



The Timber Resource In Maryland

Northeastern
Forest Experiment Station

Upper Darby, Pennsylvania
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ACKNOWLEDGMENTS

The Maryland Department of Forests and Parks, Department of Research and Education, and Game and Inland Fish Commission cooperated with the U. S. ~~Forest~~ Service in the forest survey of Maryland. These State agencies provided the aerial photographs used in the survey, provided personnel, and helped in many phases of the field work. The help they gave is gratefully acknowledged.

PREFACE

This is a report on the findings of the forest survey made in Maryland as part of the nationwide forest survey that is being carried on by the Forest Service, U. S. Department of Agriculture. It shows the area and condition of the forest land, the volume and quality of the standing timber, the rates of timber growth and mortality, and the extent of timber cutting for forest products. The field work for ~~this~~ survey was done in 1950-52.

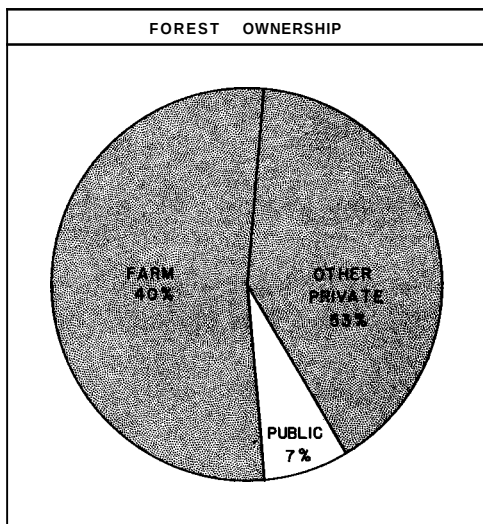
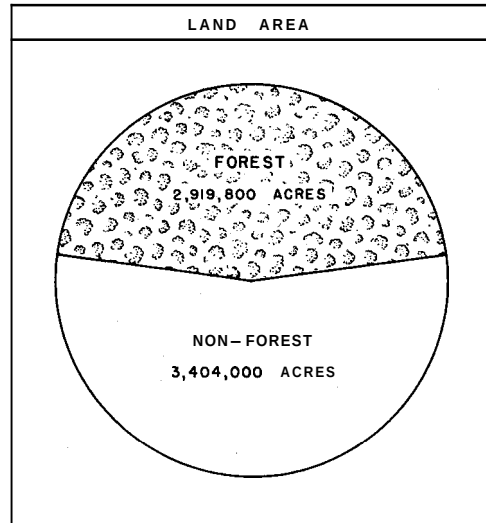
A survey of Maryland' forests was carried out by former State Forester F. W. Besley more than 40 years ago. Since then, several other ~~estimates~~ of forest acreage and timber volume have been made. Because of changes in definitions, standards, and procedures, changes in forest conditions cannot be gaged by comparing the data in this report with the earlier estimates.

THE HIGHLIGHTS

Forests occupy nearly half of the land area of Maryland.

All of the forest area except 22,800 acres is commercial forest land.

About 60 percent of the forest area lies in the Coastal Plain.



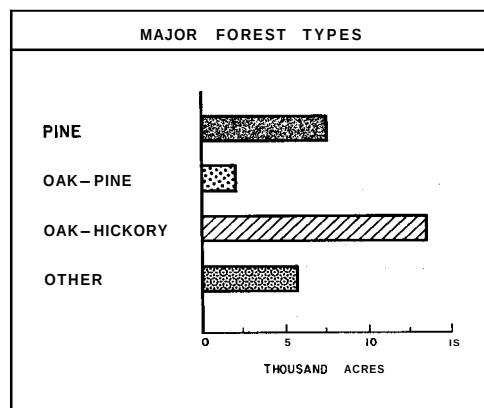
Private owners hold 93 percent of the commercial forest land.

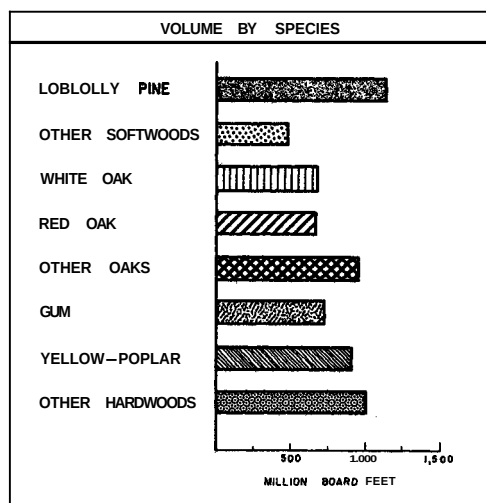
State, municipal, and Federal holdings make up the other 7 percent.

Private forest owners number 25,000 farmers and 10,000 other individuals and firms.

Forests in which softwood trees predominate occupy a fourth of the commercial forest land.

Hardwood forest types account for the rest; one of these alone, oak-hickory, occupies nearly half of the commercial forest area.





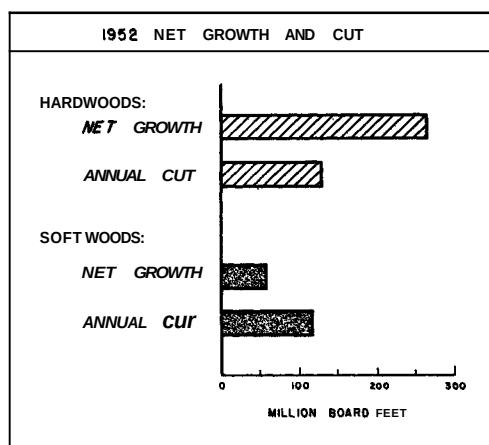
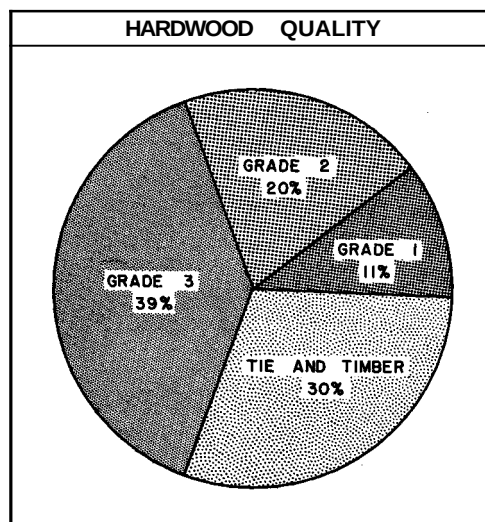
The forest growing stock amounts to 2.8 billion cubic feet of sound wood including 6.6 billion board feet of sawtimber.

Nearly three fourths of the sawtimber is hardwood.

One fourth is softwood, chiefly loblolly pine.

Because the trees are small or defective, much of the hardwood sawtimber is of low quality.

Softwood quality is poor too: 61 percent is in Grade 3 sawlog material, 29 percent in Grade 2, and only 10 percent in Grade 1.



The net growth of forest growing stock was about 117 million cubic feet in 1952.

Only 64 million cubic feet was cut. However, the softwood sawtimber growth was only half as much as the softwood cut.

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The Timber Resource In Maryland

... a report prepared by the

FOREST ECONOMICS STAFF

*Northeastern Forest Experiment Station
Forest Service, U.S. Dept. Agriculture*

I N T R O D U C T I O N

MARYLAND IS A densely populated state; and it has a highly diversified economy. Most of the 2½ million people who live in Maryland make their livings in the trade and service industries and in manufacturing. Yet Maryland's economy requires a continuing flow of the materials that come from natural resources. One of the most intensively used natural resources in Maryland is timber.

Forests For Water, Recreation, And Wildlife

Even though timber use is the subject of this report, other forest uses are frequently more important to most Marylanders. For example, forested watersheds provide water supplies for municipal and industrial use; and they minimize floods and prevent soil erosion.

More apparent to most people is the value of forests for hunting, fishing, and other kinds of recreation. In the fiscal year ended June 30, 1954, a total of 2,390,085

persons visited the state parks and forests in Maryland. In that same period 146,810 hunting licenses and 118,220 fishing licenses were sold.'

The wildlife resource depends on the kind and abundance of food and cover that are provided by the tree species and ground cover associated with the different forest types. The fruit- or mast-producing trees such as the oaks, pines, hickory, beech, cherry, dogwood, hackberry, and gum are important as sources of fall and winter food for deer, squirrels, and other wildlife. Ruffed grouse and wild turkey are found in the mixed hardwood and hardwood-conifer forests in the four westernmost counties of Maryland. Raccoons seem to prefer the older second-growth mixed hardwood stands where there are old wolf trees that provide dens for them. Beaver are attracted to aspen stands adjacent to small mountain streams in the two westernmost counties.

Income Due To Timber Use

Forest owners and loggers in recent years have received more than \$10,000,000 annually for sawlogs, pulpwood, and other raw materials harvested from Maryland forests. Some of these round products--including logs and bolts, piling, and mine timbers--are shipped to other states; but a much greater volume of rough wood products is imported from other states and countries.

Lumber, millwork, furniture, and paper--at wholesale worth more than \$60,000,000--come from the forest-supported industries of Maryland. A large part of this income goes to pay the wages of employees in these industries--numbering about 7 percent of all manufacturing employees in the State.

Other manufacturing and construction also depend upon forest products. And economic activity in the timber-based industries gives rise to many other activities such as transportation and trade.

USE OF THE TIMBER RESOURCE

Use of the timber resource has helped to raise Maryland living standards for more than 300 years. While the relative importance of timber use has declined during the past half-century at least, the forest industries have been expanding, though at a slower pace than the economy as a

¹Maryland Department of Forests and Parks.

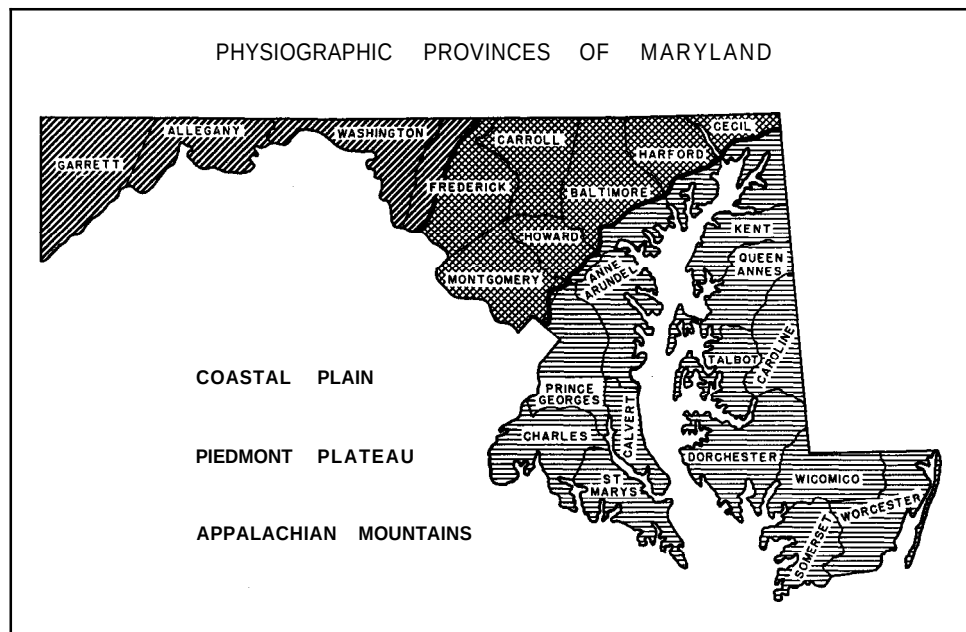


Figure 1.--The physiographic provinces of Maryland.

whole. The first reliable estimate of timber-products output, made for 1914 by the Maryland State Board of Forestry, amounted to 47 million cubic feet of industrial wood; that is, all timber products except fuelwood cut for home use.² In 1952, 53 million cubic feet of industrial timber products were produced. Use of wood for fuel has declined greatly; in 1952 only 16 million cubic feet were used.

Sawlogs are still the major timber product, accounting for more than **half** of the total output today (fig. 2). **Fuelwood** production, including **fuelwood** cut for home use, represents nearly one-quarter of the total. Pulpwood output, having tripled since 1914, now amounts to more than one-tenth of timber-products output. Mine timbers, piling, veneer logs, fence posts, and cooperage bolts are other important products cut in Maryland.

The Lumber Industry

There are some 600 sawmills in Maryland, scattered generally throughout the State (fig. 3). About one-fourth of them do only custom sawing. Many of the others are small

²Besley, F. W. The forests of Maryland. EM. State Bd. Forestry. 152 pp. Baltimore. 1916.

and portable. Some are idle for long periods; others move so frequently that it is difficult to keep track of them.

In 1952 sawmills producing more than a half a million board feet of lumber annually numbered 113. Only 47 mills sawed a million board feet or more. The larger mills are concentrated in the pine areas of the Coastal Plain--most of them on the Eastern Shore.

For the last 40 years annual lumber production in Maryland has seldom exceeded 200 million board feet. In 1914 it amounted to 229 million board feet,³ but in subsequent years, production often has been less than 100 million feet.⁴ Since the middle 30's output of lumber has been slowly rising; and in 1952, for the first time in several decades, more than 200 million board feet were sawed.

³Besley report. See footnote 2.

⁴Steer, Henry B. Lumber production in the United States, 1799-1946. U. S. Dept. Agr. Misc. Pub. 669. 233 pp. 1948.

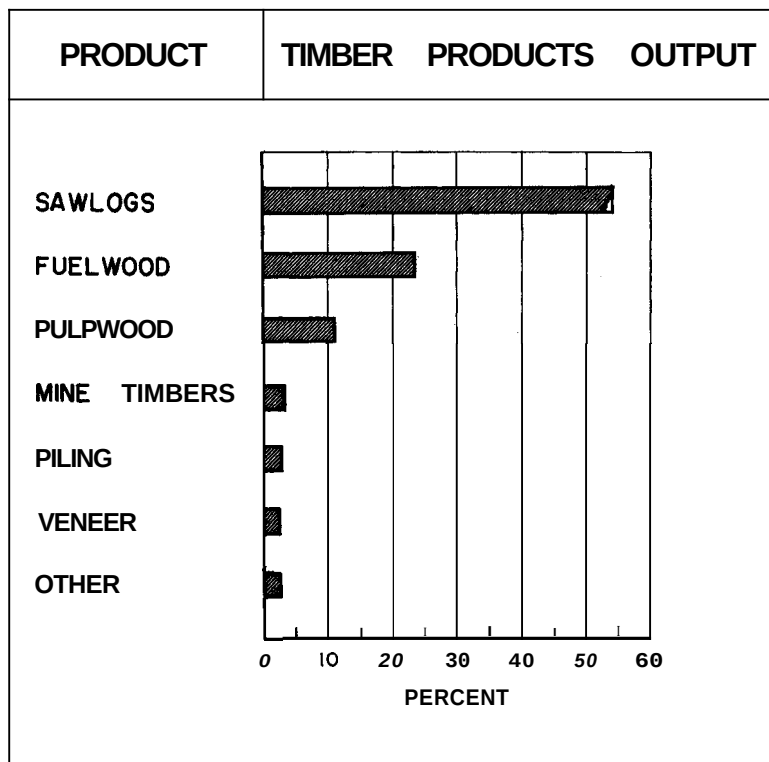


Figure 2.--Maryland forests produce a variety of timber products. Sawlogs are still the major product.

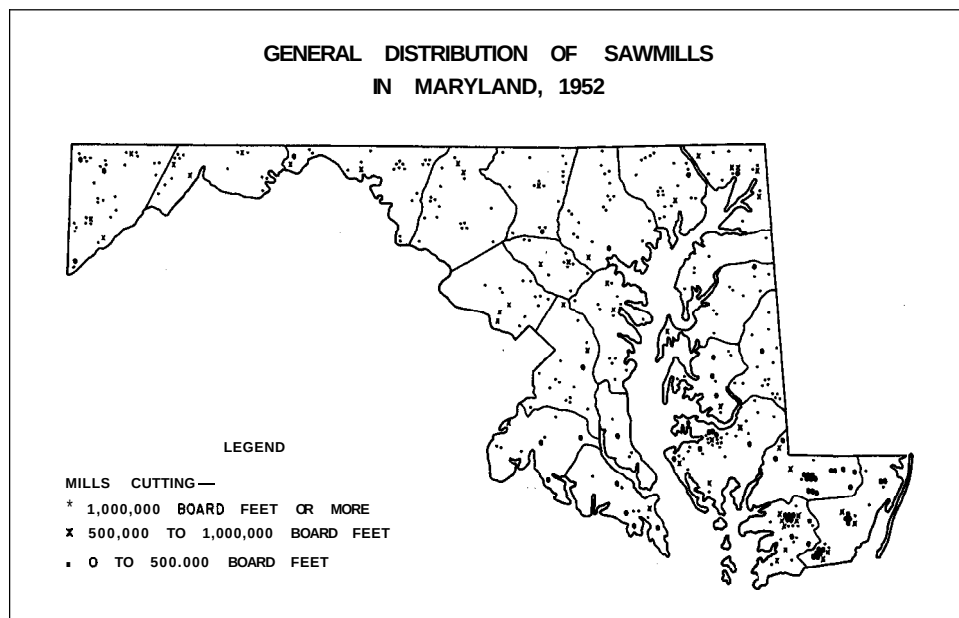


Figure 3.--Maryland is well served by sawmills. Most of the large mills are in Eastern Shore pine areas.

One significant aspect of this long-term cycle is the changing ratio of hardwood production to softwood production. In 1914, nearly 60 percent of the lumber cut was hardwood; by 1952, the hardwood component was only 48 percent.

The Veneer Industry

In 1952, eight plants produced veneer in Maryland (fig. 4). They consumed more than 8 million board feet of logs, but less than half of these logs were cut from Maryland timber. While this industry does not make heavy demands on the local forests, it does require the best raw material from species such as yellow-poplar, the oaks, walnut, cherry, gum, and maple. Much of the veneer produced in Maryland is manufactured from mahogany logs imported from Africa. About two-thirds of the 10 million board feet of veneer logs cut in Maryland in 1952 were shipped to New Jersey and other states.

The Pulpwood Industry

An estimated 92,000 standard cords of pulpwood were harvested from Maryland's forests in 1952. The two pulp mills in the State used a small part of this local production, but most of the pulpwood, chiefly pine, went to out-

of-state mills--in Virginia and Pennsylvania. On the other hand, some out-of-state pulpwood, chiefly hardwood, is imported for pulping in Maryland.

Other Primary Products

More than one-fourth of the 1952 timber-products output was used in the round without further manufacturing. First among these round products is fuelwood, which is still widely used in rural areas. The 1952 harvest was 200,300 cords. Before modern transportation made possible the extensive use of other fuels, the annual cut of fuelwood must have been far greater than it is today.

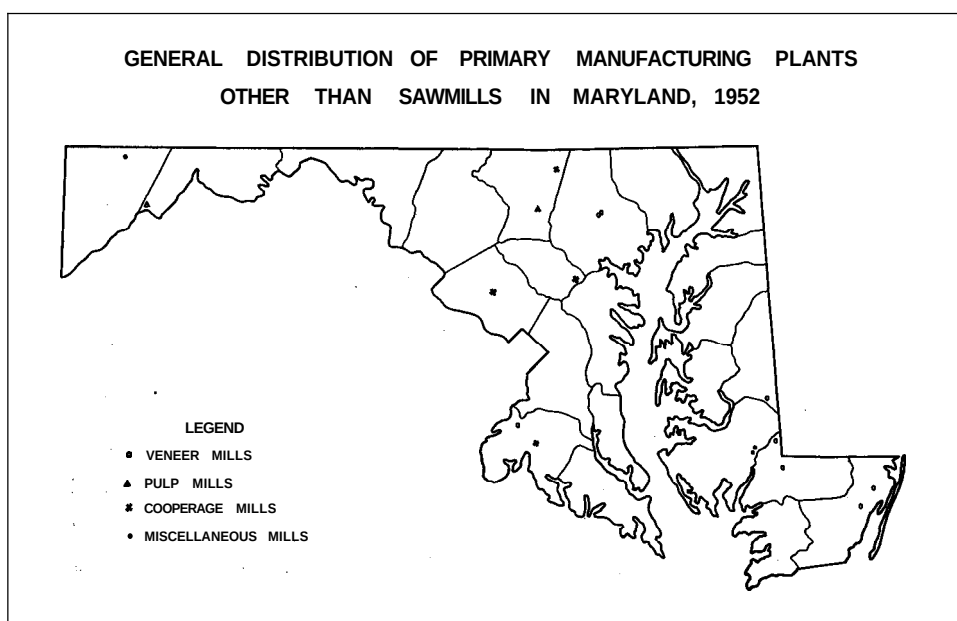


Figure 4.--A small number of veneer mills, pulp mills, and cooperage plants also operate in Maryland.

More than 3 million linear feet of wood piling was produced in 1952.⁵ Southern pine piling, largely loblolly pine, accounted for four-fifths of the total production. Oaks and other species made up the remainder.

⁵Ostrander, Myron D. Production and marketing of wood piling and poles. U.S. Forest Serv. Northeast. Forest Expt. Sta., Sta. Paper-57. 23 pp. 1953.

Maryland is also one of the larger producers of a variety of woodpoles. About 3,000 utility poles were cut in 1952, all loblolly pine. Fish-net poles and furnace poles are cut for relatively small but locally important markets. Highway and fence posts and round mine timbers are also produced.

Minor amounts of other primary products were logged in 1952 for use in other industries. These included cooperage logs and bolts, excelsior wood, and shoe-last and bowling-pin material.

The Annual Cut Of Growing Stock

The 1952 output of all of these industries totalled 69 million cubic feet of timber products and required a cut of 64 million cubic feet of growing stock⁶ (table 1). About 11 million cubic feet of timber products--mostly fuelwood--were obtained from cull trees, dead trees, and hardwood limbs. On the other hand, some 6 million cubic feet of growing stock were cut but left in the woods and not made into timber products at all. This logging residue consisted chiefly of upper stems and high stumps.

In terms of sawtimber, the 1952 annual cut amounted to 249 million board feet. Nearly three-fourths of the sawtimber cut resulted from sawlog production, but sizable volumes also were made into fuelwood and pulpwood.

THE SUPPLY OF STANDING TIMBER

In contrast to the 1952 cut of 64 million cubic feet of growing stock, the net growth in 1952 was 117 million cubic feet (table 2). Thus the cut was only 55 percent of growth. The volume of sawtimber also increased during 1952. Some 249 million board feet were cut; 324 million feet were grown. Average annual losses due to fire, windthrow, insect and disease damage, and suppression have been deducted to obtain these net growth estimates (table 3). Ingrowth of trees to pole timber and sawtimber size has been included.

Softwoods Are Over-Cut

Although the comparison of total annual cut and net growth is a favorable one, the softwoods are over-cut. The 1952 cut of pines and other conifers 5.0 inches in diameter

⁶See Appendix for definitions.

Table 1.--Output of timber products and annual cut of live sawtimber and growing stock, Maryland, 1952

Product	Output of timber products					Annual cut of sawtimber				Annual cut of growing stock		
	Units	Number	Volume in standard units				Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods
			Thousand cu.ft.	Thousand cu.ft.	Thousand cu.ft.	Thousand cu.ft.						
Sawlogs	1,000 board feet	205,495	37,712	22,324	15,388	182,717	94,474	88,243	41,423	23,696	17,727	
Veneer logs & bolts	"	9,873	1,593	11	1,582	10,124	81	10,043	1,917	14	1,903	
Cooperage logs & bolts	"	2,634	432	0	432	2,803	0	2,803	534	0	534	
Pulpwood	Standard cords ^{2/}	3/91,700	7,336	5,963	1,373	13,717	11,276	2,441	6,541	5,258	1,283	
Fuelwood	"	4/200,650	16,052	2,566	13,486	23,692	4,417	19,275	8,611	1,598	7,013	
Piling	1,000 linear feet	3,150	1,993	1,645	348	9,932	8,171	1,761	2,184	1,784	400	
Poles	1,000 pieces	3	37	37	0	180	180	0	41	41	0	
Posts	"	1,041	890	29	861	1,452	5	1,447	801	17	784	
Mine timbers	1,000 cubic feet	2,258	2,258	15	2,243	2,999	14	2,985	1,602	14	1,588	
Miscellaneous ^{5/}	"	6/536	536	320	216	1,447	698	749	505	322	183	
Total	--	--	68,839	32,910	35,929	249,063	119,316	129,747	64,159	32,744	31,415	

^{1/} International $\frac{1}{4}$ -inch rule.^{2/} Rough wood basis.^{3/} No mill residues used for pulp or hardboards.^{4/} Does not include 6,263,000 cubic feet of wood from mill residues used for domestic and industrial fuel.^{5/} Includes chemical wood, excelsior bolts, handle stock, **farm** timbers, etc.^{6/} No mill residues used for miscellaneous products.

Table 2.—Net annual growth, annual mortality, and annual cut of live sawtimber and growing stock on commercial forest land, by species group, Maryland, 1952

Item	Sawtimber			Growing stock		
	Softwoods	Hardwoods	Total	Softwoods	Hardwoods	Total
	<u>Million bd. ft.</u>	<u>Million bd. ft.</u>	<u>Million bd. ft.</u>	<u>Million cu. ft.</u>	<u>Million cu. ft.</u>	<u>Million cu. ft.</u>
Net annual growth	59.1 59	144.8 265	204.0 324	20.4 24	93	117 93.7
Annual mortality	4.8 10	16.2 11	21.0 21	3.8 9	10 7	13.8 16
Annual cut:						
Timber products	115	121	236	31	27	58
Logging residues	4	9	13	2	4	6
Total	119 93.3	130 3	249 214.4	33	31 51.3	64 79.4

Table 3.—Components of net annual growth of growing stock on commercial forest land by species group, Maryland, 1952

Item		Softwoods	Hardwoods	All species
		<u>Thousand cu. ft.</u>	<u>Thousand cu. ft.</u>	<u>Thousand cu. ft.</u>
57	37	14 23,200	42 81,200	57 104,400
72	29	10 10,400	41 18,600	51 29,000
129		33,600	99,800	133,400
13	6.7	4 9,100	10 6,900	14 16,000
116	59	24,500	92,900	117,400

and larger was one-third more than net growth. On the other hand, the hardwood timber cut was only one-third as much as net growth (table 4).

In terms of sawtimber, the cut of softwoods was double the annual growth. The total cut of sawtimber is less than the total net growth simply because the hardwood sawtimber growth is twice the annual cut (table 5).

The forests of Maryland are growing at an average rate of 110 board feet per acre per year. Of this, about 90 board feet is hardwood growth and 20 is softwood. At the

1952 rate of cutting, about 85 board feet per acre are harvested annually; but whereas only 45 board feet per acre are cut from hardwood trees, 40 feet are cut from softwood. In general, hardwood trees are gradually taking over the forest land, replacing the heavily cut softwoods.

Table 4.--Annual cut and net annual growth of growing stock on commercial forest land, by tree-size class and species group, Maryland, 1952

Tree-size class and species group	Annual cut	Net growth
	<u>Thousand</u> <u>cu.ft.</u>	<u>Thousand</u> <u>cu.ft.</u>
Sawtimber trees:		
Softwoods	27,800	18,200
Hardwoods	25,900	64,700
	53,700	82,900
Poletimber trees:		
Softwoods	5,000	6,300
Hardwoods	5,500	28,200
	10,500	34,500
Sawtimber & poletimber trees:		
Softwoods	32,800	24,500
Hardwoods	31,400	92,900
Total¹	64,200	117,400

¹The annual cut of growing stock is equivalent to about 410,000 rough standard cords of softwoods and about 392,500 rough standard cords of hardwoods; growth on growing stock is equivalent to 306,200 cords of softwoods and 1,161,200 cords of hardwoods.

Table 5.--Annual cut and net annual growth of live sawtimber on commercial forest land, by species group, Maryland, 1952

Species group	Annual cut	Net growth
	<u>Thousand</u> <u>bd.ft.</u>	<u>Thousand</u> <u>bd.ft.</u>
Softwoods	119,300	58,800
Hardwoods	129,800	265,300
Total	249,100	324,100

Table 6.--Net volume of all timber on commercial forest land
by class of material and species group, Maryland. 1950

Class of material	Total	Softwoods	Hardwoods
	<u>Million</u> <u>cu. ft.</u>	<u>Million</u> <u>cu. ft.</u>	<u>Million</u> <u>cu. ft.</u>
<u>Growing stock</u>			
Sawtimber trees:			
Sawlog portion	1,286	379	907
Upper stem portion	397	95	302
Total	1,683	474	1,209
Poletimber trees	1,110	341	769
Total growing stock	2,793	815	1,978
<u>Other material:</u>			
Sound cull trees	144	16	128
Rotten cull trees	79	1	78
Hardwood limbs	186	--	186
Salvable dead trees ¹	8	--	8
Total other material	417	17	400
Total, all timber	3,210	832	2,378

¹Includes only chestnut trees of sawtimber size.

Forest Growing Stock

Although the commercial forest land carries 3.2 billion cubic feet of sound wood, not all of this volume is classified as growing stock. Some 0.4 billion cubic feet of sound wood--in cull trees, hardwood limbs, and salvable dead chestnut trees--are not counted as growing stock. The growing stock--made up of sound wood in the main stems of sawtimber and poletimber trees, from a 1-foot stump to a 4-inch top--measured 2.8 billion cubic feet⁷ in 1950 (table 6). Because of surplus hardwood growth, it increased to 2.9 billion cubic feet by 1952.

Almost all of the wood requirements of the timber-based industries are supplied from the growing stock, and fuelwood is the only major timber product derived chiefly from other material such as cull trees and sawmill residues.

It is impossible to specify how growing stock will be used by any particular industry. For example, the sawlog

⁷In earlier reports on the forest survey of Maryland, 'net volume' was defined as 'gross wood volume less deductions for rot or defect.' In this report net volume in cubic feet excludes only rot. The difference is 12 percent of the previous estimate.

portion of a sawtimber tree may be harvested, not for sawlogs, but for veneer logs, pulpwood, piling, or some other product. A poletimber tree may be logged for pulpwood, posts, fuelwood, or even sawlogs. Some growing stock material remains in the woods as a logging residue after the tree is cut.

Sawtimber Volume

The sawlog portions of sawtimber trees, amounting to 1.3 billion cubic feet of sound wood, account for less than half of the growing stock. Measured according to the International 1/4-inch log rule, which approximates lumber tally, this material includes about 6.6 billion board feet.

Hardwood trees account for three-fourths of this sawtimber volume (table 7). The remainder is softwood, mostly loblolly pine. More than one-third of all the sawtimber is

Table 7.--Net volume of live sawtimber and growing stock
on commercial forest land by species
Maryland, 1950

Species	Sawtimber ¹	Growing stock
	<u>Million</u> <u>bd.ft.</u>	<u>Million</u> <u>cu.ft.</u>
Softwoods:		
Loblolly pine ²	1,141	484
Virginia pine	281	259
Pitch pine	85	37
Other softwoods	116	35
Total	1,623	815
Hardwoods:		
White oak ³	678	254
Red oaks ⁴	672	247
Chestnut oak	267	135
Other white oaks	86	41
Other red oaks	605	221
Soft maples	254	154
Beech	196	62
Sweet gum	578	222
Black gum	159	63
Hickory	214	93
Yellow-poplar	911	264
Other hardwoods	345	222
Total	4,965	1,978
All species	6,588	2,793

¹Log scale, International 1/4-inch rule.

²Includes small quantity of shortleaf pine.

³*Quercus alba* only.

⁴*Quercus rubra* and *Q. falcata*.

Table 8.--Net volume of sawtimber and growing stock on commercial forest land by stand-size class and species group, Maryland. 1950

Stand-size class and species group	Saw- timber	Growing stock
	<u>Million bd.ft.</u>	<u>Million cu.ft.</u>
<u>Sawtimber stands</u>		
More than 5,000 board feet per acre:		
Softwoods	809	239
Hardwoods	2,618	733
Total	3,427	972
1,500 to 5,000 board feet per acre:		
Softwoods	677	327
Hardwoods	1,930	800
Total	2,607	1,127
<u>Poletimber stands</u>		
Softwoods	122	236
Hardwoods	388	411
Total	510	647
<u>Seedling-and-sapling stands</u>		
Softwoods	15	13
Hardwoods	28	33
Total	43	46
<u>Nonstocked and other areas not elsewhere classified</u>		
Softwoods	(*)	(*)
Hardwoods	1	1
Total	1	1
<u>All stands</u>		
Softwoods	1,623	815
Hardwoods	4,965	1,978
Total	6,588	2,793

*Less than 500,000 feet.

oak. Sizable volumes of yellow-poplar, sweetgum, soft maple, and hickory are also to be found.

To the lumberman, the sawtimber volume is not quite as large as the figures seem to indicate. More than 90 per-cent of the sawtimber cut comes from five species: loblolly pine, yellow-poplar, red oak, white oak, and sweetgum. Other species are little used at present. Loblolly pine alone supplies half the sawlog cut. Yellow-poplar and sweetgum are the principal native species used by the veneer industry.

Piling is harvested almost entirely from loblolly and Virginia pine. White oak is the mainstay of the cooperage industry. Hence, of the total sawtimber volume of 6.6 billion board feet, about 4 billion are in species currently preferred by the lumber industry. Much smaller volumes are in the species chiefly used by the veneer and cooperage industries.

In addition to species, volume per acre (or stand size) is also an important factor determining timber availability. For example, on the Eastern Shore, where pine sawlogs are commonly harvested from light sawtimber stands, most of the sawtimber is "merchantable"; and most of it is found in stands of 1,500 or more board feet per acre (table 8). But the hardwood lumber producers in central and western Maryland usually depend on medium or heavy sawtimber stands of more than 5,000 board feet per acre. Only about half of the hardwood sawtimber volume occurs in such stands.

Thus the sawtimber estimate must be further qualified. Only about $2\frac{1}{2}$ billion board feet of the major lumber species are located in stands that loggers regard as currently operable timber. These operable stands are widely scattered about the State, and many are small.

Volume Suitable For Pulpwood

About 85 percent of the growing stock—including most of the sawtimber and poletimber—meets regional specifications for "pulpwood timber." This volume totals about 35 million cords.

Although four-fifths of the pulpwood cut is softwood, the softwood species represent less than 30 percent of the total volume that is suitable for pulpwood (table 9). Loblolly pine, the preferred lumber species in Maryland, is also the major source of pulpwood. It supplies nearly half of the pulpwood cut.

About 25 years ago, more than 80 percent of the pulpwood cut in Maryland was hardwood.⁸ Today hardwood species, mostly oak and yellow-poplar, comprise only a fourth of the pulpwood cut. However, in the last few years, interest in hardwood pulping has increased. Compared to conifers, hardwood chemical pulp yields per cord of pulpwood are considerably greater. Also, new processes are available for pulping

⁸Hamill, W. S. The forest resources and industries of Maryland. Assoc. of Commerce, Baltimore. 197 pp. 1937.

hardwoods cheaply. Maryland forests contain more than 20 million standard cords of hardwood timber that is suitable for pulping. Hard hardwood species--such as oak, hickory, and beech--account for 64 percent of it.

Table 9.--Net volume of pulpwood on commercial forest land by species, Maryland 1950

Species	Pulpwood volume ¹
	<u>Thousand cords</u>
Softwoods:	
Loblolly pine ²	5,184
Virginia pine	2,775
Pitch pine	392
Other softwoods	374
Total	8,725
Hardwoods:	
Yellow-poplar	2,769
White oak ³	2,667
Red oaks ⁴	2,597
Sweetgum	2,333
Other red oaks	2,321
Soft maples	1,621
Chestnut oak	1,421
Hickory	981
Blackgum	661
Beech	646
Other white oaks	432
Other hardwoods	2,326
Total	20,775
All species	29,500

¹In terms of the pulpwood specifications established by the Appalachian Technical Committee of the American Pulpwood Association. The total growing stock in Maryland represents about 34,900,000 cords, of which about 85 percent is pulpwood material.

²Includes small quantity of shortleaf pine.

³Quercus alba only.

⁴Quercus rubra and Q. falcata.

Like the lumberman, the pulpwood logger knows that not all of the species that grow in Maryland are equally desirable. More than 90 percent of the pulpwood cut is still pine and oak, but these species account for only 60 percent of the inventory volume. Most of the higher value material will be used for lumber and veneer. And some of the timber is in very light stands. However, of the total volume suitable for pulpwood, more than 90 percent is located in stands of 5 or more cords per acre, and some 60 percent is in stands of more than 15 cords per acre--including sawtimber volume.

Table 10.--Quality of hardwood sawtimber on commercial forest land
in Maryland, by species, 1950

(In millions of board feet)

Species	Standard-lumber logs			Tie and timber logs	Total
	Grade 1	Grade 2	Grade 3		
Red oaks	252	338	449	238	1,277
Yellow-poplar	112	119	432	248	911
White oaks	57	94	294	319	764
Sweetgum	46	96	209	229	578
Chestnut oak ¹	13	75	103	76	267
Red maple	14	57	99	84	254
Hickory	23	47	67	77	214
Beech	10	37	77	72	196
Blackgum	12	28	57	62	159
Sycamore	4	13	29	27	73
Other hardwoods	14	69	105	84	272
All hardwoods	555	973	1,921	1,516	4,965
Percent	11	20	39	30	100

¹Worm holes no defect.

Table 11.—Quality of pine sawtimber on commercial forest land
in Maryland, by species, 1950

(In millions of board feet)

Species	Log grade 1	Log grade 2	Log grade 3	Total
Loblolly pine	113	329	686	1,128
Virginia pine	30	84	167	281
Pitch pine	10	25	50	85
Other pines	1	5	7	13
All pines	154	463	910	1,507
Percent	10	29	61	100

Timber Quality

Standard lumber logs comprise about 7.0 percent of the hardwood sawtimber volume in Maryland; and tie and timber logs account for the other 30 percent (table 10). Less than one-third of the hardwood sawtimber meets the specifications for grade 1 or grade 2 standard lumber logs.

Some of the material in upper stems, cull trees, and cull logs is utilized as "local-use" logs in certain areas.

The surplus growth of hardwood sawtimber, referred to previously, is explained largely by the poor quality of current timber supplies, which limits the cutting that is possible. Actually, the cut of grade 1 and grade 2 sawlogs is somewhat greater than the net growth of such material (fig. 5); and thus stands are still deteriorating in quality.

About 60 percent of the pine sawtimber volume occurs in grade 3 sawlogs (table 11). The upper grades of sawlogs represent about 40 percent of the pine sawtimber volume.

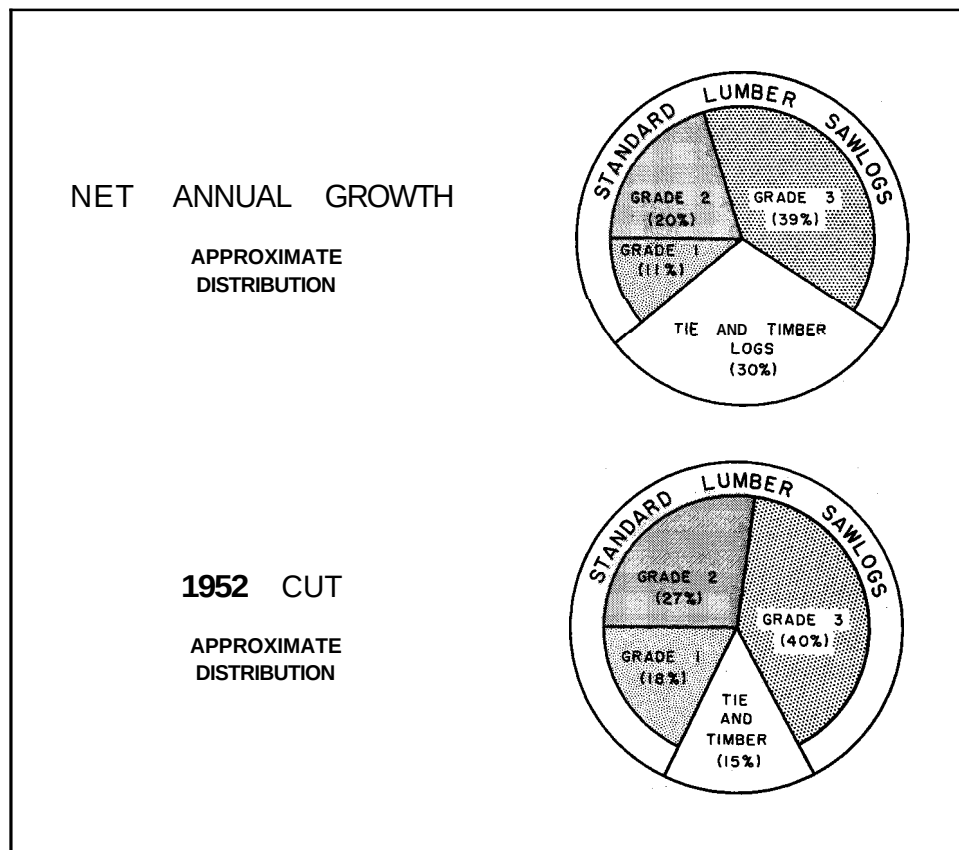


Figure 5.--The hardwood sawtimber of better quality is over-cut.

The annual cut of all softwood sawtimber is double the net annual growth and the cut of these upper grades is several times as great as the growth of such material. The softwood timber resource cannot long sustain such pressure.

Table 12.--Land area by major classes of land and physiographic region, Maryland, 1950

Class of land	Total area	Physiographic region		
		Appalachian Mountains	Piedmont Plateau	Coastal Plain
Forest:	<u>Acres</u> <u>Percent</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
Commercial	2,897,000 46	663,100	507,500	1,726,400
Noncommercial ¹	22,800 (•)	14,600	1,900	6,300
Total	2,919,800 46	677,700	509,400	1,732,700
Nonforest ²	3,404,000 54	468,600	1,144,100	1,791,300
Total all classes ³	6,323,800 100	1,146,300	1,653,500	3,524,000

¹Includes 20,300 acres reserved from commercial timber cutting, and 2,500 acres of un-productive forest land.

²Includes 25,100 acres of water according to Survey standards of area classification, but defined by the Bureau of the Census as land.

³United States Census of Agriculture, 1950

*Less than 1 percent.

Table 13.--Area of forest land, by counties, Maryland, 1907-1914 and 1950

County	1907-1914 ¹		1950	
	Forest <u>land area</u>	Forested	Forest <u>land area</u>	Forested
	<u>Thousand acres</u>	<u>Percent</u>	<u>Thousand acres</u>	<u>Percent</u>
Allegany	197	74	198	73
Anne Arundel	134	49	174	65
Baltimore	169	42	174	45
Calvert	64	46	92	66
Caroline	78	37	85	41
Carroll	70	24	78	27
Cecil	78	35	86	38
Charles	216	74	215	73
Dorchester	166	45	164	44
Frederick	132	30	142	33
Garrett	315	72	282	66
Harford	104	38	103	36
Howard	45	28	51	32
Kent	35	19	43	24
Montgomery	94	31	74	23
Prince Georges	152	50	188	60
Queen Annes	97	42	78	33
St. Marys	135	58	156	66
Somerset	153	56	92	43
Talbot	68	43	47	26
Washington	113	37	106	36
Wicomico	119	49	129	53
Worcester	169	54	163	53
Total	2,903	46	2,920	46

¹The 1907-1914 acreages and percentages include both "wooded area" and "wasteland" as given by F. W. Besley.

CHARACTER OF THE FORESTS

There are nearly 3 million acres of forest land in Maryland--46 percent of the land area of the State (table 12). Practically all of it is commercial forest land. About 20 thousand acres of noncommercial forest land are state park and game refuge property, and 3 thousand acres of forest land are classed as unproductive, chiefly because of poor soil conditions.

Table 14.--Area of commercial forest land, by major forest types,
Maryland, 1950

Forest type	Area	
	Thousand acres	Percent
Loblolly-shortleaf pine:		
Loblolly pine	307	11
Loblolly pine-hardwood	96	3
Pitch pine-Virginia pine	275	9
Pitch pine-Virginia pine-oak	84	3
Total	762	26
Oak-pine:		
Oak-pitch pine-Virginia pine	104	4
Hardwood-loblolly pine	102	3
Total	206	7
Oak-hickory:		
Red oak	681	24
White oak	443	15
Chestnut oak	152	5
Yellow-poplar	77	3
Total	1,353	47
Oak-gum-cypress:		
Bottomland hardwood	299	10
River birch-sycamore	24	1
Sweetgum--yellow-poplar	162	6
Total	485	17
Maple-beech-birch:		
Sugar maple-beech	81	3
White pine, spruce, and hemlock types	10	(*)
Total	91	3
All types	2,897	100

*Less than 1 percent.

The State Forester's survey of 1907 to 1914 found 2.2 million acres of "wooded area" in Maryland.⁹ But an additional 0.7 million acres that were classified as "waste land" then would be defined as forest land today. Hence the two survey totals are very close. However, the comparison shows considerable variation from county to county (table 13).

Oak Forests Are Most Extensive

Stands of hardwood trees cover nearly three-fourths of the commercial forest land (fig. 6). Although pines and other conifers are scattered through some of these hardwood stands, they nowhere account for as much as half of the stand volume. Stands in which the pines predominate cover only one-fourth of the commercial forest land (table 14).

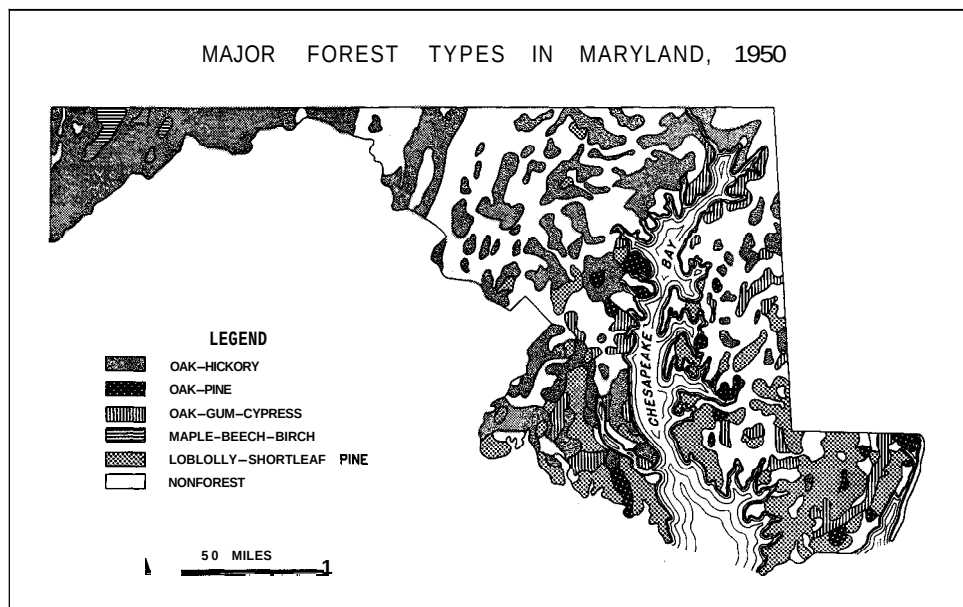


Figure 6.--Forests cover half of Maryland's land area.

Throughout the State, the most extensive type of forest cover is oak. Oak forests occupy half of all the commercial forest land. They are most common in the Appalachian

⁹Besley report. See footnote 2

Mountains (where they cover more than three-fourths of the forest land) and in the Piedmont Plateau.

In the Coastal Plain, pine is the major forest cover type, claiming 40 percent of the forest area. Here the oak types occupy less than 25 percent of the forest land (table 15).

Table 15.--Area of forest types and net volume of sawtimber and growing stock on commercial forest land, by physiographic regions, Maryland, 1950

Forest type	Area	Volume	
		Saw-timber	Growing stock
	<u>Thousand acres</u>	<u>Million bd.ft.</u>	<u>Million cu.ft.</u>
APPALACHIAN MOUNTAINS			
Softwood types	41	107	47
Red oak	279	414	218
White oak	153	191	84
Other oak types	78	110	69
Sugar maple-beech	81	83	58
Other hardwood types	31	67	32
Total	663	972	508
PIEDMONT PLATEAU			
Softwood types	28	24	12
Red oak	217	610	207
White oak	51	167	49
Other oak types	74	106	47
Yellow-poplar	51	173	54
Other hardwood types	87	110	41
Total	508	1,190	410
COASTAL PLAIN			
Loblolly pine	307	995	487
Loblolly pine-hardwood	96	210	103
Other pine types	300	323	268
Red oak	185	611	189
White oak	239	591	193
Bottomland hardwood	238	852	318
Sweetgum--yellow-poplar	138	523	166
Hardwood-loblolly pine	103	130	65
Other hardwood types	120	191	86
Total	1,726	4,426	1,875
All regions	2,897	6,588	2,793

In general, the oak types are characterized by smaller volumes of growing stock than most of the other

cover types. They average about 800 cubic feet per acre whereas the average acre in the other types carries close to 1,100 cubic feet. The Appalachian Mountain area, with the lowest level of growing stock, contains the highest proportion of oak stands.

Timber Volume Is Spread Unevenly

Sawtimber stands of more than 5,000 board feet per acre are found on 16 percent of the forest land (table 16). Yet these stands carry more than half of the total sawtimber volume and more than one-third of the growing stock. And almost all of the sawtimber occurs on the commercial forest

Table 16.--Commercial forest-land area in Maryland,
by sawtimber stand-size class and unit, 1950

Unit	More than 5,000 bd.ft. per acre	1,500 to 5,000 bd.ft. per acre	Total, all stands
	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
Eastern Shore	139,300	313,800	882,500
Central	249,200	355,400	1,100,300
Western	69,300	224,900	914,200
Total	457,800	894,100	2,897,000
Percent	16	31	100

Table 17.--Area of commercial forest land by forest **type** and stand-size class,
Maryland. 1950

(In thousands of acres)

Forest type	Sawtimber stands		Pole- stands	Seedling-and- sapling stands and other areas	Total
	More than 5,000 board feet per acre	1,500-5,000 board feet per acre			
Loblolly pine	83	111	78	35	307
Other softwood types	32	141	170	122	465
Red oak	105	222	209	145	681
White oak	93	125	122	103	443
Other oak types	25	71	108	52	256
Bottomland hardwood	55	122	87	35	299
Other hardwood types	65	102	121	158	446
All types	458	894	895	650	2,897
Percent	16	31	31	22	100

area occupied by sawtimber stands. Poletimber, sapling, and other stands--though they cover more than half of the forest land--contain but one-fourth of the growing stock (tables 17 and 8).

Most Of The Volume Is In Sawtimber Trees

More than two-thirds of the State's softwood sawtimber volume is found in the 10-, 12-, and 14-inch d.b.h. classes and the balance in larger trees. On the other hand, nearly two-thirds of the hardwood sawtimber volume shows up in the larger diameter classes--above 14 inches (table 18).

Table 18.--Net volume of live sawtimber on commercial forest land by diameter-class group. and species, Maryland, 1950

(In millions of board feet)

Species	Diameter-class group (inches)						Total
	10	12	14	16	18	20+	
Southern yellow pines ¹	3M	406	366	222	145	140	1,623
White oak ²	--	196	198	172	111	268	945
Red oak ³	--	74	139	86	75	298	672
Other oaks	--	121	147	142	76	205	691
Sweetgum	--	101	135	126	90	126	578
Yellow-poplar	--	119	156	136	139	361	911
Other hardwoods	--	213	249	244	127	335	1,168
Total hardwoods	--	824	1,024	906	618	1,593	4,965
All species	344	1,230	1,390	1,128	763	1,733	6,588

¹Includes small quantities of white pine and other softwoods.

²*Quercus alba* and *Q. prinus*.

³*Quercus rubra* and *Q. falcata*.

Of the growing stock in trees 6 inches and larger, 60 percent is in sawtimber trees and 40 percent is in pole-timber trees. Although the softwood growing stock is found chiefly in trees of the 14-inch and smaller diameter classes, more than one-third of the hardwood growing stock is represented by trees of the 16-inch class and larger (table 19).

Almost ALL Of The Forest Land Is Privately Owned

Private owners hold 93 percent of the commercial forest land in Maryland. Farm forests--parts of some 25,000

Table 19.--Growing stock on commercial forest land,
by diameter-class group and species group,
Maryland, 1950

(In millions of cubic feet)

Species group	Diameter-class group (inches)					Total
	6	8-10	12-14	16-18	20+	
Softwoods	129	323	237	94	32	815
Hardwoods	193	561	523	364	337	1,978
All species	322	884	760	458	369	2,793
Percent	12	32	27	16	13	100

Table 20.--Commercial forest land area, by ownership
and stand-size classes, Maryland, 1950

(In thousands of acres)

Ownership class	Total	Saw-timber stands	Pole-timber stands	Seedling-and-sapling stands	Nonstocked and other areas ¹
Public:					
Federal	54	25	15	11	3
State	128	56	55	15	2
Municipal	32	12	6	11	3
Total	214	93	76	37	8
Private:					
Farm	1,169	679	314	119	57
Industrial & other	1,514	580	505	343	86
Total	2,683	1,259	819	462	143
All ownerships	2,897	1,352	895	499	151

¹Includes areas not classified elsewhere.

farms--account for 40 percent. But the biggest share of the forest acreage, 53 percent, belongs to some 10,000 non-farm private ownerships. All but 2 of these 35,000 forest properties are smaller than 5,000 acres (table 20).

Seven percent of the commercial forest land is publicly owned. The Maryland Department of Forests and Parks administers more than half--117,500 acres. About 40,000 acres are managed by the U. S. Army, Navy, or Air Force.

Some 22,000 acres are held by the City of Baltimore. The remainder is made up of relatively small parcels handled by various other federal, state, and municipal agencies.

Ownership of the timber volume is distributed about the same as forest acreage; almost all of it is privately owned. However, farmers own 63 percent of the private saw-timber volume, but only 44 percent of the private commercial forest area (table 21).

Table 21.--Net volume of live sawtimber and growing stock
on commercial forest land, by ownership class,
Maryland, 1950

Ownership class	Saw- timber	Growing stock
	<u>Million bd.ft.</u>	<u>Million cu.ft.</u>
Federally owned or managed	105	51
State	333	139
Municipal	53	23
Private:		
Farm	3,847	1,410
Industrial and other	2,250	1,170
Total private	6,097	2,580
All ownerships	6,588	2,793

FOREST OPPORTUNITIES IN MARYLAND

Like the other densely populated states along the Eastern Seaboard, Maryland consumes far more wood than it produces. This is a situation of long standing, resulting from many factors. It is not necessarily an adverse situation. Self-sufficiency in wood supplies is not a feasible goal for Maryland.

However, there are potential opportunities in Maryland forests for increasing forest income and employment. For the long run, these opportunities depend on more intensive use and management of the forest land and growing stock. For the immediate future, they imply greater use of the present surplus of hardwood timber.

Forest Land Is Plentiful

The forest survey shows that nearly half of all the land in Maryland is available for timber production. Meas-

urements of tree growth indicate that both the climate and the soils are favorable for growing timber. Stability of the forest acreage shows that there is now little conflict between timber use and other land uses. Almost all of the forest land is readily accessible; it has been logged and relogged.

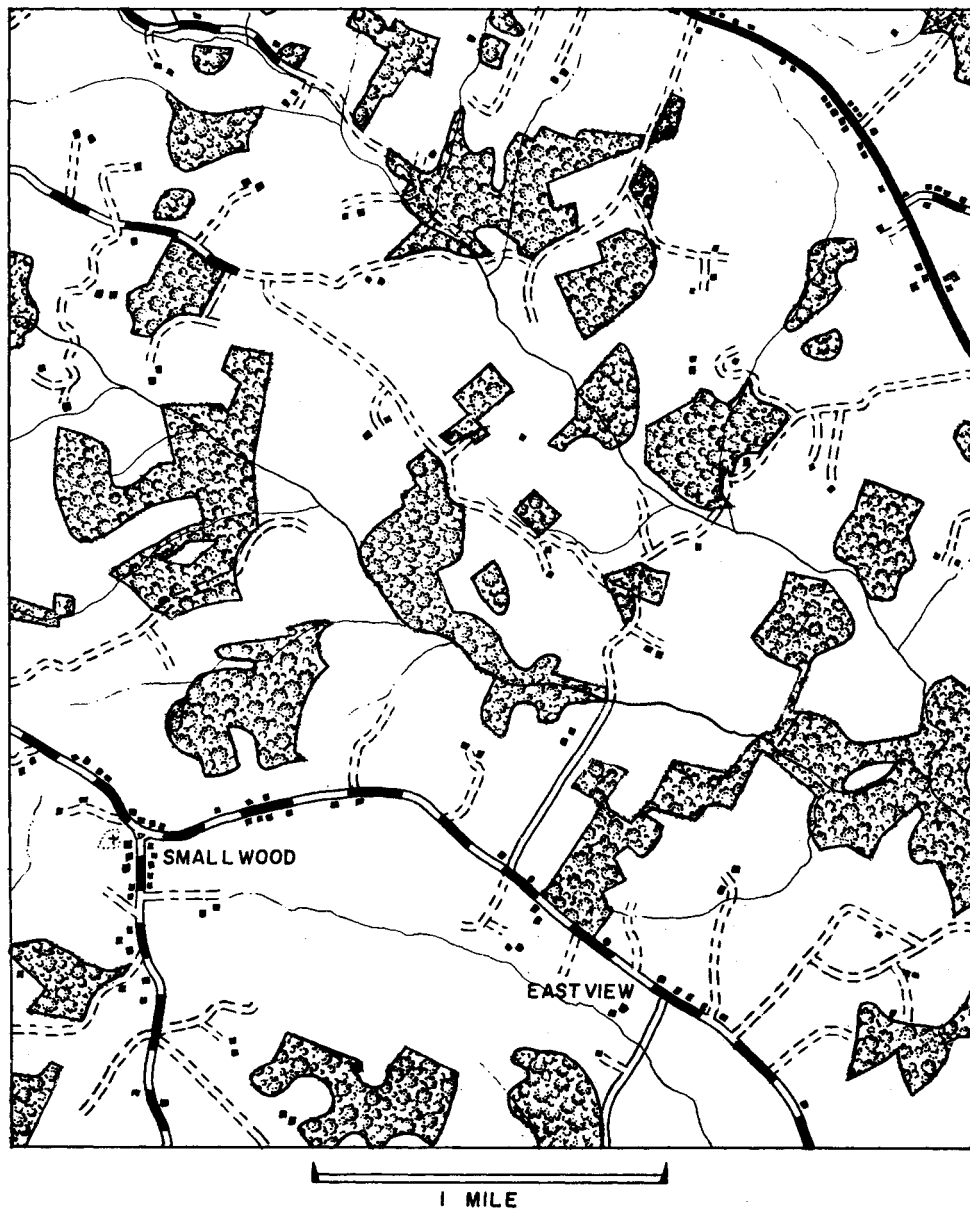


Figure 7.--The farm forests are small and scattered. This map shows a typical distribution of forest in a farming area.

On the other hand, the pattern of forest ownership offsets these advantages to some extent, although this is not necessarily true everywhere in the State. The average private forest holding contains only about 75 acres. The farm forests are typically small (they average less than 50 acres) and scattered, particularly in the Piedmont (fig. 7). On the other hand, the land-ownership pattern in farming areas is associated with a relatively cheap supply of seasonal logging labor. The non-farm forest holdings are larger (they average 150 acres) and often part of extensive forest areas where other land uses are minor.

The 35,000 forest owners in Maryland represent a wide range of interests. Some of them are interested in growing timber, but many of them hold their land for reasons other than timber values. The problem lies in convincing more forest-land owners and timber operators that better management of forest properties is consistent with their interests. The average acre of commercial forest land carries less than 1,000 cubic feet of growing stock--perhaps one-third of the capacity of the average site. And because the annual cut is less than the annual growth, there are numerous opportunities for raising the quality and quantity of the growing stock without reducing the cut.

Another opportunity for forest owners arises from the effective fire protection given to Maryland forests. In recent years the average annual number of forest fires has been cut in half and the area burned has dropped to less than 0.1 percent of the total forest acreage.

Finally, forest owners will benefit from the improvement in forest cutting practices now becoming evident. A recent survey shows that Maryland is one of the leading states in the Northeast in applying scientific forest management to its forest land.¹⁰ More than one-tenth of the sawlog and pulpwood cut in Maryland is now taken from trees designated by foresters; and the rate of improvement in cutting practices has been steadily increasing. Through proper selection of the trees to be harvested, the growing stock can be built up and maintained at a high level indefinitely.

The Surplus Stock Of Hardwoods

An immediate problem is how to gear the present growing stock to the present forest industry. Most of the th-

¹⁰Committee on Silviculture and Management, Report on timber marking in the Allegheny Section. Allegheny News 7 (3): 5-8. (Allegheny Section, Society of American Foresters.) 1954.

Table 22.--Lumber, veneer, and bolts used in manufacture,
by product. Maryland. 1948

Product	Volume
	<u>Thousand</u> <u>bd.ft.</u>
Airplanes	680
Agricultural Implements	36
Boxes, cigar and tobacco	42
Car construction and repair	1,998
Caskets and burial boxes	252
Containers (exc. cooperage)	46,124
~~Crossarms~~	1,886
Electrical equipment	103
Fixtures	4,648
Flasks	168
Flooring	588
Furniture	13,074
Handles	5,265
Instruments, musical	682
Instruments, professional & scientific	10
Ladders	200
Laundry appliances	124
Machinery	199
Millwork	16,522
Pallets	19,566
Patterns	502
Prefab houses & panels for houses	527
Printing material	4
Radios, phonographs, sewing machines	246
Refrigerators	977
Rollers, shade & map	11
Ship & boat building	5,794
Signs, scenery, displays	276
Surgical supplies	16
~~Tanks~~	48
~~Toys~~	12
Vehicles, motor	173
Venetian blinds	18
Woodenware, novelties & miscellany	145
Total	120,916

ber industries are dependent upon the small and dwindling softwood growing stock. The hardwood growing stock is largely ignored. In some products, it may be possible to substitute hardwood for softwood, as in pulp production. Combined with vigorous attempts to increase softwood growth in the future, such adjustments may succeed in **sustaining** or increasing the forest industries.

Another solution is to seek new industry to utilize the hardwoods--especially new industry that does not depend on high-quality timber. Even now the hardwood cut could be **tripled** without depleting the volume of hardwood growing stock. Without new industry, the spread between hardwood growth and cut will continue to increase.

The hardwood surplus exists because most of the hardwood volume and growth is not suitable for standard lumber; the high-grade hardwoods are fully utilized. But it also seems likely that forest industry has not realized how quickly the forest has thickened up as a result of intensive and continued fire protection. Much of the low-grade surplus wood is available at low cost because demand is limited. Logging costs are also low as a result of relatively large concentrations of timber and the feasibility of harvesting hardwoods on an integrated basis for various products.

Diversity of the present wood-using industry is evidence of the wide variety of forest products that are manufactured in Maryland (table 22). With the forest resource that Maryland has, there is an opportunity to grow larger timber crops for an expanding forest industry.

A P P E N D I X

DEFINITIONS OF TERMS

Forest Area

Forest-land area.--Includes (a) lands that are at least 10 percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting an influence on the ~~climate~~ or on the water regime; (b) land from which the trees described in (a) have been removed to less than 10 percent stocking and ~~which~~ has not been developed for other use; and (c) afforested areas. Forest tracts of less than 1 acre, isolated strips of timber less than 120 feet wide, and abandoned fields and pastures not yet 10 percent stocked with trees are excluded.

Commercial forest-land area.--Forest land that is (a) ~~producing~~, or physically capable of producing, usable crops of wood (usually sawtimber), (b) economically available ~~now~~ or prospectively, and (c) not withdrawn from timber utilization.

Noncommercial forest-land area.--Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but that otherwise qualifies as commercial forest land, or (b) incapable of yielding usable wood products (usually ~~sawtimber~~) because of adverse site conditions.

Forest Cover Types

The major forest types are determined upon the basis of predominant species as indicated by cubic volume for sawtimber and poletimber stands, and number of trees for seedling-and-sapling ~~stands~~. Where none of the indicated species comprise 50 percent or more of a given stand, the stand is typed on the basis of plurality of cubic volume or number of trees. All local types are keyed to these major types:

Loblolly-shortleaf pine.--Forests in which 50 percent or more of the stand is ~~loblolly~~ pine, shortleaf pine, or other southern yellow pines excepting ~~longleaf~~ or slash pine, singly or in combination. ~~Common~~ associates include oak, hickory, and ~~gum~~.

Oak-pine.--Forests in which 50 percent or more of the stand is hardwoods, usually upland oaks, but in which southern pines make up 25 to 49 percent of the stand. Common associates include gum, hickory, and yellow-poplar.

Oak-hickory.--Forests in which 50 percent or more of the stand is upland oaks or hickory, singly or in combination, except where pines comprise 25 to 49 percent, in which case the stand could be classified oak-pine. Common associates include yellow-poplar, elm, maple, and black walnut.

Oak-gum-cypress.--Bottomland forests in which 50 percent or more of the stand is tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, except where pines comprise 25 to 49 percent, in which case the stand would be classified as oak-pine. Common associates include cottonwood, willow, ash, elm, hackberry, and maple.

Maple-beech-birch.--Forests in which 50 percent or more of the stand is maple, beech, or yellow birch, singly or in combination. Common associates include hemlock, elm, basswood, and white pine.

Stand - Size Classes

Sawtimber stands.--Stands with sawtimber trees having a minimum net volume per acre of 1,500 board feet, International $\frac{1}{4}$ -inch rule.

Poletimber stands.--Stands failing to meet the sawtimber stand specification, but at least 10 percent stocked with poletimber and larger trees (5.0 inches d.b.h. and larger), and with at least half of the minimum stocking in poletimber trees. Poletimber stands carry at least 200 cubic feet per acre.

Seedling-and-sapling stands.--Stands not qualifying as either sawtimber or poletimber stands, but having at least 10 percent stocking of trees of commercial species and with at least half the minimum stocking in seedling-and-sapling trees.

Nonstocked and other areas not elsewhere classified.--Areas not qualifying as sawtimber, poletimber, or seedling-and-sapling stands.

Tree Classes

Sawtimber trees.--Trees of commercial species that contain at least one merchantable sawlog, as defined below, and that are of the following minimum diameters at breast

height (d.b.h.): Softwoods 9.0 inches and hardwoods 11.0 inches.

Poletimber trees.--Trees of commercial species that meet regional specifications of soundness and form, and are of the following diameters at breast height: softwoods 5.0 to 9.0 inches; hardwoods 5.0 to 11.0 inches. Such trees will usually become sawtimber trees if left to grow.

Seedling-and-sapling trees.--Live trees of commercial species less than 5.0 inches in diameter at breast height and of good form and vigor.

Cull trees.--Live trees of sawtimber or poletimber size that are unmerchantable for sawlogs now or prospectively because of defect, rot, or species.

Pulpwood trees¹¹.--Live trees of commercial species, 5.0 inches d.b.h. and larger, containing at least two contiguous pulpwood bolts and with 50 percent or more of the main stem volume usable for pulpwood. Most of the sawtimber and poletimber trees are also pulpwood trees.

Timber Volume

Growing stock.--Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top of central stem, inside bark.

Net volume in cubic feet.--Gross volume less deductions for rot.

Live sawtimber volume.--Net volume in board feet, International $\frac{1}{4}$ -inch rule, of live sawtimber trees of commercial species. Sawtimber volume is measured in 16-foot merchantable sawlogs except that the uppermost merchantable sawlog may be as short as 8 feet.

Net volume in board feet.--Gross volume in terms of the International $\frac{1}{4}$ -inch log rule less deductions for rot, sweep, and other defects affecting use for lumber.

Pulpwood volume¹².--Net volume in standard cords, including bark, of the main stem of pulpwood trees from stump

¹¹As defined by the Appalachian Technical Committee, American Pulpwood Association.

¹²Same as footnote 11.

to a point where the top breaks up into branches, unless a minimum top diameter of 4.0 inches, inside bark, is reached first. Pulpwood volume is measured in 4-foot bolts, having a minimum continuous length of 8 feet.

Net volume in standard cords.--Gross volume in terms of the standard rough cord less deductions for rot, sweep, and other defects affecting use for pulpwood. Cord estimates are derived from cubic-foot measurements by applying a factor of 80 cubic feet of wood, inside bark, per standard cord', outside bark.

Timber Quality

Merchantable sawlogs.--Sections of tree bole that meet one of the following sawlog specifications:

Hardwood sawlogs are sections of the main stem of hardwood trees of commercial species that meet one of the grade specifications for standard lumber logs¹³ or, failing to do so, qualify as tie and timber logs¹⁴ (fig. 8 and fig. 9).

Southern pine sawlogs are sections of the main stem of loblolly, Virginia, pitch, and shortleaf pine trees that meet one of the grade specifications¹⁵ in figure 10.

Other softwood sawlogs are sections of the main stem of softwood trees, except the southern pines, that are at least 6.0 inches in top diameter and at least 8 feet long. White pine, spruce and hemlock sawlogs meet the minimum grade specifications developed by the New England Timber Salvage Administration, U. S. Forest Service. Eastern red-cedar and table mountain pine sawlogs meet the general specifications of local sawmills.

Pulpwood bolts¹⁶.--Sections of the main stem of trees of commercial species, 4 feet long; 4.0 inches or more in diameter inside bark at the small end; free from any indication of rot, charred wood, tramp metal, or hollow center;

¹³Forest Products Laboratory. Hardwood log grades for standard lumber. Proposals and results. U. S. Forest Serv., Forest Prod. Lab. Rpt. D1737. 15 pp., illus. Madison, Wis. 1949.

¹⁴Southern Forest Experiment Station. Interim log grades for southern hardwoods. U. S. Forest Serv. South. Forest Expt. Sta. 9 pp. New Orleans. 1948.

¹⁵Lotti, Thomas, and Chaiken, L.E. Tree grades for loblolly and shortleaf pine. South. Lumberman 177 (2225): 107-109. 1948.

¹⁶As defined by the Appalachian Technical Committee, American Pulpwood Association.

HARDWOOD LOG GRADES FOR STANDARD LUMBER

GRADE FACTORS *		SPECIFICATIONS					
		Log Grade 1		Log Grade 2		Log Grade 3	
Position in tree		Butts only	Butts & uppers		Butts & uppers		Butts & uppers
Minimum diameter (inches)		13-15	16-19	20+	11	12+	8+
Minimum length (feet)		10+	10+	10+	8-9	10-11	12+
Clear cuttings** on each of the 3 best faces	Min. length (feet)	7	5	3	3	3	2
	Max. number	2	2	2	2	2	3
	Min. yield in face length	5/6	5/6	5/6	2/3	3/4	2/3
Max. sweep and crook allowance (percent of gross volume)		15		30		50	
Max. cull and sweep allowance (percent of gross volume)		40		450		50	
*End defects, although not visible in standing trees, are important in grading cut logs. Instructions for dealing with this factor are contained in Forest Prod. Lab. Rpt. D1737.		1Ash and basswood butts can be 12 inches if otherwise meeting requirements for small No. 1's.					
**A clear cutting is a portion of a face free of defects, extending the width of the face. A face is one-fourth the surface of the log as divided lengthwise.		210-inch logs of all species can be No. 2 if otherwise meeting requirements for small No. 1's.					
		3Otherwise No. 1 logs with 51-60 percent cull can be No. 2.					
		4Otherwise No. 2 logs with 51-60 percent cull can be No. 3.					

Figure 8.--The hardwood log grades used as standards in the Forest Survey.

and contiguous to one or more sections meeting these same requirements. Crotches are excluded; sweep or crook in any section disqualifies it if an imaginary line through the bolt, from center of top cut to center of bottom cut, passes outside the wood at any point.

Growth And Drain

Net annual growth of sawtimber. --The change during a specified year in net board-foot volume of live ~~sawtimber~~ on commercial forest land resulting from natural causes.

HARDWOOD LOG SPECIFICATIONS FOR TIES AND TIMBERS

GRADE FACTORS		SPECIFICATIONS
Position in tree		Butts and uppers
Scaling diameter (inches)		8+
Length, without trim (feet)		8+
Clear cuttings		No requirements: not graded on cutting basis.
Max sweep allowance		One-fourth d.i.b. of small end for half logs, and one-half d.i.b. for logs 16 feet long.
Sound surface defects permitted	Single knots	Any number, if none has an average collar** diameter that is more than one-third of log diameter at point of occurrence
	Whorled knots	Any number, provided the sum of the collar diameters does not exceed one-third the log diameter at point of occurrence.
	Holes	Any number not exceeding knot specifications if they do not extend more than 3 inches into the contained tie or timber.
Unsound surface defects permitted	Any number and size if they do not extend into contained tie or timber. If they extend into contained tie or timber, they shall not exceed size, number, and depth of limits for sound defects.	

*Knot collar is the average of the vertical and horizontal diameters of the limb or knot swelling as measured flush with the surface of the log.

**Interior defects are not visible in standing trees. They are considered in grading cut logs. No interior defects are permitted except one shake not more than one-third the width of the contained tie or timber, and one split not more than 5 inches long.

Figure 9.--The standards used in the Forest Survey for hardwood tie and timber logs.

GRADE SPECIFICATIONS
FOR LOGS OF SOUTHERN PINES

GRADE	DIAMETER (inside bark)	LENGTH	SURFACE REQUIREMENTS
1	<u>Inches</u> 10-16	<u>Feet</u> 8+	Surface clear (not considering adventitious knots and branches).
	16+	8+	Not more than three 2- to 4-inch knots and any number of smaller knots.
2	8-9	8+	Surface clear.
	10-13	8+	Any number of small knots (Less than 2 inches in diameter).
	14+	8+	Not more than six 2- to 4-inch knots and any number of smaller knots.
3	8-13	8+	With any 2- to 4-inch knots.
	14+	8+	More than six 2- to 4-inch knots. Any log with one or more knots 5 inches and larger.
	Knotty or crooked merchantable logs 8 inches d.i.b. or over that do not fall in either No. 1 or No. 2 grade: length 10 feet or over.		

Figure 10.--The grade standards used in the Forest Survey for southern pine logs.

Net annual growth of growing stock.--The change during a specified year in net cubic-foot volume of growing stock on commercial forest land resulting from natural causes.

Annual cut of live sawtimber.--The net board-foot volume of live sawtimber trees cut or killed by logging on commercial forest land during a specified year.

Annual cut of growing stock.--The net cubic-foot volume of live sawtimber and poletimber trees cut or killed by logging on commercial forest land during a specified year.

FOREST SURVEY METHODS

Estimates of forest area, timber volume, and tree growth in Maryland are based on data obtained from aerial photographs and sample plots examined on the ground.

Each aerial photograph had three 1-acre circular plots printed on it by use of a multilith machine. There were a total of 18,081 of these circular plots. Each plot was examined under a stereoscope and was classified as forest or non-forest. Forest plots were further classified according to broad forest type, stand-size class, and density. These plots are commonly referred to as photo-interpretation plots or PI plots.

From the PI forest plots 638 were selected at random for examination on the ground. In selecting these plots for field study those stand-size classes containing the heaviest timber volume were sampled most intensively, while the lightest sample of forest plots was taken in the seedling-and-sapling stands and nonstocked areas. An accurate tally of all trees, by species and size class, was obtained on each field plot. These plots also provided a check on the accuracy of photo classification as well as data on volume, growth, and timber quality.

A number of PI nonforest plots were randomly selected for field examination to provide a check on the accuracy of the photo classification between forest and non-forest land.

Growth was computed from measurements of tree rings on increment cores taken from sample trees. These data were used in estimating the diameter distribution of each species group 10 years hence. Future volume was predicted from this new distribution of diameters. Growth was then determined by subtracting present volume from estimated future volume and reducing the difference to an annual basis. Allowances were made for mortality, ingrowth, and timber cut.

Estimates of timber cut in 1952 were derived from timber products output data supplied by the State Forester and checked for completeness against special area surveys made in 1950. Supplemental studies were made to provide estimates of fuelwood and fence post production and of logging residues.

ACCURACY OF THE ESTIMATES

The estimates in this report may contain two kinds of error. The first type results from possible human errors such as mistakes in judgment, mistakes in measuring or recording, and errors of reporting. There is no practical way of determining the frequency or magnitude of these errors, but close training and supervision minimize them.

The second type of error is associated with sampling procedures, and it can be measured. If there are no errors of the first kind, the probabilities are two out of three that the actual areas and volumes do not vary from the estimated by more than the following percentages:

	<u>Percent</u> (Plus or minus)
Commercial forest-land area	1.7
Net volume of live sawtimber	3.6
Net volume of growing stock	2.6
Net annual growth of growing stock	6.6

In each of the tables, the total figures are more reliable than the subtotals. The subtotals are more reliable than any of the individual figures. Figures that are small in relation to totals are subject to larger sampling errors.

SPECIES TALLIED

The various tree species tallied in Maryland are listed below. Approved common names¹⁷ are shown in parentheses if these differ from the brief name used in the tables. Other tree species may occur within the State but unless they were tallied on the field plots they were not included in the following list.

Commercial Softwood Species

Loblolly pine	- <u>Pinus taeda</u>
Shortleaf pine	- <u>Pinus echinata</u>
Virginia pine	- <u>Pinus virginiana</u>
Pitch pine	- <u>Pinus rigida</u>

¹⁷Little, Elbert L., Jr. Check list of native and naturalized trees of the United States (including Alaska). U. S. Dept. Agr., Agr. Handb. 41. 472 pp. 1953.

Other softwoods

- | | |
|------------------------|---------------------------------|
| (Eastern hemlock) | - <u>Tsuga canadensis</u> |
| (Eastern white pine) | - <u>Pinus strobus</u> |
| (Table mountain pine) | - <u>Pinus pungens</u> |
| (Red spruce) | - <u>Picea rubens</u> |
| (Eastern redcedar) | - <u>Juniperus virginiana</u> |
| (Atlantic white-cedar) | - <u>Chamaecyparis thyoides</u> |
| (Bald cypress) | - <u>Taxodium distichum</u> |

Commercial Hardwood Species

- | | |
|------------------------------|----------------------------------|
| Yellow-poplar | - <u>Liriodendron tulipifera</u> |
| Northern red oak | - <u>Quercus rubra</u> |
| Southern red oak | - <u>Quercus falcata</u> |
| Other red oaks | |
| (Black oak) | - <u>Quercus velutina</u> |
| (scarlet oak) | - <u>Quercus coccinea</u> |
| (Pin oak) | - <u>Quercus palustris</u> |
| (Water oak) | - <u>Quercus nigra</u> |
| (Shingle oak) | - <u>Quercus imbricaria</u> |
| (Willow oak) | - <u>Quercus phellos</u> |
| White oak | - <u>Quercus alba</u> |
| Other white oaks | |
| (Swamp white oak) | - <u>Quercus bicolor</u> |
| (Overcup oak) | - <u>Quercus lyrata</u> |
| (Post oak) | - <u>Quercus stellata</u> |
| (Bur oak) | - <u>Quercus macrocarpa</u> |
| Sweetgum | - <u>Liquidambar styraciflua</u> |
| Chestnut oak | - <u>Quercus prinus</u> |
| Soft maple | |
| (Red maple) | - <u>Acer rubrum</u> |
| (Silver maple) | - <u>Acer saccharinum</u> |
| Hickory | - <u>Carya</u> species |
| Beech (American beech) | - <u>Fagus grandifolia</u> |
| Blackgum | - <u>Nyssa sylvatica</u> |
| Sycamore (American sycamore) | - <u>Platanus occidentalis</u> |
| Other hardwood | |
| (Sugar maple) | - <u>Acer saccharum</u> |
| (Yellow birch) | - <u>Betula alleghaniensis</u> |
| (Sweet birch) | - <u>Betula lenta</u> |
| (River birch) | - <u>Betula nigra</u> |
| (Ash) | - <u>Fraxinus</u> species |
| (American basswood) | - <u>Tilia americana</u> |
| (Elm) | - <u>Ulmus</u> species |
| (Black walnut) | - <u>Juglans nigra</u> |
| (Black locust) | - <u>Robinia pseudoacacia</u> |
| (Black cherry) | - <u>Prunus serotina</u> |
| (Butternut) | - <u>Juglans cinerea</u> |
| (Magnolia) | - <u>Magnolia</u> species |

Noncommercial Species

Flowering dogwood	- <u>Cornus florida</u>
Eastern hophornbeam	- <u>Ostrya virginiana</u>
Pin cherry	- <u>Prunus pensylvanica</u>
Sassafras	- <u>Sassafras albidum</u>
Ailanthus	- <u>Ailanthus altissima</u>

NATIONAL STANDARD TABLES

The forest resource reports issued by the U. S. Forest Service contain a set of national standard tables so that data for different areas can be compared; they also are used in making national compilations. In this report the national standard tables are scattered, rather than grouped together. The national standard data can be found in the following tables:

	<u>Table</u>	<u>Page</u>
Land area, by major classes of land	12	18
Commercial forest land area, by ownership and stand-size classes	20	24
Area of commercial forest land, by major forest types	14	19
Net volume of live sawtimber and growing stock on commercial forest land, by stand-size class	8	13
Net volume of live sawtimber and growing stock on commercial forest land, by ownership class	21	25
Net volume of live sawtimber and growing stock on commercial forest land, by species	7	12
Net volume of live sawtimber on commercial forest land, by diameter-class group and species	18	23
Net volume of all timber on commercial forest land, by class of material and species group	6	11
Net annual growth, annual mortality, and annual cut of live sawtimber and growing stock on commercial forest land, by species group	2	9
Output of timber products and annual cut of live sawtimber and growing stock	1	8