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South Carolina's Forests

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Forest Inventory and Analysis
Asheville, North Carolina

Contents

Foreword

This report presents the principal findings of the sixth evaluation of South Carolina's forest resources. Data concerning the extent and condition of forest land, associated timber volumes, and rates of growth and removals are included. In accordance with the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, the sixth inventory of South Carolina's Forests was expanded to accommodate nontimber as well as timber resources. Information on nontimber commodities was also collected in the sixth survey. Nontimber evaluations, however, will be dealt with separately. This analysis focuses mainly on changes and trends in timber resources since 1978.

The field inventory was begun in November 1985 and completed in September 1986. Five previous statewide inventories, completed in 1936, 1948, 1958, 1968, and 1978, provide statistics for measuring changes and trends over the past 50 years. Previously reported figures have been adjusted in some cases to provide the best estimate of real change.

The RPA and the Forest and Rangeland Renewable Resources Research Act of 1978 authorize these forest inventories and evaluations, which are a continuing, nationwide undertaking by the Regional Experiment Stations of the Forest Service, U.S. Department of Agriculture. In Florida, Georgia, North Carolina, South Carolina, and Virginia, these appraisals are conducted by the Forest Inventory and Analysis (FIA) Research Work Unit at the Southeastern Forest Experiment Station, with headquarters in Asheville, NC. The primary objective of these periodic evaluations is to develop and maintain the resource information needed for formulating sound forest policies and programs.

The combined efforts of many people have gone into this inventory and evaluation of South Carolina's forest resources. Appreciation is expressed to all Work Unit and Station personnel who participated in the field and office work. The Southeastern Station gratefully acknowledges the cooperation and assistance provided by the South Carolina Forestry Commission. Appreciation is also expressed for the excellent cooperation of other public agencies, forest industries, and private landowners in providing information and allowing access to the sample locations.

To facilitate both inventory and analysis, South Carolina is divided into three areas called Survey Units. A report highlighting the inventory findings and containing detailed data summaries has already been published for each of the Survey Units. Copies of these reports can be obtained from the Southeastern Forest Experiment Station. Information contained in FIA reports includes the most commonly used forest resource statistics, but additional data can often be obtained. A Forest Information Retrieval service is available for the custom compilation of forest resource data for any area within the five Southeastern States. Those requesting custom compilations or additional information provided from the raw inventory data are expected to pay the retrieval costs. Costs may range from less than $100 for a relatively simple retrieval to several thousand dollars for a complex retrieval involving the services of a computer programmer. Although we strive to serve each request promptly, other work will sometimes delay our response to requests of this kind.

Requests for information may be directed to:

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Joe P. McClure
Project Leader

Highlights

Since the fifth inventory of South Carolina's forest resources was completed in 1978—

• *area of timberland has declined by nearly 3 percent and now totals 12.2 million acres.* Losses occurred in all Survey Units. Approximately 645,000 acres of timberland were diverted to other land uses. The clearing of timberland for urban and related uses accounted for almost half of gross timberland reduction. The area of timberland diverted to nonforest uses was only partially offset by 296,000 acres of nonforest land added to the timberland base through reversions. Timberland now accounts for 63 percent of South Carolina's total land area.

• *timberland under forest industry control increased to 2.7 million acres, a rise of 16 percent.* Forest industry currently controls one-fifth of the timberland in the State. Non-industrial private forest (NIPF) timberland acreage totals 8.3 million acres, 9 percent less than in 1978. This diverse owner group still controls 68 percent of the State's timberland. Within the NIPF owner group, other private individual timberland increased by 17 percent to 3.9 million acres. These gains occurred at the expense of farm timberland ownership, which dropped 30 percent to 3.1 million acres. Farmers now own 26 percent of all timberland, down from 36 percent in 1978. Area of corporate timberland remained about the same. Similar shifts were evident in all regions of the State.

• *area of loblolly pine forest type increased by 14 percent to 3.9 million acres.* Increases occurred in all Units, but one-half of the gain was in the Southern Coastal Plain. Areas of pitch and Virginia pine types also increased. Areas of other major softwood types declined. A loss of 261,000 acres of shortleaf pine type in the Piedmont, and a combined drop of more than 141,000 acres of slash pine type in the Coastal regions, accounted for 65 percent of the gross decline. Altogether, area of softwood types dropped by 2 percent.

• *combined area of hardwood and oak–pine types declined by 3 percent to 6.7 million acres.* An increase of 310,000 acres of oak–gum–cypress type and decreases of 175,000 and 261,000 acres of oak–pine and oak–hickory types are the major changes in hardwood types.

• *almost 258,000 acres have been harvested annually and retained in timberland.* About 49 percent of the annual harvested acreage was natural pine stands, 8 percent pine plantations, 28 percent hardwood stands, and the remainder oak–pine types.

• *annual rate of regeneration averaged 263,000 acres, about 2 percent more than the area harvested.* Total area regenerated annually exceeded the area harvested by more than 10 percent on both forest industry and public land. On NIPF land, the area harvested yearly was 3 percent greater than the total area regenerated. Across all ownerships, artificial regeneration accounted for almost 43 percent of the total area regenerated. The annual rate of planting has increased by 68 percent statewide since 1978; planting has increased by 143 percent on NIPF land. A 92-percent increase in the area of pine plantations in the 0–10 year age class is indicative of this trend.

• *numbers of live softwood and hardwood trees declined in all diameter classes through the 12-inch class.* Declines were greatest in the 2- and 4-inch diameter classes; numbers of hardwoods dropped by 15 and 11 percent, while numbers of yellow pines declined by 19 and 26 percent in these classes. Inadequate regeneration in the 1970's and the decline in timberland area partially explain these drops.

• *volume of softwood growing stock declined by 2 percent to 8.8 billion cubic feet.* A 10-percent drop in volume in the Piedmont Unit accounted for almost all of the decline. Volume dropped by less than 1 percent in the Southern Coastal Plain and increased by 4 percent in the Northern Coastal Plain. Statewide, softwood volume declined in all diameter classes up through the 12-inch class. A 31-percent reduction in the volume of shortleaf pine to 729 million cubic feet accounts for 59 percent of the total decline. Loblolly pine volume increased to more than 5.6 billion cubic feet. The current inventory of softwood growing stock includes 34.1 billion board feet of sawtimber, 7 percent more than in 1978.

• *volume of hardwood growing stock increased by 6 percent to 8.9 billion cubic feet.* Gains in growing stock occurred in all diameter classes. Changes by species include increases in the volumes of yellow-poplar, soft maples, sweetgum, and all oaks. No major species declined in volume. The current inventory of hardwood growing stock includes 26.7 billion board feet of sawtimber, 9 percent more than in 1978.

• *total output of industrial timber products averaged 585 million cubic feet annually.* About 88 percent of this output was from roundwood, and 12 percent was from plant byproducts. Of the total roundwood production, pulpwood accounts for 47 percent, saw logs account for 41 percent, veneer logs 11 percent, and other miscellaneous products 1 percent. In addition, 41 million cubic feet of domestic fuelwood were produced annually during the period.

Annually between 1978 and 1985—

• *net annual growth of softwood growing stock totaled 444 million cubic feet, 28 percent less than in 1977.* Reductions occurred on all ownerships, but 88 percent of the loss can be attributed to declines on NIPF land. Declines were observed in all regions, but almost 62 percent of the drop occurred in the Piedmont. Net annual growth of hardwood growing stock also declined by 28 percent to 249 million cubic feet. Reductions occurred in all ownerships and across all geographic areas of the State.

• *annual removals of softwood growing stock equaled 455 million cubic feet, up 26 percent from 1977.* Softwood removals increased on both forest industry and NIPF land. Softwood removals exceed growth by 17 percent, or by 20 million cubic feet, on forest industry land and by 2 percent, or by 6 million cubic feet, on NIPF land. Hardwood removals increased by 27 percent and now total 172 million cubic feet. Hardwood growth currently exceeds removals by a ratio of 1.5 to 1, much less than the almost 3 to 1 relationship of 1977.

• *annual mortality of softwood growing stock totaled 83 million cubic feet and reduced gross growth by almost 16 percent.* Since 1977, softwood mortality has increased by 18 percent. Mortality of hardwood growing stock increased by almost 50 percent to 61 million cubic feet. Mortality reduced hardwood gross growth by 20 percent in 1985, compared with only 11 percent in 1977.

Forest Trends

Geography

South Carolina's boundaries encompass 19.9 million acres, including 0.6 million acres of census water (rivers more than one-eighth mile wide and lakes and reservoirs larger than 40 acres) and 19.3 million acres of land. Forest covers nearly 12.3 million acres, or more than 63 percent of the State's land area; most classified as available timberland (appendix table 1). Only 78,000 acres of South Carolina's forestland is classified as reserved. This reserved acreage includes portions of National Forests, National Wildlife Refuges, National Monuments and Battlefields, county and municipal watersheds and parks, and State forests, parks, and historic sites.

Four major physiographic provinces are represented in South Carolina (Barry 1980); the Atlantic Coastal Plain, the Sandhills, the Piedmont Plateau, and the Blue Ridge. The Coastal Plain is a gently sloping elevated sea bottom of low topographic relief characterized by extensive marshy areas. Its principal cities are located either along the coast, as is Charleston, or along the boundary with the Piedmont, as is Columbia. For analytical and reporting purposes, this province has been divided into two subregions or Survey Units (fig. 1). Most of the Northern Coastal Plain Unit is to the north of the Congaree and Cooper Rivers. Other major rivers originating or flowing through the Coastal Plain include the Pee Dee, Black, Edisto, Santee, and Waccamaw. Lakes Murray, Marion, and Moultrie account for the majority of the Coastal Plains remaining inland water. The Northern and Southern Coastal regions have similar land use patterns. Both are approximately 62 percent forested, with about 9 percent of the land area in urban and other developed uses. The Northern Coastal Plain has a slightly higher proportion of agricultural land, 25 percent compared with 23 percent, while the Southern Coastal Plain has a higher proportion of marsh.

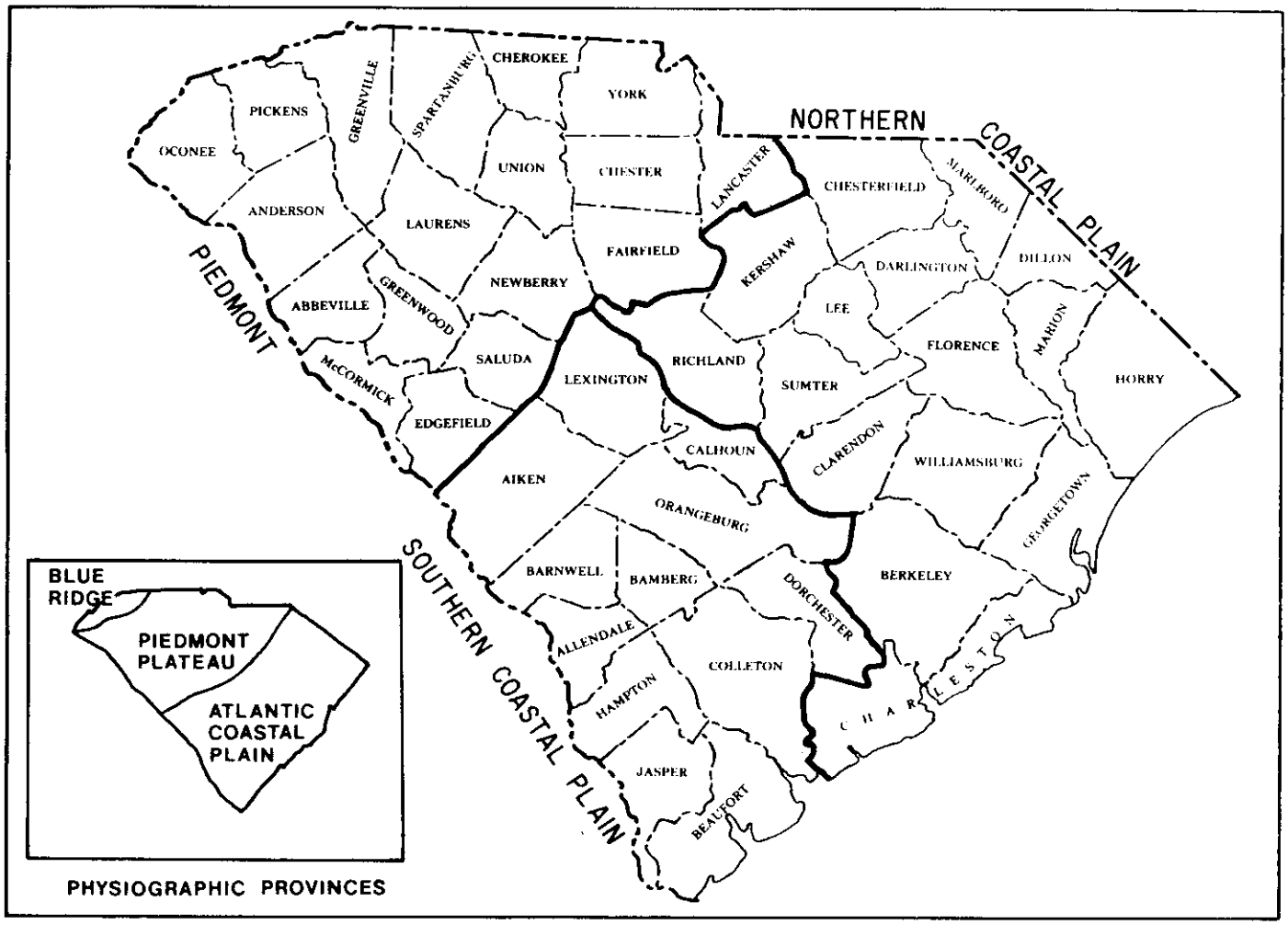


Figure 1.—Forest Survey Units in South Carolina.

The Piedmont Plateau is inland from the Coastal Province and meets the latter at the fall line, where the metamorphic rock of the Piedmont extends below the sedimentary, cretaceous, and tertiary formations of the Coastal Plain. The Sandhill Province, a zone of deep, excessively drained sands lies in a discontinuous belt along this border. The Sandhill Region roughly parallels the coastline, and varies in width from 5 to 15 miles. This fall line area is sculpted by the erosion of streams passing from the hard bedrocks of the Piedmont to the softer, less aggregated sands of the Coastal Plain (Barry 1980). The Sandhill Province is not treated as a separate region by FIA. For reporting purposes, this area is incorporated into other units. The Piedmont Plateau is characterized by greater topographic relief and higher elevations than the Coastal Region and has distinctly different geomorphology. The Carolina Slate belt, with rock formations less resistant to erosion than adjacent formations, gives rise to valleys of low ground that furnish reservoir sites on the Savannah River. Lake Hartwell, Richard B. Russell Reservoir, and Clark Hill Reservoir account for most of the inland water in the region. Major rivers originating or flowing through the Piedmont include the Broad, Saluda, Catawba, and Enoree. Land use patterns are slightly different in the Piedmont than in the Coastal Plain. Forests account for a greater percentage of land area, covering 67 percent of the region. Urban and developed areas also account for a greater proportion of land in the Piedmont, 11 percent. The two major urban centers in the region, Greenville and Spartanburg, account for over 10 percent of the State's population. About 21 percent of the region's land area is used for agricultural purposes.

Portions of Oconee, Pickens, and Greenville Counties extend into the Blue Ridge Province. This area, which is relatively small, has greater topographic relief, higher elevations, and older geologic structure than in either the Piedmont or Coastal Plain. For analytical purposes, however, this area is included with the Piedmont.

Timberland Acreage Declines by 3 Percent—Urban Land Use Up by 0.5 Million Acres

The analysis of the fifth forest survey of South Carolina (Knight and McClure 1979) reported historical increases in area of timberland between 1936 and 1968 (fig. 2) from 10.7 million acres to 12.4 million acres, and accurately predicted forest area had peaked. Between 1968 and 1978, area of timberland increased by less than 1 percent. The sixth forest survey of South Carolina is the first to measure a decrease in area of forest land. Since 1978, timberland area declined from 12.5 to 12.2 million acres (table I), or by 3 percent. Between 1978 and 1986, almost 966,000 acres in South Carolina experienced a land use change between forest and nonforest uses. Nearly 321,000 acres were added to the timberland base, but more than 645,000 acres were diverted from timberland to a nonforest land use.

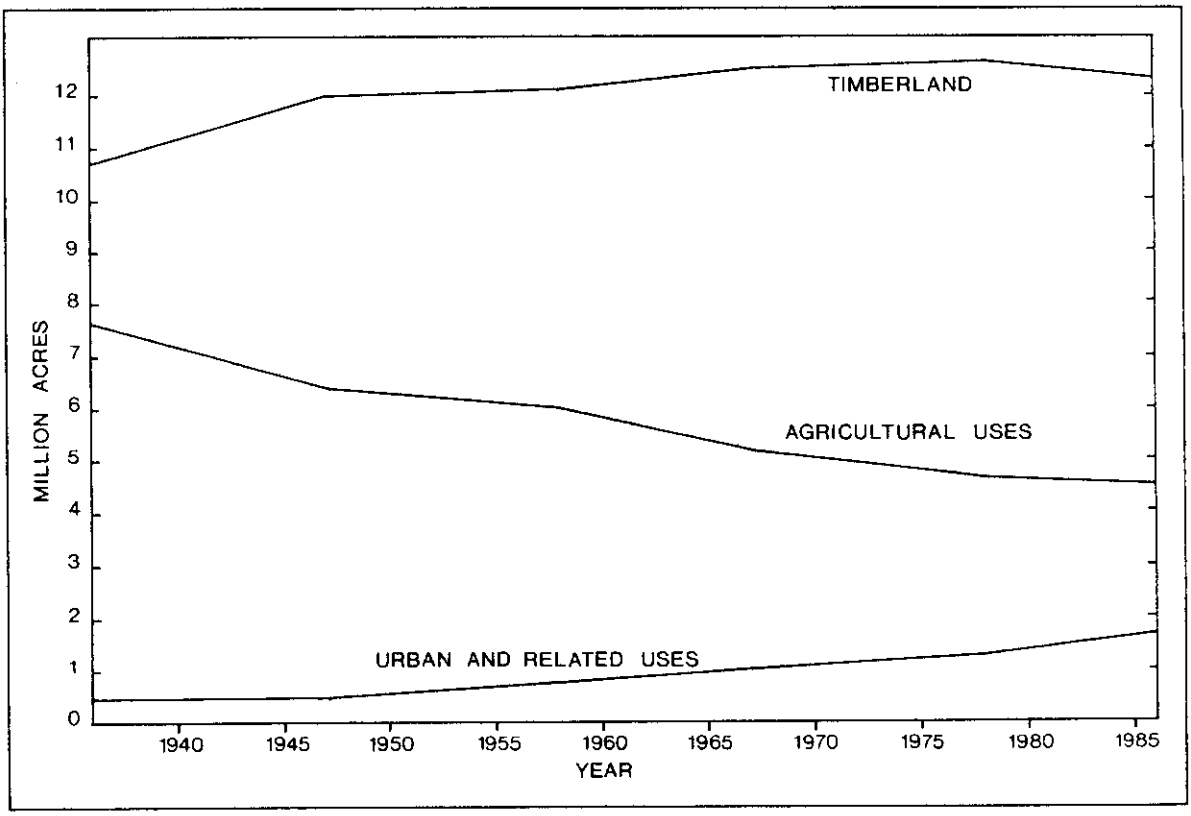


Figure 2.—Land use trends in South Carolina, 1936–1986.

Table I.—Changes in area of South Carolina's timberland, between 1978–1986, by Survey Unit

Survey Unit	Area of timberland in—		Net change [a]	Changes							
				Total gain	Additions from—		Total loss	Diversions to—			
					Nonforest	Other forest land		Other forest land	Agriculture	Urban and other	Water
	1978	1986		*Thousand acres*							
Southern Coastal Plain	3,223.4	3,162.7	–62.1	91.7	86.4	5.3	153.8	—	65.9	82.4	5.5
Northern Coastal Plain	4,751.5	4,574.9	–150.6	96.0	85.3	10.7	246.6	22.9	100.7	123.0	—
Piedmont	4,528.0	4,441.2	–111.4	133.2	124.4	8.8	244.6	3.8	93.9	93.9	53.0
State	12,502.9	12,178.8	–324.1	320.9	296.1	24.8	645.0	26.7	260.5	299.3	58.5

[a] Net change acreages for units do not account for the net change in timberland area because of timberland transfers among units. In the Southern Coastal Plain, 1,417 acres of timberland were gained; in the Northern Coastal Plain, 26,057 acres were lost; and in the Piedmont, 24,640 acres of timberland were added due to the county boundary relocation.

The 1978 assumption that timberland gains had subsided was based on evidence of heightened agricultural activity in South Carolina. Idle cropland has long been a major source of new forest in South Carolina. The area of idle cropland was 311,000 acres in 1978, compared with 854,000 acres in 1968, and 1.4 million acres in 1958. One indicator of agricultural activity, the acreage of cropland harvested declined from 4.2 million acres in 1945 to 2.0 million acres in 1969, then rose from 2.3 million acres in 1974 to 2.5 million acres in 1978 (U.S. Department of Commerce, Bureau of the Census 1981). Between 1978 and 1982, cropland harvested declined (U.S. Department of Commerce, Bureau of the Census 1984). According to Forest Survey estimates, area of idle cropland has taken an upward turn after a long downward slide. These trends might suggest a further increase in timberland area, but the rate of urban buildup has more than offset reversion of cropland to forest during the past decade. Since 1978, urban is the only major land use category to have significantly expanded in area. It expanded from 1.2 to 1.7 million acres (fig. 2). This category includes residential and industrial development, roads and highways, utility rights-of-way, and many other uses that are permanent. For both the fourth and fifth survey periods, timberland diversions to agricultural uses exceeded those to urban land uses. Between 1958 and 1968, 54 percent of timberland cleared was for agricultural purposes and 35 percent for urban use. For the period 1968 to 1978, agricultural and urban uses accounted for 42 and 40 percent of the diversions, respectively. Over the last 8 years, diversions to urban uses accounted for 46 percent of all timberland clearing, compared with 40 percent for agriculture.

While the Piedmont continues to maintain the most urban area of all units, 674,000 acres, recent timberland diversions to urban were greatest in the Coastal Regions. Of the timberland cleared for urban use, 41 percent was in the Northern Coastal Plain, 28 percent was in the Southern Coastal Plain, and 31 percent was in the Piedmont. Urban area increased by 36 percent in the Northern Coastal Plain to 583,000 acres and by 52 percent in the Southern Coastal Plain to 406,000 acres. Shifts among nonforest land uses accounted for a portion of these increases.

Statewide, more than 260,000 acres of timberland were diverted to agricultural uses over the last 8-year period. Clearing of timberland for agriculture accounted for about the same percentage of timberland loss in all survey units. During the same period, about 260,000 acres of farmland were added to the timberland base. This shift, mostly in the form of natural reversions of idle farmland and tree planting on cropland, accounts for about 88 percent of all additions to timberland in the State. Additions were slightly greater in the Piedmont than in the Coastal Plain. In the future, increased tree planting on highly erodible cropland, spurred by the Federal Conservation Reserve Program authorized under the 1985 Farm Bill, may offset continued timberland losses to urban sprawl. Currently, after six signup periods, almost 165,000 acres of qualifying farmland in South Carolina have been targeted for forestation under this program. Based on current regulations, up to 25 percent of the cropland in the State could be accepted for planting if all necessary qualifying criteria are met.

The creation of new water impoundments, particularly in the Piedmont, accounts for additional diversions. About 58,000 acres of timberland were diverted to water, including more than 26,000 acres flooded during the construction of the Richard B. Russell Lake.

A final factor affecting total timberland area is the reclassification of timberland to a reserved status or to woodland, and vice versa. During the latest survey period, almost 27,000 acres of timberland were reclassified into a reserved status. Most of this reclassification occurred in the Northern Coastal Plain. About 25,000 acres of forest formerly considered reserved are now classed as timberland. Statewide, the net change in reserved timberland since 1978 was less than 6,000 acres.

Forest Industry Controls 22 Percent of the Timberland—Farm Woodland Continues to Decline

Currently, forest industry controls 2.7 million acres of timberland in South Carolina, more than one-fifth of the timberland in the State (appendix table 2). Industry holdings include more than 80,000 acres of land leased from private individuals and corporations. Forest industry holdings have been increasing for at least three decades (fig. 3). This latest increase, a jump of more than 16 percent since 1978, comes when some companies are attempting to dispose of extensive tracts of timberland. Even when it is sold, however, industry timberland often remains in this owner class through sale to another forest product company. Forest industry now controls management and timber supplies on 18 percent of the timberland in the Piedmont, 20 percent in the Southern Coastal Plain, and 28 percent in the Northern Coastal Plain.

Area of timberland classed as farmer owned has been declining in South Carolina, and throughout much of the Southeast, for at least 35 years (fig. 3). In 1958 farmers owned 6.8 million acres of timberland. During the subsequent two survey periods (1958 to 1968 and 1968 to 1978), ownership of timberland by farmers declined by 27 and 10 percent, respectively. Since 1978, farm timberland has declined by almost one-third, from 4.5 to 3.1 million acres. This loss occurred throughout the State, but the proportionate decline was greatest in the Coastal Units. Although some of the recent net change can be attributed to timberland diversions to nonforest uses, a large share of the loss is associated with land transactions and changes in owner occupations. An estimated 4 percent of the timberland controlled by farmers in the last survey is now forest industry land. Another 4 percent is owned by private corporations (possibly incorporated farms), while 22 percent is owned by other private individuals who do not farm.

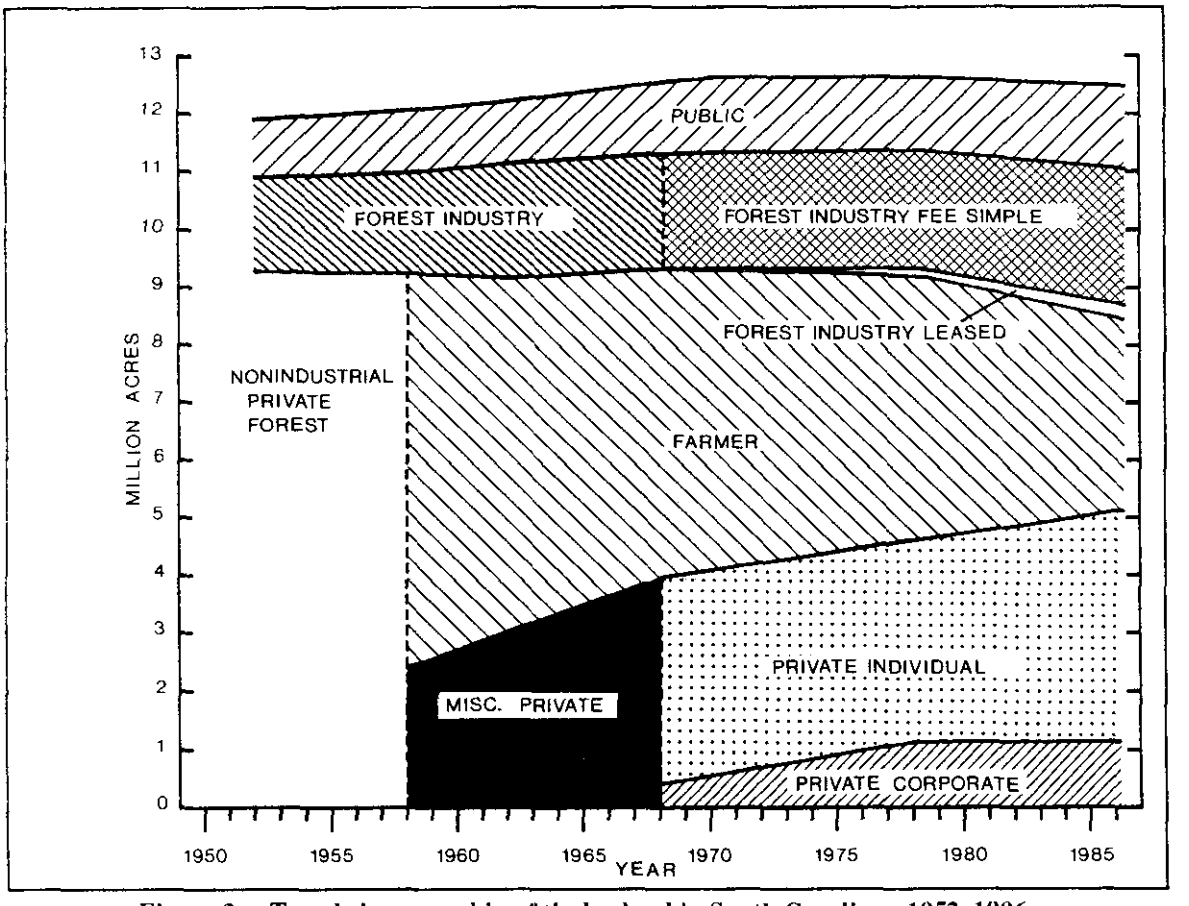


Figure 3.—Trends in ownership of timberland in South Carolina, 1952–1986.

In total, area of timberland owned by nonindustrial private forest (NIPF) landowners fell by 9 percent to 8.3 million acres between 1978 and 1986. In addition to farm owners, this diverse group includes other corporate (excluding forest industry corporations) and other individual owners. The loss of farm timberland accounts for almost all of the decline in NIPF timberland. Other corporate acreage remained about the same and now totals 1.2 million acres. Timberland held by other individuals increased by 17 percent to 3.9 million acres. Other private individuals have now surpassed farmers in timberland ownership and are the leading owner group in the State.

Since 1978, timberland held by public agencies has increased by 8 percent to 1.2 million acres and now accounts for about 10 percent of the timberland in the State. This proportion varies little by region. Almost half of all public timberland is the Sumter National Forest in the Piedmont and the Francis Marion National Forest in the Northern Coastal Plain. Other major Federal properties are the Carolina Sandhills National Wildlife Refuge, located in the Northern Coastal Plain, and the Savannah River Plant in the Southern Coastal Plain. Another one-fifth of public timberland (233,000 acres) is State owned. About 61 percent of this acreage is in the Northern Coastal Plain and includes the Sand Hill State Forest and Manchester State Forest.

Area of Softwood Type Drops Statewide—Decline Dampened by Increased Loblolly Pine Acreage

For reporting purposes, FIA places timberland in the Southeast into three broad forest types based on stocking levels of the species present. These types are softwood, oak–pine, and hardwood. Where softwood species make up more than 50 percent of the stocking, stands are classified as softwood types. In hardwood types, hardwoods make up more than 50 percent of the stocking, and pines less than 25 percent. If hardwoods make up more than 50 percent and pines account for at least 25 percent stocking, the stand is considered oak–pine. Forest types change because of natural succession, natural disturbance, or people-caused treatments and disturbances. Reported here is the net change in acreage of forest types between survey periods.

Since 1978, area of softwood forest types has declined by 134,000 acres, or by 2 percent. Area of softwood type declined in the Piedmont and Northern Coastal Plain, but increased in the Southern Coastal Plain. In the Piedmont and Northern Coastal Plain, losses on NIPF land negated gains on both forest industry and public land. In the Southern Coastal Plain, a 22-percent increase on forest industry land offset a small drop on NIPF land. Softwood types (in South Carolina, mostly southern yellow pine types) now total 5.4 million acres (appendix table 8), and account for about 45 percent of the timberland in the State, the same as in 1978. The drop in softwood type acreage is attributed to a loss in natural pine types. Between 1978 and 1986, area of natural pine stands declined from 4.2 to 3.4 million acres (appendix table 10), or by almost 19 percent. Although declines in natural pine types occurred in all owner categories, about 80 percent were on NIPF land.

Only about two-thirds of the area in natural pine in the last survey remained in that type. Close to 358,000 acres were converted to pine plantations after harvests. More than 404,000 acres shifted to hardwood and another 437,000 acres shifted to oak–pine types. Whereas 271,000 acres of natural pine stands were cleared to nonforest, more than 130,000 acres of nonforest reverted naturally to pine. This reverted area accounts for 4 percent of the current natural pine acreage.

Area of pine plantations increased by almost 650,000 acres, offsetting about four-fifths of the natural pine loss. Gains in pine plantation acreage were evident in all ownerships, but three-fourths of the increase can be attributed to planting on forest industry land. If all owners are grouped, about 316,000 acres of hardwood and oak–pine stands were harvested and planted successfully to pine, in addition to the area of natural pine stands harvested and artificially regenerated. Another 86,000 acres of plantations, previously considered hardwood or oak–pine types due to a large hardwood component, are now classified as pine types. Pine plantation losses included 22,000 acres that were cleared to nonforest and 67,000 acres on which hardwoods have encroached.

Of the timberland area in pine types (either planted or natural) in 1978, 9 of 10 acres remained in a pine type. Some 293,000 acres of pine were cleared to some nonforest use. About 9 percent of the previously classified pine types are now oak–pine, and another 8 percent are hardwood stands. Timberland shifts from pine to other types amounted to more than 971,000 acres.

Since 1978, nearly 1.5 million acres of pine type were harvested. About 0.9 million of these acres remained in pine. The remaining 0.6 million acres of harvested stands changed type and account for about 62 percent of the total pine type loss. If only pine stands that were harvested and artificially regenerated are considered, 93 percent of the acreage remained in pine types. The remaining 7 percent went to oak–pine. Obviously, artificial regeneration after harvests greatly enhances the chances of preserving pine dominance. If it is the intent of landowners to maintain cutover pinelands in pine types, proper site preparation followed by artificial regeneration is a proven way to achieve this objective.

Loblolly pine type, at 3.9 million acres, is the dominant softwood type in South Carolina and the only type to increase significantly in acreage since the last survey. Since

1978, loblolly type has increased by almost 0.5 million acres, and presently accounts for about 71 percent of all softwood stands. Because of its extensive natural range and increased use in plantations, the area of loblolly pine has been increasing since at least 1958; it occurs naturally in all but the northwesternmost portions of the State. The utility of loblolly pine, the extensive geographic area over which it occurs naturally, its broad genetic base, and its great variability in wood properties, tree form, disease resistance, and cold hardiness account for its value and desirability as a timber species. Good yields can be obtained with loblolly pine in both natural and planted stands.

Areas of shortleaf, pond, and longleaf pine types continued a 30-year decline, dropping by 44, 33, and 16 percent, respectively. Slash pine area, which declined in the last survey after previous increases, dropped by 27 percent since 1978 to 373,000 acres. Slash pine's natural range is limited to the southeasternmost counties in South Carolina. Extensive plantings elsewhere in the State often were unsuccessful because the species is highly susceptible to fusiform rust and ice damage when planted north of its natural range.

For areas remaining in timberland, about 89 percent of the acres having a loblolly type in the last survey remained as loblolly. Most of the balance became oak–pine, mainly through hardwood encroachment. More than 361,000 acres of oak–pine stands went to a loblolly type. For shortleaf pine, only 61 percent of the area remained as shortleaf type, with 19 percent becoming oak–pine and the remainder shifting to either loblolly or Virginia pine types.

Hardwood Type Acreage Declines in Coastal Regions—Increases in Piedmont

Hardwood types declined by 4 percent in both the Northern and Southern Coastal Plain and increased by 9 percent in the Piedmont. Statewide, hardwood types cover about 43 percent of all timberland. About 8 of 10 acres currently classed as a hardwood type were similarly classed in 1978. One of every 10 acres currently in hardwood types was classed as oak–pine in the last survey; another 1 of 10 acres was pine. A small percentage of the current hardwood acreage originated as natural reversions on nonforest land. About 6 percent of the 1978 hardwood type was cleared to a nonforest land use. Another 5 percent was lost through harvest and conversion to pine plantations. About 8 percent was associated with a shift to the oak–pine type.

Statewide, area of oak–pine type declined by 175,000 acres. This mixed type now covers 1.5 million acres and accounts for 13 percent of timberland in the State. Because of the mixed pine–hardwood stocking, shifting to and from this type is more common than for other types. Oak–pine stands represent an intermediate stage in the seral development of abandoned agricultural fields. Successional trends favor more tolerant hardwoods over the relatively intolerant pines, but natural disturbances such as fire may reduce hardwood stocking in young stands, shifting oak–pine types to pine. Oak–pine stands often result from partial harvesting of natural pine sites where enough pine is left in combination with a hardwood understory for the resulting stand to be classified as oak–pine. The type also occurs after artificial regeneration of sites to pine where site preparation has been inadequate or where hardwood sprouting has been heavy. Only 35 percent of the stands classed as oak–pine in 1978 remained oak–pine in 1986. About one-third shifted to pine and another third to hardwood. Of the oak–pine stands in 1978 that experienced no natural or human-caused disturbance over the last survey period, 41 percent remained oak–pine. Twenty-six percent shifted to hardwood types. Of stands that were disturbed, 28 percent remained oak–pine and 37 percent shifted to hardwood.

More Sawtimber and Sapling–Seedling Stands—Acreage of Poletimber Stands Down by 467,000 Acres

Between 1958 and 1968, area of timberland occupied by sawtimber, poletimber, and nonstocked stands declined, while area occupied by sapling–seedling stands increased from 2.7 to 3.6 million acres. Much of this increase was attributed to extensive tree planting during the Soil Bank era (1956 to 1961). Between 1958 and 1968, an average of 97,000 acres of forest were either planted or direct-seeded annually (U.S. Department of Agriculture, Forest Service 1986). For the previous decade (1948–1958), the area of artificial regeneration averaged only 34,000 acres. A large acreage of natural reversions on old-field sites contributed to the increase in sapling–seedling stands during the 1958–1968 period.

By 1978, many of these stands had developed to poletimber size or were cleared. While poletimber stands increased by 3 percent from 3.5 to 3.6 million acres, sapling–seedling stands dropped by 12 percent to 3.2 million acres. This decline was caused by a drop in the average reforestation rate from the 1958–1968 period to only 64,000 acres annually in conjunction with a decline in natural reversion of open land to forest. The decline in natural reversion corresponded with renewed agricultural activity during the period. Forest Survey data, another independent source of period regeneration totals, indicate that for the fifth survey period, timberland was artificially reforested at an average rate of 53,000 acres annually. An additional 66,000 acres of timberland and 13,000 acres of nonforest land naturally regenerated yearly.

Changes in acreage by stand size are driven by: (1) establishment of new stands, (2) natural development of existing stands, and (3) treatments and disturbances that

alter existing stands. Since 1978, area of sapling–seedling stands has increased by 3 percent, from 3.2 to more than 3.3 million acres (appendix table 9). Causes for the added acreage include greater harvesting followed by natural regeneration on timberland, a jump in artificial regeneration rates, and increased natural reversions on agricultural lands. Between 1978 and 1986, the annual harvest rate increased. The rates of both artificial and natural regeneration more than doubled, and the rate of natural forest establishment on nonforest lands increased by almost half. Concurrently, the number of sawtimber stands increased by 1 percent to 5.5 million acres and the number of stands dominated by poletimber trees declined by 13 percent to 3.1 million acres. The drop in poletimber acreage reflects low rates of stand establishment from 1958 to 1968 and increased harvest rates since 1978. Sawtimber stands now make up 45 percent of all timberland in South Carolina, and poletimber stands account for another 25 percent.

Area of nonstocked timberland changed little during the last 8 years and now totals 274,000 acres. Currently, nonstocked stands make up only 2 percent of all timberland in the State.

Current stand size distributions vary significantly by ownership class. Many of the differences are the result of diverse intentions of landowners and differing land management practices. For all forest types combined, 61 percent of public stands, 47 percent of NIPF stands, and 34 percent of forest industry stands are sawtimber size. Forest industry owns or leases 22 percent of the timberland in South Carolina but controls only 17 percent of the sawtimber stands. Due to more frequent harvests and regeneration than in other ownerships (management practices are aimed at shorter rotations), forest industry has 26 and 37 percent, respectively, of its timberland in poletimber and sapling–seedling stands, compared with the all-owner averages of 25 and 27 percent.

These percentages also vary by broad type. Forest industry holds 16 percent of the softwood sawtimber stands, but 35 percent of the softwood poletimber, 41 percent of the softwood sapling–seedling stands, and 55 percent of the nonstocked stands, again because of management practices. Over the next two decades, an increasing share of the demand for pine timber will be met from forest industry plantations.

For hardwood and oak–pine types, forest industry controls less than the average for all owners for all stand size classes. On public land with a hardwood or oak–pine type, more than 64 percent of the area is sawtimber stands. Forty-five percent of NIPF hardwood stands are sawtimber size, 28 percent are poletimber, and 24 percent are sapling–seedling stands. NIPF owners control 73 percent of all hardwood sawtimber stands, 82 percent of all hardwood poletimber stands, and 76 percent of all hardwood sapling–seedling stands. Demands for hardwoods of all sizes will have to be met largely on NIPF land for some time to come.

Fewer Saplings and Poletimber Size Softwoods and Hardwoods the Result of Land Use Trends and Management Practices

Since 1978, numbers of softwood and hardwood trees declined in all diameter classes up through the 12-inch class. For hardwoods, this is the first decline in number of stems in any diameter class in almost 30 years, and the first observed decline in number of sapling and poletimber trees since the first survey in 1936. Hardwood saplings (1.0–4.9 inches d.b.h.) increased significantly between 1947 and 1958, and to a lesser extent between 1958 and 1968. These increases are attributed to improved fire protection and to hardwood encroachment onto pine sites following harvests.

Although the area of hardwood stands remained fairly constant since 1978, the number of hardwood stems per acre declined. Together, these changes help to explain the recent decline in numbers of 2- through 12-inch trees of 15, 11, 5, 3, 2, and 1 percent, respectively (table II). Concurrently with these declines, the number of larger stems (all diameter classes above 14 inches) increased slightly. This accumulation of hardwoods in the larger diameter classes—also a continuation of a 30-year trend—is a result of past cutting practices. For the last 30 years, harvest rates in hardwood stands have been low relative to the cutting rates prior to 1958. The third survey showed declines in numbers of hardwoods in the sawtimber size classes and a buildup in smaller classes, a reflection of the higher cutting rates for previous periods. Between 1978 and 1986, average number of 2- and 4-inch stems per acre in oak–pine, lowland hardwood, and upland hardwood stands decreased by about 15 percent. At the same time, basal area per acre either increased slightly or remained about constant, a consequence of stand development and maturation. In maturing stands that are not disturbed, sapling numbers tend to decline. The drop in numbers of 2- and 4-inch stems seems consistent with the buildup of older stands and with the simultaneous decline in area of sapling–seedling hardwood stands.

The latest data indicate that the aging of the hardwood resource may be reversing. The new survey shows an increase in hardwood stands less than 11 years old. Many of the sapling–seedling stands in the 0–10 year class resulted from harvesting in the past 1 to 3 years. More than 50 percent of the stands in this age category are 4 years old or less. These stands are primarily stocked with seedlings or small coppice regeneration, much of which has not had time to cross the 1.0-inch threshold to sapling size. Most of the recent decline in number of hardwood stems in smaller classes can be attributed to losses on NIPF land. Number of saplings also declined on public land, but not as much as for all owners combined. On forest industry land, number of 2-

inch hardwoods declined by 3 percent, but increases were evident in all other diameter classes. Much of the increase in number of stems in the 4-inch and larger diameter classes on industry land can be attributed to acquisition of hardwood stands and previously unmanaged pine stands from NIPF owners.

For softwoods (primarily southern pine), number of 2- and 4-inch stems declined by 18 and 25 percent, while numbers of 6-, 8-, 10-, and 12-inch stems declined by 22, 19, 10, and 3 percent, respectively. The results of the sixth survey are consistent with findings of an interim assessment of South Carolina's pine resource conducted in 1983. This interim inventory showed that number of 2- and 4-inch live pines each had declined by 23 percent since 1978 and that numbers of 6-, 8-, and 10-inch pines had decreased by 15, 9, and 6 percent, respectively. The most recent survey confirms that number of 2-inch pines has declined, but by only 19 percent. Number of 4-inch pines declined by 26 percent. This tempered decline probably is due to increased planting midway through the survey cycle. Acres of forest planted increased by 19 percent between 1979 and 1980, and again by 17 percent between 1980 and 1981 (U.S. Department of Agriculture, Forest Service 1986). Seedlings planted in these years would not have been large enough to elicit stand table changes by 1983. The loss in number of 4-, 6-, 8-, and 10-inch live pines was somewhat greater than indicated by the interim survey, possibly due to increases in harvesting late in the period.

As with hardwoods, these declines in numbers of stems can be traced to historical trends in land use and forest

Table 11.—Number of live softwood and hardwood trees on South Carolina's timberland, by diameter and ownership classes, 1986, and change between 1978–1986

Diameter class	All ownerships		Public		Forest industry[a]		Other private	
	Inventory 1986	Change 1978–1986	Inventory 1986	Change 1978–1986	Inventory 1986	Change 1978–1986	Inventory 1986	Change 1978–1986
				SOFTWOODS (million trees)				
2	979.7	–221.5	131.1	+7.1	234.9	–2.1	613.7	–226.6
4	496.9	–165.8	61.5	–2.3	140.9	–22.7	294.5	–140.8
6	308.0	–88.7	34.7	+2.7	99.4	+8.8	173.9	–100.2
8	199.5	–48.2	21.3	+2.0	60.5	+9.3	117.7	–59.5
10	127.1	–14.6	13.1	–2.1	32.5	+8.0	81.5	–20.5
12	77.6	–2.5	11.1	—	15.2	+2.3	51.3	–4.9
14	44.9	+1.2	7.3	+.2	7.1	+.4	30.5	+.6
16+	48.1	+4.9	9.2	+1.4	6.5	+.6	32.4	+2.8
				HARDWOODS (million trees)				
2	4,122.7	–725.0	359.3	–20.2	857.5	–21.8	2,905.9	–683.0
4	1,019.7	–120.3	90.3	–5.1	178.3	+10.9	751.1	–126.1
6	416.1	–23.3	37.4	+.7	66.4	+5.0	312.3	–28.9
8	213.8	–5.8	16.9	–.1	33.1	+3.1	163.8	–8.8
10	123.5	–2.7	10.5	+.3	19.3	+.8	93.7	–3.8
12	79.4	–1.1	6.2	–.1	13.4	+.9	59.8	–1.9
14	50.0	+1.3	4.1	+.6	8.5	+.5	37.4	+.9
16+	71.3	+4.5	5.1	+.1	14.5	+.6	51.7	+3.8

[a] Including inventory on lands under long-term lease.

management over the past 30 years. The large areas of pine plantations and natural pine stands established between the late 1950's and mid-1960's have been discussed. From 1968 to 1978, fewer natural pine stands were established. Natural pine stands generally have more saplings per acre than planted stands of comparable age, so a reduction in area of natural stands has contributed to a drop in number of small pines. More recently, the rate of natural reversion on nonforest and cutover pine stands has picked up. Of more consequence in affecting the pine stand table, however, is increased planting and a replacement of natural stands by plantations. In 1978, natural pine stands accounted for 34 percent of all timberland. Natural pine stands now account for only 28 percent of all timberland. Pine plantations account for 17 percent of all timberland, up from 11 percent in 1978. Because of intensive management and stocking control, pine plantations average fewer stems per acre than natural stands. In the latest survey, pine plantations had an average 447 stems per acre, compared with 557 stems per acre in natural pine stands. With pine plantations replacing natural stands, which are frequently overstocked at a young age, it is reasonable to expect that numbers of pine stems will be reduced. Also contributing to the decline in pine trees is a reduction in average number of stems in natural stands. Number of stems in natural pine stands last survey averaged 631 per acre, 13 percent more than in the latest survey. Although current planting levels are expected to be maintained, numbers of small diameter pine trees may continue to decline during the next few survey cycles as plantations account for a greater share of timberland area in South Carolina.

Trends in stand table development differ considerably for the three main owner categories. Land transfers among owner groups, such as the acquisition of timberland by forest industry from NIPF owners and an increase in area of public timberland, strongly affected the stand tables by ownership. Within each owner group, landowner intentions also directed changes.

On forest industry land, number of stems in all poletimber and sawtimber size diameter classes increased (table II). Contributing to this trend was an increase in area of timberland by 381,000 acres—acquired mostly from NIPF owners. Also driving stand table changes were forest industry management practices. Many pine plantations established between 1966 and 1976 are now of poletimber size.

Numbers of 2- and 4-inch pines declined on forest industry land by 2 and 23 percent, respectively. This decline seems inconsistent with an increase of 61 percent in the area of natural pine stands in the 0–10 year age class and of 8 percent for the 11–20 year age class. In addition, area of pine plantations in the youngest age class increased by 74 percent to 529,000 acres. Possible explanations are: fewer average stems per acre than last survey in young natural pine stands, a loss of understory saplings connected with the harvesting and conversion of older pine stands, and a majority of the young plantations being stocked only with seedlings. Forest planting was higher on forest industry land in 1984 and 1985 than it was in previous years, as was true for all ownerships (fig. 4). Seedlings on these areas have not had time to cross the 1.0-inch threshold for saplings.

Numbers of softwoods declined on NIPF land in all diameter classes through the 12-inch class by magnitudes much greater than averages for all owners. Numbers of 2- and 4-inch softwoods declined by 27 and 32 percent. The loss of a sizable area of timberland to public and forest industry owners is the principal factor controlling the drop in numbers of both large and small stems. Also, influencing the decline in small stems is a slight shift toward older natural stands and a harvest rate that exceeds the total regeneration rate.

Softwood Inventory Volume Down 2 Percent

Volume of softwood growing stock declined from 9.1 to 8.8 billion cubic feet, or by 2 percent, between 1978 and 1986. Pine growing-stock volume declined by 3 percent to 8.2 billion cubic feet. This decline corroborates the 1983 assessment findings that yellow-pine volume had fallen by just under 1 percent since 1978. This is the first full-scale FIA survey since 1958 that has shown a reduction in softwood growing-stock inventory in South Carolina (fig. 5). The change is disconcerting, in that it is an extreme turnaround from the change which occurred between 1968 and 1978, when pine growing-stock volume increased by more than one-third. Softwoods, which accounted for about 52 percent of the total inventory in 1978, still make up about one-half of all growing-stock volume. Changes in the softwood inventory differ markedly by Survey region. In the Piedmont, softwood inventory declined by 10 percent; this loss accounted for almost all of the gross statewide decline. Volume dropped by less than 1 percent in the Southern Coastal Plain and increased by 4 percent in the Northern Coastal Plain.

Softwood changes also varied among owner groups and species classes. For each owner class, volume of "other softwoods" (all softwoods other than yellow pine) increased. Southern yellow pine (SYP) volume increased on both forest industry and public lands—by 19 and 4 percent, respectively. Loss of SYP volume on NIPF timberland accounts for all of the net decline in softwood inventory between 1978 and 1986. During this period, SYP volume fell by about 0.6 million cubic feet, or by almost 10 percent. Despite this loss, NIPF owners still control 65 percent of the SYP inventory in the State, in addition to 57 percent of the inventory of other softwoods. The loss of NIPF pine volume can be largely attributed to: (1) increased harvest rates, (2) fluctuations in historic rates of pine stand establishment, now causing reduced volumes in the smaller

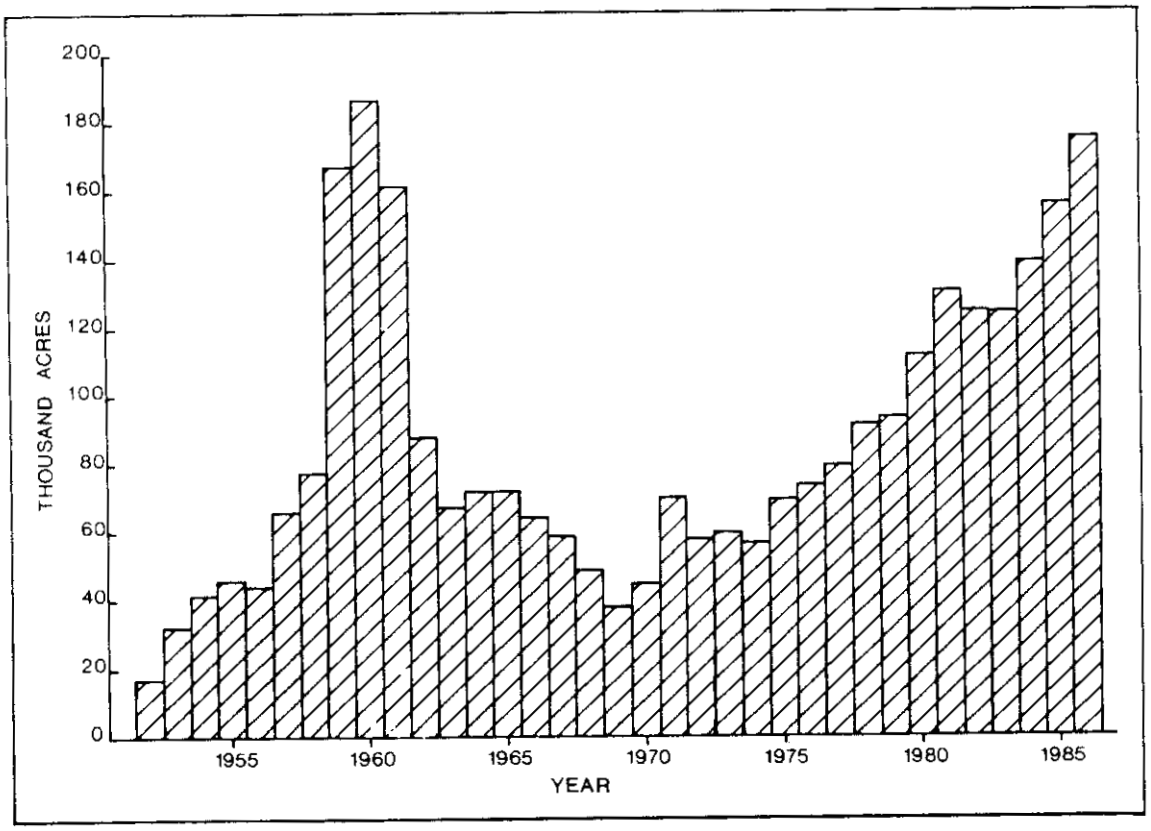


Figure 4. – Forest planting in South Carolina, 1952–1986.
Source: A statistical history of tree planting in the South 1925–1985.

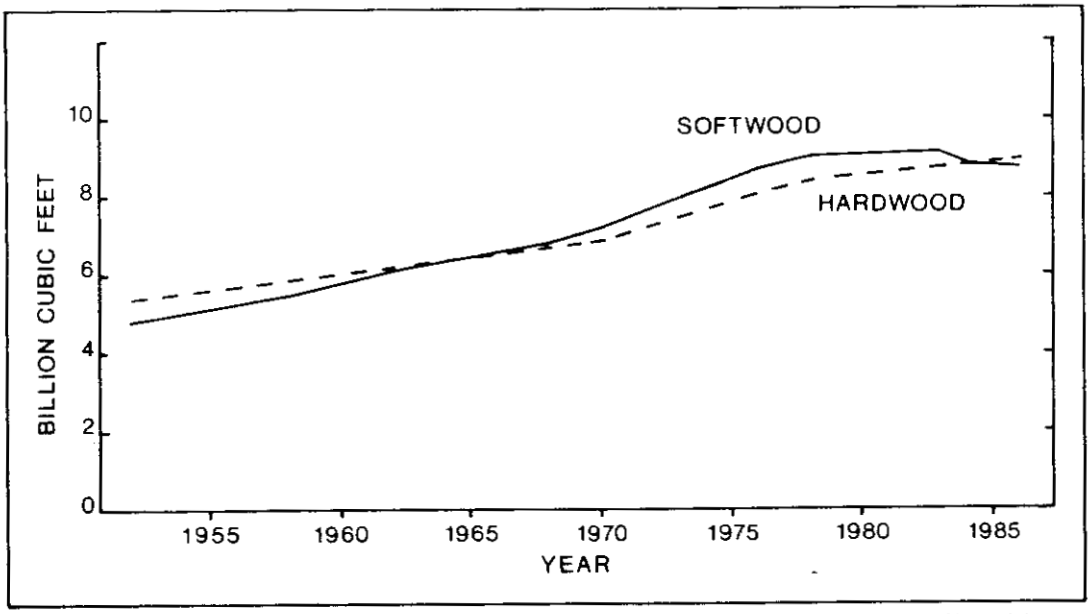


Figure 5. – Trends in volume of growing stock for softwood and hardwood, 1952–1986.

diameter classes, (3) a loss in NIPF pine volume associated with timberland transfers among owners, and (4) the disproportionate rate of land clearing on NIPF pine sites. Of the total timberland cleared to nonforest since 1978, about 87 percent was from NIPF holdings. Of this area, about 42 percent was in natural pine stands or pine plantations. This finding suggests that for every 10 acres cleared, 4 were NIPF land with a relatively high pine component.

The distribution of softwood inventory within broad management classes has changed since 1978. Then, less than 13 percent of the softwood growing-stock inventory was in pine plantations. Now, pine plantations account for about 19 percent of the softwood inventory (appendix table 28). As pine trees on the extensive areas of recently established pine plantations reach merchantable size, this portion will rise.

Statewide and for all ownerships, softwood volume declined in all diameter classes up through the 12-inch class, and increased in all larger classes (fig. 6). Volume declined by 21 percent in the 6-inch class, by 18 percent in the 8-inch class, and by smaller amounts in both the 10- and 12-inch classes. This decrease is in sharp contrast to the previous survey. Between 1968 and 1978, softwood volume increased markedly in all classes. Again, these changes can be linked to past land management practices.

On public timberland, softwood growing-stock volume increased in all diameter classes except the 10-inch class. On forest industry land, softwood volume increased in all diameter classes, especially in poletimber and small sawtimber classes (9.0 to 14.9 inches d.b.h.). The increases are attributed to sustained planting levels on industry land during the last 20 years. All of the loss of volume in small diameter classes occurred on NIPF land.

Loblolly pine volume increased to more than 5.6 billion cubic feet since 1978. Loblolly was the only major pine to show a volume increase (fig. 7). Loblolly is by far the most abundant species in the State, accounting for about one-third of both the sawtimber and growing-stock volumes of all species, including hardwoods. Virginia and pitch pine volumes also increased by 17 and 79 percent to 311 and 15 million cubic feet, respectively, but these two species account for less than 4 percent of the total softwood inventory.

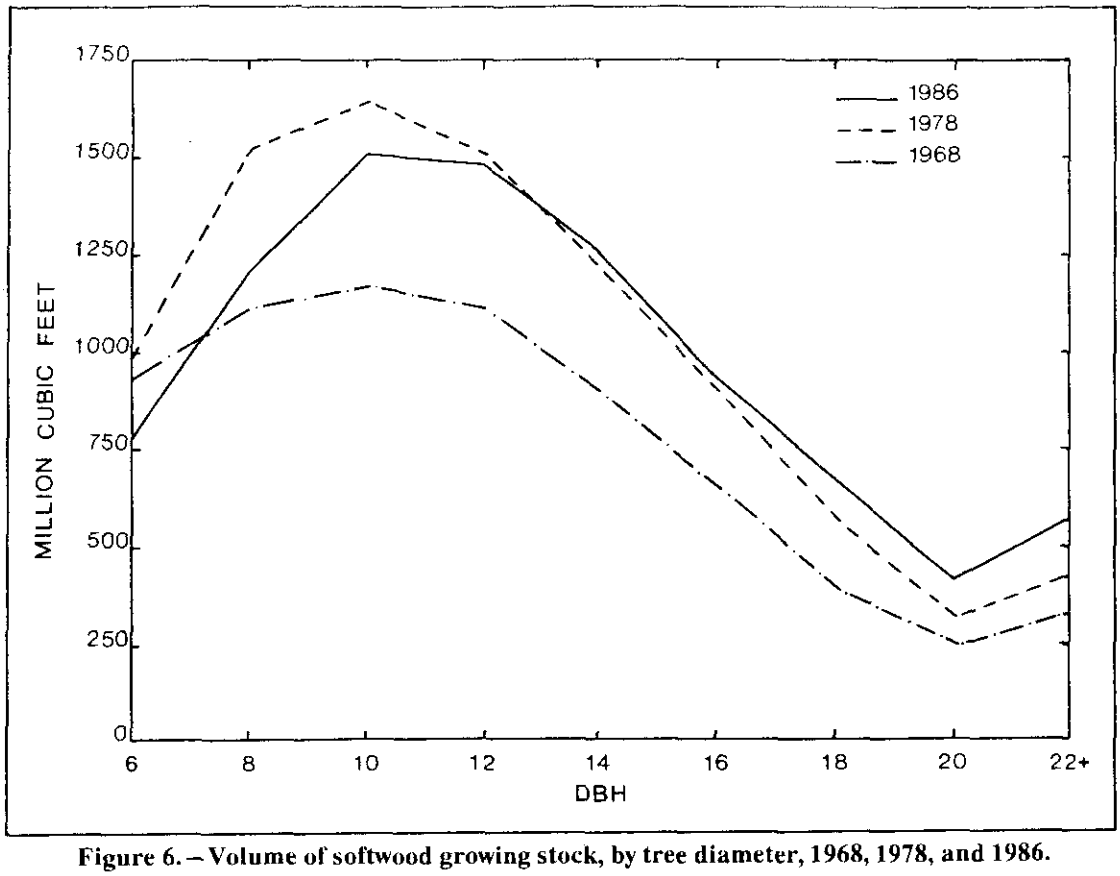


Figure 6.—Volume of softwood growing stock, by tree diameter, 1968, 1978, and 1986.

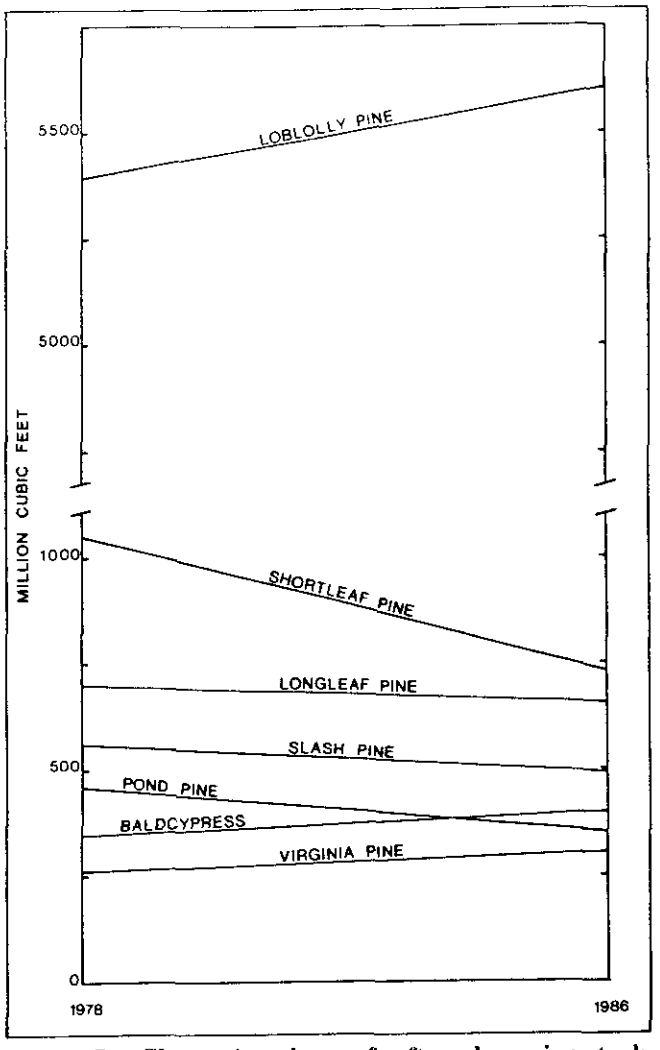


Figure 7.—Change in volume of softwood growing stock, selected species, 1978 to 1986.

Volumes of all other SYP declined. A reduction of 320 million cubic feet in volume of shortleaf growing stock accounted for 59 percent of the softwood net decline. More than 92 percent of the shortleaf decline occurred in the Piedmont.

The current inventory of softwood growing stock includes 34.1 billion board feet of sawtimber—7 percent more than in 1978. Increases in sawtimber volume occurred for all regions, in all ownership categories, and, statewide, in all diameter classes.

Hardwood Growing-Stock Volume Totals 8.9 Billion Cubic Feet—Up 6 Percent

Volume of hardwood growing stock increased from 8.4 to 8.9 billion cubic feet since 1978. Hardwoods now account for about one-half of the growing-stock inventory. Volume increases are evident across the range of diameter classes. Hardwood volume increased by 3 percent in the poletimber size classes, by 4 percent in the small sawtimber size classes (11.0 to 14.9 inches d.b.h.), and by 11 percent in the large sawtimber size classes (fig. 8). One factor contributing to the overall increase in hardwood growing-stock volume is that a higher proportion of the hardwood resource qualifies as growing stock in this survey than in the last. Merchantable volume of live hardwoods, which includes both growing stock and cull material, also increased, but by only 1 percent. The change in growing stock:cull ratio had more effect in the small diameter classes. Live merchantable hardwood volume in the poletimber size class declined by 4 percent. In the small sawtimber size classes, volume remained about constant; in the larger diameter classes, volume increased by 8 percent. About 13 percent of the merchantable hardwood inventory is in trees that do not qualify as growing stock. With hardwoods being used more as pulp furnish, interior core stock in softwood plywood, and in other composite board products, the potential importance of this low-quality material increases.

The change in growing stock:cull ratio is not the sole reason for the increase in the hardwood growing-stock inventory. Net annual growth continues to exceed removals, causing increases in volumes of both merchantable live hardwood and hardwood growing stock. It is important to point out, however, that the large surplus of hardwood growing-stock growth over removals which existed in the last survey has tightened considerably. Future increases in hardwood removals or declines in growth, or both, could easily cause reductions in the inventory.

Hardwood growing-stock volume increased by about 6 percent in all three survey regions. Hardwood growing-stock volume also increased for each of the three broad ownership categories: by 7 percent for both public and forest industry owners, and by 6 percent for NIPF owners. Increases of hardwood growing-stock volume on NIPF land amounted to 375 million cubic feet and accounted for 71 percent of the total increase. Hardwood volume on NIPF timberland now totals 6.6 billion cubic feet, three-fourths of the entire hardwood inventory.

Volumes of all major hardwood species in South Carolina increased. Volume of soft maples increased by 137 million cubic feet, or by 30 percent (fig. 9). Other soft-textured hardwoods increasing in volume include yellow-poplar (increased by 8 percent to 656 million cubic feet) and sweetgum (increased by 5 percent to 1.7 billion cubic feet). Sweetgum is the most abundant single hardwood species, accounting for one-fifth of the growing-stock inventory. Red oak volume increased by 114 million cubic feet. Although red oak volume declined in the Piedmont, it accounted for about one-third of the volume increase in each of the coastal regions. Volume of all white oaks increased by 13 percent to 1.0 billion cubic feet since last survey.

The current inventory of hardwood growing stock includes 26.7 billion board feet of sawtimber, 9 percent more than in 1978. About 25 percent of all hardwood sawtimber volume

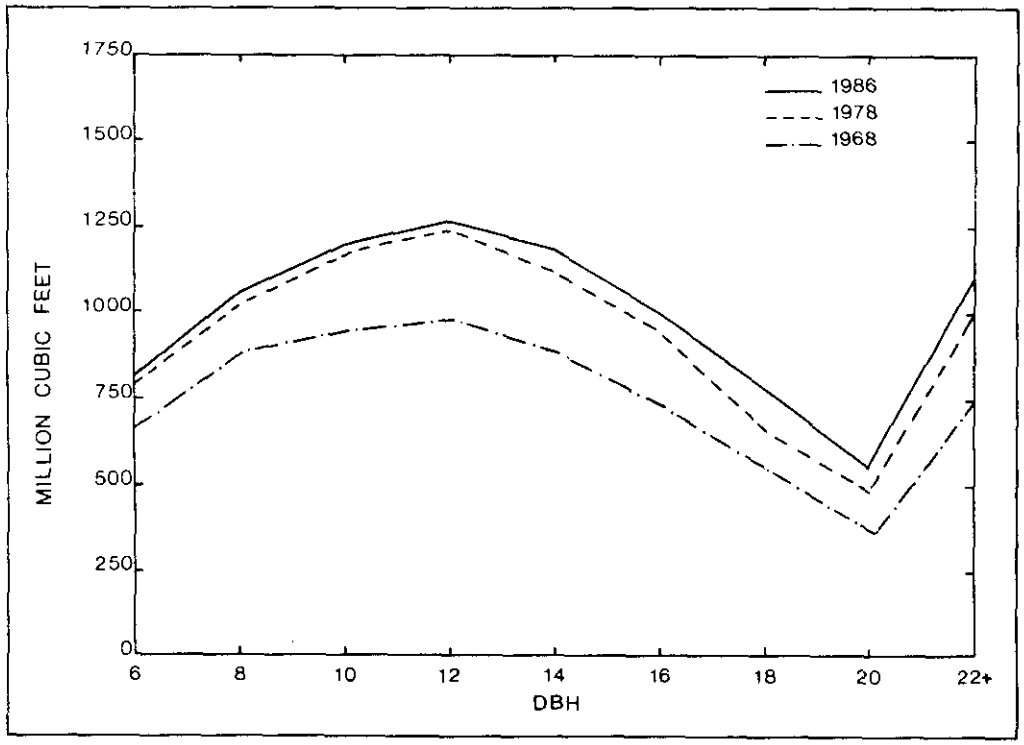


Figure 8.—Volume of hardwood growing stock, by tree diameter, 1968, 1978, and 1986.

is in grade 1 trees. It should be emphasized that tree grade is a classification of sawtimber trees based on the grade of the butt log in the tree. Upper logs are not graded; all sawtimber volume in a tree is assigned the grade of the butt log. Since, in most instances, the grade of upper logs is poorer than that of the butt log, the tree grade classification tends to overestimate the volume in high log grades. Almost 30 percent is in grade 2 trees, and another 38 percent is in grade 3 trees. About 7 percent of all sawtimber is in grade 4 trees—tie and timber grade (appendix table 21).

For some time now, hardwood volumes reported by FIA have been questioned by knowledgeable representatives of forest industry. The question has been posed, "Why is quality hardwood so difficult to find and procure if the inventory is so abundant?"

Although net annual growth exceeds removals, and hardwood inventories are increasing, a number of factors limit the availability of hardwood volume. Such factors as year-round water in stands, limited access, low volume per acre, steep slope, poor species mix, and difficult operability limit the availability of hardwoods. In addition to these physical factors, landowner intentions, wetlands legislation such as sections 208, 319, and 404 of the 1987 Clean Water Act, and social attitudes may tie up or restrict harvesting of hardwood volume on extensive areas. A complete analysis of the many factors influencing availability is not possible here. The physical, social, and legal factors controlling availability vary considerably among tracts, and each case must be analyzed separately.

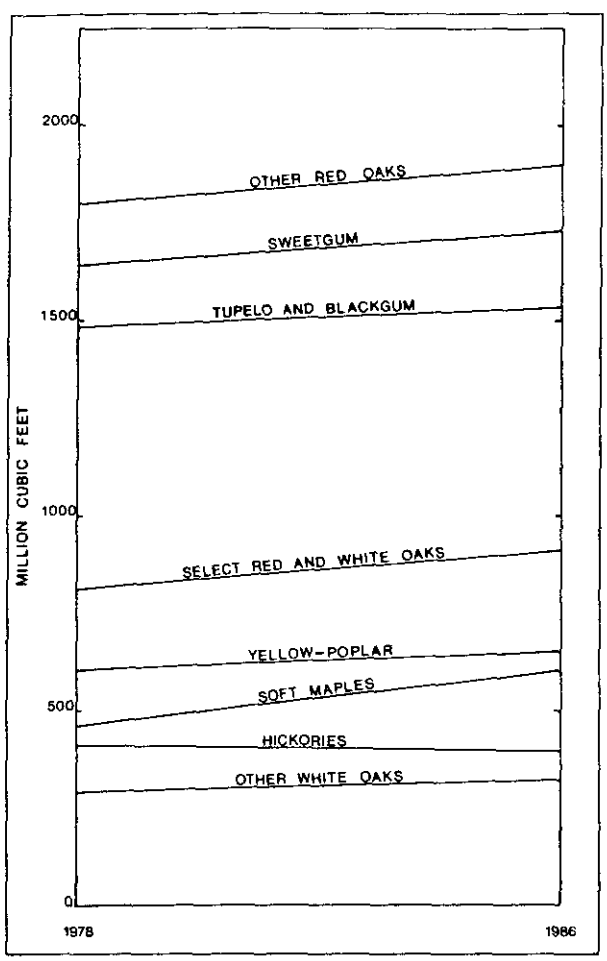


Figure 9.—Change in volume of hardwood growing stock, selected species, 1978 to 1986.

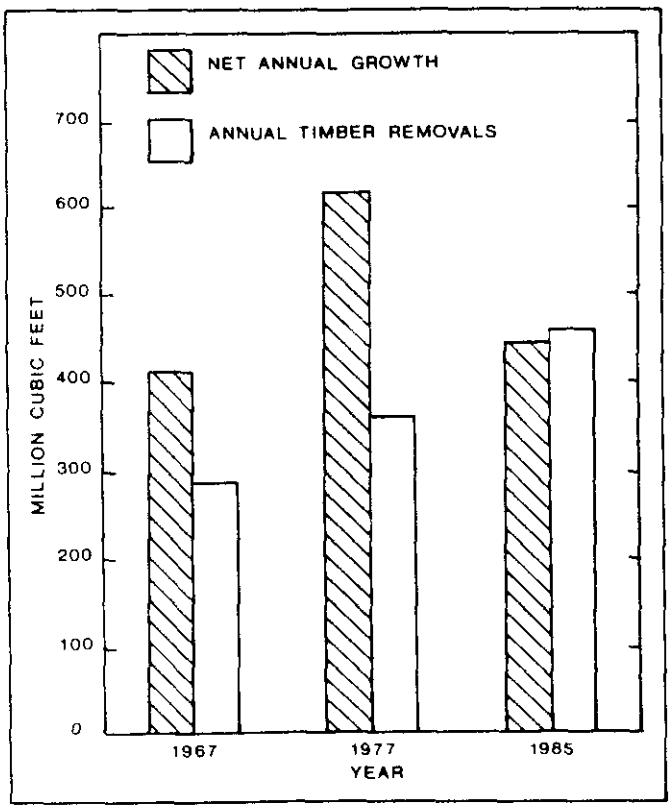


Figure 10.—Net annual growth and annual timber removals of softwood growing stock, 1967, 1977, and 1985.

Softwood and Hardwood Net Annual Growth Declines Significantly

Since 1978, net annual growth for all species of growing-stock trees has decreased from 963 to 693 million cubic feet. Softwood net annual growth declined from 618 million cubic feet to 444 million cubic feet, or by 28 percent (fig. 10). This decline is an abrupt reversal of the trend reported in the last survey; between 1968 and 1978, net annual growth of softwood growing stock increased by almost half. Current levels are about 8 percent higher than for 1958 to 1968. Gross growth probably peaked in the mid-1970's to late 1970's, and may already have been declining in 1978. The exact year of the peak is impossible to ascertain since reported growth rates are periodic averages. The interim survey revealed a large growth decline for yellow pine in 1983.

Softwood net annual growth declined between survey periods in all regions. The decline was least severe (9 percent) in the Northern Coastal Plain and most severe (43 percent) in the Piedmont. The growth loss in the Piedmont accounted for 62 percent of the statewide decline. Growth was somewhat higher than for 1958–1968 in all regions. Between 1978 and 1986, net annual growth of softwood growing stock declined for all ownerships—by 36, 9, and 14 percent on NIPF, forest industry, and public land, respectively. A drop of 153 million cubic feet in annual volume increment to 271 million cubic feet on NIPF land accounted for 88 percent of the overall decline. Again, growth rates were slightly higher than for the 1958–1968 period for each owner group.

Changes in net annual growth also occurred in relation to broad management classes. In 1978, 83 percent of the softwood growth occurred in softwood types, 21 percent in pine plantations, and 62 percent in natural pine stands. Eighty-four percent of the growth can still be attributed to softwood types, but 29 percent is now in pine plantations and only 54 percent in natural pine stands. Total softwood net annual growth has declined by 37 percent in natural pine stands and by 31 percent in oak–pine stands. It has remained about the same in pine plantations. These trends are somewhat misleading, in that the area of pine plantations has greatly increased since 1978, mostly at the expense of natural pine and oak–pine stands.

The confounding effects of shifts in land use, ownership, and in broad management classes are minimized by evaluating growth on a per-acre basis. Per-acre growth by ownership and broad management class have changed considerably between surveys, suggesting that factors other than area shifts are affecting growth rates across all ownerships and types. Softwood growth per acre decreased by 20 percent on

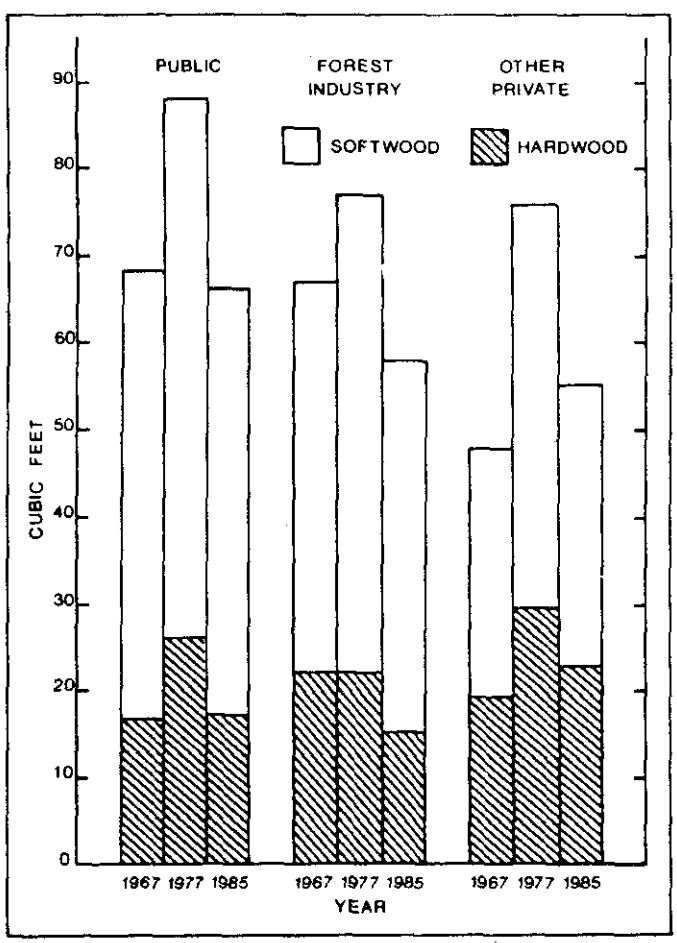


Figure 11.—Net annual growth of growing stock per acre, by ownership and species group, 1967 to 1985.

public land, by 22 percent on forest industry land, and by 30 percent on NIPF land (fig. 11). Softwood growth per acre was down in all survey units, but the decline was more significant in the Piedmont than in either the Northern or Southern Coastal Plains.

To minimize the effects of the recent jump in artificial and natural regeneration, the trend in softwood growth per acre for natural pine stands and plantations was examined after eliminating nonstocked areas, sapling–seedling stands, and all stands less than 10 years old. Such stands have few or no stems of merchantable size, and any change in the proportion of timberland area these stands occupy distorts per-acre growth values.

Growth declines are evident when comparisons are made by broad management classes between fifth and sixth survey growth in stocked poletimber and sawtimber stands older than 10 years. In pine plantations of the kinds mentioned, growth of softwood growing stock declined by 24 percent, from 151 to 115 cubic feet per acre per year. In natural stands fitting the criteria, softwood growing-stock growth declined by 21 percent, from 106 to 84 cubic feet per acre.

A number of factors acting in unison brought about the recent growth slowdown. Among these are:

(1) A reduction in timberland area. The clearing and diversion of timberland to other land uses diminishes the number of trees available to support volume growth. With fewer stems in the inventory, growth must decline unless growth rates for individual trees increase, and this did not happen.

(2) A decline in average annual radial increment for several softwood and certain hardwood species. Similar declines were identified in earlier surveys in other Southeastern States (Sheffield and Knight 1984). For some yellow pine species, the 1983 Interim Survey of South Carolina reported reductions in diameter growth rates as great as 30 percent in some regions (Tansey 1984). Diameter growth reductions have been discussed at length for the entire Southeast (Sheffield and others 1985). It is sufficient here to say that reductions in diameter increments of individual stems for both softwoods and hardwoods are contributing to the current reductions in net annual growth. As has been pointed out for other States (Sheffield and Knight 1986), lower average annual radial increments (AARI) do not necessarily translate into reduced net annual growth. Lower mortality rates, younger stands with more ingrowth, better stocking, a broader timberland base, and other factors occurring separately or together may offset lower tree diameter growth. For example, AARI's are lower for the sixth than for the fourth survey, but net annual growth is higher in almost all regions and for all owner classes because growth is occurring on a greater number of stems now than some 18 years ago.

(3) Increased mortality of both softwoods and hardwoods. Increased mortality not only negates a portion of current volume increment but erodes the inventory, reducing the volume base available for future growth.

(4) Less ingrowth. Inadequate regeneration rates have resulted in fewer seedlings being established on timberland. This has resulted in a declining number of 2- and 4-inch stems available to cross the 5.0-inch d.b.h. merchantability threshold. This situation translates into less ingrowth and a subsequent reduction of growth on ingrowth. When ingrowth is reduced, the base for future survivor growth also is lowered. The effects of an eroding base on which growth can occur have not only immediate but long-range implications.

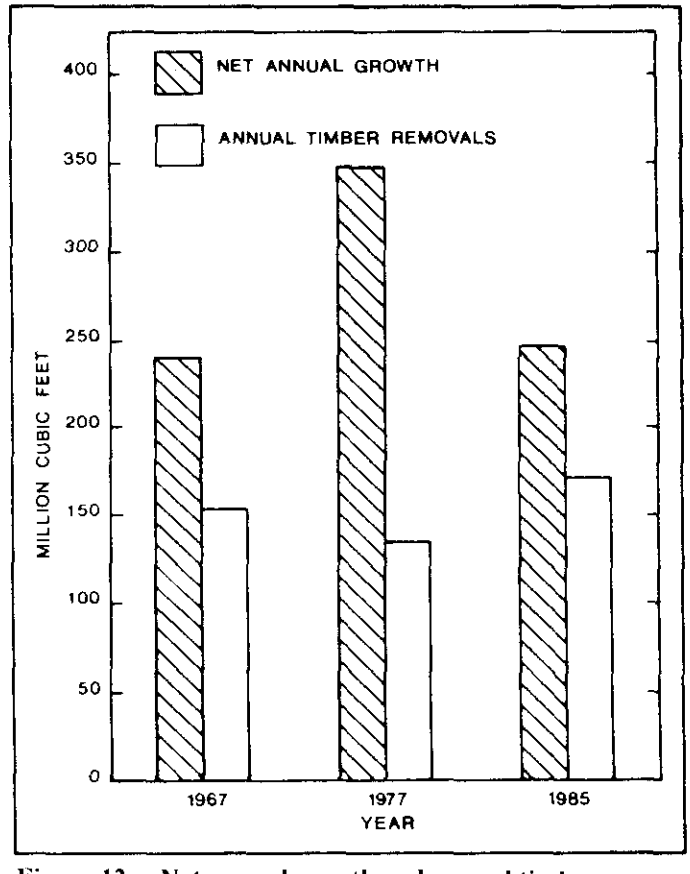


Figure 12.– Net annual growth and annual timber removals of hardwood growing stock, 1967, 1977, and 1985.

For hardwoods, net annual growth of growing stock declined by 28 percent, from 346 to 249 million cubic feet (fig. 12). Hardwood growth was down for each broad owner group in each of the three survey units in the State. For all ownerships combined, hardwood growth declined by between 27 and 29 percent in each region. Statewide, hardwood net annual growth declined by 29 percent on public and NIPF land and by 21 percent on forest industry land. As with softwoods, timberland shifts among owner groups and a slight drop in hardwood acreage affected growth levels. On

a per-acre basis, net annual growth of hardwood growing stock averaged 28 cubic feet in 1978. Since 1978, hardwood growth has declined by 7 cubic feet per acre of timberland per year. Net annual growth of hardwood growing stock declined by 34 percent to 17 cubic feet per acre on public land, by 32 percent to 15 cubic feet per acre on forest industry land, and by 23 percent to 23 cubic feet per acre on NIPF land. These per-acre changes indicate a real decline in growth rates of hardwoods on all ownerships.

The proportion of hardwood trees qualifying as growing stock increased in the latest inventory. This change confounds analysis of growth trends, but its effects can be minimized by comparing growth rates for all live merchantable hardwoods. Between 1978 and 1985, net annual growth of live hardwood timber declined by 37 percent. The change in the growing stock:cull ratio apparently buffered growth declines more severe than those found for growing stock alone.

A breakdown of gross growth into its various components, along with the distribution of mortality and removals by Survey Unit and species group, helps explain the factors causing annual changes in timber inventory (table III). The changes in these various components are presented statewide in table IV. Since net growth is gross growth minus mortality, any increase in mortality reduces net growth. Gross growth consists of survivor growth, ingrowth, growth on ingrowth, growth on mortality, and growth on removals. Survivor growth (SG) is the volume increment on trees 5.0 inches d.b.h. and larger at the beginning of the measurement period and surviving until the end of the period. Ingrowth (IG) is the net volume of growing-stock trees crossing the 5.0-inch d.b.h. threshold during the inventory period; subsequent growth on these trees is growth on ingrowth (GIG). Growth on removals (GR) and growth on mortality (GM) occur on trees prior to either cutting or death.

Table III.—Average annual components of change in the volume of growing stock on South Carolina's timberland, by Survey Unit and species group, 1978–1985

Survey Unit and species group	Components of growth									
	Gross growth	Survivor growth	Ingrowth	Growth on ingrowth	Growth on removals	Growth on mortality	Mortality	Net growth	Removals	Net change
	Million cubic feet									
Southern Coastal Plain										
Softwood	144.8	125.4	13.3	1.9	3.6	0.6	19.9	124.9	125.6	–0.7
Hardwood	79.3	70.0	7.8	.5	.7	.3	17.2	62.1	42.4	+19.7
Total	224.1	195.4	21.1	2.3	4.3	.9	37.1	187.0	168.0	+19.0
Northern Coastal Plain										
Softwood	198.1	171.3	18.9	2.9	4.4	.6	20.6	177.5	160.3	+17.2
Hardwood	123.0	107.2	13.3	1.0	1.1	.4	24.6	98.4	73.6	+24.8
Total	321.1	278.5	32.2	3.9	5.5	1.0	45.2	275.9	233.9	+42.0
Piedmont										
Softwood	184.0	154.5	22.3	2.2	4.0	1.0	42.6	141.4	168.7	–27.3
Hardwood	107.3	94.4	10.8	.7	1.0	.4	19.1	88.2	55.9	+32.3
Total	291.3	248.9	33.1	2.9	5.0	1.4	61.7	229.6	224.6	+5.0
State										
Softwood	527.0	451.3	54.5	7.0	12.0	2.2	83.2	443.8	454.6	–10.8
Hardwood	309.6	271.6	31.9	2.2	2.8	1.1	60.9	248.7	171.9	+76.8
Total	836.6	722.9	86.4	9.2	14.8	3.3	144.1	692.5	626.5	+66.0

As in prior survey periods, softwood SG made up about 86 percent of softwood gross growth. Since the last survey, SG declined by about 21 percent. This loss accounted for about 72 percent of the overall decline in softwood growth between survey periods. Declines in SG are due to the combined effects of reduced AARI's and reduced numbers of stems on which growth occurs. IG and GIG combined made up 12 percent of gross growth in this survey—slightly less than in previous surveys. IG volume was down 42 percent in comparison with the fifth survey, and 7 percent in comparison with the fourth. This decline in IG was caused by changing rates of stand establishment in previous decades. GR and GM were both greater in this survey than in previous surveys, simply because there were greater volumes of both removals and mortality.

During the latest survey period, SG made up about 88 percent of hardwood gross growth. SG declined by about 19 percent since the last survey and accounted for about four-fifths of the overall decline in growth between survey periods. IG (including GIG) made up 11 percent of gross growth in this survey. IG volume was down 31 percent in comparison with the fifth survey, but up 26 percent in comparison with the fourth. GR and GM were both greater in this survey than in the fifth and fourth surveys.

Softwood removals have increased by about one-fourth over the last two survey periods. While removals increased between 1968 and 1978, growth increased by an even greater amount, causing a large surplus of growth over removals. In the most recent survey period, softwood growing-stock removals exceeded net growth by an annual average of 11 million cubic feet.

The decline in hardwood growth, concurrent with a 27-percent increase in removals, has narrowed the gap between growth and removals. Net annual growth of hardwood growing stock exceeded removals by 57 percent during the fourth survey period (fig. 12). During the fifth survey period, growth increased substantially, removals declined, and growth was more than double removals. In the sixth survey period, this surplus was reduced to 45 percent, representing a positive annual change of 77 million cubic feet.

Mortality Increases for Both Softwoods and Hardwoods

Annual mortality of both softwoods and hardwoods increased since 1978. Statewide, mortality of softwood growing stock increased by 18 percent to 83.2 million cubic feet. Softwood mortality increased by 41 percent in the Piedmont and by 63 percent in the Southern Coastal Plain, but it declined by 26 percent in the Northern Coastal Plain. Changes during this latest period follow substantial increases in all survey regions between 1968 and 1978.

At the State level, softwood mortality on public land declined by about 8 percent to 11.8 million cubic feet. Mortality rose by about 15 percent to 13.4 million cubic feet on forest industry land and by 26 percent to 57.9 million cubic feet on NIPF land.

A comparison of annual mortality to the midpoint inventory for each survey period provides a realistic appraisal of the relative effects of mortality for each survey. Any changes in mortality levels should be proportionate to increases or decreases in the inventory if rates are not fluctuating and

Table IV.—Trends in average annual components of change of growing-stock volume for three survey periods, South Carolina

Species group and period	Components					
	Gross growth	Survivor growth	Ingrowth and growth on ingrowth	Growth on removals and growth on mortality	Mortality	Net growth
	Million cubic feet					
Softwoods						
1958–1967	442.1	367.2	66.3	8.6	29.7	412.4
1968–1977	688.2	568.9	106.6	12.7	70.5	617.7
1978–1985	527.0	451.3	61.5	14.2	83.2	443.8
Hardwoods						
1958–1967	279.9	249.9	27.0	3.0	37.8	242.1
1968–1977	386.8	334.0	49.7	3.1	41.2	345.6
1978–1985	309.6	271.6	34.1	3.9	60.9	248.7

mortality exacts the same toll over time. Between 1978 and 1986, as the softwood inventory declined, softwood mortality went up. For all owners, annual mortality was greater in relation to the midpoint inventory in the sixth than in the fifth survey (fig. 13). The consequence of softwood mortality has risen over the course of 30 years. On forest industry land, mortality increased but at a rate proportional to the increase in inventory; the relationship between mortality and inventory levels remained constant. On NIPF land, mortality increased while the inventory declined. Mortality is greater in relation to this period's midpoint inventory.

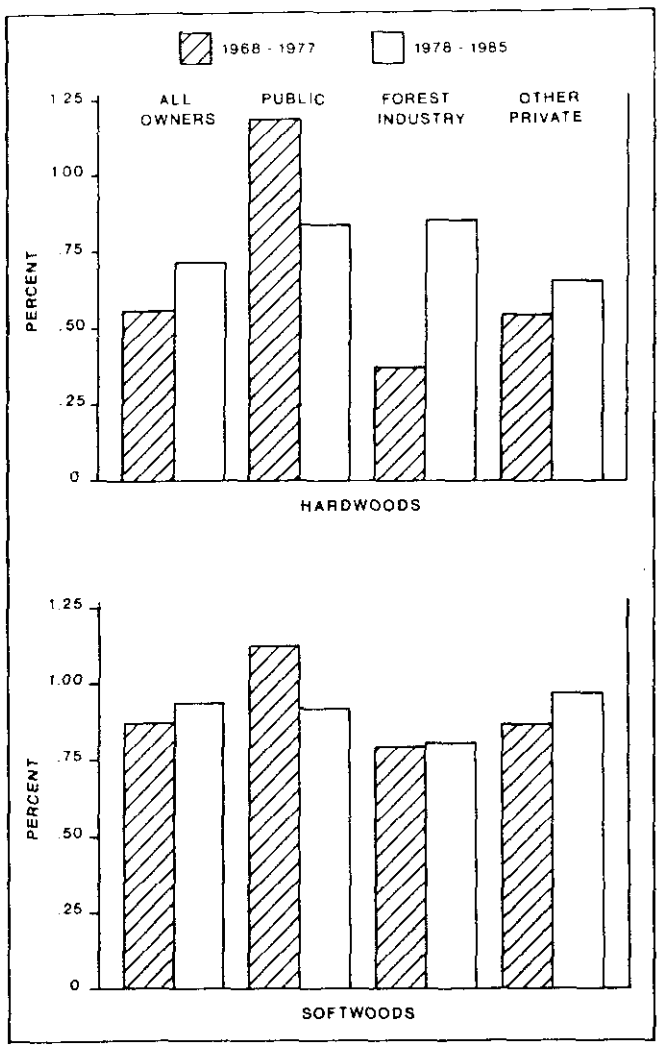


Figure 13. – Annual mortality as a percentage of midpoint inventory, by ownership class and species group, 1968 to 1985.

Between 1968 and 1978, mortality of softwood growing stock reduced potential growth by 10 percent. From 1978 to the present, mortality reduced growth by 16 percent. The role of mortality in the current growth decline being seen in many areas throughout the Southeast has already been mentioned. Diseases (primarily fusiform rust, littleleaf, and root rots), and insects (primarily the southern pine beetle), were the leading causes of death during the last survey. Insects and diseases each accounted for 24 percent of softwood mortality.

Increases in mortality were more severe for hardwood than for softwood growing stock. Hardwood growing-stock mortality has increased by 48 percent since 1978, and by 61 percent since 1968. It now totals 60.9 million cubic feet per year. Hardwood mortality increased in each Survey Unit. It was up by 59 percent in the Southern Coastal Plain, 37 percent in the Northern Coastal Plain, and 53 percent in the Piedmont. Hardwood mortality declined on public land to 5.9 million cubic feet, but it increased on both forest industry and NIPF timberland to 12.7 and 42.2 million cubic feet, respectively.

The impact of increased mortality appears to be more significant for hardwoods than for softwoods. Although hardwood inventories increased, mortality increased by a much greater degree. Between 1978 and 1986, on the average, 0.7 percent of the growing-stock inventory died each year. Between 1968 and 1978, only 0.5 percent of the inventory died annually. Although these mortality rates seem small, the change represents a 39-percent increase in the portion of inventory dying each year. The current rate of mortality translates into a reduction of potential net growth of nearly 20 percent. Between 1968 and 1978, mortality reduced potential net growth by only 11 percent. Because the portion of the inventory qualifying as growing stock increased, and because cull trees died at rate above that of growing stock, mortality had a more significant effect on the merchantable live inventory. Live inventory of hardwoods increased from 10.1 to 10.3 billion cubic feet, only 1 percent compared with 6 percent for growing stock. Annual mortality of live hardwoods accounted for a slightly greater portion of the live inventory and reduced gross growth by 27 percent.

Disease was the leading identifiable cause of death for hardwoods. The fact that each stand age class above 50 years has a higher percentage of timberland area this survey (the inventory is slightly older) had an affect in increasing mortality rates.

Timber Removals and Forest Products Output

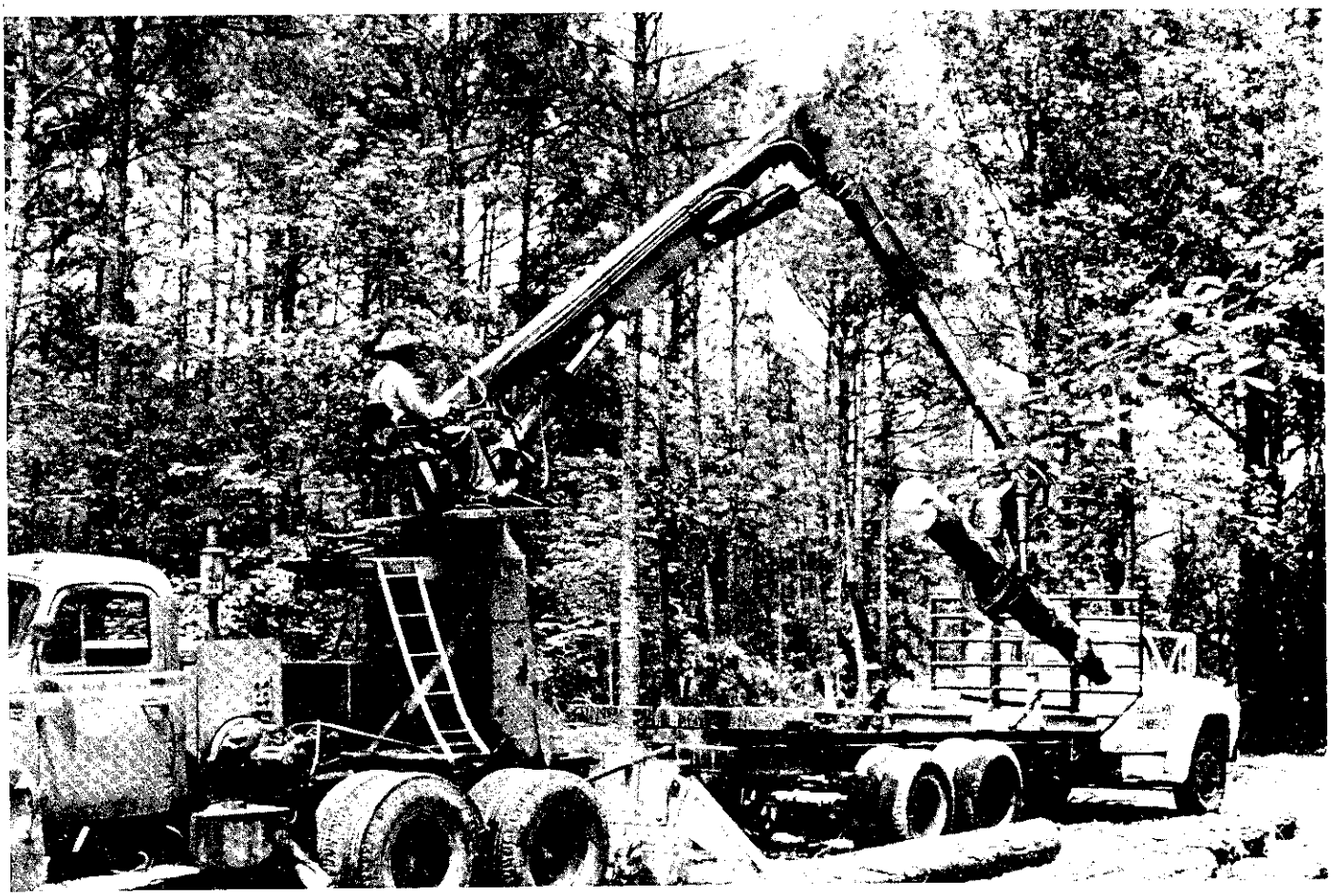
South Carolina's forest products industry contributes a great deal to the State's economy. The forest products industry includes 1,056 primary and secondary manufacturers of wood products, employs over 32,000 people, and generates an annual payroll in excess of $622 million. In the State, it ranks third behind textile and chemical manufacturers (U.S. Department of Commerce, Bureau of the Census 1985). Nontimber benefits of the forest such as wildlife habitat, recreation, water, miscellaneous resources, and esthetic values also contribute greatly to South Carolina. These nontimber benefits of forests are not addressed in this report.

Sources of Timber Removals Data

This section and associated appendix tables 36–40 present estimates of average annual timber removals and product output for the period 1978 through 1985. Several sources of data were used in the compilation of these tables. Estimates of total annual volume of trees removed from timberland for timber products manufacture, volumes of wood residue associated with these removals, and volumes of removals associated with timberland diverted to nonforest uses were derived from the remeasurement of permanent FIA ground samples.

Estimates of annual wood receipts, product output, and plant residues were obtained from canvasses of all primary wood-using mills in the State. The canvasses are conducted annually by the South Carolina State Commission of Forestry, the Clemson Forest Extension Service, and the Southeastern Forest Experiment Station. Some 136 primary wood-using plants operating in the State in 1985 were canvassed. Other years corresponding to the most recent survey period for which information was collected are 1978 to 1985, inclusive. These surveys are used to monitor fluctuations in product output throughout the survey remeasurement period. Appendix tables 36–40 include some data gathered in these surveys.

Felled trees were measured at 103 active logging operations throughout the State to obtain the average proportions of trees utilized in harvests for individual products. These



utilization factors were applied to removals data obtained from permanent plot samples to estimate the volumes of logging residues associated with the unused merchantable portions of growing-stock trees harvested for products. Also considered and included in the logging residues estimate are the merchantable portions of whole growing-stock trees destroyed during timber harvesting operations and not used. This volume is identified from permanent plot remeasurement.

Estimates of fuelwood production and consumption are based on plot remeasurement samples, industry canvasses, and independent sources (Skog and Watterson 1986). The proportion of fuelwood removals from timberland was determined from permanent plot remeasurement.

Annual Removals of Softwood and Hardwood Growing Stock Increases

Annual removals of softwood growing stock averaged 455 million cubic feet between 1978 and 1985, an increase of 26 percent since the last survey period. About 61 percent of softwood growing-stock removals were from NIPF land, 30 percent from forest industry land, and 9 percent from public land. Average annual softwood removals dropped slightly on public land, increased by 25 percent on NIPF land, and increased by 43 percent on forest industry land. About 15 percent of softwood growing-stock removals were from plantations, compared with about 10 percent in the last survey period. About 71 percent were from natural pine stands, compared with 66 percent in the last survey.

Proportions of softwood growing-stock removals from poletimber, small sawtimber, and large sawtimber trees have remained about the same since the last survey. Large sawtimber contributed slightly less in this survey than in the last. Average diameter of harvested softwood trees dropped slightly, possibly due to increased use of plantation-grown trees. About 11 percent of softwood growing-stock removals were from stands less than 20 years old; another 27 percent came from stands between 21 and 30 years old. For this survey period, the average size of softwood growing-stock tree cut was about 12 inches.

For hardwoods, annual growing-stock removals averaged 172 million cubic feet, about 27 percent more than in the last survey. Hardwood growing-stock removals increased on NIPF and forest industry land by 28 and 32 percent, respectively, while dropping by 17 percent on public land. Public land supplied only 3 percent of all hardwood growing-stock removals; forest industry land supplied 25 percent and NIPF land the remainder. As with softwoods, average diameter of trees removed decreased in this survey—from about 15 to 14 inches. The proportions of removals from large sawtimber is down, while the proportions from both poletimber and small sawtimber are up slightly.

Timber Utilization Improves Slightly—Less Logging Residue Produced

Between 1977 and 1985, 501 million cubic feet of growing stock were removed annually from South Carolina timberland in the form of primary timber products. Roundwood products accounted for 80 percent of all growing-stock removals. During the same period, an additional 54.1 million cubic feet of growing stock—about 11 percent of the roundwood product output and 9 percent of the total growing-stock removals—were cut and left in the woods as logging residue. In 1977, the production of 407 million cubic feet of roundwood products generated 49 million cubic feet of woods residues—about 12 percent of roundwood product output. Roundwood product output for this period was 23 percent more than in 1977, but volume of logging residues associated with roundwood product output increased by only 12 percent. The smaller increase in logging residue than product output indicates improvements in the utilization of harvested timber. Studies of trees felled in logging operations indicate improvements in utilization of softwood and hardwood timber cut for all roundwood products. For pole size timber, the proportion of growing-stock material meeting FIA merchantability standards that was utilized this survey has increased slightly.

Statewide, for all products combined and including all size trees, about 95 percent of the merchantable portion of softwoods is utilized. This percentage is about the same as for last period. For hardwoods, an average 82 percent of the merchantable portion was utilized, the same as last survey. For softwood and hardwood poletimber, about 9 and 7 percent of the portion of trees not considered within FIA merchantability standards (material below a 1-foot stump or above a 4.0 inch d.o.b. top) is utilized for a product. Use of this type of material for timber products dropped slightly since the last survey for softwoods but almost doubled for hardwoods. For sawtimber, rates of utilization have not changed much since last survey. About 95 percent of the merchantable portion of softwoods is utilized for a product. About 2 percent of the material considered unmerchantable is used for timber products. For hardwood sawtimber, utilization is less complete. Only 80 percent of the growing-stock material between a 1-foot stump and a 4.0 inch d.o.b. top is used for products. Less than 1 percent of stump and top volume is utilized. Offsetting improvements in utilization of merchantable volume is the increased use of growing stock for timber products output. Non-growing-stock material provided a much smaller portion of the product output in this survey than in the last. In 1977, growing-stock removals accounted for 85 percent of the total roundwood product output. Between 1978 and 1986, an average of 91 percent of the total roundwood product output was from growing stock. For softwoods, the proportion of product output from cull trees has remained at about 3 percent. However, product output from "other sources"—saplings; stumps, tops, and

limbs of trees on timberland; and trees on nonforest land such as in fencerows and wooded pastures—was much less in this survey (2 percent) than in 1977 (8 percent).

Yearly Output of Timber Products Fluctuates—Overall Trend is Upward

Timber products output (TPO) varies widely from year to year in response to changing market conditions. FIA estimates of total removals are periodic annual averages. To legitimately compare TPO with removals, the mean TPO was computed for the years spanned by the survey remeasurement period.

Most of the discussion of industrial TPO deals with this average for the period between 1978 to 1985. In some instances, the average output for the period is compared with the 1977 product output, which has been previously reported (Knight and McClure 1979). Comparisons between a period average and volumes for a single year are valid if the data for the year are representative of the entire period. In other words, if the trend in product output within the period has been fairly stable, with only moderate fluctuation, comparison with a single year is acceptable. When this comparison is misleading, comparisons between the average for the current period (1978–1985) and the previous period (1968–1977) are presented instead. Industry canvasses have been conducted annually since 1967, so mean output for both periods can be accurately computed.

Average TPO has increased since last period, but the average trend conceals very large increases in 1984 and 1985. These increases in the latter part of the period may be more indicative of near future trends of timber products output than are earlier levels. To highlight some of the fluctuations in annual industrial output during the remeasurement period, results of industry canvasses for individual individual years within the period are summarized (table V).

Table V.—Annual output of industrial timber products in South Carolina from roundwood, by product, species group, and year of survey

Product and species group	Year of survey							
	1978	1979	1980	1981	1982	1983	1984	1985
	Thousand cubic feet							
Saw logs								
Softwood	130,770	147,213	137,496	129,091	130,109	162,377	182,590	175,060
Hardwood	41,716	40,323	37,202	34,642	27,043	33,766	41,997	41,181
Total	172,486	187,536	174,698	163,733	157,152	196,143	224,587	216,241
Veneer logs								
Softwood	43,847	40,741	33,828	38,541	35,191	42,693	46,280	45,081
Hardwood	10,041	10,416	8,266	6,790	6,087	8,028	9,685	9,620
Total	53,888	51,157	42,094	45,331	41,278	50,727	55,965	54,701
Pulpwood[a]								
Softwood	163,314	166,766	171,679	186,830	168,391	164,913	171,222	169,481
Hardwood	54,422	54,188	48,077	46,629	47,827	57,879	70,061	67,734
Total	217,736	220,954	219,756	233,459	216,218	222,792	241,283	237,215
Other industrial								
Softwood	3,906	3,318	4,841	4,008	3,982	5,971	7,537	7,689
Hardwood	24	—	—	—	—	—	—	—
Total	3,930	3,318	4,841	4,008	3,982	5,971	7,537	7,689
All products								
Softwood	341,837	358,038	347,844	358,470	337,673	375,954	407,629	397,311
Hardwood	106,203	104,927	93,545	88,061	80,957	99,673	121,743	118,535
Total	448,040	462,965	441,389	446,531	418,630	475,627	529,372	515,846

[a] Includes roundwood chipped.

In table V, estimates of pulpwood produced from roundwood do not agree with the values in annual pulpwood production reports. An accurate distinction between roundwood chips and residue chips purchased for fiber production cannot be made from pulpwood production data alone. More accurate estimates of the separation are obtained from primary producers that supply the chips for pulping. Estimates of pulpwood production presented in table V have been adjusted to reflect the more accurate mix of roundwood, chipped roundwood, and residues used in pulp production.

Between 1978 and 1982, total industrial roundwood output fluctutated around a generally stable level (table V). Average production of all products combined for this 5-year period, including both hardwoods and softwoods, was about 444 million cubic feet. This average output was about the same as reported for 1977, but 15 percent greater than the 1968–1977 average output of 385 million cubic feet.

Output of all products combined, and of most individual products, was lowest in 1982 at 419 million cubic feet. Combined output of all roundwood products jumped by 14 percent in 1983 and by 11 percent in 1984. Output peaked in 1984 at 529 million cubic feet. In 1985, it dropped by 3 percent to 516 million cubic feet. Still, the output for 1985 was 15 percent higher than in 1977.

Saw-Log Output Increases 45 Percent

Average saw-log output increased by 45 percent since the last survey period and now totals 210 million cubic feet (appendix table 36). Production of saw logs accounted for about 38 percent of total roundwood output (including domestic fuelwood production) during the latest survey period. Increases in softwood saw-log output account for most of the gain since 1977. Average output of softwood saw logs from roundwood increased by 54 percent to 170 million cubic feet. Softwood plant byproducts, such as veneer cores, contributed another 2 million cubic feet to the softwood output. About 98 percent of the softwood saw-log output comes from growing stock (appendix table 37). The remainder is from cull trees harvested on timberland or trees cut from nontimberland.

Hardwood saw-log output averaged 40 million cubic feet between 1978 and 1985, a 16-percent increase from the previous period. Almost all hardwood saw logs came from sawtimber size growing-stock trees. A small portion came from poletimber growing stock (2 percent) and from cull trees (5 percent). A negligible amount of hardwood saw-log products was produced from plant byproducts.

Annual industry canvass statistics (table V) show a cyclic up-and-down trend for saw-log production this recent period,

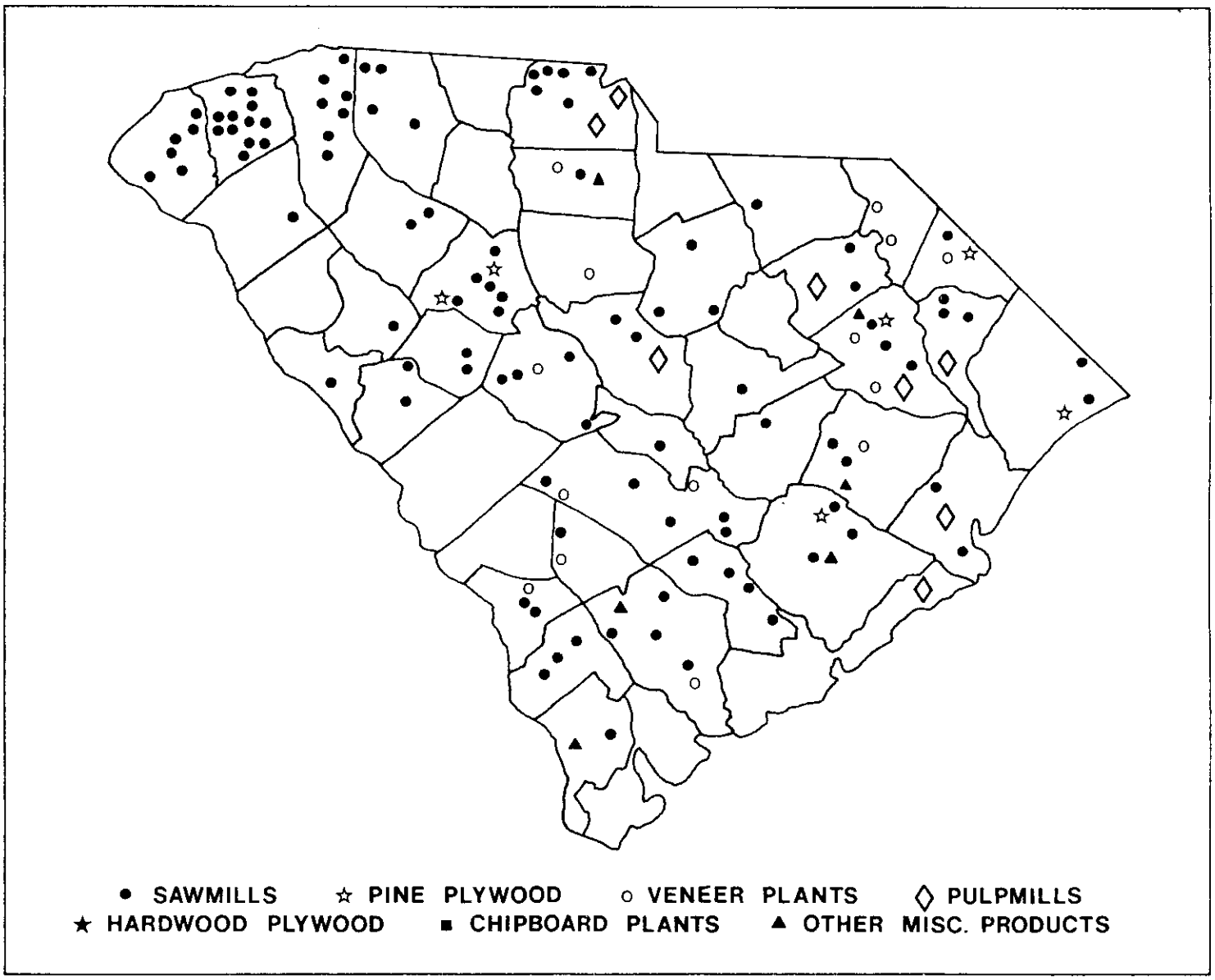


Figure 14.—Location of primary wood-using industries in South Carolina, 1986.

although generally output increased. Output was high in 1979 and 1984, and low in 1978 and 1982. High interest rates and inflation were possible causes for the downturn years. The 1985 industry canvass shows South Carolina as a net exporter of softwood saw logs. About 92 percent of the softwood saw logs produced in 1985 were retained for processing in South Carolina. About 14 million cubic feet of logs were exported to other States, principally North Carolina and Georgia. Less than 5 million cubic feet were imported from other States. For hardwood saw logs, imports and exports are about in balance at 2 million cubic feet—some 4 percent of production.

Commodity drain surveys indicate a general trend toward fewer but larger sawmills. In 1977, 119 sawmills operated in South Carolina. Number of mills increased to 128 by 1979, then decreased to the present 100 (fig. 14). Renovation, construction of new mills, and the shutdown of some older, smaller mills has led to an increased average mill capacity. Since many small sawmills operate only during periods of high product demand, a drop in present number of mills can be expected if demand slackens.

Pulpwood Production Continues to Increase

Pulpwood roundwood has been the leading industrial timber product for the past 20 years in South Carolina. In 1985, the production of 237 million cubic feet (3.5 million cords) of round pulpwood accounted for 46 percent of industrial TPO. Since 1978, pulpwood has made up approximately half of all industrial roundwood production each year. Only within the past few years has softwood saw-log production surpassed

softwood round-pulpwood production. For hardwoods, round-pulpwood output still exceeds the production of all other timber products by a significant margin.

Since 1960, total annual pulpwood production has more than doubled, increasing from 2.2 to 4.8 million cords (fig. 15). This volume includes fiber produced from both roundwood and plant byproducts. Over the past 25 years, annual pulpwood production has fluctuated somewhat, but overall the trend has been strongly upward. Small changes have occurred in species mix and in type of material used for fiber.

Use of plant byproducts for fiber has doubled since 1960. Almost 1.3 million cords were used in 1985; this volume was 27 percent of total pulpwood production. Softwood residues account for the bulk of byproducts used for fiber production. Since 1960, use of softwood residues has increased more than fourfold. In 1985, 30 percent of softwood fiber production was from residues. Although use of hardwood residues has increased almost threefold, the 196,000 cords used in 1985 accounted for only 16 percent of total hardwood production. Since 1960, total softwood pulpwood production has increased by 104 percent. In 1985, softwoods comprised 75 percent of round-pulpwood production; this is 5 percent less than the proportion in 1960. Total hardwood production has increased by 180 percent to over 1.2 million cords per year since 1960; hardwoods account for 25 percent of total pulpwood production, a slightly higher proportion than in 1960.

In 1977, about 78 percent of round pulpwood came from growing-stock material. During the latest survey period, growing-stock trees provided 88 percent of the roundwood

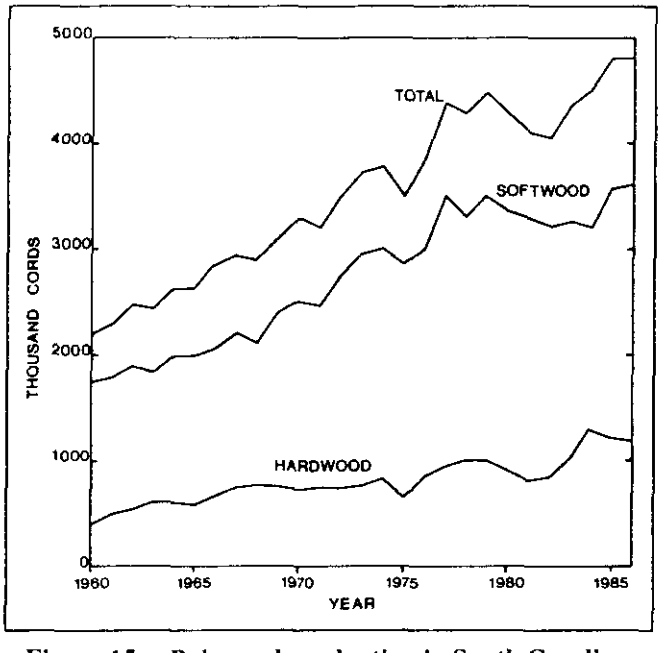


Figure 15. – Pulpwood production in South Carolina, 1960 to 1986.

used for pulp. About 60 percent of the growing stock used for pulpwood was poletimber size trees and 40 percent sawtimber size. Twelve percent of the pulpwood produced was from cull trees, saplings, tree tops, stumps, or trees on nonforest land such as in fencerows.

In the most recent survey period, South Carolina remained a net exporter of roundwood pulpwood. In 1985, exports (including both softwoods and hardwoods) totaled 752,000 cords, while imports amounted to 386,000 cords.

In 1985, about 81 percent of the round-softwood pulpwood produced in South Carolina was retained for processing in State. Softwood pulpwood exports amounting to 440,000 cords exceeded imports by 29 percent. Softwood roundwood was shipped primarily to Georgia and North Carolina. Softwood roundwood imports of 341,000 cords came principally from North Carolina.

For the same year, South Carolina was by far a net exporter of round-hardwood pulpwood. About 312,000 cords were exported, almost all to Georgia and North Carolina. About 45,000 cords were imported, mostly from North Carolina. Two-thirds of the hardwood roundwood cut in 1985 for pulp production was retained for processing in State.

Currently, eight pulpmills operate in South Carolina. Since 1977, one pulpmill has been built; it came on-line in 1983. This addition and the modernization of other mills have led to a pulping capacity increase from 7,907 to 8,478 tons per day. Another new mill is expected to begin operating in the Northern Coastal Plain in 1990.

Veneer-Log Production Increases by 58 Percent

Average annual output of veneer logs has increased by 20 million cubic feet, or by 58 percent, since the previous survey. A total of 55 million cubic feet (appendix table 36) of veneer logs was produced annually between 1978 and 1985; this was about 11 percent of total industrial roundwood product output. Softwood accounted for 83 percent of veneer-log production during the period. Average softwood veneer-log production is up 70 percent to 45 million cubic feet. Output of hardwood veneer logs, while increasing 16 percent, still amounted to less than 9 million cubic feet, accounting for only 8 percent of total industrial product output of hardwoods.

Annual output of veneer (table V) was 54 million cubic feet in 1978. Veneer-log production declined by 23 percent between 1978 and 1982 to 41 million cubic feet. This trend parallels that for saw-log production, and both were probably influenced by similar factors. Fluctuations in veneer output often coincide with residential construction rates. Production recovered to 56.0 million cubic feet in 1984, then declined by 2 percent in 1985. Softwood plywood volume

has accounted for over 80 percent of veneer production during much of the period. Production peaked in 1984–1985 after lows in 1980–1982.

Hardwood veneer-log production, which was 10 million cubic feet in 1984 and 1985, did not recover to 1978–1979 production levels after a 1981–1982 slump. In 1985, South Carolina was a net importer of hardwood veneer logs and a net exporter of softwood veneer logs. About 88 percent of the softwood veneer-log harvest (45 million cubic feet) was processed in South Carolina. Exports totaled 5 million cubic feet and exceeded imports by 19 percent. Log movement was principally with Georgia and North Carolina. Almost 97 percent of the hardwood veneer logs cut stayed in State. Imports of 621,000 cubic feet exceeded exports by nearly 288,000 cubic feet. Log movement was primarily among Southeastern States. Arkansas and Mississippi contributed to imports.

Number of veneer mills operating in South Carolina declined from a high of 24 in 1979 to 21 in 1985. Some mills produce more than one type of veneer product. Four mills that produce softwood plywood account for most of the veneer-log production.

Other Industrial Timber Products

Combined roundwood output of other industrial timber products, which includes poles, pilings, posts, wood composition board, and miscellaneous products, accounted for 1 percent of total industrial product output from roundwood. For the period 1978–1985, combined output of these products from roundwood averaged 6 million cubic feet per year. More than 93 percent of the roundwood output in this category was used in poles. Plant byproducts added another 7 million cubic feet of output of miscellaneous industrial products. Almost all of this material was softwood; most was material used for composite board or mulch. Between 1978 and 1985, output of miscellaneous timber products generally increased. Production was lowest in 1979 at only 3 million cubic feet. By 1985 volume had more than doubled to nearly 8 million cubic feet.

Domestic Fuelwood Use Increases

Roundwood use for domestic fuel averaged almost 41 million cubic feet per year from 1978 to 1985, 7 percent of the total *timber product output (TPO). Use of wood for domestic* heating accounted for 18 percent of TPO in 1957 but for only 6 percent in 1977. Moderating prices for oil and gas slowed the expansion of wood fuel markets during the early eighties.

Hardwoods made up 88 percent of total fuelwood cut during the last survey period, compared with 92 percent in 1977. Between 1978 and 1985, growing-stock trees accounted for only 59 percent of the domestic fuelwood produced, with the remainder coming from cull, dead, and small diameter trees and from nonforest land.

Utilization of Plant Byproducts Almost Complete

Almost all of the woody plant residues from the manufacture of primary timber products are used. Between 1978 and 1985, on the average, 99 percent of all bark and coarse residues, 98 percent of all sawdust, and 100 percent of all shavings generated were used. Only about 2 million cubic feet of softwood residues and 539,000 cubic feet of hardwood residues are unused (appendix table 40). Most of the unused softwood material was coarse residue, while most of the unused hardwood was fine material. These unused residues are generated mainly at small or isolated mills, which find it uneconomical to market mill waste.

Of the total wood residues generated in 1985, 49 percent *went into fiber products, 39 percent into industrial fuel,* 5 percent into sawed and board products, and the remainder into other miscellaneous products. In total, plant byproducts provided raw material for 12 percent of the total industrial timber products output each year between 1978 and 1985.

Timber Supply Outlook

Short-term timber supplies are dictated by the existing structure of the forest—by the current distributions of forest types, management classes, and stand ages. The structure of today's resource has been shaped by forest management decisions and practices implemented during past decades. Current supplies may be altered somewhat by changes in mortality rates and by improved utilization, but it will be many years before today's management practices effect increased timber supplies. This chapter examines factors that control supplies and provides estimates of short-term and 30-year prospective timber supplies.

Rates of Harvest and Regeneration

The long-term balance between rates of stand establishment, or regeneration, and rates of harvest is of prime importance in controlling resource structure and regulating future timber supplies. In evaluating prospective supplies, it helps to examine past harvest:regeneration relationships, which shaped today's forests, and to examine current relationships, which will govern the composition of future forests in South Carolina.

Between 1978 and 1986, approximately 258,000 acres of timberland experienced a final harvest each year and were subsequently retained in forest (table VI). This estimate does not include the area cleared for nontimber use. Concurrently, 263,000 acres were adequately regenerated with a manageable stand of timber each year (table VII). Manageable stands are generally 60 percent stocked with growing-stock trees of like size.

During the latest survey period, pine stands accounted for 57 percent of the annual harvest, or about 146,000 acres. A majority of this area (125,000 acres) was in natural stands. An annual rate of successful pine regeneration of 151,000 acres shows that pine harvest and regeneration are approximately in balance. Another 10,000 acres that were

Table VI.—Area of South Carolina's timberland treated or disturbed annually, by broad management and ownership classes, 1978 to 1986

Broad management[a] and ownership classes[b]	Major stand treatments				Natural disturbance
	Final harvest	Partial harvest[c]	Commercial thinning	Other cutting	
	Acres				
Pine plantation					
Public	1,382	—	1,256	289	2,263
Forest industry	8,763	—	5,888	1,918	12,211
Other private	10,342	1,894	18,163	2,184	11,980
Total	20,487	1,894	25,307	4,391	26,454
Natural pine					
Public	8,202	5,623	6,163	1,364	3,696
Forest industry	41,959	2,904	4,117	744	6,317
Other private	75,309	21,254	17,330	11,951	30,492
Total	125,470	29,781	27,610	14,059	40,505
Oak–pine					
Public	860	—	—	1,479	2,177
Forest industry	7,590	702	269	—	2,553
Other private	31,255	6,166	580	7,768	8,293
Total	39,705	6,868	849	9,247	13,023
Upland hardwood					
Public	1,376	—	408	997	1,760
Forest industry	8,934	1,294	—	850	2,915
Other private	32,776	9,786	858	7,415	12,412
Total	43,086	11,080	1,266	9,262	17,087
Lowland hardwood					
Public	—	—	—	—	706
Forest industry	11,152	2,764	—	—	3,239
Other private	17,958	8,231	269	2,074	12,839
Total	29,110	10,995	269	2,074	16,784
All classes					
Public	11,820	5,623	7,827	4,129	10,602
Forest industry	78,398	7,664	10,274	3,512	27,235
Other private	167,640	47,331	37,200	31,392	76,016
Total	257,858	60,618	55,301	39,033	113,853

[a] Broad management class before treatment or disturbance.
[b] Ownership class in 1986. Forest industry includes lands under long-term lease.
[c] Includes high-grading and some selective cutting.

Table VII.—Area of timberland regenerated annually, by broad management and ownership classes, South Carolina, 1978 to 1986

Broad management[a] and ownership classes[b]	Total regeneration	Type of regeneration					
		Artificial regeneration after a harvest	Natural regeneration after a harvest	Other artificial regeneration on forest land	Other natural regeneration on forest land	Artificial regeneration on nonforest land	Natural reversion on nonforest land
	Acres						
Pine plantation							
Public	5,144	4,823	—	321	—	—	—
Forest industry	60,548	38,099	261	18,716	—	3,472	—
Other private	34,685	22,854	—	5,410	—	6,421	—
Total	100,377	65,776	261	24,447	—	9,893	—
Natural pine							
Public	3,386	—	2,779	—	163	—	444
Forest industry	7,001	—	4,573	—	2,159	—	269
Other private	40,011	—	19,735	—	9,119	—	11,157
Total	50,398	—	27,087	—	11,441	—	11,870
Oak–pine							
Public	2,652	711	578	250	1,113	—	—
Forest industry	6,759	3,713	1,514	1,532	—	—	—
Other private	32,712	2,872	19,048	892	6,695	—	3,205
Total	42,123	7,296	21,140	2,674	7,808	—	3,205
Upland hardwood							
Public	1,615	—	1,079	—	536	—	—
Forest industry	5,339	1,436	3,903	—	—	—	—
Other private	34,741	—	27,908	—	4,078	—	2,755
Total	41,695	1,436	32,890	—	4,614	—	2,755
Lowland hardwood							
Public	289	—	289	—	—	—	—
Forest industry	6,883	—	6,237	—	646	—	—
Other private	21,123	375	15,740	—	4,405	—	603
Total	28,295	375	22,266	—	5,051	—	603
All classes							
Public	13,086	5,534	4,725	571	1,812	—	444
Forest industry	86,530	43,248	16,488	20,248	2,805	3,472	269
Other private	163,272	26,101	82,431	6,302	24,297	6,421	17,720
Total	262,888	74,883	103,644	27,121	28,914	9,893	18,433

[a] Broad management class after regeneration.
[b] Ownership class in 1986. Forest industry includes lands under long-term lease.

planted to pine entered the oak–pine type. Most oak–pine stands with evidence of artificial regeneration are pine plantations with an abundance of hardwood competition. Evidence from past surveys suggests that stocking in many of these stands eventually is dominated by pine. For this reason, artificially regenerated oak–pine stands are grouped with successfully regenerated pine plantations in this analysis of pine harvest and regeneration rates. The combined acreage of timberland that regenerated to a pine type or artificially regenerated to an oak–pine type exceeded the area of pine stands harvested by about 10 percent. About two-thirds of the pine regeneration was due to planting or direct-seeding. Although more new pine stands were established than were harvested and retained in forest, the diversion of pine timberland (predominantly NIPF pineland) to urban, agricultural and other nontimberland uses resulted in the net reduction in area of pine stands between surveys.

Pine harvest:regeneration rates differ significantly by ownership. About 86,000 acres of pine stands were harvested each year on NIPF land, but only 75,000 acres of new pine stands and 4,000 acres of artificially regenerated oak–pine stands were added. Of the 75,000 acres of new pine stands, 39 percent were naturally regenerated, 15 percent were established through natural seeding of nonforest land, and 46 percent were established by artificial regeneration of both forest and nonforest lands. By both natural and artificial means, almost one-fourth of the new pine stands established on NIPF land were on former agricultural land. This owner class is the only category where there is a shortfall in area regenerated to pine types.

On public land, 9,500 acres (including both pine and artificially regenerated oak–pine stands) were regenerated yearly, and a similar area of pine stands was harvested. About 64 percent of the new pine acreage was established by artificial methods, 31 percent by natural regeneration of previously harvested forestland, and 5 percent by natural reversion of nontimberland.

Combined pine and oak–pine regeneration rates exceed pine stand harvest rates by 43 percent on forest industry land. During the last survey period, these owners harvested 51,000 acres of pine stands but established new pine stands on 73,000 acres annually. On forest industry land, more than 9 of 10 regenerated pine acres were either planted or direct-seeded. The remainder were established by natural regeneration.

Across all ownerships, more area was harvested from a hardwood or a natural oak–pine type (112,000 acres) than was regenerated (102,000 acres). Almost all of the hardwood stand establishment was natural regeneration on cutover forestland or natural reversion of nonforestland.

On public land, natural regeneration accounted for about 61 percent more acres being established in hardwood types than were cut. Some of this regenerated acreage was forestland harvested during the previous survey period on which sufficient stocking for a manageable stand developed only recently.

On NIPF land, area regenerated to hardwood types was greater than hardwood area harvested. With more than 6,500 acres of nonforest land reverting annually to a hardwood type, and 78,000 acres of cutover land regenerating to hardwoods, total area established in hardwood exceeded harvested hardwood acreage by 3 percent. Forest industry's preference for pine is reflected in the hardwood harvesting and regeneration figures for its land. Hardwoods were regenerated on only about 60 percent of the industry acres from which hardwoods were harvested. Most of the remaining acres were planted to pine.

Additional Cutting on 155,000 Acres Yearly

In addition to volume removed in final harvest, significant volumes were removed from another 155,000 acres annually during partial harvests, commercial thinnings, and other miscellaneous cuttings. Partial harvests, mostly in the form of high-grading, occurred on 61,000 acres each year (table VI). Almost 8 of 10 acres partially harvested were NIPF land. Nearly half of the partially harvested area was natural pine stands. About 18 percent of all partial harvesting occurred in both upland and lowland hardwood stands. More than 55,000 acres of timberland were commercially thinned each year. Commercial thinning occurred almost exclusively in pine stands. About half of all thinning was in natural pine stands; another 46 percent occurred in pine plantations. Stand improvement cuttings and other miscellaneous cutting occurred on 39,000 acres yearly. Eight of 10 acres receiving such treatment were NIPF land.

Age Structure of the Pine Resource

Stand profiles, by age and broad forest type reveal much about South Carolina's timberland (fig. 16). Notable features are the buildup in acreage in the 0–10 year age class, especially the large proportion and buildup of pine plantations, and the relatively low acreage in the 11–20 year age class.

Fewer natural pine stands fed into the population between 1966 and 1976—represented by the 11–20 bar—than between the mid-1940's and mid-1950's—depicted in the 31–40 bar. Also, the acreage of pine plantations established between 1966 and 1976 was somewhat less than between 1956 and 1965, a period that included the peak planting years of the Soil Bank Program.

Acreage in the 0–10 year age class has increased by 59 percent since last survey, from 0.8 to 1.3 million acres.

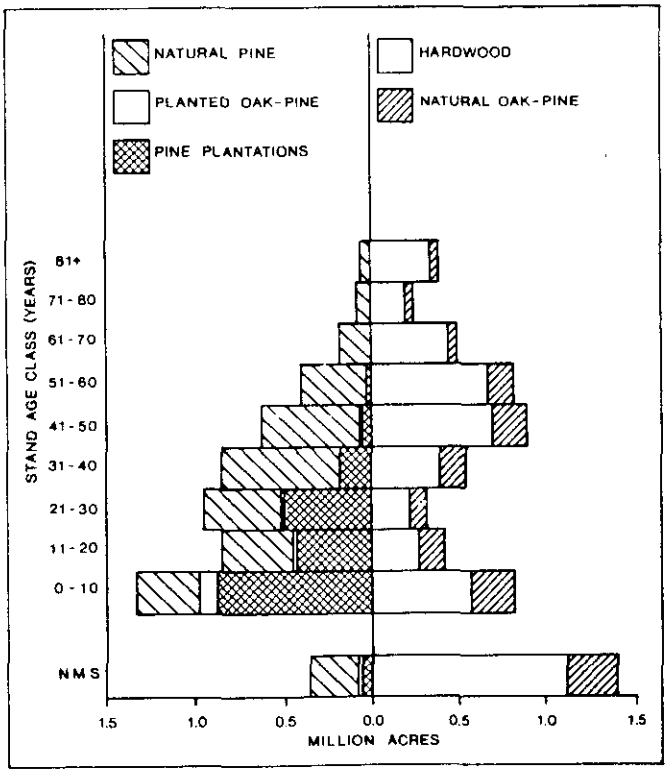


Figure 16.—Stand-age profile of South Carolina's timberland, by broad management class, 1986.

Causes are increased harvesting, increased natural regeneration, and the impressive efforts of the South Carolina Forestry Commission and other natural resource organizations to increase the annual rate of pine plantation establishment. In 1986, some 961,000 acres of manageable pine plantations and planted oak-pine stands were in the 0–10 year age class. This acreage represents an 83-percent increase over the amount in similar stands in 1978. Planted acreage in the 0–10 year age class is more than double the area of planted stands in the current 11–20 year age class.

A closer look at the age distribution within the 0–10 year age class sheds some light on why numbers of sapling stems continued to decline this survey. Almost 59 percent of the stands in this class were established after 1980. Since most trees in these stands had not attained a 1.0-inch d.b.h. when the survey was made, they were not included in the stand table. As these stands develop over the next few years, they will contribute significantly to the stand table and to growth.

In all, 2.1 million acres, or 40 percent of the State's manageable pine stands are now pine plantations or planted oak–pine stands. Until recently, pine plantations contributed little to softwood roundwood supplies. In 1978, pine plantations accounted for 10 percent of all softwood removals. In 1986 they accounted for 15 percent. The current age distribution and composition of the softwood resource suggest that within 20 years, a much greater portion of softwood removals will be from pine plantations. In the 0–10 year age class, more than 72 percent of all softwood stands are planted, compared with 52 percent in the next two oldest classes, and 18 percent in the 31–40 year age class. With incentive programs in full swing, continued high rates of pine forest establishment are anticipated.

Structure of the softwood resource varies considerably by owner group. More than 91 percent of forest industry manageable pine stands are 40 years old or less; 41 percent are 0–10 years old. Harvesting rates on forest industry land have increased since the last survey, and natural stands have been replaced with plantations. During the last remeasurement period, for every 10 pine acres harvested about 6 acres were planted to pine. For hardwood stands, 4 of 10 acres harvested were planted to pine. These rates may be higher, because many harvested stands experience a timelag in planting. Harvested stands which may be planted in the future but were not at the time of sample occupancy are not reflected in these statistics. Regeneration rates on industry land also have increased since last survey and exceed the annual rates of harvest by a wide margin. As a consequence, more than 90 percent of all manageable pine stands in the 0–10 year age class are planted. Across all ages, almost 72 percent of forest industry pine stands are planted. Areas of natural pine stands 21 to 30 and 31 to 40 years old have declined by more than half since the last survey. Natural pine acreage in age classes 41 to 50 and 51 to 60 years has increased slightly. Accelerated harvesting and pine planting have temporarily reduced growth and increased removals because a large proportion of young forest industry plantings are stocked with stems below merchantable size. As these stands age, volume of growth will increase sharply. Including both planted and natural stands, the average age of pine stands controlled by forest industry is 17 years.

Artificial regeneration rates also improved on NIPF land since the last survey. Acreage of pine plantations in the 0–10 year age class increased from 113,000 to 333,000 acres. This includes 33,000 acres of planted oak–pine. Acreage of plantations in the 11–20 year age class declined from 212,000 acres to 78,000 acres, reflecting the low regeneration rates of a decade ago. Across all age classes, area of manageable pine plantations increased by 25 percent since the last survey. Planted stands now account for about 1 of 4 acres of *pine and planted oak–pine type on* NIPF land.

The increase in plantations on NIPF land was offset by a 622,000-acre decline in area of natural pine stands. Almost all of the decline came in stands between 11 and 50 years of age. The age profile for NIPF lands suggests that reductions in pine timber supplies may occur in the next two decades. There are far fewer pine acres in the 11–20 year class than in the next three older classes. This deficit may be short-lived, however, because pine acreage in the 0–10 year age

class exceeds that in the 11–20 year class by 57 percent. For natural stands and plantations combined, stand age averages 29 years.

For all owners combined, about 355,000 acres of pine forest have insufficient stocking for management. About 6 percent of the total combined area of pine and planted oak–pine types is in this condition, but this understocked area is down from 471,000 acres in last survey period. The drop in area of pine sites with no manageable stand may be attributed to a larger portion of regeneration being by planting rather than natural and to a trend toward more intensive pine plantation management.

For all owners combined, the pine age structure portrays adequate softwood supplies for the long term. A shortfall in stands now 11 to 20 years old is likely to be felt in harvests 10 to 20 years from now. Although this dip will have some adverse effects, the concentration of pine stands in young age classes, where growth is most rapid, assures longer term supplies. Across all ownerships almost 60 percent of all manageable pine stands are under 30 years old, and another 16 percent are between 31 and 40 years old.

Age Structure of the Hardwood Resource

Among hardwood and natural oak–pine stands in South Carolina, acreage of mature stands is accumulating and there is a large area of unmanageable stands. Excluding areas that do not have a manageable stand of trees, almost 58 percent of hardwood stands are more than 40 years old. Throughout this discussion, the term hardwood type includes oak–pine stands that are not the result of artificial regeneration. Since the last survey, acreage of hardwood type in all 10-year age classes greater than 40 years has increased slightly. Since 1978, the proportion of all hardwood stands over 40 years old has increased from 41 to 46 percent. The aging of the hardwood resource is a consequence of historically low rates of harvesting in hardwood types. Low harvest rates mean that few new stands are feeding into younger age classes. Also affecting the hardwood age distribution are shifts in forest type after harvests. After some hardwood stands are harvested, pines are planted, reducing the potential acreage of young, vigorous hardwood stands. During the latest survey period, about 18,000 acres of harvested hardwood stands were planted to pine yearly. This area represents about 25 percent of the total annual harvest of hardwood sites. Loss of hardwood acreage in this manner is more than offset by reversion of areas to hardwood after pine harvests. More than 35,000 acres of harvested pine stands regenerated annually to a manageable stand of hardwoods. This acreage represents almost one-fourth of the total pine area harvested yearly. About twice as many acres shift annually from pine to hardwood following harvest as do from hardwood to pine types.

As would be expected, an insignificant portion of the hardwood stands harvested became naturally stocked with pine. Where natural regeneration created a manageable stand after a hardwood harvest, hardwoods dominated.

Hardwood acreage in the youngest (0–10 and 11–20 year) age classes has increased. Since the last survey, regeneration rates have risen from 53,000 to 100,000 acres per year for natural oak–pine and hardwoods combined. To bring the age distribution of hardwood stands more into balance, these recent increases in rates of hardwood harvesting and regeneration to hardwood types will have to be maintained.

Also contributing to the increase in hardwood stands in the younger age classes is a higher rate of natural regeneration to hardwood stands on nontimberland. For the most recent survey period, about 6,600 acres of nontimberland reverted annually to a hardwood type, compared with 4,600 acres during the previous survey period. Hardwood acreage has increased by 31 percent in the 0–10 year age class and by 41 percent in the 11–20 year age class since the last survey.

The age distribution of hardwood stands varies by ownership. On public land, 75 percent of all hardwood stands are older than 40 years; average age of hardwood stands is 54 years. Based on current information on harvest rates, average rotation age is calculated to be around 110 years, compared with much younger average rotation ages on both forest industry and NIPF land. About 61 percent more acres are regenerated to hardwood each year than were harvested on public land.

Hardwood stand characteristics are similar for forest industry and NIPF land. About 57 percent of manageable stands are over 40 years old for both ownerships; average stand age is 44 years on forest industry and 40 years on NIPF land. About 63 percent of the hardwood acres harvested on forest industry land stay in hardwood. On many acres, pine plantations replace harvested hardwood stands. More than 14 percent of forest industry's manageable hardwood sites are in bottom-land hardwood stands over 80 years old. These sites will probably remain in hardwoods. On NIPF land, 4 of 5 hardwood acres harvested and not converted to another land use remain in hardwood.

The relationship between hardwood growth and removals has changed significantly since the last survey. While growth once was twice removals, the recent increase in removals, coupled with the decline in growth, has brought the relationship more in balance. Still, there is potential for additional removals without reducing hardwood inventories. Increased cutting of overmature stands may in fact stimulate future growth and create a more desirable growth–removal relationship, as older stands are converted to more productive young stands. Furthermore, the current harvest

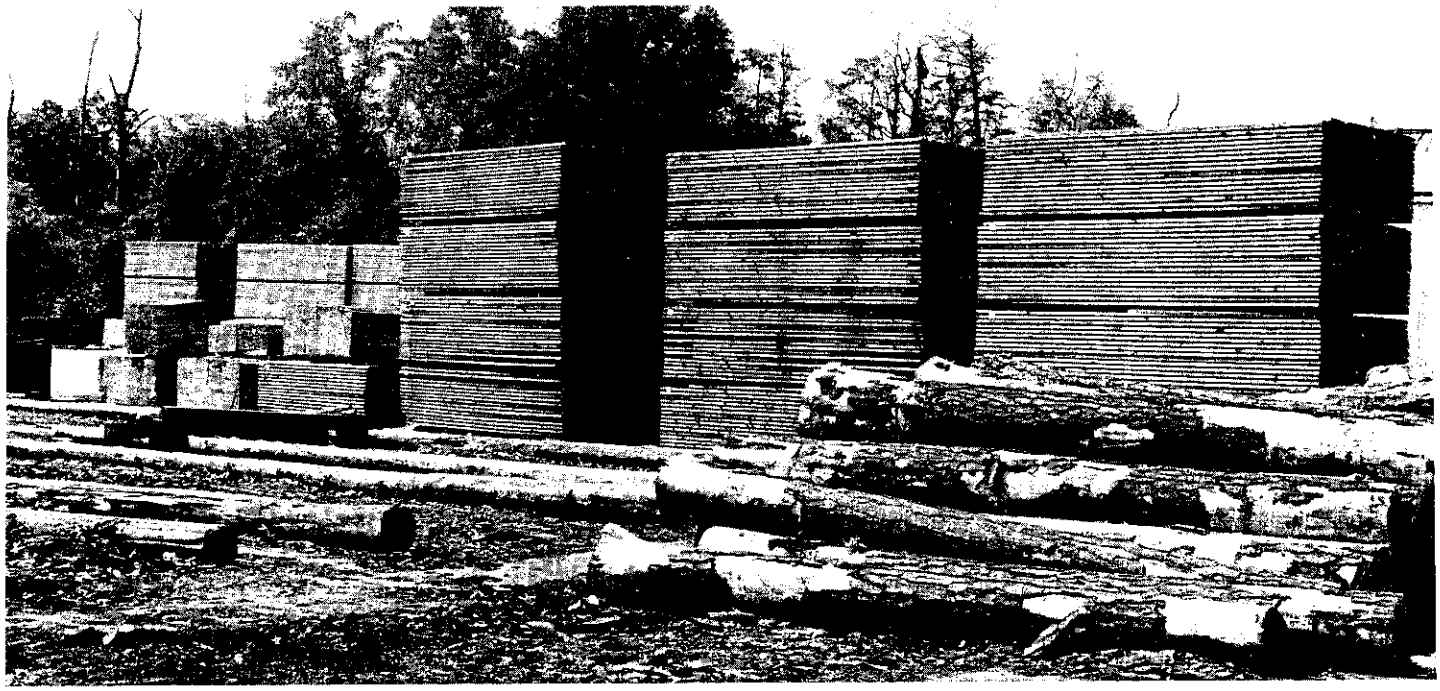
rate of 112,000 acres annually poses no threat to the depletion of the resource. In addition to creating a more balanced age distribution and stimulating growth, increased harvesting of mature and overmature hardwood stands offers a significiant opportunity to extend timber supplies; already, increased use of hardwoods has reduced the burden on the heavily utilized softwood resource. Further increases in hardwood roundwood supplies could reduce softwood removals, which already exceed growth. However, the extent to which physical site factors impact the availability of the resource must be evaluated. Potential hardwood supplies must be discounted for such factors as adverse operating conditions, which tend to have more impact on hardwood supplies than on pine.

Any reduction in area of well-stocked stands less than 40 years old could diminish future hardwood supplies. Efforts must be directed at assuring adequate regeneration with desirable growing-stock trees after harvest. Acreage in stands 11–20, 21–30, and 31–40 years old is well below that in stands 41–50 and 51–60 years old. If the harvesting of older stands increases, there is the chance that additional stands harvested might not be adequately regenerated with well-stocked younger stands. Sound management of future stands begins before stand establishment, at the time current stands are removed. Proper harvesting techniques offer a greater probability of well-stocked hardwood stands becoming established. Currently, 22 percent of all hardwood stands have no identifiable stand which could be featured in management. This percentage is a slight decrease from last survey, when 1.7 million acres, or 24 percent of all hardwood stands, were so poorly stocked that a manageable stand of trees did not exist.

Timber Supply Projections

Timber inventory, growth, and removal volumes are estimated at 10-year intervals for the next 30 years in this section. These estimates are provided to identify developing trends and to expose potential problems with the resource. Armed with the facts, decisionmakers can take action to curtail predicted shortfalls in tomorrow's resource. These projections are adapted from a 12-State regional study of forest resources in the Southern United States (U.S. Department of Agriculture, Forest Service 1988). The South Carolina projections presented here were modified to correspond with intervals beginning at the completion of the most recent survey. Procedures, models, and assumptions used for the projections are described in the regional study report.

Several models were used in making the projections. Changes in South Carolina's timberland base were modeled with the Southern Acreage Model (SAM). SAM correlates changes in forest acreage to predicted changes in population, personal income, and income from forestry and agricultural investments (Alig 1985). Estimates of future inventory volume and growth were produced by the Timber Resources Inventory Model (TRIM) (Tedder 1983). TRIM is an area-based yield table model that drives land acreage through an array of strata defined by combinations of ownership, forest types, site quality, stocking levels, and management intensities. Starting with the current inventory, the model moves acres through time and accounts for shifts among the various strata. Volume and growth estimates for each combination are derived from empirical yield tables specific to individual cells. Roundwood harvests were projected with the Timber Assessment Market Model (TAMM) (Adams and



Haynes 1980). TAMM is a market equilibrium model that interfaces with TRIM to provide estimates of future demand for timber products. Since demand is more closely related to regional rather than State or local economies, projections of timber volume, growth, and removals were initially made at the regional level for both the Southeast and the Midsouth. Regional projections were then allocated to the State with the State Allocation of Regional Inventory model (Abt 1986).

Given that the assumptions made in the modeling process are valid, area of timberland in South Carolina is predicted to continue to decline during the next decade by about 2 percent (appendix table 41). After 1996, change in timberland area will again turn upward and continue increasing through 2006. By 2016 timberland will total 12.1 million acres, about 1 percent less than the current level. Although trends are presented for all ownerships combined, projections have been made specific to ownership. Since these trends differ significantly, they will be discussed in this section.

A drop in farmer-owned timberland accounts for all of the net loss in acreage over the next three decades. Between 1986 and 2016, timberland on farms is projected to decline steadily from 3.1 to 2.2 million acres. Over the same period, timberland in all other ownerships is expected to remain at current levels or to increase. Within the NIPF category, a combined increase in area of other corporate and other individual timberland amounting to 702,000 acres will only partially offset the decline in farm timberland. Area of forest industry timberland is expected to rise about 2 percent per decade to 2.8 million acres in 2016.

The most striking changes in timberland distribution include a large increase in area of pine plantations and a decline of like magnitude in area of natural pine stands during the next 30 years. Area of pine plantation is expected to increase to 3.5 million acres by 2016—an increase of 74 percent. By 2016, pine plantations are expected to occupy 3 of every 10 acres of timberland and almost 6 of every 10 acres in softwood types. Increases will occur across all ownerships; area of pine plantations will increase by 56 percent on forest industry lands and will more than double on NIPF land. Natural pine stands, which currently account for 3 of every 10 acres of timberland, will decline in area by 38 percent to 2.1 million acres and by 2016 will account for less than 1 of every 5 acres. Area of oak–pine stands, a rather transitory type, is projected to decline by 6 percent, most likely due to increased intensity of management associated with more pine plantations. Area of upland hardwood stands will increase by 3 percent to 2.7 million acres, while area of lowland hardwood stands will decline by 10 percent to 2.3 million acres. The area of lowland hardwood could be affected by future legislation on special treatment of wetlands.

The inventory of hardwood growing stock, which has been increasing steadily for 40 years, has apparently peaked. Between 1987 and 1997, it is expected to decline by 2 percent. Further declines are anticipated through 2016, when hardwood growing-stock inventory will total 8.2 billion cubic feet, 8 percent below today's level. This decline can be attributed to: (1) further losses in timberland acreage between now and 1996 and only slight increases thereafter, (2) a proportional increase in area of pine plantations at the expense of both hardwood and natural pine stands, (3) increased use of hardwood as furnish in pulp mixes, and (4) an increased demand for forest products, such as oriented strand board, that can be manufactured using a high percentage of hardwood.

Trends in hardwood inventory vary dramatically by ownership. On public land, volume of hardwood growing stock will rise steadily to 947 million cubic feet by 2016—28 percent more than the current inventory volume. By that time, 12 percent of all hardwood will be controlled by public owners. Over the same period, hardwood growing-stock volume is expected to decline by 6 percent on forest industry land, principally due to more intensive pine plantation management, and by 13 percent on NIPF land, primarily due to the large decline in farm timberland and shifts in management types.

Softwood growing-stock inventory, which has been increasing since the 1950's, apparently peaked in the late 1970's. Inventory of softwoods, which has already declined from the last survey, is expected to continue to drop. By 2016, softwood growing stock will total 7.5 billion cubic feet, 15 percent below today's level. Significant changes are expected by both management type and ownership.

For public owners, softwood growing-stock volume is predicted to decline until 2006, when a slight turnaround is expected. By 2016, softwood growing-stock volume will amount to 1.3 billion cubic feet, about 6 percent less than the 1986 volume. Softwood growing stock on forest industry land is predicted to rise continually through 2016 to 2.0 billion cubic feet. This increase of 13 percent is attributed not only to a modest increase in timberland area but also to an increase in area of pine plantations. When they reach merchantable age and are adequately stocked, plantations typically support greater than average volume per acre.

For all stands combined, softwood growing stock per acre averaged 725 cubic feet in 1986; in pine plantations, volume averaged 864 cubic feet per acre. Softwood growing-stock volume on NIPF land is projected to decline between 1986 and 2016, from 5.7 to 4.3 million cubic feet. Declines will occur on farmer, other individual, and other corporate ownerships.

In 1985, net annual growth of softwood growing stock totaled 444 million cubic feet, a decline of 28 percent from 1977. Recent reductions in softwood net annual growth are expected to continue through 1995. Softwood growth is expected to rise between 1995 and 2005, and again between 2005 and 2015. Possible reasons for the post-1996 upturn include the expected increase in timberland area and the anticipated growth resulting as trees in young plantations reach merchantable size. It also is reasonable to assume that growth will increase as the proportion of total timberland in stocked pine plantations increases. For the latest survey period, growth per acre of softwood growing stock for all stands combined averaged 37 cubic feet annually; for plantations only, softwood growing-stock growth averaged 66 cubic feet per acre per year.

Trends in softwood growth by ownership are expected to vary over the next three decades. On public land, softwood growth will decline slightly over the next two decades but will stabilize by 2016 at 47 million cubic feet, 18 percent below current levels. By 1996, softwood growth on forest industry land will increase by 47 percent; growth increases will continue through 2016. At that time, 41 percent of all softwood growth will be on forest industry land, compared with 26 percent in 1985. Softwood growth on NIPF land will continue downward through 1996, but will turn upward thereafter. A portion of the prospective decrease in softwood growth on NIPF land is attributed to inadequate regeneration of pine following harvesting in past years. The projected reversal in growth trends after 1996 for this owner group is based on the recent surge in pine stand establishment. Currently for all owners combined, less than one-third of softwood growth occurs in plantations; by 2016 plantations will account for more than two-thirds of softwood growth.

The decline in hardwood growth experienced between 1977 and 1985 will continue at least through 2006. A 21-percent decline projected between 1986 and 2006 can be partially attributed to an accumulation of mature hardwood stands exhibiting increased mortality rates and slower growth. If expected increases in hardwood demand are realized, a large portion of these older hardwood stands may be harvested. If properly harvested and regenerated, young, adequately stocked, vigorous stands will replace them. Hardwood growth, therefore, will probably increase after 2016. The alternative is for these stands to stagnate and deteriorate, with growth dropping further or at best stabilizing at a level considerably below potential. Hardwood growing-stock growth is expected to decline by 37 percent on forest industry land between 1986 and 2016 and by 19 percent on NIPF land.

The volume of roundwood removed from timberland is largely determined by demands for timber products. These demands are dictated by social, economic, and technological factors that are very difficult to predict. Projected removals, therefore, should be viewed with a recognition that possibilities for error are quite large.

A 19-percent increase in growing-stock removals is projected in South Carolina over the next three decades. Annual removals of softwood growing stock are projected to increase by 11 percent. Almost all of the net increase will come from forest industry land (primarily plantations), where annual removals are expected to rise from 135 to 184 million cubic feet. Since 1978, about 15 percent of softwood removals from all ownerships have come from pine plantations. By 2016, plantations will supply about 61 percent of softwood removals.

On NIPF land, softwood growing-stock removals are projected to decline until shortly after 2000 and to turn back upward around 2006. In 2016, softwood growing-stock removals on NIPF land are projected to total 272 million cubic feet, slightly below the current level of 277 million cubic feet. The anticipated turnaround in a currently declining softwood inventory is due to expected growth increases in excess of removals after 1996. For all owners combined, by 2006 the softwood growth–removal relationship comes back into balance. By 2016, for all owners grouped, softwood growing-stock growth is projected to exceed removals by 5 percent; in 2016 growth exceeds removals on forest industry land by 19 percent.

Annual removals of hardwoods in South Carolina are foreseen as increasing by more than 41 percent over the next 30 years. Reasons for rapidly increasing hardwood removals are continued substitution of hardwoods for pine in some product lines, anticipated increases in hardwood use in other products, and a tight growth–removal relationship for pine. Almost 60 percent of the increase in growing-stock removals during the next three decades is from hardwood. An 18-percent reduction in hardwood removals is expected on forest industry land, where hardwood acreage is declining. Hardwood removals are predicted to rise on public land, but a majority of the increase will occur on NIPF land. In 30 years, about 79 percent of hardwood roundwood supplies will come from NIPF land.

The projections presented here reflect the impacts of past and present resource conditions with assumptions about future resources trends. Since many acres of timberland are understocked with suitable species, there are opportunities to increase prospective supplies. Some of the more immediate opportunities to improve future supplies are discussed in the next chapter.

Management Opportunities

This chapter presents treatment opportunities for South Carolina's timberland. Increasing demands for roundwood from a declining timberland base make it increasingly important to maintain timber growth near the potential of the forests. Efforts to efficiently manage forests to maximize both the quality and quantity of production are constrained by environmental concerns and regulations, a broad diversity of landowner management intentions, and the high cost of intensive stand management. These confounding factors magnify the need to improve the quantity and quality of the resource on as many timberland acres as possible. The identification of treatment opportunities is one of the first actions necessary to improve timber growth. Treatment opportunities discussed in this chapter are based on stand conditions encountered by field crews at each sample location. The assigned treatment opportunities describe the most important action that could be taken to improve growing conditions. Stand conditions, and thus treatment opportunities, vary widely by broad ownership and management classes (table VIII).

Adverse Sites Limit Management Opportunities on 4 Percent of Timberland

Physical conditions, such as excessively steep slopes and year-round excesses of water, limit timber management opportunities and severely impede the operability of machinery on 467,000 acres of timberland in South Carolina. Stands with an average slope of 40 percent or steeper make up one-third of these adverse sites. More than 95 percent of these stands are in the Piedmont. Both in the Piedmont and statewide, 9 of 10 acres classed as adverse sites due to excessive slope support hardwood stands.

Table VIII.—Area of South Carolina's idle cropland and timberland, by broad management, ownership, and treatment opportunity classes, 1986

Broad management and ownership classes[a]	Total area	Broad treatment opportunity class							
		Salvage	Harvest	Commercial thinning	Other stand improvement	Stand conversion[b]	Regeneration[c]	Stands in relatively good condition	Adverse sites or conditions[d]
	Thousand acres								
Idle cropland									
Public	—	—	—	—	—	—	—	—	—
Forest industry	—	—	—	—	—	—	—	—	—
Other private	388.1	—	—	—	—	—	388.1	—	—
Total	388.1	—	—	—	—	—	388.1	—	—
Nonstocked forest									
Public	9.9	—	—	—	—	—	9.9	—	—
Forest industry	77.3	—	—	—	—	—	74.8	—	2.5
Other private	186.7	—	—	—	—	—	186.7	—	—
Total	273.9	—	—	—	—	—	271.4	—	2.5
Pine plantations									
Public	199.3	3.0	—	12.1	5.7	8.4	2.5	167.6	—
Forest industry	1,102.5	5.9	3.5	140.2	14.8	—	5.9	932.2	—
Other private	702.1	19.3	—	39.7	19.7	—	23.5	599.9	—
Total	2,003.9	28.2	3.5	192.0	40.2	8.4	31.9	1,699.7	—
Natural pine stands									
Public	494.4	9.5	53.5	3.2	30.7	—	31.8	359.2	6.5
Forest industry	436.2	5.1	—	29.1	19.1	7.6	27.2	348.1	—
Other private	2,457.3	42.8	75.6	111.4	182.5	15.6	195.6	1,816.7	17.1
Total	3,387.9	57.4	129.1	143.7	232.3	23.2	254.6	2,524.0	23.6
Oak–pine stands									
Public	138.0	—	15.8	—	13.9	—	20.2	74.8	13.3
Forest industry	228.2	—	4.4	—	16.6	14.0	35.0	155.8	2.4
Other private	1,166.8	4.1	36.7	2.3	139.1	27.5	246.3	687.4	23.4
Total	1,533.0	4.1	56.9	2.3	169.6	41.5	301.5	918.0	39.1
Upland hardwood stands									
Public	192.9	—	25.8	—	13.1	6.7	33.3	88.3	25.7
Forest industry	245.9	—	2.4	—	29.4	13.0	52.4	148.7	—
Other private	2,043.4	3.7	73.3	7.4	195.2	78.0	393.0	1,217.7	75.1
Total	2,482.2	3.7	101.5	7.4	237.7	97.7	478.7	1,454.7	100.8
***Lowland hardwood* stands**									
Public	138.8	—	32.9	2.6	7.7	—	12.9	55.1	27.6
Forest industry	616.5	—	97.8	—	43.8	13.4	132.1	244.9	84.5
Other private	1,742.5	5.8	174.1	9.9	122.1	44.3	274.9	922.7	188.7
Total	2,497.8	5.8	304.8	12.5	173.6	57.7	419.9	1,222.7	300.8
All classes									
Public	1,173.3	12.5	127.9	17.9	71.1	15.1	110.6	745.0	73.2
Forest industry	2,706.6	11.0	108.3	169.3	123.6	47.9	327.4	1,829.8	89.3
Other private	8,686.9	75.7	359.7	170.7	658.7	165.3	1,708.2	5,244.3	304.3
Total	12,566.8	99.2	595.9	357.9	853.4	228.3	2,146.2	7,819.1	466.8

[a] Forest industry includes lands under long-term lease.

[b] Areas occupied with species unsuitable for the site from the standpoint of timber production.

[c] Includes 101.6 thousand acres where good-quality hardwood regeneration could be accomplished by felling residual trees to release advance understory hardwood reproduction and promote stump sprouting.

[d] Areas where management opportunities are severely limited because of steep slopes or poor drainage.

The remaining two-thirds of the adverse sites in South Carolina are hampered by year-round inundation. Three-fourths of these stands are found in the Northern Coastal Plain; about one-fourth are located in the Southern Coastal Plain. Almost all of these stands support hardwood types.

Including both stands with year-round water problems or steep slopes, about 6 percent of public timberland, 4 percent of NIPF timberland, and 3 percent of forest industry land are classed as adverse or inoperable. Timber was cut from far less than 1 percent of the acres classed as adverse each year during the past decade. On operable sites, about 2 percent of the total acreage was cut annually. On operable sites, average net annual growth of all species exceeded average annual removals by about 8 percent during the latest survey period; in comparison, growth exceeded removals by almost fourfold on adverse sites.

Steep slopes and year-round water problems affected average amounts of timber present. In stands with water continually present, volume of all species averaged 2,900 cubic feet of growing stock per acre and net annual growth averaged 60 cubic feet per acre. On all timberland (both operable and adverse sites), growing-stock volume of all species averaged 1,456 cubic feet per acre and growth averaged 57 cubic feet per acre. Growing-stock volume in stands with slopes of 40 percent or greater averaged 1,700 cubic feet; annual growth of all species averaged only 48 cubic feet per acre, possibly due to older average age of stands and poorer site quality. Because of difficulties anticipated in applying treatments, adverse sites are excluded from the management opportunities presented in this chapter (table VIII). However, these stands should not be ignored as productive timberland. Site limitations restrict but do not preclude management on these acres; less intensive stand management may be a consideration in capturing the potential of such timberland.

More than 7.8 Million Acres Support Stands in Good Condition

Stands in relatively good condition occupy two-thirds of South Carolina's operable timberland. Generally, these stands are at least 60 percent stocked, but not overstocked, with immature trees of acceptable quality and free from significant damage or competition. Volume of growing stock on these areas averages 1,491 cubic feet per acre; average net annual growth of growing-stock trees for all species combined amounted to 61 cubic feet per acre. Providing adequate protection, performing intermediate stand treatments when necessary, and promptly regenerating these stands as they are harvested will assure acceptable timber growth in these stands.

About 70 percent of stands controlled by forest industry and suitable for intensive timber management are in good condition and need no immediate treatment. About 68 percent of public lands and 66 percent of NIPF lands are in good shape.

About 85 percent of pine plantations and 74 percent of natural pine stands are in good condition. Pine plantations in good shape support an average 690 cubic feet of growing stock per acre; natural pine stands average 1,740 cubic feet per acre. The average stand age of pine plantations in need of no treatment is 14 years; more than half of these stands were established in the past 10 years. Low age accounts for the relatively low average volume in these plantations. Average age of natural pine stands needing no treatment is 34 years. A smaller proportion of hardwood stands are in no need of immediate treatment. Among hardwood stands suitable for intensive management, only 54 percent of lowland hardwood stands and 57 percent of upland hardwood stands are in good shape; 61 percent of oak–pine stands are in good shape. Volumes in these stands average 2,210 cubic feet per acre for lowland hardwoods, 1,540 for upland hardwoods, and 1,240 for oak–pine.

Opportunities for Improved Production on 3.9 Million Operable Acres

One-third of South Carolina's operable timberland presents the opportunity to improve both the quality and quantity of the State's current and future timber supplies. Conditions on these acres range from low stocking with suitable trees to overmaturity of stands. In the absence of treatment, these stands will contribute below their potential. Six management opportunities are presented that can substantially increase future yields.

1. *Salvage and regenerate seriously damaged stands on 99,000 acres.* These acres support stands with merchantable timber seriously damaged by various agents to the point that they are experiencing excessive mortality. Diseases, insects, and weather were the major damaging agents in these stands. Stands needing salvage average 38 years of age. Annual mortality of growing stock averages 71 cubic feet per acre, compared with an average 11 cubic feet per acre for healthy stands needing no treatment. Growing-stock volume in these stands averages 1,941 cubic feet per acre.

Pine plantations make up 28 percent of the stands needing salvage; natural pine stands, another 58 percent. Hardwood stands account for about 14 percent.

The estimated area needing salvage is misleadingly low. Many stands that would have benefited from salvage have already experienced high levels of mortality and contain such a large proportion of cull timber that stocking of growing stock has been reduced below 60 percent. These stands are included with the regeneration opportunity.

2. *Harvest and regenerate mature stands on 596,000 acres.* These stands, characterized by high volumes and older age, would benefit from harvest and subsequent regeneration. They average 78 years in age and support an average of 3,220 cubic feet of growing stock per acre, plus an additional 290 cubic feet of cull timber. Current growing-stock growth is adequate, averaging 69 cubic feet per acre annually, and mortality rates are relatively low. If left alone, however, these stands may experience reduced growth rates and increased mortality. Hardwood stands account for more than two-thirds of this opportunity. Pine stands account for another one-fifth of all stands now in need of harvest, and oak–pine stands make up the remainder. More than 60 percent of the harvest opportunity occurs on NIPF land. In this owner category, almost 8 of 10 acres to be harvested are hardwood or oak–pine stands.

3. *Thin young immature stands densely stocked with merchantable trees on 358,000 acres.* These acres support immature stands (average age is 27 years) so heavily stocked that trees are receiving considerable competition from each other. They support an average of 2,830 cubic feet of growing stock per acre. Average annual growth of growing stock in these stands is 175 cubic feet per acre; unless stocking is reduced, suppression mortality is likely to occur. When thinned, future growth will be distributed among fewer crop trees, thereby stimulating individual tree growth and productive stand development. Ideally, thinning should be done early to minimize loss of site potential and to reduce allocation of growth to noncrop trees.

More than 53 percent of the thinning opportunity is in pine plantations between 11 and 40 years old. Natural pine stands account for another 40 percent of acreage needing thinning.

4. *Remove undesirable trees and competing vegetation from immature stands on 853,000 acres.* Stands in this category contain substantial numbers of rough trees and woody shrubs that are competing with potential crop trees. Also included in this category are stands heavily stocked with growing-stock trees below merchantable size and requiring a precommercial thinning. Average age of these stands is 15 years. Oak–pine and hardwood stands account for 68 percent of this opportunity; natural pine stands and pine plantations account for another 27 and 5 percent, respectively. About 77 percent of the acres needing timber stand improvement (TSI) are NIPF land, 15 percent are forest industry land, and 8 percent are public land.

Final harvests and partial cutting over the last 8 years brought about the existing conditions on 3 of 10 acres needing TSI. Much of the remaining acreage is the result of similar harvests prior to 8 years ago. Residual trees and large woody shrubs left after harvests impede the establishment of adequate regeneration and abate the growth of existing reproduction. Average growing-stock volume per acre in these stands is only 875 cubic feet. Net annual growth of growing stock averaged 42 cubic feet per acre. Situations requiring TSI can be avoided during harvests by removing all residual trees and shrubs that may hamper the development of new stands.

5. *Alter species composition in stands that are stocked with species obviously unsuitable for the site from the standpoint of timber production on 228,000 acres.* These stands support a manageable stand but are producing well below site potential due to stocking with off-site species. The recommended stand treatment is to replace the existing stand with species better suited to the physical conditions of the site for timber production.

Such stands averaged only 713 cubic feet of growing stock, with an average annual growth of only 32 cubic feet per acre. Hardwood stands on NIPF land account for over half of the area requiring conversion. Average stand age is 25 years. Pine plantations account for about 4 percent of the area needing conversion—all of these acres are in public ownership. Natural pine stands make up another 10 percent of the area needing species replacement. The remainder of the acreage is made up of hardwood stands on public and forest industry ownerships and oak–pine stands.

6. *Regenerate 1.8 million acres so poorly stocked that a manageable stand does not exist.* Many of these acres are the result of prior timber harvests. More than 36 percent of the area in need of regeneration experienced a final harvest during the most recent remeasurement period. Much of the remaining acreage was harvested during the previous survey period. Remnants of former stands hinder the development of a manageable stand. Although stocking on these acres may improve with time, inadequate stocking may persist indefinitely in the absence of treatment. For example, 47 percent of the area needing regeneration in 1978 is still inadequately stocked. In stands now needing regeneration, volume of growing stock averages only 464 cubic feet per acre. The poor quality of trees in these stands eliminates the chance for a commercial harvest. Taking measures to assure the establishment of an adequate stand at the time of harvest could reduce significantly the area with such problems and minimize future financial investment in stands. Of the timberland needing regeneration, 15 percent is not stocked with trees, 2 percent is classed as pine plantation, 15 percent as natural pine, 17 percent as oak–pine, 27 percent as upland hardwood, and 24 percent as lowland hardwood. These distributions do not necessarily suggest the species these acres are best suited to grow. Many cutover areas currently dominated by low-quality hardwoods are best suited to growing pine. On the other hand, many hardwood stands needing regeneration are on sites best suited for growing hardwoods. Felling the trees

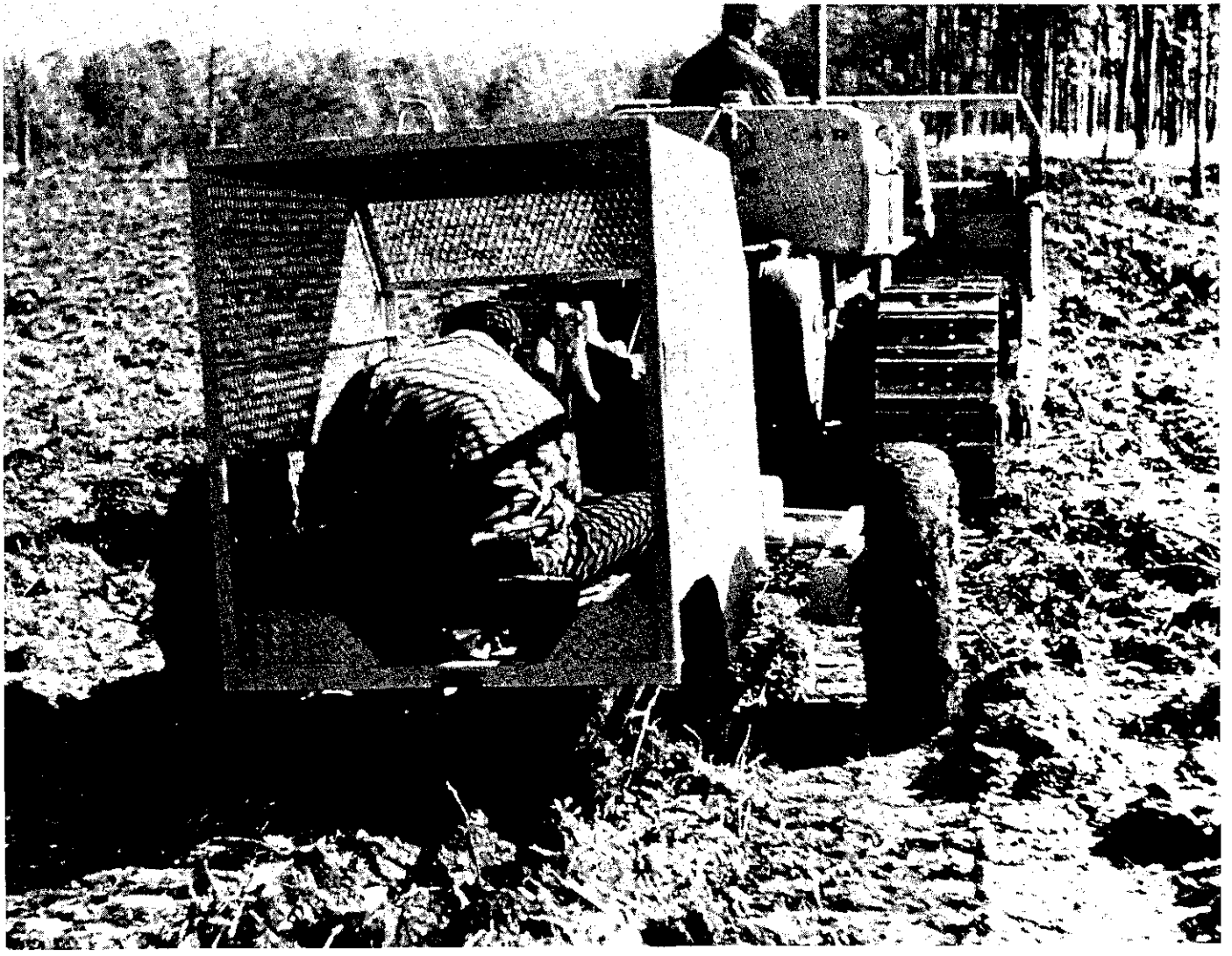
left after a previous harvest in order to release advance hardwood reproduction in the understory and to induce coppice regeneration would facilitate regeneration of many poorly stocked hardwood stands. About 102,000 acres of hardwood-dominated stands offer such opportunities. This acreage has been included in the total regeneration opportunity.

To encourage the development of better quality hardwood stands, to minimize intermediate management costs, and to allocate maximum growth to crop trees, all unmerchantable stems should be felled at the time of harvest. In most instances, a biological clearcut is the most silviculturally sound system of assuring the establishment of a quality hardwood stand on hardwood sites.

In addition to poorly stocked stands, there are 388,000 acres of idle cropland in South Carolina that could be planted to forest cheaply. These acres represent a major opportunity to add to the timberland base. Natural seeding of old fields has been a primary source of new stands in the past.

Planting acres of idle cropland in trees will reduce the effects of timberland lost to urban buildup. Site preparation and planting costs are less on these acres than on cutover forest, and competition from residuals and hardwood encroachment during early stand development are negligible.

Financial and professional assistance in timber management are available to South Carolina timberland owners through three Federal and one State program. These programs are the Forest Incentive Program, the Agricultural Conservation Program, the Conservation Reserve Program, and the South Carolina Forest Renewal Program. Objectives of these programs are to encourage private investments in improved forest management, to provide maximum public benefits in conserving natural resources, and to promote the use of sound forestry practices in order to ensure adequate future supplies of timber and all natural resources. Contact the South Carolina Forestry Commission for further information and assistance in utilizing these programs.



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Appendix

Procedure

The procedure used in the sixth statewide inventory and evaluation of South Carolina's forest resources included these basic steps:

1. Initial estimates of forest and nonforest acreages were developed from the classification of 54,273 sample clusters systematically spaced on the latest aerial photographs available. Field crews checked a subsample of 6,867 of these 16-point clusters on the ground. A linear regression was fitted to the data to develop the relationship between the photo and ground classification of the subsample. This procedure provided a means for adjusting the initial acreage estimates for change in land use since date of photography and for photo misclassifications.

2. Estimates of timber volume and forest classifications were determined from measurements recorded at 4,284 ground sample locations systematically distributed within timberland. The plot design at each location was based on a cluster of 10 points. In most cases, variable plots, delineated with basal-area factor of 37.5 square feet per acre, were systematically spaced within a single forest condition at 5 of the 10 cluster points. Trees less than 5.0 inches d.b.h. were tallied on fixed-radius plots around the point centers.

3. Seedlings, shrubs, vines, grasses, forbs, and other lesser vegetation occurring within a 35-foot radius of selected point centers were identified and recorded at each forest sample location. Each distinctive zone of lesser vegetation was classified based on its height, density, and species composition. When merged with the tree tally, this information provided a vegetative profile of each forest condition sampled. Additional nontimber attributes measured or classified included land use, terrain features, soils, erosion, litter, water, snags, tree cavities, livestock grazing, and recreational use.

4. Equations developed from detailed measurements of standing trees in South Carolina and throughout the Southeast were used to compute volumes of individual tally trees. A mirror caliper and sectional aluminum poles were used to obtain the additional measurements on standing trees required to construct the volume equations. Forest biomass estimates were made with equations developed by the Utilization of Southern Timber Research Work Unit of the Southeastern Forest Experiment Station in Athens, GA. In addition, felled trees were measured at 103 active cutting operations to provide utilization factors for the different timber products and species groups and to supplement the standing-tree volume study.

5. Growth, removals, and mortality were estimated from the remeasurement of 4,132 permanent sample plots established in the 1977 inventory. Periodic surveys of timber products output, conducted in cooperation with the South Carolina Forestry Commission and the South Carolina Extension Service, along with the annual pulpwood production study for the South, provided additional information for breakdowns of removals by product.

6. Ownership information was collected from public records and through correspondence and direct contacts in the field. In those counties where the samples missed a particular ownership class, temporary samples were added and measured to describe forest conditions within the ownership class.

7. All field data were sent to Asheville for editing and were entered into disk and magnetic-tape storage for processing. Final estimates were based on statistical summaries of the detailed data.

Reliability of the Data

Statistical analysis of the data indicates a sampling error of ±0.28 percent for the estimate of timberland, 1.44 percent for the total growing-stock volume, 1.42 percent for total growing-stock volume growth, and 3.53 percent for total growing-stock removals. As the totals are broken down by forest type, species, tree diameter, and other subdivisions, the sampling error increases. If homogeneity of variances is assumed, the order of this increase is suggested in the following tabulation showing the sampling errors in terms of one standard error, or two chances out of three.

Sampling errors for selected areas and volumes[a]

Sampling error[b] (percent)	Timberland	Volume of growing stock		
		Inventory	Net growth	Removals
	M acres	*Million cubic feet*		
1	954.8	—	—	—
2	238.7	9,191.7	349.1	—
3	106.1	4,085.2	155.2	—
4	59.7	2,297.9	87.3	487.9
5	38.2	1,470.7	55.9	312.3
10	9.5	367.7	14.0	78.1
15	4.2	163.4	6.2	34.7
20	2.4	91.9	3.5	19.5
25	1.5	58.8	2.2	12.5

[a] Sampling error of volume or area totals in question may be computed with the following formula:

$$E = \frac{(SE)\ \sqrt{\text{Specified volume or area}}}{\sqrt{(\text{Volume or area total in question})}}$$

where: E = Sampling error of the volume or area total in question.

SE = Specified sampling error in table.

[b] By random-sampling formula.

Definitions of Terms

Allowable cut. The volume of timber that could be cut on timberland during a given period under specified management plans aimed at sustained production of timber products.

Basal area. The area in square feet of the cross section at breast height of a single tree or of all the trees in a stand, usually expressed as square feet of basal area per acre.

Biomass. The aboveground green weight of solid wood and bark in live trees 1.0 inch d.b.h. and larger from the ground to the tip of the tree. All foliage is excluded. The weight of wood and bark in lateral limbs, secondary limbs, and twigs under 0.5 inch in diameter at the point of occurrence on sapling size trees is included but is excluded on poletimber and sawtimber size trees.

Bole. That portion of a tree between a 1-foot stump and a 4-inch top diameter outside bark (d.o.b.) in trees 5.0 inches d.b.h. and larger.

Broad management class. A classification of timberland based on forest type and stand origin.

Pine plantation. Stands that have been artificially regenerated by planting or direct seeding and with a southern yellow pine, white pine–hemlock, or other softwood forest type.

Natural pine. Stands that have not been artificially regenerated and with a southern yellow pine, white pine–hemlock, or other softwood forest type.

Oak-pine. Stands with a forest type of oak–pine.

Upland hardwood. Stands with a forest type of oak–hickory, chestnut oak, southern scrub oak, or maple–beech–birch.

Lowland hardwood. Stands with a forest type of oak–gum–cypress, elm–ash–cottonwood, palm, or other tropical.

Bureau of Land Management lands. Federal lands administered by the Bureau of Land Management.

Census water. Streams, sloughs, estuaries, canals, and other moving bodies of water one-eighth of a statute mile in width and greater, and lakes, reservoirs, ponds, and other permanent bodies of water 40 acres in area and greater.

Commercial forest land. (see: Timberland).

Commercial species. Tree species conventionally regarded as being able to develop into trees suitable for the manufacture of industrial timber products. Species that typically exhibit small size, poor form, or inferior quality are excluded.

Cropland. Land under cultivation within the past 24 months, including orchards and land in soil-improving crops but excluding land cultivated in developing improved pasture. Also includes idle farmland.

D.b.h. Tree diameter (outside bark) at breast height (4.5 feet above the ground).

Diameter class. A classification of trees based on tree d.b.h. Two-inch diameter classes are commonly used by Forest Inventory and Analysis, with the even inch as the approximate midpoint for a class. For example, the 6-inch class includes trees 5.0 through 6.9 inches d.b.h.

Farm. Land on which agricultural operations are being conducted and sale of agricultural products totaled $1,000 or more during the year.

Farm operator. A person who operates a farm, either doing the work himself or directly supervising the work.

Farmer-owned land. (see: Other private land).

Forest industry land. Land owned by companies or individuals operating wood-using plants.

Forest industry-leased land. Land leased or under management contracts to forest industry from other owners for periods of one forest rotation or longer. Land under cutting contracts is not included.

Forest land. Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

Forest type. A classification of forest land based on the species forming a plurality of live-tree stocking.

White pine–hemlock. Forests in which eastern white pine, red pine, or jack pine, singly or in combination, constitute a plurality of the stocking. (Common associates include hemlock, birch, and maple.)

Spruce–fir. Forests in which spruce or true firs, singly or in combination, constitute a plurality of the stocking. (Common associates include maple, birch, and hemlock.)

Longleaf–slash pine. Forests in which longleaf or slash pine, singly or in combination, constitute a plurality of the stocking. (Common associates include oak, hickory, and gum.)

Loblolly–shortleaf pine. Forests in which loblolly pine, shortleaf pine, or other southern yellow pines, except longleaf or slash pine, singly or in combination, constitute a plurality of the stocking. (Common associates include oak, hickory, and gum.)

Oak–pine. Forests in which hardwoods (usually upland oaks) constitute a plurality of the stocking but in which pines account for 25 to 50 percent of the stocking. (Common associates include gum, hickory, and yellow-poplar.)

Oak–hickory. Forests in which upland oaks or hickory, singly or in combination, constitute a plurality of the stocking, except where pines account for 25 to 50 percent, in which case the stand would be classified oak-pine. (Common associates include yellow-poplar, elm, maple, and black walnut.)

Oak–gum–cypress. Bottom-land forests in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, constitute a plurality of the stocking, except where pines account for 25 to 50 percent, in which case the stand would be classified oak–pine. (Common associates include cottonwood, willow, ash, elm, hackberry, and maple.)

Elm–ash–cottonwood. Forests in which elm, ash, or cottonwood, singly or in combination, constitute a plurality of the stocking. (Common associates include willow, sycamore, beech, and maple.)

Maple–beech–birch. Forests in which maple, beech, or yellow birch, singly or in combination, constitute a plurality of the stocking. (Common associates include hemlock, elm, basswood, and white pine.)

Palm, other tropical. Forests in which palms and other tropicals constitute a plurality of the stocking.

Gross growth. Annual increase in merchantable volume of trees in the absence of cutting and mortality. (Gross growth includes survivor growth, ingrowth, growth on ingrowth, growth on removals prior to removal, and growth on mortality prior to death.)

Growing-stock trees. Live sawtimber size trees of commercial species containing at least a 12-foot log, or two noncontiguous saw logs each 8 feet or longer, meeting minimum grade requirements (hardwoods must qualify as a log grade of either 3 or 4; softwoods must qualify as a log grade 3) with at least one-third of the gross board-foot volume (International 1/4-inch rule) between a 1-foot stump and the minimum saw-log top being sound, or a live tree below sawtimber size that will prospectively qualify under the above standards.

Desirable tree. A tree that qualifies as growing stock and has no serious defects in quality limiting present or prospective use; is of relatively high vigor (30 percent or more live crown ratio); is compatible with the site and physiographic class; has a total board-foot loss not to exceed 15 percent in softwoods or 25 percent in hardwoods as a result of severe sweep, crook, or lean; and has a relatively clear bole.

Acceptable tree. A tree that qualifies as growing stock but does not meet the minimum requirements to qualify as a desirable tree. Included are sawtimber size trees that do not contain a 12-foot saw log because of excessive, natural taper in the butt log but have the potential to produce a 12-foot saw log as diameter increases.

Growing-stock volume. Volume (cubic feet) of solid wood in growing-stock trees 5.0 inches d.b.h. and larger, from a 1-foot stump to a minimum 4.0-inch top diameter, outside bark, on the central stem. Volume of solid wood in primary forks from the point of occurrence to a minimum 4.0-inch top diameter outside bark is included.

Hardwoods. Angiosperms; dicotyledonous trees (including all palm species which are monocotyledonous), usually broadleaf and deciduous.

Soft hardwoods. Soft-textured hardwoods such as boxelder, red and silver maples, hackberry, loblolly–bay, sweetgum, yellow-poplar, magnolia, sweetbay, water tupelo, blackgum, sycamore, cottonwood, black cherry, willow, basswood, and elm.

Hard hardwoods. Hard-textured hardwoods such as sugar maple, birch, hickory, dogwood, persimmon (forest grown), black locust, beech, ash, honeylocust, holly, black walnut, mulberry, and all commercial oaks.

Idle farmland. Land including former cropland, orchard, improved pasture, and farm sites not tended within the past 2 years, and currently less than 16.7 percent stocked with live trees.

Improved pasture. Land currently improved for grazing by cultivation, seeding, irrigation, or clearing of trees or brush.

Indian land. All lands held in trust by the United States for individual Indians or tribes, or all lands, titles to which are held by individual Indians or tribes, subject to Federal restrictions against alienation.

Industrial wood. All roundwood products except fuelwood.

Ingrowth. The number or net volume of trees that grow large enough during a specified year to qualify as saplings, poletimber, or sawtimber.

Inhibiting vegetation. Cover sufficiently dense to prevent the establishment of tree seedlings.

Land area. The area of dry land and land temporarily or partly covered by water such as marshes, swamps, and river floodplains (omitting tidal flats below mean high tide), streams, sloughs, estuaries, and canals less than one-eighth of a statute mile in width, and lakes, reservoirs, and ponds less than 40 acres in area.

Live trees. *All trees 1.0 inch d.b.h. and larger which are not* dead at the time of inventory.

Live-tree volume. Volume (cubic feet) of wood above the ground line in live trees 1.0 inch d.b.h. and larger. The volume in twigs and lateral limbs smaller than 0.5 inch in diameter at the point of occurrence on sapling size trees is included but is excluded on poletimber and sawtimber size trees.

Log grade. A classification of logs based on external characteristics as indicators of quality or value.

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

Logging slash. The unmerchantable portion of growing-stock trees (including saplings) plus all cull trees 1.0 inch d.b.h. and larger cut or destroyed during logging operations and not used.

Manageable stand. Timberland at least 60 percent stocked with growing-stock trees that can be featured together under a management scheme.

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 diameter outside bark on the central stem. That portion of primary forks from the point of occurrence to a minimum 4.0-inch top diameter outside bark is included.

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

Miscellaneous Federal land. Federal land other than national forests, land administered by the Bureau of Land Management, and land administered by the Bureau of Indian Affairs.

Miscellaneous private land. (see: Other private land).

Mortality. The merchantable volume in trees that have died from natural causes during a specified period.

National forest land. Federal land that has been legally designated as national forests or purchase units, and other land under the administration of the Forest Service, including experimental areas and Bankhead–Jones Title III land.

Net annual growth. The net change in merchantable volume for a specific year in the absence of cutting (gross growth minus mortality for that specified year).

Net volume. Gross volume of wood less deductions for rot, sweep, or other defect affecting use for timber products.

Noncommercial species. Tree species of typically small size, poor form, or inferior quality which 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.

Nonindustrial private forest (NIPF) land. (see: Other private land).

Nonstocked forest land. Timberland less than 16.7 percent stocked with growing-stock trees.

Other private land. Privately owned land excluding forest industry land or forest industry-leased land. Also referred to as nonindustrial private forest (NIPF) land.

Farmer-owned land. Owned by farm operators, excluding incorporated farm ownerships.

Other individual land. Owned by individuals other than farm operators.

Other corporate land. Owned by corporations, including incorporated farm ownerships.

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 that result in the removal of the trees from the timberland.

Plant residues. Wood material generated in the production of timber products at primary manufacturing plants.

Coarse residues. Material, such as slabs, edgings, trim, veneer cores and ends, which is suitable for chipping.

Fine residues. Material, such as sawdust, shavings, and veneer chippings, which is not suitable for chipping.

Plant byproducts. Residues (coarse or fine) utilized in the further manufacture of industrial products or for consumer use, or utilized as fuel.

Unused plant residues. Residues (coarse or fine) that are not used for any product, including fuel.

Poletimber size trees. Live trees at least 5.0 inches d.b.h. but smaller than sawtimber size.

Productive-reserved forest land. (see: Reserved timberland).

Quality class. A classification of sawtimber volume by log or tree grades.

Rangeland. Land on which the natural vegetation is predominantly native grasses, grasslike plants, forbs, or shrubs valuable for forage, not qualifying as timberland and not developed for another land use. Rangeland includes natural grassland and savannah.

Reserved timberland. Forest land sufficiently productive to qualify as timberland, but withdrawn from timber utilization through statute or administrative designation.

Rotten trees. Live trees of commercial species that do not contain 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 that do not contain 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 or consumer uses.

Roundwood chipped. Any timber cut primarily for pulpwood, delivered to nonpulpmills, chipped, and then sold to pulpmills as residues, including chipped tops, jump sections, whole trees, and pulpwood sticks.

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

Salvable dead trees. Standing or down dead trees considered utilizable by Forest Inventory and Analysis standards.

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

Saw log. A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight, and with a minimum diameter inside bark for softwoods of 6 inches (8 inches for hardwoods).

Saw-log portion. That part of the bole of sawtimber trees between a 1-foot stump and the saw-log top, including the portion of forks large enough to contain a saw log.

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 in diameter outside bark (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 size trees in board feet (International 1/4-inch rule).

Seedlings. Live trees of commercial species less than 1.0 inch d.b.h. that are expected to survive and develop.

Site class. A classification of forest land in terms of inherent capacity to grow crops of industrial wood based on fully stocked natural stands, by annual production capacity.

Class 1. 165 or more cubic feet per acre.

Class 2. 120 to 164 cubic feet per acre.

Class 3. 85 to 119 cubic feet per acre.

Class 4. 50 to 84 cubic feet per acre.

Class 5. 20 to 49 cubic feet per acre.

Softwoods. Gymnosperms; in the order Coniferales, usually evergreen (includes the genus *Taxodium* which is deciduous), having needles or scalelike leaves.

Pines. Yellow pine species which include loblolly, longleaf, slash, pond, shortleaf, pitch, Virginia, sand, spruce, and Table Mountain pines.

Other softwoods. Cypress, eastern redcedar, white cedar, eastern white pine, eastern hemlock, spruce, and fir.

Stand size class. A classification of forest land based on the diameter class distribution of growing-stock trees in the stand.

Sawtimber stands. Stands at least 16.7 percent stocked with growing-stock trees, with half or more of total stocking in sawtimber and poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands. Stands at least 16.7 percent stocked with growing-stock trees of which half or more of total stocking is in poletimber and sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling–seedling stands. Stands at least 16.7 percent stocked with growing-stock trees of which more than half of total stocking is saplings and seedlings.

State, county, and municipal land. Land owned by States, counties, and local public agencies or municipalities, or land leased to these governmental units for 50 years or more.

Stocking. The degree of occupancy of land by trees, measured by basal area or the number of trees in a stand and spacing in the stand, compared with a minimum standard, depending on tree size, required to fully utilize the growth potential of the land.

Fully stocked. 100 percent or more stocking.

Medium stocked. 60 to 99 percent stocking.

Poorly stocked. Less than 60 percent stocking.

Survivor growth. The merchantable volume increment on trees 5.0 inches d.b.h. and larger in the inventory at the beginning of the year and surviving to its end.

Timberland. Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, not currently developed for nonforest use, capable of producing 20 cubic feet of industrial wood per acre per year and not withdrawn from timber utilization by legislative action.

Timber products. Roundwood products and byproducts.

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

Top. The portion of the main stem and forks from a 4.0-inch diameter outside bark to the tips of the main stem and forks, plus all other limbs above the 4.0-inch top at least 0.5 inch in diameter at their point of occurrence.

Treatment opportunity. A classification of the management or treatment that would most improve for timber production the existing condition of the stand being sampled.

Tree grade. A classification of sawtimber trees based on the log grade of the butt log in the tree.

Unproductive forest land. (see: Woodland).

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

Urban and other areas. Areas developed for residential, industrial, or recreational purposes, school yards, cemeteries, roads, railroads, airports, beaches, powerlines and other rights-of-way, or other nonforest land not included in any other specified land use class.

Woodland. Forest land incapable of producing 20 cubic feet per acre per year of industrial wood under natural conditions, because of adverse site conditions.

Stocking Standard

D.b.h. class	Minimum number of trees per acre for full stocking	Minimum basal area per acre for full stocking
Seedlings	600	—
2	560	—
4	460	—
6	340	67
8	240	84
10	155	85
12	115	90
14	90	96
16	72	101
18	60	106
20	51	111

Conversion Factors

Cubic feet of wood per average cord (excluding bark)

D.b.h. class	All species	Pine	Other softwood	Hardwood
6	60.6	61.0	68.2	60.0
8	68.5	68.1	76.0	68.4
10	73.4	73.1	81.4	73.4
12	76.7	76.7	85.2	76.4
14	79.1	79.4	88.2	78.4
16	80.9	81.6	90.4	79.8
18	82.2	83.3	92.3	80.8
20	83.2	84.8	93.8	81.5
22	83.9	86.0	95.1	82.1
24+	85.2	87.8	97.7	83.1
Average	75.2	75.0	86.5	74.7

Rough cords per M cubic feet (without bark) =

$$a + b\left(\frac{1}{\text{d.b.h.}}\right) + c\left(\frac{1}{\text{d.b.h.}}\right)^2$$

Where	*Pine*	*Other softwoods*	*Hardwoods*
a =	10.01850	9.15960	11.68410
b =	34.42135	28.75973	3.74431
c =	22.73994	25.54418	157.39417

Metric equivalents of units used in this report

1 acre = 4,046.86 square meters or 0.404686 hectare
1 cubic foot = 0.028317 cubic meter
1 inch = 2.54 centimeters or 0.0254 meter
Breast height = 1.4 meters above ground level
1 square foot = 929.03 square centimeters or 0.0929 square meter
1 square foot per acre basal area = 0.229568 square meter per hectare
1 pound = 0.454 kilogram
1 ton = 0.907 metric ton

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Table 1.--Area, by land class, South Carolina, 1986

Land class	Area
	Acres
Forest land	
Timberland	12,178,756
Reserved timberland	78,216
Woodland	--
Total	12,256,972
Nonforest land	
Cropland	3,573,102
Pasture and range	898,212
Other[a]	2,592,266
Total	7,063,580
All land[b]	19,320,552

[a]Includes swampland, industrial, and urban areas, other nonforest land, and 253,898 acres classed as water by Forest Survey standards but defined by Bureau of Census as land.
[b]From the U.S. Bureau of Census, 1980.

Table 2.--Area of timberland, by ownership class, South Carolina, 1986

Ownership class	Area
	Acres
National forest	576,518
Other Federal	
Bureau of Land Management	--
Indian	720
Miscellaneous Federal	336,026
Total	336,746
State	233,425
County and municipal	26,627
Forest industry	2,626,094
Forest industry-leased	80,483
Other private	
Farmer	3,136,366
Other individual	3,941,700
Other corporate	1,220,797
Total	8,298,863
All ownerships	12,178,756

Table 3.--Area of timberland, by stand size and ownership classes, South Carolina, 1986

Stand size class	All ownerships	National forest	Other public	Forest industry	Forest industry-leased	Other private
			Acres			
Sawtimber	5,511,198	387,364	331,007	904,754	14,548	3,873,525
Poletimber	3,085,862	88,758	141,273	686,167	22,135	2,147,529
Sapling and seedling	3,307,746	100,396	114,593	960,055	41,625	2,091,077
Nonstocked	273,950	--	9,925	75,118	2,175	186,732
All classes	12,178,756	576,518	596,798	2,626,094	80,483	8,298,863

Table 4.--Area of timberland, by stand volume and ownership classes, South Carolina, 1986

Stand volume class (board feet/acre[a])	All ownerships	National forest	Other public	Forest industry	Forest industry-leased	Other private
			Acres			
Less than 2,000	5,206,031	155,137	192,819	1,459,674	55,239	3,343,162
2,000 - 3,999	1,682,287	45,564	95,177	286,680	12,372	1,242,494
4,000 - 5,999	1,351,409	32,581	65,496	198,099	7,560	1,047,673
6,000 - 7,999	1,080,802	70,132	75,124	187,009	661	747,876
8,000 - 9,999	775,510	70,770	51,903	121,051	--	531,786
10,000 or more	2,082,717	202,334	116,279	373,581	4,651	1,385,872
All classes	12,178,756	576,518	596,798	2,626,094	80,483	8,298,863

[a]International 1/4-inch rule.

Table 5.--Area of timberland, by stocking class of growing-stock trees and ownership class, South Carolina, 1986

Stocking class	All ownerships	National forest	Other public	Forest industry	Forest industry-leased	Other private
			Acres			
Overstocked	598,409	38,856	26,374	172,226	15,983	344,970
Fully stocked	4,310,348	260,107	192,784	1,161,590	37,069	2,658,798
Moderately stocked	5,390,158	251,729	263,873	964,124	21,119	3,889,313
Poorly stocked	1,605,891	25,826	103,842	253,036	4,137	1,219,050
Nonstocked	273,950	--	9,925	75,118	2,175	186,732
All classes	12,178,756	576,518	596,798	2,626,094	80,483	8,298,863

Table 6.--Area of timberland, by site and ownership classes, South Carolina, 1986

Site class (ft^3/acre/year)	All ownerships	National forest	Other public	Forest industry	Forest industry-leased	Other private
			Acres			
>164	48,705	4,447	2,951	--	--	41,307
120-164	358,056	44,539	17,589	66,135	--	229,793
85-119	3,110,938	223,138	150,693	715,634	30,557	1,990,916
50-84	7,186,029	254,784	284,835	1,609,167	47,939	4,989,304
20-49	1,475,028	49,610	140,730	235,158	1,987	1,047,543
All classes	12,178,756	576,518	596,798	2,626,094	80,483	8,298,863

Table 7.--Area of timberland, by forest type and site index class, South Carolina, 1986

Forest type	All classes	Site index class[a]								
		<50	50-59	60-69	70-79	80-89	90-99	100-109	110-119	>119
	Acres									
Softwood types										
White pine-hemlock	10,685	--	--	--	3,867	6,818	--	--	--	--
Spruce-fir	--	--	--	--	--	--	--	--	--	--
Longleaf pine	396,471	7,927	100,880	145,659	114,284	19,264	8,457	--	--	--
Slash pine	373,083	5,824	33,978	73,439	114,420	93,169	50,058	2,195	--	--
Loblolly pine	3,870,466	14,371	131,741	591,317	1,630,164	918,914	439,912	124,984	19,063	--
Shortleaf pine	367,237	14,073	75,649	125,951	119,159	15,357	17,048	--	--	--
Virginia pine	191,259	4,462	7,773	101,254	63,456	7,326	6,988	--	--	--
Sand pine	--	--	--	--	--	--	--	--	--	--
Eastern redcedar	16,616	1,058	4,007	--	11,551	--	--	--	--	--
Pond pine	201,150	2,560	31,593	81,606	53,277	26,844	2,772	2,498	--	--
Spruce pine	2,195	--	--	--	2,195	--	--	--	--	--
Pitch pine	7,942	4,447	--	3,495	--	--	--	--	--	--
Table Mountain pine	--	--	--	--	--	--	--	--	--	--
Total	5,437,104	54,722	385,621	1,122,721	2,112,373	1,087,692	525,235	129,677	19,063	--
Hardwood types										
Oak-pine	1,543,693	6,726	174,459	372,328	553,093	292,681	99,010	36,781	8,615	--
Oak-hickory	2,432,922	10,595	166,259	514,141	892,699	510,465	241,705	66,383	21,389	9,286
Chestnut oak	15,157	--	--	3,658	11,499	--	--	--	--	--
Southern scrub oak	196,159	24,629	147,251	19,239	5,040	--	--	--	--	--
Oak-gum-cypress	2,300,911	6,850	82,552	253,994	953,576	518,858	356,373	100,264	28,444	--
Elm-ash-cottonwood	252,810	4,462	--	9,607	78,373	92,791	41,210	17,806	8,561	--
Maple-beech-birch	--	--	--	--	--	--	--	--	--	--
Total	6,741,652	53,262	570,521	1,172,967	2,494,280	1,414,795	738,298	221,234	67,009	9,286
All types	12,178,756	107,984	956,142	2,295,688	4,606,653	2,502,487	1,263,533	350,911	86,072	9,286

[a]50-year base.

Table 8.--Area of timberland, by forest type and ownership class, South Carolina, 1986

Forest type	All ownerships	Ownership class				
		National forest	Other public	Forest industry	Forest industry-leased	Other private
	Acres					
Softwood types						
White pine-hemlock	10,685	--	2,951	--	--	7,734
Spruce-fir	--	--	--	--	--	--
Longleaf pine	396,471	20,170	99,920	22,695	--	253,686
Slash pine	373,083	--	57,875	126,289	6,098	182,821
Loblolly pine	3,870,466	279,025	165,219	1,274,059	51,780	2,100,383
Shortleaf pine	367,237	20,186	9,187	25,888	3,159	308,817
Virginia pine	191,259	8,894	--	5,628	441	176,296
Sand pine	--	--	--	--	--	--
Eastern redcedar	16,616	--	1,401	4,494	--	10,721
Pond pine	201,150	10,085	14,344	41,082	--	135,639
Spruce pine	2,195	--	--	2,195	--	--
Pitch pine	7,942	4,447	--	--	--	3,495
Table Mountain pine	--	--	--	--	--	--
Total	5,437,104	342,807	350,897	1,502,330	61,478	3,179,592
Hardwood types						
Oak-pine	1,543,693	84,047	53,952	225,512	5,537	1,174,645
Oak-hickory	2,432,922	69,424	115,289	263,112	4,943	1,980,154
Chestnut oak	15,157	--	--	--	--	15,157
Southern scrub oak	196,159	--	17,393	4,518	--	174,248
Oak-gum-cypress	2,300,911	65,179	51,811	569,003	2,988	1,611,930
Elm-ash-cottonwood	252,810	15,061	7,456	61,619	5,537	163,137
Maple-beech-birch	--	--	--	--	--	--
Total	6,741,652	233,711	245,901	1,123,764	19,005	5,119,271
All types	12,178,756	576,518	596,798	2,626,094	80,483	8,298,863

Table 9.--Area of timberland, by forest type and stand size class, South Carolina, 1986

Forest type	All stands	Stand size class			Nonstocked areas
		Sawtimber	Poletimber	Sapling-seedling	
	Acres				
Softwood types					
White pine-hemlock	10,685	3,867	6,818	--	--
Spruce-fir	--	--	--	--	--
Longleaf pine	396,471	238,903	78,410	72,079	7,079
Slash pine	373,083	162,211	165,068	45,804	--
Loblolly pine	3,870,466	1,627,160	843,368	1,365,841	34,097
Shortleaf pine	367,237	128,348	151,381	87,508	--
Virginia pine	191,259	93,306	71,094	22,744	4,115
Sand pine	--	--	--	--	--
Eastern redcedar	16,616	--	8,158	8,458	--
Pond pine	201,150	121,586	34,879	44,685	--
Spruce pine	2,195	2,195	--	--	--
Pitch pine	7,942	4,447	--	3,495	--
Table Mountain pine	--	--	--	--	--
Total	5,437,104	2,382,023	1,359,176	1,650,614	45,291
Hardwood types					
Oak-pine	1,543,693	628,625	352,164	552,236	10,668
Oak-hickory	2,432,922	970,833	805,942	610,846	45,301
Chestnut oak	15,157	4,116	11,041	--	--
Southern scrub oak	196,159	11,014	30,621	37,803	116,721
Oak-gum-cypress	2,300,911	1,345,153	479,064	425,469	51,225
Elm-ash-cottonwood	252,810	169,434	47,854	30,778	4,744
Maple-beech-birch	--	--	--	--	--
Total	6,741,652	3,129,175	1,726,686	1,657,132	228,659
All types	12,178,756	5,511,198	3,085,862	3,307,746	273,950

Table 10.--Area of timberland, by stand age and broad management classes, all ownerships, South Carolina, 1986

Stand age class (years)	All classes	Broad management class				
		Pine plantation	Natural pine	Oak-pine	Upland hardwood	Lowland hardwood
			Acres			
0-10	2,176,278	874,038	365,457	354,574	342,133	240,076
11-20	1,285,963	435,450	404,174	160,789	158,784	126,766
21-30	1,276,211	482,741	448,478	96,248	110,641	138,103
31-40	1,392,698	154,530	681,994	150,193	229,456	176,525
41-50	1,543,043	21,506	596,625	188,965	433,442	302,505
51-60	1,232,437	3,778	386,654	132,127	341,749	368,129
61-70	679,963	--	154,844	62,013	207,783	255,323
71-80	309,187	--	50,652	36,328	78,084	144,123
81+	466,752	--	40,776	46,465	89,788	289,723
No manageable stand	1,816,224	37,540	297,867	315,991	652,378	512,448
All classes	12,178,756	2,009,583	3,427,521	1,543,693	2,644,238	2,553,721

Table 11.--Area of timberland, by stand age and broad management classes, public ownerships, South Carolina, 1986

Stand age class (years)	All classes	Broad management class				
		Pine plantation	Natural pine	Oak-pine	Upland hardwood	Lowland hardwood
			Acres			
0-10	110,124	45,332	27,410	21,503	13,392	2,487
11-20	108,362	40,668	52,418	9,155	4,448	1,673
21-30	125,640	72,905	34,444	738	10,786	6,767
31-40	109,585	28,193	45,701	10,189	14,036	11,466
41-50	166,300	9,725	102,411	17,539	12,285	24,340
51-60	183,099	--	101,218	23,527	35,723	22,631
61-70	99,868	--	55,632	6,070	27,391	10,775
71-80	68,456	--	24,816	6,934	23,498	13,208
81+	84,626	--	18,453	22,176	18,089	25,908
No manageable stand	117,256	2,487	31,891	20,168	42,458	20,252
All classes	1,173,316	199,310	494,394	137,999	202,106	139,507

Table 12.--Area of timberland, by stand age and broad management classes, forest industry,[a] South Carolina, 1986

Stand age class (years)	All classes	Broad management class				
		Pine plantation	Natural pine	Oak-pine	Upland hardwood	Lowland hardwood
			Acres			
0-10	762,306	528,879	63,406	61,110	49,940	58,971
11-20	455,540	316,741	46,575	35,641	24,828	31,755
21-30	325,227	203,795	76,736	17,054	4,182	23,460
31-40	214,551	42,610	81,919	32,298	23,906	33,818
41-50	216,264	4,580	91,360	23,870	44,638	51,816
51-60	168,373	--	37,937	16,386	34,161	79,889
61-70	55,968	--	11,140	2,384	2,499	39,945
71-80	59,852	--	--	4,494	6,858	48,500
81+	110,747	--	--	--	2,459	108,288
No manageable stand	337,749	11,607	46,523	37,812	79,102	162,705
All classes	2,706,577	1,108,212	455,596	231,049	272,573	639,147

[a]Includes 80,483 acres of other private land under long-term lease.

Table 13.--Area of timberland, by stand age and broad management classes, other private ownerships,[a] South Carolina, 1986

Stand age class (years)	All classes	Broad management class				
		Pine plantation	Natural pine	Oak-pine	Upland hardwood	Lowland hardwood
			Acres			
0-10	1,303,848	299,827	274,641	271,961	278,801	178,618
11-20	722,061	78,041	305,181	115,993	129,508	93,338
21-30	825,344	206,041	337,298	78,456	95,673	107,876
31-40	1,068,562	83,727	554,374	107,706	191,514	131,241
41-50	1,160,479	7,201	402,854	147,556	376,519	226,349
51-60	880,965	3,778	247,499	92,214	271,865	265,609
61-70	524,127	--	88,072	53,559	177,893	204,603
71-80	180,879	--	25,836	24,900	47,728	82,415
81+	271,379	--	22,323	24,289	69,240	155,527
No manageable stand	1,361,219	23,446	219,453	258,011	530,818	329,491
All classes	8,298,863	702,061	2,477,531	1,174,645	2,169,559	1,775,067

[a]Excludes 80,483 acres of other private land under long-term lease to forest industry.

Table 14.--Basal area per acre of live trees 5.0 inches d.b.h. and larger, by broad management class, species group, and ownership class, South Carolina, 1986

Broad management class and species group	All ownerships	National forest	Other public	Forest industry	Forest industry-leased	Other private
	Square feet					
Pine plantation						
Softwood	44.7	41.9	52.1	45.2	48.8	42.3
Hardwood	1.5	2.7	1.1	1.1	.5	2.3
Total	46.2	44.6	53.2	46.3	49.3	44.6
Natural pine						
Softwood	62.3	69.9	67.4	58.7	--	61.6
Hardwood	11.6	12.2	12.5	10.9	--	11.6
Total	73.9	82.1	79.9	69.6	--	73.2
Oak-pine						
Softwood	26.0	39.3	27.9	25.4	--	25.3
Hardwood	30.1	40.1	27.8	23.9	--	30.9
Total	56.1	79.4	55.7	49.3	--	56.2
Upland hardwood						
Softwood	5.6	7.5	5.9	3.7	--	5.7
Hardwood	53.3	69.9	57.7	46.0	--	53.6
Total	58.9	77.4	63.6	49.7	--	59.3
Lowland hardwood						
Softwood	11.5	27.2	23.0	12.6	--	10.0
Hardwood	91.0	95.6	80.4	95.4	43.1	90.0
Total	102.5	122.8	103.4	108.0	43.1	100.0
All classes						
Softwood	31.7	49.8	43.1	33.3	31.0	29.2
Hardwood	39.1	34.7	28.2	33.5	8.2	42.2
Total	70.8	84.5	71.3	66.8	39.2	71.4

Table 15.--Area of reserved timberland and woodland, by forest type group, South Carolina, 1986

Forest type group	All areas	Reserved timberland	Woodland
		Acres	
Spruce-fir	--	--	--
White pine-hemlock	--	--	--
Longleaf-slash pine	6,148	6,148	--
Loblolly-shortleaf pine	9,501	9,501	--
Oak-pine	8,178	8,178	--
Oak-hickory	31,019	31,019	--
Oak-gum-cypress	23,370	23,370	--
Elm-ash-cottonwood	--	--	--
Maple-beech-birch	--	--	--
All types	78,216	78,216	--

Table 16.--Number of live trees on timberland, by species and diameter class, South Carolina, 1986

Species	All classes	Diameter class (inches at breast height)											
		1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger
	Thousand trees												
Softwood													
Longleaf pine	106,257	32,373	23,880	15,468	9,536	8,755	7,422	4,993	2,587	941	226	73	3
Slash pine	109,300	19,287	29,048	26,375	18,622	8,715	4,110	1,883	807	256	156	41	--
Shortleaf pine	248,176	100,531	61,983	35,444	23,887	13,864	7,715	2,763	1,311	509	114	55	--
Loblolly pine	1,384,609	597,041	299,924	186,135	117,495	75,028	48,267	28,582	15,376	8,863	4,272	3,500	126
Pond pine	64,096	18,517	13,524	11,002	7,258	5,583	3,675	2,230	1,233	641	281	145	7
Virginia pine	87,606	33,773	18,744	12,673	9,988	7,912	2,504	1,461	303	214	14	20	--
Pitch pine	7,935	5,217	904	699	456	291	265	90	--	--	13	--	--
Table Mountain pine	--	--	--	--	--	--	--	--	--	--	--	--	--
Spruce pine	2,960	1,728	161	106	266	207	23	156	137	90	19	64	3
Sand pine	--	--	--	--	--	--	--	--	--	--	--	--	--
Eastern white pine	6,710	4,060	678	738	480	220	145	106	22	79	54	102	26
Eastern hemlock	2,278	1,376	--	144	257	334	42	59	40	--	--	26	--
Spruce and fir	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	34,235	10,919	5,861	3,921	2,979	2,799	1,931	1,544	1,412	876	779	1,046	168
Pondcypress	29,631	13,240	5,393	2,963	3,033	2,129	1,076	906	380	236	139	127	9
Cedars	198,118	141,664	36,841	12,359	5,213	1,293	458	154	68	28	8	32	--
Total softwoods	2,281,911	979,726	496,941	308,027	199,470	127,130	77,633	44,927	23,676	12,733	6,075	5,231	342
Hardwood													
Select white oaks[a]	162,947	76,655	32,806	17,548	12,993	8,260	5,587	3,717	2,326	1,592	629	759	75
Select red oaks[b]	40,937	20,116	7,432	4,069	1,844	2,332	2,068	1,106	793	531	301	275	70
Chestnut oak	23,559	13,927	2,312	2,251	1,283	1,442	877	618	366	145	122	182	34
Other white oaks	121,489	63,793	27,499	11,935	6,498	4,565	2,850	1,698	880	515	387	694	175
Other red oaks	861,278	540,788	144,189	70,925	43,801	23,977	14,370	8,483	5,770	3,765	1,878	2,859	473
Hickory	226,169	147,409	39,170	17,107	9,935	4,881	2,938	1,915	1,154	681	421	468	90
Yellow birch	--	--	--	--	--	--	--	--	--	--	--	--	--
Hard maple	31,951	27,266	2,938	1,277	200	119	97	48	--	--	--	6	--
Soft maple	740,989	528,703	119,660	45,537	21,429	10,398	6,090	3,994	2,328	1,326	720	744	60
Beech	16,452	10,973	1,963	1,531	776	220	305	274	147	42	75	126	20
Sweetgum	1,052,082	679,208	188,007	86,051	43,285	22,875	14,792	8,298	4,613	2,381	1,307	1,148	117
Tupelo and blackgum	590,627	353,789	98,518	45,313	28,870	20,862	15,562	11,782	6,513	4,322	2,317	2,355	424
Ash	245,480	175,402	39,129	13,384	5,877	4,752	2,961	2,003	920	447	281	293	31
Cottonwood	7,075	3,025	1,287	966	405	424	351	156	164	83	88	75	51
Basswood	658	217	--	203	232	--	--	--	--	--	--	6	--
Yellow-poplar	121,108	60,423	22,970	10,734	6,756	6,072	4,795	3,438	2,214	1,385	1,137	1,140	44
Bay and magnolia	144,026	120,549	16,068	4,852	1,582	431	245	130	80	48	9	23	9
Black cherry	120,842	90,998	19,182	7,158	2,424	725	263	53	34	--	--	5	--
Black walnut	2,626	218	1,206	492	408	129	72	--	51	15	--	35	--
Sycamore	6,070	2,384	977	718	459	317	271	284	231	110	129	168	22
Black locust	2,785	1,939	226	140	331	51	--	26	22	35	15	--	--
Elm	192,151	132,302	33,876	13,567	5,877	3,344	1,343	865	396	282	159	129	11
Other eastern hardwoods	1,385,306	1,072,621	220,323	60,318	18,589	7,344	3,597	1,135	612	300	227	217	23
Total hardwoods	6,096,607	4,122,705	1,019,738	416,076	213,854	123,520	79,434	50,023	29,614	18,005	10,202	11,707	1,729
All species	8,378,518	5,102,431	1,516,679	724,103	413,324	250,650	157,067	94,950	53,290	30,738	16,277	16,938	2,071

[a] Includes white, swamp white, swamp chestnut, and chinkapin oaks.

[b] Includes cherrybark, northern red, and Shumard oaks.

Table 17.--Number of growing-stock trees on timberland, by species and diameter class, South Carolina, 1986

Species	All classes	Diameter class (inches at breast height)											
		1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger
	Thousand trees												
Softwood													
Longleaf pine	100,458	28,631	22,333	15,234	9,368	8,672	7,397	4,993	2,587	941	226	73	3
Slash pine	105,708	17,910	27,645	25,850	18,435	8,684	4,060	1,864	807	256	156	41	--
Shortleaf pine	221,997	81,039	56,605	34,683	23,612	13,660	7,715	2,737	1,268	509	114	55	--
Loblolly pine	1,282,285	520,295	284,027	180,523	115,045	73,990	47,950	28,450	15,319	8,830	4,253	3,477	126
Pond pine	57,774	15,355	12,034	10,049	6,920	5,326	3,633	2,193	1,201	641	270	145	7
Virginia pine	76,644	25,624	16,768	12,534	9,647	7,623	2,464	1,433	303	214	14	20	--
Pitch pine	7,483	4,765	904	699	456	291	265	90	--	--	13	--	--
Table Mountain pine	--	--	--	--	--	--	--	--	--	--	--	--	--
Spruce pine	2,518	1,389	161	106	187	207	23	156	137	76	9	64	3
Sand pine	--	--	--	--	--	--	--	--	--	--	--	--	--
Eastern white pine	6,224	3,589	678	738	480	220	145	106	22	79	54	87	26
Eastern hemlock	2,278	1,376	--	144	257	334	42	59	40	--	--	26	--
Spruce and fir	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	31,458	9,319	5,426	3,713	2,754	2,766	1,908	1,460	1,354	843	779	1,007	129
Pondcypress	26,960	11,475	5,093	2,677	2,831	2,045	1,076	888	380	227	139	121	8
Cedars	164,433	113,318	32,567	11,574	5,042	1,262	420	154	33	28	8	27	--
Total softwoods	2,086,220	834,085	464,241	298,524	195,034	125,080	77,098	44,583	23,451	12,644	6,035	5,143	302
Hardwood													
Select white oaks[a]	123,305	45,663	27,678	15,536	12,336	7,871	5,414	3,654	2,260	1,571	616	667	39
Select red oaks[b]	31,524	13,695	5,725	3,572	1,594	2,140	1,879	1,048	759	505	279	261	67
Chestnut oak	17,003	9,202	1,849	1,946	1,009	1,288	759	423	281	79	55	96	16
Other white oaks	70,553	26,751	20,062	9,556	5,270	3,834	2,220	1,152	685	256	271	398	98
Other red oaks	610,072	334,327	116,101	63,006	40,292	22,289	13,082	7,773	5,201	3,442	1,681	2,499	379
Hickory	151,410	82,959	31,984	15,616	9,218	4,583	2,692	1,783	1,109	623	376	395	72
Yellow birch	--	--	--	--	--	--	--	--	--	--	--	--	--
Hard maple	7,732	5,249	1,321	761	157	119	71	48	--	--	--	6	--
Soft maple	357,411	216,309	75,485	32,015	15,512	7,596	4,235	2,718	1,757	926	422	418	18
Beech	9,813	5,552	1,274	1,240	683	220	277	274	119	42	52	70	10
Sweetgum	745,122	435,095	143,706	75,148	39,209	21,179	13,937	7,855	4,503	2,149	1,211	1,039	91
Tupelo and blackgum	314,681	137,864	67,137	34,889	22,984	16,790	12,573	9,604	5,536	3,617	1,848	1,609	230
Ash	102,701	64,206	16,754	8,451	3,963	3,413	2,437	1,732	816	425	256	223	25
Cottonwood	4,383	1,164	726	809	405	333	351	156	151	83	79	75	51
Basswood	426	217	--	203	--	--	--	--	--	--	--	6	--
Yellow-poplar	103,086	47,721	20,433	9,363	6,271	5,749	4,517	3,377	2,138	1,354	1,078	1,065	20
Bay and magnolia	36,999	27,197	5,645	2,623	920	269	171	76	67	23	--	8	--
Black cherry	48,226	36,097	7,633	2,892	1,140	370	77	17	--	--	--	--	--
Black walnut	2,055	--	1,206	313	364	80	37	--	29	15	--	11	--
Sycamore	4,476	1,801	745	287	309	218	228	284	187	110	120	168	19
Black locust	1,623	874	226	140	251	51	--	26	22	18	15	--	--
Elm	89,123	45,937	21,731	11,326	4,868	2,812	1,017	674	337	200	138	79	4
Other eastern hardwoods	52,918	27,383	11,808	4,725	3,767	2,090	1,523	669	448	202	141	158	4
Total hardwoods	2,884,642	1,565,263	579,229	294,417	170,522	103,294	67,497	43,343	26,405	15,640	8,638	9,251	1,143
All species	4,970,862	2,399,348	1,043,470	592,941	365,556	228,374	144,595	87,926	49,856	28,284	14,673	14,394	1,445

[a] Includes white, swamp white, swamp chestnut, and chinkapin oaks.

[b] Includes cherrybark, northern red, and Shumard oaks.

Table 18.--Merchantable volume of live trees on timberland, by species and diameter class, South Carolina, 1986

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	29.0 and larger
	Thousand cubic feet										
Softwood											
Longleaf pine	661,344	42,656	65,919	110,539	144,567	135,366	97,238	44,273	13,757	6,350	679
Slash pine	492,121	70,001	119,249	103,698	80,435	54,121	34,678	14,625	11,208	4,106	--
Shortleaf pine	734,947	94,975	156,461	163,663	146,495	79,738	53,261	27,402	8,001	4,951	--
Loblolly pine	5,650,507	462,847	723,119	898,294	940,414	827,225	629,689	488,117	298,539	358,855	23,408
Pond pine	366,955	29,538	44,966	62,976	67,251	59,526	43,619	29,063	16,653	12,365	998
Virginia pine	317,113	43,519	72,215	94,114	46,255	38,161	10,634	9,990	685	1,540	--
Pitch pine	14,465	1,896	2,600	2,815	4,426	1,866	--	--	862	--	--
Table Mountain pine	--	--	--	--	--	--	--	--	--	--	--
Spruce pine	29,003	284	1,454	2,700	585	4,815	5,643	5,145	1,258	6,480	639
Sand pine	--	--	--	--	--	--	--	--	--	--	--
Eastern white pine	34,343	1,947	2,775	1,963	2,238	3,073	526	4,028	3,023	10,077	4,693
Eastern hemlock	11,252	320	1,384	3,039	733	1,633	1,428	--	--	2,715	--
Spruce and fir	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	403,806	11,801	20,351	34,047	35,761	41,486	51,173	42,096	46,271	94,671	26,149
Pondcypress	134,877	10,164	18,628	24,909	17,893	20,816	12,527	9,579	7,573	9,619	3,169
Cedars	79,287	26,635	25,140	12,247	6,642	3,103	1,713	1,110	453	2,244	--
Total softwoods	8,930,020	796,583	1,254,261	1,515,004	1,493,695	1,270,929	942,129	675,428	408,283	513,973	59,735
Hardwood											
Select white oaks[a]	711,983	51,078	80,790	92,910	105,885	99,258	87,052	77,098	39,570	67,668	10,674
Select red oaks[b]	240,295	13,050	11,659	27,524	39,055	29,757	31,014	26,870	19,671	26,772	14,923
Chestnut oak	92,645	6,125	6,606	15,544	12,434	12,220	11,480	5,844	5,413	12,597	4,382
Other white oaks	331,008	30,192	34,574	42,418	42,266	34,856	25,354	19,104	19,157	54,786	28,301
Other red oaks	2,044,793	196,150	261,790	264,070	252,594	219,229	205,388	182,928	114,060	258,634	89,950
Hickory	423,290	40,946	55,658	50,257	53,588	52,687	46,434	33,856	26,664	44,707	18,493
Yellow birch	--	--	--	--	--	--	--	--	--	--	--
Hard maple	9,060	2,622	900	1,407	1,780	1,488	--	--	--	863	--
Soft maple	808,374	129,025	125,983	118,702	103,472	93,641	78,811	59,082	38,525	54,181	6,952
Beech	48,302	4,442	4,550	2,724	5,548	7,330	4,612	1,851	3,900	10,402	2,943
Sweetgum	1,835,625	219,305	265,652	273,140	292,263	243,906	187,219	127,685	87,276	116,972	22,207
Tupelo and blackgum	1,832,387	128,852	174,747	229,103	271,520	289,217	217,887	186,023	124,471	163,510	47,057
Ash	353,070	35,930	36,065	54,448	57,638	59,079	36,249	22,423	18,671	27,331	5,236
Cottonwood	61,150	2,357	2,568	4,479	6,366	4,557	6,530	4,316	6,505	9,614	13,858
Basswood	2,748	758	952	--	--	--	--	--	--	1,038	--
Yellow-poplar	682,364	33,200	45,027	71,682	89,820	97,496	86,281	74,402	73,114	105,179	6,163
Bay and magnolia	39,255	11,541	9,949	3,725	4,132	2,644	2,707	1,739	515	1,621	682
Black cherry	43,447	16,799	13,481	7,095	3,872	1,007	815	--	--	378	--
Black walnut	9,716	1,094	2,183	1,327	995	--	1,118	909	--	2,090	--
Sycamore	64,373	2,521	3,807	3,420	5,256	8,525	7,545	5,795	7,932	15,954	3,618
Black locust	6,562	306	1,926	862	--	798	855	1,079	736	--	--
Elm	201,724	31,012	33,353	37,861	23,728	22,558	14,983	13,558	11,454	11,072	2,145
Other eastern hardwoods	425,469	125,587	85,363	66,063	54,080	25,900	23,142	11,300	12,208	18,560	3,266
Total hardwoods	10,267,640	1,082,892	1,257,583	1,368,761	1,426,292	1,306,153	1,075,476	855,862	609,842	1,003,929	280,850
All species	19,197,660	1,879,475	2,511,844	2,883,765	2,919,987	2,577,082	2,017,605	1,531,290	1,018,125	1,517,902	340,585

[a] Includes white, swamp white, swamp chestnut, and chinkapin oaks.

[b] Includes cherrybark, northern red, and Shumard oaks.

Table 19.--Volume of growing stock on timberland, by species and diameter class, South Carolina, 1986

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	29.0 and larger
	Thousand cubic feet										
Softwood											
Longleaf pine	658,998	42,286	65,131	109,704	144,214	135,366	97,238	44,273	13,757	6,350	679
Slash pine	488,563	68,961	118,310	103,167	79,686	53,822	34,678	14,625	11,208	4,106	--
Shortleaf pine	728,953	93,560	154,957	161,753	146,495	79,404	52,430	27,402	8,001	4,951	--
Loblolly pine	5,603,177	451,193	710,712	888,648	935,442	824,930	627,763	486,512	297,320	357,249	23,408
Pond pine	358,445	27,438	43,393	60,905	66,586	58,421	43,042	29,063	16,234	12,365	998
Virginia pine	310,604	43,219	69,959	91,651	45,626	37,300	10,634	9,990	685	1,540	--
Pitch pine	14,465	1,896	2,600	2,815	4,426	1,866	--	--	862	--	--
Table Mountain pine	--	--	--	--	--	--	--	--	--	--	--
Spruce pine	27,272	284	1,047	2,700	585	4,815	5,643	4,383	696	6,480	639
Sand pine	--	--	--	--	--	--	--	--	--	--	--
Eastern white pine	33,356	1,947	2,775	1,963	2,238	3,073	526	4,028	3,023	9,090	4,693
Eastern hemlock	11,252	320	1,384	3,039	733	1,633	1,428	--	--	2,715	--
Spruce and fir	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	392,174	11,392	19,448	33,705	35,409	40,146	49,888	41,290	46,271	92,759	21,866
Pondcypress	131,353	9,706	17,592	24,040	17,893	20,505	12,527	9,321	7,573	9,373	2,823
Cedars	75,651	25,311	24,550	12,053	6,335	3,103	1,008	1,110	453	1,728	--
Total softwoods	8,834,263	777,513	1,231,858	1,496,143	1,485,668	1,264,384	936,805	671,997	406,083	508,706	55,106
Hardwood											
Select white oaks[a]	682,362	45,563	76,705	89,065	103,509	97,979	85,363	76,070	39,164	63,083	5,861
Select red oaks[b]	227,685	11,778	10,122	26,128	36,121	28,478	29,829	25,993	18,522	26,169	14,545
Chestnut oak	73,122	5,652	5,519	14,168	11,051	9,615	9,736	3,951	2,886	8,033	2,511
Other white oaks	252,185	24,543	29,487	36,341	34,446	25,469	20,834	11,299	15,052	35,444	19,270
Other red oaks	1,893,478	178,956	244,512	249,088	233,887	205,133	190,305	171,989	106,666	236,657	76,285
Hickory	395,537	37,913	52,172	47,648	50,517	49,632	44,913	31,396	24,928	40,530	15,888
Yellow birch	--	--	--	--	--	--	--	--	--	--	--
Hard maple	7,281	1,666	714	1,407	1,143	1,488	--	--	--	863	--
Soft maple	603,351	94,207	96,861	90,093	79,004	69,092	64,069	44,769	26,761	35,856	2,639
Beech	40,350	3,713	3,954	2,724	5,047	7,330	4,172	1,851	2,942	6,722	1,895
Sweetgum	1,725,758	196,007	244,898	256,516	280,335	232,851	184,005	118,047	84,320	109,444	19,335
Tupelo and blackgum	1,535,747	101,460	143,643	190,095	230,423	247,919	193,768	165,025	106,019	124,984	32,411
Ash	297,734	24,356	26,111	42,756	50,600	53,512	33,448	21,988	17,367	23,520	4,076
Cottonwood	59,248	1,864	2,568	3,867	6,366	4,557	6,124	4,316	6,114	9,614	13,858
Basswood	1,796	758	--	--	--	--	--	--	--	1,038	--
Yellow-poplar	655,580	29,812	42,391	69,021	85,751	96,518	84,081	73,095	71,094	100,561	3,256
Bay and magnolia	23,524	6,554	5,993	2,818	2,868	1,760	2,125	813	--	593	--
Black cherry	20,431	7,513	7,204	3,869	1,345	500	--	--	--	--	--
Black walnut	6,853	782	1,752	851	561	--	1,001	909	--	997	--
Sycamore	58,940	1,095	2,803	2,346	4,658	8,525	7,100	5,795	7,339	15,954	3,325
Black locust	5,835	306	1,572	862	--	798	855	706	736	--	--
Elm	172,053	27,376	28,577	33,213	19,319	19,325	13,765	10,851	10,134	8,446	1,047
Other eastern hardwoods	157,747	13,028	24,337	24,176	27,123	17,416	18,032	9,069	8,879	14,970	717
Total hardwoods	8,896,597	814,902	1,051,895	1,187,052	1,264,074	1,177,897	993,525	777,932	548,923	863,478	216,919
All species	17,730,860	1,592,415	2,283,753	2,683,195	2,749,742	2,442,281	1,930,330	1,449,929	955,006	1,372,184	272,025

[a] Includes white, swamp white, swamp chestnut, and chinkapin oaks.

[b] Includes cherrybark, northern red, and Shumard oaks.

Table 20.--Volume of sawtimber on timberland, by species and diameter class, South Carolina, 1986

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger
	Thousand board feet								
Softwood									
Longleaf pine	2,833,818	448,151	695,728	725,574	560,267	269,791	87,323	42,071	4,913
Slash pine	1,413,329	379,012	365,948	281,517	198,141	88,880	71,653	28,178	--
Shortleaf pine	2,210,172	600,659	665,361	407,491	291,981	162,977	49,586	32,117	--
Loblolly pine	22,594,597	3,195,622	4,217,682	4,246,911	3,540,172	2,933,913	1,880,863	2,408,054	171,380
Pond pine	1,436,812	229,035	307,091	301,115	240,148	171,660	100,524	80,279	6,960
Virginia pine	823,161	333,822	194,171	175,655	54,016	52,800	3,761	8,936	--
Pitch pine	41,739	8,874	18,570	8,943	--	--	5,352	--	--
Table Mountain pine	--	--	--	--	--	--	--	--	--
Spruce pine	144,673	11,105	2,874	25,079	30,991	25,553	4,177	40,572	4,322
Sand pine	--	--	--	--	--	--	--	--	--
Eastern white pine	166,231	6,973	9,936	15,269	2,774	22,990	17,937	58,456	31,896
Eastern hemlock	44,326	10,152	2,867	7,448	7,361	--	--	16,498	--
Spruce and fir	--	--	--	--	--	--	--	--	--
Baldcypress	1,788,881	100,895	135,279	175,155	239,761	211,609	249,407	538,255	138,520
Pondcypress	460,047	77,337	69,294	90,588	60,586	48,084	41,204	53,907	19,047
Cedars	121,921	49,258	30,812	15,921	5,628	6,501	2,793	11,008	--
Total softwoods	34,079,707	5,450,895	6,715,613	6,476,666	5,231,826	3,994,758	2,514,580	3,318,331	377,038
Hardwood									
Select white oaks[a]	2,076,675	--	352,763	391,071	379,772	364,039	200,611	352,140	36,279
Select red oaks[b]	837,901	--	121,599	113,416	130,369	125,155	95,302	152,561	99,499
Chestnut oak	200,974	--	35,716	36,403	41,076	18,133	13,812	41,684	14,150
Other white oaks	766,545	--	124,876	106,026	95,954	54,312	76,983	192,996	115,398
Other red oaks	5,904,449	--	868,825	873,872	890,384	866,207	567,068	1,355,694	482,399
Hickory	1,188,322	--	174,586	202,996	204,255	152,988	128,787	226,944	97,766
Yellow birch	--	--	--	--	--	--	--	--	--
Hard maple	14,745	--	4,006	6,035	--	--	--	4,704	--
Soft maple	1,320,531	--	258,466	262,382	270,265	203,352	127,920	183,486	14,660
Beech	117,497	--	18,383	27,723	16,212	7,360	11,898	27,848	8,073
Sweetgum	4,762,146	--	1,005,143	996,399	886,487	616,474	468,960	659,833	128,850
Tupelo and blackgum	4,711,833	--	730,482	944,097	837,966	776,759	534,295	685,912	202,322
Ash	859,127	--	163,756	207,894	144,983	103,752	86,866	127,928	23,948
Cottonwood	270,050	--	21,050	18,832	28,459	21,661	32,331	56,819	90,898
Basswood	5,758	--	--	--	--	--	--	5,758	--
Yellow-poplar	2,587,028	--	305,277	422,961	414,279	393,280	406,110	622,970	22,151
Bay and magnolia	32,357	--	9,534	6,774	9,311	3,910	--	2,828	--
Black cherry	6,437	--	4,403	2,034	--	--	--	--	--
Black walnut	13,559	--	1,847	--	3,852	3,674	--	4,186	--
Sycamore	248,936	--	15,142	33,131	30,279	27,213	36,363	87,007	19,801
Black locust	11,825	--	--	2,968	3,242	2,728	2,887	--	--
Elm	347,629	--	66,138	75,049	59,295	49,506	48,519	43,238	5,884
Other eastern hardwoods	416,171	--	94,574	69,707	80,342	42,198	44,753	80,135	4,462
Total hardwoods	26,700,495	--	4,376,566	4,799,770	4,526,782	3,832,701	2,883,465	4,914,671	1,366,540
All species	60,780,202	5,450,895	11,092,179	11,276,436	9,758,608	7,827,459	5,398,045	8,233,002	1,743,578

[a]Includes white, swamp white, swamp chestnut, and chinkapin oaks.

[b]Includes cherrybark, northern red, and Shumard oaks.

Table 21.--Volume of sawtimber on timberland, by species, size class, and tree grade, South Carolina, 1986

Species	All size classes					Trees 15.0 inches d.b.h. and larger				
	All grades	Tree grade				All grades	Tree grade			
		1	2	3	4		1	2	3	4
	Thousand board feet									
Softwood										
Yellow pines[a]	31,498,301	8,340,050	6,121,719	17,036,532	--	13,652,311	5,104,360	2,999,159	5,548,792	--
Eastern white pine[b]	166,231	52,328	57,640	37,564	18,699	134,053	48,367	44,364	22,623	18,699
Spruce and fir[b]	--	--	--	--	--	--	--	--	--	--
Cypress[c]	2,248,928	1,091,859	512,847	605,273	38,949	1,600,380	1,091,859	335,203	152,636	20,682
Other eastern softwoods[b]	166,247	7,902	30,543	76,544	51,258	49,789	--	10,412	22,787	16,590
Total	34,079,707	9,492,139	6,722,749	17,755,913	108,906	15,436,533	6,244,586	3,389,138	5,746,838	55,971
Hardwood[c]										
Select white and red oaks	2,914,576	751,041	975,147	1,006,275	182,113	1,935,727	751,041	712,703	378,796	93,187
Other white and red oaks	6,871,968	1,586,424	1,809,955	2,731,368	744,221	4,826,250	1,586,424	1,519,692	1,342,142	377,992
Hickory	1,188,322	297,165	353,580	450,026	87,551	810,740	297,165	264,752	204,033	44,790
Yellow birch	--	--	--	--	--	--	--	--	--	--
Hard maple	14,745	--	2,835	11,910	--	4,704	--	--	4,704	--
Sweetgum	4,762,146	1,242,182	1,502,690	1,812,004	205,270	2,760,604	1,242,182	973,117	476,872	68,433
Ash, walnut, and black cherry	879,123	199,175	297,456	354,677	27,815	499,189	199,175	166,305	120,423	13,286
Yellow-poplar	2,587,028	797,101	773,243	862,654	154,030	1,858,790	797,101	556,003	420,157	85,529
Other eastern hardwoods	7,482,587	1,818,146	2,282,464	2,864,366	517,611	4,828,155	1,818,146	1,616,442	1,075,235	318,332
Total	26,700,495	6,691,234	7,997,370	10,093,280	1,918,611	17,524,159	6,691,234	5,809,014	4,022,362	1,001,549
All species	60,780,202	16,183,373	14,720,119	27,849,193	2,027,517	32,960,692	12,935,820	9,198,152	9,769,200	1,057,520

[a]For yellow pines, tree grade is based on "Southern Pine Tree Grades for Yard and Structural Lumber," Research Paper SE-40, published by the Southeastern Forest Experiment Station, Asheville, NC, 1968. Tree grade 4 does not apply to yellow pine.

[b]For other softwoods (excluding cypress), tree grade is based on "Tree Grades for Eastern White Pine," Research Paper NE-214, published by the Northeastern Forest Experiment Station, Broomall, PA, 1971.

[c]For hardwoods and cypress, tree grades 1, 2, and 3 are based on "Hardwood Tree Grades for Factory Lumber," Research Paper NE-333, published by the Northeastern Forest Experiment Station, Broomall, PA, 1976. Grade 4 trees are sawtimber trees not qualifying as tree Grades 1, 2, or 3. The butt log of these trees qualify as construction (tie and timber) logs based on "A Guide to Hardwood Log Grading (revised)," General Technical Report NE-1, published by the Northeastern Forest Experiment Station, Broomall, PA, 1971.

Table 22.--Volume of live timber and associated green weight of forest biomass on timberland, by class of material, softwood, and hardwood, South Carolina, 1986

Class of material	Volume[a]			Associated green weight[b]		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Thousand cubic feet			Hundred thousand pounds		
Sawtimber trees						
Saw-log portion	11,189,819	6,229,428	4,960,391	8,410,657	4,598,712	3,811,945
Upper stem	1,477,821	595,464	882,357	1,104,843	438,547	666,296
Total[c]	12,667,640	6,824,892	5,842,748	9,515,500	5,037,259	4,478,241
Poletimber trees[c]	5,063,220	2,009,371	3,053,849	3,613,413	1,446,208	2,167,205
All growing stock[c]	17,730,860	8,834,263	8,896,597	13,128,913	6,483,467	6,645,446
Rough trees[c]	1,255,529	83,855	1,171,674	953,515	62,745	890,770
Rotten trees[c]	211,271	11,902	199,369	168,094	9,562	158,532
Saplings[d]	2,978,214	740,831	2,237,383	2,131,425	457,467	1,673,958
Stumps, tops, and limbs[e]	4,179,510	1,601,232	2,578,278	3,081,424	1,164,732	1,916,692
Total, all classes	26,355,384	11,272,083	15,083,301	19,463,371	8,177,973	11,285,398

[a]Excludes bark.
[b]Includes bark.
[c]Bole portion only.
[d]Includes entire tree above ground.
[e]Of live trees 5.0 inches d.b.h. and larger.

Table 23.--Total volume of live trees on timberland, by species and diameter class, South Carolina, 1986

Species	All classes	Diameter class (inches at breast height) 1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger
	Thousand cubic feet												
Softwood													
Longleaf pine	802,934	7,897	29,686	59,238	79,513	127,770	164,391	152,625	109,114	49,523	15,350	7,074	753
Slash pine	627,885	6,045	35,316	98,188	143,977	119,952	91,339	60,901	38,817	16,313	12,476	4,561	--
Shortleaf pine	959,981	24,590	64,258	129,426	188,697	190,007	167,322	90,324	60,050	30,790	8,974	5,543	--
Loblolly pine	7,047,307	128,508	297,872	657,947	881,701	1,047,425	1,076,006	937,733	709,839	548,329	334,597	401,220	26,130
Pond pine	447,186	3,705	14,600	39,518	54,187	73,401	77,255	67,945	49,630	32,956	18,884	13,980	1,125
Virginia pine	407,754	8,325	23,026	57,044	86,370	109,760	53,359	43,775	12,161	11,401	781	1,752	--
Pitch pine	18,717	973	639	2,429	3,130	3,292	5,119	2,149	--	--	986	--	--
Table Mountain pine	--	--	--	--	--	--	--	--	--	--	--	--	--
Spruce pine	33,657	340	315	389	1,786	3,131	667	5,459	6,375	5,795	1,416	7,269	715
Sand pine	--	--	--	--	--	--	--	--	--	--	--	--	--
Eastern white pine	42,073	955	805	2,617	3,376	2,319	2,609	3,563	609	4,642	3,482	11,687	5,409
Eastern hemlock	13,443	227	--	445	1,710	3,597	856	1,885	1,636	--	--	3,087	--
Spruce and fir	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	506,176	2,666	9,703	17,567	26,159	42,203	43,663	50,300	61,726	50,627	55,429	113,569	32,564
Pondcypress	188,755	4,065	6,480	16,609	26,003	32,630	23,007	26,509	15,788	12,082	9,485	12,087	4,010
Cedars	176,215	30,111	39,724	40,502	32,491	15,016	8,034	3,712	2,043	1,320	557	2,705	--
Total softwoods	11,272,083	218,407	522,424	1,121,919	1,529,100	1,770,503	1,713,627	1,446,880	1,067,788	763,778	462,417	584,534	70,706
Hardwood													
Select white oaks[a]	968,031	19,517	44,963	74,746	105,929	117,786	132,483	123,309	107,892	95,201	48,914	83,838	13,453
Select red oaks[b]	316,513	4,732	11,755	18,203	14,955	34,627	48,481	36,788	38,233	33,075	24,243	33,071	18,350
Chestnut oak	121,950	3,098	3,021	8,471	8,457	19,276	15,323	15,068	14,036	7,183	6,671	15,715	5,631
Other white oaks	474,893	13,448	36,514	46,275	46,108	54,421	53,392	43,693	31,641	23,620	23,574	67,093	35,114
Other red oaks	2,954,745	117,442	189,817	309,317	350,541	338,147	317,920	273,296	255,100	226,732	141,975	321,284	113,174
Hickory	613,699	31,136	46,630	63,616	73,622	63,114	65,870	64,015	56,180	40,832	32,155	54,099	22,430
Yellow birch	--	--	--	--	--	--	--	--	--	--	--	--	--
Hard maple	21,698	6,347	3,349	4,087	1,178	1,753	2,164	1,793	--	--	--	1,027	--
Soft maple	1,315,455	124,997	175,754	185,673	159,389	145,023	125,497	113,048	94,508	70,752	46,410	65,390	9,014
Beech	66,026	2,249	1,760	6,695	6,026	3,447	6,940	9,093	5,775	2,297	4,860	13,156	3,728
Sweetgum	2,583,625	142,441	230,001	322,935	330,579	323,125	338,690	279,769	213,478	145,321	99,170	132,714	25,402
Tupelo and blackgum	2,547,241	94,803	129,605	192,333	226,978	287,849	336,990	357,215	268,434	229,908	153,772	206,686	62,668
Ash	515,991	46,270	49,207	51,121	44,295	64,479	66,934	67,974	41,550	25,658	21,259	31,247	5,997
Cottonwood	73,693	644	1,219	3,350	3,187	5,441	7,490	5,305	7,566	5,000	7,500	11,052	15,939
Basswood	3,366	89	--	947	1,149	--	--	--	--	--	--	1,181	--
Yellow-poplar	828,050	14,756	31,374	44,576	53,648	82,748	102,313	110,268	97,240	83,616	82,200	118,204	7,107
Bay and magnolia	101,462	27,633	22,110	17,609	12,525	4,562	4,954	3,154	3,177	2,059	615	1,945	1,119
Black cherry	113,848	30,852	27,062	23,426	16,691	8,558	4,655	1,192	955	--	--	457	--
Black walnut	14,471	28	2,286	1,592	2,714	1,606	1,212	--	1,415	1,073	--	2,545	--
Sycamore	77,059	659	812	3,388	4,621	4,048	6,154	9,915	8,883	6,709	9,182	18,434	4,254
Black locust	8,945	614	220	417	2,427	1,054	--	962	1,030	1,338	883	--	--
Elm	322,871	26,604	45,073	45,715	41,995	45,775	28,276	26,761	17,675	15,977	13,392	13,128	2,500
Other eastern hardwoods	1,039,669	231,078	245,414	187,393	111,067	82,799	66,693	31,623	28,066	14,008	14,934	22,491	4,103
Total hardwoods	15,083,301	939,437	1,297,946	1,611,885	1,618,081	1,689,638	1,732,431	1,574,241	1,292,834	1,030,359	731,709	1,214,757	349,983
All species	26,355,384	1,157,844	1,820,370	2,733,804	3,147,181	3,460,141	3,446,058	3,021,121	2,360,622	1,794,137	1,194,126	1,799,291	420,689

[a]Includes white, swamp white, swamp chestnut, and chinkapin oaks.

[b]Includes cherrybark, northern red, and Shumard oaks.

Table 24.--Green weight of forest biomass on timberland, by species and diameter class, South Carolina, 1986

Species	All classes	Diameter class (inches at breast height)											
		1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger
	Hundred thousand pounds												
Softwood													
Longleaf pine	630,836	6,455	25,308	42,199	60,563	99,426	129,861	121,646	87,139	39,723	12,298	5,625	593
Slash pine	485,619	4,798	32,681	71,169	110,822	92,821	70,733	47,184	29,836	12,482	9,558	3,535	--
Shortleaf pine	658,857	13,858	39,134	78,825	129,639	135,384	120,648	65,234	43,364	22,278	6,479	4,014	--
Loblolly pine	5,071,983	63,194	175,835	469,035	651,995	768,741	789,367	687,796	516,127	398,091	243,093	289,949	18,760
Pond pine	315,902	2,026	8,147	27,337	38,491	52,443	55,380	48,607	35,755	23,529	13,461	9,920	806
Virginia pine	308,850	7,265	18,835	44,045	65,007	82,136	39,649	32,628	9,064	8,333	587	1,301	--
Pitch pine	12,772	707	589	1,590	2,062	2,238	3,458	1,487	--	--	641	--	--
Table Mountain pine	--	--	--	--	--	--	--	--	--	--	--	--	--
Spruce pine	23,569	244	280	216	1,142	2,134	466	3,831	4,500	4,115	1,001	5,124	516
Sand pine	--	--	--	--	--	--	--	--	--	--	--	--	--
Eastern white pine	25,776	391	368	1,748	2,289	1,609	1,791	2,279	430	2,885	2,170	6,804	3,012
Eastern hemlock	10,172	121	--	366	1,411	2,973	635	1,370	1,222	--	--	2,074	--
Spruce and fir	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	388,346	1,365	6,096	8,893	16,400	28,845	32,062	38,168	48,453	40,221	45,047	94,494	28,302
Pondcypress	122,392	2,170	4,085	7,614	14,251	20,135	15,265	18,500	11,424	8,970	7,181	9,380	3,417
Cedars	122,899	18,168	25,347	30,486	24,476	11,042	5,927	2,746	1,529	943	379	1,856	--
Total softwoods	8,177,973	120,762	336,705	783,523	1,118,548	1,299,927	1,265,242	1,071,476	788,843	561,570	341,895	434,076	55,406
Hardwood													
Select white oaks[a]	787,164	15,517	33,517	53,312	83,225	95,345	107,757	102,145	89,945	80,649	41,567	72,106	12,079
Select red oaks[b]	263,539	3,960	8,906	12,887	11,940	27,953	40,170	30,970	31,781	28,124	20,643	29,119	17,086
Chestnut oak	98,082	2,837	2,388	6,337	6,665	14,909	12,331	12,238	11,269	5,861	5,606	12,899	4,742
Other white oaks	397,639	9,642	25,748	31,822	36,450	44,906	45,227	38,071	27,857	21,548	21,463	62,130	32,775
Other red oaks	2,366,567	99,136	143,536	217,800	278,841	274,900	260,712	226,043	212,165	187,925	115,616	261,189	88,704
Hickory	503,452	27,082	40,986	45,771	56,764	50,562	53,050	52,669	46,612	34,816	27,622	47,350	20,168
Yellow birch	--	--	--	--	--	--	--	--	--	--	--	--	--
Hard maple	18,058	5,203	2,861	3,100	1,039	1,430	1,918	1,557	--	--	--	950	--
Soft maple	954,435	94,872	125,430	128,499	120,300	106,183	91,920	82,898	68,516	50,928	32,906	45,921	6,062
Beech	53,350	1,807	1,533	4,231	4,580	2,704	5,451	7,383	4,870	1,997	4,293	11,294	3,207
Sweetgum	1,848,976	94,510	152,967	209,634	233,362	232,746	248,091	207,551	160,605	110,446	76,137	102,853	20,074
Tupelo and blackgum	1,760,143	65,318	89,238	95,335	137,997	186,150	227,405	251,476	195,199	172,277	117,146	167,019	55,583
Ash	319,404	28,329	31,152	37,677	31,092	41,502	40,738	39,854	23,735	14,516	11,611	16,243	2,955
Cottonwood	52,829	417	865	1,985	2,060	3,621	5,086	3,716	5,440	3,646	5,426	8,198	12,369
Basswood	2,272	64	--	575	810	--	--	--	--	--	--	823	--
Yellow-poplar	589,231	10,891	21,010	26,963	36,434	57,761	72,673	79,418	70,481	60,827	60,248	87,130	5,395
Bay and magnolia	61,037	16,764	13,545	9,168	7,597	2,896	3,157	2,075	2,083	1,377	406	1,263	706
Black cherry	68,220	14,713	18,097	13,749	10,827	5,748	3,178	848	711	--	--	349	--
Black walnut	12,565	19	1,871	1,250	2,452	1,415	1,088	--	1,263	929	--	2,278	--
Sycamore	56,136	450	580	1,684	2,746	2,813	4,256	7,098	6,532	5,042	7,045	14,508	3,382
Black locust	8,556	534	192	396	2,266	932	--	925	998	1,397	916	--	--
Elm	209,824	19,182	31,496	27,028	26,575	28,671	18,215	17,259	11,533	10,628	8,710	8,786	1,741
Other eastern hardwoods	853,919	197,081	219,712	143,730	89,763	64,489	51,047	24,535	21,135	11,310	11,384	16,981	2,752
Total hardwoods	11,285,398	708,328	965,630	1,072,933	1,183,785	1,247,636	1,293,470	1,188,729	992,730	804,243	568,745	969,389	289,780
All species	19,463,371	829,090	1,302,335	1,856,456	2,302,333	2,547,563	2,558,712	2,260,205	1,781,573	1,365,813	910,640	1,403,465	345,186

[a] Includes white, swamp white, swamp chestnut, and chinkapin oaks.

[b] Includes cherrybark, northern red, and Shumard oaks.

Table 25.--Volume of growing stock on timberland, by species and forest-type group, South Carolina, 1986

Species	All types	Forest-type group								
		White pine-hemlock	Spruce-fir	Longleaf-slash	Loblolly-shortleaf	Oak-pine	Oak-hickory	Oak-gum-cypress	Elm-ash-cottonwood	Maple-beech-birch
	Thousand cubic feet									
Softwood										
Longleaf pine	658,998	--	--	472,564	103,534	57,492	23,280	2,128	--	--
Slash pine	488,563	--	--	430,435	26,575	28,095	2,203	1,255	--	--
Shortleaf pine	728,953	491	--	4,476	491,524	128,519	101,236	1,228	1,479	--
Loblolly pine	5,603,177	--	--	94,073	4,581,804	585,647	134,756	200,292	6,605	--
Pond pine	358,445	--	--	14,716	272,355	51,466	3,089	16,819	--	--
Virginia pine	310,604	667	--	--	237,333	43,986	28,618	--	--	--
Pitch pine	14,465	--	--	--	11,742	--	2,723	--	--	--
Table Mountain pine	--	--	--	--	--	--	--	--	--	--
Spruce pine	27,272	--	--	--	7,407	13,407	4,496	1,962	--	--
Sand pine	--	--	--	--	--	--	--	--	--	--
Eastern white pine	33,356	8,321	--	--	3,036	17,965	4,034	--	--	--
Eastern hemlock	11,252	4,312	--	--	320	5,337	1,283	--	--	--
Spruce and fir	--	--	--	--	--	--	--	--	--	--
Baldcypress	392,174	--	--	--	1,854	6,609	--	373,577	10,134	--
Pondcypress	131,353	--	--	1,662	5,636	12,362	--	111,693	--	--
Cedars	75,651	--	--	--	30,898	12,727	27,926	3,510	590	--
Total softwoods	8,834,263	13,791	--	1,017,926	5,774,018	963,612	333,644	712,464	18,808	--
Hardwood										
Select white oaks[a]	682,362	2,120	--	331	36,802	82,989	472,795	80,814	6,511	--
Select red oaks[b]	227,685	--	--	--	12,425	19,461	148,044	41,333	6,422	--
Chestnut oak	73,122	--	--	--	3,534	5,641	63,947	--	--	--
Other white oaks	252,185	--	--	943	35,570	35,384	89,882	84,347	6,059	--
Other red oaks	1,893,478	--	--	16,588	161,665	247,916	635,509	783,975	47,825	--
Hickory	395,537	--	--	1,371	21,592	54,659	238,262	60,783	18,870	--
Yellow birch	--	--	--	--	--	--	--	--	--	--
Hard maple	7,281	--	--	--	596	--	4,606	--	2,079	--
Soft maple	603,351	--	--	295	26,409	45,605	111,180	378,037	41,825	--
Beech	40,350	--	--	--	--	2,847	35,465	778	1,260	--
Sweetgum	1,725,758	--	--	8,738	201,702	151,241	453,482	829,564	81,031	--
Tupelo and blackgum	1,535,747	--	--	3,943	34,412	52,047	47,479	1,375,406	22,460	--
Ash	297,734	--	--	--	2,532	3,945	33,707	154,219	103,331	--
Cottonwood	59,248	--	--	--	--	--	940	24,264	34,044	--
Basswood	1,796	--	--	--	--	--	1,521	275	--	--
Yellow-poplar	655,580	--	--	--	40,074	63,889	372,234	164,411	14,972	--
Bay and magnolia	23,524	--	--	446	293	2,771	2,645	17,369	--	--
Black cherry	20,431	--	--	906	4,201	4,363	8,653	2,308	--	--
Black walnut	6,853	--	--	--	--	908	5,081	440	424	--
Sycamore	58,940	--	--	--	396	--	16,993	15,831	25,720	--
Black locust	5,835	--	--	--	306	556	4,973	--	--	--
Elm	172,053	--	--	--	16,645	15,150	48,422	61,020	30,816	--
Other eastern hardwoods	157,747	720	--	223	4,675	1,576	28,289	42,361	79,903	--
Total hardwoods	8,896,597	2,840	--	33,784	603,829	790,948	2,824,109	4,117,535	523,552	--
All species	17,730,860	16,631	--	1,051,710	6,377,847	1,754,560	3,157,753	4,829,999	542,360	--

[a]Includes white, swamp white, swamp chestnut, and chinkapin oaks.

[b]Incudes cherrybark, northern red, and Shumard oaks.

Table 26.--Volume of growing stock on timberland, by ownership class, species group, and diameter class, South Carolina, 1986

Ownership class and species group	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger
	Thousand cubic feet										
National forest											
Softwood	743,899	41,914	54,584	65,546	102,576	113,980	107,154	95,006	63,155	88,388	11,596
Hardwood	406,653	39,069	42,651	49,004	60,732	53,595	42,704	26,540	20,451	57,543	14,364
Total	1,150,552	80,983	97,235	114,550	163,308	167,575	149,858	121,546	83,606	145,931	25,960
Other public											
Softwood	584,705	44,210	70,639	83,783	120,139	100,364	70,069	38,029	24,815	31,893	764
Hardwood	335,653	37,390	40,931	50,091	42,052	46,790	32,916	23,941	23,329	30,053	8,160
Total	920,358	81,600	111,570	133,874	162,191	147,154	102,985	61,970	48,144	61,946	8,924
Forest industry											
Softwood	1,773,919	232,802	345,467	371,415	283,729	194,881	132,784	78,565	52,913	69,628	11,735
Hardwood	1,553,546	128,733	162,491	186,364	203,203	197,585	182,311	146,887	120,597	169,070	56,305
Total	3,327,465	361,535	507,958	557,779	486,932	392,466	315,095	225,452	173,510	238,698	68,040
Forest industry-leased											
Softwood	34,580	8,772	13,035	5,861	2,353	4,559	--	--	--	--	--
Hardwood	5,683	349	--	852	822	2,665	486	--	509	--	--
Total	40,263	9,121	13,035	6,713	3,175	7,224	486	--	509	--	--
Other private											
Softwood	5,697,160	449,815	748,133	969,538	976,871	850,600	626,798	460,397	265,200	318,797	31,011
Hardwood	6,595,062	609,361	805,822	900,741	957,265	877,262	735,108	580,564	384,037	606,812	138,090
Total	12,292,222	1,059,176	1,553,955	1,870,279	1,934,136	1,727,862	1,361,906	1,040,961	649,237	925,609	169,101
All ownerships											
Softwood	8,834,263	777,513	1,231,858	1,496,143	1,485,668	1,264,384	936,805	671,997	406,083	508,706	55,106
Hardwood	8,896,597	814,902	1,051,895	1,187,052	1,264,074	1,177,897	993,525	777,932	548,923	863,478	216,919
Total	17,730,860	1,592,415	2,283,753	2,683,195	2,749,742	2,442,281	1,930,330	1,449,929	955,006	1,372,184	272,025

Table 27.--Volume of sawtimber on timberland, by ownership class, species group, and diameter class, South Carolina, 1986

Ownership class and species group	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger
	Thousand board feet								
National forest									
Softwood	3,518,369	236,966	463,969	586,015	600,429	569,863	395,033	583,438	82,656
Hardwood	1,278,186	--	212,596	218,421	193,064	131,270	109,331	324,411	89,093
Total	4,796,555	236,966	676,565	804,436	793,493	701,133	504,364	907,849	171,749
Other public									
Softwood	2,379,079	311,114	552,436	520,220	393,868	228,652	154,759	212,479	5,551
Hardwood	948,378	--	145,707	191,226	150,423	117,725	121,594	171,651	50,052
Total	3,327,457	311,114	698,143	711,446	544,291	346,377	276,353	384,130	55,603
Forest industry									
Softwood	5,594,246	1,338,871	1,261,352	983,338	729,289	454,918	318,481	432,620	75,377
Hardwood	4,956,970	--	684,881	794,343	819,176	716,702	629,397	957,648	354,823
Total	10,551,216	1,338,871	1,946,233	1,777,681	1,548,465	1,171,620	947,878	1,390,268	430,200
Forest industry-leased									
Softwood	54,767	20,308	10,890	23,569	--	--	--	--	--
Hardwood	18,402	--	3,088	10,604	2,033	--	2,677	--	--
Total	73,169	20,308	13,978	34,173	2,033	--	2,677	--	--
Other private									
Softwood	22,533,246	3,543,636	4,426,966	4,363,524	3,508,240	2,741,325	1,646,307	2,089,794	213,454
Hardwood	19,498,559	--	3,330,294	3,585,176	3,362,086	2,867,004	2,020,466	3,460,961	872,572
Total	42,031,805	3,543,636	7,757,260	7,948,700	6,870,326	5,608,329	3,666,773	5,550,755	1,086,026
All ownerships									
Softwood	34,079,707	5,450,895	6,715,613	6,476,666	5,231,826	3,994,758	2,514,580	3,318,331	377,038
Hardwood	26,700,495	--	4,376,566	4,799,770	4,526,782	3,832,701	2,883,465	4,914,671	1,366,540
Total	60,780,202	5,450,895	11,092,179	11,276,436	9,758,608	7,827,459	5,398,045	8,233,002	1,743,578

Table 28.--Volume of growing stock on timberland, by broad management class, species group, and stand age class, South Carolina, 1986

Broad management class and species group	All classes	No manageable stand	Stand age class (years)								
			0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81+
	Thousand cubic feet										
Pine plantation											
Softwood	1,712,830	11,344	28,390	409,528	850,785	346,444	54,853	11,486	--	--	--
Hardwood	38,351	294	3,915	8,652	13,900	5,723	3,170	2,697	--	--	--
Total	1,751,181	11,638	32,305	418,180	864,685	352,167	58,023	14,183	--	--	--
Natural pine											
Softwood	5,092,905	127,324	93,865	241,676	613,461	1,277,820	1,282,888	863,216	385,867	124,106	82,682
Hardwood	602,102	8,867	17,636	29,641	58,086	130,813	156,330	133,484	47,700	17,201	2,344
Total	5,695,007	136,191	111,501	271,317	671,547	1,408,633	1,439,218	996,700	433,567	141,307	85,026
Oak-pine											
Softwood	963,612	127,076	62,219	58,542	63,664	126,614	188,998	152,855	77,334	42,803	63,507
Hardwood	790,948	50,174	49,570	28,248	41,799	106,506	170,969	137,429	91,719	54,061	60,473
Total	1,754,560	177,250	111,789	86,790	105,463	233,120	359,967	290,284	169,053	96,864	123,980
Upland hardwood											
Softwood	333,644	46,478	11,174	20,542	15,693	40,366	77,353	70,926	23,264	7,891	19,957
Hardwood	2,824,109	224,802	70,335	71,027	90,648	298,566	686,550	626,824	407,768	158,695	188,894
Total	3,157,753	271,280	81,509	91,569	106,341	338,932	763,903	697,750	431,032	166,586	208,851
Lowland hardwood											
Softwood	731,272	38,463	12,594	10,012	32,577	30,124	106,747	123,689	92,906	81,753	202,407
Hardwood	4,641,087	291,673	79,606	69,359	170,505	327,832	648,266	957,206	734,636	421,733	940,271
Total	5,372,359	330,136	92,200	79,371	203,082	357,956	755,013	1,080,895	827,542	503,486	1,142,678
All types											
Softwood	8,834,263	350,685	208,242	740,300	1,576,180	1,821,368	1,710,839	1,222,172	579,371	256,553	368,553
Hardwood	8,896,597	575,810	221,062	206,927	374,938	869,440	1,665,285	1,857,640	1,281,823	651,690	1,191,982
Total	17,730,860	926,495	429,304	947,227	1,951,118	2,690,808	3,376,124	3,079,812	1,861,194	908,243	1,560,535

Table 29.--Average net annual growth and removals of live timber and growing stock on timberland, by species, South Carolina, 1978-1985

Species	Live timber[a]		Growing stock	
	Net annual growth	Annual timber removals	Net annual growth	Annual timber removals
	Thousand cubic feet			
Softwood				
Yellow pines	431,275	458,916	426,170	446,660
Eastern white pine	1,666	--	1,659	--
Spruce and fir	--	--	--	--
Cypress	11,831	6,644	11,538	6,345
Other eastern softwoods	4,536	1,673	4,452	1,631
Total softwoods	449,308	467,233	443,819	454,636
Hardwood				
Select white and red oaks	28,239	18,927	27,719	17,749
Other white and red oaks	77,159	56,971	75,310	51,719
Hickory	8,519	6,967	8,370	6,350
Yellow birch	--	--	--	--
Hard maple	174	93	157	--
Sweetgum	50,049	50,349	48,946	46,848
Ash, walnut, and black cherry	8,955	8,086	8,011	6,554
Yellow-poplar	22,927	13,361	22,605	12,921
Tupelo and blackgum	21,660	16,098	20,774	13,946
Bay and magnolia	1,163	250	1,037	224
Other eastern hardwoods	40,922	24,815	35,803	15,586
Total hardwoods	259,767	195,917	248,732	171,897
All species	709,075	663,150	692,551	626,533

[a]Merchantable portion only.

Table 30.--Average net annual growth and removals of growing stock on timberland, by ownership class, softwood, and hardwood, South Carolina, 1978-1985

Ownership class	Net annual growth			Annual timber removals		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Thousand cubic feet					
National forest	38,487	27,998	10,489	28,412	25,785	2,627
Other public	39,174	29,436	9,738	19,096	16,399	2,697
Forest industry	153,036	112,713	40,323	172,727	133,154	39,573
Forest industry-leased	3,272	2,973	293	6,358	2,308	4,050
Other private	458,582	270,684	187,889	399,940	276,990	122,950
All ownerships	692,551	443,819	248,732	626,533	454,636	171,897

Table 31.--Average net annual growth and removals of sawtimber on timberland, by species, South Carolina, 1978-1985

Species	Net annual growth	Annual timber removals
	Thousand board feet	
Softwood		
Yellow pines	1,895,121	1,704,550
Eastern white pine	8,278	--
Spruce and fir	--	--
Cypress	61,478	27,924
Other eastern softwoods	7,997	2,574
Total softwoods	1,972,874	1,735,048
Hardwood		
Select white and red oaks	117,644	54,308
Other white and red oaks	279,011	152,666
Hickory	25,446	22,524
Yellow birch	--	--
Hard maple	304	--
Sweetgum	164,821	152,170
Ash, walnut, and black cherry	24,315	21,559
Yellow-poplar	109,827	54,862
Tupelo and blackgum	87,116	46,668
Bay and magnolia	955	424
Other eastern hardwoods	111,341	44,268
Total hardwoods	920,780	549,449
All species	2,893,654	2,284,497

Table 32.--Average net annual growth and removals of sawtimber on timberland, by ownership class, softwood, and hardwood, South Carolina, 1978-1985

Ownership class	Net annual growth			Annual timber removals		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Thousand board feet					
National forest	171,668	129,473	42,195	128,566	123,190	5,376
Other public	160,252	125,695	34,557	71,074	65,889	5,185
Forest industry	599,624	444,675	154,949	614,095	492,039	122,056
Forest industry-leased	13,410	12,131	1,279	23,856	8,468	15,388
Other private	1,948,700	1,260,900	687,800	1,446,906	1,045,462	401,444
All ownerships	2,893,654	1,972,874	920,780	2,284,497	1,735,048	549,449

Table 33.--Average annual mortality of live timber, growing stock, and sawtimber on timberland, by species, South Carolina, 1978-1985

Species	Live timber[a]	Growing stock	Sawtimber
	Thousand cubic feet		Thousand board feet
Softwood			
Yellow pines	84,318	79,818	218,206
Eastern white pine	267	267	1,813
Spruce and fir	--	--	--
Cypress	1,825	1,721	4,161
Other eastern softwoods	1,602	1,362	1,246
Total softwoods	88,012	83,168	225,426
Hardwood			
Select white and red oaks	4,522	3,119	8,863
Other white and red oaks	33,132	24,724	69,242
Hickory	2,508	1,892	6,896
Yellow birch	--	--	--
Hard maple	57	--	--
Sweetgum	11,243	8,745	28,439
Ash, walnut, and black cherry	4,591	2,317	4,530
Yellow-poplar	2,631	2,165	7,464
Tupelo and blackgum	9,283	5,212	13,250
Bay and magnolia	360	82	348
Other eastern hardwoods	27,171	12,634	34,017
Total hardwoods	95,498	60,890	173,049
All species	183,510	144,058	398,475

[a]Merchantable portion only.

Table 34.--Average annual mortality of growing stock and sawtimber on timberland, by ownership class, softwood, and hardwood, South Carolina, 1978-1985

Ownership class	Growing stock			Sawtimber		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	- - - Thousand cubic feet - -			- - - Thousand board feet - - -		
National forest	11,284	7,944	3,340	43,607	34,160	9,447
Other public	6,491	3,904	2,587	18,496	10,487	8,009
Forest industry	25,771	13,030	12,741	62,759	25,037	37,722
Forest industry-leased	358	358	--	--	--	--
Other private	100,154	57,932	42,222	273,613	155,742	117,871
All ownerships	144,058	83,168	60,890	398,475	225,426	173,049

Table 35.--Average annual mortality of growing stock and sawtimber on timberland, by cause of death, softwood, and hardwood, South Carolina, 1978-1985

Cause of death	Growing stock			Sawtimber		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	- - - Thousand cubic feet - -			- - - Thousand board feet - - -		
Fire	4,033	2,789	1,244	6,515	2,823	3,692
Insects	20,103	19,989	114	79,589	79,589	--
Disease	32,412	19,488	12,924	88,171	50,077	38,094
Weather	17,613	6,415	11,198	59,178	21,201	37,977
Suppression	18,870	12,662	6,208	8,400	4,995	3,405
Animals	2,632	--	2,632	6,478	--	6,478
Undetermined	48,395	21,825	26,570	150,144	66,741	83,403
All causes	144,058	83,168	60,890	398,475	225,426	173,049

Table 36.--Average annual output of timber products, by product, species group, and type of material, South Carolina, 1978-1985

Product and species group	Standard units	Total output		Roundwood products		Plant byproducts	
		Number of units	Thousand cubic feet	Number of units	Thousand cubic feet	Number of units	Thousand cubic feet
Saw logs							
Softwood	M fbm[a]	959,326	172,852	944,985	170,268	14,341	2,589
Hardwood	M fbm[a]	242,029	40,011	241,648	39,948	381	63
Total	M fbm[a]	1,201,355	212,863	1,186,633	210,216	14,722	2,647
Veneer logs and bolts							
Softwood	M fbm[a]	259,764	45,441	259,764	45,441	--	--
Hardwood	M fbm[a]	57,033	9,154	57,033	9,154	--	--
Total	M fbm[a]	316,797	54,595	316,797	54,595	--	--
Pulpwood[b]							
Softwood	Cords[c]	3,328,202	234,472	2,577,982	181,619	750,220	52,853
Hardwood	Cords[c]	996,135	70,228	848,618	59,828	147,517	10,400
Total	Cords[c]	4,324,337	304,700	3,426,600	241,447	897,737	63,253
Poles and piling							
Softwood	C pieces	2,606	5,140	2,606	5,140	--	--
Hardwood	C pieces	--	--	--	--	--	--
Total	C pieces	2,606	5,140	2,606	5,140	--	--
Posts (round and split)							
Softwood	M pieces	437	297	437	297	--	--
Hardwood	M pieces	47	30	47	30	--	--
Total	M pieces	484	327	484	327	--	--
Other[d]							
Softwood	M ft^3	6,663	6,663	40	40	6,623	6,623
Hardwood	M ft^3	566	566	3	3	563	563
Total	M ft^3	7,229	7,229	43	43	7,186	7,186
Total industrial products							
Softwood		--	464,865	--	402,805	--	62,060
Hardwood		--	119,989	--	108,963	--	11,026
Total		--	584,854	--	511,768	--	73,086
Fuelwood[e]							
Softwood	Cords	74,908	5,252	72,497	5,083	2,411	169
Hardwood	Cords	514,083	36,066	507,698	35,618	6,385	448
Total	Cords	588,991	41,318	580,195	40,701	8,796	617
All products[f]							
Softwood		--	470,117	--	407,888	--	62,229
Hardwood		--	156,055	--	144,581	--	11,474
Total		--	626,172	--	552,469	--	73,703

[a]International 1/4-inch rule.

[b]Roundwood figures include an estimated 32,121 thousand cubic feet of roundwood chipped at other primary wood-using plants.

[c]Rough-wood basis (includes chips converted to equivalent standard cords).

[d]Includes particleboard, charcoal, and specialty products.

[e]Excludes approximately 40,576 thousand cubic feet of plant byproducts used for industrial fuel.

[f]Excludes 2,924 thousand cubic feet of plant byproducts used for litter and mulch.

Table 37.--Average annual output of roundwood products, by product, species group, and source of material, South Carolina, 1978-1985

Product and species group	All sources	Growing-stock trees[a]			Cull trees[a]	Salvable dead trees[a]	Other sources[b]
		Total	Sawtimber	Poletimber			
	Thousand cubic feet						
Saw logs							
Softwood	170,268	167,376	165,218	2,158	2,863	--	29
Hardwood	39,948	38,064	37,160	904	1,842	--	42
Total	210,216	205,440	202,378	3,062	4,705	--	71
Veneer logs and bolts							
Softwood	45,441	45,441	45,441	--	--	--	--
Hardwood	9,154	9,154	9,154	--	--	--	--
Total	54,595	54,595	54,595	--	--	--	--
Pulpwood							
Softwood	181,619	164,589	71,468	93,121	8,415	--	8,615
Hardwood	59,828	46,687	12,709	33,978	10,830	--	2,311
Total	241,447	211,276	84,177	127,099	19,245	--	10,926
Poles and piling							
Softwood	5,140	5,140	5,140	--	--	--	--
Hardwood	--	--	--	--	--	--	--
Total	5,140	5,140	5,140	--	--	--	--
Posts (round and split)							
Softwood	297	128	39	89	--	--	169
Hardwood	30	15	7	8	--	--	15
Total	327	143	46	97	--	--	--
Other							
Softwood	40	40	26	14	--	--	--
Hardwood	3	3	1	2	--	--	--
Total	43	43	27	16	--	--	--
Total industrial products							
Softwood	402,805	382,714	287,332	95,382	11,278	--	8,813
Hardwood	108,963	93,923	59,031	34,892	12,676	--	2,368
Total	511,768	476,637	346,363	130,274	23,950	--	11,181
Fuelwood							
Softwood	5,083	3,179	1,349	1,830	141	771	992
Hardwood	35,618	20,840	14,401	6,439	3,290	1,856	9,632
Total	40,701	24,019	15,750	8,269	3,431	2,627	10,624
All products							
Softwood	407,888	385,893	288,681	97,212	11,419	771	9,805
Hardwood	144,581	114,763	73,432	41,331	15,962	1,856	12,000
Total	552,469	500,656	362,113	138,543	27,381	2,627	21,805

[a]On timberland.

[b]Includes trees less than 5.0 inches in diameter, tree tops and limbs from timberland, or material from other forest land or nonforest land such as fencerows or suburban areas.

Table 38.--Average annual timber removals from growing stock on timberland, by item, softwood, and hardwood, South Carolina, 1978-1985

Item	All species	Softwood	Hardwood
	- - - Thousand cubic feet - - -		
Roundwood products			
Saw logs	205,440	167,376	38,064
Veneer logs and bolts	54,595	45,441	9,154
Pulpwood	211,276	164,589	46,687
Poles and piling	5,140	5,140	--
Posts	143	128	15
Other	43	40	3
Fuelwood	24,019	3,179	20,840
All products	500,656	385,893	114,763
Logging residues	54,096	28,119	25,977
Other removals	71,781	40,624	31,157
Total removals	626,533	454,636	171,897

Table 39.--Average annual timber removals from live sawtimber on timberland, by item, softwood, and hardwood, South Carolina, 1978-1985

Item	All species	Softwood	Hardwood
	- - - - Thousand board feet - - - -		
Roundwood products			
Saw logs	1,207,307	991,290	216,017
Veneer logs and bolts	316,797	259,764	57,033
Pulpwood	352,450	300,941	51,509
Poles and piling	30,911	30,911	--
Posts	178	154	24
Other	153	147	6
Fuelwood	83,966	8,170	75,796
All products	1,991,762	1,591,377	400,385
Logging residues	62,636	28,709	33,927
Other removals	230,099	114,962	115,137
Total removals	2,284,497	1,735,048	549,449

Table 40.--Average annual volume of unused residues at primary manufacturing plants, by species group, type of residue, and industry, South Carolina, 1978-1985

Species group and type of residue	All industries	Lumber	Veneer and plywood	Other
	- - - - Thousand cubic feet - - - -			
Softwood				
Coarse[a]	1,626	430	1,196	--
Fine[b]	310	255	55	--
Total	1,936	685	1,251	--
Hardwood				
Coarse[a]	48	32	16	--
Fine[b]	491	315	176	--
Total	539	347	192	--
All species				
Coarse[a]	1,674	462	1,212	--
Fine[b]	801	570	231	--
Total	2,475	1,032	1,443	--

[a]Material such as slabs and edgings.

[b]Material such as sawdust and shavings.

Table 41.--Area of timberland and associated inventory, net annual growth, and annual removals of growing stock, by species group, South Carolina, 1986 with projections[a] to 2016

Component and species group	Unit of measure	Inventory year	Projected to--		
		1986	1996	2006	2016
Area	M acres	12,179	11,946	11,955	12,067
Inventory	M ft^3				
Softwood		8,834,263	7,519,200	7,291,000	7,548,800
Hardwood		8,896,597	8,685,400	8,564,400	8,177,400
Total		17,730,860	16,204,600	15,855,400	15,726,200
Net annual growth[b]	M ft^3				
Softwood		443,819	438,800	494,400	528,000
Hardwood		248,732	213,400	196,600	199,800
Total		692,551	652,200	691,000	727,800
Annual removals[b]	M ft^3				
Softwood		454,636	469,400	497,000	503,200
Hardwood		171,897	219,600	220,400	242,600
Total		626,533	689,000	717,400	745,800

[a]Projection assumptions detailed in USDA Forest Service (1987).

[b]Growth and removals are for the year prior to the inventory year.

Table 42.--Land area, by land use class, major forest type, and survey completion date, South Carolina

Land use class	Survey completion date			Change 1978-1986
	1968	1978	1986	
	- - - - - - - - - - Acres - - - - - - - - - -			
Forest land				
Timberland:				
Pine and oak-pine types	7,303,720	7,289,464	6,980,797	-308,667
Hardwood types	5,122,864	5,213,442	5,197,959	-15,483
Total	12,426,584	12,502,906	12,178,756	-324,150
Reserved timberland	70,500	72,399	78,216	+5,817
Woodland	12,655	3,893	--	-3,893
Total forest land	12,509,739	12,579,198	12,256,972	-322,226
Nonforest land				
Cropland	4,032,137	3,606,957	3,573,102	-33,855
Pasture and range	1,029,342	1,006,997	898,212	-108,785
Other	1,616,980	1,926,247	2,338,368	+412,121
Total	6,678,459	6,540,201	6,809,682	+269,481
All land[a]	19,188,198	19,119,399	19,066,654	-52,745

[a]Excludes all water areas.

Table 43.--Volume[a] of sawtimber, growing stock, and live timber on timberland, by species group, survey completion date, and diameter class, South Carolina

Species group and year	All classes	Diameter class (inches at breast height)								
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0 and larger
					SAWTIMBER (in thousand board feet)					
Softwood										
1968	23,288,069	--	--	4,211,151	4,959,125	4,547,156	3,561,432	2,362,984	1,546,725	2,099,496
1978	31,864,694	--	--	5,935,869	6,790,336	6,171,817	4,952,418	3,323,905	1,930,461	2,759,888
1986	34,079,707	--	--	5,450,895	6,715,613	6,476,666	5,231,826	3,994,758	2,514,580	3,695,369
Hardwood										
1968	19,106,349	--	--	--	3,304,658	3,581,210	3,319,329	2,704,083	1,939,057	4,258,012
1978	24,520,295	--	--	--	4,188,966	4,489,775	4,265,072	3,343,516	2,506,904	5,726,062
1986	26,700,495	--	--	--	4,376,566	4,799,770	4,526,782	3,832,701	2,883,465	6,281,211
					GROWING STOCK (in thousand cubic feet)					
Softwood										
1968	6,821,785	931,682	1,098,951	1,162,637	1,105,432	897,999	645,956	403,380	253,192	322,556
1978	9,053,523	978,011	1,502,319	1,638,028	1,513,146	1,218,385	896,919	566,711	316,081	423,923
1986	8,834,263	777,513	1,231,858	1,496,143	1,485,668	1,264,384	936,805	671,997	406,083	563,812
Hardwood										
1968	6,702,510	665,136	866,176	943,432	971,535	885,006	730,101	546,157	367,913	727,054
1978	8,368,365	793,113	1,012,180	1,157,910	1,228,924	1,109,001	938,080	675,295	475,734	978,128
1986	8,896,597	814,902	1,051,895	1,187,052	1,264,074	1,177,897	993,525	777,932	548,923	1,080,397
					LIVE TIMBER[b] (in thousand cubic feet)					
Softwood										
1968	6,977,891	977,352	1,138,690	1,189,162	1,119,508	906,081	651,921	404,939	255,852	334,386
1978	9,250,182	1,026,266	1,556,469	1,674,349	1,531,709	1,228,986	905,227	568,835	319,220	439,121
1986	8,930,020	796,583	1,254,261	1,515,004	1,493,695	1,270,929	942,129	675,428	408,283	573,708
Hardwood										
1968	8,154,144	972,497	1,116,996	1,154,919	1,153,667	1,018,159	810,815	619,649	418,721	888,721
1978	10,131,830	1,156,616	1,302,434	1,411,475	1,452,018	1,272,195	1,037,853	764,761	540,301	1,194,177
1986	10,267,640	1,082,892	1,257,583	1,368,761	1,426,292	1,306,153	1,075,476	855,862	609,842	1,284,779

[a]To provide a basis for valid comparisons, adjustments have been made to allow for differences in volume tables and sawtimber specifications used in previous surveys.

[b]Merchantable volume.

Table 44.--Merchantable volume of live timber, by species group, Survey Unit, and survey completion date, South Carolina

Species group and Survey Unit	1968	1978	Change 1968-1978	1986	Change 1978-1986
	Thousand cubic feet	Thousand cubic feet	Percent	Thousand cubic feet	Percent
Softwood					
Southern Coastal Plain	1,652,277	2,355,147	+42.5	2,310,795	-1.9
Northern Coastal Plain	2,883,478	3,354,537	+16.3	3,444,525	+2.7
Piedmont	2,442,136	3,540,498	+45.0	3,174,700	-10.3
All units	6,977,891	9,250,182	+32.6	8,930,020	-3.5
Hardwood					
Southern Coastal Plain	2,292,263	2,745,246	+19.8	2,764,748	+.7
Northern Coastal Plain	3,575,333	4,277,334	+19.6	4,224,923	-1.2
Piedmont	2,286,548	3,109,250	+36.0	3,277,969	+5.4
All units	8,154,144	10,131,830	+24.3	10,267,640	+1.3

Table 45.--Land area and total forest, by county, South Carolina, 1986

County	All land[a]	Total forest[b]	
	Acres	Acres	Percent
Abbeville	316,560	219,088	69.2
Aiken	698,758	469,213	67.1
Allendale	264,474	158,635	60.0
Anderson	458,582	193,618	42.2
Bamberg	253,043	143,463	56.7
Barnwell	356,883	230,084	64.5
Beaufort	370,304	140,891	38.0
Berkeley	708,941	551,280	77.8
Calhoun	243,437	133,304	54.8
Charleston	600,090	288,245	48.0
Cherokee	253,203	150,014	59.2
Chester	371,341	290,759	78.3
Chesterfield	513,280	342,476	66.7
Clarendon	385,222	205,157	53.3
Colleton	673,024	455,704	67.7
Darlington	360,173	179,228	49.8
Dillon	259,744	144,069	55.5
Dorchester	368,077	267,917	72.8
Edgefield	313,344	236,288	75.4
Fairfield	438,425	383,607	87.5
Florence	514,694	274,517	53.3
Georgetown	525,933	385,288	73.3
Greenville	508,672	283,085	55.7
Greenwood	288,435	201,800	70.0
Hampton	359,162	258,770	72.0
Horry	731,482	453,658	62.0
Jasper	419,130	301,739	72.0
Kershaw	462,829	345,740	74.7
Lancaster	353,312	259,382	73.4
Laurens	455,872	307,196	67.4
Lee	263,080	119,706	45.5
Lexington	452,480	246,892	54.6
Marion	315,398	205,622	65.2
Marlboro	308,858	171,337	55.5
McCormick	223,878	210,971	94.2
Newberry	405,517	299,311	73.8
Oconee	402,816	279,098	69.3
Orangeburg	711,334	367,766	51.7
Pickens	319,315	218,026	68.3
Richland	487,411	320,106	65.7
Saluda	291,757	172,323	59.1
Spartanburg	520,903	252,939	48.6
Sumter	425,446	231,958	54.5
Union	329,805	256,111	77.7
Williamsburg	597,850	389,201	65.1
York	438,278	261,390	59.6
Total	19,320,552	12,256,972	63.4

[a]Excludes inland water.

[b]Includes timberland, reserved timberland, and woodland.

Table 46.--Area of timberland, by county and ownership class, South Carolina, 1986

County	All ownerships	National forest	Other public	Forest industry[a]	Other private
			Acres		
Abbeville	218,434	21,690	13,069	58,897	124,778
Aiken	469,173	6,021	65,888	64,146	333,118
Allendale	158,635	--	4,511	30,682	123,442
Anderson	193,618	--	15,829	7,777	170,012
Bamberg	143,463	--	825	22,999	119,639
Barnwell	230,074	--	110,657	31,480	87,937
Beaufort	140,291	--	7,298	33,455	99,538
Berkeley	548,679	184,022	26,687	187,391	150,579
Calhoun	133,304	--	1,705	8,382	123,217
Charleston	275,401	47,247	3,226	61,838	163,090
Cherokee	148,727	--	250	20,466	128,011
Chester	341,962	--	95,340	42,309	204,313
Chesterfield	290,759	11,591	1,162	87,487	190,519
Clarendon	205,157	--	7,737	44,629	152,791
Colleton	455,704	--	3,854	133,891	317,959
Darlington	179,228	--	2,406	34,716	142,106
Dillon	144,069	--	1,031	36,059	106,979
Dorchester	267,917	--	2,018	88,528	177,371
Edgefield	236,288	29,865	348	66,048	140,027
Fairfield	383,607	11,560	478	130,622	240,947
Florence	274,517	--	3,889	48,702	221,926
Georgetown	383,681	--	6,307	221,240	156,134
Greenville	265,488	--	13,281	9,381	242,826
Greenwood	201,286	10,023	1,250	40,682	149,331
Hampton	258,770	--	5,494	41,189	212,087
Horry	453,646	--	2,955	151,233	299,458
Jasper	290,726	--	2,399	115,211	173,116
Kershaw	345,740	--	2,780	84,617	258,343
Lancaster	259,382	--	1,076	50,551	207,755
Laurens	307,196	20,746	2,461	74,601	209,388
Lee	119,706	--	2,920	15,165	101,621
Lexington	246,892	--	891	7,089	238,912
Marion	205,622	--	195	101,423	104,004
Marlboro	171,337	--	132	69,660	101,545
McCormick	210,851	46,578	34,564	55,099	74,610
Newberry	299,033	54,224	1,133	61,996	181,680
Oconee	271,609	71,156	11,187	573	188,693
Orangeburg	367,741	--	7,796	44,379	315,566
Pickens	215,150	--	16,289	1,651	197,210
Richland	304,971	--	50,648	40,413	213,910
Saluda	172,323	4,012	237	36,743	131,331
Spartanburg	252,939	--	9,032	20,439	223,468
Sumter	231,958	--	47,131	17,292	167,535
Union	256,111	57,783	223	64,245	133,860
Williamsburg	389,201	--	194	108,779	280,228
York	258,390	--	8,015	32,422	217,953
Total	12,178,756	576,518	596,798	2,706,577	8,298,863

[a]Includes 80,483 acres of other private land under long-term lease.

Table 47.--Area of timberland, by county and broad management class, South Carolina, 1986

County	All classes	Pine plantation	Natural pine	Oak-pine	Upland hardwood	Lowland hardwood
			Acres			
Abbeville	218,434	46,706	45,498	21,727	101,131	3,372
Aiken	469,173	114,824	125,578	72,999	99,425	56,347
Allendale	158,635	46,033	32,645	23,462	7,881	48,614
Anderson	193,618	15,208	45,399	25,814	99,641	7,556
Bamberg	143,463	25,074	24,712	10,439	19,475	63,763
Barnwell	230,074	83,881	44,268	12,782	49,767	39,376
Beaufort	140,291	24,309	39,810	12,707	8,472	54,993
Berkeley	548,679	100,570	189,723	65,672	50,139	142,575
Calhoun	133,304	33,024	41,899	10,953	30,173	17,255
Charleston	275,401	25,850	100,079	52,884	58,781	37,807
Cherokee	148,727	20,131	32,916	25,602	69,968	110
Chester	290,759	63,403	117,940	53,138	46,427	9,851
Chesterfield	341,962	75,705	94,634	39,373	88,929	43,321
Clarendon	205,157	20,295	36,566	25,350	12,030	110,916
Colleton	455,704	106,215	112,737	51,532	35,975	149,245
Darlington	179,228	14,552	34,321	27,399	38,495	64,461
Dillon	144,069	15,126	26,955	27,677	10,992	63,319
Dorchester	267,917	44,303	57,447	40,324	31,383	94,460
Edgefield	236,288	38,033	87,261	35,038	66,097	9,859
Fairfield	383,607	43,019	203,097	40,861	90,029	6,601
Florence	274,517	9,959	97,174	32,155	27,125	108,104
Georgetown	383,681	84,769	91,374	48,049	4,338	155,151
Greenville	265,488	25,620	41,158	37,041	153,325	8,344
Greenwood	201,286	36,369	91,803	30,874	38,411	3,829
Hampton	258,770	48,292	55,887	15,460	27,069	112,062
Horry	453,646	49,049	147,401	59,395	13,212	184,589
Jasper	290,726	79,243	65,716	24,645	6,098	115,024
Kershaw	345,740	79,414	84,118	57,664	73,803	50,741
Lancaster	259,382	56,918	65,857	30,277	99,287	7,043
Laurens	307,196	65,655	70,318	29,528	130,583	11,112
Lee	119,706	12,662	41,154	13,689	19,227	32,974
Lexington	246,892	11,957	76,171	46,057	92,558	20,149
Marion	205,622	15,786	49,166	19,381	29,025	92,264
Marlboro	171,337	36,170	18,224	10,158	21,157	85,628
McCormick	210,851	34,587	108,900	26,387	33,811	7,166
Newberry	299,033	40,494	140,303	46,691	54,686	16,859
Oconee	271,609	11,437	85,131	62,462	112,579	--
Orangeburg	367,741	50,295	58,304	40,520	43,442	175,180
Pickens	215,150	11,895	45,015	27,068	131,172	--
Richland	304,971	40,357	80,589	47,312	77,541	59,172
Saluda	172,323	61,122	59,264	17,053	34,884	--
Spartanburg	252,939	21,225	80,593	29,308	110,823	10,990
Sumter	231,958	34,970	50,579	26,151	28,452	91,806
Union	256,111	54,580	60,352	7,861	116,091	17,227
Williamsburg	389,201	38,380	105,492	58,164	33,205	153,960
York	258,390	42,117	63,993	24,610	117,124	10,546
Total	12,178,756	2,009,583	3,427,521	1,543,693	2,644,238	2,553,721

Table 48.--Merchantable volume of live timber 5.0 inches d.b.h. and larger on timberland, by county and species group, South Carolina, 1986

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
	Thousand cubic feet				
Abbeville	246,299	79,942	10,572	76,006	79,779
Aiken	482,717	262,942	3,951	123,021	92,803
Allendale	241,264	103,880	9,106	72,418	55,860
Anderson	305,323	103,091	2,610	67,321	132,301
Bamberg	170,494	54,575	21,097	60,344	34,478
Barnwell	307,733	145,733	14,780	99,727	47,493
Beaufort	271,500	111,655	1,909	83,912	74,024
Berkeley	912,754	505,832	36,985	203,713	166,224
Calhoun	225,354	116,935	2,697	74,187	31,535
Charleston	542,141	278,027	28,244	132,967	102,903
Cherokee	197,706	69,721	1,314	42,331	84,340
Chester	377,870	212,798	10,732	72,496	81,844
Chesterfield	428,783	207,751	381	139,198	81,453
Clarendon	394,505	113,877	26,253	162,055	92,320
Colleton	829,768	415,908	32,109	219,332	162,419
Darlington	241,602	86,940	16,688	74,038	63,936
Dillon	282,694	89,268	12,685	128,774	51,967
Dorchester	555,464	186,384	41,993	188,605	138,482
Edgefield	364,005	225,545	436	85,291	52,733
Fairfield	475,262	284,567	7,447	87,606	95,642
Florence	546,276	218,595	25,998	184,023	117,660
Georgetown	566,916	261,876	25,684	181,959	97,397
Greenville	455,987	128,550	1,754	113,201	212,482
Greenwood	254,123	162,820	1,148	49,134	41,021
Hampton	504,316	142,580	32,846	194,442	134,448
Horry	930,629	341,897	55,031	408,927	124,774
Jasper	526,783	193,593	40,693	158,085	134,412
Kershaw	352,694	185,622	2,609	98,908	65,555
Lancaster	319,322	158,423	3,059	80,670	77,170
Laurens	420,201	181,265	4,672	99,786	134,478
Lee	192,861	87,254	613	73,907	31,087
Lexington	280,985	157,261	969	51,716	71,039
Marion	503,824	117,206	42,384	257,993	86,241
Marlboro	295,675	87,454	6,716	149,053	52,452
McCormick	350,755	227,373	2,815	61,335	59,232
Newberry	471,743	295,629	4,859	80,570	90,685
Oconee	422,949	164,321	28,656	56,653	173,319
Orangeburg	679,165	187,798	29,401	289,992	171,974
Pickens	352,151	85,156	15,505	71,086	180,404
Richland	403,699	156,246	5,742	129,416	112,295
Saluda	257,910	162,688	1,164	43,982	50,076
Spartanburg	392,386	157,271	5,315	76,550	153,250
Sumter	414,431	135,375	11,900	185,295	81,861
Union	414,624	185,833	6,269	87,289	135,233
Williamsburg	659,964	256,012	17,380	202,951	183,621
York	374,053	172,986	8,394	90,408	102,265
Total	19,197,660	8,266,455	663,565	5,670,673	4,596,967

Table 49.--Volume of growing stock on timberland, by county and species group, South Carolina, 1986

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
	Thousand cubic feet				
Abbeville	231,764	79,219	10,572	69,034	72,939
Aiken	436,278	260,473	3,951	104,419	67,435
Allendale	216,866	101,562	9,106	56,748	49,450
Anderson	292,091	102,026	2,610	61,366	126,089
Bamberg	152,380	53,964	20,961	48,130	29,325
Barnwell	287,576	142,304	14,780	88,542	41,950
Beaufort	234,654	111,539	1,909	74,472	46,734
Berkeley	870,078	505,217	36,985	181,911	145,965
Calhoun	212,207	116,710	2,697	64,876	27,924
Charleston	506,039	276,867	28,244	117,743	83,185
Cherokee	184,391	68,119	1,314	39,048	75,910
Chester	360,523	212,798	10,425	65,985	71,315
Chesterfield	391,990	206,503	209	121,821	63,457
Clarendon	368,865	112,963	25,472	144,543	85,887
Colleton	798,358	414,523	31,397	205,819	146,619
Darlington	211,843	86,587	16,172	57,457	51,627
Dillon	251,106	86,936	9,572	108,932	45,666
Dorchester	506,128	185,915	40,461	162,917	116,835
Edgefield	339,235	223,654	436	75,461	39,684
Fairfield	443,132	279,698	6,913	74,167	82,354
Florence	486,066	217,175	25,017	146,947	96,927
Georgetown	526,885	260,708	24,604	159,385	82,188
Greenville	406,414	125,523	1,754	97,366	181,771
Greenwood	241,788	161,626	1,148	45,485	33,529
Hampton	471,501	141,755	32,846	170,630	126,270
Horry	827,242	337,270	51,647	336,352	101,973
Jasper	486,284	192,548	39,080	136,474	118,182
Kershaw	325,251	183,339	2,609	86,018	53,285
Lancaster	304,004	155,699	3,059	75,698	69,548
Laurens	391,790	180,026	4,469	89,657	117,638
Lee	178,669	85,056	613	67,213	25,787
Lexington	241,605	156,106	969	38,145	46,385
Marion	436,540	116,349	42,124	205,606	72,461
Marlboro	278,705	86,430	6,450	137,709	48,116
McCormick	343,495	226,689	2,815	60,313	53,678
Newberry	452,463	292,140	4,563	72,696	83,064
Oconee	389,305	161,945	28,269	52,385	146,706
Orangeburg	610,484	182,780	28,300	248,588	150,816
Pickens	320,166	83,660	14,518	67,684	154,304
Richland	369,957	155,638	5,742	110,793	97,784
Saluda	248,757	160,248	1,164	39,289	48,056
Spartanburg	364,806	155,289	5,315	66,343	137,859
Sumter	386,669	134,449	11,900	170,066	70,254
Union	381,524	184,004	6,269	73,134	118,117
Williamsburg	612,559	254,522	16,818	179,350	161,869
York	352,427	171,926	7,538	81,663	91,300
Total	17,730,860	8,190,477	643,786	4,938,380	3,958,217

Table 50.--Volume of sawtimber on timberland, by county and species group, South Carolina, 1986

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
	Thousand board feet				
Abbeville	694,809	298,463	8,636	207,546	180,164
Aiken	1,466,409	926,861	18,828	359,950	160,770
Allendale	847,022	411,323	47,919	198,987	188,793
Anderson	870,908	339,334	7,811	224,694	299,069
Bamberg	491,475	199,710	85,693	127,175	78,897
Barnwell	996,311	578,823	52,507	238,493	126,488
Beaufort	951,792	531,806	5,018	240,368	174,600
Berkeley	3,206,105	2,046,496	140,833	462,906	555,870
Calhoun	739,618	455,269	12,087	189,295	82,967
Charleston	2,022,362	1,324,696	117,134	335,999	244,533
Cherokee	521,286	217,092	2,097	103,485	198,612
Chester	1,080,451	716,684	15,773	161,906	186,088
Chesterfield	1,300,653	737,529	--	391,602	171,522
Clarendon	1,376,870	555,912	89,320	419,251	312,387
Colleton	2,669,134	1,525,632	114,566	521,530	507,406
Darlington	834,606	420,109	83,534	206,243	124,720
Dillon	886,877	385,489	48,934	316,970	135,484
Dorchester	1,837,992	803,079	177,973	472,508	384,432
Edgefield	1,349,491	1,034,730	--	215,652	99,109
Fairfield	1,340,957	939,350	5,241	187,508	208,858
Florence	1,915,075	971,053	110,633	491,640	341,749
Georgetown	1,868,047	1,004,129	97,460	482,932	283,526
Greenville	1,285,645	428,365	11,720	277,733	567,827
Greenwood	798,483	588,123	--	126,416	83,944
Hampton	1,800,492	606,558	141,478	556,227	496,229
Horry	3,073,601	1,466,982	217,963	1,012,452	376,204
Jasper	1,842,568	747,750	183,304	455,293	456,221
Kershaw	986,451	590,185	9,490	274,551	112,225
Lancaster	777,616	455,423	5,442	172,470	144,281
Laurens	1,211,046	612,075	6,438	250,883	341,650
Lee	617,334	326,943	2,843	213,906	73,642
Lexington	879,459	655,471	1,471	102,457	120,060
Marion	1,649,515	522,562	216,099	646,383	264,471
Marlboro	804,364	252,801	31,278	361,949	158,336
McCormick	1,264,386	942,869	3,663	193,245	124,609
Newberry	1,543,866	1,127,304	8,760	219,165	188,637
Oconee	1,184,051	446,118	153,935	153,089	430,909
Orangeburg	1,876,392	710,216	111,484	644,100	410,592
Pickens	999,297	255,798	46,122	249,372	448,005
Richland	1,281,762	594,678	19,353	353,054	314,677
Saluda	871,102	598,817	2,148	85,415	184,722
Spartanburg	1,039,262	440,853	10,449	162,276	425,684
Sumter	1,422,265	539,179	50,123	606,010	226,953
Union	1,248,141	629,223	14,774	231,606	372,538
Williamsburg	2,215,950	1,069,853	81,130	489,585	575,382
York	838,904	466,586	9,942	159,844	202,532
Total	60,780,202	31,498,301	2,581,406	14,554,121	12,146,374

Table 51.--Average net annual change[a] of growing stock on timberland, by county and species group, South Carolina, 1978-1985

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
			Thousand cubic feet		
Abbeville	+599	-1,107	+549	+762	+395
Aiken	+9,706	+4,989	+72	+2,425	+2,220
Allendale	-95	-1,560	+120	+736	+609
Anderson	-1,544	-1,511	-86	+295	-242
Bamberg	-9,042	-5,966	+212	-2,592	-696
Barnwell	+3,199	+1,277	+275	+1,076	+571
Beaufort	+2,971	+783	+76	+1,385	+727
Berkeley	-3,365	-4,221	+656	+1,369	-1,169
Calhoun	-1,032	+496	+53	-1,622	+41
Charleston	-3,658	-7,013	+311	+1,803	+1,241
Cherokee	+2,335	-827	+50	+836	+2,276
Chester	+6,716	+3,554	+401	+1,335	+1,426
Chesterfield	+14,942	+10,723	+6	+2,943	+1,270
Clarendon	-2,198	--	-43	-1,664	-491
Colleton	+8,722	+5,881	+258	+215	+2,368
Darlington	-2,964	-1,970	+561	-2,682	+1,127
Dillon	+3,359	+2,295	+217	-585	+1,432
Dorchester	+1,067	-125	-220	+688	+724
Edgefield	-8,246	-9,358	+14	+1,085	+13
Fairfield	+1,686	-555	+429	+1,089	+723
Florence	-401	-2,741	-316	+862	+1,794
Georgetown	-2,783	-3,063	+470	-442	+252
Greenville	+2,178	-477	+33	+1,821	+801
Greenwood	-6,928	-4,357	+40	-1,835	-776
Hampton	-7,230	-5,616	-369	-198	-1,047
Horry	+10,942	+6,278	+1,083	+4,243	-662
Jasper	+4,131	-1,223	+684	+2,499	+2,171
Kershaw	+2,557	+2,482	+74	+541	-540
Lancaster	+2,807	-23	-93	+1,427	+1,496
Laurens	+62	-3,298	+143	+1,643	+1,574
Lee	+3,924	+3,297	+8	+399	+220
Lexington	-363	-2,439	+17	+1,039	+1,020
Marion	+1,454	+1,420	+168	-56	-78
Marlboro	+8,789	+4,584	+67	+3,205	+933
McCormick	+3,867	+916	-28	+1,350	+1,629
Newberry	-13,973	-15,360	-251	+911	+727
Oconee	+7,254	+3,148	+1,118	+1,358	+1,630
Orangeburg	+7,031	+1,171	+516	+4,411	+933
Pickens	+7,433	+1,801	+983	+1,680	+2,969
Richland	+333	-1,479	+93	+289	+1,430
Saluda	-10,522	-9,933	+69	+441	-1,099
Spartanburg	+3,963	+543	-43	+1,292	+2,171
Sumter	+5,969	+1,882	+297	+2,154	+1,636
Union	+4,032	+2,014	+264	+71	+1,683
Williamsburg	+5,020	+847	+185	+2,043	+1,945
York	+3,314	+3,351	+550	-949	+362
Total	+66,018	-20,490	+9,673	+39,096	+37,739

[a]Average net annual growth minus average annual timber removals.

Table 52.--Average net annual change[a] of sawtimber on timberland, by county and species group, South Carolina, 1978-1985

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
			Thousand board feet		
Abbeville	+7,714	-1,853	+731	+4,114	+4,722
Aiken	+31,308	+16,050	+410	+9,229	+5,619
Allendale	+12,408	+3,623	+693	+3,231	+4,861
Anderson	+11,673	+7,865	-635	+2,018	+2,425
Bamberg	-25,716	-15,613	+1,177	-10,454	-826
Barnwell	+24,292	+13,541	+1,493	+6,224	+3,034
Beaufort	+18,713	+7,051	+204	+6,555	+4,903
Berkeley	-21,977	-23,005	+2,883	+3,827	-5,682
Calhoun	-517	+3,441	+312	-5,474	+1,204
Charleston	-8,168	-24,048	+2,237	+7,161	+6,482
Cherokee	+14,821	+660	+43	+3,387	+10,731
Chester	+31,381	+23,672	+887	+3,523	+3,299
Chesterfield	+49,991	+34,006	--	+11,247	+4,738
Clarendon	+2,998	+7,443	-187	-1,751	-2,507
Colleton	+55,517	+36,491	+2,059	+9,785	+7,182
Darlington	-13,558	-4,636	+2,237	-11,847	+688
Dillon	+13,608	+12,336	+1,327	-5,267	+5,212
Dorchester	+20,838	+10,712	+159	+6,655	+3,312
Edgefield	-20,171	-27,681	--	+4,752	+2,758
Fairfield	+2,879	-4,687	+576	+4,923	+2,067
Florence	+10,243	-5,778	-1,114	+6,792	+10,343
Georgetown	+46	-6,836	+3,069	+3,851	-38
Greenville	+31,873	+12,392	+226	+10,339	+8,916
Greenwood	-35,140	-23,818	+235	-7,258	-4,299
Hampton	-13,114	-8,322	-1,792	+1,096	-4,096
Horry	+68,484	+46,840	+5,806	+16,132	-294
Jasper	+39,329	+11,132	+4,585	+10,049	+13,563
Kershaw	+10,189	+8,190	+247	+979	+773
Lancaster	+19,599	+15,064	-208	+1,307	+3,436
Laurens	+18,347	+242	+142	+10,386	+7,577
Lee	+22,750	+21,750	+47	+1,012	-59
Lexington	+5,025	-3,924	+202	+4,624	+4,123
Marion	+2,236	+5,224	+1,629	-5,286	+669
Marlboro	+37,747	+20,297	+337	+11,167	+5,946
McCormick	+16,099	+7,751	-266	+3,990	+4,624
Newberry	-41,021	-49,452	+148	+2,321	+5,962
Oconee	+40,329	+17,841	+5,924	+4,105	+12,459
Orangeburg	+32,285	+11,087	+2,809	+11,679	+6,710
Pickens	+34,980	+11,637	+4,403	+6,238	+12,702
Richland	+7,995	-2,770	+375	+1,367	+9,023
Saluda	-24,086	-26,709	+44	+3,628	-1,049
Spartanburg	+20,927	+7,196	-393	+4,367	+9,757
Sumter	+25,986	+4,381	+1,505	+13,849	+6,251
Union	+18,884	+10,496	+932	-1,344	+8,800
Williamsburg	+35,152	+12,476	+1,465	+8,506	+12,705
York	+15,979	+18,816	+292	-5,818	+2,689
Total	+609,157	+190,571	+47,255	+169,916	+201,415

[a]Average net annual growth minus average annual timber removals.

Table 53.--Green weight of forest biomass on timberland, by county and species group, South Carolina, 1986

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
	- - - - - - - Hundred thousand pounds - - - - - - -				
Abbeville	269,437	78,012	14,858	80,092	96,475
Aiken	523,981	261,006	3,649	116,499	142,827
Allendale	235,057	95,069	8,886	66,925	64,177
Anderson	314,374	90,945	3,110	64,549	155,770
Bamberg	172,794	50,230	19,850	60,966	41,748
Barnwell	306,726	135,111	13,413	96,897	61,305
Beaufort	270,525	97,477	2,406	81,698	88,944
Berkeley	890,780	456,674	35,227	209,754	189,125
Calhoun	216,237	104,823	2,503	68,835	40,076
Charleston	516,610	237,859	25,847	130,846	122,058
Cherokee	210,566	64,231	1,901	44,706	99,728
Chester	397,922	197,222	18,818	79,339	102,543
Chesterfield	464,195	201,820	901	141,338	120,136
Clarendon	382,192	98,665	24,614	157,114	101,799
Colleton	819,321	378,800	29,373	220,149	190,999
Darlington	248,409	76,125	15,899	72,566	83,819
Dillon	283,753	78,397	13,032	129,891	62,433
Dorchester	560,411	165,512	40,016	194,572	160,311
Edgefield	348,920	195,125	1,141	85,727	66,927
Fairfield	506,931	270,770	14,630	98,284	123,247
Florence	527,729	188,784	24,192	178,785	135,968
Georgetown	589,672	238,999	24,563	200,204	125,906
Greenville	480,835	117,415	1,537	109,463	252,420
Greenwood	262,928	150,364	1,871	55,203	55,490
Hampton	486,133	126,771	29,525	184,286	145,551
Horry	918,385	296,310	52,559	412,758	156,758
Jasper	525,944	178,620	40,312	157,987	149,025
Kershaw	389,090	181,080	2,622	106,003	99,385
Lancaster	343,092	150,997	5,016	86,516	100,563
Laurens	435,230	166,595	6,838	108,656	153,141
Lee	186,840	78,199	546	68,176	39,919
Lexington	309,366	143,727	1,053	52,349	112,237
Marion	504,301	103,675	41,242	261,662	97,722
Marlboro	296,073	81,549	7,613	144,045	62,866
McCormick	341,134	199,262	3,747	64,371	73,754
Newberry	454,122	258,808	6,904	82,914	105,496
Oconee	453,155	150,602	22,530	62,708	217,315
Orangeburg	673,090	168,621	26,660	272,853	204,956
Pickens	380,080	76,556	13,569	71,395	218,560
Richland	424,251	147,495	7,307	133,060	136,389
Saluda	246,869	143,646	1,733	47,638	53,852
Spartanburg	410,987	148,730	8,604	78,379	175,274
Sumter	412,073	122,763	11,119	179,137	99,054
Union	421,277	171,207	8,038	88,886	153,146
Williamsburg	654,260	228,288	16,620	198,319	211,033
York	397,314	155,452	13,191	91,962	136,709
Total	19,463,371	7,508,388	669,585	5,698,462	5,586,936

Tansey, John B.; Hutchins, Cecil C., Jr. South Carolina's forests. Resour. Bull. SE-103. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; **1988.** 96 pp.

Between 1978 and 1986, area of timberland declined from 12.5 to 12.2 million acres. Area owned by forest industry rose 16 percent, while farmer-owned timberland dropped 30 percent. Volume of softwood growing stock declined by 2 percent, and volume of hardwood growing stock rose 6 percent. Annual removals of softwood growing stock increased to 455 million cubic feet and exceed softwood growth by 2 percent. Softwood net growth declined by 28 percent since 1977. Net annual growth of hardwood growing stock also declined by 28 percent, while hardwood removals increased by 27 percent. Still, hardwood growth exceeds removals by 45 percent. Since the last survey, mortality of hardwood growing stock has increased by almost 50 percent to 61 million cubic feet.

Keywords: Timberland, forest ownership, timber volume, timber growth, timber removals.

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