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**FOREST RESOURCES
OF
TENNESSEE**

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U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE



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Highlights

This report states the principal findings of a new forest survey of Tennessee. Data for growth and cut are given for 1970, and the inventory is reported for January 1, 1971. A canvass of forest products output in 1970 also contributed information.

Because forests were cleared for agriculture, the amount of land available for timber production is now 12.8 million acres, a decline of 5 percent from 1961. About three-fourths of the diversion was to pasture, mostly in central Tennessee. The rest occurred in the western part of the State for row crops such as cotton, corn, and soybeans.

The only substantial change in ownership patterns was a 14-percent decline in **farmer-owned forest**—a consequence of land clearing. Although public ownership in the federal category increased moderately, private owners still hold the bulk of the commercial forest area: about 90 percent.

Despite the loss in forest area, the timber supply picture has brightened considerably. Softwood growing **stock** rose 26 percent, while hardwood increased 11 percent.

Softwood growing stock now totals 1.8 billion cubic feet. Most of it is shortleaf pine and Virginia pine, both of which are most abundant in eastern Tennessee. About 58 percent is large enough to be considered sawtimber; the remaining is poletimber. Most of the volume increase was in trees 6 to 12 inches in diameter.

About 8.6 billion cubic feet are in hardwood growing stock trees, chiefly oaks, hickories, and yellow-poplar. Sawtimber now comprises 57 percent of the growing stock **volume**—equivalent to 22 billion board feet. Most of the volume increase was in trees 10 to 16 inches in diameter.

Stocking has improved and has stimulated growth considerably. In 1970, growth was 40 cubic feet per acre, an increase over the 1960 growth of 30 cubic feet. A promise of still further increase lies in the present excess of growth over cut for both hardwoods and softwoods.

The number of sawmills in Tennessee has declined since 1960. The attrition was in small mills, which cut most of the softwoods. The subsequent drop in softwood saw log production has had a salutary effect on the pine resource. The larger mills process mainly hardwood, and, though they more than doubled in number, hardwood saw log output for 1970 was slightly below its 1960 level.

Because of expansion in the State's pulping capacity in the last decade, pulpwood production reached a record level in 1970. Nevertheless, Tennessee mills import over one-half of their requirements from other States. Use of wood residues for pulp has been increasing steadily for the last 10 years.

Veneer and cooperage plants decreased both in number and in output. As a consequence of the decline of these industries and the closing of many small sawmills, the total volume of timber products cut was less in 1970 than in 1960.

Despite the recent resource improvement, hardwood forest types occupy almost 5 million acres that are better suited to growing pines, and cull trees preempt much growing space that could be occupied by growing stock. By remedying these conditions, Tennessee can help supply the increased requirements of its pulpmills and maintain its hardwood sawmill industry.

Resource Trends

FOREST AREA

Forests occupy 13.1 million acres or 50 percent of the land area in Tennessee (fig. 1). About 12.8 million acres are classified as commercial—that is, they are capable of growing trees for timber products, and cutting is permitted. Some 300,000 acres are reserved from cutting. Total commercial acreage is 5 percent less than at the time of the last previous forest survey in 1961 (table I). This decline reverses a trend of increasing acreage that had been documented in 1961.¹ Nevertheless, there is still more forest now than 20 years ago.

¹ Sternitzke, H. S. Tennessee forests. USDA Forest Serv. South. Forest Exp. Stn. Forest **Surv.** Release 86. 29 p. 1962.

Table I. Commercial **forest land in** 1971 and change **since** 1961

Region	Commercial forest	Change since last survey	Proportion of region forested ¹
	Thousand acres	Percent	Percent
West	1,768.5	- 7	29
West Central	2,290.9	- 1	67
Central	2,276.3	- 12	36
Plateau	3,077.0	- 3	70
East	3,407.1	- 2	54
All regions	12,819.8	- 5	49

¹Total forest, including noncommercial, as a proportion of total area in the region.

Loss in Forest Area

Much of the loss was a consequence of farm owners increasing their pasture and arable acreage by clearing forest land (table II). The declines have been greatest in the Central, Plateau, and West regions.

Statewide, 1.2 million of the acres designated by the 1961 survey as commercial forest land have been converted to agricultural use. About 75 percent went into pasture, and most of the remainder into row crops—soybeans, cotton, and corn. The change to pasture occurred mostly in the Central and Plateau regions, the shift to row crops in the West region.

Other uses, chiefly urban and highway expansion, claimed an additional 309,000 acres.

While large acreages were being cleared, nearly a million acres of crop and pasture land were allowed to revert to forest. The reversions were insufficient to offset the withdrawals, and the net loss diminished the growing stock inventory. Moreover, the effect was greater than is indicated by acreage changes alone. Land diverted from commercial forest usually contains some growing stock; land reverting to forest usually has no timber at all.

Additions to forests will continue to come from former farm lands, but a substantial di-

Table II. **Changes in commercial forest land, 1961-1 971**

Region	Net change	Additions from :			Diversions to :		
		Total	Nonforest	Noncommercial forest	Total	Agriculture	Other
Thousand acres							
West	- 130.8	126.3	126.3	.	257.1	221.8	35.3
West Central	- 11.8	67.5	67.5		79.3	70.2	9.1
Central	-304.2	307.0	307.0		611.2	557.9	53.3
Plateau	-101.0	264.4	264.4		365.4	208.5	156.9
East	- 64.8	95.8	85.8	10.0	160.6	105.6	55.0
All regions	-612.6	861.0	851.0	10.0	1,473.6	1,164.0	¹ 309.6

¹ Includes 34,300 acres diverted to water impoundments and 63,000 acres transferred to non-commercial forest.

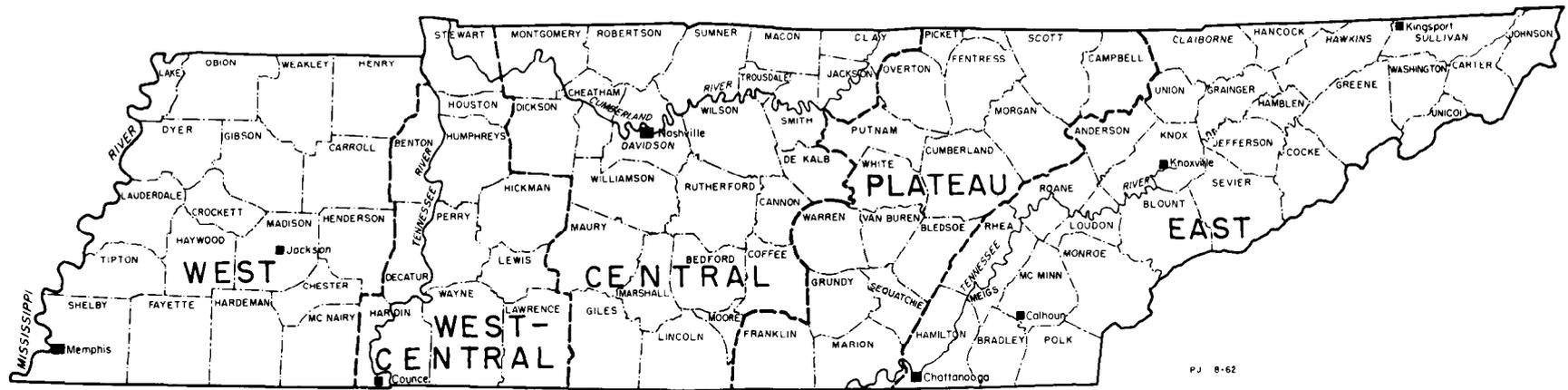


Figure 1. Forest resource regions in Tennessee.

version to agriculture will also persist, and urbanization and other uses will continue to expand. Therefore, the prospect is that the current decline will continue.

Change in Ownership

Ninety percent of the forest land is privately owned.⁷ Farmers hold a substantial amount—about 5 million acres. Chiefly because of the clearing for pasture and crops, acreage in this class diminished 14 percent since 1961.

Miscellaneous private owners hold about 5.3 million acres. Within this group, individuals own the bulk—some 4.6 million acres; the rest is in corporate ownership. There was little acreage change for either category since 1961.

Forest industry holdings increased 175,500 acres to a total of 1.1 million. These firms have better resources for forest management than do most other private owners.

Public ownership increased moderately. The biggest single change was the acquisition by TVA of 64,000 acres in the **Land-Between-The-Lakes** area.

Forest Type

The forest type covering any area is partly the result of past uses and disturbances. Fire, logging, and reversion of agricultural land to forest all affect the species composition. Forest lands in Tennessee may be divided into three basic site classes—pine, upland hardwood, and bottom-land hardwood—according to their suit-

⁷ Table 2 in the appendix shows the acres of commercial forest land by ownership classes.

ability for growing certain timber types. These classes do not necessarily describe what types are actually present; rather, they indicate what commercial types the sites are best able to support.

About 5.9 million acres, 46 percent of the commercial forest area, are suitable for Virginia pine, shortleaf pine, and, in some places, loblolly pine. Most pine sites occur in the East and Plateau regions (fig. 2). The primary forest types now on these sites are **loblolly-shortleaf pine**, oak-pine, and oak-hickory (table III). Thus a great proportion of the pine sites are presently supporting hardwood. The oak-hickory type alone occupies 3.5 million acres that could grow pine.

Sites best suited for upland hardwoods comprise 48 percent of the total. They are most numerous in the Central and West Central regions, but all regions have substantial acreages. This class lost more land to agriculture

Table III. Commercial forest **land by forest types and sites**

Forest type	Site		
	Southern pine	Upland hardwood	Bottom-land hardwood
	----- Thousand acres -----		
White pine	28.9	10.0	
Cedar	188.3	483.7	21.8
Loblolly-shortleaf pine	998.8		
Oak-pine ¹	1,164.7	33.3	
Oak-hickory	3,532.3	5,575.7	
Oak-gum-cypress			547.2
Elm-ash-cottonwood			150.7
Maple-beech-birch		84.4	.
All types	5,913.0	6,187.1	719.7

¹ Includes white pine-hardwood type.

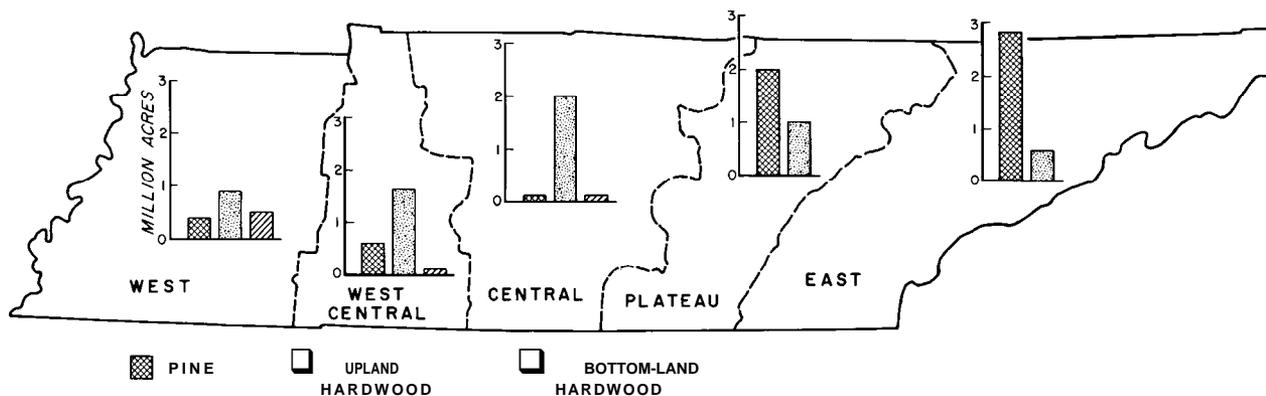


Figure 2. Commercial forest land by region and site.

than any other. The primary forest types are oak-hickory, cedar, and maple-beech-birch. The oak-hickory is overwhelmingly the largest while the maple-beech-birch occurs only in the Plateau and East regions. Some **redcedar** is also present, mainly in the Central region. Most of the existing upland types-including the cedar-are suitable.

Only 6 percent of the commercial forest land is in the bottom-land hardwood site class, and the only substantial occurrence is in the West region. Elm-ash-cottonwood and oak-gum-cypress stands occupy these sites and are considered desirable.

TIMBER VOLUME

The commercial forests of Tennessee contained over 12 billion cubic feet of wood in 1971. This total includes the volumes of rough and rotten trees that are unsuitable for timber products. Growing stock trees, which are neither rough nor rotten, made up 10.4 billion cubic feet of the total volume.

Specifications for growing stock trees and methods of computing tree volumes have changed since the last survey. Therefore, the 1961 volume data were adjusted to permit direct comparisons with 1971.

Softwood Volume Increased Moderately

Softwood volume increased 26 percent, from 1.4 billion to 1.8 billion cubic feet, between surveys (table IV). Most is shortleaf pine and Virginia pine (fig. 3). The East and Plateau regions have 81 percent of the shortleaf pine and 99 percent of the Virginia pine. The gains

Table IV. Growing stock volume in **1971** and change since 1961

Region	Softwood		Hardwood	
	Volume	Change	Volume	Change
	Million cu. ft.	Percent	Million cu. ft.	Percent
West	155.5	+58	1,484.3	+ 3
West Central	108.0	+62	1,710.4	+18
Central	46.0	+65	1,302.1	+ 8
Plateau	467.5	+ 7	2,056.1	+ 7
East	1,022.8	+28	2,043.1	+20
All regions	1,799.8	+26	8,596.0	+11

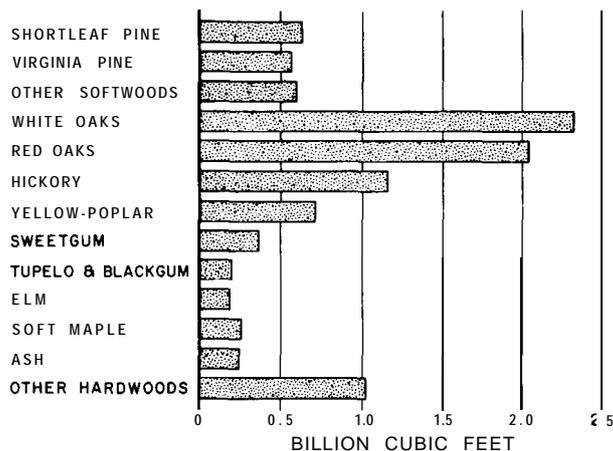


Figure 3. Growing stock by species.

were not uniform throughout the range of tree diameters (fig. 4). Most of the increase was in the **6- to 12-inch** classes.

Because pines as a group have good form and low incidence of decay, virtually all can be considered as growing stock (fig. 5). About 42 percent of the growing stock volume is in poletimber. Sawtimber comprises 58 percent, or almost 4.7 billion board feet.

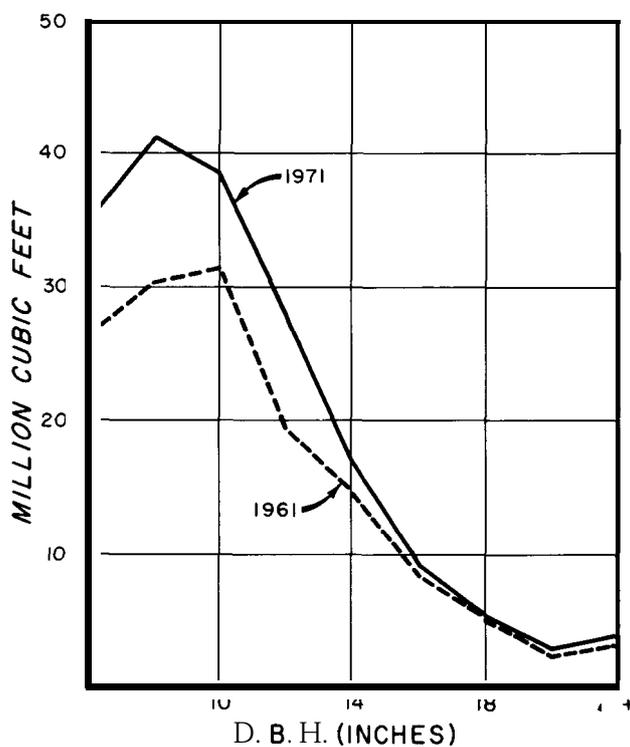


Figure 4. Softwood growing stock by tree diameter, 1961 and 1971.

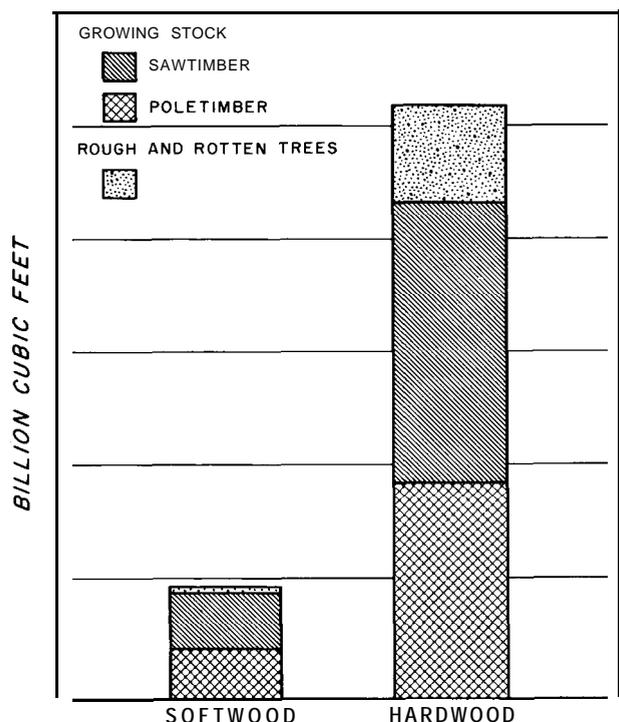


Figure 5. Volume of softwoods and hardwoods by class of timber.

Softwood sawtimber volume increased 22 percent (table V). The small sawmills in Tennessee cut chiefly softwood, and a recent decline in the number of these mills³ has diminished the pressure on the resource.

Table V. Sawtimber volume in 1971 and change since 1961

Region	Softwood		Hardwood	
	Volume	Change	Volume	Change
	Million bd. ft.	Percent	Million bd. ft.	Percent
West	450.1	+40	4,415.3	+ 5
West Central	201.5	+80	3,434.3	+27
Central	27.2	+28	3,224.1	+ 9
Plateau	1,363.3	+24	5,293.5	+12
East	2,656.9	+15	5,273.9	+18
All regions	4,699.0	+22	21,641.1	+14

Most of the sawtimber volume is in non-industrial private ownership (fig. 6), but some is on industrial or public land. The regional distribution follows that of growing stock: most of it is in the East and Plateau regions.

³Bertelson, D. F. Tennessee forest industries. USDA Forest Serv. Resour. Bull. SO-30, 27 p. South. Forest Exp. Stn., New Orleans, La. 1971.

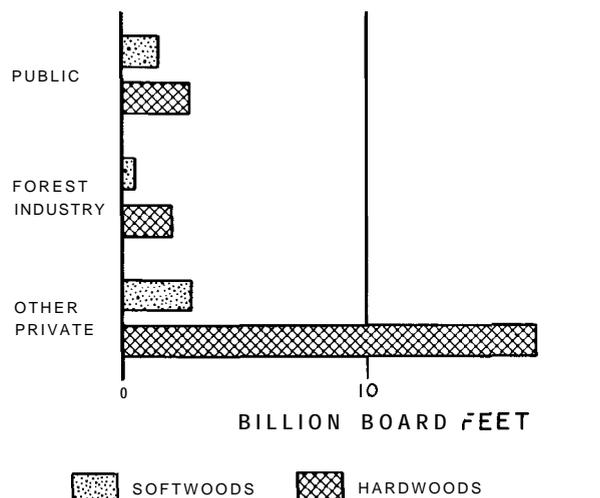


Figure 6. Sawtimber volume by class of ownership.

Hardwood Volume Increased Slightly

Despite the loss of 600,000 acres of commercial forest land between surveys, hardwood growing stock volume increased from 7.7 billion to 8.6 billion cubic feet, or 11 percent (table IV).

White oaks, red oaks, hickories, and yellow-poplar comprise most of the growing stock volume (fig. 3). The oaks are most abundant in the East, Plateau, and West Central regions, while over two-thirds of the yellow-poplar volume is in the East and Plateau regions.

Tennessee's forests contain almost 10.3 billion cubic feet of hardwood. About 16 percent is in rough and rotten trees; the hardwoods do not have the pines' inherently better form and low incidence of decay. Some 8.6 billion cubic feet of the total is growing stock; pole-timber trees comprise 43 percent of the growing stock volume, and the remainder is in sawtimber.

Hardwood sawtimber volume is 22 billion board feet, 14 percent more than in the previous survey (table V). The overwhelming part is privately owned (fig. 6). Saw log quality improved slightly; about 36 percent of the hardwood sawtimber volume is now in grade-2 logs or better.

Most of the volume increase was in trees 10 to 16 inches in diameter (fig. 7).

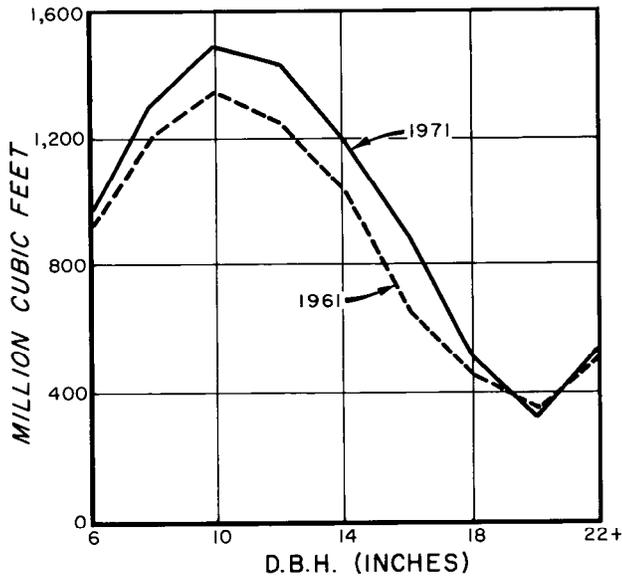


Figure 7. **Hardwood growing** stock by tree **diameter, 1961 and 1971.**

GROWTH AND REMOVALS

In 1970, the inventory of growing stock in Tennessee increased by almost 293 million cubic feet (table VI). This increase is net growth minus removals. Growth exceeded removals by a wide margin for both hardwoods and softwoods.

Table VI. Summary of **volume-change** statistics, 1970

Item	Growing stock			Sawtimber	
	Soft-wood	Hard-wood	All species	Soft-wood	Hard-wood
	Million cubic feet			Million board feet	
Net growth, 1970	102.9	406.2	509.1	309.0	1,119.2
Timber removals, 1970	33.2	183.2	216.4	124.0	695.6
Net change, 1970	+69.7	+223.0	+292.7	+185.0	+423.6

Removals totaled more than 216 million cubic feet in 1970, and the hardwood cut greatly exceeded that of softwoods. A favorable growth-cut ratio existed for most species. In cypress, tupelo, and blackgum, however, the ratios indicate that the sawtimber inventory is being reduced.

Gross growth for 1970 was about 552 million cubic feet. This growth can be divided into five components: (1) survivor growth—the increment in net volume of trees in the growing stock at the beginning of the year and surviving to its end; (2) ingrowth—the net vol-

ume of trees at the time they grew into growing stock during 1970; (3) growth on **ingrowth**—the increment in net volume of trees after they grew into growing stock; (4) growth on removals—the increment in net volume of growing stock trees that were cut during the year; (5) mortality—the net volume in growing stock trees that died during the year.

Survivor growth made up 74 percent of the gross growth during 1970, **ingrowth** and growth on **ingrowth** contributed 17 percent, and growth on trees removed added another 1 percent (table VII). The volume of trees dying was 8 percent of gross growth.

Survivor growth was the biggest growth component for the hardwood species group. It also accounted for the greatest part of gross growth in softwoods, except that in the Central region **ingrowth** was the biggest component. Substantial softwood **ingrowth** also occurred in the West Central region.

The net growth was about 509 million cubic feet, of which 52 percent occurred in the Plateau and East regions. These regions also contained most of the growing stock volume. The West Central region contributed 18 percent to net growth, the West 16, and the Central region 14.

Net volume growth can be compared with its potential to determine how fully the sites are being utilized. The growth potential of each survey plot was determined, and the results indicate that the commercial forest land in Tennessee has an average potential productivity of 71 cubic feet per acre annually. In 1970, net annual growth was 40 cubic feet per acre, or only 56 percent of potential. Why is growth not at its capacity? Stocking and stand structure provide an answer.

Stocking is a measure of the extent to which the growth potential of a site is utilized by trees, and it is determined by comparing the stand density (in terms of number of trees or basal area) with a specified standard. Full or 100 percent stocking is the level at which there is no increase in growth with an increase in stocking.

About 80 percent of the commercial forest land in Tennessee is less than fully stocked with growing stock trees. In some stands, space is preempted by rough and rotten trees; **conse-**

quently, little natural improvement will occur until this space is made available to growing stock. In other stands part of the space is unoccupied by any trees, good or bad.

Stand structure also affects per-acre volume growth. About 4.6 million acres of commercial

forest land are either nonstocked or in sapling or seedling stands. Another 4.9 million acres are in poletimber, and sawtimber occupies 3.3 million acres. Thus over one-third are in seedling and sapling stands, which contribute little volume growth.

Table VII. *Growth components of growing stock on commercial forest land by species group and resource region, Tennessee, 1970*

Region and species group	Growth components					Total	
	Survivor growth	Ingrowth	Growth on ingrowth	Growth on removals	Mortality	Gross growth	Net growth
----- <i>Million cubic feet</i> -----							
West							
Softwood	7.1	1.6	(¹)	0.2	0.5	9.4	8.9
Hardwood	<u>61.4</u>	<u>7.8</u>	<u>0.2</u>	<u>1.5</u>	<u>8.6</u>	<u>79.5</u>	<u>70.9</u>
Total	68.5	9.4	.2	1.7	9.1	88.9	79.8
West Central							
Softwood	5.2	3.0	(¹)	.1	.2	8.5	8.3
Hardwood	<u>69.4</u>	<u>15.0</u>	<u>.2</u>	<u>.5</u>	<u>6.2</u>	<u>91.3</u>	<u>85.1</u>
Total	74.6	18.0	.2	.6	6.4	99.8	93.4
Central							
Softwood	1.9	2.3	(¹)	.1	.2	4.5	4.3
Hardwood	<u>50.9</u>	<u>13.1</u>	<u>.2</u>	<u>.7</u>	<u>6.3</u>	<u>71.2</u>	<u>64.9</u>
Total	52.8	15.4	.2	.8	6.5	75.7	69.2
Plateau							
Softwood	21.5	4.5	.1	.1	2.5	28.7	26.2
Hardwood	<u>71.2</u>	<u>16.1</u>	<u>.2</u>	<u>.8</u>	<u>7.5</u>	<u>95.8</u>	<u>88.3</u>
Total	92.7	20.6	.3	.9	10.0	124.5	114.5
East							
Softwood	42.3	12.2	.2	.5	4.3	59.5	55.2
Hardwood	<u>77.1</u>	<u>18.9</u>	<u>.2</u>	<u>.8</u>	<u>7.0</u>	<u>104.0</u>	<u>97.0</u>
Total	119.4	31.1	.4	1.3	11.3	163.5	152.2
All regions							
Softwood	78.0	23.6	.3	1.0	7.7	110.6	102.9
Hardwood	<u>330.0</u>	<u>70.9</u>	<u>1.0</u>	<u>4.3</u>	<u>35.6</u>	<u>441.8</u>	<u>406.2</u>
Total	408.0	94.5	1.3	5.3	43.3	552.4	509.1

¹Negligible.

Timber Products Output

Tennessee's output of industrial roundwood in 1970 was 137 million cubic feet," a decline of 6 percent from 1960. An additional 24 million cubic feet were cut for domestic use, chiefly firewood.

LARGE SAWMILLS INCREASE

In 1970, the total saw log production was 534 million board feet or 89 million cubic feet (fig. 8). Most of the saw logs harvested in Tennessee also received primary processing there. Imports and exports were a small fraction of the total.

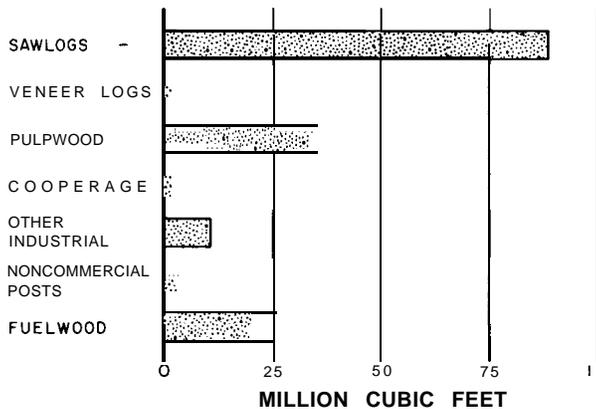


Figure 8. Output of Tennessee roundwood by product, 1970.

Softwood saw logs comprised 69 million board feet. Two-thirds of this volume was southern pine, and the remainder was cypress, white pine, redcedar, and hemlock.

Softwood lumber is sawn mainly by small mills. That two-thirds of the softwood saw logs were converted into lumber without having crossed a county line attests both the modest requirements of individual mills and their aggregate importance in the State's softwood lumber industry.

Softwood saw log production was 56 percent less than in 1960. Considerable attrition of

Tennessee sawmills has occurred in the last 25 years. In 1946, there were 2,789 sawmills: that number had decreased to 1,135 in 1960 and 546 in 1970. Competition from larger mills, equipment obsolescence, and rising labor costs all contributed to the decline.

The output of hardwood saw logs in 1970 was 465 million board feet, slightly less than the 1960 total of 477 million. Oaks comprised 59 percent of the total.

The large mills process mainly hardwood saw logs. Mills cutting at least 3 million board feet annually more than doubled in number during the last decade. As an indication of the roundwood requirements of these plants, almost half of the hardwood saw log volume cut in Tennessee was transported across county boundaries for primary processing.

Locations of sawmills and other primary wood-using plants are mapped in figure 9.

PULPWOOD PRODUCTION A RECORD

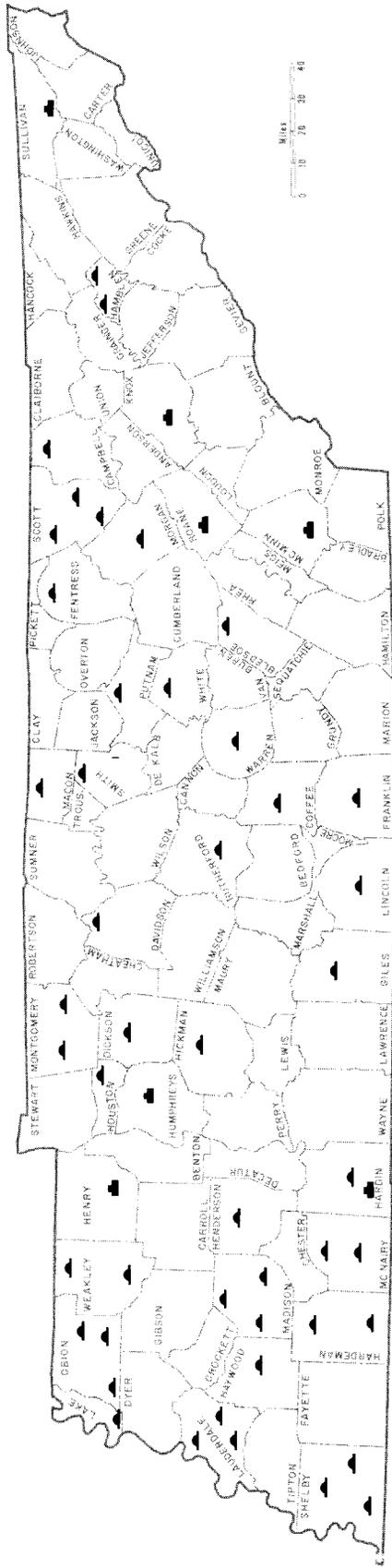
With construction of two mills and expansion of existing facilities, Tennessee's 24-hour pulping capacity rose from 2,357 tons in 1960 to 3,670 tons in 1970. Daily capacity of the average mill increased from 471 to 524 tons.

The 1970 pulpwood harvest reflects the industry expansion. A total of 437,000 cords were removed from Tennessee's forests *-a 24 percent increase over 1960 and a record for the State. Concurrently with the pulping capacity, the rate of pulpwood production has been increasing since 1966.

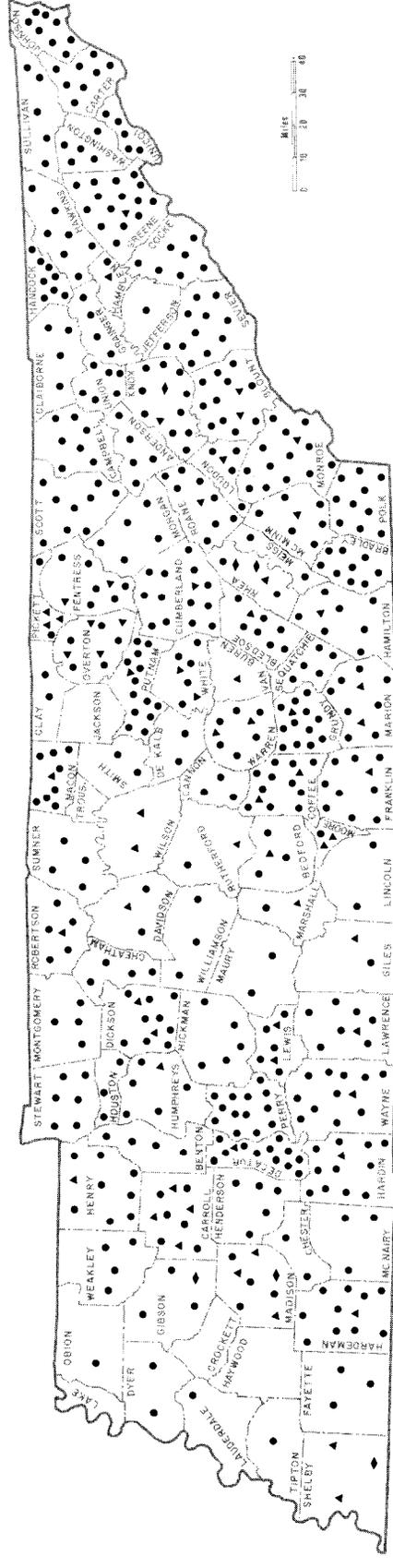
Over half of the cordage is hardwood. Ten years ago the proportion of pine was greater than that of hardwood, but since 1964 hardwood has exceeded pine.

Despite the increase in pulpwood harvest, more than half the wood used by Tennessee

⁴Beltz, R. C. southern pulpwood production, 1970. USDA Forest Serv. Resour. Bull. SO-28, 22 p. South. Forest Exp. Stn., New Orleans, La. 1971.



■ LARGE SAWMILLS ■ PULPMILLS



◆ VENEER ▲ OTHER PLANTS ● SMALL SAWMILLS

Figure 9. Primary industries in Tennessee, 1970.

pulpmills is imported. These imports, chiefly southern pine, totaled 505,000 cords in 1970; only 40,000 cords were exported.

OTHER PRODUCTS

Veneer log production in 1970 was 7 million board feet, a decline of 37 percent from 1960 and a very small fraction of the total **roundwood** output. Hardwoods, mostly yellow-poplar and sweetgum, comprised 99 percent of the total. The number of veneer mills dropped from nine to six during the decade.

Cooperage is also a declining industry; the number of mills decreased by two-thirds during the decade. Output of cooperage bolts dropped accordingly to 11 million board feet—a decline of 58 percent from 1960. Most of the bolts were white oak for tight cooperage.

Other products comprised less than 8 percent of the total. Among these are handlestock, charcoal, commercial posts, excelsior, furniture stock, mine timbers, miscellaneous dimension, piling, poles, and shuttleblocks.

Domestic use, largely for fuel, was 50 percent of the total roundwood production in 1949, 20 percent in 1960, and 15 percent in 1970. Movement of rural populations to the cities

and a switch to more modern fuels among those remaining in the country explain the steady decrease in fuelwood.

PLANT RESIDUES AND BYPRODUCTS

In 1970, Tennessee forest industries produced 51 million cubic feet of residues in converting roundwood into primary products. This total was equally divided between coarse and fine residues. Coarse residue is material, such as slabs and edgings, that can be made into pulp chips. Fine residue consists mainly of sawdust and shavings, which cannot be converted into pulp chips.

More than half of the residue was utilized. Ten million cubic feet went into pulp and particleboard; the use of residues in pulp has been expanding consistently since 1960. About 12 million cubic feet were burned for fuel, and more than 5 million cubic feet were used for other products such as animal bedding, charcoal, and soil mulch.

The nonutilized portion of the residues totaled 23 million cubic feet in **1970—equivalent** to the growing stock volume on 29,000 acres of Tennessee's commercial forest land. **Two-thirds** of the unused residues are fines.

Timber Supply Outlook

Demand for timber will probably increase. But what about the supply? Projections can aid in evaluating Tennessee's prospects of satisfying future demand. Projections are not predictions, since no attempt is made to estimate what conditions will be in the future. They show only what will occur if certain assumptions hold true.

Two projections, prospective cut and potential cut, were made for Tennessee. In the **propective** cut, the assumption is that the cut will be brought into balance with growth. In the potential cut, it is assumed that forest management will be intensified so that there will be a better balance of tree sizes in 30 years, the-end of the projection period.

PROSPECTIVE CUT

In this projection the cut is adjusted each year until the last year of the projection period, when it is assumed to equal the growth on growing stock (figs. 10 and 11). The other assumptions are that the commercial forest area, growth rates, and mortality rates will not change.

The growth-cut ratios were favorable for softwoods in 1970: 3.1 for growing stock and 2.5 for sawtimber. These ratios mean that the annual cut can be increased without diminishing the softwood inventory. In the year 2,000 the growth and cut are 135 million cubic feet (fig. 10).

Most of the inventory increase will be in the lower diameter classes (fig. 12). About 75 percent of the softwood sawtimber volume is in the 14-inch class and less.

The proportions of growth to cut for **hardwood** in 1970 were 2.2 for growing stock and 1.6 for sawtimber. As in softwood, the cut of growing stock trees can be increased greatly during the projection period (fig. 11). In the

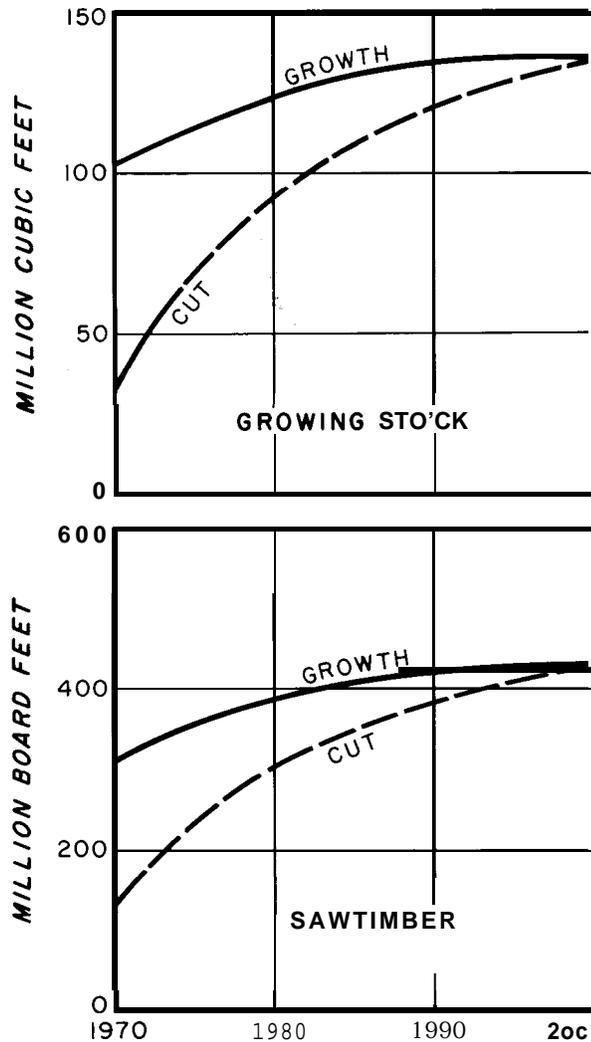


Figure 10. Prospective *growth* and *cut* of *softwood*, 1970-2000.

year 2000, growth and cut are 556 million cubic feet.

Growth and cut are initially favorable for hardwood sawtimber. As the projection period proceeds, however, the ratio diminishes. By 1977, and for every year thereafter, the cut is larger than the growth. The result is a diminution of the sawtimber inventory (fig. 13).

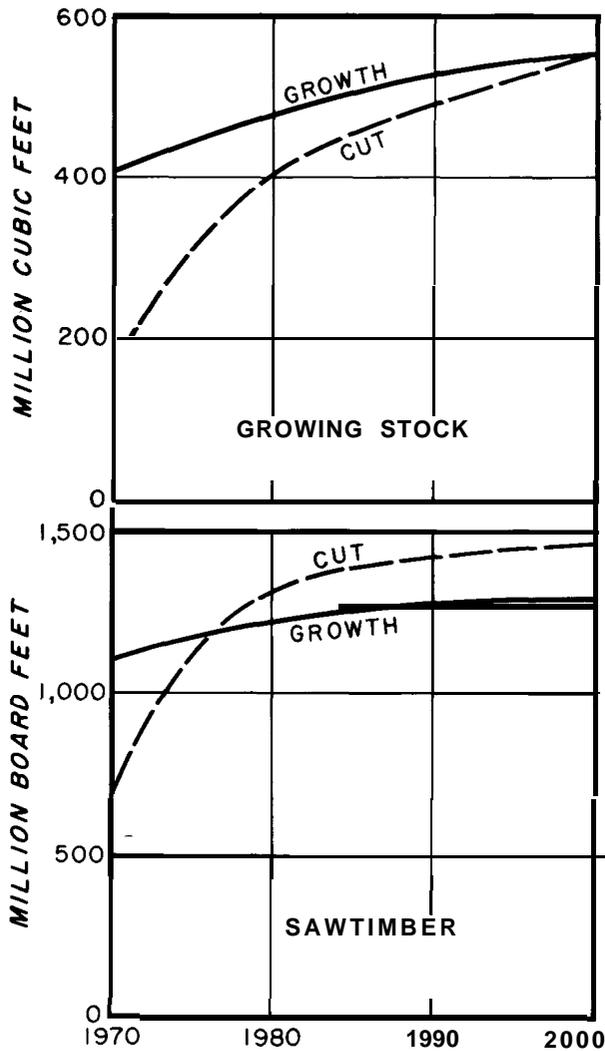


Figure 11. Prospective growth and *cut of hardwood, 1970-2000.*

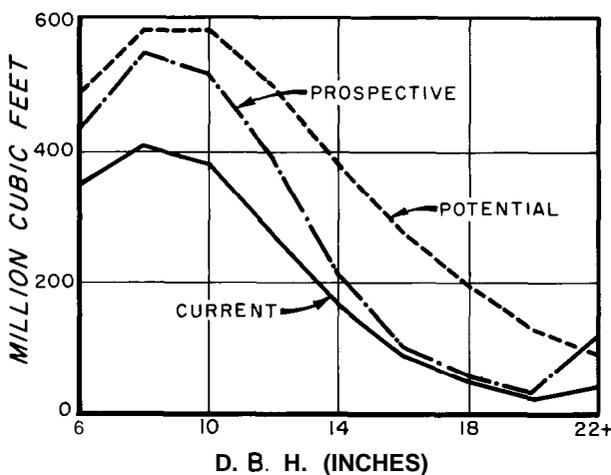


Figure 12. Comparison of 1971 softwood growing stock with prospective and potential inventories of 2001.

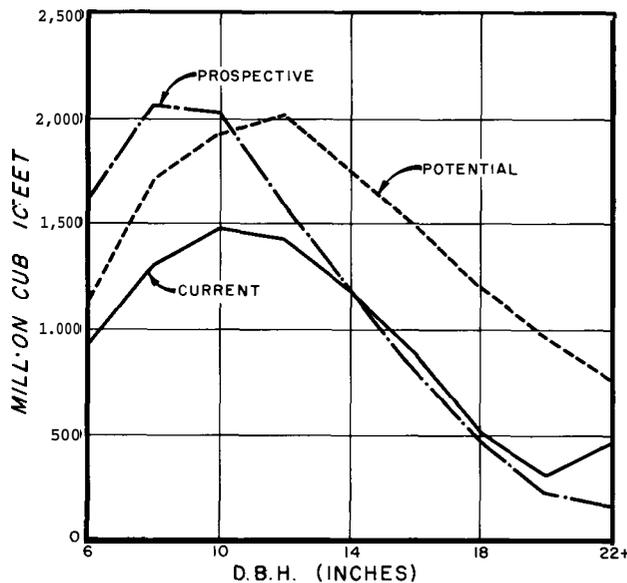


Figure 13. Comparison of 1971 hardwood growing stock with prospective and potential inventories of 2001.

The management goal in the prospective cut is a modest one. The deficit of trees in the upper diameter classes was not considered; consequently, a reduction of the hardwood sawtimber inventory occurred. More ambitious management goals are possible, and they are considered in the potential cut.

POTENTIAL CUT

In calculating the potential cut, it is assumed that the commercial forest area will remain the same as now but that the oak-pine forest type will be converted to pure pine by the end of the projection period. With the conversion there will be 2.9 million acres in the softwood type and 9.9 million acres in the hardwood type. Growth and mortality rates remain unchanged.

To correct the deficit of trees in the larger diameter classes, a goal for both types is to improve the distribution of tree sizes by adjusting the annual cut. With the 1971 inventory and the desired inventory of 2001 as the bases, stand tables for each year of the projection period were found by interpolation. The cut each year was adjusted so that the interpolated stand was attained. In the early years of the projection period the cut is reduced, but as growth rebuilds the inventory the removals

are increased. The cut is concentrated in the lower tree sizes so that the deficit in large trees is gradually ameliorated.

The specific goals for the softwood type are a basal area of 80 square feet per acre and a growing stock proportion of 97 percent of the total stand. The goals for the hardwood type are a density of 90 square feet per acre and a growing stock proportion of 90 percent of the total stand.

If these goals are achieved, Tennessee's forests will have an annual growth of 704 million cubic feet or 55 cubic feet per acre in 2000. The growing stock needed for this growth is

seen in figures 12 and 13. Softwood comprises 20 percent of the inventory.

Although the cubic-foot growth does not increase much, the sawtimber growth is increased markedly-to 187 board feet per acre in the year 2000, as opposed to 135 board feet for the prospective cut in 2000 and 111 board feet at present.

The potential inventory for both species groups has much more volume in the higher diameter classes than does the 1971 inventory. Thus, the potential cut indicates that Tennessee's forests could furnish much more timber than they now do.

Management Opportunities

PINE SITES

Tennessee is considered primarily a hardwood State. However, 46 percent or 5.9 million acres of the commercial forest area belong in the pine site class. Since only about 1 million acres are currently in pine, almost 5 million acres are candidates for conversion. The time for conversion depends upon the management potential of the present stands.

Pine sites that are poorly stocked with growing stock trees total 594,000 acres. These stands have little management potential and are candidates for immediate conversion. Only 59,000 acres have an adequate pine seed source; the remaining would have to be planted or seeded.

The other pine sites contain stands that are at least 60 percent stocked with growing stock trees. The stands can be managed and regenerated to pure pine subsequently. These areas total 5.3 million acres, and only 1.6 million acres have an adequate pine seed source.

HARDWOOD SITES

One problem with the hardwood resource is an unfavorable distribution of tree sizes. As indicated by the projection of potential cut, a better distribution may be obtained by concentrating annual removals on trees too small for saw logs. The hardwood pulpwood market offers an outlet for this material.

Another problem is inadequate stocking with desirable trees. Desirable trees are growing stock which have high vigor, possess no serious defects to limit prospective or present use, and contain no pathogens likely to cause death or serious deterioration before rotation age. Acceptable trees are growing stock that do not qualify as desirable. Sample plots of the survey were classified according to their condition class—that is, as having poor, medium, or good stocking of desirable trees—and these data

were used to estimate the amount of commercial forest land in each condition class.

Poorly Stocked Stands

Some 1.4 million acres of hardwood sites are poorly stocked with growing stock trees. All regions have some acreage in this condition class, but a large proportion occurs in the Central region. Some areas are suitable for the planting of yellow-poplar; on others, cull tree removal may facilitate natural restocking.

Another 5.4 million acres are poorly stocked with desirable trees but have medium or better stocking of growing stock trees. More hardwood sites occur in this condition class than any other. Stands can be improved by removing cull trees and favoring desirable trees in intermediate cuts or thinnings.

Medium Stocked Stands

On 16,000 acres desirable trees supply medium stocking, and less than 30 percent of the area is occupied by other trees or conditions that prevent occupancy by desirable trees. These areas occur in the Central and Plateau regions. No stand treatments are necessary.

On 81,000 acres of hardwood sites desirable trees provide medium stocking, but 30 percent or more of the area is occupied by other trees. This condition class occurs in the Central, Plateau, and West regions. Thinning of acceptable trees and removal of culls can improve stocking of desirable trees.

Well Stocked Stands

About 6,000 acres are well stocked with desirable trees, but not overstocked. All are in the West Central region. Since these stands have maximum growth in desirable trees, no special treatments are necessary.

RESOURCE IMPROVEMENT

Despite the net loss of about 600,000 acres of commercial forest since 1961, the timber resource of Tennessee has improved. Among the improvements are increases in stocking, volume of desirable species, and growth. However, problems still remain. Only 20 percent of the commercial forest area is well stocked, large trees are scarce, and hardwoods occupy many acres that could support pine.

Two ways of improving the resource have been mentioned. One is the conversion of suitable areas to pine. The other is stand treatment in the hardwood type.

The identification of stand conditions and pine sites does not necessarily mean that improvements should be undertaken. In some situations, the cost of improvement may be greater than the financial returns, and the gains from some treatments, such as cull tree removal, are sometimes difficult to assess. Nevertheless, some priorities can be outlined on the basis of cost and technical feasibility.

Priorities on pine sites can be assigned on the basis of conversion cost. If stands that can be profitably managed are excluded, the first priority would be sites that can be regenerated naturally to pine. Some stands already have pine reproduction, which can be released by harvesting or deadening any competing **over-**story. Others have a pine seed source but no reproduction. On these areas a pine **under-**

story can be established naturally before the overstory is eliminated.

Conversions which necessitate artificial regeneration of pine are second in priority. Conversion costs will vary widely according to stand conditions. Some areas have a few large trees which can be deadened economically. Most stands, however, are composed of many stems of varying sizes, and heavy machinery is needed to clear and prepare for planting. Machine clearing is expensive, but there is no other way of restoring these sites.

On hardwood sites management should be aimed at increasing the stocking of desirable trees. Ranking first in priority is the harvesting of merchantable but less desirable trees, next is deadening of large culls, and finally is deadening of small culls. The harvesting of less desirable trees can provide an immediate economic return while freeing growing space. Large culls can be treated singly, while blanket treatment may be needed for small culls. In some cases, areas can be cleared of their present stand and profitably planted to yellow-poplar.

Though the stand treatments outlined here require the careful judgement of foresters and often will entail a large financial outlay, they are feasible in many situations. The extent to which land managers adopt them will determine the future productivity of Tennessee's forests.

Appendix

SURVEY METHODS

The data on forest acreage and timber volume in this report were secured by a sampling method involving a forest-nonforest classification on aerial photographs and on-the-ground measurements of trees at sample locations. The sample locations were at the intersections of a grid of lines spaced 3 miles apart. In Tennessee, 121,290 photographic classifications were made and 4,665 ground sample locations were visited.

The initial estimates of forest area that were obtained with the aerial photographs were adjusted on the basis of the ground check.

A cluster of 10 variable-radius plots was installed at each ground sample location. Each sample tree on the variable-radius plots represented 3.75 square feet of basal area per acre. Trees less than 5.0 inches in diameter were tallied on fixed-radius plots around the plot centers. Together, these samples provided most of the information for the new inventory. A subsample of trees on the plots was measured in detail to obtain data for calculating timber volumes.

The plots established by the prior survey were remeasured to determine the elements of change and were the basis for estimating growth, mortality, removals, and changes in land use.

With the assistance of the Tennessee Valley Authority and the Tennessee Department of Conservation, a special study was made to determine product output. It consisted of a canvass of all primary wood-using plants active in Tennessee during 1970. Out-of-State firms known to use Tennessee roundwood were also contacted. Additionally, **fuelwood** and other domestic uses were determined from an area sample.

RELIABILITY OF THE DATA

Reliability of the estimates may be affected by two types of errors. The first stems from

the use of a sample to estimate the whole and from variability of the items being sampled. This type is termed sampling error; it is susceptible to a mathematical evaluation of the probability of error. The second type—often referred to as reporting or estimating **error**—derives from mistakes in measurement, judgment, or recording, and from limitations of method or equipment. Its effects cannot be appraised mathematically, but the Forest Service constantly attempts to hold it to a minimum by proper training and good supervision, and by emphasis on careful work.

Statistical analysis of the data indicates a sampling error of plus or minus 0.3 percent for the estimate of total commercial forest area, 1.7 percent for total cubic volume, and 2.7 percent for total board-foot volume. As these totals are broken down by forest type, species, tree diameter, and other subdivisions, the possibility of error increases and is greatest for the smallest items. The order of this increase is suggested in the following tabulation, which shows the sampling error to which the timber volume and area estimates are liable, two chances out of three:

Commercial forest area	Sampling error ¹	Cubic volume ²	Sampling error ¹	Board-foot volume ²	Sampling error ¹
Thousand acres	Percent	Million cubic feet	Percent	Million board feet	Percent
12,819.8	0.3				
1,153.8	1.0	10,395.8	1.7		
288.4	2.0	7,454.5	2.0	26,340.2	2.7
128.2	3.0	3,313.1	3.0	21,335.6	3.0
72.1	4.0	1,863.6	4.0	12,001.3	4.0
46.2	5.0	1,192.7	5.0	7,680.8	5.0
11.5	10.0	298.2	10.0	1,920.2	10.0
5.1	15.0	132.5	15.0	853.4	15.0
2.9	20.0	14.5	20.0	480.1	20.0
1.8	25.0	47.7	25.0	307.2	25.0

¹ By random-sampling formula.

² Growing-stock volume on commercial forest land

³ Sawtimber volume on commercial forest land.

The sampling error to which the estimates of growth, mortality, and removals are liable, on a probability of two chances out of three, are :

Net annual growth				Annual removals			
Cubic volume	Sampling error ¹	Board foot volume	Sampling error ¹	Cubic volume	Sampling error ¹	Board foot volume	Sampling error ¹
Million cubic feet	Percent	Million board feet	Percent	Million cubic feet	Percent	Million board feet	Percent
509.1	2.4						
325.8	3.0	1,428.2	3.8	216.4	3.2	819.6	3.0
183.3	4.0	1,289.0	4.0	138.5	4.0	461.0	4.0
117.3	5.0	824.9	5.0	88.6	5.0	295.1	5.0
29.3	10.0	206.2	10.0	22.2	10.0	73.8	10.0
13.0	15.0	91.7	15.0	9.8	15.0	32.8	15.0
7.3	20.0	51.6	20.0	5.5	20.0	18.4	20.0
4.7	25.0	33.0	25.0	3.5	25.0	11.8	25.0

¹ By random-sampling formula.

DEFINITIONS OF TERMS

Forest Land Class

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

Commercial forest land.-Forest land that is producing or is capable of producing crops of industrial wood and **not** withdrawn from timber utilization.

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

Productive-reserved forest land.-Productive public forest land withdrawn from timber utilization through statute or administrative regulation.

Unproductive forest land.-Forest land incapable of yielding crops of industrial wood because of adverse site conditions.

Tree Species

Commercial species.-Tree species presently or prospectively suitable for industrial wood products; excludes so-called weed species such as blackjack oak and blue beech.

Hardwoods.-Dicotyledonous trees, usually **broad-**leaved and deciduous.

Softwoods.—**Coniferous** trees, usually evergreen, having needle or scale-like leaves.

Forest Type

White pine.-Forests in which eastern white pine comprises 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, comprise a plurality of the stocking. Common associates include maple, birch, and hemlock.

Loblolly-shortleaf pine.-Forests in which southern pines comprise a plurality of the stocking. Common associates include oak, hickory, and gum.

Oak-pine.-Forests in which hardwoods (usually upland oaks) comprise a plurality of the stocking but in which softwoods, except cypress and eastern redcedar, comprise 25-50 percent of the stocking. Common associates include gum, hickory, and yellow-poplar.

Cedar.-Forests in which eastern **redcedar** comprises 25 percent or more of the stocking. Common associates include southern pines, oak, and hickory.

Oak-hickory.-Forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking except where pines comprise 25-50 percent, in which case the stand is 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, comprise a plurality of stocking except where pines comprise 25-50 percent, in which case the stand is 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, comprise a plurality of the stocking. Common associates include willow, sycamore, beech, and maple.

Maple-beech-birch.-Forests in which sugar maple, beech, or yellow birch, singly or in combination, comprise a plurality of the stocking. Common associates include hemlock, elm, basswood, and white pine.

Class of Timber

Growing stock **trees.**—**Sawtimber** trees, **poletim-**ber trees, saplings, and seedlings; that is, all live trees except rough and rotten trees.

Desirable **trees.—Growing-stock** trees that have no serious defects to limit present or prospective use, are of relatively high vigor, and contain no pathogens that may result in death or serious deterioration before rotation age. They comprise the type of trees that forest managers aim to grow; that is, the trees favored in silvicultural operations.

Acceptable trees.-Trees meeting the specifications for growing stock but not qualifying as **desirable** trees.

Sawtimber trees.-Live trees of commercial species, 9.0 inches and larger in diameter at breast height for softwoods and 11.0 inches and larger for hardwoods, and containing at least one **12-foot** saw log.

Poletimber trees.-Live trees of commercial species 5.0 to 9.0 inches in d.b.h. for softwoods and 5.0 to 11.0 inches for hardwoods, and of good form and vigor.

Saplings.-Live trees of commercial species, 1.0 inch to 5.0 inches in d.b.h. and of good form and vigor.

Rough and rotten trees.-Live trees that are unmerchantable for saw logs now or prospectively because of defect, rot, or species.

Salvable dead trees.-Standing or down dead trees that are considered currently or potentially merchantable.

Stand-Size Class

Sawtimber **stands.—Stands** at least 16.7 percent stocked with growing-stock trees, with half or more of this stocking in sawtimber or 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, with half or more of this stocking in sawtimber or poletimber trees, and with poletimber stocking exceeding that of sawtimber stocking.

Sapling-seedling **stands.—Stands** at least 16.7 percent stocked with growing-stock trees, with more than half of this stocking in saplings or seedlings.

Nonstocked areas.-Commercial forest lands less than 16.7 percent stocked with growing-stock trees.

Stocking

Stocking is a measure of the extent to which the growth potential of the site is utilized by trees or preempted by vegetative cover. Stocking is determined by comparing the stand density in terms of number of trees or basal area with a specified standard. Full stocking is assumed to range from 100 to 133 percent of the stocking standard.

The tabulation below shows the density standard in terms of trees per acre, by size class, required for full stocking:

D.b.h. (inches)	Number of trees	D.b.h. (inches)	Number of trees
Seedlings	600	16	72
2	560	18	60
4	460	20	51
6	340	22	42
8	240	24	36
10	155	26	31
12	115	28	27
14	90	30	24

Volume

Volume of sawtimber.-Net volume of the **saw-log** portion of live sawtimber trees in board feet of the International rule, 1/a-inch kerf.

Volume of growing stock.-Volume of sound wood in the bole of sawtimber and poletimber trees, from stump to a **minimum** 4.0-inch top outside bark or to the point where the central stem breaks into limbs.

Volume of timber.-The volume of sound wood in the bole of growing stock, rough, rotten, and salvable dead trees 5.0 inches and larger in d.b.h. from stump to a minimum 4.0-inch top outside bark or to the point where the central stem breaks into limbs.

Area Condition Class

A classification of commercial forest land based upon stocking by desirable trees and other conditions affecting current and prospective timber growth.

Class 10.-Areas 100 percent or more stocked with desirable trees and not overstocked.

Class 20.-Areas 100 percent or more stocked with desirable trees and overstocked with all live trees.

Class **30.—Areas** 60 to 100 percent stocked with desirable trees and with less than 30 percent of the area controlled by other trees, inhibiting vegetation, slash, or nonstockable conditions.

Class 40.-Areas 60 to 100 percent stocked with desirable trees and with 30 percent or more of the area controlled by other trees, or conditions that ordinarily prevent occupancy by desirable trees.

Class 10.-Areas less than 60 percent **stocked** with desirable trees, but with 100 percent or more stocking of growing-stock trees.

Class **60.—Areas** less than 60 percent stocked with desirable trees, but with 60 to 100 percent stocking of growing-stock trees.

Class **70.—Areas** less than 60 percent stocked with desirable trees and with less than 60 percent stocking of growing-stock trees.

Miscellaneous Definitions

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 per acre.

D.b.h. (Diameter breast high) .-Tree diameter in inches, outside bark, measured at 4% feet above ground.

Diameter classes.-The **2-inch** diameter classes extend from 1.0 inch below to 0.9 inch above the stated midpoint. Thus, the **12-inch** class includes trees 11.0 inches through 12.9 inches d.b.h.

Site classes.-A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

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

Gross growth.-Annual increase in net volume of trees in the absence of cutting and mortality.

Net annual growth.-The increase in volume of a specified size class for a specific year. Components of net annual growth include the increment in net volume of trees at the beginning of the specific year surviving to its end plus volume of trees reaching the size class during the year minus the volume of trees that died during the year minus the net volume of trees that become rough or rotten during the year.

Mortality.-Number or sound-wood volume of live trees dying from natural causes during a specified period.

Timber removals.-The net volume of **growing-stock** trees removed from the inventory by harvesting, cultural operations such as timber-stand improvement, land clearing, or changes in land use.

Timber products.-Roundwood products and plant byproducts. Timber products output includes roundwood products cut from growing stock on commercial forest land; from other sources, such as cull trees, salvable dead trees, limbs, and saplings; from trees on noncommercial and nonforest lands; and from plant byproducts.

Roundwood products.-Logs, bolts, or other round sections cut from trees for industrial or consumer uses. Included are saw logs, veneer logs and bolts, cooperage logs and bolts, pulpwood, fuelwood, piling, poles and posts, hewn ties, mine timbers, and various other round, split, or hewn products.

Logging residues.-The unused portions of trees cut or killed by logging.

Plant byproducts.-Wood products, such as pulp chips, obtained incidental to manufacture of other products.

Plant residues.-Wood materials from manufacturing plants not utilized for some product. Included are slabs, edgings, trimmings, **miscuts**, sawdust, shavings, veneer cores and clippings, and pulp screening.

STANDARD TABLES

NOTE: Regional tables, identical in format to standard State tables 1-22, are available for each of the five forest resource regions in Tennessee. They are free on request to the Southern Forest Experiment Station.

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Table 1. *Area by land classes, Tennessee, 1971*

Land class	Area
	Thousand acres
Forest:	
Commercial	12,819.8
Productive-reserved	316.5
Unproductive	
Total forest	13,136.3
Nonforest:	
Cropland ¹	7,855.2
Pasture and range ¹	1,808.2
Other ²	3,675.2
Total nonforest	13,338.6
All land ³	26,474.9

¹ Source: Census of Agriculture.

² Includes swampland, industrial and urban areas, other nonforest land, and 36,500 acres classed as water by Forest Survey standards but defined by the Bureau of the Census as land.

³ Source: United States Bureau of the Census, Land and Water Area of the United States.

Table 2. *Area of commercial forest land by ownership classes, Tennessee, 1971*

Ownership class	Area
	Thousand acres
Public :	
National forest	599.7
Other federal	340.3
State	324.0
County and municipal	22.2
Total public	1,286.2
Private:	
Forest industry ¹	1,121.4
Farmer	5,079.1
Miscellaneous private :	
Individual	4,577.2
Corporate	755.9
Total private	11,533.6
All ownerships	12,819.8

¹ Not including 53,700 acres of farmer-owned and miscellaneous private lands leased to forest industry.

Table 3. *Area of commercial forest land by stand-size and ownership classes, Tennessee, 1971*

Stand-size class	All ownerships	National forest	Other public	Forest industry	Farmer and misc. private
	----- <i>Thousand acres</i> -----				
Sawtimber	3,297.8	257.0	297.8	233.2	2,509.8
Poletimber	4,893.6	230.6	271.5	432.2	3,959.3
Sapling and seedling	4,595.9	112.1	117.2	456.0	3,910.6
Nonstocked areas	32.5	.	...		32.5
All classes	12,819.8	599.7	686.5	1,121.4	10,412.2

Table 4. *Area of commercial forest land by stand-volume and ownership classes, Tennessee, 1971*

Stand-volume per acre ¹	All ownerships	National forest	Other public	Forest industry	Farmer and misc. private
	----- <i>Thousand acres</i> -----				
Less than 1,500 board feet	6,953.0	153.2	272.7	617.0	5,910.1
1,500 to 5,000 board feet	4,555.9	285.5	265.2	380.8	3,624.4
More than 5,000 board feet	1,310.9	161.0	148.6	123.6	877.7
All classes	12,819.8	599.7	686.5	1,121.4	10,412.2

¹ International $\frac{1}{4}$ -inch rule.

Table 5. Area of commercial forest land by stocking classes based on selected stand components, Tennessee, 1971

Stocking percentage	Stocking classified in terms of					
	All trees	Growing-stock trees			Rough and rotten trees	Inhibiting vegetation
		Total	Desirable	Accentable		
----- Thousand acres -----						
160 or more	11.6	11.6	.	.	.	.
150 to 160	28.0	11.7	.	.	...	.
140 to 150	275.0	50.7	...	5.3	...	.
130 to 140	629.2	147.8	11.1	15.2	.	.
120 to 130	1,420.9	318.5	5.7	27.9	...	.
110 to 120	2,706.6	773.4	35.1	124.0	...	.
100 to 110	3,254.3	1,286.7	22.3	298.5	6.4	.
90 to 100	2,431.9	1,917.3	62.4	782.7	..	.
80 to 90	1,194.4	2,514.5	67.0	1,498.3	23.5	.
70 to 80	477.9	2,193.5	164.5	2,201.8	71.3	.
60 to 70	236.5	1,619.2	243.2	2,262.2	171.8	.
50 to 60	97.7	1,170.6	370.8	2,121.9	415.4	.
40 to 50	44.9	525.0	669.8	1,669.1	932.0	.
30 to 40	10.9	190.6	1,150.4	989.2	1,902.2	5.4
20 to 30	.	50.9	1,962.2	529.0	3,203.2	14.2
10 to 20	.	26.4	3,134.4	169.4	3,598.0	75.6
Less than 10	.	11.4	4,920.9	125.3	2,496.0	12,724.6
All areas	12,819.8	12,819.8	12,819.8	12,819.8	12,819.8	12,819.8

Table 6. Area of commercial forest land by area-condition and ownership classes, Tennessee, 1971

Area-condition class	All ownerships	National forest	Other public	Forest industry	Farmer and misc. private
----- Thousand acres -----					
10	50.8	.	8.0	10.8	32.2
20	23.4	.	5.3	14.8	3.3
30	79.4	.	5.3	11.1	63.0
40	457.7	11.7	10.1	45.8	390.1
50	2,129.7	148.6	96.4	251.0	1,633.7
60	8,103.9	330.7	458.4	630.2	6,684.6
70	1,974.9	108.7	103.0	157.9	1,605.3
All classes	12,819.8	599.7	686.5	1,121.4	10,412.2

Table 7. Area of commercial forest land by site and ownership classes, Tennessee, 1971

Site class	All owner-ships	National forest	Other public	Forest industry	Farmer and misc. private
----- Thousand acres -----					
165 cu. ft. or more	165.2	.	16.8	40.6	107.8
120 to 165 cu. ft.	379.7	5.5	50.6	11.3	312.3
85 to 120 cu. ft.	2,465.7	104.9	160.0	151.4	2,049.4
50 to 85 cu. ft.	6,497.2	334.1	335.5	626.2	5,201.4
Less than 50 cu. ft.	3,312.0	155.2	123.6	291.9	2,741.3
All classes	12,819.8	599.7	686.5	1,121.4	10,412.2

Table 8. Area of commercial forest land by forest types and ownership classes, Tennessee, 1971

Type	All ownerships	Public	Private
-- Thousand acres --			
White pine	38.9	21.9	17.0
Loblolly-shortleaf pine	1,198.0	151.9	844.9
Oak-pine	693.8	39.9	653.9
Cedar	9,108.0	759.6	8,348.4
Oak-hickory	547.2	80.6	466.6
Oak-gum-cypress	150.7	10.3	140.4
Elm-ash-cottonwood	84.4	23.6	60.8
Maple-beech-birch	12,819.8	1,286.2	11,533.6
All types			

Table 9. Area of noncommercial forest land by forest types, Tennessee, 1971

Type	All areas	Productive- reserved areas	Un- productive areas
-- Thousand acres --			
Spruce-fir	15.6	15.6	
White pine	55.8	55.8	
Loblolly-shortleaf pine	11.6	11.6	
Oak-pine	44.8	44.8	
Oak-hickory	155.4	155.4	
Maple-beech-birch	33.3	33.3	
All types	316.5	316.5	

Table 10. Number of growing-stock trees on commercial forest land by species and diameter classes, Tennessee, 1971

Species	Diameter class (inches at breast height)										
	All classes	5.0- 6.9	7.0- 8.9	9.0- 11- 10.9	12- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 28.9	29.0 and larger
----- Thousand trees -----											
Softwood:											
Shortleaf pine	87,357	38,984	25,285	14,274	5,672	2,035	773	276	46		12
Loblolly	41,421	25,349	11,335	3,068	1,132	323	157	39	9	9	
Virginia pine	90,244	44,833	22,900	12,916	6,396	2,507	471	166	38	17	
Pitch pine	10,300	5,353	2,070	1,487	553	466	157	124	82		8
Table-Mountain pine	1,694	653	579	199	134	78	51	...	...	...
White pine	10,346	2,299	2,474	2,021	1,219	892	608	410	182	216	25
Hemlock	4,846	1,141	1,391	705	518	383	295	71	77	58	9
Redcedar	39,590	26,602	9,703	2,313	638	171	113	42	8		
Cypress	1,201	254	233	118	194	123	90	42	64	52	31
Total	286,799	145,468	75,970	37,101	16,454	6,978	2,715	1,170	506	372	65
Hardwood:											
Select white oaks ¹	152,596	59,511	37,136	25,248	14,328	8,469	4,269	2,261	626	715	33
Select red oaks ²	43,665	13,159	8,712	8,253	5,018	3,700	2,210	1,070	559	901	83
Other white oaks	123,406	47,902	30,341	19,141	11,925	7,216	3,721	1,642	788	672	58
Other red oaks	159,268	59,216	35,881	26,934	15,777	10,894	5,827	2,422	1,063	1,066	182
Pecan	328	139		105				39	36	9	
Other hickories	152,454	64,133	39,867	23,605	13,065	6,367	3,096	1,257	510	533	21
Sweetgum	36,090	13,696	9,646	5,940	3,600	1,460	996	432	129	175	16
Tupelo and blackgum	29,164	12,619	8,064	3,942	2,284	1,245	472	290	172	76	
Hard maple	25,806	10,668	6,706	4,060	1,776	1,380	596	229	215	168	8
Soft maple	42,044	21,189	10,087	5,792	2,787	791	811	338	132	109	8
Beech	12,496	3,592	3,639	1,941	885	797	672	324	276	354	18
Ash	33,236	16,866	7,236	4,291	1,721	1,323	850	381	421	342	5
Cottonwood	865	171			80	193	77	68	245	31	
Basswood	4,375	1,435	1,232	836	402	300	123	120	62	85	
Yellow-poplar	61,389	22,608	13,792	9,417	6,905	3,946	2,732	955	666	342	26
Black walnut	9,788	3,385	2,866	1,766	1,064	465	189	31	22		
Black cherry	9,065	3,995	3,170	1,001	563	223	69	44			
Willow	1,730	732	380	38	153		89	232	81	25	
Magnolia											
(Magnolia spp.)	2,400	734	723	349	330	154	47	26	10	27	
American elm	16,248	7,912	3,639	2,531	1,024	515	232	171	98	97	29
Other elms	15,206	8,569	2,787	2,194	961	415	107	43	104	26	
Hackberry	10,597	4,760	2,740	1,374	805	433	330	80	63	12	
Sycamore	5,106	1,417	996	949	661	397	299	102	95	187	3
Other hardwoods	66,964	45,409	13,221	4,257	1,734	1,210	587	248	121	161	16
Total	1,014,286	423,617	242,867	153,764	87,768	51,780	28,517	12,814	6,317	6,307	535
All species	1,301,085	569,085	318,837	190,865	104,222	58,758	31,232	13,984	6,823	6,679	600

¹Includes white, swamp chestnut, swamp white, chinkapin and bur oaks.

²Includes northern red, Shumard, and cherrybark oaks.

Table 11. Volume of timber on commercial forest land by class of timber and by softwoods and hardwoods, Tennessee, 1971

Class of timber	All species	Soft-wood	Hard-wood
	-- Million cubic feet --		
Sawtimber trees :			
Saw-log portion	4,615.9	893.8	3,722.1
Upper-stem portion	1,288.9	144.9	1,144.0
Total	5,904.8	1,038.7	4,866.1
Poletimber	4,491.0	761.1	3,729.9
All growing stock	10,395.8	1,799.8	8,596.0
Rough trees	1,111.6	37.1	1,074.5
Rotten trees	605.0	20.7	584.3
Salvable dead trees	26.8	12.8	14.0
All timber	12,139.2	1,870.4	10,268.8

Table 12. Volume of growing stock and sawtimber on commercial forest land by ownership classes and by softwoods and hardwoods, Tennessee, 1971

Ownership class	Growing stock			Sawtimber		
	All species	Soft-wood	Hard-wood	All species	Soft-wood	Hard-wood
	- Million cubic feet -			-- Million board feet --		
National forest	736.5	261.0	475.5	2,096.5	863.6	1,232.9
Other public	724.6	197.8	526.8	2,166.7	621.6	1,545.1
Forest industry	904.3	170.8	733.5	2,406.6	446.3	1,960.3
Farmer and misc. private	8,030.4	1,170.2	6,860.2	19,670.4	2,767.6	16,902.8
All ownerships	10,395.8	1,799.8	8,596.0	26,340.2	4,699.1	21,641.1

Table 13. Volume of growing stock on commercial forest land by species and diameter classes, Tennessee, 1971

Species	Diameter class (inches at breast height)										
	All classes	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
	----- Million cubic feet -----										
Softwood:											
Shortleaf pine	634.7	111.5	157.2	163.2	103.6	52.7	30.0	13.2	2.6	0.7	.
Loblolly pine	184.5	61.3	58.3	29.3	19.2	8.0	4.9	2.0	.8	.7	.
Virginia pine	560.8	109.9	127.2	135.4	106.7	57.3	14.7	6.5	2.1	1.0	.
Pitch pine	71.2	12.6	11.0	12.0	7.8	11.6	5.7	6.0	4.1	.4	.
Table-Mountain pine	10.1	1.4	2.9	1.6	1.8	1.4	1.0	..	.	..	..
White pine	151.1	5.4	13.2	20.0	19.7	22.2	19.6	18.2	9.9	19.0	3.9
Hemlock	55.2	2.4	7.5	7.4	7.2	8.9	9.3	2.9	4.4	4.3	.9
Redcedar	103.6	43.5	32.9	15.0	6.2	2.6	2.4	.9	.1	..	.
Cypress	28.6	1.0	1.9	.8	3.1	3.6	2.9	2.7	3.6	4.3	4.;
Total	1,799.8	349.0	412.1	384.7	275.3	168.3	90.5	52.4	27.6	30.4	9.5
Hardwood:											
Select white oaks	1,305.4	136.4	196.6	248.2	229.2	194.1	130.6	87.5	30.8	49.3	2.7
Select red oaks	554.7	33.6	51.3	84.3	82.4	84.2	70.4	40.4	28.8	69.8	9.5
Other white oaks	1,016.6	107.4	158.6	172.7	179.2	154.2	103.8	60.2	35.7	39.7	5.1
Other red oaks	1,486.4	135.7	192.3	255.0	245.0	237.8	173.6	95.8	52.7	74.0	24.5
Pecan	5.7	.2		1.0				1.8	2.3	.4	
Other hickories	1,191.5	135.8	217.7	235.7	219.0	153.5	101.8	52.8	28.9	43.6	2.7
Sweetgum	337.4	30.0	55.4	84.5	68.5	39.9	34.6	18.6	8.2	15.2	2.5
Tupelo and blackgum	196.4	23.9	38.8	35.6	33.8	26.6	13.9	11.1	7.5	5.2	.
Hard maple	200.0	24.6	34.5	35.9	27.5	29.2	17.0	9.0	10.1	11.2	1.0
Soft maple	264.1	50.5	54.4	51.9	43.1	17.6	23.4	10.3	5.9	6.2	.8
Beech	138.5	7.9	17.6	16.2	12.3	15.9	17.3	11.1	12.7	26.3	1.2
Ash	259.0	36.9	41.8	41.5	27.9	29.0	26.0	13.7	19.1	22.7	.4
Cottonwood	54.8	.3	..	..	.	3.2	8.1	3.9	6.0	27.9	5.4
Basswood	52.7	3.4	6.5	7.3	7.7	8.8	4.6	5.7	3.3	5.4	.
Yellow-poplar	724.0	58.3	85.6	107.4	138.8	111.0	102.3	46.8	40.7	29.3	3.8
Black walnut	73.0	8.8	14.8	15.2	16.5	10.2	5.5	1.1	.9	.	.
Black cherry	54.5	9.4	15.9	10.6	9.2	4.7	2.8	1.9	.	.	.
Willow	30.0	1.5	2.3	.4	2.3	..	4.5	12.3	4.3	2.4	.
Magnolia (Magnolia spp.)	26.5	1.9	4.0	4.8	5.9	4.5	1.9	1.1	.5	1.9	.
American elm	105.5	16.3	16.1	21.2	15.8	10.9	5.4	5.8	4.3	5.5	4.2
Other elms	83.7	16.4	13.7	17.9	15.0	9.6	2.9	1.2	4.9	2.1	.
Hackberry	68.2	8.1	13.0	10.8	10.4	9.6	9.4	3.8	2.3	.8	.
Sycamore	73.0	2.9	5.8	11.1	11.2	10.2	8.9	3.5	4.3	14.7	.4
Other hardwoods	294.4	89.4	65.3	39.1	28.8	25.7	15.9	10.4	5.9	12.1	1.8
Total	8,596.0	939.6	1,302.0	1,488.3	1,429.5	1,190.4	884.6	509.8	320.1	465.7	66.0
All species	10,395.8	1,288.6	1,714.1	1,873.0	1,704.8	1,358.7	975.1	562.2	347.7	496.1	75.5

Table 14. Volume of sawtimber on commercial forest land by species and diameter classes, Tennessee, 1971

Species	Diameter class (inches at breast height)								
	All classes	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
----- Millionboard feet -----									
Softwood:									
Shortleaf pine	1,691.5	665.2	501.8	270.4	163.1	72.4	14.6	4.0	
Loblolly pine	280.6	104.2	91.5	41.7	25.0	10.6	3.9	3.7	.
Virginia pine	1,428.6	510.6	498.4	291.3	75.0	36.1	11.6	5.6	.
Pitch pine	217.1	36.7	35.5	59.8	30.0	31.0	22.3	1.8	.
Table-Mountain pine	22.1	4.6	5.6	7.1	4.8	...			.
White pine	622.3	71.7	89.3	106.7	98.0	89.3	50.0	98.2	19.1
Hemlock	211.9	27.7	30.3	43.3	44.1	14.2	25.6	22.2	4.5
Cypress	130.0	1.4	12.7	18.9	14.4	16.4	18.6	22.2	25.4
Redcedar	95.0	43.0	24.1	12.2	10.7	4.5	.5		
Total	4,699.1	1,465.1	1,289.2	851.4	465.1	274.5	147.1	157.7	49.0
Hardwood:									
Select white oaks	3,133.0	.	847.3	845.5	608.1	421.4	147.3	251.0	12.4
Select red oaks	1,781.0	.	315.7	382.7	331.5	200.5	140.1	363.6	46.9
Other white oaks	2,494.0	.	659.9	664.7	477.5	287.3	178.5	198.9	27.2
Other red oaks	3,966.6	.	901.1	1,028.0	796.5	473.2	261.9	390.0	115.9
Pecan	20.8	.	.	.	.	8.7	9.4	2.7	
Other hickories	2,796.4	.	881.9	714.0	516.8	268.4	156.8	244.0	14.5
Sweetgum	839.8	.	255.7	186.6	165.9	93.7	41.5	82.5	13.9
Tupelo and blackgum	410.9	.	119.5	106.8	69.8	54.9	34.7	25.2	
Hard maple	460.4	.	99.5	122.5	78.7	45.1	51.1	57.9	5.6
Soft maple	446.5	.	158.1	73.6	102.2	46.5	28.8	31.9	5.4
Beech	440.9	.	43.7	65.8	81.6	58.5	65.5	118.8	7.0
Ash	624.6	.	103.1	133.6	121.7	68.2	90.1	105.8	2.1
Cottonwood	278.6	.	.	13.5	38.4	20.6	31.7	143.9	30.5
Basswood	164.5	.	29.2	43.0	21.7	27.3	15.7	27.6	
Yellow-poplar	2,112.1	.	528.1	494.9	485.1	228.7	204.4	150.9	20.0
Black walnut	147.4	.	65.0	47.3	24.9	6.1	4.1	.	.
Black cherry	74.6	.	31.6	20.6	13.2	9.2	...	...
Willow	145.3	.	8.3	...	28.0	67.6	28.7	12.7	
Magnolia (<i>Magnolia</i> spp.)	71.3	.	25.6	19.4	8.6	5.6	2.9	9.2	
American elm	240.7	.	60.5	46.6	26.4	31.7	21.7	30.6	23.2
Other elms	162.6	.	60.6	41.4	13.4	6.2	25.7	15.3	.
Hackberry	151.2	.	37.1	39.7	42.2	17.9	11.4	2.9	...
Sycamore	232.4	.	31.7	44.7	40.4	14.3	23.3	75.3	2.7
Other hardwoods	445.5	.	108.9	111.4	75.6	50.9	27.8	61.2	9.7
Total	21,641.1	.	5,372.1	5,246.3	4,168.2	2,512.5	1,603.1	2,401.9	337.0
All species	26,340.2	1,465.1	6,661.3	6,097.7	4,633.3	2,787.0	1,750.2	2,559.6	386.0

Table 15. Volume of sawtimber on commercial forest land *by species and log grade*, Tennessee, 1971

Species	All grades	Grade 1	Grade 2	Grade 3	Grade 4
- - - - - Million board feet - - - - -					
Softwood:					
Yellow pines ¹	3,639.9	371.7	429.3	2,838.9	(²)
Cypress ¹	130.0	37.8	20.5	71.7	(²)
Redcedar ³	95.0	95.0	(²)	(²)	(²)
Other softwoods ⁴	834.2	27.4	113.5	397.5	295.8
Total	4,699.1	531.9	563.3	3,308.1	295.8
Hardwood:					
Select white and red oaks	4,914.0	848.9	1,069.8	2,386.8	608.5
Other white and red oaks	6,460.6	1,044.2	1,251.4	3,289.1	875.9
Hickory	2,817.2	375.0	493.6	1,545.9	402.7
Hard maple	460.4	65.8	75.2	241.8	77.6
Sweetgum	839.8	119.8	164.2	417.6	138.2
Ash, walnut, and black cherry	846.6	182.9	197.6	390.7	75.4
Yellow-poplar	2,112.1	362.6	351.6	965.6	423.3
Other hardwoods	3,190.4	553.1	633.2	1,466.4	537.7
Total	21,641.1	3,552.3	4,236.6	10,703.9	3,148.3
All species	26,340.2	4,084.2	4,799.9	14,012.0	3,444.1

¹Based on Southern Pine Log Grades for Yard and Structural Lumber, Research Paper SE-39, published by the Southeastern Forest Experiment Station in 1968.

²Not applicable.

³All **redcedar** saw logs are graded as No. 1.

⁴Based on Trial Log Grades for Eastern White Pine, prepared by the North-eastern Forest Experiment Station in 1960.

⁵Grades 1-3 are based on Hardwood Log Grades for Standard Lumber, issued by the U. S. Forest Products Laboratory under the designation **D1737A** in 1961. Grade-4 tie and timber log specifications are based chiefly on knot size and log soundness.

Table 16. *Annual growth and removals of growing stock on commercial forest land by species, Tennessee, 1970*

Species	Net annual growth	Annual removals
Million cubic feet		
Softwood:		
Yellow pines	85.1	20.9
White pine	5.3	2.8
Cypress	.7	1.7
Other softwoods	11.8	7.8
Total	102.9	33.2
Hardwood:		
Select white and red oaks	85.7	36.2
Other white and red oaks	124.9	47.9
Hickory	51.1	21.0
Hard maple	9.3	3.3
Sweetgum	13.7	8.5
Tupelo and blackgum	8.3	4.2
Ash, walnut, and black cherry	19.4	10.1
Yellow-poplar	27.8	10.0
Other hardwoods	66.0	42.0
Total	406.2	183.2
All species	509.1	216.4

Table 17. **Annual growth and removals of growing stock on commercial forest land by ownership classes and by softwoods and hardwoods, Tennessee, 1970**

Ownership class	Net annual growth			Annual removals		
	All species	Soft-wood	Hard-wood	All species	Soft-wood	Hard-wood
----- Million cubic feet -----						
National forest	36.7	14.1	22.6	9.5	3.4	6.1
Other public	36.2	11.4	24.8	12.5	1.4	11.1
Forest industry	44.5	9.9	34.6	14.1	1.1	13.0
Farmer and misc. private	391.7	67.5	324.2	180.3	27.3	153.0
All ownerships	509.1	102.9	406.2	216.4	33.2	183.2

Table 18. **Annual growth and removals of sawtimber on commercial forest land by species, Tennessee, 1970**

Species	Net annual growth	Annual removals
Million board feet		
Softwood:		
Yellow pines	267.5	67.4
White pine	24.2	13.5
Cypress	3.1	9.0
Other softwoods	14.2	34.1
Total	309.0	124.0
Hardwood:		
Select white and red oaks	235.6	137.2
Other white and red oaks	342.1	162.9
Hickory	151.6	81.6
Hard maple	23.6	14.5
Sweetgum	38.3	33.0
Tupelo and blackgum	14.7	15.1
Ash, walnut, and black cherry	57.7	37.5
Yellow-poplar	102.7	51.8
Other hardwoods	152.9	162.0
Total	1,119.2	695.6
All species	1,428.2	819.6

Table 19. **Annual growth and removals of sawtimber on commercial forest land by ownership classes and by softwoods and hardwoods, Tennessee, 1970**

Ownership class	Net annual growth			Annual removals		
	All species	Soft-wood	Hard-wood	All species	Soft-Hard-	Hard-wood
----- Million board feet -----						
National forest	111.4	51.9	59.5	47.0	18.6	28.4
Other public	122.5	40.2	82.3	45.7	2.4	43.3
Forest industry	138.1	32.4	105.7	48.8	4.5	44.3
Farmer and misc. private	1,056.2	184.5	871.7	678.1	98.5	579.6
All ownerships	1,428.2	309.0	1,119.2	819.6	124.0	695.6

Table 20. Mortality of growing *stock and* sawtimber on *commercial forest land by species, Tennessee, 1970*

Species	Growing stock	Sawtimber
	<i>Million cubic feet</i>	<i>Million board feet</i>
Softwood:		
Yellow pines	6.5	14.6
White pine	.4	1.5
Cypress	.3	1.5
Other softwoods	.5	1.6
Total	<u>7.7</u>	19.2
Hardwood:		
Select white and red oaks	3.8	9.1
Other white and red oaks	9.2	23.6
Hickory	4.4	7.5
Hard maple	1.8	.9
Sweetgum	2.1	3.8
Tupelo and blackgum	2.2	5.9
Ash, walnut, and black cherry	2.6	3.8
Yellow-poplar	1.4	3.3
Other hardwoods	8.1	17.7
Total	35.6	75.6
All species	43.3	94.8

Table 21. *Mortality of growing stock and sawtimber on commercial forest land by ownership classes and by softwoods and hardwoods, Tennessee, 1970*

Ownership class	Growing stock			Sawtimber		
	All species	Soft-wood	Hard-wood	All species	Soft-wood	Hard-wood
	<i>- Million cubic feet -</i>			<i>- Million board feet -</i>		
National forest	2.7	1.1	1.6	8.7	4.1	4.6
Other public	3.2	.9	2.3	7.9	2.6	5.3
Forest industry	3.8	.7	3.1	7.6	1.5	6.1
Farmer and misc. private	33.6	<u>5.0</u>	<u>28.6</u>	70.6	<u>11.0</u>	<u>59.6</u>
All ownerships	43.3	7.7	35.6	94.8	19.2	75.6

Table 22. *Mortality of growing stock and sawtimber on commercial forest land by causes and by softwoods and hardwoods, Tennessee, 1970*

Cause of death	Growing stock			Sawtimber		
	All species	Soft-wood	Hard-wood	All species	Soft-wood	Hard-wood
	<i>- Million cubic feet -</i>			<i>- Million board feet -</i>		
Fire	2.1	0.3	1.8	4.7	1.0	3.7
Insects	.4	.4	.	1.7	1.7	.
Disease	.6	.1	.5	.5	..	.5
Other	5.2	1.4	3.8	17.7	4.8	12.9
Unknown	35.0	<u>5.5</u>	<u>29.5</u>	70.2	<u>11.7</u>	<u>58.5</u>
All causes	43.3	7.7	35.6	94.8	19.2	75.6

Table 23. Total output of **timber** products by **product, by type of material used, and** by softwoods and hardwoods, Tennessee, 1970

Product and species group	Standard units	Total output		Roundwood products		Plant byproducts	
		Number	M cu. ft.	Number	M cu. ft.	Number	M cu. ft.
Saw logs:							
Softwood	M bd. ft. ¹	69,218	11,386	69,218	11,386		
Hardwood	M bd. ft. ¹	464,823	77,486	464,823	77,486		
Total	M bd. ft. ¹	<u>534,041</u>	<u>88,872</u>	<u>534,041</u>	<u>88,872</u>		
Veneer logs and bolts:							
Softwood	M bd. ft.	70	12	70	12		
Hardwood	M bd. ft.	6,941	1,165	6,941	1,165		
Total	M bd. ft.	<u>7,011</u>	<u>1,177</u>	<u>7,011</u>	<u>1,177</u>	1,177	1,177
Pulpwood:							
Softwood	Std. cords ²	202,245	16,378	190,105	15,398	12,140	980
Hardwood	Std. cords ²	365,099	29,211	246,836	19,747	118,263	9,464
Total	Std. cords ²	<u>567,344</u>	<u>45,589</u>	<u>436,941</u>	<u>35,145</u>	<u>130,403</u>	<u>10,444</u>
Cooperage:							
Softwood	M bd. ft.	112	18	112	18		
Hardwood	M bd. ft.	10,773	1,551	10,773	1,551		
Total	M bd. ft.	<u>10,885</u>	<u>1,569</u>	<u>10,885</u>	<u>1,569</u>		
Piling:							
Softwood	M linear ft.	6	4	6	4		
Hardwood	M linear ft.						
Total	M linear ft.	<u>6</u>	<u>4</u>	<u>6</u>	<u>4</u>		
Poles:							
Softwood	M pieces	71	317	71	317		
Hardwood	M pieces						
Total	M pieces	<u>71</u>	<u>317</u>	<u>71</u>	<u>317</u>		
Mine timbers (round) :							
Softwood	M cu. ft.						
Hardwood	M cu. ft.	94	94	94	94		
Total	M cu. ft.	<u>94</u>	<u>94</u>	<u>94</u>	<u>94</u>		
Commercial posts (round and split) :							
Softwood	M pieces	762	502	762	502		
Hardwood	M pieces	2	1	2	1		
Total	M pieces	<u>764</u>	<u>503</u>	<u>764</u>	<u>503</u>		
Other:³							
Softwood	M cu. ft.	690	690	267	267	423	423
Hardwood	M cu. ft.	14,541	14,541	9,530	9,530	5,011	5,011
Total	M cu. ft.	<u>15,231</u>	<u>15,231</u>	<u>9,797</u>	<u>9,797</u>	<u>5,434</u>	<u>5,434</u>
Total industrial products:							
Softwood					27,904		1,403
Hardwood					109,574		14,475
Total					<u>137,478</u>		<u>15,878</u>
Noncommercial posts (round and split) :							
Softwood	M pieces	987	651	987	651		
Hardwood	M pieces	3,671	2,416	3,671	2,416		
Total	M pieces	<u>4,658</u>	<u>3,067</u>	<u>4,658</u>	<u>3,067</u>		
Fuelwood:							
Softwood	Std. cords	44,832	3,379	2,538	190	⁴ 42,294	⁴ 3,189
Hardwood	Std. cords	384,370	28,828	274,770	20,608	⁴ 109,600	⁴ 8,220
Total	Std. cords	<u>429,202</u>	<u>32,207</u>	<u>277,308</u>	<u>20,798</u>	<u>⁴ 151,894</u>	<u>⁴ 11,409</u>
All products:							
Softwood						28,745	4,592
Hardwood						132,598	22,695
Total						<u>161,343</u>	<u>27,287</u>

¹ International 3/4 -inch rule.

² Rough wood basis (for example, chips converted to equivalent standard cords).

³ Includes chemical wood, handle stock, miscellaneous dimension, miscellaneous domestic use, and other minor industrial products. Additionally, byproducts include material used for livestock bedding, mulch, etc.

⁴ Includes plant byproducts used for industrial and domestic fuel.

Table 24. **Output of roundwood** products by **source and by softwoods and** hardwoods, Tennessee, 1970

Product and species group	All sources	Growing-stock trees ¹			Rough and rotten trees	Salvable dead trees ²	Other sources ²
		Total	Saw-timber	Pole-timber			
----- Thousand cubic feet -----							
Industrial products:							
Saw logs:							
Softwood	11,386	11,310	11,268	42	14		62
Hardwood	77,486	74,604	74,511	93	1,023	1,812	47
Total	88,872	85,914	85,779	135	1,037	1,812	109
Veneer logs and bolts:							
Softwood	12	12	12				
Hardwood	1,165	1,145	1,145		15		5
Total	1,177	1,157	1,157		15		5
Pulpwood:							
Softwood	15,398	14,663	10,109	4,554	102		633
Hardwood	19,747	15,863	8,909	6,954	2,995	51	838
Total	35,145	30,526	19,018	11,508	3,097	51	1,471
Misc. industrial products:							
Cooperage:							
Softwood	18	18	17	1			
Hardwood	1,551	1,530	1,530		11		10
Total	1,569	1,548	1,547	1	11		10
Piling:							
Softwood	4	4	4				
Hardwood							
Total	4	4	4				
Poles:							
Softwood	317	315	279	36			2
Hardwood							
Total	317	315	279	36			2
Mine timbers (round) :							
Softwood	94	94		94			
Hardwood							
Total	94	94		94			
Commercial posts (round and split):							
Softwood	502	457		457			45
Hardwood	1	1		1			
Total	503	458		458			45
Other:							
Softwood	267	246	94	152			21
Hardwood	9,530	9,008	6,057	2,951	177	79	266
Total	9,797	9,254	6,151	3,103	177	79	287
All misc. industrial products:							
Softwood	1,108	1,040	394	646			68
Hardwood	11,176	10,633	7,587	3,046	188	79	276
Total	12,284	11,673	7,981	3,692	188	79	344
All industrial products:							
Softwood	27,904	27,025	21,783	5,242	116		763
Hardwood	109,574	102,245	92,152	10,093	4,221	1,942	1,166
Total	137,478	129,270	113,935	15,335	4,337	1,942	1,929
Noncommercial posts (round and split):							
Softwood	651	588	320	268	28		35
Hardwood	2,416	2,180	635	1,545	105		131
Total	3,067	2,768	955	1,813	133		166
Fuelwood:							
Softwood	190	131	70	61	6	13	40
Hardwood	20,608	14,220	6,467	7,753	596	1,388	4,404
Total	20,798	14,351	6,537	7,814	602	1,401	4,444
All products:							
Softwood	28,145	27,144	22,173	5,571	150	13	838
Hardwood	132,598	118,645	99,254	19,391	4,922	3,330	5,701
Total	161,343	146,389	121,427	24,962	5,072	3,343	6,539

¹ On commercial forest land.² Includes noncommercial forest land, nonforest land such as fence rows, trees less than 5.0 inches in diameter, and treetops and limbs.

Table 25. **Timber removals from growing stock on commercial forest land by items and by softwoods and hardwoods, Tennessee, 1970**

Item	All species	Soft-wood	Hard-wood
-- Thousand cubic feet --			
Roundwood products:			
Saw logs	85,914	11,310	74,604
Veneer logs and bolts	1,157	12	1,145
Pulpwood	30,526	14,663	15,863
Cooperage logs and bolts	1,548	18	1,530
Piling	4	4	
Poles	315	315	
Mine timbers	94		94
Posts	3,226	1,045	2,181
Other	9,254	246	9,008
Fuelwood	14,351	131	14,220
All products	146,389	27,744	118,645
Logging residues	37,923	1,958	35,965
Other removals	31,997	3,450	28,547
Total removals	216,309	33,152	183,157

Table 26. Timber removals from live sawtimber on commercial forest land by items and by softwoods and hardwoods, Tennessee, 1970

Item	All species	Soft-wood	Hard-wood
-- Thousand board feet			
Roundwood products:			
Saw logs	504,988	68,380	436,608
Veneer logs and bolts	6,803	69	6,734
Pulpwood	74,710	40,191	34,519
Cooperage logs and bolts	10,393	98	10,295
Piling	26	26	
Poles	1,609	1,609	
Mine timbers			
Posts	3,730	1,269	2,461
Other	34,327	423	33,904
Fuelwood	31,919	348	31,571
All products	668,505	112,413	556,092
Logging residues	81,096	3,293	77,803
Other removals	69,997	8,306	61,691
Total removals	819,598	124,012	695,586

Table 27. Volume of plant residues **by** industrial source and **type of** residue and **by softwoods and** hardwoods, Tennessee, 1970

Species group and type	All industries	Lumber	Veneer and plywood	Other
----- Thousand cubic feet -----				
Softwood:				
Coarse ¹	1,463	1,454	5	4
Fine ²	1,559	1,502		57
Total	3,022	2,956	5	61
Hardwood:				
Coarse	6,097	5,647	115	335
Fine	14,166	13,093	11	1,062
Total	20,263	18,740	126	1,397
All species:				
Coarse	7,560	7,101	120	339
Fine	15,725	14,595	11	1,119
All types	23,285	21,696	131	1,458

¹ Unused material suitable for chipping, such as slabs, edgings, and veneer cores.

² Unused material not suitable for chipping, such as sawdust and shavings.

Table 28. Projections of net annual growth, available cut, and inventory of growing stock and **sawtimber** on commercial **forest** land, Tennessee, 1970-2000 ¹

Species group	Growing stock				Sawtimber			
	1970	1980	1990	2000	1970	1980	1990	2000
	_ - - - - Thousand cubic feet - - - - -				- - - - - Thousand board feet - - - - -			
Softwood:								
cut	33,200	94,900	120,400	135,300	124,000	301,000	380,000	430,000
Growth	102,900	124,100	134,100	135,300	309,000	384,000	421,000	430,000
Inventory ²	1,799,800	2,161,200	2,367,500	2,420,000	4,699,100	5,739,000	6,332,000	6,518,000
Hardwood:								
cut	183,200	404,900	493,300	555,800	695,600	1,270,000	1,420,000	1,456,000
Growth	406,200	478,000	531,800	555,800	1,119,200	1,237,000	1,282,000	1,300,000
Inventory ²	8,596,000	9,425,600	9,966,100	10,159,800	21,641,100	22,304,000	21,303,000	19,777,000
Total:								
cut	216,400	499,800	613,700	691,100	819,600	1,571,000	1,800,000	1,886,000
Growth	509,100	602,100	665,900	691,100	1,428,200	1,621,000	1,703,000	1,730,000
Inventory ²	10,395,800	11,586,800	12,333,600	12,579,800	26,340,200	28,043,000	27,635,000	26,295,000

¹ Based on the assumption that the cut of the growing stock will be in balance with growth by the year 2000, and that forestry progress will continue at the rate indicated by recent trends.

² Inventory as of January 1 of the following year.

