note: Includes volume removed for roundwood products, logging residues, and other removals.)

Growing-stock trees. Living trees of commercial species classified as sawtimber, poletimber, saplings, and seedlings. Growing-stock trees must contain at least one 12-foot or two 8-foot logs in the saw-log portion, currently or potentially (if too small to qualify). The log(s) must meet dimension and merchantability standards and have, currently or potentially, one-third of the gross board-foot volume in sound wood.

Growing-stock volume. The cubic-foot volume of sound wood in growing-stock trees at least 5.0 inches d.b.h. from a 1-foot stump to a minimum 4.0-inch top d.o.b. of the central stem.

Hardwoods. Dicotyledonous trees, usually broadleaf and deciduous.

Soft hardwoods. Hardwood species with an average specific gravity of 0.50 or less, such as gums, yellow-poplar, cottonwoods, red maple, basswoods, and willows.

Hard hardwoods. Hardwood species with an average specific gravity greater than 0.50, such as oaks, hard maples, hickories, and beech.

Industrial roundwood products. Any primary use of the main stem of a tree, such as saw logs, pulpwood, and veneer logs, intended to be processed into primary wood products, such as lumber, wood pulp, and sheathing, at primary wood-using mills.

International ¼-inch rule. A log rule or formula for estimating the board-foot volume of logs, allowing ½-inch of taper for each 4-foot length. The rule appears in a number of forms that allow for kerf. In the form used by FIA, a ¼-inch of kerf is assumed. This rule is used as the Forest Service standard log rule in the Eastern United States.

Log. A primary forest product harvested in long, primarily 8-, 12-, and 16-foot lengths.

Logging residues. The unused merchantable portion of growing-stock trees cut or destroyed during logging operations.

Merchantable portion. That portion of live trees 5.0 inches d.b.h. and larger between a 1-foot stump and a minimum 4.0-inch top d.o.b. on the central stem. That portion of primary forks from the point of occurrence to a minimum 4.0-inch top d.o.b. is included.

Merchantable volume. Solid-wood volume in the merchantable portion of live trees.

Noncommercial species. Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Nonforest land. Land that has never supported forests and land formerly forested where timber production is precluded by development for other uses.

Nongrowing-stock sources. The net volume removed from the nongrowing-stock portions of poletimber and sawtimber trees (stumps, tops, limbs, cull sections of central stem) and from any portion of a rough, rotten, sapling, dead, or nonforest tree.

Other forest land. Forest land other than timberland and productive reserved forest land. It includes available and reserved forest land that is incapable of producing annually 20 cubic feet per acre of industrial wood under natural conditions because of adverse site conditions such as sterile soils, dry climate, poor drainage, high elevation, steepness, or rockiness.

Other products. A miscellaneous category of roundwood products, e.g., cooperage, excelsior, shingles, and mill residue byproducts (charcoal, bedding, mulch, etc.).

Other removals. The growing-stock volume of trees removed from the inventory by cultural operations such as timber stand improvement, land clearing, and other changes in land use, resulting in the removal of the trees from timberland.

Other sources. (See: Nongrowing-stock sources.)

Poletimber-size trees. Softwoods 5.0 to 8.9 inches d.b.h. and hardwoods 5.0 to 10.9 inches d.b.h.

Posts, poles, and pilings. Roundwood products milled (cut or peeled) into standard sizes (lengths and circumferences) to be put in the ground to provide vertical and lateral support in buildings, foundations, utility lines, and fences. May also include nonindustrial (unmilled) products.

Primary wood-using plants. Industries that convert roundwood products (saw logs, veneer logs, pulpwood, etc.) into primary wood products, such as lumber, veneer or sheathing, and wood pulp.

Pulpwood. A roundwood product that will be reduced to individual wood fibers by chemical or mechanical means. The fibers are used to make a broad generic group of pulp products that includes paper products, as well as chipboard, fiberboard, insulating board, and paperboard.

Rotten trees. Live trees of commercial species not containing at least one 12-foot saw log, or two noncontiguous saw logs, each 8 feet or longer, now or prospectively, primarily because of rot or missing sections, and with less than one-third of the gross board-foot tree volume in sound material.

Rough trees. Live trees of commercial species not containing at least one 12-foot saw log, or two noncontiguous saw logs, each 8 feet or longer, now or prospectively, primarily because of roughness, poor form, splits, and cracks, and with less than one-third of the gross board-foot tree volume in sound material; and live trees of noncommercial species.

Roundwood (roundwood logs). Logs, bolts, or other round sections cut from trees for industrial manufacture or consumer uses.

Roundwood chipped. Any timber cut primarily for industrial manufacture, delivered to nonpulpmills, chipped, and then sold to pulpmills for use as fiber. Includes tops, jump sections, whole trees, and pulpwood sticks.

Roundwood products. Any primary product, such as lumber, poles, pilings, pulp, or fuelwood that is produced from roundwood.

Roundwood product drain. That portion of total drain used for a product.

Salvable dead trees. Standing or downed dead trees that were formerly growing stock and considered merchantable. Trees must be at least 5.0 inches d.b.h. to qualify.

Saplings. Live trees 1.0 to 5.0 inches d.b.h.

Saw log. A roundwood product, usually 8 feet in length or longer, processed into a variety of sawn products such as lumber, cants, pallets, railroad ties, and timbers.

Saw-log portion. The part of the bole of sawtimber trees between a 1-foot stump and the saw-log top.

Saw-log top. The point on the bole of sawtimber trees above which a conventional saw log cannot be produced. The minimum saw-log top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber-size trees. Softwoods 9.0 inches d.b.h. and larger and hardwoods 11.0 inches d.b.h. and larger.

Sawtimber volume. Growing-stock volume in the saw-log portion of sawtimber-sized trees in board feet (International ¼-inch rule).

Seedlings. Trees < 1.0 inch d.b.h. and > 1 foot tall for hardwoods, > 6 inches tall for softwood, and > 0.5 inch in diameter at ground level for longleaf pine.

Softwoods. Coniferous trees, usually evergreen, having leaves that are needles or scalelike.

Standard cord. A unit of measure applied to roundwood, usually bolts or split wood. It is a stack of wood 4 feet high, 4 feet wide, and 8 feet long encompassing 128 cubic feet of wood, bark, and air space. This usually translates to approximately 75.0 to 81.0 cubic feet of solid wood for pulpwood, because pulpwood is more uniform.

Standard unit. A unit measure applied to roundwood timber products. Board feet (International ¼-inch rule) is the standard unit used for saw logs and veneer; cords are used for pulpwood, composite panel, and fuelwood; hundred pieces for poles; thousand pieces for posts; and thousand cubic feet for all other miscellaneous forest products.

Timberland. Forest land capable of producing 20 cubic feet of industrial wood per acre per year and not withdrawn from timber utilization.

Timber products. Roundwood products and byproducts.

Timber products output. The total volume of roundwood products from all sources plus the volume of byproducts recovered from mill residues (equals roundwood product drain).

Timber removals. The total volume of trees removed from the timberland inventory by harvesting, cultural operations such as stand improvement, land clearing, or changes in land

use. (Note: Includes roundwood products, logging residues, and other removals.)

Tree. Woody plant having one erect perennial stem or trunk at least 3 inches d.b.h., a more or less definitely formed crown of foliage, and a height of at least 13 feet (at maturity).

Upper-stem portion. The part of the main stem of sawtimber trees above the saw-log top and the minimum top diameter of 4.0 inches outside bark, or to the point where the main stem breaks into limbs.

Utilization studies. Studies conducted on active logging operations to develop factors for merchantable portions of trees left in the woods (logging residues), logging damage, and utilization of the unmerchantable portion of growing-stock trees and nongrowing-stock trees.

Veneer log. A roundwood product either rotary cut, sliced, stamped, or sawn into a variety of veneer products such as plywood, finished panels, veneer sheets, or sheathing.

Weight. A unit of measure for mill residues, expressed as oven-dry tons (2,000 oven-dry pounds).

Appendix

Index of Tables

Table A.1—Harvest and utilization volume by species group, source, and volume type, Georgia, 2004

Species group and source	Total tree volume	Growing stock					Nongrowing stock				
			Saw log		Upper stem			Stumps		Tops/limbs	
		Total	Utilized	Not utilized	Utilized	Not utilized	Total	Utilized	Not utilized	Utilized	Not utilized
		cubic feet									
Softwood											
Sawtimber	25,776.89	22,748.80	20,077.76	752.85	1,241.41	676.78	3,028.09	499.75	508.06	47.57	1,972.71
Poletimber	4,582.12	3,737.74	—	—	3,699.00	38.74	844.38	157.45	107.56	297.66	281.71
Total	30,359.01	26,486.54	20,077.76	752.85	4,940.41	715.52	3,872.47	657.20	615.62	345.23	2,254.42
Hardwood											
Sawtimber	14,245.99	11,898.07	9,555.08	748.07	531.23	1,063.69	2,347.92	144.48	550.72	2.20	1,650.52
Poletimber	3,612.84	2,865.47	—	—	2,712.26	153.21	747.37	114.99	133.37	83.29	415.72
Total	17,858.83	14,763.54	9,555.08	748.07	3,243.49	1,216.90	3,095.29	259.47	684.09	85.49	2,066.24

Numbers in rows and columns may not sum to totals due to rounding.
— = no sample for the cell.

Table A.2—Volume of softwood growing stock by product and utilization for sawtimber and poletimber, Georgia, 2004

Product	Total volume utilized	Growing stock			Nongrowing stock utilized	Saw-log portion			
		Total	Utilized	Not utilized		Total	Utilized	Cull utilized	Not utilized
					cubic feet				
Saw logs	14,222.11	14,860.36	13,857.62	1,002.74	364.49	13,003.45	12,476.91	526.55	—
Veneer logs	4,191.62	4,331.28	4,099.67	231.61	91.95	4,072.55	3,966.80	103.59	2.16
Composite panels	959.81	903.86	878.18	25.68	81.63	210.60	197.02	13.59	—
Pulpwood	3,249.12	2,937.01	2,882.14	54.87	366.98	438.50	416.94	21.56	—
Poles	3,239.04	3,308.69	3,156.84	151.85	82.20	3,105.48	3,020.08	81.69	3.71
Posts	158.88	145.34	143.71	1.63	15.17	—	—	—	—
Fuelwood	—	—	—	—	—	—	—	—	—
Total	26,020.58	26,486.54	25,018.16	1,468.38	1,002.42	20,830.58	20,077.75	746.98	5.87

Numbers in rows and columns may not sum to totals due to rounding.
— = no sample for the cell.

Table A.3—Percent of overutilization and underutilization for softwood growing stock by product for sawtimber and poletimber, Georgia, 2004

Product	Overutilization		Underutilization		Saw-log portion		
	Growing stock utilized/ total volume utilized	Nongrowing stock utilized/ total volume utilized	Growing stock utilized/total growing-stock volume	Growing stock not utilized/ total growing-stock volume	Saw log utilized/ total saw-log volume	Cull utilized/ total saw-log volume	Saw log not utilized/ total saw-log volume
	percent						
Saw logs	97.44	2.56	93.25	6.75	95.95	4.05	—
Veneer logs	97.81	2.19	94.65	5.35	97.40	2.54	0.05
Composite panels	91.50	8.50	97.16	2.84	93.55	6.45	—
Pulpwood	88.71	11.29	98.13	1.87	95.08	4.92	—
Poles	97.46	2.54	95.41	4.59	97.25	2.63	0.12
Posts	90.45	9.55	98.88	1.12	—	—	—
Fuelwood	—	—	—	—	—	—	—
All products	96.15	3.85	94.46	5.54	96.39	3.59	0.03

— = no sample for the cell.

Table A.4—Volume of softwood growing stock by product and utilization for sawtimber, Georgia, 2004

Product	Total volume utilized	Growing stock			Nongrowing stock utilized	Saw-log portion			
		Total	Utilized	Not utilized		Total	Utilized	Cull utilized	Not utilized
					cubic feet				
Saw logs	13,681.29	14,328.57	13,337.93	990.64	343.36	13,003.45	12,476.91	526.55	—
Veneer logs	4,155.30	4,295.67	4,065.15	230.52	90.15	4,072.55	3,966.80	103.59	2.16
Composite panels	249.35	261.29	241.27	20.02	8.08	210.60	197.02	13.59	—
Pulpwood	541.49	554.57	517.96	36.61	23.53	438.50	416.94	21.56	—
Poles	3,239.04	3,308.69	3,156.84	151.85	82.20	3,105.48	3,020.08	81.69	3.71
Posts	—	—	—	—	—	—	—	—	—
Fuelwood	—	—	—	—	—	—	—	—	—
Total	21,866.47	22,748.79	21,319.15	1,429.64	547.32	20,830.58	20,077.75	746.98	5.87

Numbers in rows and columns may not sum to totals due to rounding.
— = no sample for the cell.

Table A.5—Percent of overutilization and underutilization for softwood growing stock by product for sawtimber, Georgia, 2004

Product	Overutilization		Underutilization		Saw-log portion		
	Growing stock utilized/ total volume utilized	Nongrowing stock utilized/ total volume utilized	Growing stock utilized/total growing-stock volume	Growing stock not utilized/ total growing-stock volume	Saw log utilized/ total saw-log volume	Cull utilized/ total saw-log volume	Saw log not utilized/ total saw-log volume
				percent			
Saw logs	97.49	2.51	93.09	6.91	95.95	4.05	—
Veneer logs	97.83	2.17	94.63	5.37	97.40	2.54	0.05
Composite panels	96.76	3.24	92.34	7.66	93.55	6.45	—
Pulpwood	95.65	4.35	93.40	6.60	95.08	4.92	—
Poles	97.46	2.54	95.41	4.59	97.25	2.63	0.12
Posts	—	—	—	—	—	—	—
Fuelwood	—	—	—	—	—	—	—
All products	97.50	2.50	93.72	6.28	96.39	3.59	0.03

— = no sample for the cell.

Table A.6—Volume of softwood growing stock by product and utilization for poletimber, Georgia, 2004

Product	Total volume utilized	Growing stock			Nongrowing stock utilized
		Total	Utilized	Not utilized	
			cubic feet		
Saw logs	540.82	531.79	519.69	12.10	21.13
Veneer logs	36.32	35.61	34.52	1.09	1.80
Composite panels	710.46	642.57	636.91	5.66	73.55
Pulpwood	2,707.63	2,382.44	2,364.18	18.26	343.45
Poles	—	—	—	—	—
Posts	158.88	145.34	143.71	1.63	15.17
Fuelwood	—	—	—	—	—
Total	4,154.11	3,737.75	3,699.01	38.74	455.10

Numbers in rows and columns may not sum to totals due to rounding.
— = no sample for the cell.

Table A.7—Percent of overutilization and underutilization for softwood growing stock by product for poletimber, Georgia, 2004

Product	Overutilization		Underutilization	
	Growing stock utilized/ total volume utilized	Nongrowing stock utilized/ total volume utilized	Growing stock utilized/total growing-stock volume	Growing stock not utilized/ total growing-stock volume
	percent			
Saw logs	96.09	3.91	97.72	2.28
Veneer logs	95.04	4.96	96.94	3.06
Composite panels	89.65	10.35	99.12	0.88
Pulpwood	87.32	12.68	99.23	0.77
Poles	—	—	—	—
Posts	90.45	9.55	98.88	1.12
Fuelwood	—	—	—	—
All products	89.04	10.96	98.96	1.04

— = no sample for the cell.

Table A.8—Volume of softwood cull by product and utilization, Georgia, 2004

Product	Total volume utilized	Nongrowing stock			
		Merchantable			Unmerchantable utilized
		Total	Utilized	Not utilized	
		cubic feet			
Saw logs	—	—	—	—	—
Veneer logs	—	—	—	—	—
Composite panels	140.46	133.80	133.39	0.41	7.07
Pulpwood	114.73	106.82	105.94	0.88	8.79
Poles	—	—	—	—	—
Posts	—	—	—	—	—
Fuelwood	—	—	—	—	—
Total	255.19	240.62	239.33	1.29	15.86

Numbers in rows and columns may not sum to totals due to rounding.

— = no sample for the cell.

Table A.9—Percent of overutilization and underutilization for softwood cull by product, Georgia, 2004

Product	Overutilization		Underutilization	
	Merchantable utilized/ total volume utilized	Unmerchantable utilized/ total volume utilized	Merchantable utilized/total merchantable volume	Merchantable not utilized/ total merchantable volume
	percent			
Saw logs	—	—	—	—
Veneer logs	—	—	—	—
Composite panels	94.97	5.03	99.69	0.31
Pulpwood	92.34	7.66	99.18	0.82
Poles	—	—	—	—
Posts	—	—	—	—
Fuelwood	—	—	—	—
All products	93.79	6.21	99.46	0.54

— = no sample for the cell.

Table A.10—Volume of hardwood growing stock by product and utilization for sawtimber and poletimber, Georgia, 2004

Product	Total volume utilized	Growing stock			Nongrowing stock utilized	Saw-log portion			
		Total	Utilized	Not utilized		Total	Utilized	Cull utilized	Not utilized
					cubic feet				
Saw logs	7,741.22	9,159.51	7,635.92	1,523.59	105.30	7,666.48	7,004.27	624.78	37.43
Veneer logs	2,030.39	2,201.23	2,002.27	198.96	28.12	1,977.16	1,935.64	41.52	—
Composite panels	385.95	395.25	364.36	30.89	21.59	149.93	140.74	9.19	—
Pulpwood	2,810.71	2,824.04	2,628.52	195.52	182.19	475.90	442.20	33.69	—
Poles	—	—	—	—	—	—	—	—	—
Posts	—	—	—	—	—	—	—	—	—
Fuelwood	175.24	183.48	167.48	16.00	7.76	33.67	32.22	0.24	1.21
Total	13,143.51	14,763.51	12,798.55	1,964.96	344.96	10,303.14	9,555.07	709.42	38.64

Numbers in rows and columns may not sum to totals due to rounding.
— = no sample for the cell.

Table A.11—Percent of overutilization and underutilization for hardwood growing stock by product for sawtimber and poletimber, Georgia, 2004

Product	Overutilization		Underutilization		Saw-log portion		
	Growing stock utilized/ total volume utilized	Nongrowing stock utilized/ total volume utilized	Growing stock utilized/total growing-stock volume	Growing stock not utilized/ total growing-stock volume	Saw log utilized/ total saw-log volume	Cull utilized/ total saw-log volume	Saw log not utilized/ total saw-log volume
				percent			
Saw logs	98.64	1.36	83.37	16.63	91.36	8.15	0.49
Veneer logs	98.62	1.38	90.96	9.04	97.90	2.10	—
Composite panels	95.40	5.59	92.18	7.82	93.87	6.13	—
Pulpwood	93.52	6.48	93.08	6.92	92.92	7.08	—
Poles	—	—	—	—	—	—	—
Posts	—	—	—	—	—	—	—
Fuelwood	95.57	4.43	91.28	8.72	95.69	0.71	3.59
All products	97.38	2.62	86.69	13.31	92.74	6.89	0.38

— = no sample for the cell.

Table A.12—Volume of hardwood growing stock by product and utilization for sawtimber, Georgia, 2004

Product	Total volume utilized	Growing stock			Nongrowing stock utilized	Saw-log portion			
		Total	Utilized	Not utilized		Total	Utilized	Cull utilized	Not utilized
					cubic feet				
Saw logs	7,385.45	8,783.33	7,289.78	1,493.55	95.67	7,666.48	7,004.27	624.78	37.43
Veneer logs	2,030.39	2,201.23	2,002.27	198.96	28.12	1,977.16	1,935.64	41.52	—
Composite panels	185.95	205.24	180.90	24.34	5.05	149.93	140.74	9.19	—
Pulpwood	593.77	664.09	576.02	88.07	17.75	475.90	442.20	33.69	—
Poles	—	—	—	—	—	—	—	—	—
Posts	—	—	—	—	—	—	—	—	—
Fuelwood	37.42	44.16	37.33	6.83	0.09	33.67	32.22	0.24	1.21
Total	10,232.98	11,898.05	10,086.30	1,811.75	146.68	10,303.14	9,555.07	709.42	38.64

Numbers in rows and columns may not sum to totals due to rounding.

— = no sample for the cell.

Table A.13—Percent of overutilization and underutilization for hardwood growing stock by product for sawtimber, Georgia, 2004

Product	Overutilization		Underutilization		Saw-log portion		
	Growing stock utilized/ total volume utilized	Nongrowing stock utilized/ total volume utilized	Growing stock utilized/total growing-stock volume	Growing stock not utilized/ total growing-stock volume	Saw log utilized/ total saw-log volume	Cull utilized/ total saw-log volume	Saw log not utilized/ total saw-log volume
				percent			
Saw logs	98.70	1.30	83.00	17.00	91.36	8.15	0.49
Veneer logs	98.62	1.38	90.96	9.04	97.90	2.10	—
Composite panels	97.28	2.72	88.14	11.86	93.87	6.13	—
Pulpwood	97.01	2.99	86.74	13.26	92.92	7.08	—
Poles	—	—	—	—	—	—	—
Posts	—	—	—	—	—	—	—
Fuelwood	99.76	0.24	84.53	15.47	95.69	0.71	3.59
All products	98.57	1.43	84.77	15.23	92.74	6.89	0.38

— = no sample for the cell.

Table A.14—Volume of hardwood growing stock by product and utilization for poletimber, Georgia, 2004

Product	Total volume utilized	Growing stock			Nongrowing stock utilized
		Total	Utilized	Not utilized	
			cubic feet		
Saw logs	355.77	376.18	346.14	30.04	9.63
Veneer logs	—	—	—	—	—
Composite panels	200.00	190.01	183.46	6.55	16.54
Pulpwood	2,216.94	2,159.95	2,052.50	107.45	164.44
Poles	—	—	—	—	—
Posts	—	—	—	—	—
Fuelwood	137.82	139.32	130.15	9.17	7.67
Total	2,910.53	2,865.46	2,712.25	153.21	198.28

Numbers in rows and columns may not sum to totals due to rounding.

— = no sample for the cell.

Table A.15—Percent of overutilization and underutilization for hardwood growing stock by product for poletimber, Georgia, 2004

Product	Overutilization		Underutilization	
	Growing stock utilized/ total volume utilized	Nongrowing stock utilized/ total volume utilized	Growing stock utilized/total growing-stock volume	Growing stock not utilized/ total growing-stock volume
	percent			
Saw logs	97.29	2.71	92.01	7.99
Veneer logs	—	—	—	—
Composite panels	91.73	8.27	96.55	3.45
Pulpwood	92.58	7.42	95.03	4.97
Poles	—	—	—	—
Posts	—	—	—	—
Fuelwood	94.43	5.57	93.42	6.58
All products	93.19	6.81	94.65	5.35

— = no sample for the cell.

Table A.16—Volume of hardwood cull by product and utilization, Georgia, 2004

Product	Total volume utilized	Nongrowing stock			
		Merchantable			Unmerchantable utilized
		Total	Utilized	Not utilized	
		cubic feet			
Saw logs	—	—	—	—	—
Veneer logs	—	—	—	—	—
Composite panels	127.20	125.92	124.83	1.09	2.37
Pulpwood	350.84	347.21	327.02	20.19	23.82
Poles	—	—	—	—	—
Posts	—	—	—	—	—
Fuelwood	63.17	72.14	59.95	12.19	3.22
Total	541.21	545.27	511.80	33.47	29.41

Numbers in rows and columns may not sum to totals due to rounding.

— = no sample for the cell.

Table A.17—Percent of overutilization and underutilization for hardwood cull by product, Georgia, 2004

Product	Overutilization		Underutilization	
	Merchantable utilized/ total volume utilized	Unmerchantable utilized/ total volume utilized	Merchantable utilized/total merchantable volume	Merchantable not utilized/ total merchantable volume
	percent			
Saw logs	—	—	—	—
Veneer logs	—	—	—	—
Composite panels	98.14	1.86	99.13	0.87
Pulpwood	93.21	6.79	94.19	5.81
Poles	—	—	—	—
Posts	—	—	—	—
Fuelwood	94.90	5.10	83.10	16.90
All products	94.57	5.43	93.86	6.14

— = no sample for the cell.

Bentley, James W.; Harper, Richard A. 2007. Georgia harvest and utilization study, 2004. Resour. Bull. SRS–117. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 25 p.

In 2004, a harvest and utilization study was conducted on 96 operations throughout Georgia. There were 2,368 total trees measured, 1,581 or 67 percent were softwood, while 787 or 33 percent were hardwood. Results from this study showed that 86 percent of the total softwood volume measured was utilized for a product, while the other 14 percent was left as logging residue. Seventy-four percent of the total hardwood volume measured was utilized for a product, while 26 percent was left as logging residue.

Keywords: FIA, growing stock, logging residue, nongrowing stock, overutilization, product, removals, underutilization.

The Forest Service, U.S. Department of Agriculture (USDA), is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.