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# Virginia's Forests

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## **Foreword**

In accordance with the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, the fifth inventory of Virginia's forests was expanded to accommodate nontimber as well as timber resources. This report presents the principal findings concerning the extent and condition of forest land, associated timber volumes, and rates of growth and removals. Nontimber evaluations will be dealt with separately.

The field inventory was begun in September 1984 and completed in November 1985. Four previous statewide inventories, completed in 1940, 1957, 1966, and 1977, provide statistics for measuring changes and trends over the past 46 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 Virginia's forest resources. Appre-

ciation 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 Department of Forestry, Commonwealth of Virginia, and the Tennessee Valley Authority. 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, Virginia is divided into five 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 Forest Inventory and Analysis reports includes the most commonly used forest resource statistics, but additional data can often be obtained. A Forest Information Retrieval (FIR) service is available for the customer 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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## Highlights

### Since the fourth inventory of Virginia's forest resources was completed in 1977—

- area classified as timberland declined by 551,000 acres to 15.4 million acres. This loss of timberland represents the first decline measured since the first survey of Virginia. Altogether, 1.3 million acres underwent land use changes. Only 382,000 acres of new timberland were added, as opposed to 933,000 acres that were diverted to other land uses, primarily urban development and agriculture. Net reductions in timberland occurred in all regions except the Southern Piedmont, where area of timberland remained relatively unchanged.
- area of nonindustrial private forest (NIPF) timberland is down by 759,000 acres to 11.6 million acres. Within the NIPF group, the categories of other individual and corporate ownership increased in timberland but not enough to offset the loss of farmer-owned timberland, which decreased 33 percent to 4.2 million acres. NIPF owners still control 75 percent of Virginia's timberland. Forest industry manages 12 percent, or 1.9 million acres, up 10 percent. Public agencies own 13 percent, or 2.0 million acres, up 2 percent since 1977. National forests account for three-fourths of the public timberland.
- area of timberland with stands dominated by sawtimber-size trees increased by almost 1 million acres to 7.3 million acres. The area in poletimber stands decreased by 15 percent to 5.1 million acres, and sapling–seedling stands decreased 17 percent to 2.8 million acres. These changes were similar for both softwoods and hardwoods except in the poletimber class, where softwoods increased slightly. The area classified as sawtimber increased in all regions except the Coastal Plain.
- area in pine plantations increased by 72 percent to almost 1.2 million acres. Pine plantations now account for more than one-third of the 3.4 million acres classified as softwood forest types. The increase in plantations was countered by a decrease in area of natural pine stands, which dropped by 21 percent to 2.2 million acres. Loblolly pine is the favored species for plantations, as reflected by its 197,000-acre increase to 1.8 million acres. Virginia is dominated by hardwood forest types, covering 10.4 million acres. The area in oak–pine type covers 1.7 million acres.
- softwood inventory volume rose 5 percent to 5.9 billion cubic feet. Softwood growing-stock volume increased 24 percent on forest industry lands to 1.1 billion cubic feet. However, softwood volume on NIPF lands remained relatively unchanged at 4.2 billion cubic feet. Softwood volume increased in all regions except the Coastal Plain, where it declined by 3 percent. Although softwood volume was up in every diameter class except the 12-inch class, most of the poletimber-size increases occurred on forest industry land.

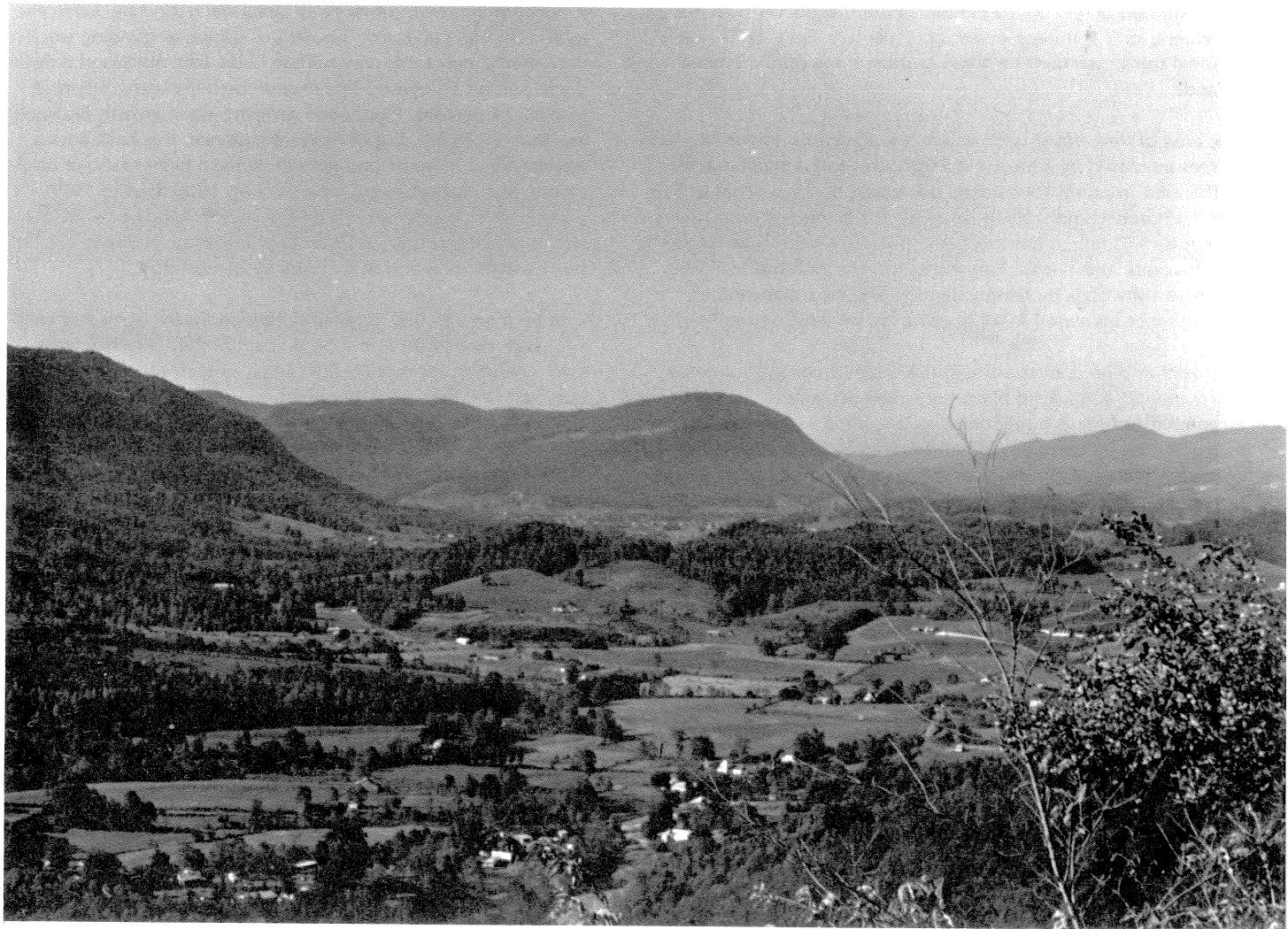
- hardwood inventory volume increased by 11 percent to 17.1 billion cubic feet. Hardwood growing-stock volume increased on all major ownership categories, with the smallest gain occurring on forest industry land. Almost 13.4 billion cubic feet of the hardwood volume is on NIPF lands, 1.1 on forest industry lands, and 2.6 on public lands. Hardwood volume was up in all regions of the State, with the smallest increase occurring in the Coastal Plain. Hardwood volume increased in the 10-inch and larger diameter classes, whereas it decreased in the 6- and 8-inch classes.
- total number of saplings has declined by 11 percent to 9.1 billion trees. Softwood saplings declined by 17 percent to 1.3 billion trees. This is the second consecutive drop in small softwoods. Softwood saplings decreased on each major ownership except public. Hardwood saplings declined 9 percent to 7.8 billion trees. This is the first decline measured in numbers of small hardwoods. Hardwood saplings decreased on all ownerships except forest industry.
- net annual growth of growing stock decreased by 3 percent to 802 million cubic feet. Growth of softwood growing stock decreased 7 percent to 229 million cubic feet. Softwood growth decreased on all ownerships except forest industry, where it rose by 24 percent. Hardwood growing-stock growth declined less than 1 percent, but of more importance, this halts a long upward trend in hardwood growth. Since a higher ratio of hardwoods was classed as growing stock in 1986 than in 1977, a better comparison is with that of all-live hardwood growth which actually reveals a 10-percent reduction. Growth of all-live hardwoods was down across all ownerships.
- more than 183,000 acres of timberland were harvested each year and retained in forest. Significant timber volumes were removed from another 86,000 acres annually through partial harvests, commercial thinning, and other miscellaneous cutting. Annual volume of growing-stock removals totaled 206 million cubic feet for softwoods and 274 million cubic feet for hardwoods. Softwood removals remained about the same, but hardwood removals fell by 6 percent. Of the total growing-stock removals, 80 percent were for roundwood products, 9 percent remained in the woods as logging residues, and 11 percent resulted from cultural practices, land clearing, or other actions where trees were removed from timberland but not used. Annual removals from growing stock in 1985 included 1.7 billion board feet of sawtimber.
- total output of timber products averaged 587 million cubic feet per year. About 13 percent of the total output was produced from plant byproducts generated during the primary manufacture of timber, and 87 percent was produced from roundwood. Of the total roundwood production, saw logs account for 39 percent, pulpwood for 32 percent, and fuelwood for 26 percent; the remaining 3 percent is divided between

veneer logs and miscellaneous other industrial products. Output of industrial products from roundwood averaged 381 million cubic feet per year between 1976 and 1985. Although this periodic average represents a 7-percent increase over the output in 1976, most of the gain occurred during the latter part of the period. Industrial roundwood output in 1984 surpassed output in 1976 by 30 percent.

- *successful regeneration averaged about 173,000 acres annually, or the equivalent of 94 percent of the area harvested.* Acreage of new pine stand establishment surpassed the 62,000 acres of pine stands harvested and retained in forest by 35 percent. Rates of pine establishment exceeded pine harvest by 68 percent on forest industry land, 79 percent on public lands, and 16 percent on NIPF land. Even so, diversions of pine timberland to nonforest caused a net decline in the total amount of pine acreage. If pine diversions are considered, only 85 percent of the total pine acreage harvested or diverted since 1977 has been replaced. Planted stands accounted for 79 percent of the new pine establishment. Area of newly established hardwood stands amounted to only 73 percent of the 121,000 acres of hardwoods harvested and retained in forest. Most of the hardwood deficit is attributed to a lack of successful regeneration following final harvest. Of all hardwood stands

harvested since 1977, 37 percent currently lack sufficient regeneration to constitute a manageable stand.

- *only 5 percent of softwood growing-stock removals came from pine plantations.* In years to come, Virginia will rely much more heavily on the planted component of the pine resource. Softwood removals from pine plantations are expected to exceed removals from natural pine stands before the year 2000. Over the next 30 years, slight to moderate increases are projected for volumes of softwood inventory, growth, and removals. The past upward spiral of hardwood inventory volume is expected to stabilize due to growth rates dampened by an accumulation of old hardwood stands and projected increases in hardwood removals.
- *better management of hardwoods is seen as the most significant opportunity to increase future timber supplies.* Continued proliferation of overmature and poorly stocked hardwood stands will seriously detract from prospective supplies. Any effort to enhance the quality of Virginia's forest resources is best directed at NIPF owners, since they control three-fourths of the timberland where management opportunities have been identified.



Forest Trends

#### **Background and Geography**

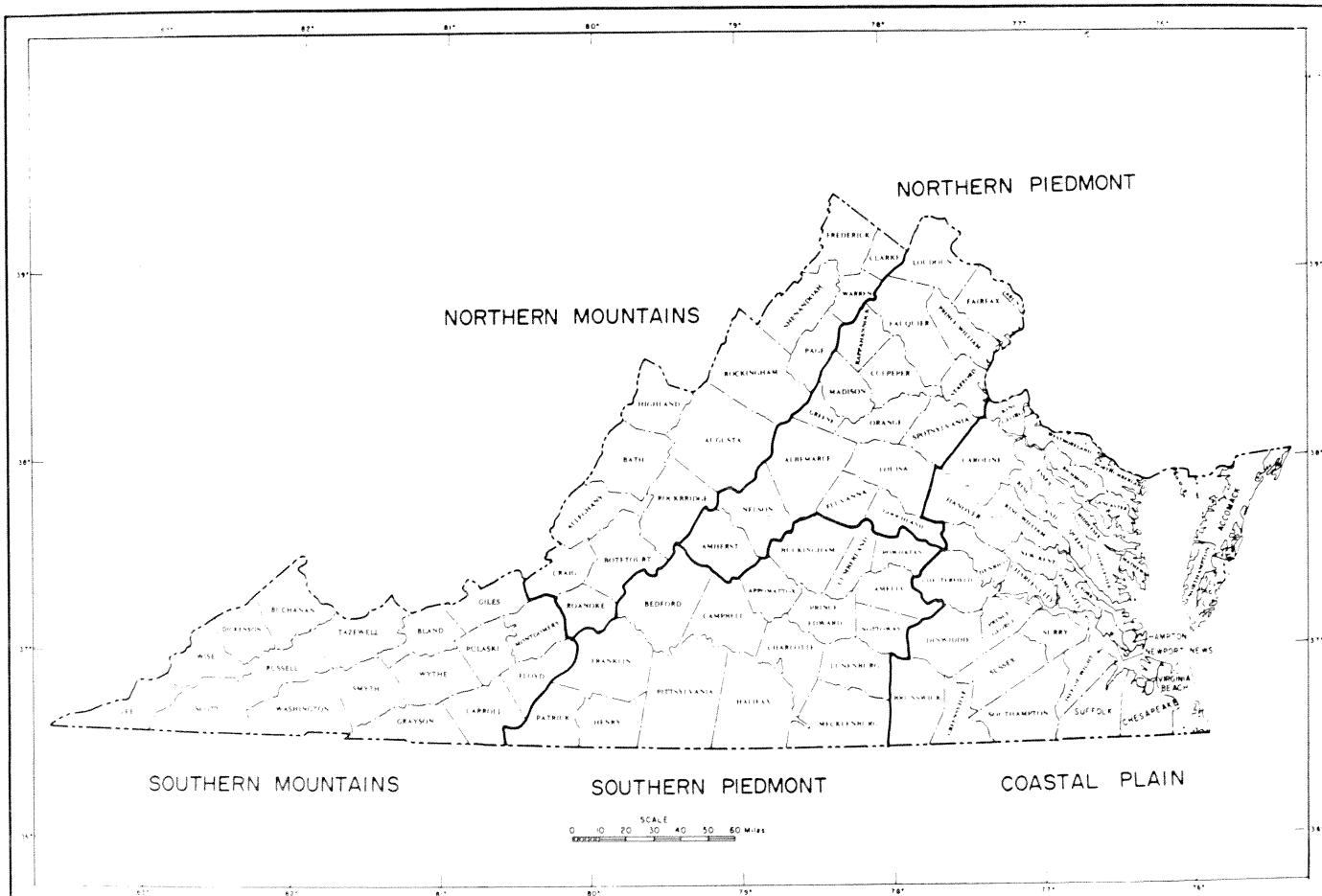
Virginia's boundaries encompass 26.1 million acres of land and water. This total includes nearly 0.7 million acres of inland water (large lakes, rivers, and reservoirs) and 25.4 million acres of land. Almost 16.0 million acres, or 63 percent of the land, is forested. More than 15.4 million of these forested acres are considered timberland (formerly termed commercial forest). The approximately half million remaining acres consist primarily of reserved timberland and a small amount of woodland (formerly called unproductive forest). The areas in reserved status make up wilderness, parks, scenic and historic sites. Those few areas classed as woodland consist primarily of rock outcrops, peat bogs, and harsh coastal environments.

Virginia covers many physiographic conditions ranging from swamps in the eastern Coastal Plain to hilly central Piedmont areas to the rugged western mountains. Because of these differences the State is divided into five Survey Units for inventory and reporting purposes. These units are the Coastal Plain, the Southern Piedmont, the Northern Piedmont, the Northern

Mountains, and the Southern Mountains (fig. 1). By region, only the Southern Piedmont exceeds the State average in forest cover, with 68 percent of the area forested. Figure 2 shows the proportion and geographic occurrence of forest land in Virginia. The Northern Piedmont and the eastern portion of the Coastal Plain show up as areas well below the State average in forest cover.

## **Land Use Changes Drop Area of Timberland by One-half Million Acres**

Between 1977 and 1986, more than 1.3 million acres underwent land use changes (table I). Of these acres, 382,000 were added to the timberland base and 933,000 were diverted to nonforest uses. About 96 percent of the additions came from previously nonforest land. The remainder came from reserved timberland released from that status. One-third of the additions to timberland occurred in the Southern Mountains and another one-fourth in the Southern Piedmont.



**Figure 1.—Forest Survey Units in Virginia.**

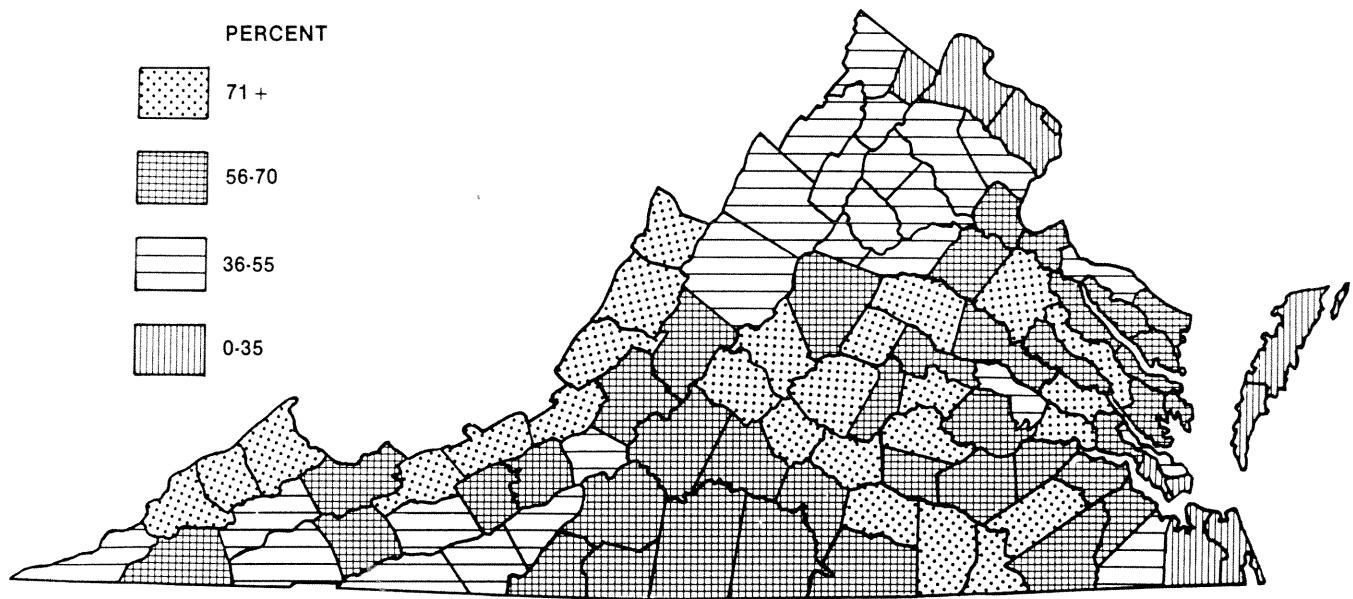


Figure 2.—Percentage of county land area in forest, Virginia, 1986.

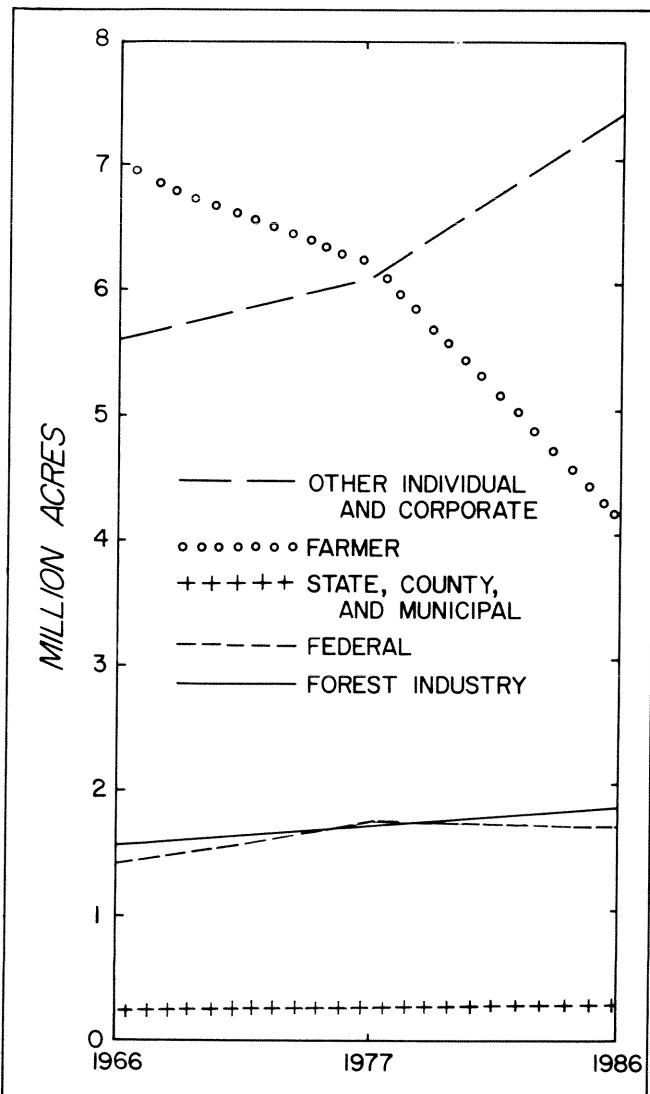


Figure 3.—Area of timberland, by ownership class, 1966, 1977, and 1986.

Of the total acreage diverted, more than half went to urban and related uses, and almost one-third went to agriculture. The more than 503,000 acres most recently removed from timberland for urban and related uses is the largest change of this kind since the first survey of Virginia in 1940. It more than doubles the loss for these purposes in any other survey period. The Northern Piedmont experienced the most loss of timberland to urban land uses, whereas the Southern Piedmont was affected the least by changes to urban uses. Another 291,000 acres were converted from timberland to agricultural uses. The largest loss in this category centered in the Coastal Plain. In fact, the Coastal Plain had the highest total loss of timberland to nonforest uses and the lowest total gain of new timberland of any region in Virginia.

As a result of these land use shifts, the net area of timberland in Virginia declined by 551,000 acres, or by 3 percent, between 1977 and 1986. Declines occurred everywhere except in the Southern Piedmont. This net loss of timberland represents the first decline measured since the initial survey of the State. Past increases were possible due to relatively low rates of urbanization combined with high rates of reversions and tree planting on abandoned agricultural lands. However, this source of new timberland has been steadily dwindling from each survey period to the next. The current figure of 367,000 acres is the smallest addition from nonforest land measured to date. In the future, this trend might be altered by tree planting on highly erodible cropland under the Federal Conservation Reserve Program authorized by the 1985 Farm Bill.

#### NIPF Acreage Down 6 Percent

Area of timberland owned by nonindustrial private forest (NIPF) landowners dropped by 759,000 acres, or by 6 percent, between 1977 and 1986. NIPF owners now hold 11.6 million acres, about 75 percent of Virginia's timberland. The NIPF group, which consists of farmer, other corporate (excluding forest industry), and other individually owned lands, controls the majority of the timberland in each of the five Survey Units in Virginia. Within the NIPF category, other individual and

Table I.—Changes in area of Virginia's timberland, by Survey Unit, 1977–1986

Survey Unit	Area of timberland in—		Net change	Changes								
				Additions from—			Diversions to—					
	1977	1986		Total gain	Nonforest	Other forest land	Total loss	Other forest land	Agricul- ture	Urban and other	Water	
----- Thousand acres -----												
Coastal Plain	4,003.5	3,773.9	-229.6	42.2	39.5	2.7	271.8	29.9	106.6	123.0	12.3	
Southern Piedmont	3,778.4	3,783.6	+5.2	92.2	92.2	—	87.0	6.9	51.0	21.8	7.3	
Northern Piedmont	2,566.4	2,399.6	-166.8	61.7	59.7	2.0	228.5	17.2	60.4	150.9	—	
Northern Mountains	2,625.7	2,526.7	-99.0	47.7	37.9	9.8	146.7	25.3	47.7	73.3	.4	
Southern Mountains	3,013.1	2,952.0	-61.1	138.3	138.2	.1	199.4	37.6	25.1	134.3	2.4	
State	15,987.1	15,435.8	-551.3	382.1	367.5	14.6	933.4	116.9	290.8	503.3	22.4	

corporate ownership both increased by 24 and 10 percent, respectively. In contrast, the farmer-owned portion of timberland declined by 33 percent to 4.2 million acres (fig. 3), a trend consistent with that found in other Southeastern States. Although some of this reduction resulted from diversions to agricultural uses, a large part is attributed to changes in owner occupation, sale of timberland to other owners, and farm incorporation.

Forest industry holdings, 1 percent of which are acres under long-term leases, have increased 10 percent since 1977 to nearly 1.9 million acres in 1986. Forest industry currently controls 12 percent of the total timberland in Virginia. Almost half the forest industry holdings are located in the Coastal Plain, and another third are situated in the Southern Piedmont. Forest industry manages 22 percent of the timberland in the Coastal Plain and 17 percent in the Southern Piedmont.

Since 1977, the area of timberland publicly owned has increased 2 percent to 2.0 million acres. Public ownership includes national forest, other Federal, county, and municipal lands. Timberland on the George Washington and Jefferson National Forests totals almost 1.5 million acres and accounts for three-fourths of the timberland in public ownership. More than half of all the public timberland is in the Northern Mountains and accounts for 43 percent of the total. The military holdings of Quantico Reservation, Fort Pickett, and Fort A.P. Hill represent most of the other Federal timberland. The State forests of Pocahontas, Prince Edward Gallion, Cumberland, and Buckingham-Appomattox account for most of the State-owned timberlands.

### Sawtimber Stands on the Rise

Since 1977, stands classified as sawtimber increased from about 6.4 to more than 7.3 million acres, or by 15 percent. This increase took place in all Survey Units except the Coastal Plain, where area of sawtimber stands declined 3 percent. Area of poletimber stands decreased from 6.0 to 5.1 million acres, or by 15 percent. The amount of sapling—seedling stands dropped from almost 3.4 to only 2.8 million acres, or by 17 percent.

The remaining area of about 198,000 acres was classified as nonstocked, down from about 253,000 acres.

By species group, the trends by stand size are similar to those for all timber except in softwood poletimber. For softwoods, poletimber acreage increased. This increase, however, was largely on forest industry land, where acreage of softwood poletimber has increased by 97 percent since 1977. Growth of pine plantations established 10 to 20 years ago by forest industry has caused this increase. Area of poletimber softwoods decreased on NIPF and public lands. Stands of sapling—seedling softwoods decreased in area on all major ownerships except public, where they increased slightly. Area of sawtimber softwood stands increased on NIPF and public lands, but decreased on forest industry land. For hardwoods, sawtimber acreage was up across all major ownership categories. Area of hardwood poletimber stands decreased in each major owner category. The area of hardwood sapling—seedling stands declined on NIPF and public lands, but increased on forest industry lands.

### Less Timberland in All Broad Forest Types

Forest Inventory and Analysis often categorizes timberland in the Southeast by three broad forest types: pine, oak—pine, and hardwood. Pine types are those stands in which pines make up more than 50 percent of the stocking. Hardwood types are forests in which hardwoods comprise a plurality of the stocking, except where pines account for 25 to 50 percent, in which case the stand would be classified as oak—pine. In Virginia all three broad types lost acreage between 1977 and 1986. The hardwood types dropped by 2 percent and currently total 10.4 million acres, or two-thirds of the State's total timberland. The pine types also lost 2 percent and fell to less than 3.4 million acres, or about one-fifth of the timberland. The largest decrease was in area of oak—pine, which fell sharply by 13 percent to 1.7 million acres.

The type reductions were not uniformly distributed across the State. More than half of the decrease in pine type acreage took place in the Northern Piedmont. In contrast, the South-

ern Piedmont and Southern Mountains experienced slight increases in pine forest types. The gains in the Southern Mountains can be attributed to increases in area of white pine; those in the Southern Piedmont are mainly increases in loblolly pine plantation acreage. Hardwood acreage decreased statewide except in the Southern Piedmont, where it remained relatively stable. The largest decrease in hardwood forest type occurred in the Coastal Plain, where nearly half of the decrease took place. Underlying causes include more intensive management for pine, such as timber stand improvement (TSI) and stand conversion, and increased utilization of the hardwood resource there. Reductions in area of oak-pine type took place in all regions of Virginia. More than one-fourth of the oak-pine acreage lost was located in the Northern Piedmont.

Softwood type acreage, in particular, can be maintained, expanded by artificial regeneration, or perpetuated through enhanced natural regeneration, as provided by Virginia's seed tree law. Since 1977, the area in pine plantations increased by 72 percent to almost 1.2 million acres. This figure would be higher if it included nearly 340,000 acres having evidence of planting or seeding but classified as an oak-pine or hardwood type because hardwoods currently constitute more than 50 percent of the stocking. Eventually, many of these acres will reenter the pine type classifications if the hardwoods are controlled. In conjunction with the large increase in planted pines, the area of natural pine stands dropped by 21 percent to less than 2.2 million acres.

Among the broad forest types, certain specific forest types changed significantly. Most notable is the large gain in area of loblolly pine forest type, which increased by nearly 197,000 acres, or more than 12 percent. Already the most prevalent pine type, loblolly now accounts for almost 1.8 of the 3.4 million acres classified as softwood forest types. Loblolly is again approaching the 2 million acres measured in the earliest survey of 1940. Loblolly steadily declined to a low of about 1.5 million acres in the third survey of 1966, but has since increased gradually due to plantation establishment with the species in the Coastal Plain and Piedmont.

The second most abundant pine type is Virginia pine. However, Virginia pine type dwindled by 189,000 acres to 1.0 million acres. In 1940, Virginia pine covered as much acreage as the loblolly type, but has continued to decrease each survey period.

The most severe decline in forest type acreage has been in shortleaf pine. In 1940, shortleaf pine rivaled loblolly and Virginia pine in extent, but now occupies only 147,000 acres, having dropped 49 percent since 1977. Area of shortleaf type is declining throughout the Southeast. Typified by slower growth rates, shortleaf is seldom replanted. After harvest, hardwoods often replace shortleaf stands, or the area is converted to loblolly plantations.

Within the hardwood group, each individual forest type experienced some decline in area. The predominant type by far remains oak-hickory, representing 9.7 million of the 10.4 million acres classified as hardwood. The oak-gum-cypress type with 311,000 acres is next, followed by elm-ash-cottonwood with 308,000 acres.

### Softwood Inventory Volume Up 5 Percent

Of the 23 billion cubic feet of growing-stock inventory in Virginia, one-fourth is softwood. Softwood inventory has increased from 5.6 to 5.9 billion cubic feet since 1977.

Although softwood volume increased in four of the five Survey Units, softwood volume in the Coastal Plain actually decreased 3 percent. Furthermore, this decrease follows almost a 2-percent decline recorded between 1966 and 1977. Although the Coastal Plain lost some softwood acreage, the liquidation of older pine stands caused most of the decrease in softwood volume. The Coastal Plain remains the major softwood region in Virginia and currently accounts for almost 40 percent of Virginia's softwood volume. Nearly one-half of the softwood gains occurred in the Southern Piedmont as a result of increases in the volume of loblolly pine. This gain was closely followed by those in the Southern Mountains, which supplied more than one-third of the increase. White pine volume accounted for most of this increase.

Softwood inventory increased in all ownership categories. The least gain was on NIPF land, where volume rose less than 1 percent. Of the factors inhibiting softwood volume accumulation on this ownership, one is that timberland diversion to other land uses occurred almost entirely in the NIPF category. Here, diversions from timberland disproportionately favored softwood types. Still, almost 4.2 billion cubic feet, or 71 percent of the softwood volume, is on NIPF lands. The largest gain took place on areas controlled by forest industry, where volume increased 24 percent to 1.1 billion cubic feet. On public lands, increases in softwood volume averaged 11 percent and totaled 0.6 billion cubic feet.

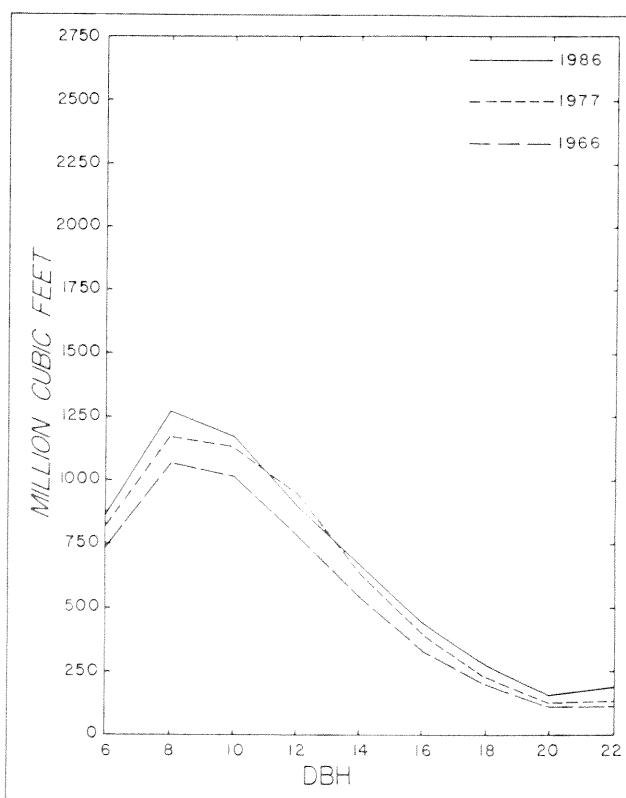


Figure 4.—Volume of softwood growing stock, by tree diameter, 1966, 1977, and 1986.

For all ownerships combined, softwood volume rose in each diameter class except the 12-inch class (fig. 4). In the 12-inch class, volume of softwood growing stock declined 4 percent. The turnaround in the 12-inch class reflects a high rate of removal from the class and low ingrowth into the class. In fact, softwoods in the diameter classes 12-inches and below account for two-thirds of Virginia's softwood removals. For the past three surveys of Virginia, the 8-inch diameter class in softwoods has consistently contained the most volume and continues to do so. In fact, the increases in the 6- through 10-inch classes were almost entirely supported by forest industry lands.

The softwood growing-stock inventory includes 17.5 billion board feet of sawtimber, up from 16.6 billion in 1977. Even though the volume of sawtimber in the Coastal Plain declined, this region still contains 45 percent of Virginia's sawtimber. The distribution of increases in softwood sawtimber by Survey Unit generally resembles that of growing stock except that the Southern Mountains provided nearly one-half of the increase and the Southern Piedmont more than one-third.

By ownership, softwood sawtimber decreased 3 percent on areas controlled by forest industry, yet increased 6 percent on NIPF lands and 12 percent on publicly owned areas. More than three-fourths of the gains in softwood sawtimber were on NIPF land. The decrease in sawtimber on forest industry lands is due to shorter rotations and conversion of older natural stands to plantations.

### Hardwood Inventory Volume Up 11 Percent

In Virginia, three-fourths of the growing-stock inventory is hardwood. Since 1977, the inventory of hardwood growing stock has increased by nearly 1.7 billion cubic feet to 17.1 billion cubic feet.

Although hardwood volume was up in all regions, the smallest increase was in the Coastal Plain and the largest increases in the Southern Mountains and Southern Piedmont. Together, these latter regions accounted for two-thirds of the increase in hardwood growing-stock volume.

Statewide, volume increased in the 10-inch and larger diameter classes, but decreased in the 6- and 8-inch classes (fig. 5). These changes correlate with the aforementioned increased acreage of sawtimber stands. With this large buildup in hardwood inventory it would appear that hardwood demand is below resource capabilities. Although partially true, there are other reasons for the low utilization of the hardwood resource. Stand accessibility and operability problems, along with mixed species composition, are barriers inherent to hardwood stands. For instance, the consumer market may favor only select species from a mixed hardwood stand, which leaves the remaining volume relatively unmarketable. Even landowner attitudes or restrictions affect the utilization of this resource.

By ownership, hardwood volume rose in all categories. Currently, 79 percent, or 13.4 billion cubic feet,<sup>\*</sup> of the hardwood volume in Virginia is on NIPF land; three-fourths of the volume increase occurred there also. The smallest gains in hardwood volume were on areas controlled by forest industry. On these lands, hardwood volume increased by 7 percent to 1.1 billion cubic feet. Hardwood growing-stock volume on public lands increased 15 percent to almost 2.6 billion cubic feet.

The total inventory of hardwood growing stock in Virginia includes nearly 50 billion board feet of sawtimber, up 19 percent since 1977. Hardwood sawtimber increased on all three ownership categories; four-fifths of the increase was on NIPF lands. Hardwood sawtimber volume rose by 20 percent on NIPF lands, by 18 percent on publicly owned areas, and by only 12 percent on lands controlled by forest industry. The distribution of these sawtimber increases by Survey Unit was similar to that of total growing stock, with the smallest gain in the Coastal Plain and the largest in the Southern Mountains and Southern Piedmont.

### Yellow-Poplar Is Dominant Species

Although both hardwood and softwood volume increased, the changes differed among individual species and some actually declined.

In the hardwood group, the various oak species collectively account for about one-half of the volume. However, yellow-poplar is the most abundant individual species in Virginia, with almost 2.9 billion cubic feet (fig. 6). Yellow-poplar accrued the largest gain of any single species in Virginia, increasing by 515 million cubic feet, which accounted for 29 percent of the total hardwood volume increase. The second most abundant individual hardwood species is chestnut oak, with 2.0 billion cubic feet, accounting for 13 percent of the overall in-

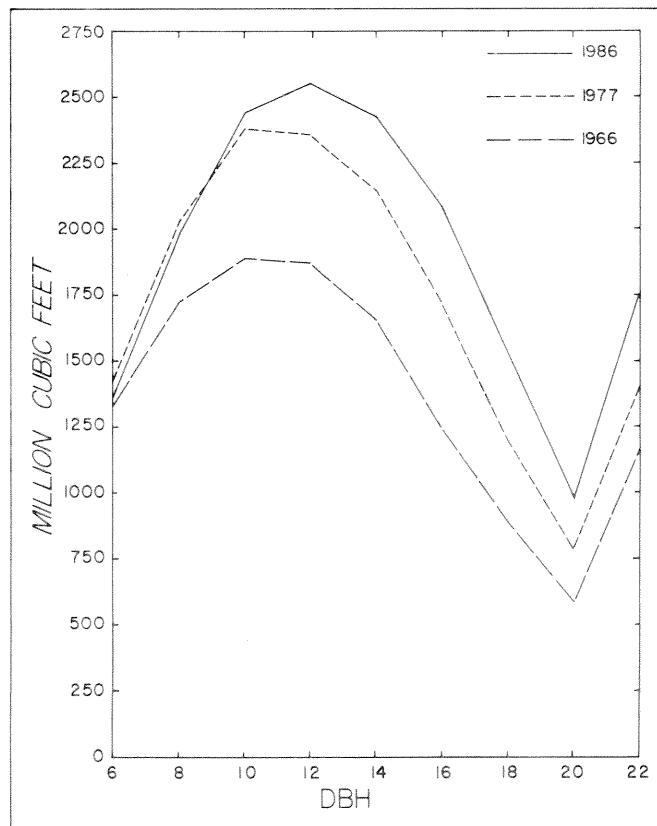


Figure 5.—Volume of hardwood growing stock, by tree diameter, 1966, 1977, and 1986.

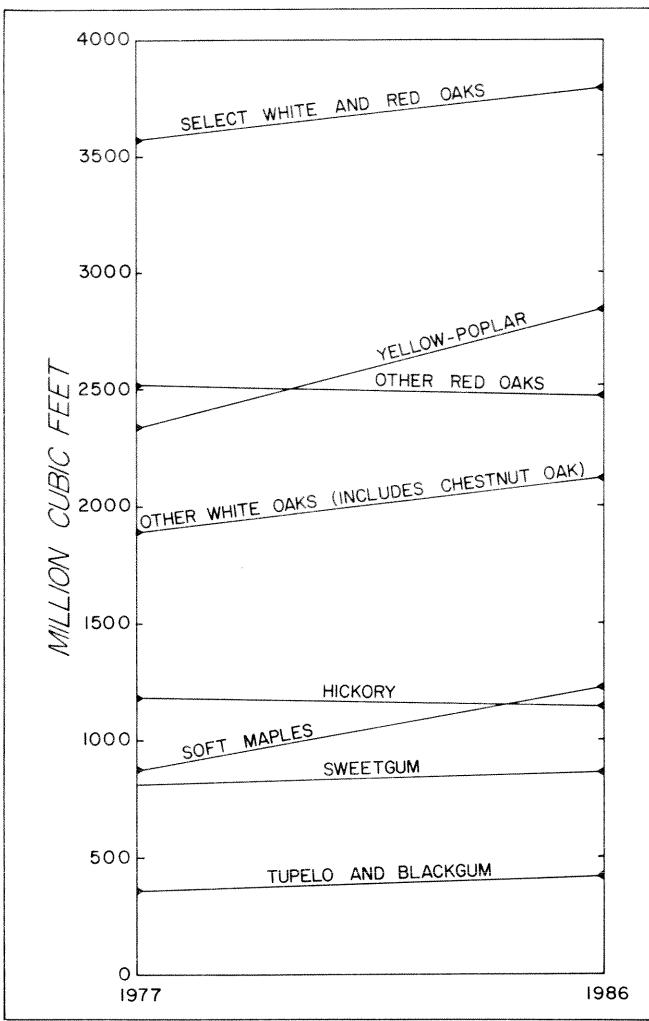


Figure 6.—Change in volume of hardwood growing stock, by species, 1977 to 1986.

crease in hardwood volume. Altogether, the soft maples increased to 1.2 billion cubic feet and accounted for 20 percent of the total statewide increase in hardwood volume. Of the hardwood species decreasing in volume, hickory dropped by 3 percent to a current figure of 1.1 billion cubic feet. Also noted was a 1-percent decrease in the composite volume of other red oaks to less than 2.5 billion cubic feet. Elm, sycamore, and magnolia also declined in volume.

In the softwood group, loblolly pine continues to be the most prevalent species with 2.5 billion cubic feet, or more than two-fifths of the total inventory of softwood growing stock (fig. 7). Loblolly alone accounted for 42 percent of the increase in softwood growing-stock volume. Virginia pine, as the second most abundant softwood species, showed a decline in total area, but actually increased in total volume to 1.8 billion cubic feet. Virginia pine supplied 20 percent of the overall increase in softwood growing-stock volume. Since 1977, white pine volume increased by nearly one-half, reaching more than 0.5 billion cubic feet. White pine now has the third highest softwood volume in Virginia and contributed 29 percent of the overall increase in softwood volume. The largest decrease in volume occurred in shortleaf pine, which dropped by 30 percent to 0.5 billion cubic feet. Shortleaf pine fell to fourth

place in amount of softwood volume. Other softwood species losing volume were pitch pine, cypress, spruce and fir, and pond pine.

#### Fewer Sapling-Size Trees

The number of sapling trees between 1.0 and 4.9 inches d.b.h. has declined from 10.2 billion in 1977 to 9.1 billion in 1986. This is the first decline measured in total sapling numbers in any Virginia survey (table II).

By major species group, softwood saplings declined by 17 percent to 1.3 billion trees. The drop in small softwood numbers is a sequel to the decline measured in 1977. Yellow pines accounted for most of the decline in numbers of softwood saplings. The overall decline in acreage of pine forest types, especially in the 0–10 year age class, and the higher proportion of pine stands now in plantations are factors affecting the decrease. Many planted pine stands contain fewer softwood trees per acre than do some naturally regenerated pine stands. The number of softwood trees declined in the 2-, 4-, and 12-inch diameter classes but increased in the others. More than 70 percent of the increases in numbers of softwood trees occurred in the 6- and 8-inch classes. Forest industry lands ac-

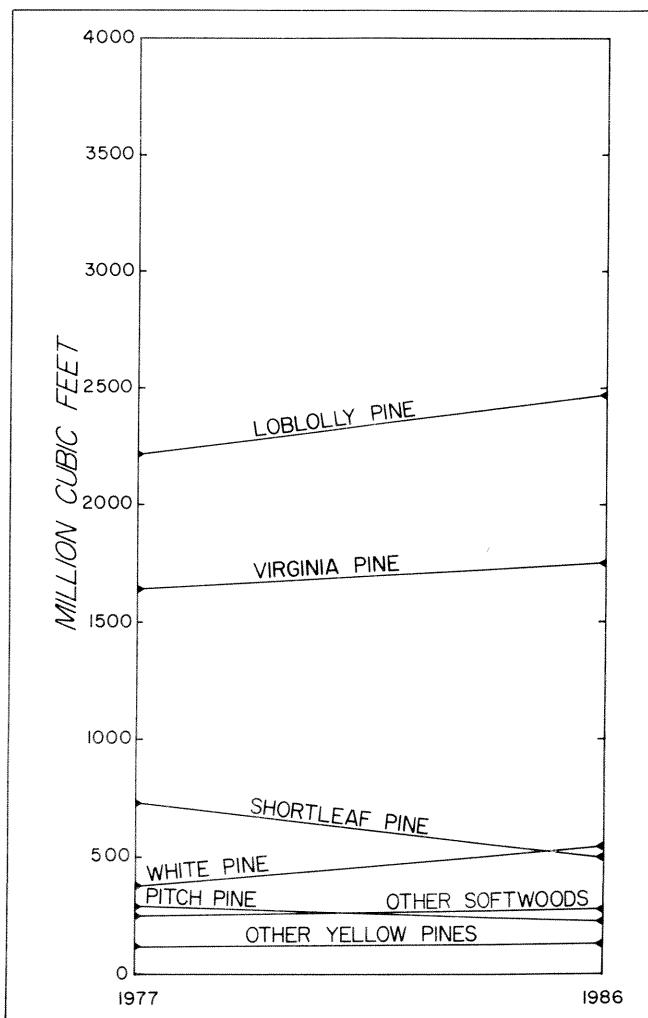


Figure 7.—Change in volume of softwood growing stock, by species, 1977 to 1986.

Table II.—Number of live softwood and hardwood trees on Virginia's timberland, by diameter and ownership classes, 1986, and change between 1977–1986

Diameter class	All ownerships		Public		Forest industry <sup>a</sup>		Other private	
	Inventory 1986	Change 1977–1986	Inventory 1986	Change 1977–1986	Inventory 1986	Change 1977–1986	Inventory 1986	Change 1977–1986
SOFTWOODS (in million trees)								
2	850.2	-191.7	84.2	+3.6	170.6	-69.6	595.4	-125.7
4	498.1	-80.4	37.9	+ .2	126.2	-30.0	334.0	-50.6
6	341.1	+15.5	29.9	+6.3	100.9	+31.7	210.3	-22.5
8	203.7	+14.7	17.9	+ .2	50.6	+24.4	135.2	-10.0
10	103.3	+4.1	11.4	+1.1	16.5	+2.8	75.4	+ .3
12	49.4	-1.6	6.4	+ .3	6.6	-1.0	36.4	- .9
14	24.5	+ .5	3.3	- .2	3.1	- .7	18.1	+1.5
16+	21.8	+3.3	3.3	+ .9	2.8	- .2	15.6	+2.6
HARDWOODS (in million trees)								
2	6,201.1	-611.5	779.0	-26.9	888.9	+93.8	4,533.2	-678.4
4	1,593.1	-193.5	249.2	-8.6	162.0	+12.6	1,181.9	-197.5
6	696.8	-39.9	115.5	-5.9	54.7	+1.8	526.6	-35.8
8	409.7	-5.9	69.1	+4.3	25.2	-4.3	315.4	-5.9
10	260.0	+5.4	41.1	+2.9	15.8	—	203.1	+2.4
12	164.7	+12.4	24.7	+3.7	10.5	+ .8	129.4	+7.9
14	105.1	+12.3	15.5	+1.9	6.9	+1.2	82.6	+9.2
16+	144.8	+28.0	24.7	+3.0	7.9	+ .9	112.2	+24.1

<sup>a</sup> Including inventory on lands under long-term lease.

counted for most of these increases. The progression of earlier pine plantations established on forest industry lands has fueled the increases in poletimber and small sawtimber-size trees. Forest industry lands experienced declines in the 2- and 4-inch softwoods as well as those 12-inches and larger. On NIPF lands, the number of softwoods decreased in each of the 2- through 8-inch diameter classes, with significant gains occurring only in the 14-inch and larger classes. On public lands, the number of softwoods actually increased in the smaller diameter classes. One reason for this situation is that a higher proportion of the softwood acreage under public ownership exists as natural pine stands than it does on either private or forest industry lands.

For hardwoods, saplings declined by 9 percent to 7.8 billion trees. This is the first downturn for Virginia in numbers of small hardwoods, reversing a long upward trend. Hardwood tree numbers decreased in all diameter classes 8 inches and below. Conversely, numbers of hardwood trees increased in all diameter classes 10 inches and above. Almost half of the increase in hardwood numbers were in the 16-inch and larger diameter classes. On NIPF lands, hardwood numbers went down in the 2- through 8-inch diameter classes. On the other hand, hardwoods increased in all but the 8-inch class on forest industry areas. Much of this increase in small hardwoods is due to the overall young age structure of forest industry stands, including plantations. Hardwood numbers on public lands declined in the 2- through 6-inch classes and increased in the 8-inch and larger classes.

#### Forest Biomass Totals 35.4 Billion Cubic Feet

For decades, measures of growing-stock and sawtimber volumes were sufficient to gauge the timber resource. Tree utili-

zation, however, has improved as more and more products are made from chips, fuelwood use has increased, and technology has advanced the yield of conventional products from trees. These changes create interest in estimates of the entire timber resource in terms of forest biomass (appendix table 22). Such biomass is composed of conventional growing-stock volumes, sapling volumes, and volumes found in stumps, tops, and limbs. Cumulatively, the aboveground biomass in Virginia totals 35.4 billion cubic feet and equates to 1.4 billion tons. Biomass averages 88 tons per acre of timberland.

Virginia's growing-stock inventory totals almost 23 billion cubic feet; yet, nearly 2.4 billion cubic feet of additional merchantable volume exists in non-growing-stock trees. These are trees that failed to qualify as growing stock due to rough form, species, or excessive internal cull. In addition, saplings contribute another 4.2 billion cubic feet to total biomass. The amount of volume represented by stumps, tops, and limbs totals almost 5.9 billion cubic feet, one-fourth of the growing-stock total. Altogether, these sources of volume add nearly 12.5 billion cubic feet to the growing-stock base. Hardwoods account for 83 percent of this additional volume.

#### Net Annual Growth Decreases

Since 1976, total net annual growth of growing-stock trees has decreased from 823 to 802 million cubic feet. Declines in net volume increment were measured for both softwoods and hardwoods.

Softwood net annual growth dropped from 247 to 229 million cubic feet, or by 7 percent (fig. 8). Softwoods account for 29 percent of the current growth total. The softwood growth downturn follows a 28-percent increase measured in the previous

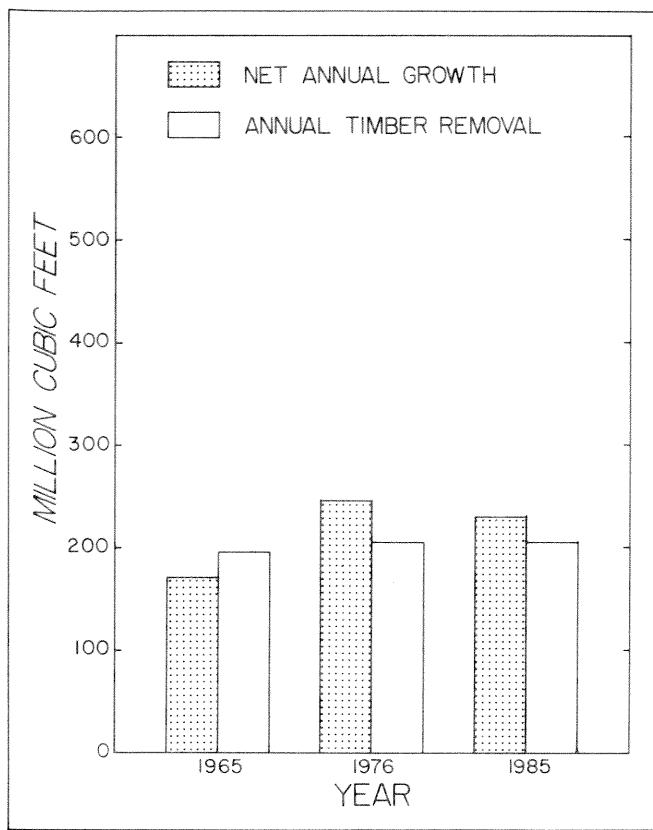


Figure 8.—Net annual growth and annual timber removals of softwood growing stock, 1965, 1976, and 1985.

survey. By ownership, net annual growth of softwoods on forest industry land increased by 24 percent between surveys to 65 million cubic feet. In contrast, softwood growth on NIPF lands decreased by 16 percent to 148 million cubic feet. On public lands, softwood growth decreased to 16 million cubic feet.

There are many factors involved in the overall softwood net growth declines, and similar declines are occurring in other Southeastern States. Some of the causes identified are loss of timberland, high mortality, and a slowdown in the growth rates of survivor trees (Knight 1987; Sheffield and others 1985). Although Virginia's regeneration rates have improved immensely, inadequate regeneration during the 1960's is another factor affecting the current softwood growth decline. The increase in softwood growth on forest industry lands, in face of declines elsewhere, appears to be related to a gain in timberland and more intensive management practices.

Softwoods accounted for 206 million cubic feet, or 43 percent, of the total net annual removals in Virginia. The relationship between softwood growth and removals has been fairly tight during the last three remeasurement periods. In 1965, removals exceeded growth by 15 percent. Due to increased planting efforts, that situation was reversed by 1976, when growth exceeded removals by 20 percent. Today, softwood growth exceeds removals by 11 percent, and since removals have increased by less than 1 percent from 1976, a fairly stable situation is indicated. However, in the Coastal Plain, a major softwood-producing region, removals of softwoods exceeded growth by 15 percent.

For hardwoods, net annual growth of growing stock decreased from 576 to 573 million cubic feet (fig. 9). Hardwoods accounted for 71 percent of the total net annual growth in Virginia. This slight decline halts a long upward trend in hardwood growth in Virginia. The reductions in net growth of hardwood growing stock are conservative because a higher proportion of the trees was classed as growing stock in this survey than in the previous one. To avoid any effects from the increase in growing-stock classifications, a comparison of the growth in the merchantable portion of all-live hardwoods 5.0 inches d.b.h. and larger provides a better measure of change. Based on all live hardwoods, growth actually decreased by 10 percent, from 656 to 593 million cubic feet. By ownership, net annual growth of all live 5.0-inch and larger hardwoods on forest industry was down 9 percent to less than 45 million cubic feet. Net annual growth of hardwoods on NIPF lands decreased 11 percent to 469 million cubic feet. Hardwood growth on publicly owned areas declined the least, 4 percent, to 79 million cubic feet. Obviously, the bulk of the hardwood growth and the greatest declines occurred on NIPF lands. Returning to growing stock, hardwood removals amounted to 274 million cubic feet, less than one-half the growth of hardwoods. However, not all of this excess is available or accessible. About 80 percent of the excess is located on NIPF land and the remainder is on public land.

Measuring growth on a per-acre basis prevents land use changes in the timberland base from influencing growth comparisons. Average net annual growth per acre of all-live trees in Virginia has dropped from 57 to 53 cubic feet.

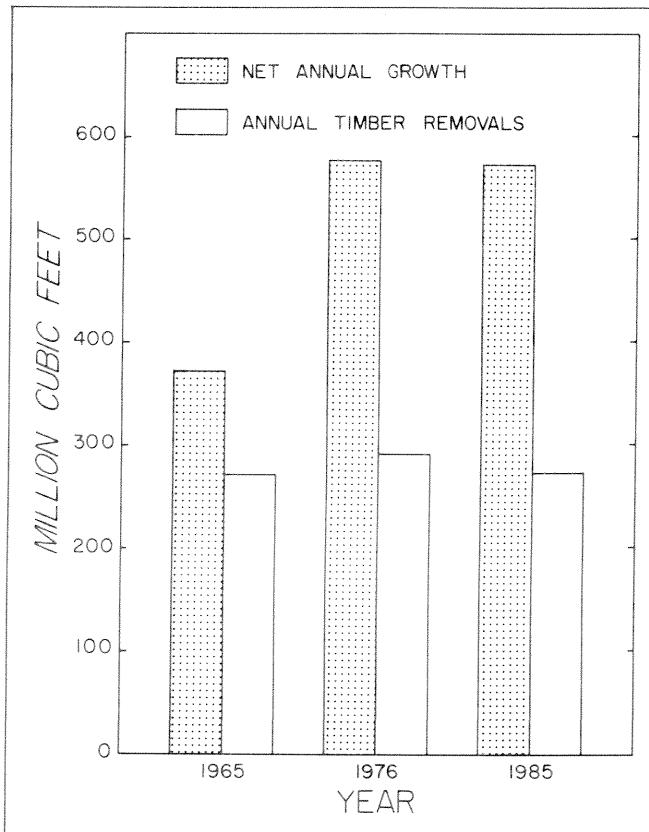


Figure 9.—Net annual growth and annual timber removals of hardwood growing stock, 1965, 1976, and 1985.

Regionally, net annual growth per acre was highest in the Coastal Plain with 63 cubic feet and lowest in the Northern Mountains at 35 cubic feet. Growth rates approximated the State average in the remaining regions. Per-acre growth decreased in four of the five Survey Units, with only the Southern Mountains showing an overall increase.

The softwood component of per-acre growth fell by 6 percent. By ownership, softwood growth per acre decreased by 8 percent on public and 13 percent on NIPF lands. In contrast to these declines, softwood growth per acre was up 14 percent on forest industry land (fig. 10). This increase was due in part to the younger average age of softwood stands and higher proportion of plantations on forest industry land than on NIPF or public lands. Per-acre softwood growth was down in the Piedmont and Northern Mountains, but increased 3 percent in the Coastal Plain and 25 percent in the Southern Mountains. Rapid growth in loblolly pine plantations is responsible for the increase in the Coastal Plain, whereas growth of white pine is responsible for the boost in softwood growth in the Southern Mountains.

The hardwood component of per-acre growth fell by 6 percent. Although hardwood growth per acre was down on each of the major ownerships, the largest decline was on forest industry land where average hardwood growth per acre was down 15 percent. This decline resulted from emphasis on softwood management and conversion of some sites to pine. On NIPF

land, hardwood growth decreased by 5 percent; on public ownerships, it was down by 3 percent. Hardwood growth was down everywhere except in the Southern Mountains, where it was up 6 percent. Another factor affecting the decline in hardwood growth is the maturing of the hardwood resource.

Table III summarizes the various components of growth. Net growth is gross growth minus mortality. Gross growth consists of survivor growth, ingrowth, growth on ingrowth, growth on removals, and growth on mortality. Survivor growth is the volume increment on trees that are 5.0 inches d.b.h. and larger at the beginning of the year and surviving until year's end. During the last remeasurement period, survivor growth accounted for 86 percent of gross growth. Ingrowth is the net volume of growing-stock trees crossing the 5.0-inch d.b.h. threshold during the year; any subsequent growth on these trees during the year is considered as growth on ingrowth. Together, these two components account for 13 percent of Virginia's gross growth. Growth on removals is growth on trees before they were harvested, and growth on mortality represents any growth on trees prior to death. Together, these two components provided the remaining 1 percent of gross growth in Virginia.

#### Mortality Up

Since 1976, net annual mortality of growing-stock trees increased from about 120 to 163 million cubic feet.

Softwood mortality increased 16 percent to 72 million cubic feet and reduced potential net growth of growing stock by 24 percent. Although softwood mortality increased, it was proportionate to the increase in inventory volume, which indicates that softwood mortality rates have been relatively stable. The leading identifiable causes of death to softwoods were insects and suppression, accounting for 26 and 19 million cubic feet of the mortality, respectively. Softwood mortality declined slightly in the Southern Piedmont but increased elsewhere.

Hardwood mortality climbed 59 percent to 91 million cubic feet and reduced potential net growth of growing stock by 14 percent. Hardwood mortality was up substantially more than the corresponding increase in inventory. The increasing age and density of the hardwood resource is partially responsible for the mortality increase. The leading identifiable cause of death to hardwoods was disease, resulting in 36 million cubic feet of the mortality. Weather and suppression were the next biggest contributors to hardwood mortality at 14 and 11 million cubic feet, respectively. Hardwood mortality increased statewide, but two-thirds of the increase occurred in the Mountain regions.

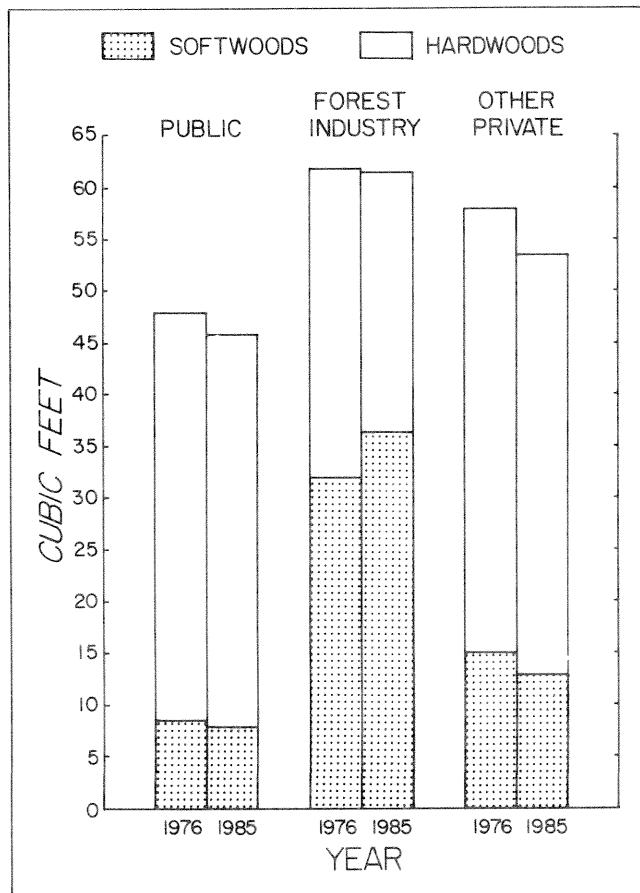


Figure 10.—Net annual growth of growing stock per acre, by ownership class and species group, 1976 to 1985.

Table III.—Annual components of change in the volume of growing stock on Virginia's timberland, by Survey Unit and species group, 1985

Survey Unit and species group	Gross growth	Components of growth					Mortality	Net growth	Removals	Net change
		Survivor growth	Ingrowth	Growth on ingrowth	Growth on removals	Growth on mortality				
- - - - - Million cubic feet - - - - -										
<b>Coastal Plain</b>										
Softwood	130.8	105.5	20.3	1.8	2.3	0.9	29.6	101.2	115.9	-14.7
Hardwood	147.9	129.6	15.3	.9	1.8	.3	16.3	131.6	105.0	+26.6
Total	278.7	235.1	35.6	2.7	4.1	1.2	45.9	232.8	220.9	+11.9
<b>Southern Piedmont</b>										
Softwood	85.0	64.7	17.3	1.5	1.1	.4	18.3	66.7	61.2	+5.5
Hardwood	147.8	128.3	16.7	1.0	1.5	.3	14.3	133.5	82.0	+51.5
Total	232.8	193.0	34.0	2.5	2.6	.7	32.6	200.2	143.2	+57.0
<b>Northern Piedmont</b>										
Softwood	38.6	29.6	7.9	.6	.3	.2	11.3	27.3	22.8	+4.5
Hardwood	112.5	102.3	8.7	.6	.6	.3	14.3	98.2	40.5	+57.7
Total	151.1	131.9	16.6	1.2	.9	.5	25.6	125.5	63.3	+62.2
<b>Northern Mountains</b>										
Softwood	18.1	14.8	3.0	.2	—	.1	6.2	11.9	3.2	+8.7
Hardwood	95.9	84.5	10.1	.7	.3	.3	19.9	76.0	20.1	+55.9
Total	114.0	99.3	13.1	.9	.3	.4	26.1	87.9	23.3	+64.6
<b>Southern Mountains</b>										
Softwood	28.7	23.6	4.3	.6	.1	.1	6.8	21.9	3.2	+18.7
Hardwood	159.6	148.5	9.7	.5	.4	.5	26.3	133.3	25.9	+107.4
Total	188.3	172.1	14.0	1.1	.5	.6	33.1	155.2	29.1	+126.1
<b>State</b>										
Softwood	301.2	238.2	52.8	4.7	3.8	1.7	72.2	229.0	206.3	+22.7
Hardwood	663.7	593.2	60.5	3.7	4.6	1.7	91.1	572.6	273.5	+299.1
Total	964.9	831.4	113.3	8.4	8.4	3.4	163.3	801.6	479.8	+321.8

## **Timber Removals and Forest Products Output**

Virginia's forests, in addition to being a major source of raw material for both the South- and mid-Atlantic regional forest product industries, provide for many nontimber uses. These include wildlife habitat, esthetic enjoyment, and outdoor recreation. Nonconsumptive uses will likely increase in the future, placing additional demands on Virginia's forests. Although other uses are important, this chapter addresses only the timber products output of Virginia's timberland resources.

Timber-related industries contribute significantly to the State's economy. These industries are the leading employer group in Virginia, and they generate an annual payroll second only to the chemical manufacturing industry. In 1984, 1,364 establishments engaged in some aspect of forest products manufacturing. These firms employed more than 54,000 workers and supported an annual payroll in excess of \$917 million (U.S. Department of Commerce 1986). Roundwood timber products accounted for more than 48 percent of the total value of all major agricultural products produced in the State during that year.

### **Sources of Timber Removals Data**

Appendix tables 36–40 provide estimates of annual timber removals and product output for the period between 1976 and 1985. Information presented in these tables was derived from several sources. Total annual volume of trees removed from timberland, as well as the volume of removals associated with timberland diverted to nonforest uses, was estimated from the remeasurement of permanent ground samples.

Estimates of annual wood receipts, product output, residue production, and residue disposal were obtained from mail canvasses of all primary wood-using mills in the State. Canvasses of pulpmills within the State have been conducted annually since 1960. Mail canvasses of other primary wood-using plants were first conducted in 1965 and again in 1967. For years corresponding to the latest survey period, this information was collected for calendar years 1976, 1978, 1980, and 1984. Values in appendix tables 36–40 are composite averages of the latest four studies.



*Photo courtesy of the Virginia Department of Forestry.*

Average rates of felled-tree utilization were obtained from measurements collected at active logging operations throughout the State. These rates were applied to removals data from permanent plot remeasurements to estimate the volume of logging residues associated with the unused merchantable portions of growing-stock trees harvested for products. Logging residues also include the merchantable portions of whole growing-stock trees destroyed during the course of timber harvesting operations and not used.

Finally, estimates of total fuelwood use, and fuelwood cut from nonforest land are based on findings reported by Skog and Waterson (1986). The proportion of total fuelwood removals from timberland was determined from plot remeasurement data.

#### **Annual Removals of Growing Stock Decline**

Annual growing-stock removals of all species averaged 480 million cubic feet between 1976 and 1985 (appendix table 38). This represents a decline of about 3 percent since the previous survey period. Softwood removals remained fairly constant at 206 million cubic feet. Average annual hardwood removals were down by 17 million cubic feet, or 6 percent, and accounted for all of the decline.

Since 1976, the relationship between growth and removals has remained about the same for both softwoods and hard-

woods. Softwood net annual growth exceeds removals by 11 percent, and hardwood growth still exceeds removals by about 2:1.

By ownership, 73 percent of all growing-stock removals came from NIPF land, 22 percent from forest industry land, and 5 percent from public land. Since 1976, annual removals of growing stock have declined on both public and NIPF lands by 51 and 5 percent, respectively, but have increased by 30 percent on forest industry lands. These trends were similar for both softwoods and hardwoods.

By tree size, the proportions of growing-stock removals from poletimber, small sawtimber, and large sawtimber trees have remained about the same since the last survey.

#### **Timber Utilization Improves**

Since 1976, 85 percent of all softwood and 62 percent of all hardwood growing-stock removals have been used for industrial roundwood products (appendix table 38). When all species are combined, 71 percent of total growing-stock removals were used for industrial products. Another 9 percent of growing-stock removals were used for residential fuelwood, bringing the total utilized portion of growing-stock removals to 80 percent. Logging residues associated with timber harvesting operations accounted for 9 percent of all growing-stock removals. The remaining 11 percent of the annual removal of

Table IV.—Industrial output of Virginia's timber products from roundwood, by product, species group, and year of survey

Product and species group	Year of survey			
	1976	1978	1980	1984
----- Thousand cubic feet -----				
<b>Saw logs</b>				
Softwood	80,157	91,443	91,929	92,533
Hardwood	109,129	108,349	109,238	131,921
Total	189,286	199,792	201,167	224,454
<b>Veneer logs and bolts</b>				
Softwood	8,273	9,390	6,369	15,056
Hardwood	2,693	4,273	3,022	4,182
Total	10,966	13,663	9,391	19,238
<b>Pulpwood<sup>a</sup></b>				
Softwood	73,875	67,936	84,996	102,555
Hardwood	75,062	70,884	79,746	109,171
Total	148,937	138,820	164,742	211,726
<b>Other industrial</b>				
Softwood	3,918	3,877	2,030	5,470
Hardwood	2,949	3,719	2,754	2,368
Total	6,867	7,596	4,784	7,838
<b>All products</b>				
Softwood	166,223	172,646	185,324	215,614
Hardwood	189,833	187,225	194,760	247,642
Total	356,056	359,871	380,084	463,256

<sup>a</sup> Includes roundwood chipped.

growing stock resulted from TSI operations and land use changes, where removed trees were not used for industrial or domestic roundwood products. Some of the trees on land cleared for nonforest use are still standing but are now in an urban or agricultural setting.

Even though growing-stock removals have declined slightly, output of industrial roundwood products has increased since 1976. This seemingly contradictory trend indicates improvements in two areas. These improvements have extended growing-stock supplies, and they explain why the annual output of 514 million cubic feet of roundwood products surpasses the total volume of growing-stock removals by 34 million cubic feet.

First, more complete utilization of harvested growing-stock timber resulted in fewer logging residues. During the latest period, fewer than 42 million cubic feet of logging residues were left in the woods each year, a reduction of 11 percent. Although some of the reduction was due to the overall decline in growing-stock removals, improvements in the utilization of harvested timber are definitely indicated. In 1976, 85 percent of softwood and 71 percent of hardwood growing-stock removals were used for roundwood products (including domestic fuelwood). Since then, these percentages have increased to 88 and 75 percent, respectively. Utilization studies reveal improvements in utilization of timber cut for all roundwood products, both softwoods and hardwoods, and for small and large trees. The most significant change is a 5-percent increase in the utilization of poletimber-size hardwoods. Although the most recent improvement in utilization of growing-stock material is a continuation of trends from previous surveys, the magnitude of change is less than measured between 1965 and 1976.

Second, an increasing amount of roundwood products is being produced from non-growing-stock material. In 1976, growing-stock removals made up 82 percent of the total roundwood product output (appendix table 37). Since 1976, only 75 percent of the total roundwood product output has come from growing stock. Almost 5 percent came from cull trees on timberland. Salvageable dead trees accounted for an additional 5 percent of roundwood product output. Another 15 percent of the total came from "other sources"—saplings; stumps, tops, and limbs of trees on timberland; and from trees on nonforest land such as in fencerows and wooded pastures. Comparisons with data from 1976 indicate substantial increases in the utilization of material from salvageable dead trees and the other sources. Most of the improvement is related to a larger amount of this non-growing-stock material used for domestic fuelwood. However, the volume of fuelwood produced from these sources was probably underestimated in 1976, and comparisons of current fuelwood figures with previous figures could be misleading.

### Interim Trends in Industrial Products Output

Much of the following discussion concerning industrial timber products output deals with the average annual output for the period between 1976 and 1985. The average output of industrial timber products has increased since 1976, but this average change does not fully reflect significant increases in product output toward the end of the 1976–1985 period. To highlight some of the fluctuations in annual industrial output during the remeasurement period, results of industry canvasses for available years are summarized in table IV.

In table IV, estimates of pulpwood produced from roundwood do not match the output from roundwood published in annual pulpwood production reports. An accurate distinction between roundwood chips and residue chips sold to pulp companies for fiber cannot be made from pulpwood production data alone. More accurate estimates of the true breakdown are obtained from sawmills and other producers that supply the chips to pulp companies. This information is available for those years when complete industry canvasses are conducted. Estimates of pulpwood production posted in table IV have therefore been adjusted to reflect the more accurate measures of roundwood chips.

Between 1976 and 1980, total industrial roundwood output had increased by only 7 percent. By 1984, however, annual industrial output had increased by another 22 percent, indicating that most of the increased production since 1976 took place during the latter half of the survey remeasurement period. Softwood output increased each canvass year, with an overall increase of 30 percent, or 49 million cubic feet between 1976 and 1984. Hardwood output dipped slightly between 1976 and 1978, but had increased by 30 percent by 1984. Although no industry canvass is available for 1985, comparison of forest products tax revenues indicates industrial output in 1985 probably surpassed that of 1984.

### Average Annual Saw-Log Output Increases

Saw logs are the leading roundwood product in Virginia, accounting for 39 percent of the total roundwood output (appendix table 36). Average annual production of saw logs from roundwood totaled 199 million cubic feet, an increase of 5 percent from the estimate in 1976. Softwoods were responsible for most of the gain, as softwood saw-log output from roundwood rose from 80 to 88 million cubic feet. Hardwood saw-log output also increased—from 109 to 111 million cubic feet. Another 2 million cubic feet of saw logs were produced from plant byproducts such as veneer cores. Use of plant byproducts boosted total annual saw-log output from all sources and all species to about 200 million cubic feet.

The most recent industry canvass indicates that Virginia is a net exporter of softwood saw logs. This is a change from 1976 when softwood saw-log imports exceeded exports by almost 4 million cubic feet, or by 60 percent. About 88 percent of the softwood saw logs produced in 1984 were retained for processing in Virginia. About 12 percent, or 11 million cubic feet,

was exported to other States. Almost 10 million cubic feet were imported from domestic sources, bringing Virginia's consumption of softwood saw logs in 1984 to 91 million cubic feet. Virginia was a net importer of hardwood saw logs in 1984. In all, 7 million cubic feet were imported and about 5 million cubic feet of hardwood saw logs were exported. Most imports and exports were between Virginia and North Carolina, but Virginia also traded saw logs with West Virginia, Kentucky, Tennessee, Maryland, and Pennsylvania.

The number of sawmills operating in Virginia has declined from 452 to 410 since 1976. About 39 percent of all mills now in operation had receipts totaling less than 1 million board feet. Another 45 percent had receipts averaging between 1.0 and 4.9 million board feet. By region, the greatest number of mills are located in the Southern Piedmont. However, nearly half of all mills with annual receipts greater than 5 million board feet are located in the Coastal Plain.

#### Pulpwood Production Continues Upward Trend

Pulpwood is the second leading timber product from roundwood in Virginia. Between 1976 and 1985, annual production averaged 163 million cubic feet, an increase of about 9 percent. Pulpwood accounts for 32 percent of the total output from roundwood, and half the pulpwood produced from roundwood was hardwood (appendix table 36). Both these proportions remained about the same as in 1976.

In addition to roundwood, 59 million cubic feet of plant byproducts were used for the production of fiber. While this represents an increase of 18 percent, the percentage of total pulp production from plant byproducts averaged 27 percent over the latest period—nearly the same as in 1976. As with roundwood, about half of the plant byproducts used for fiber was hardwood. When fiber produced from plant byproducts is added to that produced from roundwood, pulpwood is the primary timber product in the State, and accounts for nearly half of all industrial production.

Annual pulpwood production data for individual years between 1960 and 1985 are depicted in figure 11. These data include fiber produced from both roundwood and plant byproducts. Over the past 25 years, pulpwood production in Virginia has fluctuated considerably, but the general trend has sloped upward. In 1985, annual production totaled 3.5 million cords (about 264 million cubic feet)—nearly double the figure reported for 1960. Changes within the industry have resulted in the use of a wider variety of species. In 1960, softwoods accounted for three-fourths of the total pulpwood output. Beginning in 1966 and continuing through the early 1970's, softwood pulpwood production declined as use of hardwoods mounted. Since then, hardwood pulpwood production has rivaled softwood production, and both have increased consistently at about the same rate. Technological improvements such as press drying, high-density pressing, and improved fiber refining techniques are responsible for greater use of both soft- and hard-textured hardwoods in kraft linerboard and other paper products. A substantial price differential between pine and hardwood stumps has also contributed to an increase in hardwood use as these technological advances have evolved.

Since 1976, Virginia has remained a net importer of round pulpwood for both softwood and hardwood fiber production (excluding roundwood chips). Pulpwood production data for 1985 show that softwood imports exceeded exports by 56,000 cords, or 43 percent. North Carolina, Maryland, and West Virginia were the principal sources of softwood imports, which totaled 186,000 cords. About 498,000 cords of hardwood roundwood were imported in 1985. Hardwood imports exceeded exports by 389,000 cords. North Carolina and West Virginia supplied nearly all of Virginia's hardwood imports. Altogether, net imports accounted for 17 percent of softwood and 31 percent of hardwood roundwood consumed by pulpmills within the State.

Nine pulpmills are currently in operation. The opening of one new mill in 1979 added 520 tons of pulping capacity, while the closing of another reduced capacity by 300 tons. Total daily pulping capacity has risen from 7,200 to 8,400 tons, mostly due to expansion and renovation.

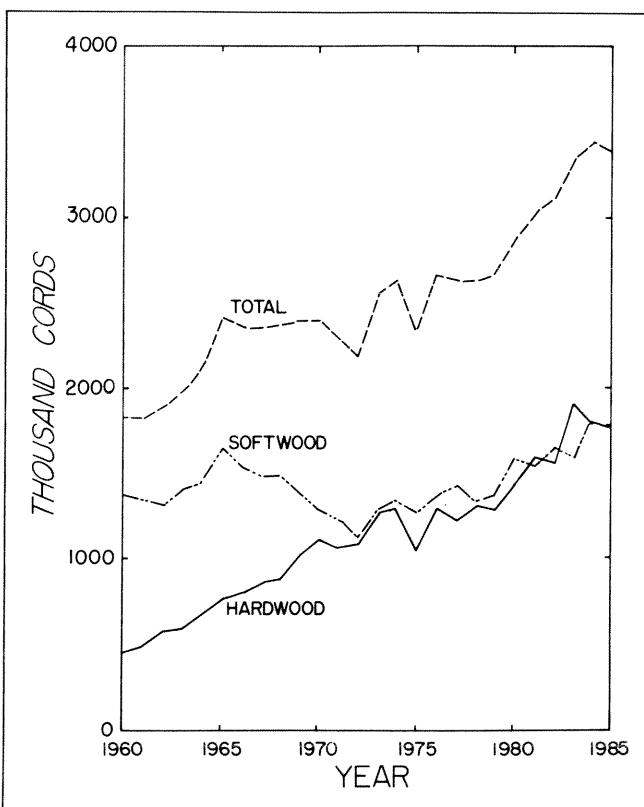


Figure 11.—Pulpwood production in Virginia, 1960 to 1985.

#### Veneer-Log Production Increases

The annual output of veneer logs averaged 13.1 million cubic feet between 1976 and 1985, an increase of 19 percent. Production of veneer logs is responsible for 3 percent of the total output from roundwood (appendix table 36). Although overall production has generally been increasing for the past two decades, there has been a significant shift in the species used. Virginia's first pine plywood plant began operation in 1965; at that time, softwoods provided only 3 percent of total veneer-log production. By 1976, the softwood share of veneer-

log production had increased to 75 percent. Since 1976, the ratio of softwood veneer logs has stabilized, and averaged about 74 percent between 1976 and 1985. Hardwood veneer-log output has dropped significantly from that recorded during the mid-1960's. The trend since 1976, however, has been upward. In 1984 hardwood veneer-log production totaled 4.2 million cubic feet compared with 2.7 million cubic feet in 1976 (table IV).

Residential construction has traditionally been the largest market for softwood plywood, furnishing about half the demand for sheathing, decking, and exterior siding (McKeever and Gary 1983). For individual years during the latest remeasurement period, fluctuations in veneer output have coincided with changes affecting residential construction. Yearly softwood veneer-log output in 1984 surpassed the output reported for 1976 by 82 percent, with most of the increase occurring in the last canvass year. Output of veneer logs was suppressed in 1980. For the Nation, the number of housing starts, along with the level of furniture and fixture production, dropped significantly from 1979 to 1980 and did not recover to 1979 levels until 1983 (Ulrich 1987).

Since 1976, the number of veneer mills in Virginia increased from 10 to 11. Some mills are involved in the production of more than one type of veneer product. Two mills are currently producing softwood plywood, eight are producing hardwood plywood, and seven are producing hardwood veneer (Forest Industries 1986). All of Virginia's production of veneer logs was from roundwood, and 99 percent of the total output came from sawtimber trees. The remaining 1 percent came from poletimber, cull trees, and other sources (appendix table 37).

Virginia was a net importer of both hardwood and softwood peeler logs in 1984. North Carolina was the source of most of Virginia's softwood imports. North Carolina, West Virginia, Pennsylvania, and about a dozen other States and foreign countries were outside sources of hardwood peeler logs. Almost all of Virginia's softwood peeler-log production was retained and processed in the State; about 83 percent of the hardwood output was retained, with most of the exported volume going to North Carolina.

### **Other Industrial Timber Products**

The combined output of all other industrial products from roundwood, which includes poles, pilings, posts, wood composition board, and other miscellaneous industrial products, averaged 6.7 million cubic feet per year between 1976 and 1985, about the same level as in 1976. When output from

plant byproducts are included, total production during the latest period averaged 14.6 million cubic feet (appendix table 36), an increase of 25 percent. Plant byproducts made up 41 percent of other industrial products output in 1976, but have since increased to 54 percent. The use of more residues for production of other industrial products reflects a higher proportion of composition-board products such as particleboard, oriented strandboard, and waferboard.

Until recently, most composition-board products have traditionally been used in nonstructural applications such as insulation or core stock for cabinets and furniture. With the development of waferboard and oriented strandboard, other major uses now include floor underlayment, roof decking, and exterior sheathing. The desirable structural properties and cheaper manufacturing costs of some of these new board products suggest they will eventually compete in many markets now dominated by softwood plywood. In the past, composition-board manufacturers have relied heavily on inexpensive and readily available sawmill residues. Improvements in lumber utilization technology, increased use of residues for industrial fuel, and use of residues for other products could make it more difficult to obtain this raw material in the future. On the other hand, the abundance of low-quality hardwoods, ideal for the manufacture of some board products, could easily provide more than enough raw material to supply a growing industry. Hardwoods accounted for only 37 percent of the total output of other industrial products between 1976 and 1985. As the manufacture and use of composition-board products increase, hardwoods will likely provide a greater share of the output.

The number of mills producing other industrial timber products has risen from 15 to 38. Of the mills now in operation, 10 are involved in the manufacture of nonstructural composition-board products. Three other mills operating in Virginia are producing structural-board products such as waferboard and oriented strandboard (Forest Industries 1986).

### **Domestic Fuelwood Accounts for One-fourth of Roundwood Output**

The annual output of fuelwood from roundwood is estimated at 132 million cubic feet (appendix table 36). This represents nearly 26 percent of the total roundwood produced in the State. Because of large increases in the cost of electricity and other home-heating fuels over the last 15 years, many homeowners have turned to wood as an alternative energy source. Use of firewood in private homes, as well as a source of industrial energy, has increased over the last decade. Much of the increased output of fuelwood has originated from non-growing-stock sources. More than half the 12 million cubic feet of softwoods used for fuel came from sources other than growing stock. Of the 121 million cubic feet of hardwood roundwood harvested for fuel, 8 percent came from cull trees, 19 percent from salvable-dead trees, and 42 percent from the unmerchantable portions of growing-stock trees and nontimberland.

### **Utilization of Plant Residues Improves**

Since 1976, an average of 60 million cubic feet of coarse residues (including veneer cores, slabs, and edgings) and 39 million cubic feet of fine residues (sawdust and shavings) were generated each year during the production of primary timber products. About 92 percent of the coarse and fine residues were generated during the processing of saw logs, and 7 percent from the manufacture of veneer products.

Of the total wood residues produced annually by primary processors between 1976 and 1985, only 11.4 million cubic feet, or 11 percent, were unused (appendix table 40). Utilization of these byproducts improved dramatically during the remeasurement period. In 1976, 20 percent of all wood residues were unused. By the end of the period, however, this proportion was reduced to 8 percent.

Of the total wood residues generated each year, 53 percent was used for the manufacture of fiber products, 17 percent for industrial fuel, and 7 percent for composition-board products. The remaining 12 percent was used for various other miscellaneous products, such as charcoal, litter, and mulch. Since 1976, plant byproducts have provided raw material for 15 percent of the total industrial timber product output.

In addition to wood residues, 1.3 million tons of bark were generated annually. About 59 percent of the bark was used for industrial fuel, and 30 percent went for a variety of miscellaneous uses, primarily litter, mulch, and landscape nuggets. Only 11 percent was not used.



## Timber Supply Outlook

Prospective timber supplies available during the next two or three decades are largely constrained by the current forest type and stand age structure of the resource. In this chapter, we review some of the past practices that have played key roles in shaping the resource. We also examine some of the relationships between the present structure of the resource and future supplies. We then use simulation models to estimate prospective 30-year timber supplies.

### Rates of Harvesting and Regeneration

The long-term balance between rates of harvesting and regeneration is among the most important of all factors responsible for shaping the resource and influencing timber supplies. To evaluate prospective supplies, it is helpful to examine recent past relationships between these two practices.

Between 1977 and 1986, 183,000 acres of timberland underwent a final harvest each year and were retained in forest (table V). This total does not include timberland that was harvested and subsequently diverted to a nonforest land use. During this same period 173,000 acres, or the equivalent of 94 percent of the area harvested, annually regenerated to a manageable stand of timber (table VI). Manageable stands are at least 60-percent stocked with growing-stock trees of similar size.

All of the net gap between harvesting and regeneration is traceable to hardwood stands. Pine harvest:regeneration ratios in Virginia are among the best in the Southeast. Since 1977, 62,000 acres of pine stands annually experienced a final harvest and were retained in timberland, while 66,000 acres regenerated each year to a pine forest type. This includes regeneration by both natural and artificial methods, and also includes 12,000 acres of pine established on nonforest land. In addition, another 18,000 acres of artificially regenerated stands resulted in an oak-pine forest type. Analysis of data from previous inventories indicates that most oak-pine stands with evidence of artificial regeneration eventually become dominated by the planted pines. For this reason, artificially regenerated oak-pine stands will be grouped with successfully regenerated pine plantations in the following discussion of pine regeneration rates. If these acres are added to the 66,000 acres of pine stands established each year, current rates of pine regeneration and harvest indicate that 135 acres of new pine forest will eventually replace every 100 acres of pines harvested and subsequently retained in forest between 1977 and 1986.

Although more new pine stands were established than were harvested and retained in forest, diversions of pine timberland to urban, agricultural, and other nonforest land uses have caused the net decline of pine acreage in the State. If diversions of pine timberland to nonforest are considered, only 85 percent of the pine timberland harvested or diverted since 1977 has been replaced.

On NIPF land, 40,000 acres of pine forest were harvested annually and kept in timberland, but 46,000 acres of newly estab-

lished natural pine, planted pine, and planted oak-pine stands were added. Forest industry replaced 20,000 acres of harvested pine stands with 34,000 acres of pine and planted oak-pine stands. On public timberland, 2,000 acres of harvested pine stands were replaced by 3,000 acres of new pines each year.

Of the stands successfully regenerated to pine during the latest survey period, 66,000 acres, or 79 percent, were planted. An additional 8,000 acres showed evidence of artificial regeneration, but these plantations were either unsuccessful or planted to hardwood species. In total, nearly 74,000 acres were planted each year between 1977 and 1986. About 49 percent of all planting efforts took place on NIPF land, 47 percent on forest industry land, and 4 percent on public land. When compared with the period between 1966 and 1976, overall planting has increased by 27 percent. The largest gains were realized on timberland held by NIPF owners, where planting rates climbed from 26,000 to 36,000 acres per year. The area planted on lands managed by forest industry rose from 31,000 to 35,000 acres. Rates of planting on public land more than tripled and averaged close to 3,000 acres per year.

Hardwood harvest:regeneration ratios are not as good as those for softwoods. Between 1977 and 1986, 121,000 acres supporting hardwood stands were harvested each year and retained in timberland. More than 71 percent of this harvesting took place in upland hardwood stands, 20 percent in oak-pine stands, and 9 percent in lowland hardwood stands. During the same period, 89,000 acres successfully regenerated to manageable hardwood and natural oak-pine stands, effectively replacing only 73 percent of the harvested hardwood stands. Although some of these harvested acres were converted to pine, much of the deficit was caused by the replacement of harvested hardwood stands with poorly stocked nonmanageable stands. Failure to adequately provide for hardwood regeneration at the time of final harvest is the source of the problem. Of all hardwood stands that experienced a final harvest since 1977, 37 percent do not currently have enough regeneration to constitute a manageable stand. Without further treatment, many of these stands will remain poorly stocked for decades. Counting diversions to nonforest, only 48 percent of all manageable hardwood and oak-pine acreage harvested or diverted since 1977 has been replaced.

### Additional Cutting on 86,000 Acres Annually

Aside from final harvesting, significant volumes of timber were removed from another 86,000 acres of forest each year in the form of partial harvests, commercial thinnings, and other miscellaneous cutting. Partial harvests took place on an average of 34,000 acres annually. Most partial harvests were actually high-grading, with only a minor amount of true selection cutting. Almost all partial harvesting was done in oak-pine and upland hardwood stands. About 15,000 acres of timberland were commercially thinned each year. Seventy percent of all thinning operations were performed in natural and planted pine stands. TSI and other miscellaneous cuttings occurred on 38,000 acres each year.

Table V.—Area of Virginia's timberland treated or disturbed annually, by broad management and ownership classes, 1977–1986

Broad management <sup>a</sup> and ownership classes <sup>b</sup>	Major stand treatments				Natural disturbance	
	Final harvest	Partial harvest <sup>c</sup>	Commercial thinning	Other cutting		
----- Acres -----						
<b>Pine plantation</b>						
Public	—	—	—	359	—	
Forest industry	595	—	2,798	673	1,654	
Other private	908	—	2,290	519	1,781	
Total	1,503	—	5,088	1,551	3,435	
<b>Natural Pine</b>						
Public	1,808	307	372	456	2,529	
Forest industry	19,584	318	1,207	248	5,619	
Other private	38,846	2,903	3,454	3,918	25,608	
Total	60,238	3,528	5,033	4,622	33,756	
<b>Oak-pine</b>						
Public	1,612	359	—	—	2,446	
Forest industry	6,247	503	248	277	1,429	
Other private	16,901	2,625	386	5,212	10,627	
Total	24,760	3,487	634	2,489	14,502	
<b>Upland hardwood</b>						
Public	3,381	1,248	977	4,723	21,857	
Forest industry	17,836	1,762	—	816	6,759	
Other private	65,137	23,385	2,533	19,380	54,492	
Total	86,354	26,395	3,510	24,919	83,108	
<b>Lowland hardwood</b>						
Public	—	—	—	—	110	
Forest industry	867	—	—	310	2,242	
Other private	9,418	279	295	1,095	7,240	
Total	10,285	279	295	1,405	9,592	
<b>All classes</b>						
Public	6,801	1,914	1,349	5,538	26,942	
Forest industry	45,129	2,583	4,253	2,324	17,703	
Other private	131,210	29,192	8,958	30,124	99,748	
Total	183,140	33,689	14,560	37,986	144,393	

<sup>a</sup> Broad management class before treatment or disturbance.

<sup>b</sup> Ownership class in 1986. Forest industry includes lands under long-term lease.

<sup>c</sup> Includes high-grading and some selective cutting.

Table VI.—Area of Virginia's timberland regenerated annually, by broad management and ownership classes, 1977–1986

Broad management <sup>a</sup> and ownership classes <sup>b</sup>	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								
<b>Pine plantation</b>								
Public	1,983	1,499	—	484	—	—	—	
Forest industry	24,400	19,913	—	4,487	—	—	—	
Other private	22,372	15,092	—	4,334	—	2,386	560	
Total	48,755	36,504	—	9,305	—	2,386	560	
<b>Natural pine</b>								
Public	890	—	—	—	—	—	890	
Forest industry	1,623	—	1,376	—	247	—	—	
Other private	14,276	—	4,082	—	1,879	—	8,315	
Total	16,789	—	5,458	—	2,126	—	9,205	
<b>Oak-pine</b>								
Public	814	359	455	—	—	—	—	
Forest industry	9,782	6,264	1,227	1,714	—	—	577	
Other private	21,978	7,505	10,179	2,070	701	—	1,523	
Total	32,574	14,128	11,861	3,784	701	—	2,100	
<b>Upland hardwood</b>								
Public	5,671	53	3,804	444	812	—	558	
Forest industry	9,256	318	6,740	1,091	1,107	—	—	
Other private	56,032	4,593	36,596	—	5,422	—	9,421	
Total	70,959	4,964	47,140	1,535	7,341	—	9,979	
<b>Lowland hardwood</b>								
Public	—	—	—	—	—	—	—	
Forest industry	1,224	687	227	310	—	—	—	
Other private	2,202	—	1,543	—	258	—	401	
Total	3,426	687	1,770	310	258	—	401	
<b>All classes</b>								
Public	9,358	1,911	4,259	928	812	—	1,448	
Forest industry	46,285	27,182	9,570	7,602	1,354	—	577	
Other private	116,860	27,190	52,400	6,404	8,260	2,386	20,220	
Total	172,503	56,283	66,229	14,934	10,426	2,386	22,245	

<sup>a</sup> Broad management class after regeneration.

<sup>b</sup> Ownership class in 1986. Forest industry includes lands under long-term lease.

### Age Structure of the Pine Resource

The present structure of Virginia's timberland, in terms of stand age and broad forest type composition, is shown in figure 12. In the illustration, acres of timberland are divided into pine and hardwood forest types. The pine types have been further subdivided into natural pine stands, pine plantations, and planted pine stands that resulted in an oak-pine forest type. Oak-pine stands of natural origin have been grouped with the hardwoods. Stands less than 60 percent stocked are excluded from the age classes and designated as lacking a manageable stand.

The success of Virginia's planting programs is clearly visible in figure 12. Rates of artificial regeneration have accelerated dramatically over the past 30 years. Altogether, 1.4 million acres, or 40 percent of the State's manageable pine stands, are now in pine plantations and planted oak-pine stands. To date, these plantations have contributed little to softwood supplies. During the latest survey period, only 5 percent of softwood growing-stock removals came from planted stands. However, the age profile of the planted component of Virginia's pine resource indicates that plantations will become a major source of softwood timber supplies within the next 10 years because a fair amount of planted acreage is now in the 21-30 year category. Of all planted pine and oak-pine stands in the State, 49 percent is in the Coastal Plain, 34 percent in the Southern Piedmont, 12 percent in the Northern Piedmont, and 5 percent in the Northern and Southern Mountains.

Compared with older plantations, the proportion of planted pine stands dominated by hardwood stocking is notably higher in the 0-10 year age class. These are the planted oak-pine stands in figure 12. This increase is due to a higher percentage of plantations established on cutover timberland, where hardwood competition is more intense than on nonforest land. In addition, many of these young plantations will likely be treated for hardwood competition and thus will eventually be reclassified to pine forest types as they move into older age classes.

The age distribution of Virginia's pine resource generally depicts a balanced situation for short-term future softwood supplies. About 61 percent of all manageable pine stands in the State are now 30 years of age or younger. Over the next two decades or so, this relatively large acreage currently in young pine stands should be enough to replace older stands as they are harvested, and might be enough to sustain moderate increases from current supply levels. Beyond that time, the ability to maintain increased levels of pine supplies is less certain, since the acreage of pine stands in the youngest age class is 9 percent less than the pine acreage in the 11-20 year age class. This dropoff could mean that overall rates of pine regeneration peaked about 10 years ago. Even so, there is still more acreage in the 0-10 year class than any older age class except the 11-20 year class. If declines in the youngest age class continue into the next decade, they could have an adverse impact on long-term supplies (beyond 30 years).

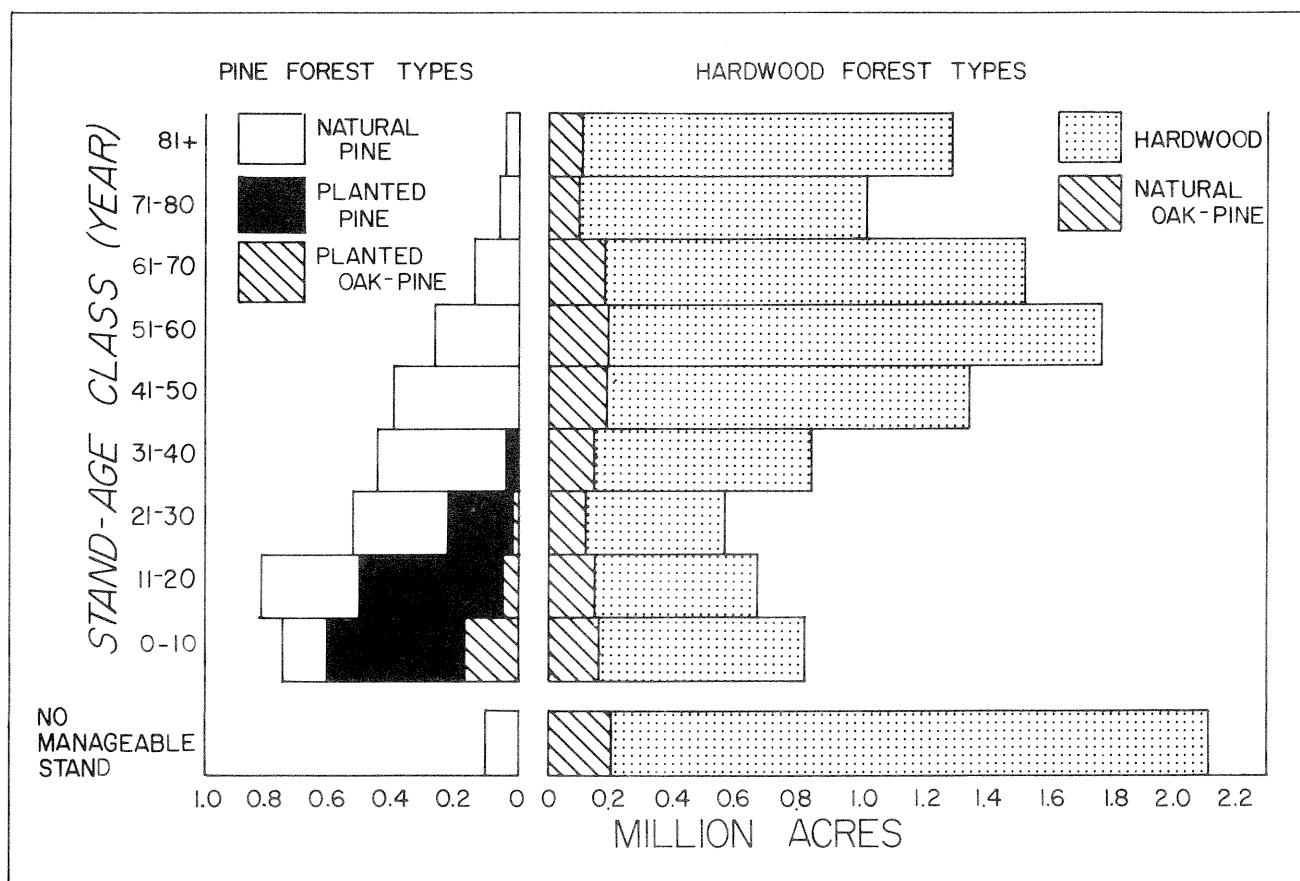


Figure 12.—Stand-age profile of Virginia's timberland, by broad management classes, 1986.

The net reduction of pine acreage in the youngest age class is largely attributed to diversions of pine timberland to nonforest land uses by NIPF owners. About half the reduction in the 0–10 age class of pine stands took place in the Northern Piedmont where urban development is particularly heavy. As older pine stands are harvested and diverted to nonforest, less acreage is available for pine regeneration. A smaller amount of nonforest acreage naturally reverting to pine forest is also contributing to the decline. Because a higher percentage of the land available for pine regeneration is being artificially regenerated, reductions in the youngest age class are confined to natural stands. The shifting composition of the pine resource from natural to planted stands and the smaller amounts of acreage in the youngest age class are also responsible for reductions in the numbers of 2- and 4-inch pines.

Pine stand-age profiles by ownership differ somewhat from the overall pine profile. Older pine stands on forest industry land are uncommon. Only 17 percent of the manageable pine stands on these lands are over 30 years of age. In contrast, almost half the pine stands on NIPF land are older than 30. Young natural pine stands on forest industry land are also becoming rare. On industry land, about 87 percent of all pine stands 30 years old and younger have been artificially regenerated. On NIPF land, only 50 percent of pine stands in the same age bracket have been planted. Plantation management on forest industry land is fast approaching equilibrium. If forest industry regenerates the same amount of pine acreage during the next 10 years as they have for the past two decades, the number of acres in the three youngest age classes on industry land will almost be equal.

Between 1977 and 1986, 66 percent of all pine growing-stock removals came from NIPF timberland, 30 percent from forest industry, and 4 percent from public holdings. Since almost all the recent reduction in pine stands 0–10 years old took place on NIPF land, some shifting of pine supplies from NIPF owners to forest industry could occur during the next 30 years. The NIPF share of pine stands between 0–10 years old is now 54 percent, 43 percent is owned by forest industry, and 3 percent occurs on public land. However, these latest shifts could be somewhat buffered by the relatively heavy accumulation of older pine stands on NIPF land. For example, the age distribution of pine stands on NIPF land suggests an average rotation length of 57 years. The average rotation of forest industry pine stands is approximately 32 years. If the rotation length of NIPF stands is shortened, their share of future pine supplies would increase.

### Age Structure of the Hardwood Resource

The age profiles in figure 12 reveal two features about Virginia's hardwood resource that are particularly striking. First, 2.1 million acres, or 18 percent, of all hardwood and natural oak–pine stands lack a manageable stand of timber. Far too many hardwood stands are in poor condition, and no obvious sign of improvement is evident, since the percentage of nonmanageable hardwood stands in existence now is about the same as in 1977. Conditions on some of these acres will eventually improve, but most will require treatment before they can contribute to future supplies. Opportunities to improve poorly stocked stands are discussed in the next chapter.

Second, there is a large accumulation of hardwood stands in the older age classes. Excluding those acres that are non-manageable, 71 percent of all hardwood stands are older than 40 years. This buildup is the result of historically low rates of removals. In order to improve the age distribution of hardwood stands, rates of hardwood harvesting and regeneration will have to accelerate dramatically. On the average, the rotation length of hardwood stands in Virginia is well over 100 years.

In addition to a more balanced age distribution, increased harvesting of mature and overmature hardwood stands offers a significant opportunity to boost future timber supplies; this would likely relieve some of the demand pressure on the softwood resource. The present relationship between hardwood growth and removals indicates that hardwood growing-stock removals could almost immediately be doubled without reducing the hardwood inventory. However, the ability to double hardwood removals is doubtful because of factors limiting the availability of the resource. Potential hardwood supplies must be discounted for such factors as adverse operating conditions and restrictions imposed by a variety of owners with management objectives other than timber production. On the other hand, a serious effort to harvest and regenerate overmature hardwood stands would eventually increase growth (and therefore potential removals) as older stands are converted to more productive young stands.

Past levels of demand for hardwoods have been inadequate to encourage efficient management of the resource. To boost removals high enough to improve hardwood management will require an expansion of hardwood markets. Many hardwood producers are able to use only a limited range of species and tree sizes. Since hardwoods rarely grow in pure stands, it is often difficult for producers to locate stands with sufficient quantities of trees that are economically harvestable. This situation also encourages high-grading and is contributing to the large number of nonmanageable hardwood stands. Recent advances in hardwood utilization technology offer some hope that an expansion of hardwood markets may currently be underway.

Although not likely, a deficiency of well-stocked stands less than 40 years old could pose a threat to future hardwood supplies. If the harvesting of older hardwood stands accelerates too rapidly, there is some danger they might not be adequately replenished by young stands. This shortage is most severe in the 21–30 year age class.

### Timber Supply Projections

In this section, we focus on a more tangible appraisal of Virginia's future timber supplies. Timber inventory, growth, and removal volumes are estimated at 10-year intervals for the next 30 years. These estimates are provided mainly in an effort to identify developing trends and expose potential problems in time to take corrective measures. As always, such projections should not be viewed as bold forecasts but as reasonable estimates of future supplies, if the assumptions behind them hold true.

The projections discussed below are drawn from a 12-State regional study of timber resources in the Southern United States (USDA Forest Service 1987). The Virginia projections pre-

sented here were essentially developed during the course of that analysis. More detailed descriptions of the procedures, models, and assumptions used for the projections are included in the Forest Service report.

Several models were used to accomplish the projections. Prospective changes affecting Virginia's forest land base were simulated by the Southern Acreage Model (SAM). SAM links changes in the forest land base to expected changes related to population, personal income, and income from forestry and agricultural investments (Alig 1985). Estimates of inventory volume and growth were generated by the Timber Resource Inventory Model (TRIM) (Tedder 1983). TRIM is an area-based yield table system that tracks acreage through an array of strata defined by different combinations of ownership, forest type, site quality, stocking level, and management intensity. Starting with the current inventory, the model moves numbers of acres through time and accounts for shifting among the various strata. Volume and growth estimates are derived from empirical yield tables specific to each strata. The Timber Assessment Market Model (TAMM) was used to produce estimates of roundwood harvest (Adams and Haynes 1980). TAMM is a market equilibrium model that interfaces with TRIM to develop estimates of the demand for timber products. Since the demand is more appropriately tied to regional economies rather than State or local economies, projections of timber volume, growth, and removals were initially made at the Southeast and Midsouth regional levels. The State Allocation of Regional Inventory (SARI) model (Abt 1986) was then used to allocate the regional projections back to individual States. Results of the Virginia projections are summarized in appendix table 41.

Area of timberland in Virginia is expected to continue declining for the next two decades, after which it will stabilize at about 400,000 acres below the current 15.4 million acres. Practically all of the projected loss of forest acreage is on NIPF land. Area of timberland owned by forest industry is expected to increase by about 3 percent. By forest management type, all of the loss occurs in upland hardwood and natural pine stands. Area in pine plantations is projected to nearly double, from 1.2 to 2.3 million acres, by 2016. Acreage in pine plantations will likely surpass the acreage in natural pine stands around the year 2000.

Results of the projections suggest the long upward trend in timber inventory volume has almost run its course. For hardwoods and softwoods combined, only a 3-percent increase above the current inventory is projected, and this will likely occur between now and 1996. Beyond 1996, a 2-percent reduction in hardwood inventory more than offsets a small gain in the inventory of softwoods.

Between 1996 and 2016, softwood and hardwood inventories on NIPF land are expected to decline by 5 and 3 percent. On forest industry land, little change is projected in the inventory of softwoods, but hardwood inventories fall by 19 percent. Contrary to the situation on NIPF and forest industry lands, the overall inventory on public timberland is projected to increase by more than 17 percent after 1996. Across all ownerships, the

Virginia projections show a 2.4-fold increase in the inventory volume of pine plantations between now and 2016. By 2010, the inventory volume of pine plantations surpasses that of natural pine stands.

Recent reductions in the net annual growth of softwoods are expected to continue for another decade before growth turns back up after 1995. Practically all the anticipated reduction of softwood growth between now and 1995 occurs on NIPF land, where it drops by about 36 percent. This more than offsets an increase in the growth of softwoods on forest industry land. Because of higher proportions of pine plantations, softwood growth is projected to increase across all three major owner groups between 1995 and 2015. Anticipated gains in softwood growth are largely responsible for the slight increase in softwood inventory volume throughout the projection period.

Because of the historically tight growth-removal situation in Virginia, only a small increase in softwood removals is likely during the next 30 years. Annual removals of softwoods are projected to increase by only 12 percent. Most of the additional removals will come from forest industry land, where a 38-percent increase is indicated. As with projected gains in softwood inventory and growth, most additional softwood removals will come from pine plantations.

Growth projections portend a major reduction in the net annual growth of hardwoods in Virginia during the next 20 years. A 28-percent decline projected between now and 2005 is at least partially attributable to an accumulation of mature hardwood stands, resulting in slower growth and higher mortality rates. If projected increases in hardwood demand materialize, many of these overmature hardwood stands will be harvested. If they are properly regenerated, they will be replaced by young, vigorous stands with faster rates of growth. This scenario is the basis for an upturn in hardwood growth toward the end of the projection period.

Estimates of future timber demand call for a 40-percent increase in total annual removals of Virginia's growing-stock timber between 1985 and 2015. Since there is currently a large margin of hardwood growth over removals, and because of recent movement toward greater use of hardwoods for paper, composition-board products, and fuelwood, 88 percent of the anticipated increase was assigned to hardwoods. Annual removals of hardwoods in Virginia are projected to climb by more than 61 percent over the next 30 years, with most of the gain happening before 1995. All of this increase occurs on NIPF and public timberland, as reductions are expected in the volume of hardwood removals from forest industry land.

These projections reflect the impacts of past and present resource conditions and assumptions about future resource trends. Whether or not the projections actually come to pass, opportunities will always exist to improve prospective timber supplies during and beyond the next 30 years. Some of the more immediate opportunities to improve future supplies are discussed in the following chapter.

## Management Opportunities

Increased demands on a diminishing forest land base are certain to challenge the inherent growth capacity of all lands available for timber production. Efforts to efficiently manage the resource are constrained by the high costs of forest management, a diversity of owners with a variety of management objectives, environmental concerns, and a lack of adequate markets for certain tree species and sizes. All of this is further complicated by increasing competition from foreign timber imports, which threaten to displace domestic markets and jobs. These problems, however, only intensify the need to improve the quantity and quality of the resource on as many acres as possible.

The treatment opportunities discussed in this chapter are based on conditions encountered by field crews at each sample location. These opportunities describe the single most important action that could be undertaken to improve the general growth and quality of the stand. Table VII provides a summary of the major treatment opportunities identified across the range of ownerships and forest types in the State.

### Adverse Sites Limit Management Opportunities on 2.9 Million Acres

Difficult operating conditions on adverse sites limit timber management opportunities on 2.9 million acres, or about 19 percent, of Virginia's timberland. Because severe physiographic conditions prohibit intensive timber management activities on such sites, they have been excluded from the opportunities listed in table VII. Even though intensive management for timber production is impractical on most of these fragile acres, management strategies designed to optimize water quality, wildlife, esthetics, or other nontimber resources should certainly be encouraged.

Steep slopes (40 percent or more) hinder the mobility of workers and equipment on 95 percent of the timberland classified as adverse. Operability on the remaining 5 percent is restricted by year-round water problems. More than 81 percent of the adverse sites in the State are concentrated in the two Mountain Survey Units, where timber management opportunities on 43 percent of all timberland are limited by severe



*Photo courtesy of the Virginia Department of Forestry.*

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

Broad management and ownership classes <sup>a</sup>	Total area	Broad treatment opportunity class							
		Salvage	Harvest	Commercial thinning	Other stand improvement	Stand conversion <sup>b</sup>	Regeneration <sup>c</sup>	Stands in relatively good condition	
----- Thousand acres -----									
<b>Idle cropland</b>									
Public	—	—	—	—	—	—	—	—	
Forest industry	—	—	—	—	—	—	—	—	
Other private	378.7	—	—	—	—	—	378.7	—	
Total	378.7	—	—	—	—	—	378.7	—	
<b>Nonstocked forest</b>									
Public	12.5	—	—	—	—	—	8.3	—	
Forest industry	29.0	—	—	—	—	—	29.0	—	
Other private	156.3	—	—	—	—	—	115.9	—	
Total	197.8	—	—	—	—	—	153.2	—	
<b>Pine plantations</b>									
Public	26.2	—	—	2.2	5.9	—	—	18.1	
Forest industry	634.9	—	—	172.1	53.5	—	2.1	407.2	
Other private	508.9	—	—	110.3	39.3	—	—	354.6	
Total	1,170.0	—	—	284.6	98.7	—	2.1	779.9	
<b>Natural pine stands</b>									
Public	232.7	5.5	26.8	22.3	6.1	—	3.4	130.2	
Forest industry	272.0	2.7	31.1	47.8	22.5	—	—	163.7	
Other private	1,653.3	15.9	91.2	158.7	172.0	6.5	62.8	1,058.9	
Total	2,158.0	24.1	149.1	228.8	200.6	6.5	66.2	1,352.8	
<b>Oak-pine stands</b>									
Public	182.6	—	23.7	—	10.0	—	6.4	63.5	
Forest industry	235.2	—	27.4	2.3	19.6	—	9.2	162.3	
Other private	1,263.9	8.4	111.4	5.4	173.7	12.2	107.9	724.0	
Total	1,681.7	8.4	162.5	7.7	203.3	12.2	123.5	949.8	
<b>Upland hardwood stands</b>									
Public	1,529.4	15.0	263.6	5.8	66.1	1.8	68.7	584.4	
Forest industry	599.6	—	69.4	—	47.5	38.0	86.0	270.2	
Other private	7,512.9	58.9	825.8	33.4	536.7	93.7	879.8	3,274.5	
Total	9,641.9	73.9	1,158.8	39.2	650.3	133.5	1,034.5	4,129.1	
<b>Lowland hardwood stands</b>									
Public	10.7	—	4.1	—	—	—	2.3	4.3	
Forest industry	82.5	—	20.5	—	3.7	—	3.5	38.3	
Other private	493.2	—	58.8	7.5	28.8	—	131.7	179.1	
Total	586.4	—	83.4	7.5	32.5	—	137.5	221.7	
<b>All classes</b>									
Public	1,994.1	20.5	318.2	30.3	88.1	1.8	89.1	800.5	
Forest industry	1,853.2	2.7	148.4	222.2	146.8	38.0	129.8	1,041.7	
Other private	11,967.2	83.2	1,087.2	315.3	950.5	112.4	1,676.8	5,591.1	
Total	15,814.5	106.4	1,553.8	567.8	1,185.4	152.2	1,895.7	2,919.9	

<sup>a</sup> Forest industry includes lands under long-term lease.<sup>b</sup> Areas occupied with species unsuitable for the site from the standpoint of timber production.<sup>c</sup> Includes 122.6 thousand acres where good-quality hardwood regeneration could be accomplished by felling residual trees to release advance understory hardwood reproduction and promote stump sprouting.<sup>d</sup> Areas where management opportunities are severely limited because of steep slopes or poor drainage.

slopes. The majority of adverse mountain sites support hardwood stands held by NIPF owners. In contrast to the Mountains, only 6 percent of the timberland in the Piedmont and 5 percent of the forest acreage in the Coastal Plain are classified as adverse.

The annual rate of timber cutting on adverse sites was four times less than the rate for stands considered operable. As a result, growth of stands on adverse sites exceeded removals by almost fivefold. Despite the disparity between growth and removals, growing-stock volume averaged 1,584 cubic feet per acre—only about 8 percent higher than operable sites. This is attributed to the lower average site quality of stands with adverse operating conditions.

#### **Over 7.4 Million Acres in Good Condition**

More than 7.4 million acres, or about 59 percent of the forest area suitable for timber production, support timber stands in relatively good condition. Stands in this category are generally 60-percent or better stocked with immature trees of acceptable quality, and are free from significant damage or excessive competition. Current volume of growing stock on this land averages 1,540 cubic feet per acre, and net annual growing-stock growth exceeds 57 cubic feet per acre. These stands harbor a substantial portion of Virginia's present and future timber supplies. Adequate protection and the prompt regeneration of these stands as they are harvested will ensure their continued productivity.

Hardwood stands (including oak–pine) occupy 71 percent of this acreage; natural pine stands, 18 percent; and pine plantations, 11 percent. About 58 percent of all hardwood stands on manageable sites are in good shape, as compared with 67 percent for both natural and planted pine stands. By region, 62 percent of all operable stands in the Piedmont are presently in a condition acceptable for timber production, followed by 59 percent in the Coastal Plain and 56 percent in the Mountains. No appreciable differences are evident by ownership. Proportions of NIPF, public, and forest industry timberland in acceptable condition on operable sites are close to 59 percent for all three owner groups.

#### **Opportunities on 5.1 Million Acres**

Existing conditions on 5.1 million acres of Virginia's timberland offer substantial opportunities to improve the State's future timber supplies. In the absence of treatment, these acres will contribute far below their potential yields. This analysis identifies six major opportunities.

1. *Salvage and regenerate seriously damaged stands on 106,000 acres.* This opportunity typically applies to timber stands damaged to the point that they are now in imminent danger of catastrophic mortality. Annual mortality of growing stock in these stands is already more than 61 cubic feet per acre—about six times greater than stands in good condition. Average volume of growing stock is 1,944 cubic feet per acre. Although the number of stands in need of salvage is relatively small, it should be noted that stands which have already experienced enough mortality to drop them below 60-percent stocking are included under the regeneration opportunity.

Disease is the most prevalent damaging agent responsible for stands in this condition, and upland hardwood stands are the most commonly affected. Various diseases affecting upland hardwoods account for 56 percent of all stands in need of salvage. Other destructive agents include insects, fire, and weather.

2. *Harvest and regenerate mature stands on 1.6 million acres.* Over 12 percent of all stands on operable sites would benefit from harvest and subsequent regeneration. These are generally older stands with high inventory volumes. If left alone, they will likely experience slow growth rates and excessive age or competition-induced mortality. The mean age of these stands is 78 years, and growing-stock volume averages 2,379 cubic feet per acre.

Upland hardwood stands account for three-fourths of all stands now in need of harvest. By ownership, 24 percent of public, 12 percent of NIPF, and 9 percent of all operable stands on forest industry land were assigned a harvest opportunity. The high proportion of public timberland in this category is due to long rotations and emphasis of multiple use management practices on national forest land.

3. *Thin young, immature stands densely stocked with merchantable trees on 568,000 acres.* These acres support immature stands so heavily stocked that trees are receiving considerable competition from each other. Stands in need of commercial thinning average 26 years of age and 2,114 cubic feet of growing-stock volume. Average annual growth of these stands is almost 119 cubic feet per acre, and, unless they are thinned, some of their accumulated timber volume is likely to be lost to suppression mortality. Future growth of these stands should be channeled to the best trees while they are still young enough to respond to release. Over 90 percent of the thinning opportunity is concentrated in pine stands. About 55 percent of all pine stands in need of thinning are planted.

4. *Remove undesirable trees and competing vegetation from immature stands on 1.2 million acres.* Potential crop trees in these immature stands are receiving serious competition from rough trees and other inhibiting vegetation. Some type of TSI operation such as cleaning or release would enhance the future quality and growth of stands in this condition. Stands in need of TSI average 17 years old with 720 cubic feet of growing-stock volume per acre. Oak–pine and hardwood stands constitute three-fourths of all stands that would benefit from such treatment. Over 80 percent of all stands presenting this opportunity are held by NIPF owners.

5. *Convert stands with species that are obviously off-site, to a more productive species on 152,000 acres.* These acres support manageable stands, but annual growth of growing stock averages only 32 cubic feet per acre. Unless they are converted to species more suitable from the standpoint of timber production, they will produce far less volume than the site's potential. Volume of growing stock in these stands currently averages 792 cubic feet per acre. The majority of such stands are owned by the NIPF group and dominated by upland hardwoods.

*6. Regenerate 1.5 million acres of timberland so poorly stocked with acceptable trees that a manageable stand does not exist.* Growing-stock volume in these poorly stocked stands averages only 561 cubic feet per acre. Conditions on most of these acres are the result of past harvesting practices. Nearly one-third of the acreage in this category experienced a final harvest between 1977 and 1986. Remnants of former stands, cull seedlings and saplings, shrubs, and other undesirable vegetation are preventing the development of a manageable stand. Although conditions on many of these acres will eventually improve naturally, it sometimes takes decades for a manageable stand to finally emerge. In the meantime, a substantial amount of potential growth has been sacrificed, and the quality of the resulting stand is seriously compromised. Almost half the stands now in need of regeneration have been in this condition for at least a decade.

Of the timberland acres now in need of regeneration, 77 percent is classified as hardwood, 8 percent as oak-pine, and 5 percent as pine forest types. The remaining 10 percent is nonstocked. This distribution represents the species that currently occupy these stands, which is not necessarily indicative of the stand that existed prior to harvest. The preponderance of these acres, however, are best suited to growing hardwoods; most were formerly hardwood stands prior to harvest, as emphasized by the gap between rates of hardwood harvesting and regeneration discussed in the previous chapter.

At a minimum, correction of conditions on many of these acres involves removal of the inhibiting overstory to release advance regeneration and promote stump sprouting. More intensive measures include control of other competing vegetation and encouragement of desirable natural regeneration through mechanical or chemical means. Unfortunately, such tactics may prove prohibitively expensive, since the low volumes and poor-quality trees characteristic of stands already in this condition do little to offset the costs of improvement.

The easiest way to combat the proliferation of poorly stocked hardwood stands is to promote conditions favorable to natural regeneration at the time of harvest. Corrective actions taken years later are costly and do not attack the source of the problem. One less-expensive way to encourage the development of better quality hardwood stands is to simply fell all unmerchantable trees at the time of harvest (clearfelling).

In addition to the 1.5 million acres of poorly stocked timberland, there are 379,000 acres of idle cropland that could easily be planted to trees. In the past, such land has been the primary source of new forest acreage. Loss of pine timberland poses a threat to the maintenance and future expansion of Virginia's pine resource. Planting acres of idle cropland to pine will certainly mitigate the problem. Site preparation and planting costs are considerably less on these acres than on cutover or poorly stocked forest.

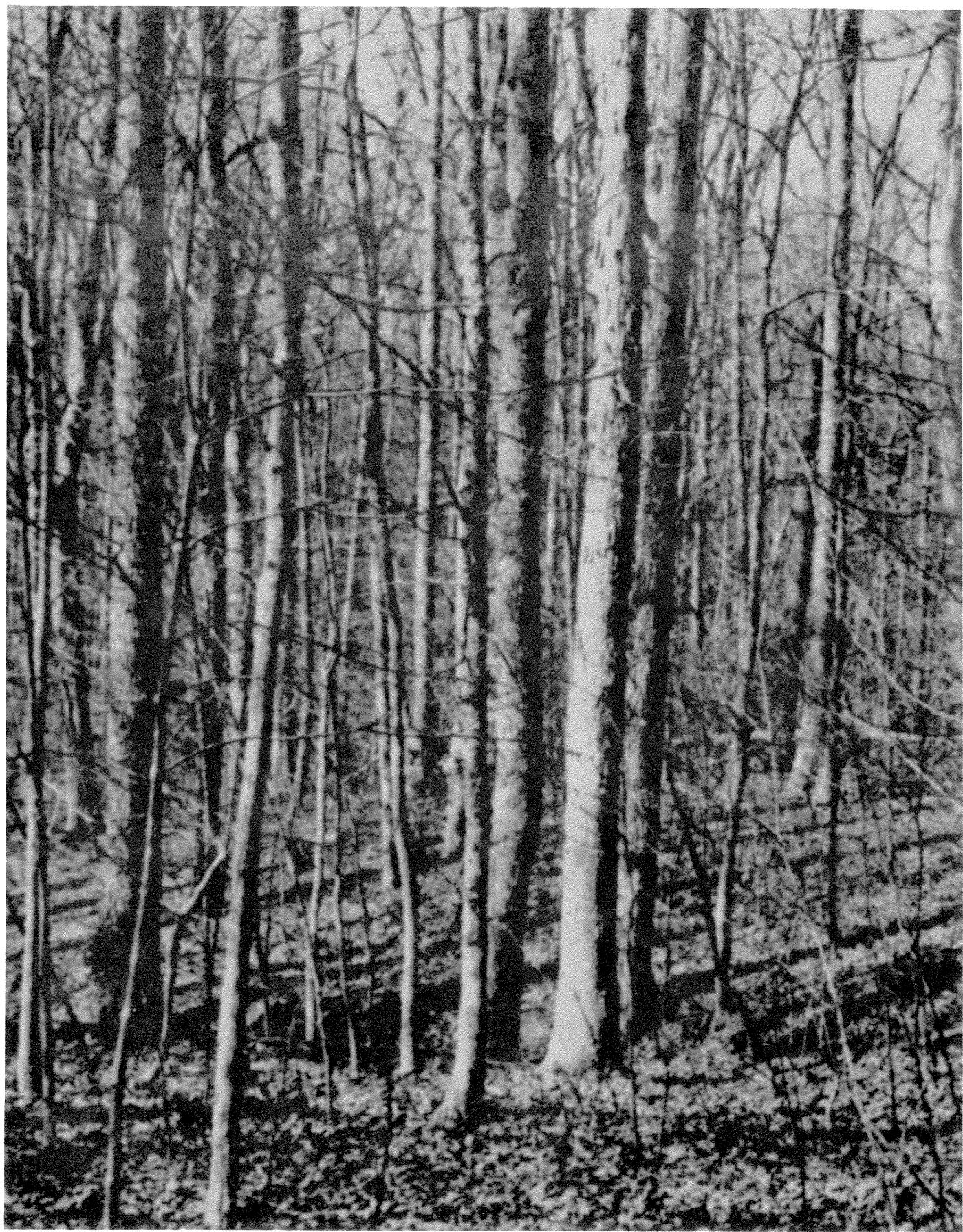
#### **Help Is Available**

Virginia's forest resource is largely controlled by a diversity of NIPF landowners. Seventy-five percent of all timberland in the State is held by them. Three-fourths of all opportunities to improve future timber supplies likewise occur on NIPF land. The success of efforts to enhance the quality of Virginia's forests will thus be measured by the ability of forestry interests within the State to reach these owners.

Financial and professional assistance in timber management are available to Virginia landowners from a variety of sources. The Forestry Incentives Program (FIP) is designed to share the cost of tree planting and other timber management practices with small landowners. Another source of Federal cost sharing is provided under the Agricultural Conservation Program (ACP). Attractive financial incentives to convert qualifying marginal cropland to timberland are now available under the federally administered Conservation Reserve Program. Cost-sharing assistance is also offered by the State in the form of the Reforestation of Timberlands (RT) program. Professional advice and services are available from private forestry consultants; the Department of Forestry, Commonwealth of Virginia; and Cooperative Extension Services, Virginia Polytechnic Institute. Many wood-using companies also offer landowners technical assistance.

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## Appendix

### Procedure

The procedure used in the fifth statewide inventory and evaluation of Virginia's forest resources included these basic steps:

1. Initial estimates of forest and nonforest acreages were developed from the classification of 74,655 sample clusters systematically spaced on the latest aerial photographs available. Field crews checked a subsample of 7,006 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 4,266 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 Virginia 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 105 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 4,150 permanent sample plots established in the 1977 inventory. Periodic surveys of timber products output, conducted by the Department of Forestry, Commonwealth of Virginia, 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  $\pm 0.22$  percent for the estimate of timberland, 1.15 percent for the total growing-stock volume, 1.18 percent for total growing-stock volume growth, and 4.17 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<sup>a</sup>

Sampling error <sup>b</sup> (percent)	Timberland	Volume of growing stock			
		M acres	Inventory	Net growth	Removals
1	747.1	—	—	—	—
2	186.8	7,588.8	279.1	—	—
3	83.0	3,372.8	124.0	—	—
4	46.7	1,897.2	69.8	—	—
5	29.9	1,214.2	44.6	333.8	—
10	7.5	303.6	11.2	83.4	—
15	3.3	134.9	5.0	37.1	—
20	1.9	75.9	2.8	20.9	—
25	1.2	48.6	1.8	13.4	—

<sup>a</sup>Sampling error of volume or area totals in question may be computed with the following formula:

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

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

SE = Specified sampling error in table.

<sup>b</sup>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 mid-point 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 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, pole-timber, 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 flood-plains (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 nonpulp mills, chipped, and then sold to pulp mills 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	60.5	61.0	68.2	60.0
8	68.5	68.1	76.0	68.4
10	73.5	73.1	81.4	73.4
12	76.6	76.7	85.2	76.4
14	78.8	79.4	88.2	78.4
16	80.4	81.6	90.4	79.8
18	81.5	83.3	92.3	80.8
20	82.2	84.8	93.8	81.5
22	82.8	86.0	95.1	82.1
24+	83.8	87.5	97.7	83.0
Average	74.6	72.0	84.8	74.9

Rough cords per M cubic feet (without bark) =

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

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,  
Virginia, 1986

Land class	Area
	<u>Acres</u>
<b>Forest land</b>	
Timberland	15,435,836
Reserved timberland	471,188
Woodland	61,417
Total	<u>15,968,441</u>
<b>Nonforest land</b>	
Cropland	3,463,490
Pasture and range	3,227,675
Other <sup>a</sup>	2,750,243
Total	<u>9,441,408</u>
<b>All land<sup>b</sup></b>	<b>25,409,849</b>

<sup>a</sup>Includes swampland, industrial, and urban areas, other nonforest land, and 163,675 acres classed as water by Forest Survey standards but defined by Bureau of Census as land.

<sup>b</sup>From the U.S. Bureau of Census, 1980.

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

Ownership class	Area
	<u>Acres</u>
<b>National forest</b>	
	<u>1,486,459</u>
<b>Other Federal</b>	
Bureau of Land Management	--
Indian	460
Miscellaneous Federal	<u>220,950</u>
Total	<u>221,410</u>
<b>State</b>	
	<u>209,087</u>
<b>County and municipal</b>	
	<u>77,104</u>
<b>Forest industry</b>	
	<u>1,833,811</u>
<b>Forest industry-leased</b>	
	<u>19,438</u>
<b>Other private</b>	
Farmer	4,163,959
Other individual	6,147,443
Other corporate	<u>1,277,125</u>
Total	<u>11,588,527</u>
<b>All ownerships</b>	<b>15,435,836</b>

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

Stand-size class	All ownerships	National forest	Other public	Forest industry	Forest industry- leased	Other private
<u>Acres</u>						
Sawtimber	7,329,352	831,344	306,208	521,890	2,323	5,667,587
Poletimber	5,102,614	516,604	142,700	696,095	17,085	3,730,130
Sapling and seedling	2,806,064	130,251	54,463	586,844	30	2,034,476
Nonstocked	197,806	8,260	4,230	28,982	--	156,334
All classes	15,435,836	1,486,459	507,601	1,833,811	19,438	11,588,527

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

Stand volume class (board feet/acre <sup>a</sup> )	All ownerships	National forest	Other public	Forest industry	Forest industry- leased	Other private
<u>Acres</u>						
Less than 2,000	5,973,114	477,586	124,631	1,081,994	16,291	4,272,612
2,000 - 3,999	2,667,520	348,694	87,213	216,067	2,323	2,013,223
4,000 - 5,999	2,360,076	295,643	85,465	132,310	824	1,845,834
6,000 - 7,999	1,658,920	153,936	70,337	128,405	--	1,306,242
8,000 - 9,999	1,054,668	82,317	42,780	85,380	--	844,191
10,000 or more	1,721,538	128,283	97,175	189,655	--	1,306,425
All classes	15,435,836	1,486,459	507,601	1,833,811	19,438	11,588,527

<sup>a</sup>International 1/4-inch rule.

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

Stocking class	All ownerships	National forest	Other public	Forest industry	Forest industry- leased	Other private
<u>Acres</u>						
Overstocked	690,125	49,943	39,953	148,433	4,035	447,761
Fully stocked	5,047,426	327,295	184,904	870,267	14,035	3,650,925
Moderately stocked	7,244,676	785,995	220,340	664,492	30	5,573,819
Poorly stocked	2,255,803	314,966	58,174	121,637	1,338	1,759,688
Nonstocked	197,806	8,260	4,230	28,982	--	156,334
All classes	15,435,836	1,486,459	507,601	1,833,811	19,438	11,588,527

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

Site class (ft <sup>3</sup> /acre/year)	All ownerships	National forest	Other public	Forest industry	Forest industry- leased	Other private
<u>Acres</u>						
>164	124,642	8,497	2,215	9,484	--	104,446
120-164	407,703	22,408	3,126	30,676	--	351,493
85-119	3,197,576	78,808	145,081	378,537	8,480	2,586,670
50-84	9,389,219	731,320	289,107	1,249,724	10,958	7,108,110
20-49	2,316,696	645,426	68,072	165,390	--	1,437,808
All classes	15,435,836	1,486,459	507,601	1,833,811	19,438	11,588,527

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

Forest type	All classes		Site index class <sup>a</sup>						
	<50	50-59	60-69	70-79	80-89	90-99	100-109	110-119	>119
<b>Softwood types</b>									
White pine-hemlock	183,257	3,452	8,955	48,831	64,827	36,426	11,972	8,794	--
Spruce fir	--	--	--	--	--	--	--	--	--
Longleaf pine	--	--	--	--	--	--	--	--	--
Slash pine	--	--	--	--	--	--	--	--	--
Loblolly pine	1,772,630	2,613	48,338	265,825	924,578	431,778	85,324	14,174	--
Shortleaf pine	146,573	8,500	32,961	42,061	43,668	11,850	7,533	--	--
Virginia pine	1,029,744	27,795	92,963	427,144	354,456	106,472	17,125	3,789	--
Sand pine	--	--	--	--	--	--	--	--	--
Eastern redcedar	91,754	4,251	2,055	34,683	50,765	--	--	--	--
Pond pine	4,940	2,202	--	2,738	--	--	--	--	--
Spruce pine	--	--	--	--	--	--	--	--	--
Pitch pine	68,495	10,685	23,628	25,152	4,317	4,713	--	--	--
Table Mountain pine	58,258	23,131	31,535	3,592	--	--	--	--	--
Total	3,355,651	82,629	240,435	850,026	1,442,611	591,239	121,954	26,757	--
<b>Hardwood types</b>									
Oak-pine	1,689,191	102,521	161,572	432,330	580,722	284,689	108,138	19,219	--
Oak-hickory	9,230,215	295,856	1,117,723	1,977,790	2,772,109	1,528,473	1,085,124	352,856	80,476
Chestnut oak	454,071	83,075	158,858	125,838	52,024	30,845	--	3,431	19,808
Southern scrub oak	4,766	4,766	--	--	--	--	--	--	--
Oak-gum-cypress	310,705	2,499	19,873	68,031	116,036	65,889	22,592	15,785	--
Elm-ash-cottonwood	307,829	--	10,046	37,675	103,267	67,740	53,861	32,657	2,583
Maple-beech-birch	83,408	--	9,496	21,715	24,029	23,447	4,721	--	--
Total	12,080,185	488,717	1,477,568	2,663,379	3,648,187	2,001,083	1,274,436	423,948	80,476
All types	15,435,836	571,346	1,718,003	3,513,405	5,090,798	2,592,322	1,396,390	450,705	80,476

<sup>a</sup> 50-year base.

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

Forest type	All ownerships	National forest	Other public	Forest industry	Forest industry- leased	Other private
<u>Acres</u>						
<b>Softwood types</b>						
White pine-hemlock	183,257	24,814	2,690	10,095	--	145,658
Spruce-fir	--	--	--	--	--	--
Longleaf pine	--	--	--	--	--	--
Slash pine	--	--	--	--	--	--
Loblolly pine	1,772,630	--	63,434	786,392	9,751	913,053
Shortleaf pine	146,573	--	5,801	6,987	--	133,785
Virginia pine	1,029,744	16,876	69,220	108,498	--	835,150
Sand pine	--	--	--	--	--	--
Eastern redcedar	91,754	--	4,098	--	--	87,656
Pond pine	4,940	--	--	--	--	4,940
Spruce pine	--	--	--	--	--	--
Pitch pine	68,495	34,268	--	--	--	34,227
Table Mountain pine	58,258	38,322	--	2,058	--	17,878
Total	3,355,651	114,280	145,243	914,030	9,751	2,172,347
<b>Hardwood types</b>						
Oak-pine	1,689,191	135,822	46,804	235,195	--	1,271,370
Oak-hickory	9,230,215	1,082,432	274,375	573,640	8,863	7,290,905
Chestnut oak	454,071	142,395	30,467	29,263	--	251,946
Southern scrub oak	4,766	--	--	--	--	4,766
Oak-gum-cypress	310,705	--	3,752	32,419	--	274,534
Elm-ash-cottonwood	307,829	--	6,960	49,264	824	250,781
Maple-beech-birch	83,408	11,530	--	--	--	71,878
Total	12,080,185	1,372,179	362,358	919,781	9,687	9,416,180
All types	15,435,836	1,486,459	507,601	1,833,811	19,438	11,588,527

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

Forest type	All classes	Stand-size class			Nonstocked areas		
		Sawtimber	Poletimber	Sapling- seedling			
<u>Acres</u>							
<b>Softwood types</b>							
White pine-hemlock	183,257	117,536	33,457	32,264	--		
Spruce-fir	--	--	--	--	--		
Longleaf pine	--	--	--	--	--		
Slash pine	--	--	--	--	--		
Loblolly pine	1,772,630	466,225	674,955	612,504	18,946		
Shortleaf pine	146,573	78,437	51,407	16,729	--		
Virginia pine	1,029,744	317,831	503,883	199,314	8,716		
Sand pine	--	--	--	--	--		
Redcedar	91,754	5,248	8,363	78,143	--		
Pond pine	4,940	4,940	--	--	--		
Spruce pine	--	--	--	--	--		
Pitch pine	68,495	40,007	25,482	3,006	--		
Table Mountain pine	58,258	29,958	28,300	--	--		
Total	3,355,651	1,060,182	1,325,847	941,960	27,662		
<b>Hardwood types</b>							
Oak-pine	1,689,191	727,433	507,276	447,002	7,480		
Oak-hickory	9,230,215	4,822,641	2,972,594	1,321,769	113,211		
Chestnut oak	454,071	292,919	131,767	16,807	12,578		
Southern scrub oak	4,766	--	--	--	4,766		
Oak-gum-cypress	310,705	174,147	74,123	47,990	14,445		
Elm-ash-cottonwood	307,829	178,449	81,180	30,536	17,664		
Maple-beech-birch	83,408	73,581	9,827	--	--		
Total	12,080,185	6,269,170	3,776,767	1,864,104	170,144		
All types	15,435,836	7,329,352	5,102,614	2,806,064	197,806		

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

Stand-age class (years)	All classes	Broad management class				
		Pine plantation	Natural pine	Oak-pine	Upland hardwood	Lowland hardwood
<u>Acres</u>						
0-10	1,567,659	444,010	142,687	312,933	630,446	37,583
11-20	1,491,892	463,207	313,612	188,969	508,318	17,786
21-30	1,070,408	219,480	295,623	120,360	403,656	31,289
31-40	1,281,086	41,108	408,608	143,618	649,505	38,247
41-50	1,730,520	100	401,714	167,091	1,078,265	83,350
51-60	2,029,154	--	266,249	178,405	1,527,462	57,038
61-70	1,653,187	--	139,589	174,829	1,265,545	73,224
71-80	1,077,748	--	63,057	91,095	890,497	33,099
81+	1,320,763	--	41,511	103,351	1,134,708	41,193
No manageable stand	2,213,419	2,148	112,948	208,540	1,684,058	205,725
All classes	15,435,836	1,170,053	2,185,598	1,689,191	9,772,460	618,534

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

Stand-age class (years)	All classes	Broad management class				
		Pine plantation	Natural pine	Oak-pine	Upland hardwood	Lowland hardwood
<u>Acres</u>						
0-10	82,202	18,535	3,376	7,475	52,816	--
11-20	133,180	1,372	20,577	31,346	79,459	426
21-30	38,251	4,977	15,404	200	17,670	--
31-40	108,740	1,206	54,529	4,740	47,805	460
41-50	150,405	100	25,111	10,176	114,993	25
51-60	250,491	--	35,805	10,342	204,344	--
61-70	291,153	--	36,325	34,339	216,346	4,143
71-80	255,362	--	21,559	17,313	216,267	223
81+	383,283	--	12,400	29,915	337,865	3,103
No manageable stand	300,993	--	8,247	36,780	253,634	2,332
All classes	1,994,060	26,190	233,333	182,626	1,541,199	10,712

Table 12.--Area of timberland, by stand-age and broad management classes, forest industry,<sup>a</sup> Virginia, 1986

Stand-age class (years)	All classes	Broad management class				
		Pine plantation	Natural pine	Oak-pine	Upland hardwood	Lowland hardwood
- - - - - <u>Acres</u> - - - - -						
0-10	433,462	227,377	22,084	91,700	80,647	11,654
11-20	367,130	266,131	30,533	28,824	34,963	6,679
21-30	238,344	127,200	59,021	9,186	40,354	2,583
31-40	119,627	12,104	40,526	14,995	48,827	3,175
41-50	111,980	--	45,787	10,062	37,264	18,867
51-60	127,020	--	25,711	26,536	64,478	10,295
61-70	125,722	--	34,747	22,620	68,355	--
71-80	85,982	--	13,566	7,957	59,275	5,184
81+	83,372	--	--	6,967	64,829	11,576
No manageable stand	160,610	2,148	16,846	16,348	112,774	12,494
All classes	1,853,249	634,960	288,821	235,195	611,766	82,507

<sup>a</sup>Includes 19,438 acres of other private land under long-term lease.

Table 13.--Area of timberland, by stand-age and broad management classes, other private ownerships,<sup>a</sup> Virginia, 1986

Stand-age class (years)	All classes	Broad management class				
		Pine plantation	Natural pine	Oak-pine	Upland hardwood	Lowland hardwood
- - - - - <u>Acres</u> - - - - -						
0-10	1,051,995	198,098	117,227	213,758	496,983	25,929
11-20	991,582	195,704	262,502	128,799	393,896	10,681
21-30	793,813	87,303	221,198	110,974	345,632	28,706
31-40	1,052,719	27,798	313,553	123,883	552,873	34,612
41-50	1,468,135	--	330,816	146,853	926,008	64,458
51-60	1,651,643	--	204,733	141,527	1,258,640	46,743
61-70	1,236,312	--	68,517	117,870	980,844	69,081
71-80	736,404	--	27,932	65,825	614,955	27,692
81+	854,108	--	29,111	66,469	732,014	26,514
No manageable stand	1,751,816	--	87,855	155,412	1,317,650	190,899
All classes	11,588,527	508,903	1,663,444	1,271,370	7,619,495	525,315

<sup>a</sup>Excludes 19,438 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, Virginia, 1986

Broad management class and species group	All ownerships	National forest	Other public	Forest industry	Forest industry- leased	Other private
<u>Square feet</u>						
<b>Pine plantation</b>						
Softwood	46.8	30.0	28.1	47.1	120.0	46.5
Hardwood	4.7	--	8.4	4.5	--	4.9
Total	51.5	30.0	36.5	51.6	120.0	51.4
<b>Natural pine</b>						
Softwood	69.1	70.6	88.6	72.2	--	66.8
Hardwood	18.0	23.8	16.3	20.0	--	17.5
Total	87.1	94.4	104.9	92.2	--	84.3
<b>Oak-pine</b>						
Softwood	25.6	27.8	27.2	20.2	--	26.4
Hardwood	40.4	45.0	42.2	28.0	--	42.3
Total	66.0	72.8	69.4	48.2	--	68.7
<b>Upland hardwood</b>						
Softwood	3.9	4.0	3.6	5.2	7.5	3.7
Hardwood	76.0	85.4	84.7	60.4	97.5	75.6
Total	79.9	89.4	88.3	65.6	105.0	79.3
<b>Lowland hardwood</b>						
Softwood	5.1	--	3.0	6.7	--	5.0
Hardwood	86.4	--	116.9	78.1	165.0	85.4
Total	91.5	--	119.9	84.8	165.0	90.4
<b>All classes</b>						
Softwood	19.8	11.1	27.2	33.2	61.9	18.0
Hardwood	57.7	76.9	62.7	30.8	65.6	60.0
Total	77.5	88.0	89.9	64.0	127.5	78.0

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

Forest-type group	All areas	Reserved timberland	Woodland
<u>Acres</u>			
Spruce-fir	--	--	--
White pine-hemlock	8,311	8,311	--
Longleaf-slash pine	--	--	--
Loblolly-shortleaf pine	41,742	34,561	7,181
Oak-pine	18,806	18,806	--
Oak-hickory	388,680	337,183	51,497
Oak-gum-cypress	68,752	66,013	2,739
Elm-ash-cottonwood	6,314	6,314	--
Maple-beech-birch	--	--	--
All types	532,605	471,188	61,417

Table 16.—Number of live trees on timberland, by species and diameter classes, Virginia, 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	12.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	
— Thousand trees —												
<b>Softwood</b>												
Longleaf pine												
Slash pine	—	—	—	—	—	—	—	—	—	—	—	
Shortleaf pine	112,541	29,659	26,294	20,337	17,119	10,876	5,230	1,957	771	187	96	
Loblolly pine	775,448	247,744	211,616	155,994	85,522	35,261	17,800	11,170	5,692	2,807	1,175	
Pond pine	766	—	—	74	169	253	99	59	37	44	21	
Virginia pine	697,334	282,427	168,738	115,250	71,448	38,065	15,488	4,455	1,186	222	27	
Pitch pine	38,268	12,420	4,106	5,096	5,581	4,538	3,711	1,565	826	335	68	
Table Mountain pine	28,605	8,424	4,522	5,460	4,839	2,304	1,326	825	247	42	16	
Spruce pine	—	—	—	—	—	—	—	—	—	—	—	
Sand pine	—	—	—	—	—	—	—	—	—	—	—	
Eastern white pine	156,212	81,577	27,088	16,016	11,522	7,162	4,107	3,377	2,385	1,619	689	
Eastern hemlock	51,499	25,930	10,506	6,397	3,287	2,423	928	691	530	284	188	
Spruce and fir	1,227	968	—	—	101	50	80	28	—	—	—	
Baldcypress	1,024	—	170	—	109	68	202	132	103	66	40	
Pondcypress	181	—	—	—	—	—	26	58	16	12	11	
Cedars	228,882	161,038	45,029	16,470	4,002	1,656	404	190	93	—	—	
Total softwoods	2,091,987	850,187	498,069	341,094	203,699	103,256	49,401	24,507	11,886	5,618	2,331	
											1,753	
<b>Hardwood</b>												
Select white oaks <sup>a</sup>	600,098	267,945	120,285	73,414	48,551	33,913	21,823	14,290	9,164	4,810	2,622	
Select red oaks <sup>b</sup>	208,049	93,004	40,533	20,066	14,817	10,696	8,433	6,776	5,268	3,066	2,975	
Chestnut oak	418,456	106,151	88,855	71,804	59,156	34,030	22,311	13,593	9,238	3,103	3,055	
Other white oaks	49,144	27,092	8,380	5,114	3,787	2,238	1,096	665	5,655	3,103	427	
Other red oaks	661,496	324,202	116,943	71,924	54,532	36,799	22,101	15,053	9,266	5,210	3,978	
Hickory	528,004	318,265	93,557	43,722	28,621	18,818	11,303	6,719	3,352	1,966	1,210	
Yellow birch	2,629	861	287	764	236	229	76	28	52	33	29	
Hard maple	123,897	76,495	24,067	10,521	4,840	3,471	1,775	1,128	712	354	263	
Soft maple	1,569,142	1,142,585	235,214	91,556	46,188	22,615	14,917	7,423	3,868	2,169	1,210	
Beech	174,550	115,073	25,454	10,048	6,831	5,199	3,362	2,917	1,977	1,471	1,196	
Sweetgum	770,015	529,464	135,390	52,068	22,203	14,878	7,800	4,260	1,980	826	538	
Tupelo and blackgum	681,599	538,672	81,323	27,406	13,721	8,695	5,265	2,925	1,753	956	529	
Ash	165,573	96,564	33,562	15,350	8,645	4,555	3,037	1,935	929	478	339	
Cottonwood	484	160	—	—	—	208	88	—	15	—	13	
Basswood	24,573	10,364	4,114	2,030	2,982	1,392	1,339	887	714	273	222	
Yellow-poplar	600,472	301,101	110,550	57,663	37,260	28,532	23,645	17,688	11,453	6,501	3,035	
Bay and magnolia	45,520	31,760	7,452	3,062	1,068	1,573	263	223	69	—	35	
Black cherry	133,032	97,148	23,842	6,199	2,629	1,316	1,062	387	225	61	62	
Black walnut	25,094	6,990	7,894	1,903	2,760	2,105	1,271	1,157	346	314	197	
Sycamore	20,225	8,218	3,956	2,184	1,409	1,008	968	888	574	442	174	
Black locust	123,678	56,037	25,018	14,791	9,594	9,445	4,426	2,427	1,019	526	167	
Elm	95,333	60,677	19,146	8,069	3,144	2,176	1,000	425	389	191	52	
Other eastern hardwoods	2,554,307	1,992,264	387,313	107,182	36,732	16,185	7,331	3,237	2,064	957	496	
Total hardwoods	9,575,370	6,201,092	1,593,135	696,840	409,706	259,976	164,692	105,131	64,893	36,388	19,310	
All species	11,667,357	7,051,279	2,091,204	1,037,934	613,405	363,232	214,093	129,638	76,779	42,006	21,641	
											2,294	

<sup>a</sup> Includes white, swamp white, swamp chestnut, and chinquapin oaks.

<sup>b</sup> Includes cherrybark, northern red, and Shumard oaks.

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

Species	All classes	Diameter class (inches at breast height)										Total thousand trees
		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	
<b>Softwood</b>												
Longleaf pine	--	--	--	--	--	--	--	--	--	--	--	--
Slash pine	104,605	23,665	25,215	19,984	16,979	10,706	5,230	1,957	771	187	96	15
Shortleaf pine	751,828	230,488	207,197	154,845	85,032	35,076	17,750	11,123	5,678	2,807	1,165	660
Loblolly pine	728	--	--	74	169	253	81	39	37	44	21	7
Pond pine	628,407	236,741	154,909	109,060	69,811	37,075	15,174	4,282	1,088	222	27	3
Virginia pine	30,593	6,782	3,811	4,523	4,981	4,292	3,548	1,445	826	295	68	22
Pitch pine	23,087	5,333	3,354	5,460	3,997	2,658	1,326	754	247	42	16	--
Table Mountain pine	--	--	--	--	--	--	--	--	--	--	--	--
Spruce pine	--	--	--	--	--	--	--	--	--	--	--	--
Sand pine	--	--	--	--	--	--	--	--	--	--	--	--
Eastern white pine	142,129	71,609	24,498	15,312	11,355	6,767	4,065	3,285	2,340	1,580	678	618
Eastern hemlock	47,112	23,042	9,342	6,397	3,085	2,351	879	691	530	284	188	231
Spruce and fir	1,227	968	--	--	101	50	80	28	--	--	--	--
Baldcypress	1,020	--	170	--	109	68	202	132	103	66	40	87
Pondcypress	181	--	--	--	--	--	26	58	16	12	43	43
Cedars	185,296	126,564	38,004	14,819	3,711	1,570	365	170	93	--	--	15
Total softwoods	1,916,213	724,992	466,500	330,174	199,230	100,866	48,726	23,964	11,729	5,539	2,310	1,701
<b>Hardwood</b>												
Select white oaks <sup>a</sup>	479,647	178,362	102,290	68,768	45,031	31,815	20,953	13,779	8,931	4,531	2,426	2,561
Select red oaks <sup>b</sup>	155,261	59,891	29,951	15,650	12,917	9,985	7,890	6,297	4,999	2,930	1,766	2,666
Chestnut oak	284,014	55,228	53,414	54,874	47,193	27,984	17,598	10,679	7,361	4,391	2,125	2,829
Other white oaks	36,863	17,555	6,600	4,535	3,681	2,194	1,017	571	429	82	54	16
Other red oaks	528,653	230,147	95,921	63,142	50,244	34,702	20,836	14,644	8,972	5,069	2,532	2,334
Hickory	361,955	176,709	77,688	39,361	26,894	17,593	10,709	6,427	3,188	1,874	813	653
Yellow birch	1,058	--	287	408	83	109	39	--	52	33	18	29
Hard maple	75,915	36,520	19,720	8,173	4,155	2,548	1,575	1,004	609	331	181	178
Soft maple	826,758	526,434	153,447	68,975	36,346	18,007	11,748	5,535	2,935	1,615	921	740
Beech	108,242	63,159	17,019	8,663	5,137	4,434	2,805	2,510	1,754	1,272	664	62
Sweetgum	582,829	373,510	112,412	47,099	20,539	14,117	7,407	4,093	1,886	775	492	486
Tupelo and blackgum	250,237	153,744	48,837	21,140	10,544	6,574	4,321	2,432	1,465	668	202	285
Ash	77,826	34,119	18,403	9,725	6,005	3,200	2,457	1,620	802	400	266	30
Cottonwood	484	160	--	--	--	208	88	--	15	--	13	--
Basswood	14,222	2,855	2,562	1,756	2,521	1,230	1,302	790	630	254	148	159
Yellow poplar	517,445	243,063	95,551	53,284	34,307	27,345	23,189	17,343	11,258	6,543	2,935	2,683
Bay and magnolia	24,568	15,122	4,539	2,242	1,068	1,025	230	223	69	--	15	35
Black cherry	59,571	40,501	14,181	2,312	901	471	749	199	99	61	42	14
Black walnut	12,566	1,335	4,068	2,132	1,409	1,077	943	271	265	111	82	8
Sycamore	15,165	4,150	3,580	1,900	1,409	965	878	836	493	412	162	334
Black locust	57,086	22,401	11,179	7,155	4,851	5,836	2,895	1,702	556	384	48	79
Elm	45,544	22,874	11,669	5,458	2,280	1,491	810	395	272	179	52	2
Other eastern hardwoods	120,609	56,477	23,019	14,749	10,280	7,525	3,490	2,206	1,277	790	418	352
Total hardwoods	4,636,418	2,315,016	906,337	500,734	328,818	220,767	144,068	94,228	58,327	32,706	16,419	17,611
All species	6,552,631	3,040,008	1,372,837	831,208	528,048	321,633	192,794	118,192	70,056	38,245	18,729	19,312
Total species	6,552,631	3,040,008	1,372,837	831,208	528,048	321,633	192,794	118,192	70,056	38,245	18,729	19,312

<sup>a</sup> Includes white, swamp white, swamp chestnut, and chinquapin oaks.  
<sup>b</sup> Includes cherrybark, northern red, and Shumard oaks.

Table 18.--Merchantable volume of live trees on timberland, by species and diameter class, Virginia, 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	21.0-28.9	29.0 and larger
<b>Softwood</b>											
Longleaf pine	--	--	--	--	--	--	--	--	--	--	--
Slash pine	--	51,789	118,028	135,028	100,402	54,785	29,836	9,040	6,703	1,404	--
Shortleaf pine	507,040	51,529	361,238	502,504	412,334	346,230	325,174	230,474	150,131	81,808	64,154
Loblolly pine	2,475,529	12,524	155	855	2,610	1,224	1,371	1,252	2,063	1,237	666
Pond pine	1,801,887	357,341	507,372	468,997	290,410	120,463	43,591	10,071	1,598	2,044	--
Virginia pine	--	235,751	12,571	29,089	46,794	61,992	38,045	26,592	15,179	4,001	1,888
Pitch pine	125,104	15,881	28,250	30,027	22,424	18,905	7,498	1,528	591	--	--
Table Mountain pine	--	--	--	--	--	--	--	--	--	--	--
Spruce pine	--	--	--	--	--	--	--	--	--	--	--
Sand pine	--	--	--	--	--	--	--	--	--	--	--
Eastern white pine	555,010	41,878	62,191	70,555	62,930	78,396	77,522	68,996	36,822	52,238	3,482
Eastern hemlock	153,410	10,982	15,004	20,044	12,213	15,452	17,242	13,153	10,531	21,849	16,640
Spruce and fir	3,146	--	517	659	1,249	721	--	--	--	--	--
Baldcypress	34,368	--	797	901	4,022	3,349	3,793	3,322	2,434	8,121	7,629
Pondcypress	8,755	--	--	--	525	1,602	603	617	603	3,514	1,291
Cedars	79,402	33,584	19,939	14,248	4,974	3,604	3,053	--	--	--	--
Total softwoods	5,991,926	885,419	1,284,571	1,202,197	908,895	661,867	441,456	274,100	146,328	155,878	31,215
<b>Hardwood</b>											
Select white oaks <sup>a</sup>	2,650,811	191,777	299,978	374,944	390,876	377,629	331,981	230,138	156,718	244,597	52,173
Select red oaks <sup>b</sup>	1,661,548	60,760	90,215	117,640	146,897	169,371	186,342	145,035	113,365	260,392	71,531
Chestnut oak	2,450,437	174,803	330,407	335,641	343,334	296,447	278,189	217,862	146,453	269,261	58,140
Other white oaks	116,643	11,359	19,762	22,796	16,409	14,005	14,192	5,398	4,529	4,768	3,425
Other red oaks	2,591,045	190,910	318,554	390,626	371,660	374,971	318,919	235,377	155,181	212,057	23,090
Hickory	1,198,696	99,274	159,867	205,674	204,142	177,295	123,875	96,327	59,452	65,141	7,649
Yellow birch	14,590	2,044	1,611	2,335	1,270	687	1,569	1,380	1,338	2,356	--
Hard maple	236,330	29,191	30,098	36,415	30,500	27,531	25,355	16,698	11,907	20,438	8,197
Soft maple	1,531,395	253,130	20,246	233,804	240,429	167,490	118,818	85,128	63,829	80,856	17,665
Beech	534,073	28,207	37,197	53,663	55,731	71,896	66,687	66,541	49,609	89,299	13,443
Sweetgum	901,824	112,398	133,946	174,026	153,092	120,239	78,150	42,354	33,312	49,174	5,133
Tupelo and blackgum	518,304	62,210	73,434	86,752	85,632	67,628	56,402	36,413	12,804	30,792	6,237
Ash	336,486	37,952	49,930	48,264	52,848	48,407	31,743	21,257	18,169	20,929	6,987
Cottonwood	5,593	--	--	2,694	1,549	--	513	--	--	837	--
Basswood	162,054	5,472	18,913	16,378	23,302	23,369	26,248	13,609	12,699	16,506	4,958
Yellow poplar	2,928,884	165,468	241,936	336,387	449,167	497,473	439,716	322,343	189,075	251,816	35,503
Bay and magnolia	47,027	8,141	7,528	14,808	5,056	4,806	2,075	--	1,171	3,442	--
Black cherry	84,636	14,369	13,562	12,149	17,954	8,620	5,971	2,591	5,333	1,182	--
Black walnut	132,325	3,994	14,915	19,656	21,209	27,493	10,241	14,372	10,105	8,472	1,868
Sycamore	158,596	8,606	10,035	12,614	18,406	22,247	19,990	19,756	9,929	28,460	8,553
Black locust	338,100	31,213	46,501	81,137	64,913	49,771	26,938	18,714	6,659	10,612	1,442
Elm	115,497	16,887	17,285	22,761	17,664	9,520	12,983	8,796	3,084	5,800	717
Other eastern hardwoods	931,230	237,301	182,765	157,228	108,773	73,178	63,272	39,771	26,198	36,487	6,257
Total hardwoods	19,346,124	1,745,466	2,368,385	2,758,192	2,821,413	2,630,073	2,240,169	1,639,760	1,088,691	1,717,825	336,150
All species	25,338,050	2,630,885	3,652,956	3,960,389	3,730,308	3,291,940	2,681,625	1,913,860	1,235,019	1,873,703	367,365

<sup>a</sup> Includes white, swamp white, swamp chestnut, and chinkapin oaks.<sup>b</sup> Includes cherrybark, northern red, and Shumard oaks.

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

Species	All classes	Diameter class (inches at breast height)										29.0 and larger
		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		
Softwood												
Longleaf pine	--	--	--	--	--	--	--	--	--	--	--	--
Slash pine	--	50,727	117,299	133,107	100,402	54,666	29,836	9,040	6,703	1,404	--	--
Shortleaf pine	503,303	50,727	117,299	133,107	100,402	54,666	29,836	9,040	6,703	1,404	--	--
Loblolly pine	2,467,358	359,154	500,097	410,630	345,529	324,517	230,223	150,131	81,441	64,154	1,482	--
Pond pine	11,877	155	855	2,610	1,371	977	1,252	2,063	1,237	666	691	--
Virginia pine	1,759,465	344,322	498,162	460,350	286,005	116,452	41,016	10,071	1,598	1,489	--	--
Pitch pine	223,689	11,370	26,410	44,298	59,329	36,161	26,592	13,640	4,001	1,888	--	--
Table Mountain pine	117,244	15,881	23,792	27,779	22,244	17,751	7,498	1,528	591	--	--	--
Spruce pine	--	--	--	--	--	--	--	--	--	--	--	--
Sand pine	--	--	--	--	--	--	--	--	--	--	--	--
Eastern white pine	543,711	40,594	61,674	67,243	62,488	76,746	76,623	68,106	36,253	50,502	3,482	--
Eastern hemlock	151,265	10,982	14,218	19,947	12,203	15,452	17,242	13,153	10,531	20,897	16,640	--
Spruce and fir	3,146	--	517	659	1,249	721	--	--	--	--	--	--
Baldypress	33,621	--	797	901	4,022	3,349	3,793	3,322	2,434	8,121	6,882	--
Pondcypress	8,755	--	--	--	525	1,602	603	617	603	3,514	1,291	--
Cedars	74,267	30,741	18,832	13,652	4,609	3,380	3,053	--	--	--	--	--
Total softwoods	5,891,701	863,926	1,262,653	1,181,176	900,156	651,893	437,731	271,671	145,392	153,635	30,468	--
Hardwood												
Select white oaks <sup>a</sup>	2,530,964	182,645	285,190	357,872	380,445	369,031	326,544	219,570	148,286	221,734	39,647	--
Select red oaks <sup>b</sup>	1,268,046	50,155	81,881	111,175	139,982	160,129	146,668	108,479	78,476	238,976	58,039	--
Chestnut oak	2,005,991	140,072	274,397	287,212	245,111	244,452	235,334	179,793	113,812	210,314	35,494	--
Other white oaks	110,027	10,419	19,571	22,498	15,582	12,050	13,545	5,398	4,529	3,977	2,458	--
Other red oaks	2,477,548	170,653	300,141	373,895	356,478	368,040	310,427	231,139	148,723	199,254	17,998	--
Hickory	1,141,817	90,543	152,385	196,284	195,953	171,248	120,246	92,379	54,804	60,326	7,649	--
Yellow birch	9,825	1,231	616	1,214	660	--	1,1,669	1,380	799	2,356	--	--
Hard maple	204,115	25,079	27,914	29,238	28,242	24,874	22,046	15,846	10,346	16,898	3,634	--
Soft maple	1,224,015	198,260	220,544	193,639	196,306	131,720	98,070	69,472	51,280	56,083	8,641	--
Beech	445,870	24,101	29,944	47,336	48,613	61,514	61,078	60,251	40,978	66,163	10,792	--
Sweetgum	856,106	102,106	125,433	167,604	148,370	117,149	75,404	40,662	31,650	44,053	3,675	--
Tupelo and blackgum	422,139	49,282	98,768	69,265	72,369	59,564	49,229	29,235	9,927	20,386	3,514	--
Ash	274,874	25,651	37,608	37,579	44,639	42,127	28,656	19,192	15,444	17,513	6,465	--
Cottonwood	5,593	--	--	2,694	1,549	--	513	--	--	837	--	--
Basswood	143,620	4,782	16,613	14,349	23,414	21,876	23,837	13,201	9,285	13,077	3,186	--
Yellow-poplar	2,851,048	155,260	227,315	325,935	442,693	490,867	434,044	317,262	185,501	243,116	29,055	--
Bay and magnolia	40,159	6,218	7,528	10,430	4,489	4,806	2,075	--	1,171	3,442	--	--
Black cherry	45,043	5,949	4,455	4,633	12,831	4,861	3,067	2,591	2,227	3,247	1,182	--
Black walnut	102,402	1,746	12,132	14,350	18,524	21,555	8,383	12,259	6,649	5,618	1,86	--
Sycamore	148,893	7,634	10,035	12,271	16,763	21,003	17,706	18,576	9,726	27,101	8,078	--
Black locust	217,894	16,947	25,569	55,135	44,137	37,456	16,469	14,644	2,184	5,353	--	--
Elm	93,523	11,666	13,919	16,720	15,006	8,727	9,635	8,249	3,084	5,800	717	--
Other eastern hardwoods	4,311,607	42,189	62,516	83,112	57,868	53,156	42,032	33,807	23,520	28,435	4,972	--
Total hardwoods	17,055,119	1,322,588	1,994,474	2,434,440	2,550,024	2,426,205	2,079,175	1,526,268	981,1504	1,494,059	246,382	--
All species	22,952,820	2,186,514	3,257,127	3,615,616	3,450,180	3,078,098	2,516,906	1,797,939	1,126,896	1,646,694	276,850	--

<sup>a</sup> Includes white, swamp chestnut, and chinkapin oaks.<sup>b</sup> Includes cherrybark, northern red, and Shumard oaks.

Table 20.—Volume of sawtimber on timberland, by species and diameter class, Virginia, 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	—	—
<b>Softwood</b>											
Longleaf pine	—	—	—	—	—	—	—	—	—	—	—
Slash pine	—	—	—	—	—	—	—	—	—	—	—
Shortleaf pine	1,497,142	493,584	452,360	280,791	166,143	53,346	41,534	9,384	—	—	—
Loblolly pine	7,812,602	1,451,111	1,550,801	1,663,334	1,293,410	900,312	513,382	429,262	10,790	—	—
Pond pine	56,765	9,783	6,137	5,023	7,013	11,999	7,528	4,321	4,961	—	—
Virginia pine	3,682,310	1,655,674	1,208,467	542,639	205,860	52,625	8,706	8,339	—	—	—
Pitch pine	840,153	147,465	254,442	178,004	144,014	79,385	24,614	12,229	—	—	—
Table Mountain pine	359,957	108,641	104,802	92,479	41,482	8,939	3,614	—	—	—	—
Spruce pine	—	—	—	—	—	—	—	—	—	—	—
Sand pine	—	—	—	—	—	—	—	—	—	—	—
Eastern white pine	2,248,822	241,079	275,304	380,681	409,656	386,705	213,896	317,563	23,938	—	—
Eastern hemlock	645,925	68,579	51,508	73,446	87,793	71,438	59,306	125,106	108,749	—	—
Spruce and fir	11,845	2,660	5,561	3,244	—	—	—	—	—	—	—
Baldcypress	172,106	2,713	15,413	14,583	18,005	17,009	13,047	47,116	44,220	—	—
Pondcypress	47,210	—	2,116	7,269	2,913	3,248	3,241	20,428	7,995	—	—
Cedars	110,946	54,945	21,407	17,656	16,938	—	—	—	—	—	—
Total softwoods	<u>17,485,783</u>	<u>4,236,234</u>	<u>3,948,318</u>	<u>3,259,529</u>	<u>2,393,227</u>	<u>1,565,006</u>	<u>889,068</u>	<u>973,748</u>	<u>209,653</u>		
<b>Hardwood</b>											
Select white oaks <sup>a</sup>	7,428,067	—	1,290,102	1,469,065	1,441,668	1,044,469	746,236	1,196,540	239,987	—	—
Select red oaks <sup>b</sup>	4,526,637	—	467,330	613,083	753,090	633,389	513,150	1,210,286	327,309	—	—
Chestnut oak	5,518,562	—	939,340	932,602	999,491	817,845	546,042	1,081,540	201,702	—	—
Other white oaks	256,373	—	55,582	50,288	62,386	27,078	21,793	28,847	15,399	—	—
Other red oaks	7,152,683	—	1,226,706	1,479,534	1,383,921	1,114,456	752,568	1,086,820	108,678	—	—
Hickory	3,024,787	—	673,989	693,717	542,676	450,504	282,393	334,547	46,961	—	—
Yellow birch	31,760	—	2,305	—	6,796	6,462	3,776	12,421	—	—	—
Hard maple	525,915	—	105,902	100,860	95,498	72,190	48,618	83,959	18,888	—	—
Soft maple	2,448,717	—	637,230	497,676	413,794	315,856	245,824	288,075	50,260	—	—
Beech	1,370,642	—	177,813	232,856	237,892	239,758	162,168	274,118	46,037	—	—
Sweetgum	2,072,928	—	531,178	499,156	362,632	214,301	176,096	266,650	24,915	—	—
Tupelo and blackgum	991,296	—	231,639	227,624	213,386	137,499	49,143	109,407	22,628	—	—
Ash	731,767	—	144,089	163,095	124,026	90,720	76,537	94,430	38,870	—	—
Cottonwood	12,137	—	5,230	—	2,261	—	—	—	—	—	—
Basswood	463,117	—	78,896	87,230	103,566	61,285	45,328	68,044	18,765	—	—
Yellow-poplar	10,305,407	—	1,579,760	2,134,560	2,125,614	1,697,988	1,057,083	1,501,379	203,023	—	—
Bay and magnolia	68,364	—	14,988	19,241	9,301	—	6,066	18,768	—	—	—
Black cherry	129,302	—	44,357	19,986	14,229	12,814	11,705	18,851	7,360	—	—
Black walnut	277,729	—	62,569	78,019	31,847	48,860	27,215	23,906	5,313	—	—
Sycamore	539,234	—	53,289	80,336	75,642	86,208	47,999	145,836	48,924	—	—
Black locust	441,182	—	155,300	137,281	62,084	56,482	8,572	21,463	—	—	—
Elm	211,965	—	51,213	33,432	41,249	37,631	14,798	29,525	4,117	—	—
Other eastern hardwoods	1,023,044	—	199,877	206,459	179,615	151,212	112,795	142,081	31,905	—	—
Total hardwoods	<u>49,550,615</u>	<u>—</u>	<u>8,728,684</u>	<u>9,756,100</u>	<u>9,282,664</u>	<u>7,316,982</u>	<u>4,957,905</u>	<u>8,048,139</u>	<u>1,460,141</u>		
All species	<u>67,036,398</u>	<u>4,236,234</u>	<u>12,677,002</u>	<u>13,015,629</u>	<u>11,675,891</u>	<u>8,901,988</u>	<u>5,846,973</u>	<u>9,021,887</u>	<u>1,660,794</u>		

<sup>a</sup> Includes white, swamp white, swamp chestnut, and chinquapin oaks.<sup>b</sup> Includes cherrybark, northern red, and Shumard oaks.

Table 21.--Volume of sawtimber on timberland, by species, size class, and log grade, Virginia, 1986

Species	All size classes				Trees 15.0 inches d.b.h. and larger			
	All grades		Log grade		All grades		Log grade	
	1	2	3	4	1	2	3	4
<b>Softwood:</b>								
Yellow Pines <sup>a</sup>	14,248,929	3,445,153	1,058,318	8,845,458	(b)	4,043,392	1,352,498	583,932 2,106,962
Eastern white pine	2,248,822	148,694	139,353	1,132,765	828,010	1,351,58	148,694	540,703 594,773
Cypress	219,316	38,059	108,728	72,529	--	177,222	37,217	86,839 53,166
Spruce and fir	11,845	--	119	7,225	4,501	--	--	--
Other eastern softwoods	756,871	49,764	42,650	367,550	296,907	469,330	49,764	40,715 163,008 215,843
Total	17,485,783	3,681,670	2,249,168	10,425,527	1,129,418	6,041,702	1,588,173	779,074 2,863,839 810,616
<b>Hardwood:</b>								
Select white and red oaks	11,954,704	2,175,466	2,852,297	4,686,911	2,240,030	8,115,124	2,175,466	2,226,264 2,663,971 1,049,423
Other white and red oaks	12,927,618	1,690,922	2,582,187	5,168,934	3,485,575	8,243,566	1,690,922	1,986,801 2,674,533 1,891,310
Hickory	3,024,787	330,249	550,641	1,266,404	877,493	1,657,081	330,249	381,856 592,130 352,846
Yellow birch	31,760	5,535	7,934	11,306	8,985	29,455	3,35	7,658 10,015 8,247
Hard maple	525,915	38,443	108,511	225,289	153,672	319,153	38,443	83,053 108,874 88,783
Sweetgum	2,072,928	316,557	470,536	1,046,677	239,158	1,042,594	316,557	257,781 361,584 106,672
Ash, walnut, and black cherry	1,138,798	220,331	264,321	548,660	105,486	626,683	214,766	159,787 180,722 71,408
Yellow-poplar	10,305,407	2,110,387	2,038,877	3,826,295	2,329,848	6,591,087	2,110,387	1,062,978 2,026,431 1,391,291
Other eastern hardwoods	7,568,698	820,870	1,738,666	3,358,340	1,650,822	4,441,088	820,870	1,240,131 1,483,670 896,417
Total	49,550,615	7,706,760	10,613,970	20,138,816	11,091,069	31,055,831	7,701,195	7,406,309 10,101,930 5,856,397
All species	67,036,398	11,388,430	12,863,138	30,564,343	12,220,487	37,107,533	9,289,368	8,185,383 12,965,769 6,667,013

<sup>a</sup> Based on "Southern Pine Log Grades for Yard and Structural Lumber," Research Paper SE-39, published by the Southeastern Forest Experiment Station, Asheville, NC, 1968.

<sup>b</sup> Not applicable.

<sup>c</sup> Based on "Sawlog Grades for Eastern White Pine," Research Paper NE-205, published by the Northeastern Forest Experiment Station, Broomall, PA, 1971.

<sup>d</sup> Based on "A Guide to Hardwood Log Grading (revised)," General Technical Report NE-1, published by the Northeastern Forest Experiment Station, Broomall, PA, 1973.

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

Class of material	Volume <sup>a</sup>			Associated green weight <sup>b</sup>		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
- - - Thousand cubic feet - - -						
Sawtimber trees				- - - Hundred thousand pounds - - -		
Saw-log portion	11,407,147	3,187,576	8,219,571	8,805,093	2,288,328	6,516,765
Upper stem	3,667,592	583,546	3,084,046	2,883,484	422,883	2,460,601
Total <sup>c</sup>	15,074,739	3,771,122	11,303,617	11,688,577	2,711,211	8,977,366
Poletimber trees <sup>c</sup>	7,878,081	2,126,579	5,751,502	5,817,912	1,529,185	4,288,727
All growing stock <sup>c</sup>	22,952,820	5,897,701	17,055,119	17,506,489	4,240,396	13,266,093
Rough trees <sup>c</sup>	2,087,888	89,551	1,998,337	1,613,427	65,935	1,547,492
Rotten trees <sup>c</sup>	297,342	4,674	292,668	249,944	3,417	246,527
Saplings <sup>d</sup>	4,200,511	784,370	3,416,141	3,100,616	526,816	2,573,800
Stumps, tops, and limbs <sup>e</sup>	5,871,409	1,189,536	4,681,873	4,561,676	883,359	3,678,317
Total, all classes	35,409,970	7,965,832	27,444,138	27,032,152	5,719,923	21,312,229

<sup>a</sup>Excludes bark.

<sup>b</sup>Includes bark.

<sup>c</sup>Bole portion of trees 5.0 inches d.b.h. and larger.

<sup>d</sup>Includes entire tree above ground.

<sup>e</sup>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, Virginia, 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	14.0-16.9	15.0-16.9	17.0-18.9	19.0-20.9
		Thousand cubic feet										
<b>Softwood</b>												
Longleaf pine	--	--	--	--	--	--	--	--	--	--	--	--
Slash pine	--	--	--	--	--	--	--	--	--	--	--	--
Shortleaf pine	638,656	6,434	32,172	70,390	142,261	157,087	115,000	62,242	33,757	10,189	7,548	1,576
Loblolly pine	3,250,448	55,566	224,151	512,352	615,320	482,151	396,908	369,320	260,298	168,981	91,864	71,871
Pond Pine	14,488	--	1,99	1,043	3,059	1,878	1,574	1,432	2,354	1,408	757	784
Virginia pine	2,468,668	68,659	226,604	473,904	610,150	54,025	336,114	138,528	49,992	11,529	1,828	2,335
Pitch pine	281,110	2,255	4,248	15,962	34,807	54,663	71,255	43,838	30,541	17,381	4,590	2,170
Table Mountain pine	153,425	2,354	4,964	20,299	33,214	34,570	25,606	21,495	8,523	1,732	668	--
Spruce pine	--	--	--	--	--	--	--	--	--	--	--	--
Sand pine	--	--	--	--	--	--	--	--	--	--	--	--
Eastern white pine	705,597	20,519	30,218	55,845	75,585	83,285	73,374	90,931	89,605	79,647	42,409	60,183
Eastern hemlock	199,548	6,188	12,294	15,850	18,489	23,728	14,533	17,786	19,762	15,025	12,013	24,898
Spruce and fir	3,925	190	--	--	650	780	1,467	838	--	--	--	--
Baldcypress	42,065	--	332	--	1,019	1,115	4,911	4,064	4,579	3,996	2,921	9,736
Pond Cypress	10,971	--	--	--	--	672	2,027	759	774	754	4,379	9,392
Cedars	196,331	34,132	53,090	51,868	25,625	17,591	6,003	4,395	3,627	--	--	1,606
Total softwoods	7,965,832	196,297	588,073	1,216,669	1,558,163	1,407,054	1,047,721	757,048	502,875	311,608	166,903	177,905
												36,416
<b>Hardwood</b>												
Select white oaks <sup>a</sup>	3,587,788	61,191	158,695	284,402	392,978	475,510	488,997	468,914	410,859	284,153	193,482	302,824
Select red oaks <sup>b</sup>	1,783,265	23,592	57,280	84,062	115,670	147,723	182,841	209,921	230,369	179,159	140,184	322,565
Chestnut oak	3,197,197	22,972	115,141	246,129	422,080	417,267	422,529	362,956	339,988	265,513	179,208	330,325
Other white oaks	169,009	5,952	10,462	17,463	26,93	29,379	20,916	17,721	17,849	6,766	5,651	4,459
Other red oaks	3,535,530	76,906	174,637	284,005	417,211	493,141	462,807	463,556	392,994	289,339	190,639	261,300
Hickory	1,688,219	63,755	106,163	154,621	211,195	258,324	251,461	216,182	150,395	116,444	71,585	78,814
Yellow birch	18,962	202	361	2,906	2,036	2,891	1,562	850	1,913	1,680	1,692	2,869
Hard maple	341,999	17,094	29,892	41,284	38,121	44,875	37,092	33,424	30,529	20,130	14,365	25,082
Soft maple	2,548,368	261,104	359,240	364,127	342,53	286,148	291,083	202,037	143,037	102,354	76,608	97,767
Beech	741,043	29,	583	33,612	42,339	49,129	67,923	69,709	89,99	82,763	82,551	61,609
Sweetgum	1,364,847	114,608	156,475	166,788	166,430	206,353	177,825	138,441	89,398	48,407	38,026	56,089
Tupelo and blackgum	848,339	102,991	92,763	89,728	93,485	107,084	103,945	81,881	68,108	44,932	15,667	38,634
Ash	471,307	22,645	45,935	53,457	61,618	57,091	61,437	55,722	36,434	24,340	20,738	23,894
Cottonwood	6,717	90	--	--	3,234	1,829	--	600	--	--	--	7,996
Basswood	197,144	2,420	6,460	7,100	22,433	19,028	27,521	26,939	30,121	15,596	14,688	19,137
Yellow-poplar	3,593,037	69,929	151,127	221,433	288,611	388,934	563,884	496,525	363,172	212,921	282,380	40,332
Bay and magnolia	75,825	7,299	9,842	11,754	9,369	17,951	6,018	5,726	2,442	--	1,376	4,048
Black cherry	167,241	32,057	31,405	19,880	16,743	14,567	21,227	10,134	7,003	3,036	3,438	6,353
Black walnut	172,344	1,612	10,278	5,664	18,725	23,997	25,552	32,767	12,715	17,015	12,067	10,269
Sycamore	195,774	2,208	6,391	11,416	12,251	15,032	21,644	25,977	23,343	22,961	11,596	9,949
Black locust	471,528	12,875	31,739	44,219	59,636	101,434	80,222	61,101	33,067	22,912	8,526	13,317
Elm	182,218	12,629	26,219	24,799	21,798	27,583	21,040	11,274	15,372	10,298	3,603	6,769
Other eastern hardwoods	2,086,437	413,222	445,088	356,776	239,353	197,435	134,967	89,793	77,119	48,393	31,697	45,030
Total hardwoods	27,444,138	1,356,936	2,059,205	2,534,100	3,027,892	3,403,504	3,424,813	3,168,399	2,692,563	1,963,151	1,309,386	2,081,269
All species	35,409,970	1,553,233	2,647,278	3,750,769	4,586,055	4,810,538	4,472,534	3,195,438	2,280,759	1,475,389	2,259,174	453,336

<sup>a</sup> Includes white, swamp white, swamp chestnut, and chinkapin oaks.

<sup>b</sup> Includes cherrybark, northern red, and Shumard oaks.

Table 24.--Green weight of forest biomass on timberland, by species and diameter class, Virginia, 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	14.0-16.9	15.0-16.9	16.0-18.9	
Hundred thousand pounds												
<b>Softwood</b>												
Longleaf pine												
Slash pine	--	--	--	--	--	--	--	--	--	--	--	
Shortleaf pine	439,198	3,576	19,358	42,839	97,204	110,828	82,296	44,803	24,349	7,383	5,418	
Loblolly pine	2,325,972	28,565	132,785	362,576	455,443	353,777	290,810	270,072	189,036	122,443	66,710	
Pond pine	10,405	--	--	160	2,212	1,347	1,151	1,035	1,035	1,660	993	
Virginia pine	1,869,279	59,182	183,999	362,679	458,910	407,423	247,777	101,383	36,360	8,350	533	
Pitch pine	192,336	1,564	3,891	10,700	24,048	37,320	48,483	29,597	20,661	11,598	1,330	
Table Mountain pine	95,257	1,959	4,497	10,811	19,635	21,196	16,215	13,828	5,544	1,126	446	
Spruce pine	--	--	--	--	--	--	--	--	--	--	--	
Sand pine	--	--	--	--	--	--	--	--	--	--	--	
Eastern white pine	457,300	8,511	13,912	37,237	52,856	57,197	50,436	61,258	58,844	51,405	26,885	
Eastern hemlock	152,317	3,605	7,854	13,142	16,254	20,701	12,322	14,216	15,078	11,032	8,734	
Spruce and fir	2,846	108	--	--	461	569	1,091	617	--	--	--	
Baldcypress	32,601	--	207	--	605	722	3,449	2,978	3,406	3,042	2,255	
Pondcypress	8,508	--	--	--	--	--	467	1,462	562	594	579	
Cedars	133,904	20,770	32,473	37,818	19,381	13,026	4,625	3,172	2,639	--	--	
Total softwoods	5,719,923	127,840	398,976	877,962	1,145,557	1,024,971	759,318	544,537	357,714	219,133	116,426	
<b>Hardwood</b>												
Select white oak <sup>a</sup>	2,907,137	47,978	115,747	198,806	310,401	385,548	401,025	387,075	342,777	237,893	163,598	
Select red oak <sup>b</sup>	1,455,964	18,315	42,133	62,558	95,420	122,303	151,593	174,296	190,586	146,581	116,449	
Chestnut oak	2,553,531	21,048	90,431	177,978	326,184	327,327	336,385	292,636	277,077	217,727	148,592	
Other white oaks	4,266	7,302	12,357	20,627	23,447	17,243	14,916	14,940	5,736	4,764	275,943	
Other red oaks	2,999,277	61,485	128,140	215,882	354,198	426,499	403,319	400,480	340,115	250,306	165,134	
Hickory	1,364,891	55,950	93,023	109,398	162,821	203,613	201,837	176,908	125,242	98,324	60,722	
Yellow birch	15,455	173	308	2,070	1,615	2,396	1,259	684	1,608	1,411	1,428	
Hard maple	281,735	14,040	25,253	29,923	30,221	36,790	30,919	28,141	25,828	17,179	12,460	
Soft maple	1,860,948	199,559	252,081	246,627	259,368	216,043	217,801	150,217	105,244	74,759	54,944	
Beech	601,172	20,766	24,561	25,908	38,596	55,306	57,933	74,260	69,252	69,010	52,018	
Sweetgum	970,794	75,445	104,674	108,912	118,551	148,207	130,143	102,822	67,106	66,893	29,234	
Tupelo and blackgum	579,918	79,937	67,468	48,054	57,859	69,280	69,654	56,609	48,313	33,146	11,848	
Ash	300,381	13,655	29,000	39,290	43,908	37,872	38,337	34,066	21,604	14,028	11,798	
Cottonwood	4,592	65	--	--	--	2,104	1,257	--	424	--	--	
Basswood	2,535,687	50,992	101,725	132,762	196,602	271,749	12,759	18,647	20,955	10,775	10,430	
Yellow poplar	1,355,499	1,607	4,439	4,244	15,016	12,759	18,785	36,222	36,835	155,514	208,758	
Bay and magnolia	46,438	4,418	6,091	6,485	5,739	11,483	3,664	3,659	1,585	--	832	
Black cherry	105,628	15,140	20,434	11,927	11,057	9,903	14,156	7,090	5,217	2,204	2,482	
Black walnut	152,281	1,329	8,624	4,774	16,356	21,233	22,284	28,968	10,999	15,111	10,794	
Sycamore	139,904	1,494	4,349	5,457	7,449	9,782	14,951	18,894	17,198	17,300	8,810	
Black locust	455,041	10,717	26,663	37,328	57,258	100,201	78,708	61,546	33,954	25,442	8,854	
Elm	119,489	9,194	18,252	14,793	13,927	17,579	13,504	7,565	10,239	6,923	2,432	
Other eastern hardwoods	1,591,511	337,151	358,378	233,572	174,510	143,589	100,946	70,309	62,187	40,426	25,854	
Total hardwoods	21,312,229	1,044,724	1,529,076	1,729,105	2,317,683	2,655,013	2,688,751	2,512,830	2,150,209	1,583,032	1,056,990	
All species	21,312,229	1,044,724	1,529,076	1,729,105	2,317,683	2,655,013	2,688,751	2,512,830	2,150,209	1,583,032	1,056,990	
											345,141	

<sup>a</sup>Includes white, swamp chestnut, and chinkapin oaks.

<sup>b</sup>Includes cherrybark, northern red, and Shumard oaks.

Total species

27,032,152

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

Species	Forest-type group					
	All types	White pine-hemlock	Spruce-fir	Longleaf-slash	Loblolly-shortleaf	Oak-hickory
	Thousand cubic feet					
<b>Softwood</b>						
Longleaf pine	--	--	--	--	--	--
Slash pine	--	2,449	--	--	84,645	103,177
Shortleaf pine	503,303	2,467,358	--	312,226	169,138	24,957
Loblolly pine	--	--	--	1,917,918	350,371	1,839
Pond pine	11,877	--	--	10,038	--	--
Virginia pine	1,759,465	9,126	--	1,330,384	242,706	175,350
Pitch pine	223,689	1,855	--	104,223	51,090	66,521
Table Mountain pine	117,244	1,946	--	--	81,869	12,467
Spruce pine	--	--	--	--	--	--
Sand pine	--	--	--	--	--	--
Eastern white pine	543,711	252,132	--	32,141	159,229	100,209
Eastern hemlock	151,265	34,561	--	231	51,439	60,593
Spruce and fir	3,146	--	--	--	--	--
Baldcypress	33,621	--	--	--	--	--
Pondcypress	8,755	--	--	--	--	--
Cedars	74,267	--	--	24,731	7,693	40,715
Total softwoods	5,897,701	302,069	--	--	3,813,761	939,640
<b>Hardwood</b>						
Select white oaks <sup>a</sup>	2,530,964	7,368	--	88,642	248,648	2,152,048
Select red oaks <sup>b</sup>	1,268,046	5,001	--	8,442	49,748	1,167,596
Chestnut oak	2,005,991	7,188	--	12,696	99,620	1,883,825
Other white oaks	110,027	--	--	8,015	8,100	--
Other red oaks	2,477,548	11,487	--	122,599	258,289	2,019,502
Hickory	1,141,817	1,391	--	20,011	48,498	1,058,706
Yellow birch	9,825	--	--	--	1,231	5,216
Hard maple	204,115	--	--	2,159	15,111	139,902
Soft maple	1,224,015	6,400	--	47,523	88,299	893,700
Beech	449,870	3,306	--	8,190	19,916	375,009
Sweetgum	856,106	--	--	106,963	93,827	494,624
Tupelo and blackgum	422,139	1,543	--	19,865	30,865	201,051
Ash	274,874	--	--	2,232	5,890	179,146
Cottonwood	5,593	--	--	--	--	1,246
Basswood	143,620	--	--	--	2,273	135,358
Yellow-poplar	2,851,048	5,403	--	145,327	185,487	2,424,975
Bay and magnolia	40,159	--	--	--	38,124	1,254
Black cherry	45,043	--	--	3,594	--	38,019
Black walnut	102,402	--	--	1,821	2,864	92,727
Sycamore	148,893	--	--	3,259	293	73,284
Black locust	6,774	--	--	12,284	4,011	184,048
Elm	93,523	--	--	3,827	4,768	57,934
Other eastern hardwoods	431,607	6,193	--	--	3,800	17,700
Total hardwoods	17,055,119	62,054	--	--	621,249	1,185,438
All species	22,952,820	364,123	--	--	4,435,010	2,145,078

<sup>a</sup> Includes white, swamp white, swamp chestnut, and chinkapin oaks.

<sup>b</sup> Includes cherrybark, northern red, and Shumard oaks.

Table 26.--Volume of growing stock on timberland, by ownership class, species group, and diameter class, Virginia, 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
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Table 27.—Volume of sawtimber on timberland, by ownership class, species group, and diameter class, Virginia, 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	1,075,856	205,861	254,444	246,216	149,032	102,369	26,135	75,170	16,629
Hardwood	5,163,124	--	819,875	967,819	774,851	799,559	539,465	1,088,757	172,798
Total	6,238,980	205,861	1,074,319	1,214,035	923,883	901,928	565,600	1,163,927	189,427
Other public									
Softwood	1,058,777	225,999	221,897	165,404	218,518	149,865	43,792	33,302	--
Hardwood	2,104,414	--	341,735	319,083	371,889	389,333	255,070	404,781	22,523
Total	3,163,191	225,999	563,632	484,487	590,407	539,198	298,862	438,083	22,523
Forest industry									
Softwood	2,572,699	662,844	562,449	455,626	320,873	260,360	145,720	158,729	6,098
Hardwood	3,042,146	--	569,132	708,139	557,721	390,469	289,555	444,817	82,313
Total	5,614,845	662,844	1,131,581	1,163,765	878,594	650,829	435,275	603,546	88,411
Forest industry-leased									
Softwood	7,767	7,767.	--	--	--	--	--	--	--
Hardwood	15,670	--	4,085	6,857	2,268	--	--	2,460	--
Total	23,437	7,767	4,085	6,857	2,268	--	--	2,460	--
Other private									
Softwood	12,770,684	3,133,763	2,909,528	2,392,283	1,704,804	1,072,412	673,421	706,547	177,926
Hardwood	39,225,261	--	6,993,857	7,754,202	7,575,935	5,737,621	3,873,815	6,107,324	1,182,507
Total	51,995,945	3,133,763	9,903,385	10,146,485	9,280,739	6,810,033	4,547,236	6,813,871	1,360,433
All ownerships									
Softwood	17,485,783	4,236,234	3,948,318	3,259,529	2,393,227	1,585,006	889,068	973,748	200,653
Hardwood	49,550,615	--	8,728,684	9,756,100	9,282,664	7,316,982	4,957,905	8,048,139	1,460,141
Total	67,036,398	4,236,234	12,677,002	13,015,629	11,675,891	8,901,988	5,846,973	9,021,887	1,660,794

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

Broad management class and species group	All classes	No stand	Manageable	Stand-age class (years)									
				0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81+	
— — — — — — — — — — —													
Pine plantation													
Softwood	850,918	--	9,630	359,359	371,622	110,307	--	--	--	--	--		
Hardwood	72,600	--	4,993	21,160	35,806	10,641	--	--	--	--	--		
Total	923,518	--	14,623	380,519	407,428	120,948	--	--	--	--	--		
Natural pine													
Softwood	3,264,912	20,038	6,604	172,260	379,500	815,073	870,759	560,909	256,002	106,854	76,913		
Hardwood	610,703	13,256	2,881	30,064	64,398	103,775	154,813	111,470	68,907	28,960	32,179		
Total	3,875,615	33,294	9,485	202,324	443,898	918,848	1,025,572	672,379	324,909	135,814	109,092		
Oak-pine													
Softwood	959,640	67,654	21,973	59,112	67,456	112,747	143,899	162,692	141,877	89,211	93,019		
Hardwood	1,185,438	51,426	31,515	64,736	75,125	124,652	182,464	214,281	180,925	130,053	130,261		
Total	2,145,078	119,080	53,488	123,848	142,581	237,399	326,363	376,973	322,802	219,264	223,280		
Upland hardwood													
Softwood	746,438	75,786	16,160	32,456	37,178	64,885	83,489	134,061	126,324	82,013	94,086		
Hardwood	14,159,708	967,555	121,671	245,769	366,908	877,841	1,956,739	2,971,184	2,477,517	1,798,048	2,376,476		
Total	14,906,146	1,043,341	137,831	278,225	404,086	942,726	2,040,228	3,105,245	2,603,841	1,880,061	2,470,562		
Lowland hardwood													
Softwood	75,793	7,096	2,228	674	4,914	4,329	6,560	9,410	16,383	2,453	21,746		
Hardwood	1,026,670	131,440	14,264	11,660	44,699	59,461	198,188	154,674	180,059	103,323	128,902		
Total	1,102,463	138,536	16,492	12,334	49,613	63,790	204,748	164,084	196,442	105,776	150,648		
All classes													
Softwood	5,897,701	170,574	56,595	623,861	860,670	1,107,341	1,104,707	867,072	540,586	280,531	285,764		
Hardwood	17,055,119	1,163,677	175,324	373,389	586,936	1,176,370	2,492,204	3,451,609	2,907,408	2,060,384	2,667,818		
Total	22,952,820	1,334,251	231,919	997,250	1,447,606	2,283,711	3,596,911	4,318,681	3,447,994	2,340,915	2,953,582		

Table 29.--Net annual growth and removals of live timber and growing stock on timberland, by species, Virginia, 1985

Species	Live timber <sup>a</sup>		Growing stock	
	Net annual growth	Annual timber removals	Net annual growth	Annual timber removals
- - - - - Thousand cubic feet - - - - -				
<b>Softwood</b>				
Yellow pines	199,353	199,327	198,779	196,809
Eastern white pine	21,989	5,325	21,975	5,242
Spruce and fir	43	--	43	--
Cypress	1,026	1,989	1,026	1,989
Other eastern softwoods	7,261	2,422	7,203	2,296
Total softwoods	<u>229,672</u>	<u>209,063</u>	<u>229,026</u>	<u>206,336</u>
<b>Hardwood</b>				
Select white and red oaks	116,462	73,720	115,261	69,314
Other white and red oaks	140,156	79,668	137,703	71,699
Hickory	29,021	16,517	28,581	15,772
Yellow birch	231	--	201	--
Hard maple	7,058	1,158	6,827	845
Sweetgum	35,248	26,567	34,517	24,720
Ash, walnut, and black cherry	16,045	7,017	14,623	4,830
Yellow-poplar	129,480	48,695	128,225	47,169
Tupelo and blackgum	8,495	7,506	8,061	5,768
Bay and magnolia	1,494	--	1,412	--
Other eastern hardwoods	109,143	49,814	97,207	33,394
Total hardwoods	<u>592,833</u>	<u>310,662</u>	<u>572,618</u>	<u>273,511</u>
All species	822,505	519,725	801,644	479,847

<sup>a</sup>Merchantable portion only.

Table 30.--Net annual growth and removals of growing stock on timberland, by ownership class, softwood, and hardwood, Virginia, 1985

Ownership class	Net annual growth			Annual timber removals		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
- - - - - Thousand cubic feet - - - - -						
National forest	59,549	6,154	53,395	6,362	1,108	5,254
Other public	33,161	10,013	23,148	15,007	6,035	8,972
Forest industry	106,634	63,748	42,886	106,697	59,205	47,492
Forest industry-leased	1,515	844	671	518	518	--
Other private	600,785	148,267	452,518	351,263	139,470	211,793
All ownerships	801,644	229,026	572,618	479,847	206,336	273,511

Table 31.--Net annual growth and removals of sawtimber on timberland, by species, Virginia, 1985

Species	Net annual growth	Annual timber removals
	Thousand board feet	
<b>Softwood</b>		
Yellow pines	668,573	679,176
Eastern white pine	110,949	24,304
Spruce and fir	216	--
Cypress	6,406	9,961
Other eastern softwoods	25,447	6,086
Total softwoods	<u>811,591</u>	<u>719,527</u>
<b>Hardwood</b>		
Select white and red oaks	495,394	237,538
Other white and red oaks	548,617	235,263
Hickory	118,167	46,515
Yellow birch	1,308	--
Hard maple	27,980	3,337
Sweetgum	111,196	77,764
Ash, walnut, and black cherry	49,483	15,440
Yellow-poplar	621,522	201,298
Tupelo and blackgum	26,268	18,761
Bay and magnolia	4,283	--
Other eastern hardwoods	301,059	98,745
Total hardwoods	<u>2,305,277</u>	<u>934,661</u>
All species	3,116,868	1,654,188

Table 32.--Net annual growth and removals of sawtimber on timberland, by ownership class, softwood, and hardwood, Virginia, 1985

Ownership class	Net annual growth			Annual timber removals		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
- - - - - Thousand board feet - - - - -						
National forest	222,501	25,588	196,913	19,190	4,378	14,812
Other public	138,381	44,098	94,283	53,997	22,482	31,515
Forest industry	289,627	149,522	140,105	359,578	209,476	150,102
Forest industry-leased	6,257	3,771	2,486	546	546	--
Other private	2,460,102	588,612	1,871,490	1,220,877	482,645	738,232
All ownerships	3,116,868	811,591	2,305,277	1,654,188	719,527	934,661

Table 33.--Mortality of live timber, growing stock, and sawtimber on timberland, by species, Virginia, 1985

Species	Live timber <sup>a</sup>	Growing stock	Sawtimber
	Thousand cubic feet	Thousand board feet	Thousand board feet
<b>Softwood</b>			
Yellow pines	73,934	69,199	154,247
Eastern white pine	1,914	1,688	5,992
Spruce and fir	--	--	--
Cypress	--	--	--
Other eastern softwoods	1,448	1,282	1,758
Total softwoods	77,296	72,169	161,997
<b>Hardwood</b>			
Select white and red oaks	21,472	13,704	39,977
Other white and red oaks	51,945	36,932	93,081
Hickory	13,132	9,699	22,965
Yellow birch	208	208	1,047
Hard maple	697	271	1,536
Sweetgum	4,883	3,576	5,634
Ash, walnut, and black cherry	6,849	3,185	8,890
Yellow-poplar	7,371	5,988	13,682
Tupelo and blackgum	1,831	730	1,325
Bay and magnolia	206	74	--
Other eastern hardwoods	41,960	16,744	38,067
Total hardwoods	150,554	91,111	226,204
<b>All species</b>	<b>227,850</b>	<b>163,280</b>	<b>388,201</b>

<sup>a</sup>Merchandise portion only.

Table 34.--Mortality of growing stock and sawtimber on timberland, by ownership class, softwood, and hardwood, Virginia, 1985

Ownership class	Growing stock			Sawtimber		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
-- -- Thousand cubic feet -- --						
National forest	19,327	3,398	15,929	45,751	11,041	34,710
Other public	5,673	3,825	1,848	10,969	7,181	3,788
Forest industry	19,488	11,271	8,217	43,920	19,932	23,988
Forest industry-leased	157	--	157	--	--	--
Other private	118,635	53,675	64,960	287,561	123,843	163,718
All ownerships	163,280	72,169	91,111	388,201	161,997	226,204

Table 35.--Mortality of growing stock and sawtimber on timberland, by cause of death, softwood, and hardwood, Virginia, 1985

Cause of death	Growing stock			Sawtimber		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
-- -- Thousand cubic feet -- --						
Fire	1,618	321	1,297	2,151	--	2,151
Insects	27,964	26,031	1,933	83,049	79,950	3,099
Disease	44,990	8,617	36,373	120,828	20,519	100,309
Weather	23,927	9,593	14,334	66,998	26,078	40,920
Suppression	30,495	19,406	11,089	14,422	9,438	4,984
Animals	4,678	883	3,795	14,938	4,020	10,918
Undetermined	29,608	7,318	22,290	85,815	21,992	63,823
All causes	163,280	72,169	91,111	388,201	161,997	226,204

Table 36.--Annual output of timber products, by product, species group, and type of material, Virginia, 1976-1985

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
<b>Saw logs</b>							
Softwood	M fbm <sup>a</sup>	477,912	89,813	468,951	88,129	8,961	1,684
Hardwood	M fbm <sup>a</sup>	594,747	110,589	594,629	110,567	118	22
Total	M fbm <sup>a</sup>	1,072,659	200,402	1,063,580	198,696	9,079	1,706
<b>Veneer logs and bolts</b>							
Softwood	M fbm <sup>a</sup>	59,384	9,674	59,384	9,674	--	--
Hardwood	M fbm <sup>a</sup>	23,344	3,408	23,344	3,408	--	--
Total	M fbm <sup>a</sup>	82,728	13,082	82,728	13,082	--	--
<b>Pulpwood<sup>b</sup></b>							
Softwood	Cords <sup>c</sup>	1,519,325	111,019	1,116,566	81,589	402,759	29,430
Hardwood	Cords <sup>c</sup>	1,448,031	110,589	1,064,000	81,260	384,031	29,329
Total	Cords <sup>c</sup>	2,967,356	221,608	2,180,566	162,849	786,790	58,759
<b>Poles and piling</b>							
Softwood	M pieces	57	1,602	57	1,602	--	--
Hardwood	M pieces	--	--	--	--	--	--
Total	M pieces	57	1,602	57	1,602	--	--
<b>Posts (round and split)</b>							
Softwood	M pieces	228	197	228	197	--	--
Hardwood	M pieces	16	16	16	16	--	--
Total	M pieces	244	213	244	213	--	--
<b>Other<sup>d</sup></b>							
Softwood	M ft <sup>3</sup>	7,450	7,450	1,987	1,987	5,463	5,463
Hardwood	M ft <sup>3</sup>	5,367	5,367	2,863	2,863	2,504	2,504
Total	M ft <sup>3</sup>	12,817	12,817	4,850	4,850	7,967	7,967
<b>Total industrial products</b>							
Softwood		--	219,755	--	183,178	--	36,577
Hardwood		--	229,969	--	198,114	--	31,855
Total		--	449,724	--	381,292	--	68,432
<b>Fuelwood<sup>e</sup></b>							
Softwood	Cords	178,250	13,025	159,255	11,637	18,995	1,388
Hardwood	Cords	1,632,266	124,652	1,580,105	120,676	52,061	3,976
Total	Cords	1,810,416	137,677	1,739,360	132,313	71,056	5,364
<b>All products<sup>f</sup></b>							
Softwood		--	232,780	--	194,815	--	37,965
Hardwood		--	354,621	--	318,790	--	35,831
Total		--	587,401	--	513,605	--	73,796

<sup>a</sup>International 1/4-inch rule.

<sup>b</sup>Roundwood figures include an estimated 13,270 thousand cubic feet of roundwood chipped at other primary wood-using plants.

<sup>c</sup>Rough-wood basis (includes chips converted to equivalent standard cords).

<sup>d</sup>Includes particleboard, charcoal, and specialty products.

<sup>e</sup>Excludes approximately 16,919 thousand cubic feet of plant byproducts used for industrial fuel.

<sup>f</sup>Excludes 3,468 thousand cubic feet of plant byproducts used for litter and mulch.

Table 37.--Annual output of roundwood products, by product, species group, and source of material, Virginia, 1976-1985

Product and species group	All sources	Growing-stock trees <sup>a</sup>			Cull trees <sup>a</sup>	Salvable dead trees <sup>a</sup>	Other sources <sup>b</sup>
		Total	Sawtimber	Poletimber			
<u>- - - - - Thousand cubic feet - - - - -</u>							
<b>Saw logs</b>							
Softwood	88,129	87,616	83,084	4,532	171	--	342
Hardwood	110,567	101,996	97,696	4,300	3,832	253	4,486
Total	198,696	189,612	180,780	8,832	4,003	253	4,828
<b>Veneer logs and bolts</b>							
Softwood	9,674	9,674	9,674	--	--	--	--
Hardwood	3,408	3,337	3,200	137	33	--	38
Total	13,082	13,011	12,874	137	33	--	38
<b>Pulpwood</b>							
Softwood	81,589	74,352	35,503	38,849	1,658	--	5,579
Hardwood	81,260	61,211	27,737	33,474	8,808	--	11,241
Total	162,849	135,563	63,240	72,323	10,466	--	16,820
<b>Poles and piling</b>							
Softwood	1,602	1,602	1,602	--	--	--	--
Hardwood	--	--	--	--	--	--	--
Total	1,602	1,602	1,602	--	--	--	--
<b>Posts (round and split)</b>							
Softwood	197	197	117	80	--	--	--
Hardwood	16	5	3	2	5	--	6
Total	213	202	120	82	5	--	6
<b>Other</b>							
Softwood	1,987	1,987	658	1,329	--	--	--
Hardwood	2,863	1,706	1,271	435	445	--	712
Total	4,850	3,693	1,929	1,764	445	--	712
<b>Total industrial products</b>							
Softwood	183,178	175,428	130,638	44,790	1,829	--	5,921
Hardwood	198,114	168,255	129,907	38,348	13,123	253	16,483
Total	381,292	343,683	260,545	83,138	14,952	253	22,404
<b>Fuelwood</b>							
Softwood	11,637	5,317	4,243	1,074	152	2,309	3,859
Hardwood	120,676	37,794	29,781	8,013	9,683	22,874	50,325
Total	132,313	43,111	34,024	9,087	9,835	25,183	54,184
<b>All products</b>							
Softwood	194,815	180,745	134,881	45,864	1,981	2,309	9,780
Hardwood	318,790	206,049	159,688	46,361	22,806	23,127	66,808
Total	513,605	386,794	294,569	92,225	24,787	25,436	76,588

<sup>a</sup>On timberland.

<sup>b</sup>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.--Annual timber removals from growing stock on timberland, by item, softwood, and hardwood, Virginia, 1976-1985

Item	All species	Softwood	Hardwood
<u>- - - Thousand cubic feet - - -</u>			
<b>Roundwood products</b>			
Saw logs	189,612	87,616	101,996
Veneer logs and bolts	13,011	9,674	3,337
Pulpwood	135,563	74,352	61,211
Poles and piling	1,602	1,602	--
Posts	202	197	5
Other	3,693	1,987	1,706
Fuelwood	43,111	5,317	37,794
<b>All products</b>	<b>386,794</b>	<b>180,745</b>	<b>206,049</b>
<b>Logging residues</b>			
	<b>41,619</b>	<b>11,354</b>	<b>30,265</b>
<b>Other removals</b>			
	<b>51,434</b>	<b>14,237</b>	<b>37,197</b>
<b>Total removals</b>	<b>479,847</b>	<b>206,336</b>	<b>273,511</b>

Table 39.--Annual timber removals from live sawtimber on timberland, by item, softwood, and hardwood, Virginia, 1976-1985

Item	All species	Softwood	Hardwood
- - - - Thousand board feet - - - -			
<b>Roundwood products</b>			
Saw logs	936,567	425,324	511,243
Veneer logs and bolts	78,439	57,142	21,297
Pulpwood	306,764	162,772	143,992
Poles and piling	9,315	9,315	--
Posts	572	561	11
Other	10,118	3,119	6,999
Fuelwood	149,238	18,304	130,934
All products	<u>1,491,013</u>	<u>676,537</u>	<u>814,476</u>
<b>Logging residues</b>			
	<u>34,675</u>	<u>16,368</u>	<u>18,307</u>
<b>Other removals</b>			
	<u>128,500</u>	<u>26,622</u>	<u>101,878</u>
<b>Total removals</b>	<b>1,654,188</b>	<b>719,527</b>	<b>934,661</b>

Table 40.--Annual volume of unused residues at primary manufacturing plants, by species group, type of residue, and industry, Virginia, 1976-1985

Species group and type of residue	All industries	Lumber	Veneer and plywood	Other
<u>- - - - Thousand cubic feet - - - -</u>				
<b>Softwood</b>				
Coarse <sup>a</sup>	1,082	1,045	--	37
Fine <sup>b</sup>	2,749	2,723	--	26
Total	<u>3,831</u>	<u>3,768</u>	--	63
<b>Hardwood</b>				
Coarse <sup>a</sup>	1,812	1,783	9	20
Fine <sup>b</sup>	5,707	5,673	12	22
Total	<u>7,519</u>	<u>7,456</u>	21	42
<b>All species</b>				
Coarse <sup>a</sup>	2,894	2,828	9	57
Fine <sup>b</sup>	8,456	8,396	12	48
Total	<u>11,350</u>	<u>11,224</u>	21	105

<sup>a</sup>Material such as slabs and edgings.

<sup>b</sup>Material such as sawdust and shavings.

Table 41.--Current area of timberland and associated inventory, net annual growth, and annual removals of growing stock, by species group and ownership, with 30-year projections,<sup>a</sup> Virginia

Component, species group, and ownership	Unit of measure	Inventory year		Projected to--	
		1986	1996	2006	2016
<b>Area</b>					
	M acres				
Public		1,994	2,031	2,044	2,055
Forest industry		1,853	1,906	1,917	1,932
Other private		11,589	11,179	11,073	11,051
Total		15,436	15,116	15,034	15,038
<b>Softwoods</b>					
Inventory	MM ft <sup>3</sup>				
Public		636	784	944	1,089
Forest industry		1,104	1,192	1,175	1,189
Other private		4,158	4,024	3,911	3,822
Total		5,898	6,000	6,030	6,100
Net annual growth <sup>b</sup>	MM ft <sup>3</sup>				
Public		16	14	17	20
Forest industry		65	71	90	96
Other private		148	95	123	144
Total		229	180	230	260
Annual removals <sup>b</sup>	MM ft <sup>3</sup>				
Public		7	9	10	9
Forest industry		60	74	81	83
Other private		139	138	133	138
Total		206	221	224	230
<b>Hardwoods</b>					
Inventory	MM ft <sup>3</sup>				
Public		2,569	2,483	2,641	2,743
Forest industry		1,097	1,060	980	861
Other private		13,389	14,001	13,854	13,532
Total		17,055	17,544	17,475	17,136
Net annual growth <sup>b</sup>	MM ft <sup>3</sup>				
Public		76	47	42	47
Forest industry		44	38	30	25
Other private		453	393	339	338
Total		573	478	411	410
Annual removals <sup>b</sup>	MM ft <sup>3</sup>				
Public		14	22	24	31
Forest industry		48	42	39	35
Other private		212	357	374	376
Total		274	421	437	442

<sup>a</sup>Projection assumptions detailed in USDA Forest Service (1987).

<sup>b</sup>Growth and removals are for the year prior to the inventory year.

Table 42.--Land area, by class, major forest type, and survey completion date, Virginia

Land use class	Survey completion date			Change 1977-1986	
	1966	1977	1986		
- - - - - <u>Acres</u> - - - - -					
<b>Forest land</b>					
Timberland					
Pine and oak-pine types	5,523,492	5,373,812	5,044,842	-328,970	
Hardwood types	10,300,856	10,613,320	10,390,994	-222,326	
Total	15,824,348	15,987,132	15,435,836	-551,296	
Reserved timberland	313,427	360,222	471,188	+110,966	
Woodland	216,292	70,025	61,417	-8,608	
Total forest land	16,354,067	16,417,379	15,968,441	-448,938	
<b>Nonforest land</b>					
Cropland	3,607,794	3,098,623	3,463,490	+364,867	
Pasture and range	3,593,906	3,641,844	3,227,675	-414,169	
Other	1,831,039	2,138,656	2,586,568	+447,912	
Total	9,032,739	8,879,123	9,277,733	+398,610	
All land <sup>a</sup>	25,386,806	25,296,502	25,246,174	-50,328	

<sup>a</sup>Excludes all water areas.

Table 43.--Volume<sup>a</sup> of sawtimber, growing stock, and live timber on timberland, by species group, survey completion date, and diameter class, Virginia

Species group and year	All classes	Diameter class (inches at breast height)						21.0 and larger
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	
SAWTIMBER (in thousand board feet)								
<b>Softwood</b>								
1966	14,305,192	--	--	3,630,149	3,472,069	2,730,522	1,847,550	1,207,747
1977	16,570,654	--	--	4,071,239	4,135,508	3,219,800	2,181,227	1,339,166
1986	17,485,783	--	--	4,236,234	3,948,318	3,259,529	2,393,227	1,585,006
<b>Hardwood</b>								
1966	32,154,020	--	--	6,402,333	6,684,504	5,587,519	4,253,710	2,933,865
1977	41,658,583	--	--	8,092,621	8,640,891	7,654,423	5,781,553	3,944,271
1986	49,550,615	--	--	8,728,684	9,756,100	9,282,664	7,316,982	4,957,905
								9,508,280
GROWING STOCK (in thousand cubic feet)								
<b>Softwood</b>								
1966	4,911,884	737,958	1,065,294	1,012,696	788,088	543,166	335,287	205,066
1977	5,596,752	825,018	1,169,698	1,135,321	940,540	643,143	397,113	228,370
1986	5,897,701	863,926	1,262,653	1,181,176	900,156	651,893	437,731	271,671
<b>Hardwood</b>								
1966	12,325,640	1,319,818	1,720,333	1,887,046	1,869,717	1,661,110	1,250,350	887,117
1977	15,401,230	1,398,032	2,026,348	2,383,197	2,364,123	2,148,131	1,714,541	1,205,565
1986	17,055,119	1,322,588	1,994,474	2,434,440	2,550,024	2,426,205	2,079,175	1,526,268
								981,504
LIVE TIMBER <sup>b</sup> (in thousand cubic feet)								
<b>Softwood</b>								
1966	4,982,879	757,269	1,083,041	1,028,638	794,451	549,456	337,627	205,592
1977	5,684,602	846,030	1,190,663	1,155,470	949,070	652,536	400,151	229,408
1986	5,991,926	885,419	1,284,571	1,202,197	908,895	661,867	441,456	274,100
<b>Hardwood</b>								
1966	14,066,786	1,743,027	2,038,327	2,131,820	2,062,516	1,795,465	1,344,336	953,659
1977	17,530,510	1,847,514	2,404,330	2,701,093	2,613,392	2,325,332	1,847,542	1,294,757
1986	19,346,124	1,745,466	2,368,385	2,758,192	2,821,413	2,630,073	2,240,169	1,639,760
								1,088,691

<sup>a</sup>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.

<sup>b</sup>Merchantable volume.

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

Species group and Survey Unit	1966	1977	Change 1966-1977	1986	Change 1977-1986
	Thousand cubic feet	Thousand cubic feet	Percent	Thousand cubic feet	Percent
<b>Softwood</b>					
Coastal Plain	2,447,491	2,411,838	-1.5	2,334,683	-3.2
Southern Piedmont	1,191,089	1,449,507	+21.7	1,620,457	+11.8
Northern Piedmont	561,213	742,756	+32.3	792,606	+6.7
Northern Mountains	457,207	595,395	+30.2	613,772	+3.1
Southern Mountains	325,879	485,106	+48.9	630,408	+30.0
All units	4,982,879	5,684,602	+14.1	5,991,926	+5.4
<b>Hardwood</b>					
Coastal Plain	3,544,676	3,829,829	+8.0	3,922,981	+2.4
Southern Piedmont	2,567,510	3,278,333	+27.7	3,778,867	+15.3
Northern Piedmont	2,297,792	2,967,293	+29.1	3,261,391	+9.9
Northern Mountains	2,628,236	3,353,585	+27.6	3,568,860	+6.4
Southern Mountains	3,028,572	4,101,470	+35.4	4,814,025	+17.4
All units	14,066,786	17,530,510	+24.6	19,346,124	+10.4

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

County	All land <sup>a</sup>	Total forest <sup>b</sup>	
	Acres	Acres	Percent
Accomack	304,435	104,715	34.4
Albemarle	470,829	290,860	61.8
Alleghany	290,317	251,501	86.6
Amelia	228,410	167,507	73.3
Amherst	306,246	221,538	72.3
Appomattox	215,078	155,856	72.5
Arlington	16,614	--	--
Augusta	643,097	345,921	53.8
Bath	343,651	302,052	87.9
Bedford	482,618	287,093	59.5
Bland	229,446	178,055	77.6
Botetourt	348,550	245,026	70.3
Brunswick	360,460	287,198	79.7
Buchanan	322,355	287,004	89.0
Buckingham	373,401	299,235	80.1
Campbell	355,040	208,415	58.7
Caroline	342,695	262,658	76.6
Carroll	308,777	164,004	53.1
Charles City	116,128	86,139	74.2
Charlotte	304,960	214,857	70.5
Chesapeake	270,655	115,140	42.5
Chesterfield	304,448	193,898	63.7
Clarke	114,138	40,601	35.6
Craig	211,085	175,307	83.1
Culpeper	244,480	106,997	43.8
Cumberland	191,712	135,560	70.7
Dickenson	212,077	186,145	87.8
Dinwiddie	337,213	239,824	71.1
Essex	168,051	95,625	56.9
Fairfax	266,592	99,337	37.3
Fauquier	416,570	180,056	43.2
Floyd	243,981	134,179	55.0
Fluvanna	185,510	132,590	71.5
Franklin	437,248	286,692	65.6
Frederick	271,532	130,947	48.2
Giles	231,654	176,181	76.1
Gloucester	144,122	99,488	69.0
Goochland	180,032	123,054	68.4
Grayson	287,582	161,648	56.2
Greene	100,371	64,253	64.0
Greenville	193,779	139,144	71.8
Halifax	525,818	348,892	66.4
Hampton	32,832	6,334	19.3
Hanover	299,155	184,587	61.7
Henrico	169,210	66,929	39.6
Henry	251,712	178,116	70.8
Highland	266,112	195,822	73.6
Isle of Wight	204,454	117,676	57.6
James City	101,293	64,104	63.3
King and Queen	202,982	153,245	75.5
King George	115,245	73,029	63.4
King William	177,766	113,537	63.9

Continued

Table 45.--Land area and total forest, by county,  
Virginia, 1986--Continued

County	All land <sup>a</sup>	Total forest <sup>b</sup>	Percent
	Acres	Acres	
Lancaster	85,043	52,896	62.2
Lee	279,974	156,526	55.9
Loudoun	333,498	101,055	30.3
Louisa	317,805	232,229	73.1
Lunenburg	276,627	208,183	75.3
Madison	205,913	118,289	57.4
Mathews	55,776	35,237	63.2
Mecklenburg	394,330	262,562	66.6
Middlesex	85,728	51,470	60.0
Montgomery	254,074	146,183	57.5
Nelson	303,590	223,672	73.7
New Kent	136,256	102,268	75.1
Newport News	41,792	10,908	26.1
Northampton	144,602	29,932	20.7
Northumberland	118,106	67,888	57.5
Nottoway	202,502	140,994	69.6
Orange	218,822	120,565	55.1
Page	200,346	120,991	60.4
Patrick	307,885	225,130	73.1
Pittsylvania	647,731	400,638	61.9
Powhatan	167,162	127,998	76.6
Prince Edward	226,253	160,816	71.1
Prince George	178,537	119,262	66.8
Prince William	223,591	121,061	54.1
Pulaski	203,661	117,241	57.6
Rappahannock	170,970	105,446	61.7
Richmond	123,335	76,818	62.3
Roanoke	197,472	102,107	51.7
Rockbridge	389,382	243,783	62.6
Rockingham	557,376	308,742	55.4
Russell	306,560	166,872	54.4
Scott	342,668	229,142	66.9
Shenandoah	327,833	185,674	56.6
Smyth	289,325	172,534	59.6
Southampton	388,307	241,634	62.2
Spotsylvania	262,471	184,537	70.3
Stafford	173,510	120,200	69.3
Suffolk	261,869	147,230	56.2
Surry	180,058	124,910	69.4
Sussex	314,490	250,306	79.6
Tazewell	332,832	207,118	62.2
Virginia Beach	163,795	47,785	29.2
Warren	139,053	79,845	57.4
Washington	367,366	194,164	52.9
Westmoreland	145,049	76,613	52.8
Wise	263,417	190,561	72.3
Wythe	297,312	145,345	48.9
York	83,277	34,510	41.4
Total	25,409,849	15,968,441	62.8

<sup>a</sup>Excludes inland water.

<sup>b</sup>Includes timberland, reserved timberland, and woodland.

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

County	All ownerships	National forest	Other public	Forest industry <sup>a</sup>	Other private
<u>Acres</u>					
Accomack	102,592	--	1,765	11,538	89,289
Albemarle	275,629	--	3,741	22,363	249,525
Alleghany	249,379	138,460	2,360	8,565	99,994
Amelia	167,378	--	1,970	48,993	116,415
Amherst	219,671	55,226	1,212	22,990	140,243
Appomattox	155,176	--	10,206	40,411	104,559
Arlington	--	--	--	--	--
Augusta	297,003	156,253	12,083	--	128,667
Bath	291,651	171,395	10,004	450	109,802
Bedford	281,061	18,012	1,978	33,683	227,388
Bland	172,081	64,289	660	9,408	97,724
Botetourt	235,918	69,694	6,920	40,346	118,958
Brunswick	287,198	--	6,599	86,047	194,552
Buchanan	287,004	--	101	22,524	264,379
Buckingham	299,235	--	12,940	89,468	196,827
Campbell	208,415	--	639	36,945	170,831
Caroline	262,658	--	58,529	21,479	182,650
Carroll	162,551	3,837	1,816	6,632	150,266
Charles City	85,984	--	4,791	22,441	58,752
Charlotte	214,857	--	2,179	55,418	157,260
Chesapeake	73,545	--	3,568	7,012	62,965
Chesterfield	190,035	--	6,538	37,948	145,549
Clarke	39,279	--	266	5	39,008
Craig	173,085	112,130	--	--	60,955
Culpeper	106,997	--	623	7,947	98,427
Cumberland	135,560	--	16,073	29,497	89,990
Dickenson	182,405	8,082	6,197	408	167,718
Dinwiddie	239,104	--	8,294	72,080	158,730
Essex	95,625	--	497	14,263	80,865
Fairfax	78,855	--	12,618	--	66,237
Fauquier	180,056	--	8,505	3,683	167,868
Floyd	131,487	--	100	3,463	127,924
Fluvanna	132,590	--	1,018	18,276	113,296
Franklin	282,572	--	3,041	14,324	265,207
Frederick	130,606	4,491	272	375	125,468
Giles	165,781	51,221	430	5,728	108,402
Gloucester	99,488	--	204	10,993	88,291
Goochland	123,054	--	195	14,813	108,046
Grayson	149,318	21,549	190	4,093	123,486
Greene	49,387	--	1,284	493	47,610
Greensville	139,144	--	277	48,920	89,947
Halifax	347,578	--	10,463	41,326	295,789
Hampton	6,334	--	154	--	6,180
Hanover	184,368	--	1,721	19,225	163,422
Henrico	66,721	--	2,878	3,008	60,835
Henry	175,769	--	1,871	21,885	152,013
Highland	194,889	56,498	13,728	13,906	110,757
Isle of Wight	117,326	--	850	25,850	90,626
James City	59,954	--	4,707	5,890	49,357
King and Queen	153,245	--	670	57,733	94,842
King George	70,322	--	1,833	995	67,494
King William	113,537	--	477	28,410	84,650

Continued

Table 46.--Area of timberland, by county and ownership class, Virginia, 1986--Continued

County	All ownerships	National forest	Other public	Forest industry <sup>a</sup>	Other private
<u>Acres</u>					
Lancaster	52,896	--	499	8,523	43,874
Lee	148,685	11,229	20	78	137,358
Loudoun	100,175	--	7,181	--	92,994
Louisa	232,229	--	734	22,973	208,522
Lunenburg	208,183	--	505	53,695	153,983
Madison	86,037	--	8,214	4,029	73,794
Mathews	35,237	--	21	7,516	27,700
Mecklenburg	259,926	--	24,191	27,840	207,895
Middlesex	51,470	--	30	5,283	46,157
Montgomery	146,000	18,858	2,801	4,116	120,225
Nelson	222,224	15,248	943	44,758	161,275
New Kent	102,268	--	611	29,927	71,730
Newport News	10,695	--	5,729	--	4,966
Northampton	29,316	--	50	163	29,103
Northumberland	67,888	--	212	13,620	54,056
Nottoway	140,994	--	15,313	24,543	101,138
Orange	120,165	--	210	10,749	109,206
Page	81,161	23,826	85	60	57,190
Patrick	217,454	--	12,300	19,340	185,814
Pittsylvania	400,638	--	3,084	58,254	339,300
Powhatan	127,998	--	7,128	19,050	101,820
Prince Edward	160,816	--	10,472	23,806	126,538
Prince George	118,282	--	2,480	36,991	78,811
Prince William	100,742	--	13,256	--	87,486
Pulaski	116,929	19,092	3,819	548	93,470
Rappahannock	73,707	--	--	20	73,687
Richmond	76,818	--	265	15,848	60,705
Roanoke	99,622	3,006	12,874	7,098	76,644
Rockbridge	234,494	57,172	24,782	16,338	136,202
Rockingham	256,501	124,930	309	748	130,514
Russell	166,872	--	5,858	58	160,956
Scott	227,435	32,630	184	516	194,105
Shenandoah	177,799	69,631	220	--	107,948
Smyth	168,540	68,444	10,295	--	89,801
Southampton	241,582	--	1,730	64,560	175,292
Spotsylvania	177,890	--	2,418	37,089	138,383
Stafford	120,200	--	24,007	2,029	94,164
Suffolk	114,732	--	2,784	33,183	78,765
Surry	123,970	--	1,782	49,596	72,592
Sussex	250,306	--	220	103,767	146,319
Tazewell	200,743	2,101	4,728	928	192,986
Virginia Beach	45,165	--	3,328	--	41,837
Warren	65,307	5,362	2,437	557	56,951
Washington	194,079	19,262	9,411	--	165,406
Westmoreland	75,076	--	120	5,558	69,398
Wise	190,140	33,807	7,723	--	148,610
Wythe	141,945	50,724	2,183	7,215	81,823
York	31,048	--	20,020	29	10,999
Total	15,435,836	1,486,459	507,601	1,853,249	11,588,527

<sup>a</sup>Includes 19,438 acres of other private land under long-term lease.

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

County	All classes	Pine plantation	Natural pine	Oak-pine	Upland hardwood	Lowland hardwood
- - - - - <u>Acres</u> - - - - -						
Accomack	102,592	2,307	39,249	21,646	31,273	8,117
Albemarle	275,629	25,601	32,082	32,083	182,298	3,565
Alleghany	249,379	--	21,200	30,787	197,392	--
Amelia	167,378	41,856	25,420	18,143	81,959	--
Amherst	219,671	10,647	25,497	27,322	156,205	--
Appomattox	155,176	33,670	16,448	8,223	92,652	4,183
Arlington	--	--	--	--	--	--
Augusta	297,003	463	28,203	30,106	238,231	--
Bath	291,651	3,542	11,981	37,497	238,631	--
Bedford	281,061	8,421	29,684	20,686	222,270	--
Bland	172,081	--	9,430	10,286	152,365	--
Botetourt	235,918	--	32,809	22,387	176,620	4,102
Brunswick	287,198	72,512	31,858	64,968	103,009	14,851
Buchanan	287,004	--	--	14,164	272,840	--
Buckingham	299,235	67,562	28,232	35,215	152,972	15,254
Campbell	208,415	20,050	45,372	11,533	127,746	3,714
Caroline	262,658	24,969	65,833	42,358	107,859	21,639
Carroll	162,551	8,839	37,568	30,936	85,208	--
Charles City	85,984	13,381	16,178	21,771	29,363	5,291
Charlotte	214,857	26,146	63,246	23,158	99,229	3,078
Chesapeake	73,545	--	11,120	17,960	13,582	30,883
Chesterfield	190,035	38,091	30,207	21,687	93,999	6,051
Clarke	39,279	--	--	--	39,274	5
Craig	173,085	--	33,436	30,065	109,584	--
Culpeper	106,997	3,175	16,218	3,175	81,254	3,175
Cumberland	135,560	29,164	27,605	15,199	56,218	7,374
Dickenson	182,405	--	9,583	4,792	168,030	--
Dinwiddie	239,104	41,888	42,331	57,117	89,265	8,503
Essex	95,625	2,852	21,878	23,032	41,393	6,470
Fairfax	78,855	--	9,462	--	63,085	6,308
Fauquier	180,056	--	30,167	24,667	121,725	3,497
Floyd	131,487	8,077	31,981	18,329	73,100	--
Fluvanna	132,590	22,212	20,475	16,209	68,408	5,286
Franklin	282,572	2,865	30,310	36,654	212,743	--
Frederick	130,606	--	15,684	7,842	107,080	--
Giles	165,781	--	4,713	9,426	151,642	--
Gloucester	99,488	8,277	18,293	13,235	46,449	13,234
Goochland	123,054	3,178	25,424	12,710	78,564	3,178
Grayson	149,318	8,233	28,479	8,233	104,373	--
Greene	49,387	493	13,718	--	35,176	--
Greensville	139,144	12,374	26,278	16,007	44,662	39,823
Halifax	347,578	34,371	91,975	34,258	160,023	26,951
Hampton	6,334	100	54	6,180	--	--
Hanover	184,368	21,991	43,340	31,714	73,932	13,391
Henrico	66,721	--	8,691	16,964	38,038	3,028
Henry	175,769	8,001	59,748	26,686	73,332	8,002
Highland	194,889	--	9,380	23,107	162,402	--
Isle of Wight	117,326	11,919	15,883	26,359	42,481	20,684
James City	59,954	4,418	7,051	7,052	41,433	--
King and Queen	153,245	40,351	27,133	20,341	53,894	11,526
King George	70,322	995	7,788	5,191	53,529	2,819
King William	113,537	32,712	12,832	10,411	49,866	7,716

Continued

Table 47.--Area of timberland, by county and broad management class, Virginia, 1986  
--Continued

County	All classes	Pine plantation	Natural pine	Oak-pine	Upland hardwood	Lowland hardwood
<u>Acres</u>						
Lancaster	52,896	4,388	13,409	13,162	17,549	4,388
Lee	148,685	--	9,156	--	139,529	--
Loudoun	100,175	--	17,222	1,219	78,290	3,444
Louisa	232,229	22,256	23,170	25,294	156,875	4,634
Lunenburg	208,183	29,135	44,020	21,997	95,986	17,045
Madison	86,037	4,029	11,069	11,069	59,870	--
Mathews	35,237	6,276	13,831	5,036	7,576	2,518
Mecklenburg	259,926	16,504	30,922	37,718	174,782	--
Middlesex	51,470	6,819	5,063	29,673	9,890	25
Montgomery	146,000	816	40,894	5,969	98,321	--
Nelson	222,224	22,380	14,573	3,431	174,978	6,862
New Kent	102,268	14,727	21,569	15,383	45,985	4,604
Newport News	10,695	--	2,972	2,483	5,240	--
Northampton	29,316	2,588	14,552	2,476	7,275	2,425
Northumberland	67,888	8,384	8,293	2,845	45,521	2,845
Nottoway	140,994	44,597	27,154	11,210	49,238	8,795
Orange	120,165	10,599	17,235	13,651	75,268	3,412
Page	81,161	--	10,092	3,364	67,645	60
Patrick	217,454	3,224	14,449	28,468	167,669	3,644
Pittsylvania	400,638	7,625	94,895	19,062	252,367	26,689
Powhatan	127,998	10,266	19,857	--	86,868	11,007
Prince Edward	160,816	13,622	43,272	25,123	66,868	11,931
Prince George	118,282	28,667	14,091	10,168	60,271	5,085
Prince William	100,742	--	23,767	--	72,809	4,166
Pulaski	116,929	--	--	17,525	98,000	1,404
Rappahannock	73,707	3,370	3,349	3,349	63,639	--
Richmond	76,818	13,705	8,908	2,921	39,722	11,562
Roanoke	99,622	--	25,549	13,525	60,548	--
Rockbridge	234,494	4,397	17,166	31,545	177,129	4,257
Rockingham	256,501	92	13,487	40,955	192,644	9,323
Russell	166,872	4,734	4,734	--	157,404	--
Scott	227,435	--	5,108	5,108	217,219	--
Shenandoah	177,799	--	17,049	12,954	143,478	4,318
Smyth	168,540	--	7,389	21,567	139,584	--
Southampton	241,582	54,627	35,776	34,307	69,043	47,829
Spotsylvania	177,890	32,414	34,873	19,497	87,262	3,844
Stafford	120,200	--	20,679	6,494	93,027	--
Suffolk	114,732	25,591	16,112	11,674	38,729	22,626
Surry	123,970	15,566	27,964	18,750	52,325	9,365
Sussex	250,306	55,222	68,590	42,803	48,107	35,584
Tazewell	200,743	--	5,216	--	190,311	5,216
Virginia Beach	45,165	--	8,483	6,606	18,240	11,836
Warren	65,307	--	414	--	51,193	13,700
Washington	194,079	--	5,514	27,568	160,997	--
Westmoreland	75,076	2,779	17,137	9,572	43,195	2,393
Wise	190,140	--	--	4,793	185,347	--
Wythe	141,945	4,922	8,454	14,102	114,467	--
York	31,048	29	6,593	6,904	17,522	--
Total	15,435,836	1,170,053	2,185,598	1,689,191	9,772,460	618,534

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

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
<u>Thousand cubic feet</u>					
Accomack	195,648	116,380	--	48,184	31,084
Albemarle	447,634	71,579	12,654	109,430	253,971
Alleghany	368,090	36,897	14,818	33,322	283,053
Amelia	274,165	101,405	1,789	58,516	112,455
Amherst	359,956	50,932	18,910	97,553	192,561
Appomattox	183,369	54,175	972	31,449	96,773
Arlington	--	--	--	--	--
Augusta	400,425	54,039	15,030	32,111	299,245
Bath	490,970	35,060	14,247	56,274	385,389
Bedford	479,062	91,508	5,578	146,597	235,379
Bland	293,662	12,360	27,093	78,055	176,154
Botetourt	395,308	34,840	20,076	91,814	248,578
Brunswick	370,023	167,724	1,129	90,989	110,181
Buchanan	525,028	297	16,430	205,033	303,268
Buckingham	283,208	89,908	669	52,610	140,021
Campbell	281,688	82,885	201	58,417	140,185
Caroline	441,018	156,750	312	121,594	162,362
Carroll	275,795	19,406	95,071	32,073	129,245
Charles City	167,713	59,131	6,011	51,735	50,836
Charlotte	298,668	127,276	3,126	69,793	98,473
Chesapeake	159,150	40,259	679	82,722	35,490
Chesterfield	300,948	94,924	--	72,879	133,145
Clarke	93,084	--	--	32,493	60,591
Craig	315,973	72,417	16,028	12,664	214,864
Culpeper	205,069	55,479	1,274	52,954	95,362
Cumberland	161,575	65,248	1,141	39,846	55,340
Dickenson	343,980	11,595	10,804	102,031	219,550
Dinwiddie	309,661	129,760	609	67,450	111,842
Essex	177,720	49,664	--	48,964	79,092
Fairfax	162,657	9,547	2,545	39,138	111,427
Fauquier	293,225	44,324	2,190	78,931	167,780
Floyd	272,306	22,807	90,669	64,863	93,967
Fluvanna	159,957	50,202	735	34,710	74,310
Franklin	466,960	67,686	25,851	171,674	201,749
Frederick	217,633	10,886	9,206	33,874	163,667
Giles	325,396	10,016	9,520	95,495	210,365
Gloucester	190,311	49,813	261	81,795	58,442
Goochland	203,759	56,047	772	56,858	90,082
Grayson	279,218	6,109	51,855	64,153	157,101
Greene	102,108	24,069	559	30,985	46,495
Greenville	204,168	73,483	1,778	56,059	72,848
Halifax	478,823	161,654	2,865	147,693	166,611
Hampton	12,075	6,977	--	2,717	2,381
Hanover	286,111	96,807	426	83,673	105,205
Henrico	90,684	25,601	--	22,220	42,863
Henry	212,647	90,812	15,256	40,210	66,369
Highland	377,507	11,152	35,718	65,990	264,647
Isle of Wight	191,496	61,079	--	64,293	66,724
James City	118,226	24,352	595	26,800	66,479
King and Queen	267,163	114,709	4,895	71,777	75,782
King George	144,224	19,066	1,850	69,892	53,416
King William	172,506	56,111	435	52,217	63,743

Continued

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

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
- - - - - Thousand cubic feet - - - - -					
Lancaster	93,368	50,702	--	21,488	21,178
Lee	280,990	--	6,325	100,948	173,717
Loudoun	166,652	6,709	1,675	33,864	124,404
Louisa	305,728	68,697	2,989	67,128	166,914
Lunenburg	293,180	95,484	1,216	90,455	106,025
Madison	194,611	21,704	6,477	43,914	122,516
Mathews	65,897	42,106	--	8,839	14,952
Mecklenburg	398,433	93,126	2,311	124,062	178,934
Middlesex	97,702	42,669	--	35,678	19,355
Montgomery	261,821	37,994	43,052	26,113	154,662
Nelson	411,642	21,608	13,441	129,758	246,835
New Kent	198,131	74,496	--	54,859	68,776
Newport News	20,418	9,900	--	6,196	4,322
Northampton	57,532	31,674	--	16,056	9,802
Northumberland	108,708	30,109	--	34,351	44,248
Nottoway	218,599	114,003	--	40,237	64,359
Orange	161,927	17,195	6,350	43,840	94,542
Page	136,742	18,439	3,972	16,681	97,650
Patrick	333,208	42,579	15,908	123,729	150,992
Pittsylvania	610,555	177,105	2,608	191,868	238,974
Powhatan	215,632	29,132	854	73,215	112,431
Prince Edward	209,552	55,205	921	57,200	96,226
Prince George	181,879	77,618	8,905	38,924	56,432
Prince William	205,563	42,759	1,563	44,364	116,877
Pulaski	159,122	8,266	4,380	28,994	117,482
Rappahannock	134,031	9,633	1,785	47,860	74,753
Richmond	151,086	41,334	--	63,838	45,914
Roanoke	138,730	23,650	11,343	12,579	91,158
Rockbridge	365,875	38,604	16,097	52,036	259,138
Rockingham	455,051	27,232	36,077	48,774	342,968
Russell	272,260	--	5,038	84,669	182,553
Scott	442,681	15,880	3,726	163,233	259,842
Shenandoah	335,351	35,275	14,348	38,299	247,429
Smyth	313,960	29,971	13,919	59,478	210,592
Southampton	432,681	150,269	11,948	161,379	109,085
Spotsylvania	288,324	111,178	2,704	80,959	93,483
Stafford	251,154	54,006	315	86,963	109,870
Suffolk	168,199	40,456	4,303	73,420	50,020
Surry	184,024	61,891	1,694	59,163	61,276
Sussex	385,272	207,501	3,261	93,295	81,215
Tazewell	400,311	--	4,267	149,031	247,013
Virginia Beach	86,214	18,606	964	44,452	22,192
Warren	91,893	7,036	1,285	14,316	69,256
Washington	392,893	16,739	7,363	151,085	217,706
Westmoreland	133,897	39,497	210	40,113	54,077
Wise	345,998	1,575	8,903	137,581	197,939
Wythe	259,012	20,016	18,962	18,659	201,375
York	93,811	23,000	--	34,920	35,891
<b>Total</b>	<b>25,338,050</b>	<b>5,157,835</b>	<b>834,091</b>	<b>6,602,432</b>	<b>12,743,692</b>

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

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
- - - - - Thousand cubic feet - - - - -					
Accomack	187,072	115,507	--	44,410	27,155
Albemarle	416,337	69,893	12,654	101,956	231,834
Alleghany	306,157	36,411	14,159	28,876	226,711
Amelia	264,608	100,405	1,789	54,924	107,490
Amherst	307,321	47,718	17,604	86,764	155,235
Appomattox	174,116	53,862	972	27,951	91,331
Arlington	--	--	--	--	--
Augusta	332,337	51,903	15,030	24,544	240,860
Bath	419,651	33,083	14,247	45,039	327,282
Bedford	438,766	91,098	5,082	139,814	202,772
Bland	229,930	11,943	27,093	62,820	128,074
Botetourt	325,930	34,840	19,829	77,650	193,611
Brunswick	346,322	166,093	774	80,525	98,930
Buchanan	462,729	297	16,430	193,973	252,029
Buckingham	266,265	88,310	426	45,052	132,477
Campbell	253,744	78,783	--	52,441	122,520
Caroline	419,543	156,201	312	114,606	148,424
Carroll	243,261	18,808	94,532	19,123	110,798
Charles City	161,637	59,131	6,011	47,636	48,859
Charlotte	282,756	126,220	3,126	65,928	87,482
Chesapeake	151,152	40,259	679	78,305	31,909
Chesterfield	290,085	94,702	--	66,823	128,560
Clarke	79,320	--	--	28,149	51,171
Craig	274,212	69,753	16,028	8,251	180,180
Culpeper	199,086	55,479	1,274	49,004	93,329
Cumberland	142,905	63,878	776	33,974	44,277
Dickenson	281,974	11,595	10,804	88,900	170,675
Dinwiddie	294,072	129,366	609	59,551	104,546
Essex	168,509	49,664	--	46,713	72,132
Fairfax	152,466	9,181	2,545	35,600	105,140
Fauquier	260,032	42,142	2,190	66,630	149,070
Floyd	257,020	20,144	90,171	60,360	86,345
Fluvanna	147,042	49,280	735	29,606	67,421
Franklin	433,614	67,686	25,851	164,636	175,441
Frederick	190,419	10,886	9,206	26,958	143,369
Giles	290,545	9,116	9,520	89,731	182,178
Gloucester	183,891	49,813	261	78,162	55,655
Goochland	195,185	55,042	772	52,070	87,301
Grayson	213,634	5,470	46,193	43,992	117,979
Greene	94,809	24,069	559	28,279	41,902
Greenville	185,765	72,800	1,778	47,330	63,857
Halifax	449,831	159,696	2,865	136,468	150,802
Hampton	10,359	6,977	--	1,001	2,381
Hanover	273,340	96,807	426	78,720	97,387
Henrico	87,505	25,438	--	21,312	40,755
Henry	202,095	89,859	15,256	37,992	58,988
Highland	315,366	9,053	35,308	53,647	217,358
Isle of Wight	177,640	61,079	--	56,215	60,346
James City	110,978	24,352	345	24,879	61,402
King and Queen	258,637	114,709	4,895	67,791	71,242
King George	131,610	19,066	1,626	64,959	45,959
King William	163,618	56,111	435	49,215	57,857

Continued

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

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
- - - - - Thousand cubic feet - - - - -					
Lancaster	89,762	50,702	--	21,284	17,776
Lee	239,541	--	6,325	92,662	140,554
Loudoun	152,492	6,488	1,675	27,801	116,528
Louisa	288,312	66,959	2,989	56,776	161,588
Lunenburg	279,966	95,484	1,216	85,063	98,203
Madison	167,017	20,728	6,477	38,395	101,417
Mathews	64,621	41,810	--	8,839	13,972
Mecklenburg	372,207	93,126	1,965	113,139	163,977
Middlesex	92,166	42,669	--	31,298	18,199
Montgomery	246,234	36,301	43,052	24,498	142,383
Nelson	370,094	20,745	13,441	124,628	211,280
New Kent	190,222	74,496	--	52,935	62,791
Newport News	19,500	9,900	--	5,570	4,030
Northampton	55,362	31,162	--	15,015	9,185
Northumberland	97,591	28,879	--	28,708	40,004
Nottoway	215,107	114,003	--	39,703	61,401
Orange	147,159	17,195	6,350	39,885	83,729
Page	118,211	17,882	3,143	13,938	83,248
Patrick	284,301	41,944	15,908	107,871	118,578
Pittsylvania	573,497	173,501	2,252	181,071	216,673
Powhatan	207,028	29,132	854	68,029	109,013
Prince Edward	196,735	55,205	921	52,408	88,201
Prince George	174,198	77,618	8,905	35,727	51,948
Prince William	185,766	39,664	1,260	35,152	109,690
Pulaski	117,203	7,607	4,004	18,672	86,920
Rappahannock	113,548	8,240	1,785	40,676	62,847
Richmond	141,328	41,013	--	57,655	42,660
Roanoke	123,903	23,650	11,092	11,707	77,454
Rockbridge	331,371	38,256	16,097	46,903	230,115
Rockingham	385,678	22,630	34,124	41,334	287,590
Russell	237,857	--	4,638	76,264	156,955
Scott	390,277	15,880	3,726	152,091	218,580
Shenandoah	299,800	33,930	14,348	35,736	215,786
Smyth	280,146	25,477	13,919	56,001	184,749
Southampton	390,715	149,163	11,201	135,351	95,000
Spotsylvania	270,012	110,506	1,895	75,494	82,117
Stafford	239,814	52,909	315	81,644	104,946
Suffolk	151,367	40,456	4,303	66,950	39,658
Surry	172,684	61,891	1,694	52,256	56,843
Sussex	364,438	206,948	3,261	81,992	72,237
Tazewell	347,329	--	4,267	128,783	214,279
Virginia Beach	81,208	18,353	964	41,011	20,880
Warren	87,349	7,036	1,285	12,744	66,284
Washington	357,561	16,739	7,363	141,272	192,187
Westmoreland	126,867	38,583	210	37,503	50,571
Wise	302,506	1,575	7,951	130,621	162,359
Wythe	218,191	19,523	18,413	13,502	166,753
York	89,381	23,000	--	33,749	32,632
Total	22,952,820	5,082,936	814,765	5,959,561	11,095,558

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

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
- - - - - Thousand board feet - - - - -					
Accomack	602,571	448,621	--	83,424	70,526
Albemarle	1,351,338	185,436	53,273	397,721	714,908
Alleghany	853,106	84,328	59,493	80,042	629,243
Amelia	775,427	243,274	5,249	200,196	326,708
Amherst	896,013	77,712	73,526	303,732	441,043
Appomattox	378,520	94,244	--	62,064	222,212
Arlington	--	--	--	--	--
Augusta	887,520	176,291	46,095	60,796	604,338
Bath	1,186,750	98,964	40,343	107,102	940,341
Bedford	1,245,562	241,965	19,724	430,831	553,042
Bland	655,144	39,341	124,114	174,741	316,948
Botetourt	1,057,140	93,118	88,464	325,161	550,397
Brunswick	950,388	511,947	--	211,976	226,465
Buchanan	1,419,585	--	75,221	546,436	797,928
Buckingham	581,620	141,064	1,732	119,672	319,152
Campbell	567,208	129,849	--	151,243	286,116
Caroline	1,246,387	469,433	--	369,856	407,098
Carroll	755,663	41,679	375,172	60,008	278,804
Charles City	499,422	186,694	31,994	123,733	157,001
Charlotte	723,932	235,594	3,946	206,680	277,712
Chesapeake	569,028	215,696	3,682	240,546	109,104
Chesterfield	802,395	275,513	--	195,192	331,690
Clarke	310,232	--	--	125,844	184,388
Craig	679,006	240,179	65,561	6,367	366,899
Culpeper	533,315	144,013	1,946	122,493	264,863
Cumberland	326,548	124,258	--	77,479	124,811
Dickenson	946,257	28,257	50,826	319,803	547,371
Dinwiddie	895,338	490,984	--	154,530	249,824
Essex	526,456	166,798	--	122,447	237,211
Fairfax	582,236	29,050	1,256	141,521	410,409
Fauquier	770,480	120,562	3,328	206,220	440,370
Floyd	771,234	34,612	326,680	170,616	239,326
Fluvanna	341,305	126,862	--	68,304	146,139
Franklin	1,141,752	144,655	100,568	444,899	451,630
Frederick	577,467	22,947	28,779	57,375	468,366
Giles	870,406	30,880	52,733	282,694	504,099
Gloucester	618,231	192,070	--	240,566	185,595
Goochland	485,921	81,182	--	158,890	245,849
Grayson	741,202	28,425	222,697	122,634	367,446
Greene	317,829	41,844	--	119,859	156,126
Greenville	586,419	290,509	8,033	115,570	172,307
Halifax	1,106,880	364,696	--	342,233	399,951
Hampton	42,006	27,963	--	3,306	10,737
Hanover	690,631	233,637	--	178,539	278,455
Henrico	213,801	81,418	--	26,095	106,288
Henry	482,296	198,720	57,858	86,526	139,192
Highland	963,373	14,313	157,322	155,156	636,582
Isle of Wight	655,897	275,706	--	140,294	239,897
James City	367,815	79,635	--	80,971	207,209
King and Queen	720,766	298,651	27,624	176,296	218,195
King George	456,245	76,184	4,868	220,226	154,967
King William	457,105	150,208	--	132,752	174,145

Continued

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

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
- - - - - Thousand board feet - - - - -					
Lancaster	240,595	136,869	--	63,899	39,827
Lee	724,191	--	--	278,644	445,547
Loudoun	511,439	9,832	1,203	120,098	380,306
Louisa	604,279	137,671	5,248	132,300	329,060
Lunenburg	808,835	306,349	--	240,373	262,113
Madison	614,999	60,029	32,785	156,507	365,678
Mathews	192,000	119,221	--	17,203	55,576
Mecklenburg	971,212	230,310	2,522	301,148	437,232
Middlesex	261,673	110,793	--	97,407	53,473
Montgomery	728,996	90,376	187,264	62,460	388,896
Nelson	1,298,889	37,666	49,074	470,789	741,360
New Kent	558,261	184,005	--	174,629	199,627
Newport News	69,413	33,398	--	22,311	13,704
Northampton	166,934	127,965	--	19,915	19,054
Northumberland	323,558	109,259	--	88,278	126,021
Nottoway	599,833	329,008	--	111,627	159,198
Orange	427,099	14,559	18,847	145,301	248,392
Page	333,523	44,596	15,815	47,895	225,217
Patrick	689,393	64,046	56,024	251,312	318,011
Pittsylvania	1,424,278	421,611	8,934	489,318	504,415
Powhatan	547,423	64,532	--	196,207	286,684
Prince Edward	457,183	76,702	1,861	125,059	253,561
Prince George	573,017	253,962	49,721	119,721	149,613
Prince William	589,329	77,531	--	125,849	385,949
Pulaski	244,765	29,808	22,823	49,118	143,016
Rappahannock	422,444	22,687	8,621	164,632	226,504
Richmond	439,333	92,645	--	188,549	158,139
Roanoke	295,414	40,531	43,422	27,305	184,156
Rockbridge	1,002,486	101,962	63,497	138,544	698,483
Rockingham	1,268,911	68,434	115,087	106,001	979,389
Russell	761,221	--	20,569	243,542	497,110
Scott	1,277,986	59,987	8,722	523,524	685,753
Shenandoah	844,144	108,524	64,280	77,927	593,413
Smyth	873,894	81,617	68,974	153,322	569,981
Southampton	1,302,044	523,258	52,995	406,703	319,088
Spotsylvania	575,443	194,394	5,802	174,992	200,255
Stafford	727,170	117,896	--	223,383	385,891
Suffolk	475,694	127,709	21,550	209,715	116,720
Surry	605,008	246,213	7,946	168,530	182,319
Sussex	1,240,555	809,309	17,101	231,140	183,005
Tazewell	954,936	--	21,598	358,987	574,351
Virginia Beach	282,178	89,602	5,030	114,388	73,158
Warren	242,569	16,254	4,449	52,557	169,309
Washington	1,040,470	72,388	29,732	448,392	489,958
Westmoreland	342,725	94,496	--	96,006	152,223
Wise	959,411	7,051	38,390	394,937	519,033
Wythe	619,196	83,224	74,861	36,086	425,025
York	338,881	90,669	--	117,496	130,716
Total	67,036,398	14,248,929	3,236,854	17,615,683	31,934,932

Table 51.--Net annual change<sup>a</sup> of growing stock on timberland, by county and species group, Virginia, 1985

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
- - - - - Thousand cubic feet - - - - -					
Accomack	+1,956	+453	--	+724	+779
Albemarle	+3,697	+501	+476	+2,435	+285
Alleghany	+6,809	+203	+581	+531	+5,494
Amelia	+4,361	+3,205	-40	+359	+837
Amherst	+7,116	+448	+183	+3,325	+3,160
Appomattox	+457	-318	+33	+544	+198
Arlington	--	--	--	--	--
Augusta	+7,463	+594	+483	+1,128	+5,258
Bath	+8,219	+431	+430	+1,564	+5,794
Bedford	+10,434	-10	+127	+5,093	+5,224
Bland	+7,390	-128	+1,310	+2,423	+3,785
Botetourt	+2,942	+278	+390	+2,160	+114
Brunswick	+3,230	-95	+42	+892	+2,391
Buchanan	+13,637	+7	+460	+7,528	+5,642
Buckingham	-2,365	+1,307	-102	+66	-3,636
Campbell	+3,474	+778	+13	+1,493	+1,190
Caroline	-2,919	-4,206	-67	+873	+481
Carroll	+5,971	+324	+3,391	+751	+1,505
Charles City	+2,315	+1,605	+130	+1,483	-903
Charlotte	-4,122	-928	+165	+682	-4,041
Chesapeake	-5,108	-1,535	+18	-1,830	-1,761
Chesterfield	+5,295	+2,822	+8	+342	+2,123
Clarke	+1,905	--	--	+764	+1,141
Craig	+5,408	+209	+423	+281	+4,495
Culpeper	+6,741	+1,599	+26	+2,246	+2,870
Cumberland	+1,360	+485	+16	+382	+477
Dickenson	+6,470	+245	+296	+2,389	+3,540
Dinwiddie	-3,191	-3,644	+25	-290	+718
Essex	-239	-656	+60	+660	-303
Fairfax	+439	-1,398	+58	-117	+1,896
Fauquier	+5,495	-964	-25	+2,831	+3,653
Floyd	+10,455	+1,395	+4,105	+2,414	+2,541
Fluvanna	+1,600	-949	-50	+254	+2,345
Franklin	+5,305	+15	-1,152	+5,445	+997
Frederick	+3,958	+174	+291	+1,066	+2,427
Giles	+8,101	+119	+228	+3,198	+4,556
Gloucester	-300	-2,864	+9	+2,573	-18
Goochland	+6,678	+1,714	+102	+2,183	+2,679
Grayson	+3,761	+48	+1,590	+1,271	+852
Greene	+1,990	+713	+54	+670	+553
Greenville	-643	-917	+96	-587	+765
Halifax	+3,101	-1,323	-67	+3,216	+1,275
Hampton	+330	+203	--	+75	+52
Hanover	+5,671	-685	-87	+3,155	+3,288
Henrico	+1,044	-222	--	+289	+977
Henry	+2,552	-703	+514	+1,121	+1,620
Highland	+5,557	-447	+745	+1,154	+4,105
Isle of Wight	-6,107	-5,050	--	-631	-426
James City	+216	-789	+6	+594	+405
King and Queen	+7,298	+3,317	+98	+2,731	+1,152
King George	+4,109	+460	+79	+2,109	+1,461
King William	-799	-2,642	+16	+1,456	+371

Continued

Table 51.--Net annual change<sup>a</sup> of growing stock on timberland, by county and species group, Virginia, 1985--Continued

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
<u>- - - - - Thousand cubic feet - - - - -</u>					
Lancaster	+3,745	+2,404	--	+826	+515
Lee	+6,408	-183	+45	+3,385	+3,161
Loudoun	+1,226	+334	+91	+396	+405
Louisa	+1,108	-1,473	-91	+181	+2,491
Lunenburg	+3,002	+1,651	-24	+1,866	-491
Madison	+3,084	-248	+135	+675	+2,522
Mathews	-191	-826	+51	+559	+25
Mecklenburg	+8,139	+913	+166	+2,919	+4,141
Middlesex	+1,027	-272	--	+593	+706
Montgomery	+8,201	+563	+1,932	+1,466	+4,240
Nelson	+3,769	-2,631	+183	+3,581	+2,636
New Kent	+2,119	+1,777	--	+1,473	-1,131
Newport News	-1,802	-1,764	--	+54	-92
Northampton	+1,009	+584	--	+357	+68
Northumberland	+1,197	+283	--	+464	+450
Nottoway	+4,365	+3,062	+16	+801	+486
Orange	+3,024	+1,114	+104	+997	+809
Page	+1,683	+304	+59	+416	+904
Patrick	+6,647	+741	-306	+3,867	+2,345
Pittsylvania	+4,790	-2,360	-273	+1,541	+5,882
Powhatan	+5,003	-120	+22	+2,877	+2,224
Prince Edward	+514	-66	+68	+829	-317
Prince George	-911	+509	+179	-834	-765
Prince William	+1,891	+885	+43	+900	+63
Pulaski	+4,179	+81	+123	+1,094	+2,881
Rappahannock	+1,924	+198	-65	+1,126	+665
Richmond	+3,077	+1,677	--	+1,694	-294
Roanoke	+2,115	+473	+285	-694	+2,051
Rockbridge	+3,819	+625	+368	+744	+2,082
Rockingham	+6,025	+134	+912	+945	+4,034
Russell	+6,315	--	+65	+2,966	+3,284
Scott	+11,661	+252	+94	+6,277	+5,038
Shenandoah	+7,732	+352	+386	+2,043	+4,951
Smyth	+3,410	-198	+621	+1,676	+1,311
Southampton	-5,441	-497	-1,700	-3,029	-215
Spotsylvania	+6,532	+3,112	+35	+2,320	+1,065
Stafford	+5,933	+319	+6	+3,243	+2,365
Suffolk	-4,992	-1,965	+113	-1,669	-1,471
Surry	-1,806	-1,950	+47	+460	-363
Sussex	-2,247	-392	+73	+83	-2,011
Tazewell	+10,202	--	+86	+4,705	+5,411
Virginia Beach	-108	-149	+23	-397	+415
Warren	+938	-18	+35	+431	+490
Washington	+8,015	+200	+280	+5,184	+2,351
Westmoreland	+3,530	+1,526	+15	+946	+1,043
Wise	+8,555	+11	+225	+5,733	+2,586
Wythe	+3,315	+230	+806	+450	+1,829
York	+1,550	-411	--	+1,223	+738
Total	+321,797	+1,970	+20,720	+143,211	+155,896

<sup>a</sup>Net annual growth minus timber removals.

Table 52.--Net annual change<sup>a</sup> of sawtimber on timberland, by county and species group, Virginia, 1985

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
- - - - - Thousand board feet - - - - -					
Accomack	+12,655	+8,984	--	+1,476	+2,195
Albemarle	+25,267	+2,320	+1,657	+15,625	+5,665
Alleghany	+19,094	-82	+2,134	-833	+17,875
Amelia	+11,613	+9,490	+128	-2,349	+4,344
Amherst	+30,227	+2,788	+1,402	+15,692	+10,345
Appomattox	+8,335	-1,019	+422	+1,827	+7,105
Arlington	--	--	--	--	--
Augusta	+29,307	+3,655	+1,757	+1,483	+22,412
Bath	+32,464	+1,899	+2,851	+2,959	+24,755
Bedford	+47,806	+9,271	+651	+14,292	+23,592
Bland	+31,819	-762	+6,458	+10,886	+15,237
Botetourt	+18,489	+194	+2,202	+12,704	+3,389
Brunswick	+14,002	+980	--	+5,939	+7,083
Buchanan	+59,679	--	+2,389	+33,547	+23,743
Buckingham	-7,117	+2,743	-559	-821	-8,480
Campbell	+16,883	+5,058	--	+3,120	+8,705
Caroline	+2,705	-8,478	--	+6,695	+4,488
Carroll	+33,233	+2,179	+17,595	+3,329	+10,130
Charles City	+11,744	+7,019	+866	+4,800	-941
Charlotte	-9,000	-5,437	+450	+5,349	-9,362
Chesapeake	-23,688	-5,794	+125	-9,290	-8,729
Chesterfield	+17,155	+7,076	--	+1,498	+8,581
Clarke	+7,514	--	--	+3,489	+4,025
Craig	+16,665	+1,391	+1,709	+1,875	+11,690
Culpeper	+28,764	+4,758	+87	+11,564	+12,355
Cumberland	+8,008	+2,108	+137	+2,794	+2,969
Dickenson	+30,843	+2,071	+2,070	+11,011	+15,691
Dinwiddie	-10,219	-21,065	+132	+4,522	+6,192
Essex	+2,344	-3,844	--	+993	+5,195
Fairfax	+4,546	-2,834	+23	-960	+8,317
Fauquier	+25,911	-4,226	+115	+10,839	+19,183
Floyd	+40,223	+2,854	+17,509	+10,507	+9,353
Fluvanna	+8,428	+418	--	-2,935	+10,945
Franklin	+25,642	+1,325	-4,820	+22,278	+6,859
Frederick	+17,887	+856	+1,410	+1,854	+13,767
Giles	+38,509	+551	+1,353	+17,384	+19,221
Gloucester	-5,402	-16,386	--	+10,806	+178
Goochland	+28,213	+5,184	+43	+11,618	+11,368
Grayson	+20,392	+192	+9,951	+5,509	+4,740
Greene	+8,789	+1,442	+98	+3,681	+3,568
Greenville	-73	-1,702	+271	-1,629	+2,987
Halifax	+13,624	-1,096	+43	+8,610	+6,067
Hampton	+2,028	+1,594	--	+138	+296
Hanover	+23,307	-2,519	-437	+12,254	+14,009
Henrico	+3,125	-1,073	--	-322	+4,520
Henry	+13,899	+2,511	+2,482	+2,256	+6,650
Highland	+24,499	-3,627	+3,007	+5,390	+19,729
Isle of Wight	-25,446	-22,536	--	-175	-2,735
James City	+6,871	+1,791	+69	+1,989	+3,022
King and Queen	+23,120	+7,208	+607	+10,214	+5,091
King George	+18,059	+2,782	+502	+9,475	+5,300
King William	-12,730	-17,867	--	+3,463	+1,674

Continued

Table 52.--Net annual change<sup>a</sup> of sawtimber on timberland, by county and species group, Virginia, 1985--Continued

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
- - - - - Thousand board feet - - - - -					
Lancaster	+11,425	+5,675	--	+2,906	+2,844
Lee	+28,839	-651	-111	+11,942	+17,659
Loudoun	+1,119	+648	+109	+2,192	-1,830
Louisa	+9,301	-5,599	+91	-220	+15,029
Lunenburg	+25,326	+10,533	--	+12,382	+2,411
Madison	+15,814	-554	+817	+2,372	+13,179
Mathews	-320	-1,292	--	+393	+579
Mecklenburg	+32,267	+4,076	+121	+8,212	+19,858
Middlesex	+973	-3,438	--	+1,560	+2,851
Montgomery	+41,718	+2,701	+10,312	+4,423	+24,282
Nelson	+25,734	-9,207	+729	+21,354	+12,858
New Kent	+2,078	+1,926	--	+3,610	-3,458
Newport News	-10,133	-9,778	--	+624	-979
Northampton	+4,048	+3,652	--	+659	-263
Northumberland	+6,179	+1,935	--	+850	+3,394
Nottoway	+16,892	+7,950	--	+6,302	+2,640
Orange	+8,559	-101	+618	+2,615	+5,427
Page	+9,329	+1,354	+355	+2,000	+5,620
Patrick	+16,811	+2,379	-1,683	+9,623	+6,492
Pittsylvania	+27,460	-3,199	-1,124	+10,373	+21,410
Powhatan	+22,527	+2,992	--	+9,403	+10,132
Prince Edward	+6,948	+23	+90	+5,938	+897
Prince George	-2,568	+217	+1,208	-2,677	-1,316
Prince William	+11,998	+2,960	+64	+4,490	+4,484
Pulaski	+13,022	+356	+880	+3,392	+8,394
Rappahannock	+10,849	+1,596	+120	+6,584	+2,549
Richmond	+6,889	+3,585	--	+6,994	-3,690
Roanoke	+5,727	+1,343	+1,418	-3,473	+6,439
Rockbridge	+14,935	+3,156	+515	+1,735	+9,529
Rockingham	+29,483	+757	+3,362	+1,835	+23,529
Russell	+35,521	--	+346	+14,407	+20,768
Scott	+55,749	+1,559	+862	+30,734	+22,594
Shenandoah	+29,242	+2,924	+2,028	+4,774	+19,516
Smyth	+25,289	-883	+2,655	+9,902	+13,615
Southampton	-35,247	-11,935	-8,062	-13,811	-1,439
Spotsylvania	+21,406	+5,683	+206	+11,596	+3,921
Stafford	+23,727	+4,154	--	+9,696	+9,877
Suffolk	-17,153	-8,324	+713	-2,029	-7,513
Surry	-7,026	-10,708	+290	+1,600	+1,792
Sussex	-9,915	-8,917	+481	+2,633	-4,112
Tazewell	+43,270	--	+363	+20,341	+22,566
Virginia Beach	+2,337	+46	+148	-3	+2,146
Warren	+7,481	+523	+153	+2,020	+4,785
Washington	+46,914	+887	+1,135	+36,950	+7,942
Westmoreland	+14,208	+6,163	--	+3,123	+4,922
Wise	+39,815	+72	+1,179	+22,657	+15,907
Wythe	+14,990	+1,162	+5,390	+727	+7,711
York	+8,831	-1,349	--	+6,375	+3,805
Total	+1,462,680	-10,603	+102,667	+606,505	+764,111

<sup>a</sup>Net annual growth minus timber removals.

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

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
- - - - - Hundred thousand pounds - - - - -					
Accomack	197,313	101,398	6	54,999	40,910
Albemarle	471,473	71,116	12,819	102,081	285,457
Alleghany	423,301	36,372	12,999	42,714	331,216
Amelia	284,075	97,775	2,318	59,484	124,498
Amherst	378,509	54,131	16,404	92,928	215,046
Appomattox	204,616	57,321	1,683	33,554	112,058
Arlington	--	--	--	--	--
Augusta	464,262	45,067	14,958	44,765	359,472
Bath	545,262	30,521	13,002	68,334	433,405
Bedford	506,418	87,281	5,500	141,618	272,019
Bland	321,663	9,561	22,018	78,136	211,948
Botetourt	431,692	32,966	16,770	90,220	291,736
Brunswick	415,240	160,518	3,707	103,884	147,131
Buchanan	534,677	469	15,209	182,281	336,718
Buckingham	339,144	96,414	1,928	67,324	173,478
Campbell	311,636	83,354	1,292	62,686	164,304
Caroline	452,178	149,536	903	116,859	184,880
Carroll	282,392	19,665	80,711	35,038	146,978
Charles City	177,972	55,254	5,795	57,308	59,615
Charlotte	321,523	126,207	5,107	72,178	118,031
Chesapeake	153,209	33,012	626	80,340	39,231
Chesterfield	324,781	90,708	496	78,746	154,831
Clarke	93,488	--	--	28,750	64,738
Craig	335,803	58,714	14,086	18,581	244,422
Culpeper	209,143	50,834	2,047	50,006	106,256
Cumberland	187,627	68,869	2,711	41,701	74,346
Dickenson	355,369	10,670	9,957	93,125	241,617
Dinwiddie	328,724	119,743	1,670	74,045	133,266
Essex	189,099	45,602	357	49,589	93,551
Fairfax	168,225	9,050	3,593	37,222	118,360
Fauquier	309,271	41,574	4,520	74,848	188,329
Floyd	277,010	28,285	73,821	63,699	111,205
Fluvanna	176,963	48,253	1,290	39,276	88,144
Franklin	491,683	69,818	23,609	161,105	237,151
Frederick	238,805	10,923	8,246	39,011	180,625
Giles	340,189	7,962	8,200	85,326	238,701
Gloucester	198,836	46,071	278	81,270	71,217
Goochland	222,830	55,900	2,896	59,782	104,252
Grayson	285,891	5,355	43,145	62,726	174,665
Greene	104,992	23,254	1,031	28,595	52,112
Greenville	218,484	65,322	1,924	62,530	88,708
Halifax	518,339	163,556	8,426	149,749	196,608
Hampton	13,029	5,888	--	4,297	2,844
Hanover	312,211	96,456	784	89,193	125,778
Henrico	102,132	23,238	131	26,222	52,541
Henry	246,402	94,861	13,421	48,484	89,636
Highland	414,353	12,972	32,773	66,373	302,235
Isle of Wight	197,315	54,338	--	64,286	78,691
James City	127,785	25,818	600	27,443	73,924
King and Queen	288,306	111,085	5,446	75,432	96,343
King George	146,120	16,880	1,799	65,174	62,267
King William	188,940	58,164	871	53,954	75,951

Continued

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

County	All species	Yellow pine	Other softwood	Soft hardwood	Hard hardwood
- - - - - Hundred thousand pounds - - - - -					
Lancaster	101,050	50,867	126	22,689	27,368
Lee	288,705	--	7,976	90,338	190,391
Loudoun	177,118	7,348	3,429	33,989	132,352
Louisa	339,835	65,595	4,320	73,607	196,313
Lunenburg	306,927	88,719	3,102	92,287	122,819
Madison	197,028	19,386	5,258	37,732	134,652
Mathews	67,911	37,491	129	12,611	17,680
Mecklenburg	427,983	86,508	5,846	124,486	211,143
Middlesex	98,978	38,311	176	34,237	26,254
Montgomery	274,752	33,511	34,982	27,425	178,834
Nelson	414,649	26,405	12,416	112,796	263,032
New Kent	207,572	69,594	32	56,542	81,404
Newport News	20,315	8,398	26	6,889	5,002
Northampton	61,218	28,547	--	18,755	13,916
Northumberland	114,745	29,176	--	33,195	52,374
Nottoway	219,498	104,543	654	42,378	71,923
Orange	186,378	25,251	6,980	43,228	110,919
Page	142,228	16,527	3,753	17,178	104,770
Patrick	356,410	40,494	13,388	123,323	179,205
Pittsylvania	664,702	180,666	4,148	186,976	292,912
Powhatan	228,041	30,945	1,697	72,084	123,315
Prince Edward	226,980	57,239	1,944	56,175	111,622
Prince George	190,121	71,716	8,878	42,808	66,719
Prince William	214,801	40,397	3,167	44,869	126,368
Pulaski	189,716	7,505	3,744	34,586	143,881
Rappahannock	137,619	9,410	1,374	43,607	83,228
Richmond	155,082	41,927	28	59,889	53,238
Roanoke	161,301	25,012	10,429	14,485	111,375
Rockbridge	404,913	37,636	15,362	54,729	297,186
Rockingham	486,841	22,296	34,795	54,166	375,584
Russell	282,025	228	5,243	78,678	197,876
Scott	475,365	13,823	3,868	156,108	301,566
Shenandoah	357,187	29,750	12,376	46,563	268,498
Smyth	337,053	24,388	12,223	58,975	241,467
Southampton	457,936	138,232	11,116	172,522	136,066
Spotsylvania	316,428	116,287	3,413	84,411	112,317
Stafford	259,051	47,504	853	86,711	123,983
Suffolk	174,381	37,585	3,873	74,164	58,759
Surry	198,363	56,664	1,606	63,151	76,942
Sussex	393,316	186,054	3,293	100,640	103,329
Tazewell	429,538	--	4,092	137,222	288,224
Virginia Beach	86,716	16,542	879	44,504	24,791
Warren	98,495	5,767	1,218	15,508	76,002
Washington	393,886	14,188	7,549	133,940	238,209
Westmoreland	144,822	39,049	536	39,082	66,155
Wise	360,002	1,260	8,812	128,887	221,043
Wythe	284,436	16,070	16,484	26,343	225,539
York	91,035	19,535	--	32,365	39,135
Total	27,032,152	4,932,447	787,476	6,635,104	14,677,125



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Between 1977 and 1986, area of timberland in Virginia declined from 16.0 to 15.4 million acres. Volume of softwood growing stock increased by 5 percent, and volume of hardwood growing stock increased by 11 percent. Softwood net annual growth decreased by 7 percent, and hardwood growing-stock growth decreased by 1 percent. Softwood removals remained almost unchanged, whereas removals of hardwood growing stock fell by 6 percent. Softwood growth exceeded removals by 11 percent, and hardwood growth exceeded removals by about two to one.

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



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