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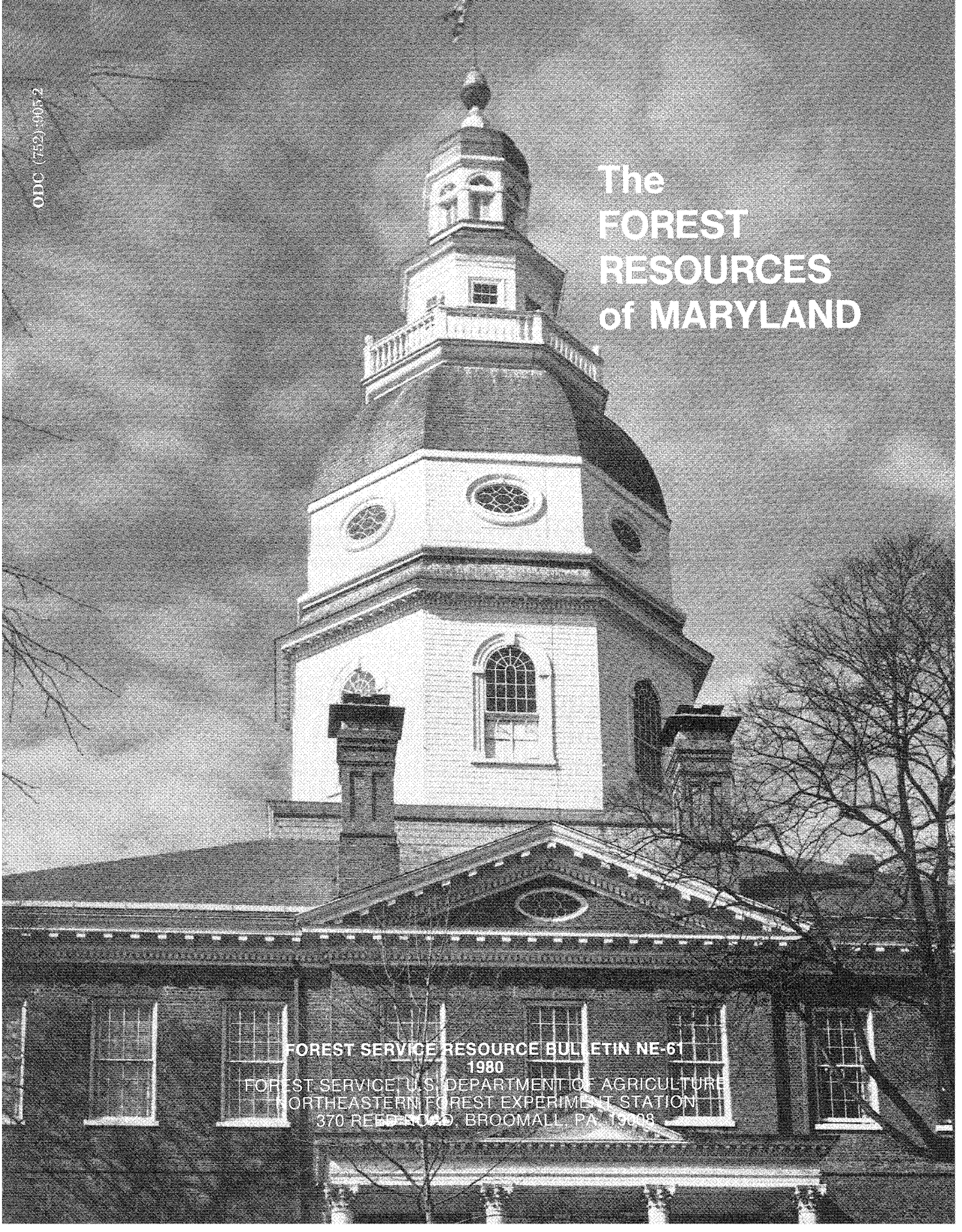


The FOREST RESOURCES of MARYLAND

FOREST SERVICE RESOURCE BULLETIN NE-61
1980
FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE
NORTHEASTERN FOREST EXPERIMENT STATION
370 REED ROAD, BROOMALL, PA 19008

Foreword

UNDER the authority of the Forest and Rangeland Renewable Resources Research Act of 1978, the USDA Forest Service conducts periodic inventories of and evaluates the forest resources of all states to provide up-to-date information about the forest resources of the Nation.

The first forest inventory of Maryland by the Federal Government was made in 1950 by the Northeastern Forest Experiment Station. A second survey was conducted by the same unit in the early 1960's and was completed in 1964. The third and latest survey was made in 1975 and 1976, also by the Northeastern Station. As in the previous surveys, the Forest Service had the cooperation and assistance of many individuals and agencies. Special thanks are due former State Forester Adna R. Bond and the personnel of the Maryland Forest Service of the Maryland Department of Natural Resources, especially Tunis Lyon, Jack Brodie, and Jim Burtis.

The third inventory of Maryland was directed by Carl E. Mayer, Resources Evaluation unit leader. Joseph E. Barnard was responsible for the design of the inventory and sample selection as well as for supervision of data compilation. John R. Peters supervised the aerial-photo interpretation and data collection by field crews. The field work was under the immediate supervision of Ronald L. Taylor and James M. Miller. The other field workers were:

David J. Alerich
Timothy J. Breneisen
William S. Cook
Eileen M. Doherty
Daniel J. Evans
Michael E. Glova
Kris A. Hasbrouck
Dennis R. Kline
David J. Lemonick
Susan N. Little
Kenneth M. Maleski
David T. Plunkett
Steven F. Resh
Robert A. Romans
Karen J. Sykes
Richard C. Whittaker
Michael S. Woodbury

David Dickson applied FINSYS (Forest Inventory System), a generalized data-processing system, to the specific data needs of the Maryland inventory, and produced summary tables for the state, geographic sampling units, and counties. Teresa M. Bowers assisted in the inventory design by performing all calculations necessary for sample-size determination and plot selection. She was responsible for the coordination of key punching and other data preparation tasks, and the final preparation and statistical check of tables for the report. Flora C. Clements prepared and balanced most of the statistical tables in the report.

James T. Bones, with the assistance of State personnel, collected and compiled the data on timber products output and timber removals. He was assisted in the compilation phase by David R. Dickson and Teresa M. Bowers. Carmela M. Hyland was responsible for administrative and secretarial services.

The authors and Joseph E. Barnard checked the consistency of the new inventory with previous inventories. The TRAS (Timber Resource Analysis System) forest-stand simulation model was used in this phase of the data analysis.

The photo-interpretation phase of this inventory was completed in November 1975, and the last field plot was measured in June 1976. Final computer output was available in September 1977. Users of this report who need more detailed information should contact: Resources Evaluation, Northeastern Forest Experiment Station, 370 Reed Road, Broomall, Pa. 19008.

Users are strongly advised to read carefully the definitions of forest survey terms and the section on the reliability of the estimates in the appendix of this report.

by Douglas S. Powell and Neal P. Kingsley

The FOREST RESOURCES of MARYLAND

Contents

M. E. Warren photo

COVER PHOTO

Built in the 1770's with large timbers, presumably loblolly pine, the dome of the Maryland State House is the largest wooden dome in the country.

Abstract

The findings in this statistical and analytical report of the third forest survey of Maryland, completed in 1976, are based on remeasured 1/5 acre plots and both remeasured and new 10-point variable radius plots. The present status and trends in forest-land area, timber volume, and annual growth and removals are discussed. Timber products output by forest industries, based upon a canvass of industries in 1975, and the importance of timber to the economy of Maryland also are discussed. The report includes a discussion of the outlook for timber supplies through 2006, forest-management opportunities in the state, and the status and importance of the nontimber forest resources of Maryland.

The Authors

DOUGLAS S. POWELL, research forester, received a B.S. degree in forestry from the University of Michigan in 1971 and an M.S. degree in forest ecology from West Virginia University in 1976. He joined the Northeastern Forest Experiment Station in July 1971, and is now a Resource Analyst in the Northeastern Station's Resources Evaluation unit, located in Broomall, Pa.

NEAL P. KINGSLEY, research forester, received a B.S. degree in forestry from the University of New Hampshire in 1961 and an M.S. degree in forest economics from the same university in 1963. He joined the Northeastern Forest Experiment Station in August 1962, and is now Resource Analysis Group Leader in the Station's Resources Evaluation unit.

MANUSCRIPT RECEIVED FOR PUBLICATION 26 JUNE 1979

HIGHLIGHTS

- More than 2.5 million acres—40 percent of the land area—is commercial forest land. This is a decrease of almost 13 percent since the previous survey.
- There are an estimated 95,800 owners of the 2.3 million acres of privately owned commercial forest land.
- The average size of private, forested ownerships is 23.8 acres.
- Sawtimber stands predominate, covering 1.4 million acres or 56 percent of commercial forest land.
- Oak-hickory is the dominant forest type, occupying 46 percent of the commercial forest land, and accounting for 49 percent of the growing-stock volume.
- Growing-stock volume is 3.5 billion cubic feet, and the sawtimber component is 8.2 billion board feet.
- Seventy-seven percent of the growing-stock volume is in hardwood species, but loblolly pine is the single species with the most volume—470 million cubic feet.
- All species except sweetgum have increased in volume.
- In 1975, for growing stock statewide, hardwood removals were 72 percent of growth and softwood removals were 95 percent of growth.
- In 1975, sawlogs accounted for 55 percent of the roundwood production, followed by pulpwood with 32, veneer logs with 8, and other products with 5.
- Thirty-year projections show a slight decrease in commercial forest area, an increase in total inventory, and little change in total growth and removals.
- There are numerous opportunities to improve timber management, but private owner objectives, the moderately high ownership turnover rate, and the small size of ownerships must be dealt with to achieve this goal.
- Besides timber, Maryland's forests produce or affect other important resources such as water, soil, fish, and wildlife, and provide excellent opportunities for outdoor recreation.

INTRODUCTION

WHEN LEONARD CALVERT established the first settlement in 1634 at St. Marys City (St. Marys County), the entire land area of Maryland was forested except for about 5 percent in marshes around Chesapeake Bay. These forests were nearly all hardwood and certainly contained many mammoth trees. The forest resources have changed dramatically during these three centuries.

The early settlers viewed the forest as an adversary, something to be reduced or eliminated so that the land could be farmed. Fire was a commonly used method, and much more timber was destroyed than was used. As the population increased, more timber from land clearing went into such products as log cabins and rail fences. As cities and towns were built, demand increased substantially, and a stable market requiring timber beyond local needs developed. This was when exploitation of forests began. With abundant supply, only the choicest sections of the best trees were used. Poor transportation made logging costly, and stumpage values at that time were very low (Besley 1916).

As improved logging, transportation, and sawmill technology was applied, serious inroads were made on the forests. Areas that were first cutover to remove the best timber were visited again and again, and each time a lower grade of product was taken. Since young growth had no value, it received no consideration. It was not until 70 or 80 years ago that even limited attention was given to the practical application of forestry.

During the first few decades of this century, forest exploitation became forest conservation, and land use throughout the state began to stabilize. Western Maryland, with mountainous terrain and rocky hillsides, remained heavily forested with limited farming. In central Maryland, where the land is well drained and fertile, farming dominated; the forests generally were only on rocky ridges, hillsides, and stream banks. This area has long been the most urbanized of the state.

In the southern portion of the state, the land on hillsides or slopes or ravines, where soil erosion can be severe, remained in woodland or, if cleared, has been allowed to revert to woodland. On the lower Eastern Shore, many forests grew in low-lying areas that were too wet for cultivation but that supported tree growth quite well. The drier, sandy sites also supported good pine stands. The use of the land remained basically like this up until the 1960's when the population around Baltimore and Washington began to expand rapidly and land use began to shift again (see Forest Land Area).

Today's forests are the result of man's influence as well as the inherent nature of the land. Although a small state, Maryland has a greater diversity of land forms, climate, soils, and forests than any other state in the Northeast. This is attributable to its location as a Middle Atlantic coastal state and its elongated shape. It is 262 miles across, stretching over five physiographic provinces and touching three major forest regions (South, Central, and North). It is interesting that because of the shape of the state, Oakland (Garrett County) is closer, as the crow flies, to Canada than it is to Ocean City (Worcester County).

From a physiographic viewpoint, the largest province is the Coastal Plain. Lying east of the Fall Line, it is an easily recognized topographic feature than runs northeast from Washington, D.C. to Delaware (Fig. 1). The Coastal Plain, with altitudes ranging from sea level to around 100 feet, is characterized by low topographic relief with marshes and swampy tidal flats around Chesapeake Bay. Adjoining this province on the west is the Piedmont, an area of rolling uplands with altitudes ranging generally from 100 to 500 feet. Farther west is the Blue Ridge where the first of the Appalachian Mountains are encountered. The fourth province is the Ridge and Valley, which when viewed from the air shows a striking alternation of parallel ridges and valleys ending on the west with an imposing escarpment known as the Allegheny Front. The westernmost province, the Appalachian Plateau, is the most mountainous and contains Backbone Mountain, which at 3,360 feet is the highest point in the state. The slopes are steep and the terrain is deeply incised by winding stream valleys.

Accompanying these changes in physiography are changes in climate, soils and vegeta-

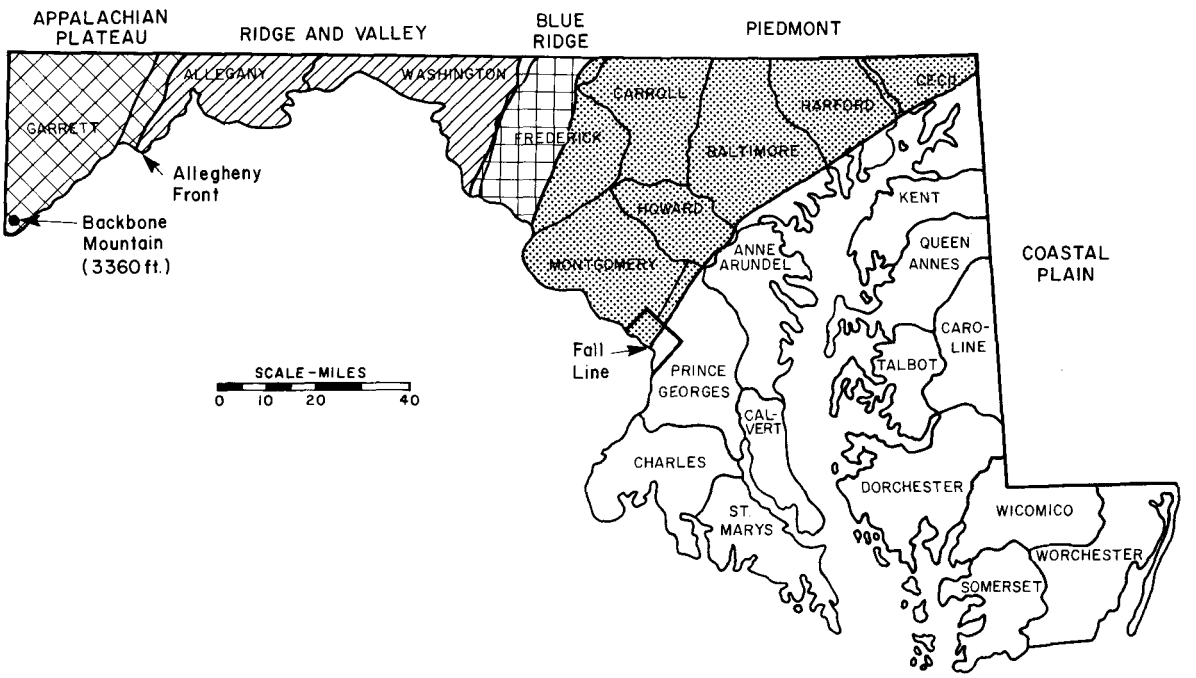


Figure 1.—The five physiographic provinces of Maryland.

tion. In the southeast the climate is mild and rainy, and the soils range from sands and sandy loams to silt loams—all resulting from marine deposits. The forests, especially on the Lower Eastern Shore, are similar to those found much farther south, including such species as baldcypress, loblolly pine, and sweetgum. Also present in this area is Atlantic white-cedar, a species that grows in a relatively narrow, patchy, coastal belt from Maine to Florida.

As you proceed west, the soils become less sandy and more clay loams are encountered. The climate is moderate in central Maryland, but in the higher elevations of the west, conditions are similar to those of the Northern States and Canada. The Ridge and Valley Province is the driest part of the state since most of the precipitation coming from the west is discharged west of the Allegheny Front. The forests of central Maryland are predominantly oak/hickory with some oak/pine and elm/ash/red maple. In the west, however, forests not unlike those found much farther north are common. The northern hardwood sugar maple/beech/yellow birch type is common here and northern conifers such as red spruce, white pine, and red pine are also present.

With this historical perspective and glimpse of the tremendous diversity offered by the "Old Line State," let's move on to a discussion of what the forest resources of Maryland are like now, and what changes they have undergone in the recent past and are likely to undergo in the near future.

THE THIRD SURVEY

In 1950, USDA Forest Service, in cooperation with other Federal and state agencies, conducted the first in this series of periodic forest inventories of Maryland (U.S. Forest Service 1955). The second inventory was taken in the early 1960's and completed in 1964 (Ferguson 1967). This report discusses the results of the third survey, which began in 1975 and was completed in 1976.

Comparisons between surveys

Since the 1950 and 1964 surveys many definitions and procedures have changed as the result of refinements and improvements in forest inventory and data-processing techniques. As a consequence, before any comparisons with the most recent information can be made, many of the published volume estimates from the previous surveys must be adjusted somewhat. These adjustments are reflected in the following figures for growing-stock volume (in millions of cubic feet):

Species group	*1950*	*1964*	*1976*	*Change (1964-1976)*
Loblolly, pond, and shortleaf pines	450.6	413.6	482.9	+ 69.3
Other softwoods	308.2	309.2	310.1	+ 0.8
Total softwoods	758.8	722.9	793.0	+ 70.1
White oaks	449.2	520.9	579.5	+ 58.6
Red oaks	488.8	578.2	654.0	+ 75.8
Yellow-poplar	275.8	317.3	350.6	+ 33.3
Sweetgum	231.9	228.6	221.2	− 7.4
Hickory	97.1	107.5	114.8	+ 7.3
Soft maples	136.9	146.8	280.6	+133.8
Other hardwoods	362.5	435.1	498.4	+ 63.3
Total hardwoods	2,042.2	2,334.4	2,669.1	+364.7
All species	2,801.0	3.057.3	3.492.1	+434.8

For sawtimber volume, adjustments for the broad species groups are reflected in the following figures (in millions of board feet, International ¼-inch rule):

Species group	*1950*	*1964*	*1976*	*Change (1964-1976)*
Softwoods	1,547.0	1,529.1	1,726.4	+ 197.3
Hardwoods	4,567.3	5,432.8	6,440.2	+1,007.4
All species	6,114.3	6,961.9	8,166.6	+1,204.7

The changes in the 1950 and 1964 data are for the most part either within the limits of the sampling errors or close to them. The changes make the softwood and hardwood totals more comparable for the three surveys by reflecting the 1976 standards as well as recognized changes in growth and removals. Changes for smaller species groups were made to reflect more accurately what has happened to that part of the timber resource in Maryland over the 26-year period. For a more detailed explanation of these changes, see Comparisons Between Inventories in the appendix.

IF YOU WANT TO COMPARE 1976 VOLUME ESTIMATES WITH COMPARABLE ESTIMATES FOR 1950 OR 1964, USE THE ABOVE FIGURES RATHER THAN THOSE PUBLISHED PREVIOUSLY. Many comparisons will require some simple arithmetic to derive a comparable figure for 1950 or 1964. For example, suppose we wanted to compare the softwood growing-stock volume in poletimber stands between 1964 and 1976. Going back to the published data for 1964 (Ferguson 1967), we find in Table 16 that the softwood volume in poletimber stands was 127 million cubic feet. This represented 20.1 percent of the softwood growing-stock total of 632 million cubic feet. To obtain our adjusted figure, we simply multiply the 1964 proportion by the adjusted total (from the above table) and get 145.3 million cubic feet. The calculations are: (127/632) (722.9) = 145.3. This new figure is the one to use for comparing to the corresponding 1976 figure of 235.3 million cubic feet found in Table 15 of this report. Contact the Resources Evaluation unit at the Northeastern Forest Experiment Station if you need further assistance in making comparisons.

Four geographic units

To provide better quality regional information, Maryland was divided into four geographic sampling units (Fig. 2). Since these units are identical to those of the 1964 survey, we can make some comparisons of inventories and analyze certain trends for portions of the state. Here are some area and population statistics for the state and the four units:

Maryland

COUNTIES: 23
LAND AREA: 6,330,240 acres
COMMERCIAL FOREST: 40 percent
POPULATION: 3,922,399[1]
RURAL POPULATION: 23 percent[1]
POPULATION DENSITY:
397 per square mile[1]
PER CAPITA INCOME: $3,512[2]

[1]U.S. Department of Commerce, Bureau of Census. 1971. 1970 census of population, number of inhabitants, Maryland. Final report PC(1)-A22 Maryland. Washington, D.C. 28 p.

[2]U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of Census. 1973. County and city data book 1972, a statistical abstract supplement. Washington, D.C. p. 225.

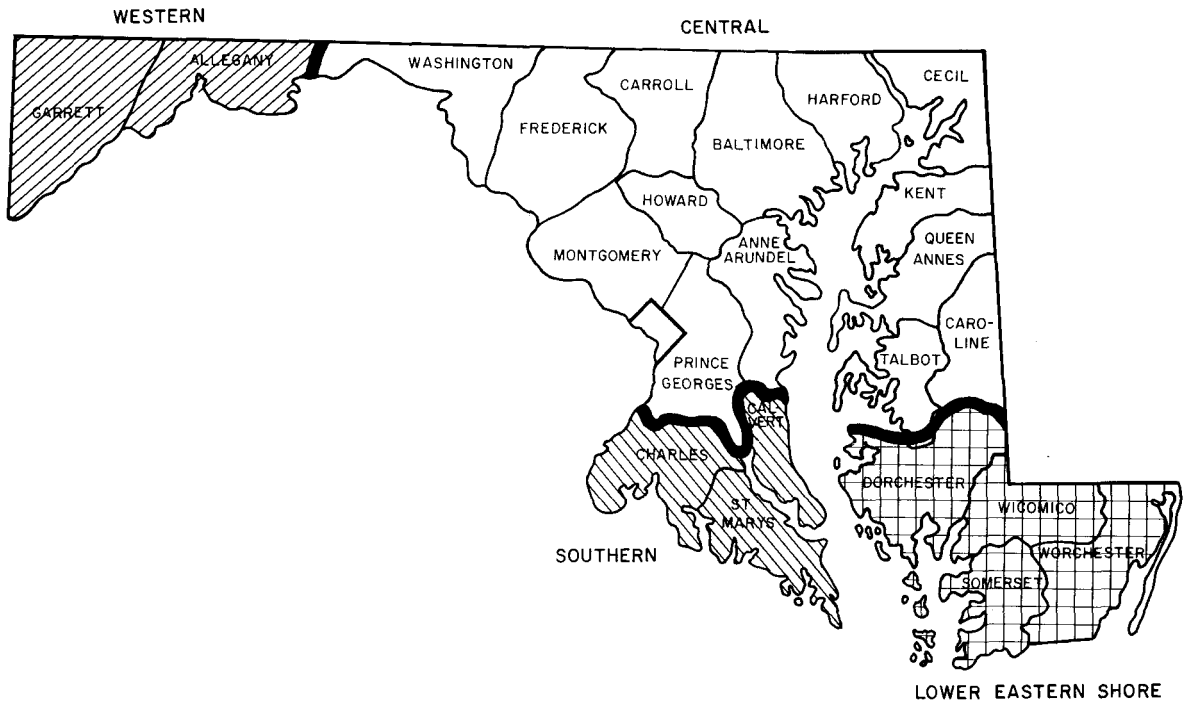


Figure 2.—The four geographic units of Maryland, 1976.

Lower Eastern Shore Unit
COUNTIES: 4
LAND AREA: 1,147,520 acres
COMMERCIAL FOREST: 46 percent
POPULATION: 127,007[1]
RURAL POPULATION: 74 percent[1]
POPULATION DENSITY:
71 per square mile[1]
PER CAPITA INCOME: $2,586[2]

The forests of this unit are dominated by loblolly pine stands growing on flat, poorly drained lowlands. Most of the softwood volume in the state is in this unit where forest industries are relatively active. The commercial forest land in this unit has the greatest volume per acre of all units. This unit also has the sparsest population.

Western Unit
COUNTIES: 2
LAND AREA: 695,680 acres
COMMERCIAL FOREST: 74 percent
POPULATION: 105,520[1]
RURAL POPULATION: 58 percent[1]
POPULATION DENSITY:
97 per square mile[1]
PER CAPITA INCOME: $2,410[2]

This is the most mountainous and heavily forested unit. Because of its relatively high elevation, this is the section of the state where most of the northern hardwoods, hemlock, and white pine are found. All of the coal reserves of Maryland are in this unit. This unit also has the lowest per capita income.

Central Unit
COUNTIES: 14
LAND AREA: 3,815,680 acres
COMMERCIAL FOREST: 29 percent
POPULATION: 3,574,124[1]
RURAL POPULATION: 19 percent[1]
POPULATION DENSITY: 599 per square mile[1]
PER CAPITA INCOME: $3,607[2]

This unit is by far the largest and most diverse. Since it has more people per square mile and a greater proportion of land in farms than any other unit, it has the lowest percentage of commercial forest land. Per capita income is much greater than in the other units.

Southern Unit

COUNTIES: 3
LAND AREA: 671,360 acres
COMMERCIAL FOREST: 56 percent
POPULATION: 115,748[1]
RURAL POPULATION: 86 percent[1]
POPULATION DENSITY: 110 per square mile[1]
PER CAPITA INCOME: $2,583[2]

This is the smallest unit and also the one with the highest percentage of rural population. Much of the land in this unit was farmland that was abandoned and invaded by Virginia pine, the most common softwood tree in the unit. Common hardwoods include oak, yellow-poplar, and sweetgum.

FOREST AREA

The total area of Maryland is 7,873,920 acres. Of this, 20 percent is classed as water by the U.S. Bureau of Census—14 percent for Chesapeake Bay (1,104,640). The remaining 6.3 million acres is considered land, making Maryland the 42nd largest state in the country.

The land area can be divided into two classes: nonforest and forest. There are 3.7 million acres—58 percent of the total land area—that are nonforest. This land is taken up by such uses as roads, parking lots, buildings, and farmland. But not all of these acres are void of trees or even miniforest stands. Trees that occupy less than an acre of land, or trees in median strips of highways, backyards, along streets, or in inner-city parks are not included in the statistics of this report. Yet these trees are very important and valuable for the Maryland city dweller. They provide shade and thus serve as natural air conditioners. They muffle noise and cleanse the air, thus reducing levels of these types of pollution. They provide food and shelter for squirrels and songbirds, which, in turn, provide recreational opportunities for members of urban communities. And they also provide physical and mental contentment—relief that is hard to come by in an environment of asphalt, glass and steel. So while we are not charged with inventorying the urban forest, we recognize it as a valuable resource and one that is used intensively by most Marylanders.

The other class, forest land, presently covers 42 percent of the land area of Maryland —a total of 2,653,200 acres. Forty percent of the land area—2,522,700 acres—is classed as commercial forest land, and it is land which we will be dealing with in this report. The remaining forest land is noncommercial and is primarily land withdrawn from timber utilization by statute or administrative order, such as state parks.

Total forest land has decreased by more than 10 percent since 1964. All of this loss occurred in commercial forest land, which dropped nearly 13 percent over this period. Noncommercial forest land actually increased by 52,100 acres or 66 percent.

The change in commercial forest-land area is distributed unevenly among the four geographic units. The Central Unit had the greatest loss of commercial forest land, dropping 22 percent since 1964. The Southern Unit had the next largest decrease—13 percent—followed by the Lower Eastern Shore Unit, which had a loss of only 3 percent. The Western Unit showed an increase of 6 percent, exemplifying the current trend in Appalachian areas where many marginally productive farms have been left to revert to woodland.

These changes seem inversely related to the changes in population that have occurred. From 1960 to 1970 the population rose from 3,100,689 to 3,922,399, an increase of 26.5 percent. For this period, this was the largest percentage increase in the Northeast and the sixth largest of the 50 states. The Western Unit had a population increase of less than 1 percent, and this is the unit registering an increase in forest-land area. The Lower Eastern Shore Unit had a population increase of 4 percent, and its forest-land acreage dropped only slightly. The other two units had large population increases and large decreases in forest-land area. The Southern Unit gained 28,435 residents—a 33-percent rise and the Central Unit gained 787,409 residents—a 28-percent rise.

While Maryland, on the average, is 40 percent commercial forest land, this land use is

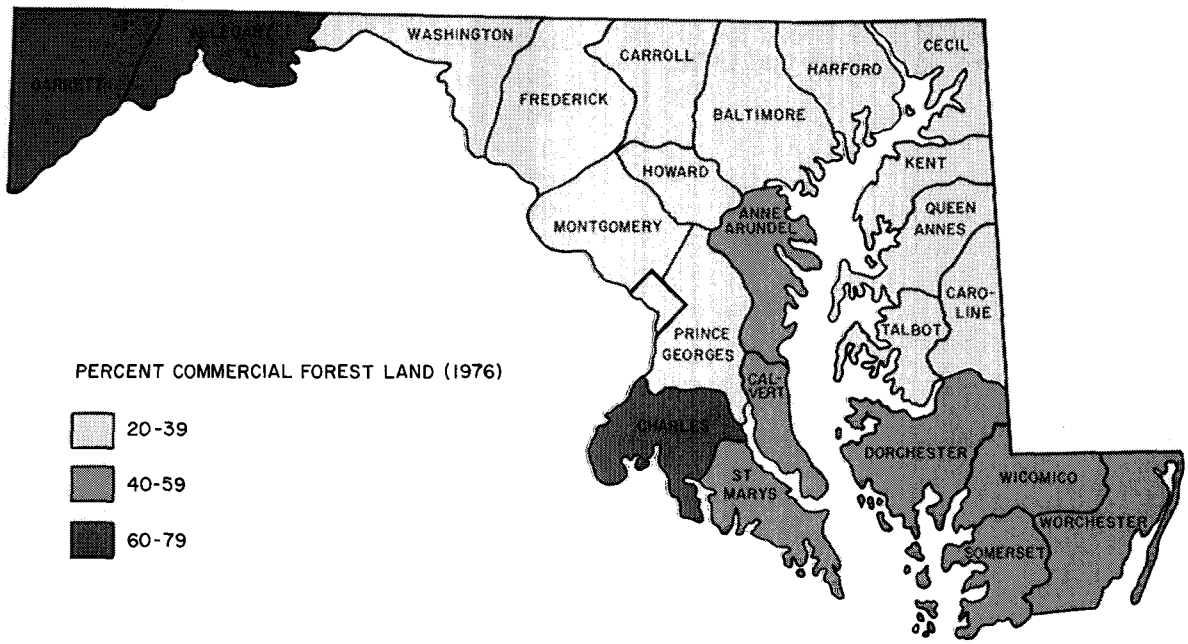


Figure 3.—The distribution of commercial forest land is uneven.

not distributed evenly. Carroll and Montgomery counties have the lowest percentages of commercial forest land—22 each—compared with Allegany County, which has the highest percentage at 76. Figure 3 shows the general distribution of commercial forest land across the state.

Forest-land ownership

Private ownerships make up 90 percent of the commercial forest land in Maryland. Of the 10 percent that is publicly owned—242,700 acres, 76 percent is administered by the state, and about one-half of this land is in the State Forest system.

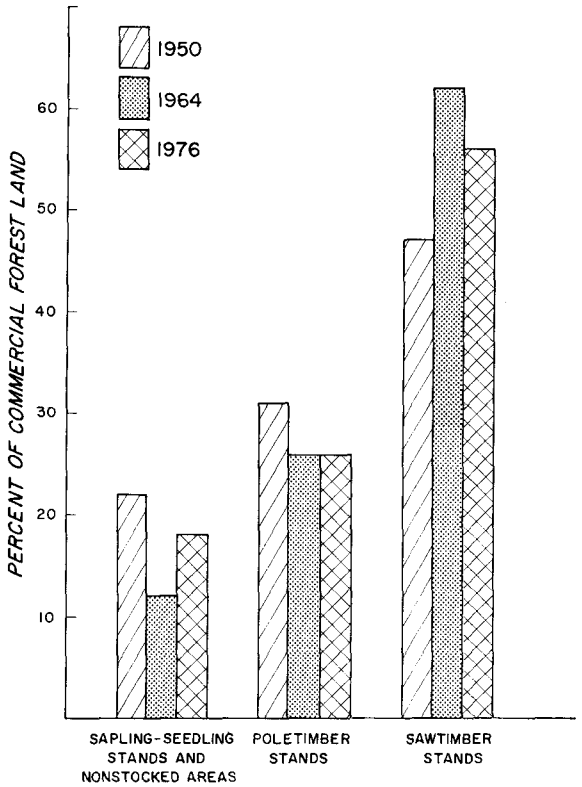
The 2.3 million acres that are not publicly owned are in the hands of an estimated 95,800 private owners. Eighty-seven percent (83,100) of these are individuals; 6 percent (6,200) are corporations; 4 percent (3,600) are partnerships; and 3 percent (2,900) are clubs, youth organizations, churches, and similar associations. The average size of a private ownership of commercial forest land is 23.8 acres, but ownerships range in size from 1 to more than 50,000 acres. Smaller ownerships, fewer than 10 acres, account for the majority (55 percent) of the private owners, but they only amount to 7 percent of the private commercial forest land.

The individuals owning forest land have diverse occupations. Of the total estimated number of 83,100, 20 percent are skilled laborers, 16 percent are retired, 14 percent are white collar workers, 13 percent are farmers, and 11 percent are professionals. In acreage owned, farmers own the largest share—406,700 acres or 25 percent of the individual total; the retired sector is second with 274,200 acres or 17 percent.

Of the total number of corporate owners, nonindustrial businesses and real estate firms account for 54 and 25 percent, respectively. Less than 0.5 percent are forest industries. On an acreage basis, however, real estate firms own 32 percent of the corporate total (of 417,400 acres), forest industries own 26 percent, corporate farms hold 14 percent, and nonindustrial businesses own 8 percent. The average size of corporate ownership of woodland ranges from 11 acres for nonindustrial business to more than 2,200 acres for forest industry.

These estimates of numbers of owners and the amount of commercial forest land they own are based on the responses to questionnaires that were sent to a sample of forest

Figure 4.—Percent of commercial forest land area, by stand size, 1950, 1964, and 1976.



owners in Maryland. The results of this ownership study will be published separately.

Some of these results give indications of how much timber is or will actually be available from these private woodlands. Only 22 percent of the private owners have harvested timber, but they own 53 percent of the forest acreage. Many owners who have not harvested are not opposed to harvesting, but restrictions such as low volume, insufficient area, and immature timber have prevented them from cutting thus far. Two of the most common reasons that woodland owners have for cutting were that they needed money or that the timber was mature. Only an estimated 1,600 owners (2 percent) consider timber production as their primary reason for owning forest land, and they own an estimated 268,300 acres of commercial forest land—12 percent of the private total.

Stand size

Since the initial survey in 1950, sawtimber stands have dominated in the state, followed by poletimber stands, and sapling-seedling stands and nonstocked areas (Fig. 4). This most recent survey showed that sawtimber stands occupy 56 percent—1,413,100 acres—of the commercial forest land. Poletimber stands occupy 26.4 percent—665,500 acres; and sapling-seedling stands and nonstocked areas occupy 17.4 percent (438,200) and 0.2 percent (5,900), respectively.

Since the 1964 survey, the proportion of sawtimber stands has dropped by 6 percent, this loss being picked up entirely by the sapling-seedling stands and nonstocked areas (Fig. 4). The proportion of poletimber stands has varied little over this period. In actual acreage, however, sawtimber stands decreased by 380,300 acres, poletimber stands decreased by 88,400 acres, and other stands increased by 105,900. Most of the drop in sawtimber and poletimber stands occurred in the Central Unit while most of the increase in other stands occurred in the Western Unit.

In a regulated hardwood forest, that is, an intensively managed forest that produces a steady and continual supply of sawlogs, the optimum distribution of stand sizes is 50 percent in sawtimber, 30 percent in poletimber, and 20 percent in sapling-seedling stands (Liscinsky 1978). The situation in Maryland was closest to this ideal in 1950 (Fig. 4). By 1964, the sawtimber stands had increased to 62 percent, mainly at the expense of the sapling-seedling stands. This indicates that cutting was less intense than in a regulated situation, allowing more of the smaller size stands to move into larger size classes. Since 1964, this trend apparently has been reversed, and the distribution is once again approaching this theoretical ideal.

With the absence of natural disasters since 1964, this reversal can be attributed to the activities of man in the forest. More sawtimber stands have been cut and, through either natural or artificial regeneration, transformed into sapling-seedling stands. Such activity could be the result of efforts by State, consulting, and industrial foresters to improve the level of forest management in Maryland.

Forest-type groups

Because of the diversity of the forests of Maryland, a total of 32 forest types were encountered in this survey. These were assigned to eight forest-type groups. Figure 5 gives a breakdown of the commercial forest-land area by group. Growing-stock volume is similarly distributed (Fig. 6).

Oak/hickory. The oak/hickory group dominates all areas of Maryland except the Lower Eastern Shore. The eight forest types composing this group account for 1.2 million acres of commercial forest land. These types are dominated by upland oak species but the forest type with the most acreage in the group is sweetgum/yellow-poplar.

Loblolly and shortleaf pine. This group accounts for nearly all of the softwood acreage in Maryland, but its 522,000 acres account for only 21 percent of the commercial forest land in this hardwood-dominated state. The majority of this acreage is in loblolly pine—295,000 acres—with Virginia pine a close second at 217,900 acres. The remaining acreage in this group is covered by pitch pine and eastern redcedar types. The loblolly pine type dominates the Lower Eastern Shore Unit while the Virginia pine type is more common to the other three units.

Elm/ash/red maple. The five types in this group cover 322,700 acres with the two red maple types accounting for 73 percent of this area. The black ash/American elm/red maple type covers 54,800 acres, or 17 percent of this group, while the two streambank types, river birch/sycamore and willow, make up the remaining 10 percent.

Maple/beech/birch. This fourth most plentiful group—accounting for nearly 200,000 acres—is most heavily concentrated in the higher elevations in western Maryland. The mixed northern hardwood type covers 100,900 acres and is dominated by such species as basswood, white ash, sweet birch, sugar maple, and northern red oak. The sugar maple/beech/yellow birch type, composed almost entirely of the first two species, accounts for one quarter of the group's acreage. Two other high-value types, black cherry and black walnut, cover about 48,100 acres.

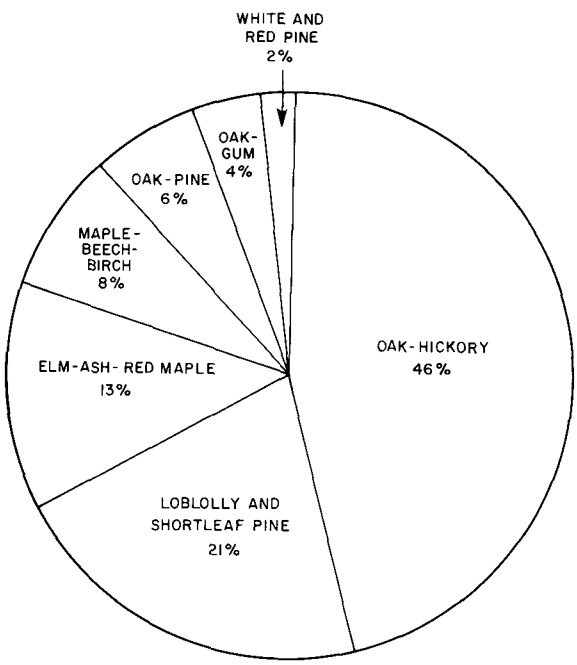


Figure 5.—Percent commercial forest land area, by major forest-type group, Maryland, 1976. (Spruce/fir percentage is less than 0.5 percent.)

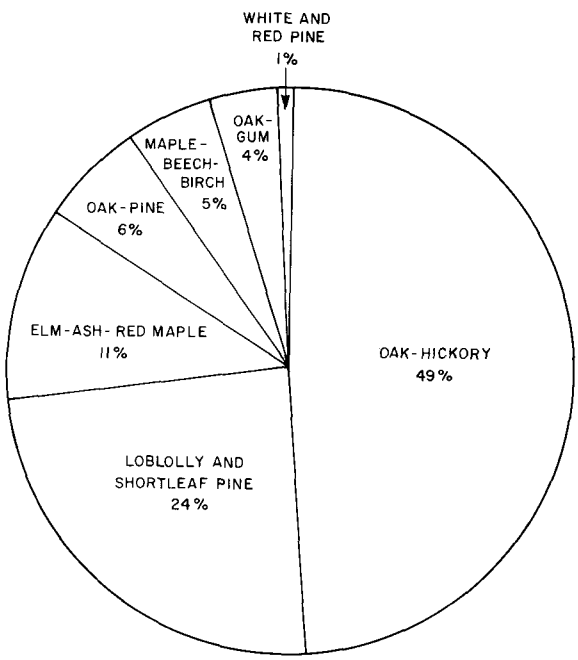
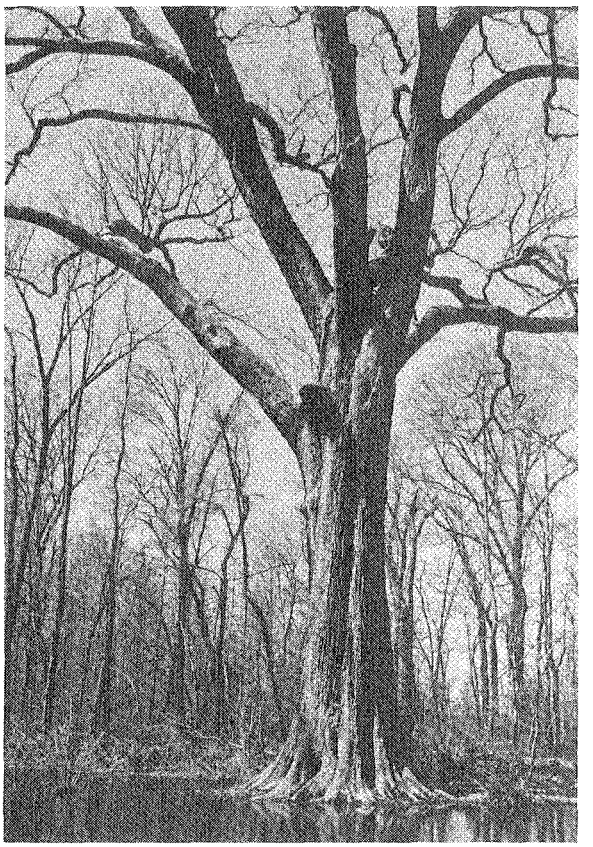


Figure 6.—Percent of growing-stock volume, by major forest-type group, Maryland, 1976. (Spruce/fir percentage is less than 0.5 percent.)

Mistaken for a swamp white oak until recently, the Tuckahoe Oak is the national champion overcup oak. It is located in the Tuckahoe State Park.



Mike Walsh photo

Oak/pine. This group covers 163,100 acres of commercial forest land and is most common in eastern Maryland. The Virginia pine/southern red oak type accounts for more than two-thirds of the group—111,200 acres scattered throughout the state except for the Lower Eastern Shore. There, the loblolly pine/hardwood type prevails in this group, accounting for nearly 50,000 acres.

Oak/gum/cypress. This bottomland hardwood group covers nearly 100,000 acres and is most commonly found in tidal areas around Chesapeake Bay. Not surprisingly, the Lower Eastern Shore Unit contains over one-half of the group's acreage, and this is the only area of the state where baldcypress is found. Sweetgum is an important species in this group. The sweetgum/willow oak type makes up 72 percent of the group's area. The swamp chestnut oak/cherrybark oak type covers the remainder. These types are not found in the Western Unit.

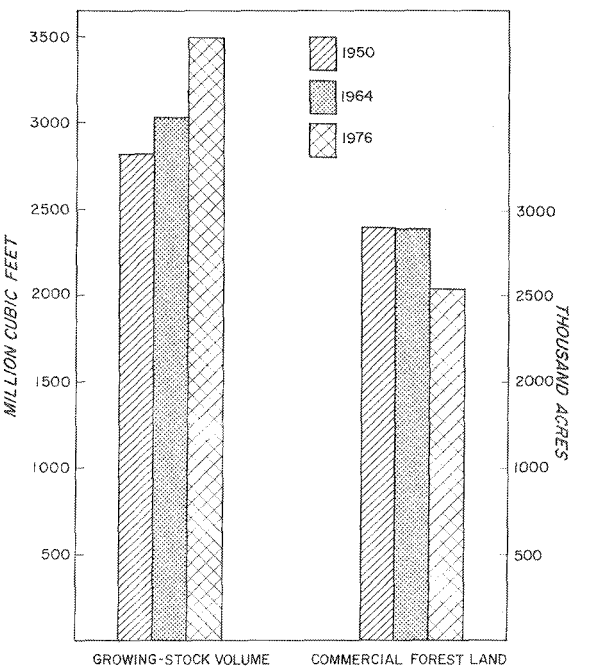
White and red pine. There are only 43,400 acres of this group in Maryland, and the white pine type accounts for 57 percent. The three other types—red pine, white pine/hemlock, and hemlock—split the remaining area evenly. There is considerable native white pine, but all of the red pine as well as much of the white pine is planted. This group is confined to the western areas of the state.

Spruce/fir. There are only about 11,200 acres in the spruce/fir group in Maryland. It is found only in the Western Unit and only at the highest elevations. All of the spruce/fir areas encountered by our field plots had been planted, either to white or Norway spruce.

TIMBER VOLUME

While the area of commercial forest land has been declining over the last quarter century, the volume of timber growing on that land has been rising steadily (Fig. 7). In 1950,

Figure 7.—Growing-stock volume and commercial forest land area of Maryland, 1950, 1964, and 1976.



Maryland had about 2.8 billion cubic feet of growing stock. By 1960, the total had climbed to 3.1 billion, and in 1976 the figure was 3.5 billion. This is nearly a 25-percent increase from 1950 to 1976. Sawtimber volume increased at a faster rate, rising by 34 percent since 1950. The total in 1950 was 6.1 billion board feet; in 1964 it was 7.0 billion; in 1976 it was 8.2 billion.

Because volume has been increasing on a shrinking land base, the average volume per acre has been increasing. In 1950, the average acre of commercial forest land had a net growing-stock volume of 967 cubic feet and a net sawtimber volume of 2,111 board feet. In 1964, these averages had risen to 1,060 cubic feet and 2,413 board feet. The latest survey shows them to be even higher at 1,384 and 3,237, respectively. While sawtimber stands dominate in the state and account for most of the increase, the sapling-seedling and pole-timber stands had the largest percentage increases.

Besides the 3.5 billion cubic feet of net volume in growing-stock trees, there are almost 400 million more cubic feet of net volume in cull trees. There are 285 million net cubic feet in rough trees. These are trees that are too crooked or misshapen to be considered growing stock. And there are 111.7 million net cubic feet of sound wood in trees that contain too much rot to be classed as growing stock. In Maryland, about 16 percent of all trees larger than 5.0 inches in diameter at breast height (dbh) are either rough or rotten. For hardwoods, about 1 of 5 trees is a cull while in softwoods only 1 of 25 is a cull. Compared to the situation in 1964, this shows a slight improvement in softwoods but an increased proportion of hardwood culls.

Sawlog quality

The volume of softwood sawtimber in Maryland is 1.7 billion board feet. Of this, 21 percent is Grade 1. 12 percent is Grade 2 and 67 percent is Grade 3. Pine sawlog quality has improved since 1964 when only 3 percent of the pine sawtimber volume was Grade 1, 14 percent was Grade 2, and 83 percent was Grade 3. This improvement is due to residual trees growing larger and shedding their branches and to improved management of loblolly pine on the Lower Eastern Shore.

Indeed, the softwood quality is best in the Lower Eastern Shore Unit, where 28 percent of the pine sawtimber volume is Grade 1. This is mainly loblolly pine, a species that prunes itself rapidly early in life, yielding logs with few knots and, therefore, higher quality. The other units, in descending order of pine quality, are: Central, Southern, and Western. Most of the pine in these units is Virginia pine, which is a very poor natural pruner.

Hardwoods are graded by standards very different from pines, so the situation is not comparable. Twelve percent of the 6.4 billion board feet of hardwood sawtimber volume is Grade 1, 20 percent is Grade 2, 44 percent is Grade 3, and 24 percent is in tie and timber material. This seems a slight improvement over 1964 when 9 percent was Grade 1, 17 percent was Grade 2, 35 percent was Grade 3, and 39 percent was in tie and timber material.

The differences between units are not as large for hardwood quality as for softwood quality. The state, on average, has 32 percent of its hardwood sawtimber volume in Grades 1 and 2. The Central Unit is best in this respect with 36 percent. The Western Unit is worst with only 20 percent. The Southern and Lower Eastern Shore Units both have 30 percent of their hardwood sawtimber volume in these grades.

The best way of improving hardwood quality is through better forest management. This entails removal of low-grade material so that the growth of the stand will be on the remaining higher quality trees. Removal of these poorer stems will also allow the residual trees to grow larger faster. Thus they will meet the minimum diameter specifications for Grade 1 and 2 sawlogs in a shorter period of time.

Species

The growing-stock volume of Maryland is 23 percent softwood—793 million cubic feet—and 77 percent hardwood—2.7 billion cubic feet. In 1950, the softwood component amounted to 27 percent and by 1964 it was down to 24 percent, so the trend is toward proportionately fewer softwoods and more hard-

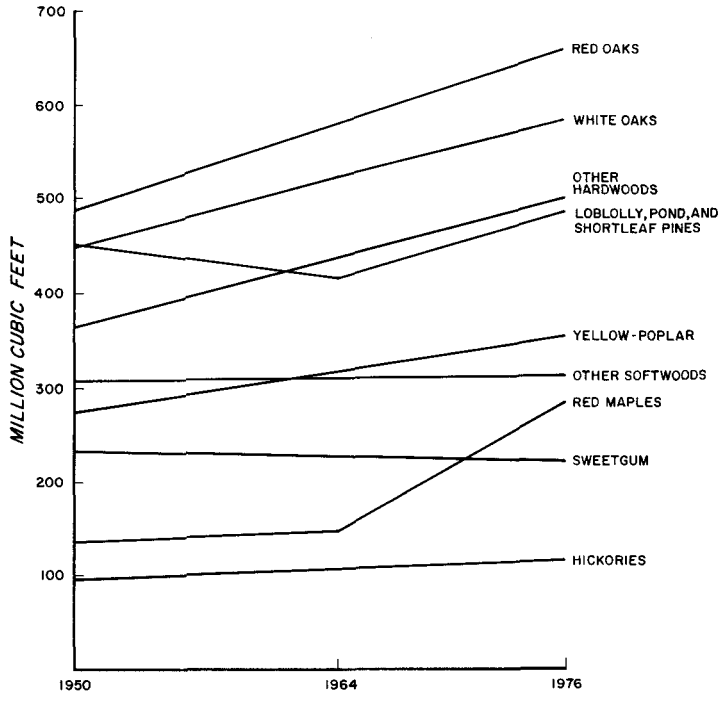


Figure 8.—Growing-stock volume in Maryland, by species, 1950 and 1976.

woods. This is also true for sawtimber volume. This is interesting in that the original forests of Maryland were nearly all hardwood; so the proportion of softwoods has been increased by the activities of man. The successional trend of the pine sites of the state is back toward hardwood species, and the pine will be maintained only by the conscious efforts of landowners and land managers.

Softwoods. The softwoods are dominated by the 470 million cubic feet of loblolly pine. This desirable southern pine, found in Maryland principally on the Lower Eastern Shore, is the species with the most volume in this predominantly hardwood state (see box). It accounts for 14 percent of the total growing-stock volume and 59 percent of the softwood volume. Because of its high growth rate and usefulness in many products, loblolly pine has received the most attention from a management standpoint. Loblolly pine was being overcut from the late 1940's through the mid-1960's. The inventory was steadily decreasing, and shortages of pine on the Eastern Shore were certain to occur unless something was done. After the results of the second survey were published (Ferguson 1967), and the situation became known, corrective actions were taken. Due to efforts by industry, private landowners and the Maryland Forest Service, the overcutting slowed, stopped, and growth began to exceed removals. Because cutting was reduced and more intensive management was applied, loblolly pine, along with its southern associates of pond and shortleaf pines, has increased in volume by 17 percent since 1964 (Fig. 8).

THE TOP TEN

Here are the ten species that dominate the timber resource of Maryland:

		Million cubic feet	*Percent of total*
1.	Loblolly pine	470	14
2.	White oak	368	11
3.	Yellow-poplar	351	10
4.	Red maple	279	8
5.	Virginia pine	237	7
6.	Sweetgum	221	6
7.	Northern red oak	182	5
8.	Chestnut oak	171	5
9.	Black oak	155	4
10.	Scarlet oak	136	4
	Total	2,570	74

The other major softwood species in Maryland is Virginia pine. At 237 million cubic feet, it ranks fifth in the state. Virginia pine is found throughout Maryland but most is concentrated in the Central Unit. Its volume, along with the relatively small volumes of the other softwoods (white pine, pitch pine, eastern redcedar, red spruce, baldcypress, hemlock, and others), has changed little since 1950. The reason for this is that growth and removals of these species have remained very close (Fig. 9).

Hardwoods. Hardwood volume has risen by nearly 32 percent since 1950, and by 16 percent since 1964. This is attributable to annual growth exceeding annual removals for the period and thus the difference, or net change, has been added on every year. This net change is due primarily to the maturing of Maryland's second- and third-growth stands. Ingrowth (the net volume of trees that become poletimber size) and accretion (the net growth on the initial inventory) have increased the volumes per acre significantly and removals simply have not kept pace.

For convenience, the more than 50 hardwood species found in Maryland have been combined into seven groups. The red oaks are most common and the volumes of the nine red oak species in Maryland total 654 million cubic feet, an increase of 34 percent since 1950 (Fig. 8). Northern red, black, and scarlet oak account for 72 percent of this volume. Fifty-six percent of the red oak volume is in the Central Unit, and 21 percent is in the Western Unit. The remainder is split evenly between the Southern and Lower Eastern Shore Units.

The white oaks are the second largest group, containing 580 million cubic feet, a 29 percent rise since 1950. In this group of seven species, white oak accounts for 64 percent of the volume, or 368 million cubic feet, and is the most abundant hardwood species in the state. Chestnut oak, which ranks eighth in volume in Maryland with 171 million cubic feet, has 29 percent of the white oak group's volume. The white oaks are distributed similarly to the red oaks, except they are concentrated a little less heavily in the Central Unit and proportionately more so in the Southern and Lower Eastern Shore Units.

Other hardwoods, a group that includes such species as blackgum (20 percent), beech (19 percent), white ash (12 percent), sycamore, sugar maple, and black locust (7 percent each), has over 18 percent of the hardwood volume—498 million cubic feet. This mixture of species has increased in volume by 38 percent since 1950, mainly because there are few markets for many of these species. About half

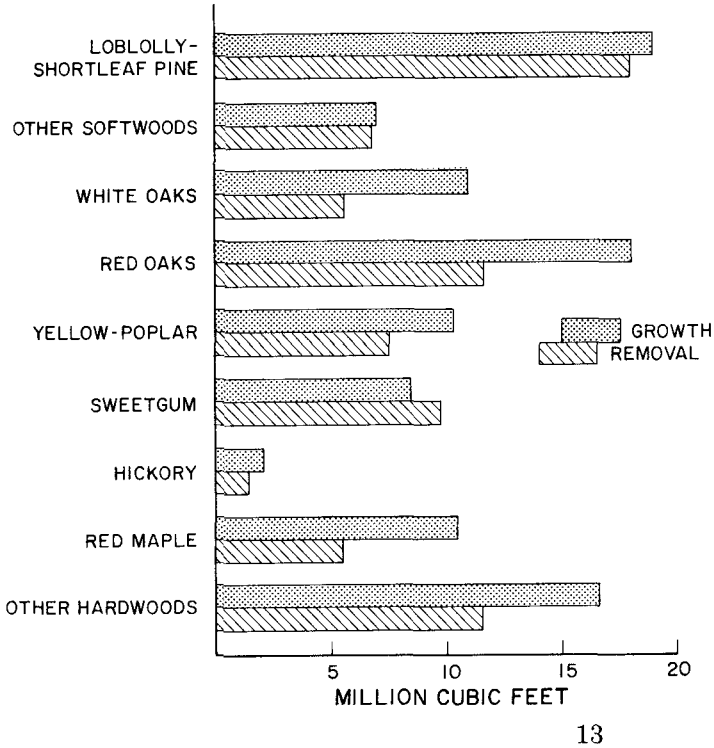


Figure 9.—Average annual growth and removals of growing stock in Maryland, by species, 1950-1976.

of the volume of this group is in the Central Unit, the remainder is nearly evenly divided among the other three units.

Yellow-poplar, with 351 million cubic feet, has enough volume to be a separate group. It is the second most abundant hardwood, and has increased in volume by 27 percent since 1950. Seventy-seven percent of the volume of this straight and fast growing species is in the Central Unit, commonly occurring on the north and east-facing slopes of mesic sites. Eighteen percent of the yellow-poplar is in the Southern Unit, and very little is found in the Lower Eastern Shore or Western Units.

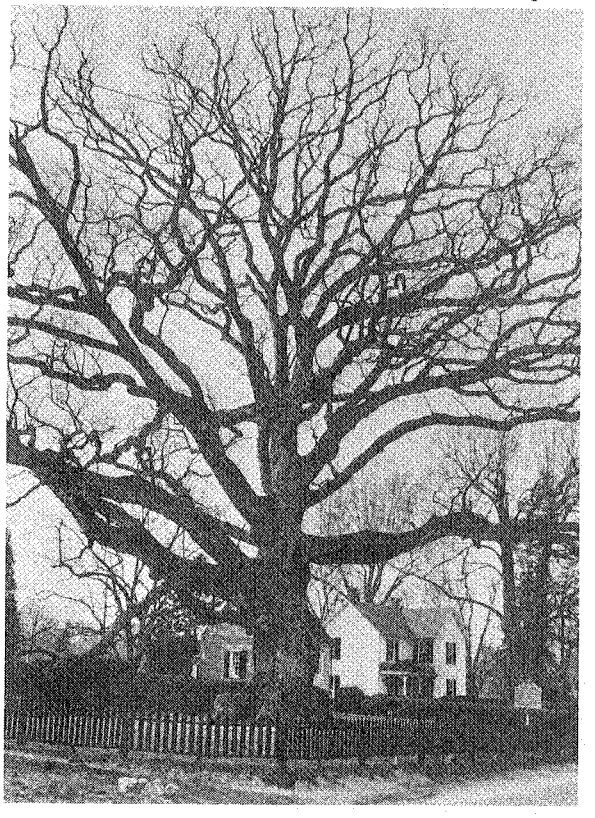
The soft maple group, nearly 100 percent of which is red maple, has increased in volume most dramatically since 1964—up over 90 percent (Fig. 8). In 1950 and 1964, the red maple resource was very small and immature. In 1964, 76 percent of the red maple volume was in trees less than 11.0 inches dbh, and many stands had significant numbers of red maple saplings. As stands were cut, the red maple was left to grow relatively free of competition. So in the absence of demand, rapid growth was attained on standing timber, especially on sawtimber trees. But there also was a big increase in the smaller trees. While the proportion of volume in poletimber trees dropped to 49 percent in 1976, the volume in this smaller material nearly equals the total for red maple in 1964. Ingrowth was thus substantial as the red maple filled holes left by previous occupants of cut stands. So it is not surprising to find most of the red maple—42 percent—in the Lower Eastern Shore Unit, often in cutover stands. It is also the most common hardwood in this unit.

Sweetgum, at 221 million cubic feet, is the only species that has decreased in volume since 1950—down about 5 percent. This is attributable to removals exceeding growth for this highly desirable species. This typically southern and bottomland hardwood is found most frequently in the Lower Eastern Shore Unit, followed by the Central and Southern Units. It does not occur naturally in western Maryland, where the climate is too cold.

The hickories form the seventh hardwood group and have a growing-stock volume of 115 million cubic feet. Hickory volume is up 18 percent since 1950. Over two-thirds of the volume (68 percent) is in the Central Unit. The Western and Southern Units each contain 15 percent of the hickory volume with the remaining 2 percent found on the Lower Eastern Shore.

This national champion white oak, known as the Wye Oak, is a splendid example of Maryland's state tree. It is located in Wye Oak State Park in Talbot County.

Mike Walsh photo



GROWTH AND REMOVALS

To understand how the inventory changes, we compare the average annual growth with the average annual removals—the growth of wood on trees versus the volume removed from the inventory through cutting and changes in land use. The volume of growing stock in Maryland has increased by 667 million cubic feet since 1950, and the sawtimber component has increased by 2 billion board feet. This increase was due almost entirely to a slight de-

cline in timber harvesting statewide since 1950 (see Timber Supply Outlook). In 1952, actual timber removals in Maryland stood at 64 million cubic feet compared with 58.9 million in 1975 (Table 27).

Change in the inventory

The annual change in growing-stock and sawtimber volume is equal to net growth less timber removals. Net growth is the sum of several factors. The first of these is accretion and ingrowth. The sum of these is gross growth. Net growth is gross growth less changes in merchantability (cull-increment and mortality). It is these components of net growth that the forester seeks to manipulate through forest management.

An unusual change in any one of these factors can cause a substantial change in the annual inventory. For example, a sudden insect attack may increase mortality or cull increment. A sudden increase in timber demand may increase timber removals, which, in turn, could reduce the rate of increase in the inventory.

From 1950 to 1975, gross growth of growing stock averaged 125 million cubic feet per year (Table 20). Of this, 93.3 million or 75 percent of gross growth was growth on the initial inventory. Ingrowth accounted for 31.7 million cubic feet or 25 percent of gross growth.

Cull increment is the volume that became rough or rotten, and growing-stock mortality is the volume of growing-stock trees that die. Together, cull increment and mortality reduced gross growth by 21.7 million cubic feet per year or about 17 percent. Thus during this period Maryland produced 103.3 million cubic feet of growing stock annually. Of this volume, an average of 77.6 million was removed for products or in land use changes such as highways and park land. So during the past quarter century, Maryland added an average of 25.7 million cubic feet to its growing stock inventory each year.

Net growth and removals

During the period from 1950 to 1975, average annual growth exceeded average annual removals by 33 percent. For softwoods, the margin of average annual growth over removals was much closer at only 5 percent. During the 25 year period, the average annual growth of hardwoods exceeded removals by 46 percent.

Figure 9 shows growth and removals for major species for the last quarter century. Only one species, sweetgum, was being overcut during this period. Two other groups, other softwoods and loblolly-shortleaf pine, had removals of 99 and 94 percent of growth, respectively. Besides these three, the other species have growth well in excess of cut. The white oaks are in least danger of overcutting since their removals are only 50 percent of growth.

Although these 26-year averages appear encouraging statewide, the trend-level situation in 1975 showed softwoods being removed faster than they were growing in the Central and Western Units, while hardwood removals exceeded hardwood growth in the Southern and Western Units. The large amount of land clearing and loss of commercial forest land to nonforest land uses is perhaps the primary reason that removals exceeded growth in the Central and Southern Units. The volume of growing stock on land that has been cleared or otherwise changed from commercial forestland use during the period between inventories is considered as timber removals. In the Western Unit, timber is a more important component of the local economy than in the less timbered farm and urban areas to the east. There are many small sawmills and a large woodpulp mill in western Maryland that require steady supplies of raw material. Also, the annual net growth per acre is low in this region, so it does not take too high a level of removals before overcutting occurs.

TIMBER PRODUCTS OUTPUT

The output of timber products and timber removals data shown in Tables 25 through 27 should not be confused with the estimates of annual timber removals shown in Tables 20 through 22. Tables 25, 26, and 27 are based on the results of a 100-percent canvass of all primary wood-product manufacturers that were operating in Maryland in 1975. The results of utilization studies of recent logging operations also were used in compiling this information.

These tables will be the basis of the discussion in this section. Tables 20, 21, and 22 were developed from remeasurement of permanent sample plots and represent 1976 growth and removals as indicated by the trend between 1963 and 1975.

The output of timber products in Maryland from all sources totaled 54.4 million cubic feet in 1975, a decrease of 23 percent from the total output of 70.5 million cubic feet in 1963. From tables 25 and 26 the 1975 total can be broken down:

Source	*Million cubic feet*	*Percent*
Softwood growing stock	15.6	29
Hardwood growing stock	23.4	43
Total growing stock	39.0	72
Other sources	4.2	7
Total roundwood output	43.2	79
Plant byproducts	11.2	21
Total, all sources	54.4	100

The other sources mentioned include trees that are less than 5.0 inches dbh, tree tops and limbs from commercial forest areas, any material from noncommercial forest land or nonforest land such as fence rows and suburban areas, rough and rotten trees, and salvable dead trees.

In 1975, softwoods made up 43 percent of the total output and 42 percent of the roundwood output (18 million cubic feet). Hardwoods made up 57 percent of the total output and 58 percent of the roundwood output (25 million cubic feet). Compared with 1963, total softwood output decreased by 15 percent while the total hardwood output decreased by 28 percent.

If we look at total roundwood output by product and species group, we see some interesting changes from 1963 to 1975. The output from roundwood decreased by 31 percent with the softwood component decreasing by 25 percent and the hardwood component by 35 percent. Most of the softwood drop occurred in sawlog production where softwoods decreased by 61 percent compared with a 22-percent hardwood decrease. Softwoods registered the

Figure 10.—Lumber production in Maryland, 1869-1975.

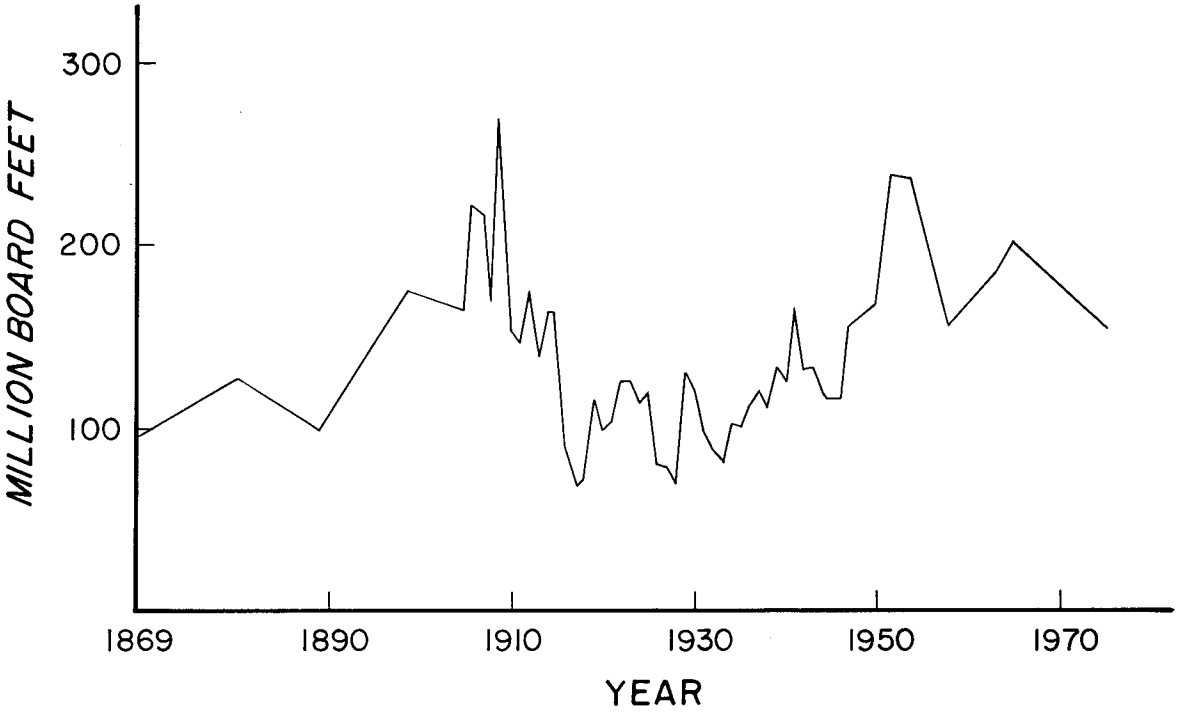
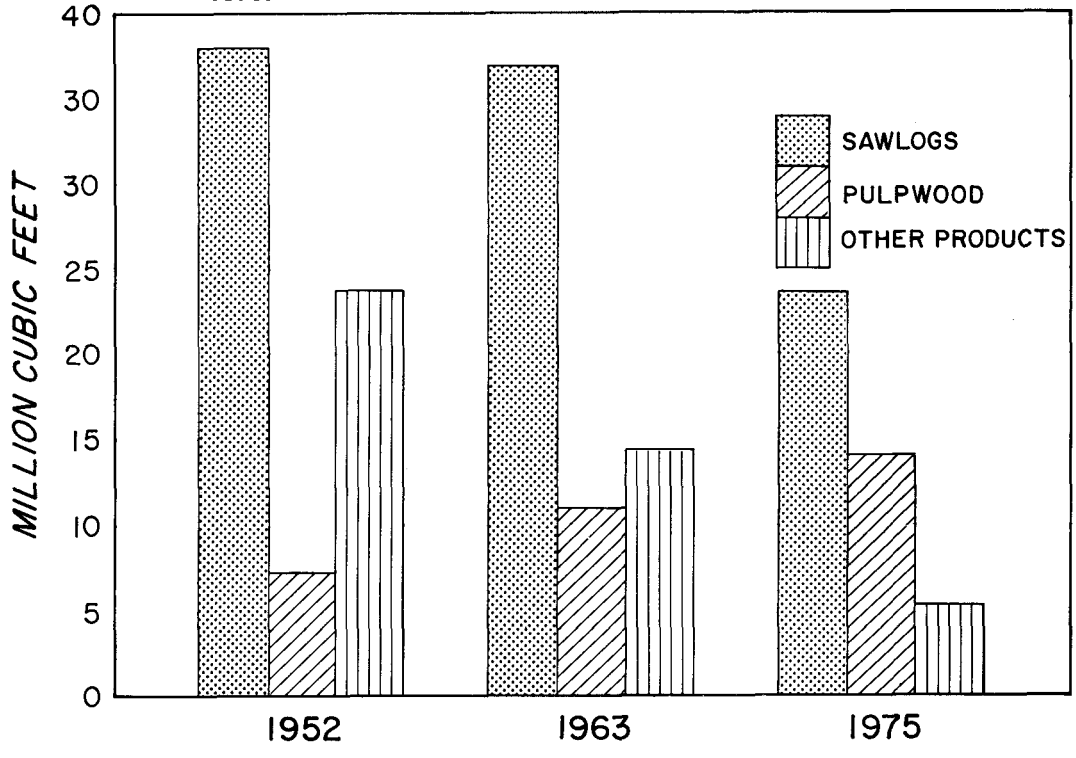


Figure 11.—Timber products output for roundwood in Maryland, by major product, for 1952, 1963, and 1975.



only increases in roundwood output, showing a 52 percent rise in pulpwood and a jump of nearly 1,150 percent (from 222,000 to 2,770,000 cubic feet) in veneer logs and bolts with the establishment of the state's only softwood veneer mill. In 1963 lumber was the primary softwood product while in 1975 more softwood went into pulpwood than any other product. The changes in industrial roundwood production are discussed at greater length in "The Timber Industries of Maryland" (Bones and Brodie 1977). The 1975 roundwood production in Maryland from all sources by product is:

Product	*Million cubic feet*	*Percent*
Sawlogs	23.6	55
Pulpwood	14.0	32
Veneer logs and bolts	3.6	8
Piling	1.2	3
Other industrial	0.4	1
Fuelwood	0.4	1
Total	43.2	100

Lumber and sawlogs

Lumber production in Maryland reached its highest level in 1909—268 million board feet produced by 721 sawmills (Fig. 10). Production fell off sharply to a record low of 68 million board feet in 1917. It climbed to 238 million board feet in 1952 and has generally decreased since then. Lumber production for 1975 was estimated at 156 million board feet based on sawlog receipts (Bones and Brodie 1978). In that year there were 91 sawmills operating, producing an average of 1.7 million board feet of lumber a year. The trend in Maryland, as in many other states, is toward fewer mills with higher annual production levels.

Sawlog production has always dominated the timber output of Maryland, but this appears to be lessening. Figure 11 compares sawlog production with pulpwood and other product production for 1952, 1963, and 1975. Sawlog production in 1952 and 1963 was 37.7 and 36.9 million cubic feet, respectively. By 1975, sawlog production, while still greater than all

Sawlog production accounts for the greatest use of Maryland's timber resource.

Maryland Forest Service photo

other products combined, had dropped substantially to 23.6 million cubic feet. With pulpwood production continuing to increase, the gap between sawlog and pulpwood production narrowed considerably. If this trend continues, pulpwood may soon relegate sawlogs to secondary importance.

The species composition of sawlog production also has changed. Figure 12 shows that loblolly pine, the primary softwood sawlog species, has declined from over one-half of the production in 1954 to less than one-fifth in 1975. This change does not reflect a reduction in the volume of loblolly pine in the state or even a reduction in the volume of larger trees. A comparison of loblolly volume between 1950 and 1976 shows a slight increase in sawtimber volume and only a minor change in the distribution of this volume in dbh class. The decline in loblolly sawlog production is due instead to a change in softwood markets in recent years from sawlogs to pulpwood and veneer.

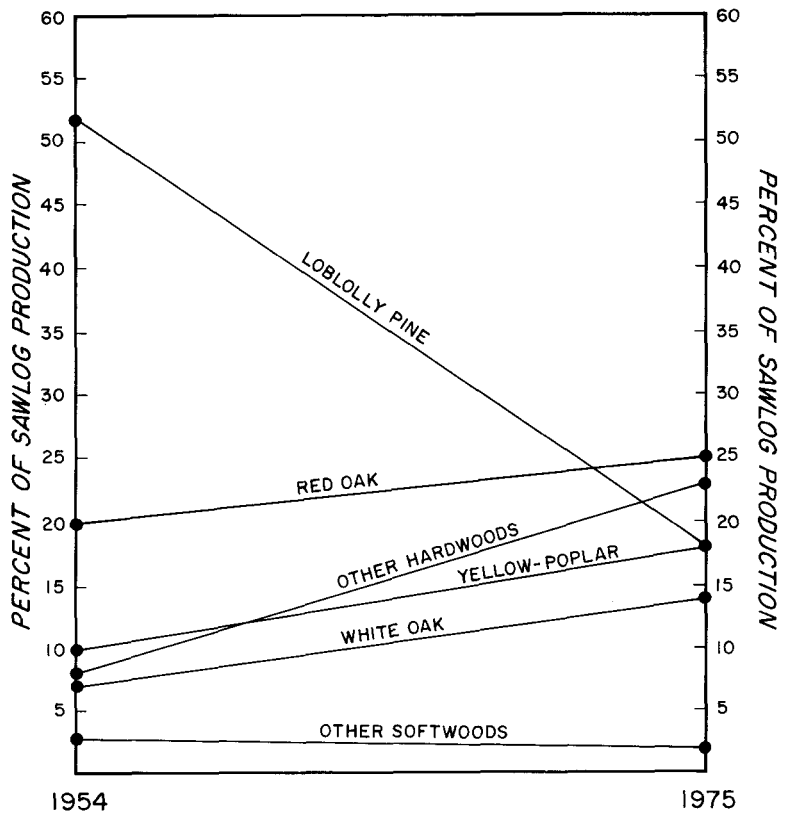
Since total sawlog production has not declined nearly as sharply as loblolly pine sawlog production, the hardwood species have increased proportionately to make up the difference. Oaks have increased in sawlog production from 27 percent in 1954 to 39 percent in 1975. Yellow-poplar production rose from 10 to 18 percent. Other hardwoods, such as gum, maple, ash, cherry, hickory, and beech, have increased dramatically from 8 percent of the sawlog production in 1954 to 23 percent in 1975.

Pulpwood

Pulpwood production has steadily increased in importance since 1952 (Fig. 11). In 1952, pulpwood accounted for 11 percent of the roundwood harvest. By 1963, this figure had increased to 18 percent and in 1975 reached 32 percent.

Total pulpwood production is derived from two sources: roundwood, harvested from the forests and chipped residues, a byproduct of sawmills and other primary wood manufacturing plants. In 1963, roundwood production was 138,000 cords and made up 75 percent of the total pulpwood production. In 1975, roundwood production had increased by 20 percent to 165,200 cords, but made up only 62 percent of the total production. Residues, generally slabs and trimmings from sawmills that are chipped for pulpwood, have increased their share of production from 25 percent in 1963 to 38 percent in 1975. In 1963, only 45,600 cord equivalents of chips were produced from resi-

Figure 12.—Percent of sawlog production in Maryland, by major species group, 1954 and 1975.



dues while 100,941 cord equivalents were produced in 1975—an increase of 121 percent. Total pulpwood production rose by 45 percent over this period, increasing from 183,600 cords in 1963 to 266,100 in 1975. In 1976, the most recent year for which pulpwood production data are available, total production increased by 6 percent to 281,900 cords. Both roundwood and residue production rose.

The softwood-hardwood mix of pulpwood production for 1975 showed that softwoods accounted for 60 percent of the total and hardwoods 40 percent. This has changed little since 1963. In 1975, more than 97 percent of the softwood pulpwood harvest was pine, mostly loblolly pine from the Lower Eastern Shore. Oak and hickory accounted for 43 percent of the 1975 hardwood pulpwood harvest. Figure 13 shows pulpwood production in Maryland, by source, for 1963 through 1976.

In both 1963 and 1975, five counties accounted for more than three-quarters of the roundwood production:

1963

County	*Production in cords*
Allegany	36,600
Garrett	33,800
Wicomico	14,900
Charles	12,700
Prince Georges	10,600
Total	108,600

1975

County	*Production in cords*
Garrett	31,100
Worcester	30,400
Allegany	29,300
Wicomico	22,000
Somerset	11,700
Total	124,500

Garrett and Allegany counties produce most of the hardwood pulpwood. They are heavily forested with hardwood stands, and, with a pulpmill at Luke (Allegany County), there is an available market for the raw material. Wor-

cester, Wicomico, and Somerset Counties, in the heart of the loblolly pine region of Maryland, produce most of the softwood pulpwood.

Since there are only two woodpulp mills in the state (the other is a small plant that makes floor covering and building materials in Finksburg (Carroll County), it is not surprising that 53 percent of the 1975 pulpwood harvest was shipped to out-of-state pulpmills. The difference between hardwood and softwood exports is pronounced and is mainly the result of pulpmill location. In 1975, only a small fraction of the hardwood production left Maryland. Of the softwoods, however, 68 percent of the roundwood production was harvested from the four Lower Eastern Shore counties and most was shipped to Virginia. Thus an increasingly larger portion of trees cut in Maryland is for pulpwood, more than one-half of which is shipped out-of-state for conversion into woodpulp.

Other timber products

Roundwood output of timber products other than sawlogs and pulpwood has been declining at a faster rate than total roundwood output since 1952 (Fig. 11). In 1952, these products, including veneer, piling, fuelwood, cooperage, poles, posts, and mine timbers, amounted to 23.8 million cubic feet or 35 percent of the

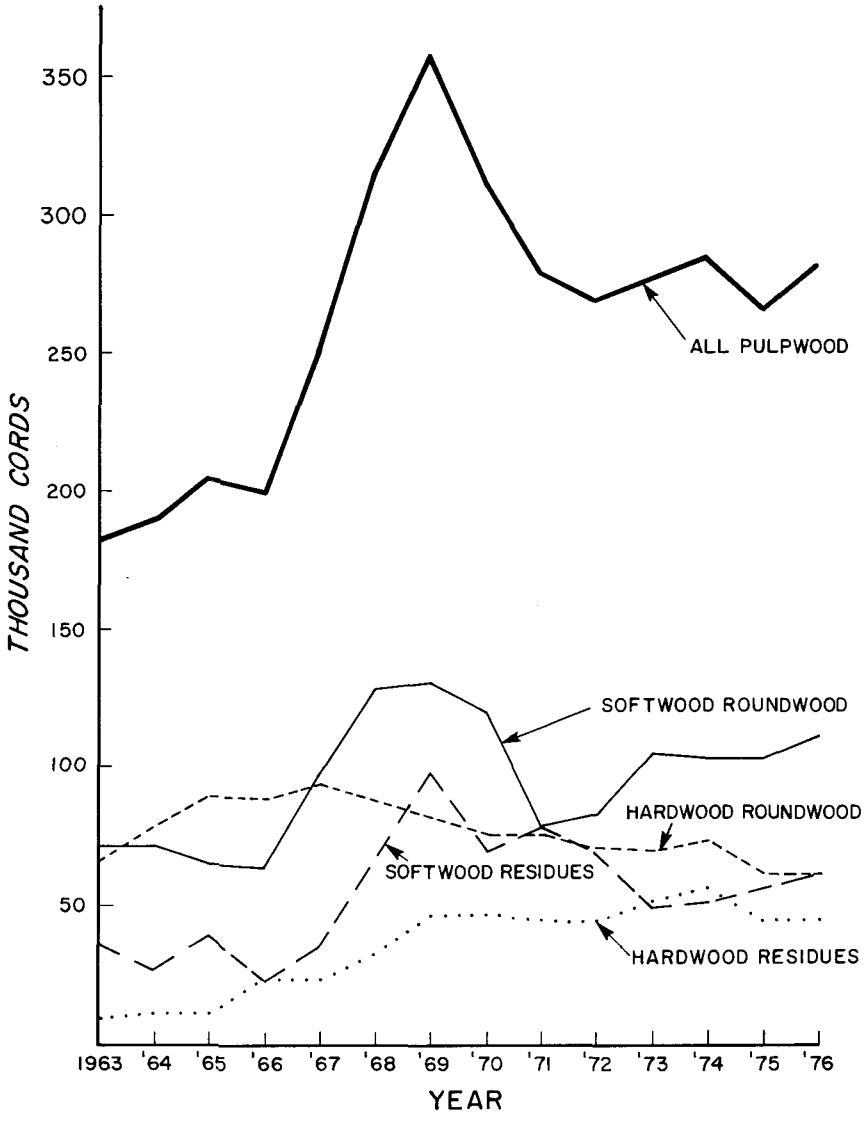
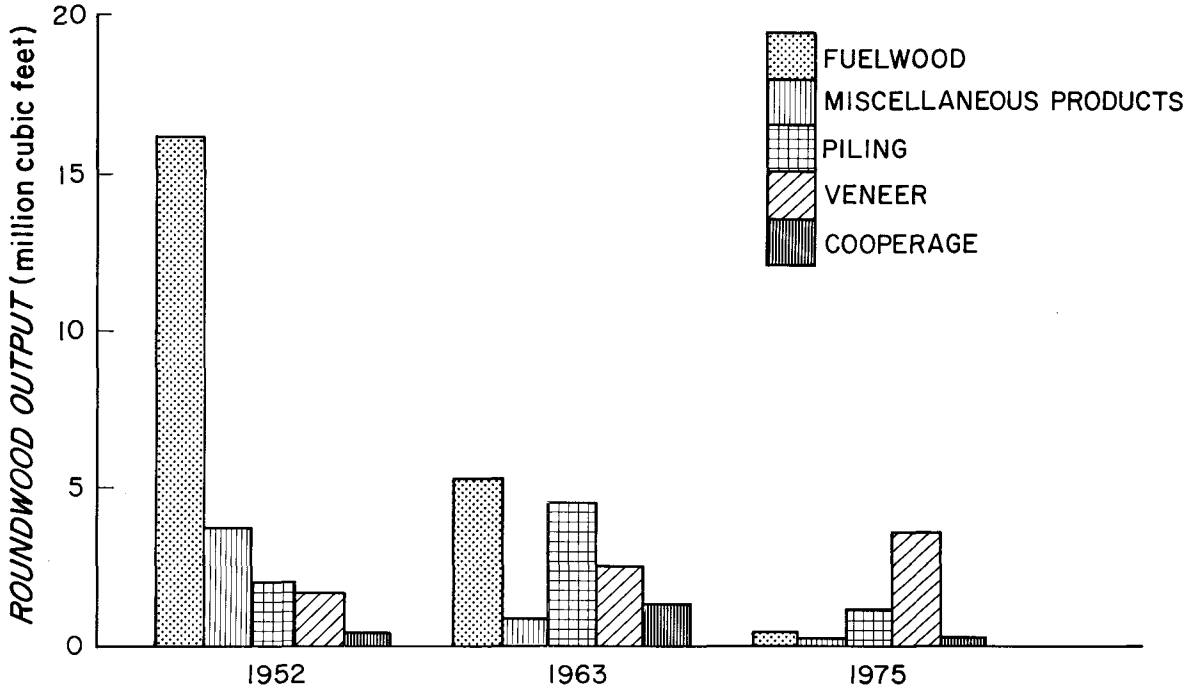


Figure 13.—Pulpwood production in Maryland, by source, 1963-1976.

Figure 14.—Other timber products output from roundwood in Maryland (fuelwood, miscellaneous products, piling, veneer, and cooperage), 1952, 1963, and 1975.



roundwood output. In 1963, only 14.5 million cubic feet (or 23 percent of that year's total) of these products were produced; by 1975, output had dropped to 5.6 million cubic feet or only 13 percent of the total. Figure 14 shows how the output of the more important minor products has changed since 1952.

Besides pulpwood, the veneer industry is the only other timber industry that is expanding production in Maryland. While Figure 14 shows a steady increase in production since 1952, a peak of 23.4 million board feet was reached in 1968 and production dropped back to 21.8 million board feet by 1975. The 1975 output is still a 37-percent increase over the 15.9 million board feet produced in 1963. The most recent data available show that veneer production rose to 24.8 million board feet in 1976.

There are three veneer plants in Maryland. The two located in Cockeysville, Baltimore County, are face-veneer mills that slice hardwood logs for veneer used in furniture and paneling. Though they are relatively small operations, they produce valuable, high-quality material. The third mill is a commercial plywood mill located in Pocomoke City, Somerset County. This mill peels loblolly pine logs and makes the veneer into plywood for construction use. This large mill, built in 1967, is the main reason that softwood veneer log output jumped by nearly 1,150 percent from 1963 to 1975. Two container veneer plants that produced hardwood basket veneer have closed since 1963. These closures are the main reason that hardwood veneer log output dropped by 64 percent between 1963 and 1975.

While piling output amounted to 2.9 million linear feet in 1975, or only 3 percent of the roundwood output of the state, Maryland produces the majority of the pilings in the Northeast. Nearly all of the pilings produced in Maryland in 1975 were softwood, mostly loblolly pine. Because these pilings must be very straight and often quite long, they are more valuable than sawlogs or pulpwood. Piling production fluctuates widely and since many pilings are used to replace damaged or rotten ones, piling production often increases after a particularly harsh winter.

All other products combined amounted to only 2 percent of the 1975 roundwood output. Fuelwood production has dropped drastically since 1952, both from roundwood and from manufacturing byproducts. With fossil fuels becoming scarcer and more expensive, the use of wood as fuel may rise. Cooperage log production, generally from hardwoods, was 1.5 million board feet in 1975, down 79 percent from the 7.2 million board feet produced in 1963. Miscellaneous products such as poles, posts, mine timbers, and ties have decreased since 1952 (Fig. 14), and in 1975 amounted to only 200,000 cubic feet or ½ of 1 percent of the roundwood output.

The place of wood in Maryland's economy

Maryland is a state with a great variety of resources, and this has contributed to the large number of different industries in the state today. Wood-based industries represent a healthy share of the total, accounting for 12 percent of the manufacturing establishments in Maryland in 1972 (U.S. Bureau of Census 1975). This group of industries is diverse and includes such primary industries as sawmills, pulpmills, and veneer mills, as well as secondary industries producing such items as furniture, mill stock, flooring, cabinets, boats, and paper.

In 1972, the payroll for wood-based industries in Maryland amounted to about $128 million, or 5 percent of the statewide industrial payroll. Value added by manufacturing, which indicates the relative economic importance of an industry, is the difference between the cost of goods and services purchased by a manufacturer and the value of the products sold. In 1972, the value added by wood-based industries was about $245 million, again, 5 percent of the state total. The paper and allied products industries accounted for the greatest part —about 65 percent—of the total for all wood-based industries.

While wood-based industries do not constitute a large share of the total manufacturing, they are certainly important in several counties. Garrett, Charles, Calvert, and St. Marys Counties have between 45 and 59 percent of their industry in lumber, wood, and paper and allied products (U.S. Bureau of Census 1975). These counties also have between 51 and 74 percent of their land in commercial forests, and rural populations account for at least 80 percent of the total population. Most of the secondary wood-based industries are located in more heavily populated areas, such as Baltimore County, but they are outnumbered by other industries in these areas.

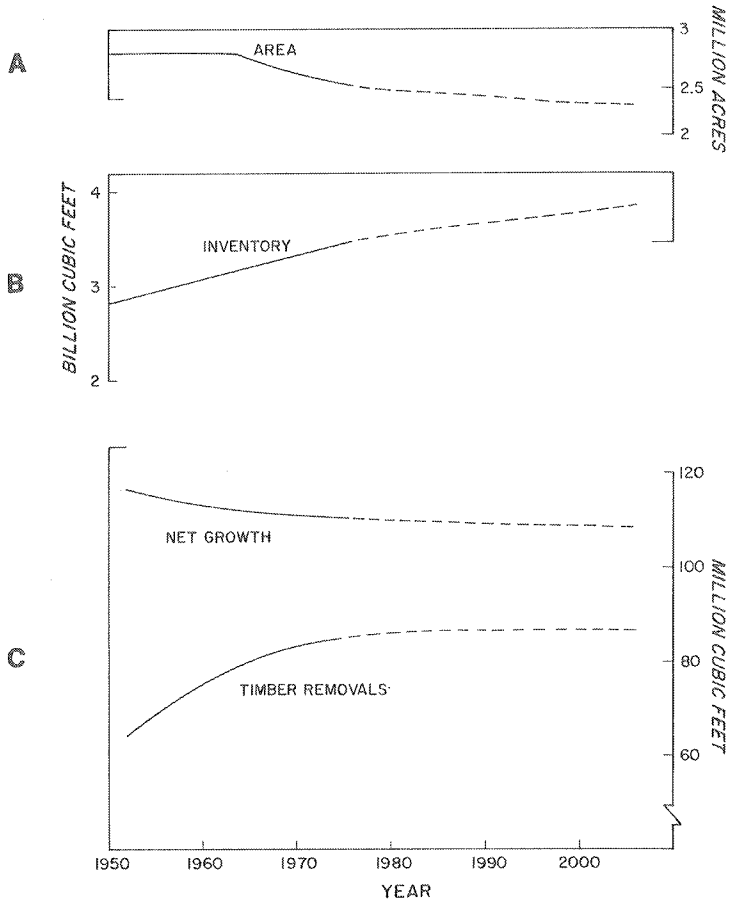
TIMBER SUPPLY OUTLOOK

Long-range projections are hazardous. Long-range projections of timber supply, particularly in today's rapidly changing world, are no exception to this rule. In Maryland, the problem is further compounded by the location of the state. The Boston-Washington megalopolis cuts a wide swath through Maryland's center; to the east lies one of the most productive agricultural regions on the Eastern Seaboard; and to the west lies a region of steep hills and mountains more typical of West Virginia and western Pennsylvania than of the rest of Maryland.

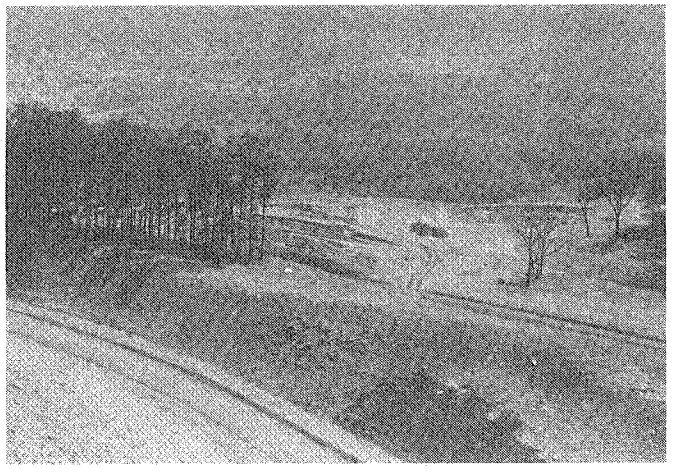
From 1907 to 1950 forest land increased by fewer than 17,000 acres. With increasing farm abandonment, particularly in central and western Maryland, forest land rose from 2,919,800 acres in 1950 to 2,963,000 in 1964. Since 1964, the area of forest land has declined significantly to 2,653,200 in 1976. Most of this decline has resulted from urban and suburban expansion, primarily in the Central and Southern Units. Over the next 30 years, the area of commercial forest land is expected to decline at a constant rate of 0.3 percent per year. Thus commercial forest land will drop from the present 2,522,700 acres to 2,305,000 in the year 2006 (Fig. 15A). Most of this decrease will be in the Central and Southern Units, where urbanization is expected to continue. The Lower Eastern Shore is expected to show a slight decline in commercial forest land as a result of an increasing demand for agricultural land. The forest-land area of the Western Unit, the only unit to show an increase in forest land since 1964, is expected to decline slightly as farm abandonment abates and more forest land is lost due to increases in strip mining and road building.

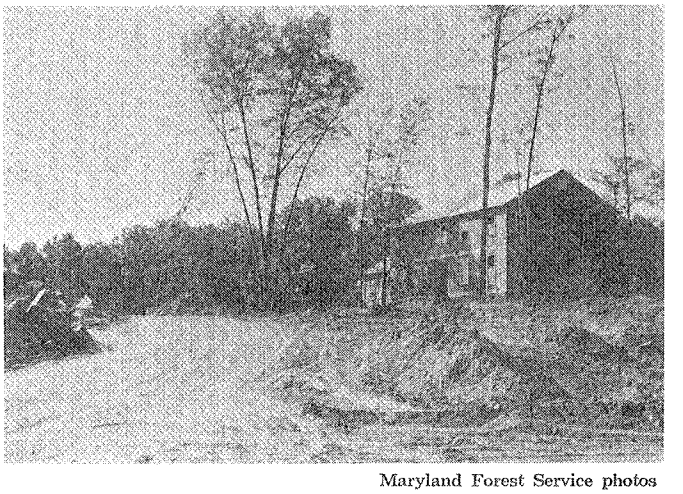
Statewide, only a very modest increase in timber removals is expected—1.2 million cubic

Figure 15.—Projected changes in area, inventory, net growth, removals through 2006.



Considerable forest-land acreage has been lost in Maryland to highway construction and housing developments since the mid-1960's.





Maryland Forest Service photos

feet (Fig. 15C). This, however, is a net effect. Decreases in removals are expected in the Central and Western Units; in the Southern Unit, no change is expected. However, increases are expected in the Lower Eastern Shore Unit as the demand for loblolly pine becomes greater. As Table 30 shows, all of the increase in removals will come from softwoods; hardwood removals should drop slightly over this 30-year period.

Because total removals are not expected to exceed growth over the projection period (Fig. 15C) and because the excess of growth over removals will more than offset the decreasing area of commercial forest, we anticipate an increase in the total growing-stock inventory (Fig. 15B). The current growing-stock inventory stands at 3.5 billion cubic feet and is expected to rise to 3.8 billion in 2006. Nearly all of this increase will come from hardwood species since this is where the gap between growth and removals will be largest.

Again, however, this overall view masks many important regional changes. In the Central Unit we can expect a slight drop in growth brought on by increasing stand density, which itself will be brought on by declining timber removals. Little change in the inventory is expected in the Southern Unit. In the Lower Eastern Shore Unit, despite an increase in timber removals, we can expect an increase in the inventory as growth, already the highest per acre in the state, is increased further as forest management of the region's pine resource is stepped up. In the Western Unit, the only unit in which removals exceed growth, the growing-stock inventory is expected to drop as this overcutting continues. Although overcutting is expected to continue, it will become less severe as timber demand is shifted out of the region and forest management becomes more intense.

Although we anticipate no significant increase in timber removals over the projection period, we do expect that more of the timber that is removed will be used for products. At the present time, about a third of the total volume of growing stock that is removed in Maryland is not used for timber products. With multi-product logging techniques and whole-tree chippers, it will become more and more practical to convert more of the volume removed into a useable product.

TIMBER MANAGEMENT OPPORTUNITIES

When managing commercial forest land for timber production, the primary objective of the manager usually is to grow as much high-quality timber as possible. It follows that his efforts should be in areas that have good potential for growing crops of trees. Eighty-four percent of the commercial forest land in Maryland has the potential of growing at least 50 cubic feet per acre per year. Nearly 40 percent of the woodland is capable of producing at least 85 cubic feet per acre per year, and it is these 981,700 acres that offer the best opportunities for management. While the differences between units are not large, the units with the highest proportion of good sites are the Central and Western.

There is much work to be done, however, before these stands reach their potential. When we look at actual productivity, we see that only 22 percent of the commercial forest land is producing more than 50 cubic feet per acre per year, and only 5 percent is producing more than 85 cubic feet per acre per year. Opportunities for improvement are greatest in the Central Unit, where 89 percent of the commercial forest land is currently producing less than 50 cubic feet per acre per year. Achieving this improvement will be difficult in this part of Maryland, however, since this is an area with an expanding population, where thousands of forested acres are being converted to housing and other nonforest uses each year. Another obstacle, the private ownership of small, forested tracts, will be discussed later.

There are many ways to improve productivity. One major opportunity in Maryland would be to bring understocked forest land to a fully stocked condition. If we consider all live trees, 85 percent of the commercial forest land in Maryland is fully stocked or better. This seems to leave little room for improvement. However, when we eliminate all the cull trees and consider only growing-stock trees, only 52 percent of the forest land is at least

fully stocked. The Lower Eastern Shore Unit has the best stocking with 75 percent of its stands fully stocked. The Western Unit is poorest with only 18 percent.

Stocking and productivity can be improved by applying sound silvicultural practices. In an effort to identify the stands that could benefit from such practices, our field crews evaluated each forested plot and made recommendations that they felt were necessary to maintain or improve the condition of the stand. The results indicate that 58 percent of the stands could use some type of silvicultural treatment, such as thinning, weeding, pruning, improvement cutting, conversion of stand to another type by thinning or planting or both, or removal of immature stand to be followed by regeneration. Only 13 percent of the stands have mature timber and are ready to be harvested and regenerated. The remaining 29 percent of the stands are in good condition and need no treatment at present. This last category ranges from 12 percent in the Western Unit to 53 percent in the Lower Eastern Shore Unit, reflecting basically the current intensity of timber management.

Recommended treatments are quite variable between stands because of differences in forest type, site and stand conditions, past management practices, owner objectives, and economic feasibility. Because of this, there is no substitute for an on-the-ground inspection and evaluation by a professional forester of each stand to be managed. The Maryland Forest Service will provide such services to interested landowners free of charge, and many consulting and industrial foresters also are available to provide assistance. Even though each prescription by a forester will be tailored to a particular set of conditions and circumstances, some general statements concerning timber management of Maryland's two most important forest types will give the reader a better feeling for how such stands are usually managed when maximum timber yield is the primary goal.

The major hardwood type-group, oak/hickory, is best managed using even-age silvicultural procedures if oaks are to be perpetuated (Watt et al. 1973). This means that trees in a stand should be cut at roughly the same time

This loblolly pine was killed by the southern pine bark beetle. The bark sloughed off with help from a hungry woodpecker.

Maryland Forest Service photo

so that all trees forming the new stand will be nearly the same age. The most common method, clearcutting, allows the oak, hickory, yellow-poplar and other associated species that grow best without shade to establish the new stand. To maintain oak/hickory, however, clearcutting should only be done when there are enough small oak and hickory trees growing in the ground-level stratum of the present stand to regenerate it. Without such advance reproduction, the new stand will contain few oaks and hickories. Light cuttings from the needed intermediate operations will not only remove culls and improve the stocking, productivity, and quality of many oak/hickory stands, but they will also open the canopy enough so that oak/hickory advance reproduction can become established.

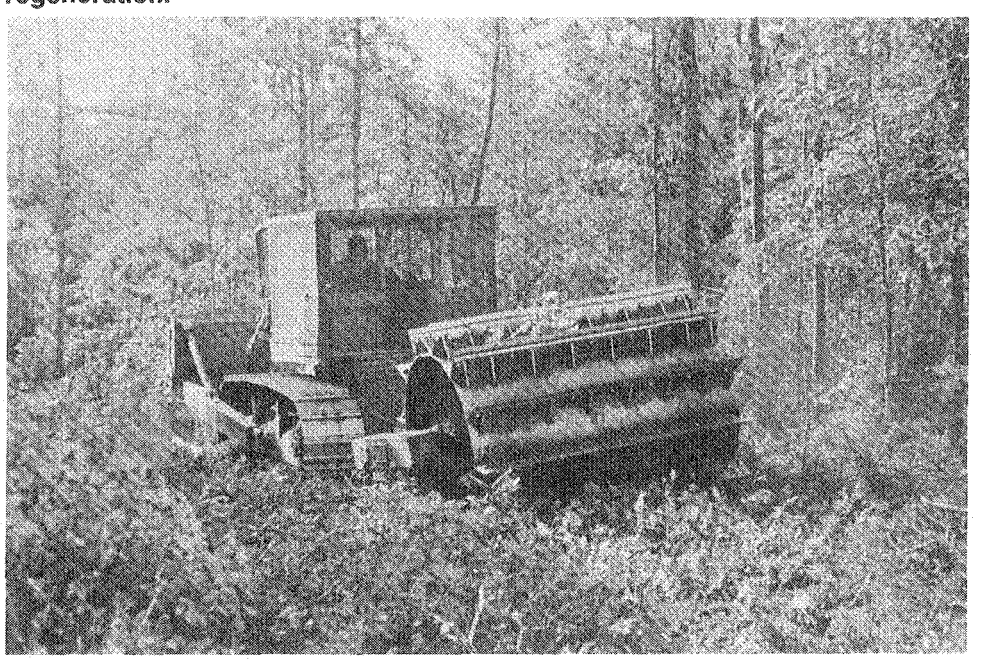
The major softwood-type group, loblolly and shortleaf pine, also is best managed for

timber production by even-age operations (Mann 1973). While this is a valuable, productive type on the Lower Eastern Shore, good loblolly pine stands do not result without strict control of hardwoods. Because so many good pine sites reverted to hardwoods after the pine was cut out, Maryland recently passed the Pine Tree Reforestation Act to get more pine lands into pine production. The law states that anyone cutting timber on lands 25 percent stocked with loblolly, shortleaf, or pond pine must either leave seed trees or submit an alternate plan for reforesting the area. While the natural regeneration from seed trees is relatively inexpensive, there is often a better opportunity, especially on good sites, for artificial regeneration, or planting. After a stand has been clearcut and the hardwoods controlled, generally by prescribed burning or mechanical chopping, the area can be hand or machine planted with genetically superior pine seedlings obtained from State and private nurseries. This form of intensive management is profitable and is practiced on many loblolly pine stands in eastern Maryland.

Another way to increase productivity is to reduce mortality by protecting forests from wildfires, insects, and diseases. From 1964 to 1976 there were nearly 8,000 fires that burned some 25,750 acres. While this 13-year total amounts to only 1 percent of the forest land in Maryland, losses from forest fires may be significant to individual land owners. Even though fire may not kill trees directly, it often weakens them and fire scars provide entryways for insects and diseases. Practically all of the fires were man-caused, a fact which points to the need for more education of the dangers of wildfires and more caution in the woods.

Insects that damage or kill trees have been serious threats in the past and may cause problems in the future. In 1971, on the Delmarva Peninsula, an outbreak of the Southern pine bark beetle killed or weakened thousands of pine trees, destroying some 35 million board feet of timber. The activity of this serious pest has subsided since then, but may flare up again when conditions are right. Gypsy moths have been in the state since 1970, but there has been no serious defoliation so far. This defoliator of hardwoods (primarily white oak) is currently moving south from Pennsylvania,

In some intensively managed loblolly pine stands in eastern Maryland, drum choppers are used in cutover areas to prepare them for pine regeneration.



Maryland Forest Service photo

and its progress is being closely monitored in Maryland. Controlling this pest will be a major challenge in the near future. Other diseases and insects—oak wilt, sweetfern rust, forest tent caterpillar—are serious only in scattered, local situations and containing them will keep mortality levels low.

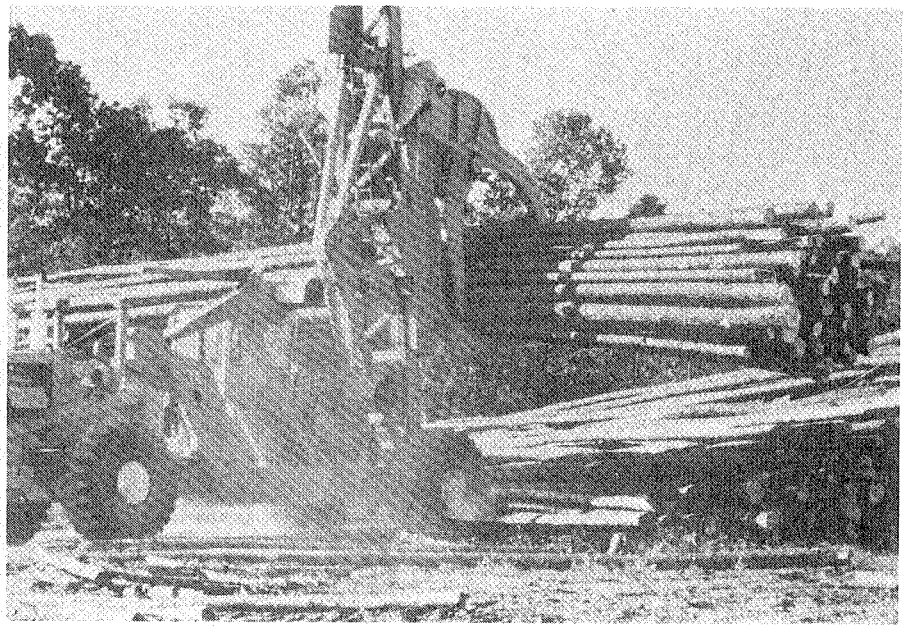
In 1975, growing-stock mortality totaled 16.1 million cubic feet, and sawtimber mortality was 25 million board feet. Much of this was due to nonpreventable causes such as weather and natural suppression. But some of this loss was caused by man's activities—logging and fire—and some by his inactivity—lack of forest management. But there is an opportunity to change this loss into a gain in productivity.

For timber management to be an attractive investment for the forest landowner, there must be markets available for the timber he cuts. There has been and will continue to be a strong demand for high-quality stock of preferred species, because this is a scarce resource. Much of the removals necessary for upgrading the quality and productivity of the timber resource are low-grade or small materials or both. What are the opportunities for using and marketing such removals?

Several products are being made from low-quality timber. Veneer is usually made from high-quality logs, but more and more poor-grade material is being sliced to make beautifully charactered veneer. Other products from low-quality logs are mine timbers, which are in demand in the coal fields of western Maryland as well as neighboring West Virginia and Pennsylvania; pallets, which are in demand in the Baltimore area for shipping and storage of a wide variety of goods; and crossties, which are produced mainly on the Eastern Shore where several treating plants are located.

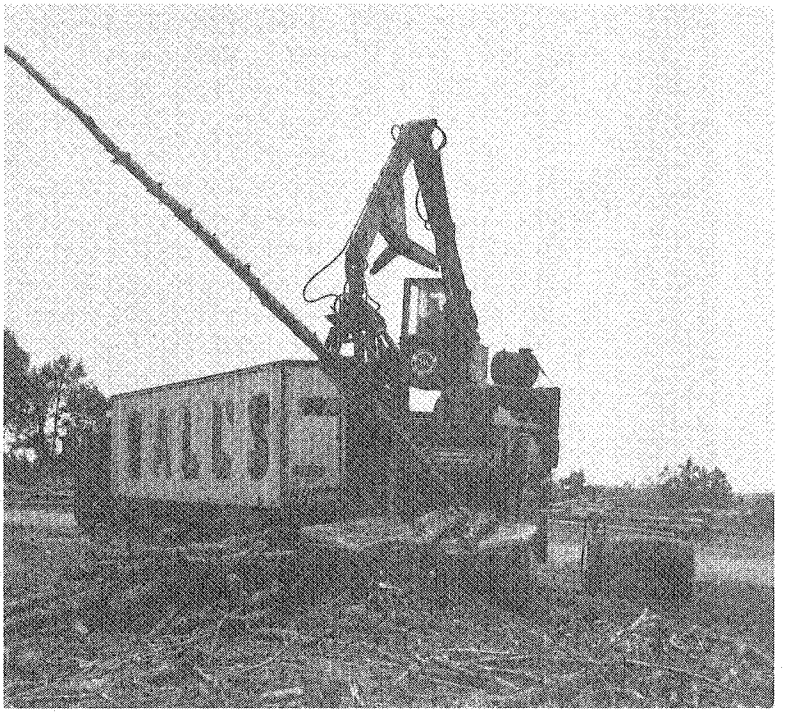
In the woods, whole-tree utilization and tree-length logging offer good potential for increased use. The former, used in eastern Maryland with both softwoods and hardwoods, entails clearcutting an area and then chipping all material that will not make quality sawlogs. Thus nearly all of the logging residues, such as tops and branches, are used and the wood resource is used more completely. On the Eastern Shore, tree-length logging of pine has increased the amount of wood that is removed and used.

Whole-tree logging is one way to use the timber resource more effectively.



Maryland Forest Service photo

Whole-tree chipping on the logging site has been used to reduce logging residues.



Northeastern Forest Experiment Station

Northeastern Forest Experiment Station

After as much wood as possible is removed during logging, what are the opportunities for using this fiber, much of which is unsuitable for lumber? One major use is pulpwood or chips for wood pulp. Both hardwoods and softwoods can be used successfully. Hardwood chips are gaining in popularity and the possibilities for their use are numerous. Perhaps the product with the greatest potential in Maryland is fuelwood. Many forest industries could use residues to fuel their operations and may be expected to do so in the future. But, with the expanding urban and suburban population of the state, the demand for firewood for household fireplaces and stoves is very strong and is perhaps the best solution to using poorer material and upgrading the timber resource of Maryland.

Despite the many opportunities for improved timber management, there are some serious barriers. One that we touched on is lack of local markets in certain areas for small or low grade material from intermediate or harvest cuttings. Perhaps an even larger obstacle is the ownership situation in the state.

Since 90 percent of the commercial forest land is in private hands, the private landowner holds the timber management key. The reasons these people own woodland are quite varied, but 12 percent of the private woodland acreage is held by owners who have timber production as their primary reason. This figure is only 4 and 5 percent for the Central and Southern Units, and 15 and 31 percent for the Western and Lower Eastern Shore Units. These last two units seem to have the best potential on the basis of reasons for owning forest land.

Another factor is length of ownership—28 percent of the private woodland has been held fewer than 10 years by its owners. With tree crops requiring anywhere from 40 to 100 years to mature, this turnover rate may be a problem. Size of ownership is also an obstacle, the average ownership being only 23.8 acres of woodland. This ranges from 15.9 acres in the Central Unit to 50.2 acres in the Western Unit. For the state, 38 percent of the private woodland is in ownerships of fewer than 50 acres. This ranges from 23 percent in the Lower Eastern Shore Unit to 53 percent in the Central Unit. Generally, ownerships of fewer than 50 acres are difficult to manage with long-term forestry goals because they are too small to yield profitable returns at reasonable intervals.

All of these factors—owner objectives, turnover rate, and size of ownership—must be dealt with if significant gains in timber production are to be realized. Means should be found to interest forest landowners in the continued practice of forest management. An answer to this, where possible, is for owners of adjoining tracts to work together over extended periods of time. While it may be difficult for these owners to agree on managing their land for timber, if they can agree to manage their lands for any of the various forest resources, such as water, wildlife, or recreational use, then they will have made an excellent start. If done properly, timber production can benefit or be compatible with management of these other forest resources. With good incentives, markets, assitance, and determination, the private forest landowners of Maryland can improve the quality and productivity of their woodlands and at the same time reap the many benefits that forest-land ownership can provide.

NONTIMBER FOREST RESOURCES

Although the bulk of this report concentrates on the timber resource of Maryland, there are many other resources that are very much influenced by trees and forest stands. While 40 percent of the land area of the state may be covered with commercial forests, only a small percentage of the 4 million residents of Maryland view this land from a timber or wood-product perspective. Recreational use of the forest rates high with the typical Marylander, who lives in an urban environment. But other resources are plentiful in Maryland's woodland: water, soil, fish, and wildlife. These resources are all interrelated, and, together with the timber resource, form an integral part of the forest ecosystem.

Water

Water, the most vital natural resource, is directly and indirectly affected by the forests of Maryland. Annual precipitation averages 43 inches, ranging from 48 inches on the west side of Backbone Ridge (Garrett County) and

Lower Eastern Shore (Worcester County) to 36 inches in the rain shadow of Allegany County. Most of the rain that falls on forests is readily absorbed by the litter and humus soil layers that act as a sponge. Overland flow or runoff in undisturbed forests is uncommon. Once water enters the soil, tree roots take in much of it. The remainder becomes ground water that eventually finds its way into streams and rivers.

Because of Maryland's unique shape and geographic location, there are four major drainages in the state (Fig. 16). Water from 3 percent of the commercial forest land drains directly into the Atlantic Ocean; 8 percent into the Ohio River; 36 percent into the Potomac River; and 53 percent into Chesapeake Bay. The topography of the area determines the nature of the streams in these drainages. In general, streams in western Maryland are fast-flowing because of pronounced changes in elevation; those in the Piedmont vary from fast-flowing at their headwaters to moderate as they near the estuarian areas of the Chesapeake; and those that traverse the low-lying Coastal Plain are the most sluggish.

Tree growth is an excellent watershed cover. Because the forest soil absorbs so much moisture and the trees and shrubs pull in so much through their roots (indeed, forests may transpire one-half the annual precipitation yearly), there is much less water available for flooding. No land use can prevent floods, but forest cover comes closest to this by tempering their intensity and lessening the danger of severe floods. Forests also help regulate streamflow by releasing water gradually. Forest cover also provides shade which minimizes water loss through surface evaporation. Forests act as storage reservoirs that continue to release water even when natural precipitation fails.

By minimizing flooding and runoff and by binding the soil with extensive root systems, forests control erosion. Erosion leads to stream sedimentation, which is a form of pollution that can kill fish, clog channels, displace water from reservoirs, and increase water treatment costs. The inevitable movement of soil from land to sea is so slow beneath a cover of woody growth that the ongoing forces of soil formation balance, or even exceed, the forces of erosion.

Several cities, including Baltimore, Hagerstown, and Frederick, recognize the need for forests in meeting their municipal water demands. These cities own and manage forested lands as watersheds for the primary purpose of providing a good and steady water supply. While a no-cut, no public use policy on a forested watershed will maintain high water quality and relatively even flows, sound multiple-use management of the watershed can provide many more benefits with little, if any, change in the quantity and quality of the water leaving the area. Baltimore is perhaps most active in this field, owning forest land on three watersheds on which it cuts timber as well as permits a great variety of recreational activities (Hartley 1975). But publicly owned watersheds are few and far between. Thus private woodland owners must be relied upon to manage their forest land intelligently with water quality in mind if Maryland is to continue to meet the needs of its growing population.

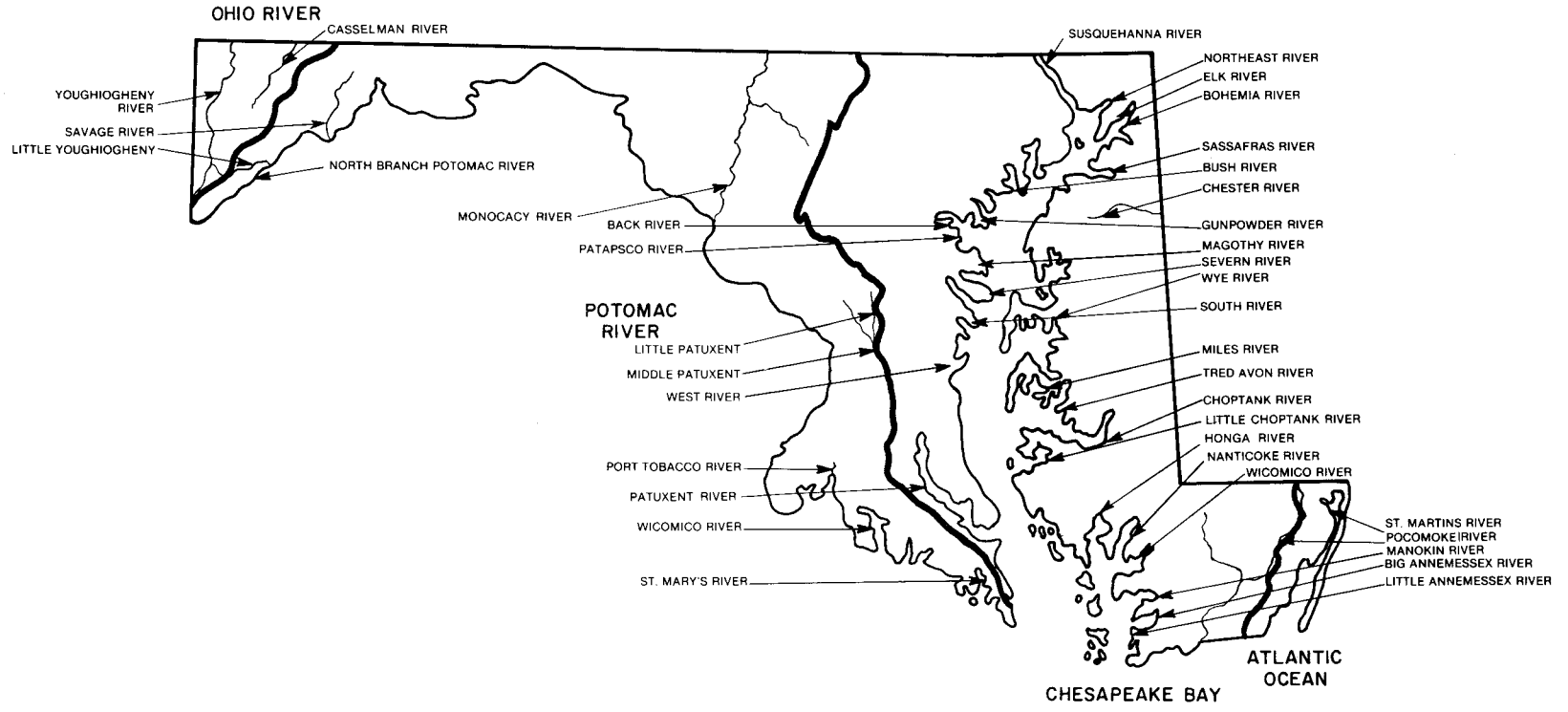
Soil

Soil is perhaps the most overlooked and underrated forest resource. It is generally out of sight, lying beneath leaves, shrubs, rocks, trails, or roads. You can't drink it, play in it (unless you're a kid), grow it, or market it. And yet without soil, there would be no forests.

Soil formation is a very slow process; it can take hundreds of years to produce an inch of mineral soil. The raw material for soil comes from below—parent material or bedrock—and from above—organic matter such as leaves and dead trees or animals, and exposed rocks and outcrops. Weather is the primary force on these materials as wind and water work to wear down exposed material and as water freezes in crevices breaking apart larger rocks. Tree roots also help by growing into cracks and enlarging them as they grow. Moisture and temperature also work closely with fungi to convert organic debris on the forest floor to humus, which is eventually incorporated into the topsoil.

Soils provide trees with four essentials: anchorage, water, mineral nutrients, and aeration for roots. Additionally, soil provides a medium for mycorrhizal-forming fungi, which increases the absorptive surface area of plants, which improves plant growth and vitality. How

Figure 16.—The four major drainages of Maryland.



well water, nutrients, and air move through the soil to provide a proper rooting medium depends on the physical and chemical properties of the soil. The closer these properties are to meeting the optimum requirement of the trees growing in a soil, the greater the soil's potential productivity for those trees.

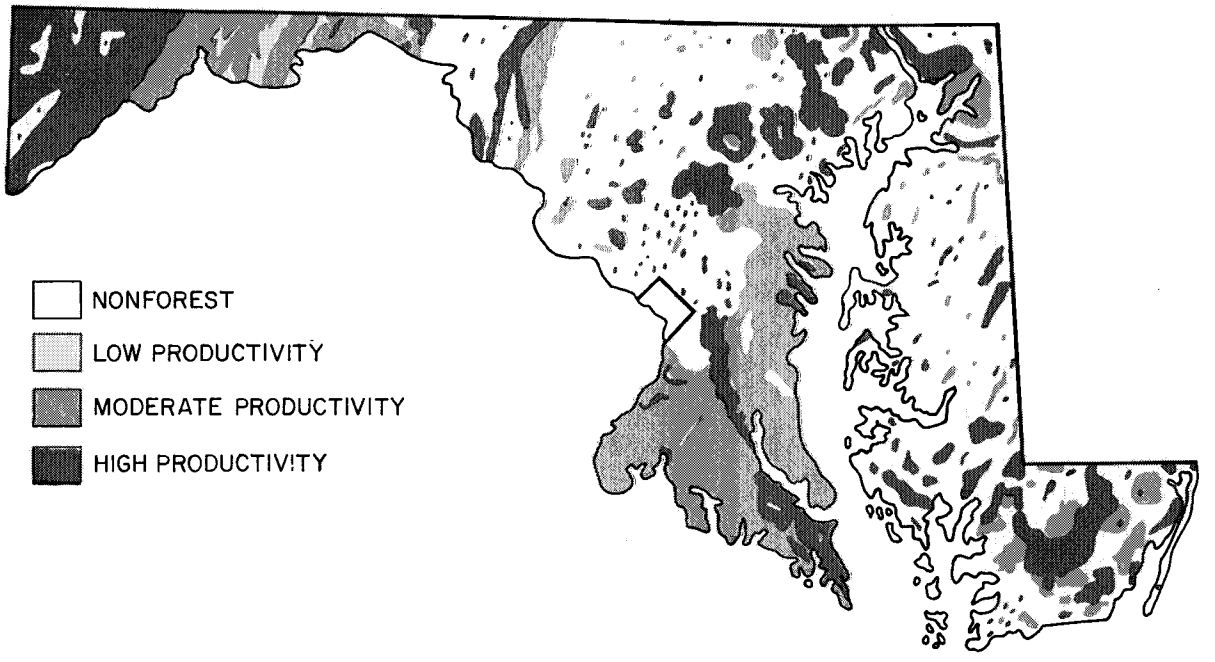
Because of the variety of raw materials and climates in Maryland, there are some 750 different types of soils in the state (Maryland Department of State Planning 1973), each with its own particular set of properties. These properties naturally influence tree occurrence and growth. The U.S. Soil Conservation Service has developed woodland productivity ratings that indicate the potential of each soil for producing tree crops. With the help of the Maryland Forest Service and the Maryland Department of State Planning, we produced a map of Maryland showing forested areas of high, medium, and low woodland productivity, based on soil properties and characteristics (Fig. 17).

Of the forested land in Maryland, only 3 percent has low potential for producing crops of timber on the basis of soil characteristics. Nearly all of this land is in Allegany County in the "rain shadow" area east of the Allegheny Front. This area receives the least precipitation in the state, and this is reflected by the thin and relatively unfertile shale soils. Forty-four percent of the forested land has moderate potential. These areas are scattered throughout the state, but concentrated in Allegany, Frederick, Charles, and Calvert Counties.

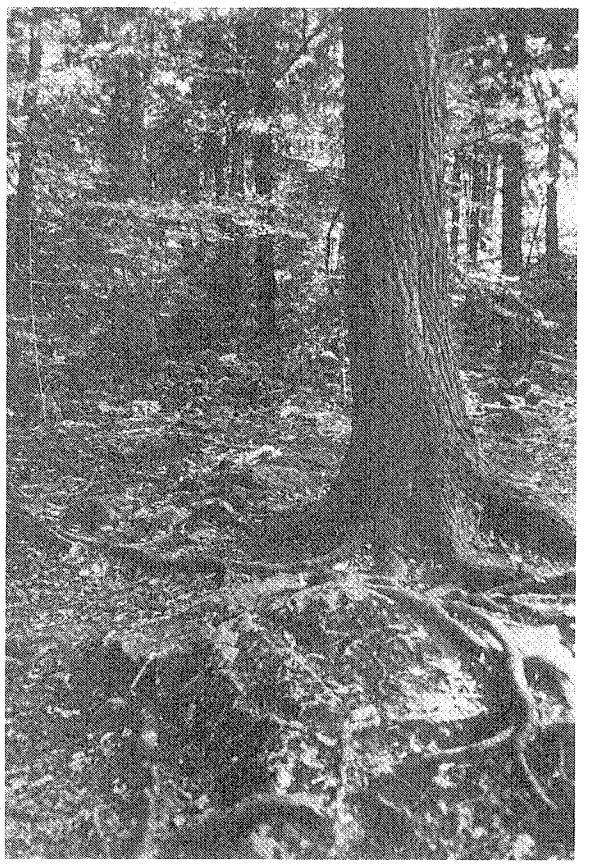
The majority of the woodland—53 percent—occurs on soils with high potential productivity. These areas are also scattered throughout the state, but are most common in Garrett, St. Marys, and Dorchester Counties and in the central Lower Eastern Shore area around Whiteburg, Worcester County. Many of these soils are in areas that receive up to 48 inches of precipitation yearly. On many of these sites, the potential is realized in excellent, well-managed stands of timber. In other areas, the forest stands do not indicate the high productivity potential because of past land history and current nonmanagement conditions.

The productivity of the forests depends on fertile soils; anything that lessens fertility will be detrimental. Soil erosion, particularly of the fertile top soil, is a natural process that is

Figure 17.—Potential for growing trees on the basis of soil properties and characteristics.



The concentrated use of nonreinforced hiking trails can lead to soil compaction and erosion, and exposure of and injury to tree roots.



Mike Walsh photo

often increased several fold by man, and can be very harmful to the soil and other forest resources.

Because of differences in soil, climate, topography, and land use, the amount of erosion varies from one area of the state to another. For the counties in the Coastal Plain east of the Chesapeake Bay (Fig. 1), where the terrain is relatively flat, erosion is least destructive. North-Central Maryland is an area with only moderate erosion on forest land. Soil erosion is certainly a problem in this region, however, since it is the least heavily forested area of Maryland. This area also supports substantial farmland where soil is often left bare between plantings and is vulnerable to the forces of wind and water.

The situation is worst in the Western Unit and in southern Maryland (Anne Arundel, Prince Georges, Calvert, Charles, and St. Marys Counties). In the west the steep slopes often have thin soils. Serious erosion may result if these soils are disturbed, for example, in the building of roads for logging. This potential for erosion, which exists throughout Maryland but is greatest in the west, can be minimized by careful planning, construction, and maintenance of haul and skidroads. The situation in the south is one of relatively flat terrain but with short, steep slopes and wet flood plains. The soils contain little sand, much clay, and are very erodible. Maintenance of forest cover is critical to the soil resource in certain localities, and logging should be done with special care.

Fish and wildlife

There are approximately 1,428 miles of fishable, nontidal streams and rivers in Maryland, nearly all of which flow through forest land at one point or another (Maryland Department of State Planning 1972).

Forests affect fish habitats in several beneficial ways. Shade lowers stream temperatures, improving living conditions for coldwater fish and spawning conditions for warmwater fish. Forests along streams and around reservoirs

After logging is completed, nonpermanent roads should be revegetated quickly to minimize soil erosion. This is a logging road 1 year after harvesting.

protect the waters and the fish in them by yielding surface and ground water at relatively stable rates, even during storms. Water from forested watersheds is generally sediment free. Sediment harms fish by killing insects and other preferred foods, by suffocating fish eggs, and by decreasing living space by filling pools. Also, trees growing along the edge of streams and reservoirs stabilize the banks. This improves fish habitat by reducing erosion.

Good forest management is necessary to maintain maximum benefits for Maryland's fisheries. Clearcuts in the vicinity of streams should not be large, and buffer strips should be left surrounding the streams themselves. Logging roads of all types should be designed to minimize erosion, and stream crossings should be made only at properly constructed bridges, culverts, or fords. In western Maryland, areas disturbed by strip mining should be reforested to improve the fish habitat. In general, forestry practices that protect the water resource also will protect the fish resource.

Warmwater and coldwater fisheries are most affected by Maryland's forests. A third, tidal fisheries, is affected only indirectly through the discharge of freshwater into tidal areas and through the use of freshwater streams for spawning of anadromous and estaurine species such as striped bass, shad, herring, white perch, and yellow perch.

Warmwater fish, those that generally prefer water 75°F or warmer, include such native species as bass, bluegill, catfish, carp, crappie, and pickerel and such introduced species as northern pike and walleye. Warmwater fishing is more popular in Maryland than coldwater because the modern angler prefers pond fishing over stream fishing (personal communication, Dave Woronecki, Coldwater Fisheries Program Leader, Maryland Fisheries Administration). Also, access is easier to ponds and reservoirs, especially for fishermen with boats. Roughly 60 percent of the Maryland Fisheries Administration's inland fish budget goes to warmwater programs. An active stocking program adds nearly ½ million largemouth bass, bluegills, and channel catfish annually to streams, ponds and reservoirs in Maryland. A large warmwater fish hatchery is under construction at the Cedarville Natural Resources Management Area on the Prince Georges-Charles County line.

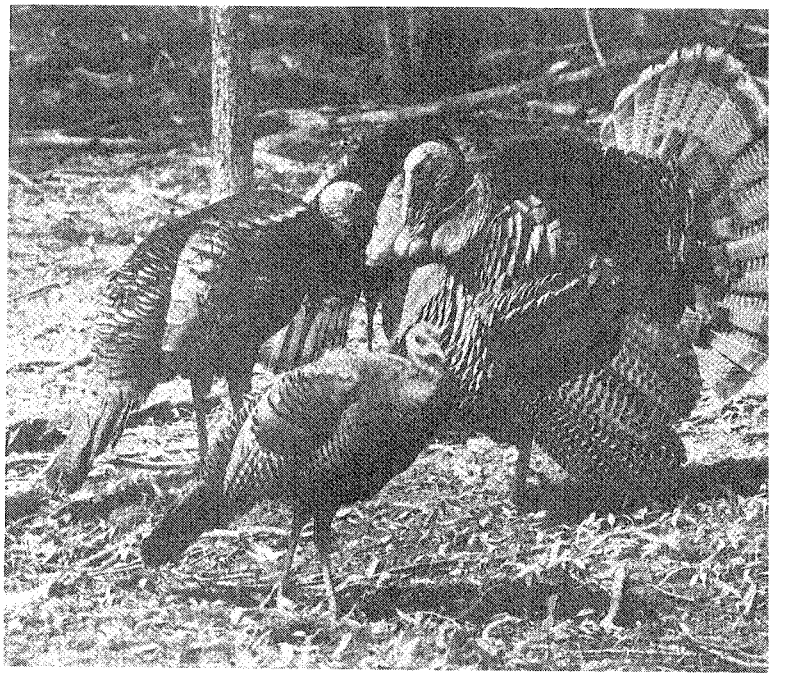
Coldwater fishery means trout, the prestige fish in the Northeast. Brook trout is the only native trout, but catches of it are insignificant when compared to the harvest of the introduced and heavily stocked rainbow trout. On average 225,000 catchable-size trout are stocked in coldwater streams and impoundments and 75 to 90 percent of these are rainbows. Some brook trout also are stocked. These fish are stocked primarily for recreational purposes as 50 to 75 percent of fish stocked each year are caught.

Because of its location, Maryland is marginal between being a coldwater or a warmwater state. This means most of the coldwater habitat is either in the Western Unit where the climate is cool or in areas such as Washington, and Baltimore Counties where limestone springs yield cool, hard, nutritious water that is excellent for trout reproduction and survival. In fact, the greatest population of native trout in Maryland is in heavily populated Baltimore County. In these warmer areas, forest shading of streams is very important to keep the streams as cool as possible.

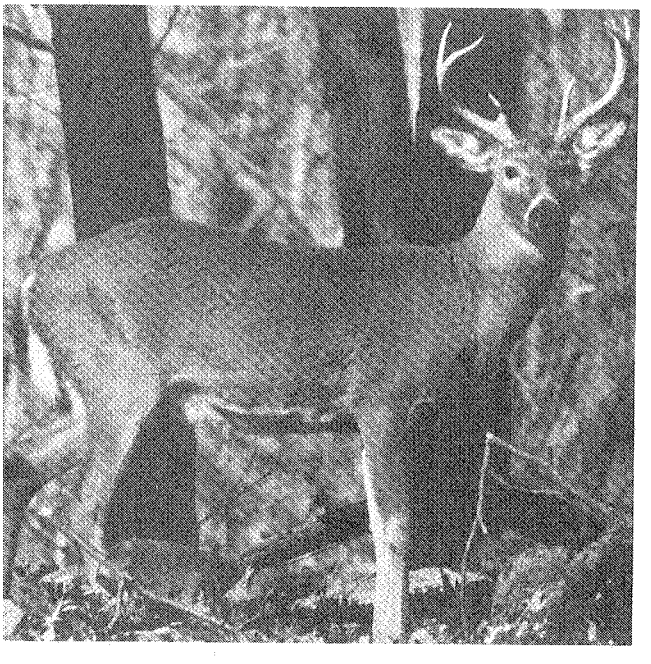
From 1964 through 1976, an average of nearly 125,000 fishing licenses were sold in Maryland each year. The number of trout fishermen is between 30,000 and 50,000. The Fisheries Administration estimates current production of nontidal waters at 10.7 million pounds a year. Total expenditures by fishermen in Maryland for 1975 were estimated at over $190 million. These figures show the importance of the fish resource. The maintenance and expansion of the resource to meet future demand will be due in no small part to the forests of Maryland and the roles that they play in the feeding and harboring of the state's fisheries.

Wildlife, other than fish, are grouped into two broad classes: nongame species and game species. Many species in each class depend heavily on forests for food and shelter. Nongame species, while clearly more abundant and common than game species, have not received as much attention from public agencies whose funding comes primarily from the hunting sector. Recently, more attention has been given these species, which include songbirds, hawks,

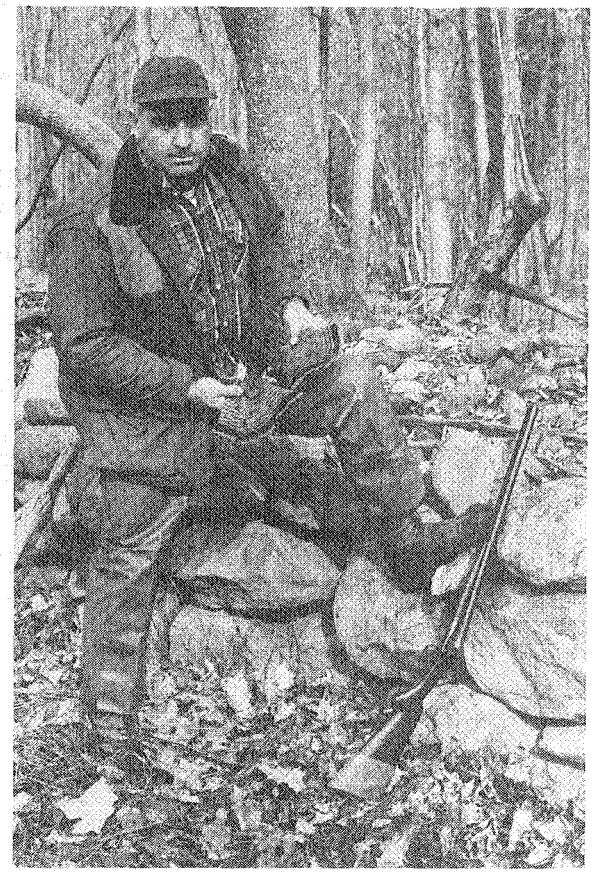
To varying degrees, Maryland's forests contribute to the well-being of many wild animals such as turkeys, mallards, great horned owls, and white-tailed deer.



Denise Hendershot photo; the rest are Leonard Lee Rue III



This hunter displays a pair of ruffed grouse, one of the most challenging upland game birds in Maryland's forests.



Leonard Lee Rue III photo

woodpeckers, shrews, mice, salamanders, turtles, and snakes. The Maryland Wildlife Administration now has a nongame and endangered species program that is responsible for 37 species of amphibians, 46 species of reptiles, 280 species of birds, and 51 species of nongame wildlife. In Maryland there are 35 species recognized as endangered. Many of these species, such as the black bear, mountain lion, and bobcat, are very dependent on forests for their survival. The loss of forest land to nonforest uses has reduced the suitable habitat for these animals. The state's endangered species program has been inventorying these species to identify the extent of the problem. A future step is to enter into land-protection agreements with private forest-land owners, who control more than 90 percent of the forest land in Maryland. In this way, protection, and maybe expansion, of critical habitats can be assured.

Besides playing essential roles in their respective forest ecosystems, nongame animals, as well as game species, provide significant recreational opportunities. Because of its diversity of habitats and its location in the midst of the Atlantic Flyway, Maryland is a paradise for bird watchers. Wildlife photography also is popular. There are several wildlife refuges in the state where nonconsumptive use of this forest resource is in demand year round.

There are many popular game animals in Maryland. In order of popularity and demand, based primarily on hunter days spent afield, squirrels rank number one, and are generally followed by deer, rabbits, geese, pheasants, quail, mourning doves, ducks, grouse, and turkey. There are nearly 50 state-owned hunting areas with associated forest land scattered across Maryland. There are also cooperative wildlife management areas in Baltimore and Carroll Counties where state and private landowners work together to provide good hunting. And there are four managed hunting areas where proximity to urban areas and heavy demand have required the state to restrict hunting. The greatest opportunity, however, lies with private forest-land owners. According to our ownership survey, approximately 18,100 of them, owning 749,400 acres of commercial forest land, would permit public hunting on their land.

The importance and popularity of hunting in Maryland is undeniable. Total expenditures for hunting in 1975 were estimated to exceed $100 million. The sale of hunting licenses provided money for 58 percent of the Maryland Wildlife Administration's budget. From 1964 to 1976, an average of nearly 185,000 licenses were sold annually. These hunters in the mid-1970's harvested an estimated 10,000 deer and turkey and more than 2.1 million small game animals annually.

Game and nongame species are associated with forests to varying degrees. Geese, for example, rely on the forest primarily for the clean water it produces. Squirrels, at the other extreme, depend exclusively on the forest for food and shelter. For those animals that spend most of their time on land, certain forest types are more favorable than others, mainly be-

cause of available food and cover. Even more important in determining desirable habitat are the stand size and transition zones between different-size stands. Some species, like wild turkey, prefer extensive pole- and sawtimber-size stands. Others, like rabbits, prefer scattered patches of scrubby seedling and sapling stands.

The more diverse the vegetation is in composition, size, and distribution, the more species of wildlife the area will support. Thus, one way that a forest can be managed for both wildlife and timber is to keep cut areas relatively small, numerous, and well distributed over the entire area. This results in the diversity needed for many animals. Specific forestry practices also can be applied for single-species management.

The Maryland Wildlife Administration actively manages the forest lands for which it is responsible. Each area has its own set of wildlife management practices tailored to fit the existing and desired timber wildlife resources. Some of these practices are: rotation mowing of permanent forest openings; daylighting (opening up) woods roads to more sunlight to favor intolerant plant growth; releasing and pruning fruit trees; clearcutting, selection cutting, and thinning of timber for increased mast production, browse, and cover; constructing brush piles; planting shrubs; and releasing desirable food and cover vegetation by girdling and cutting the least desirable trees.

Despite such activity, the wildlife resources of Maryland face serious problems. One major problem is loss of habitat, especially forested areas. Since 1964, Maryland has lost nearly ½ million acres in sawtimber and poletimber stands. More than 70 percent of this loss has occurred in the Central Unit. Once an animal's habitat is destroyed it must move elsewhere or adapt. Some animals have nowhere to move and others cannot adapt further to man's encroachment. This is the story of the threatened and endangered species of Maryland, and the fate, perhaps, of many more. Without wise land use planning, this problem is likely to persist.

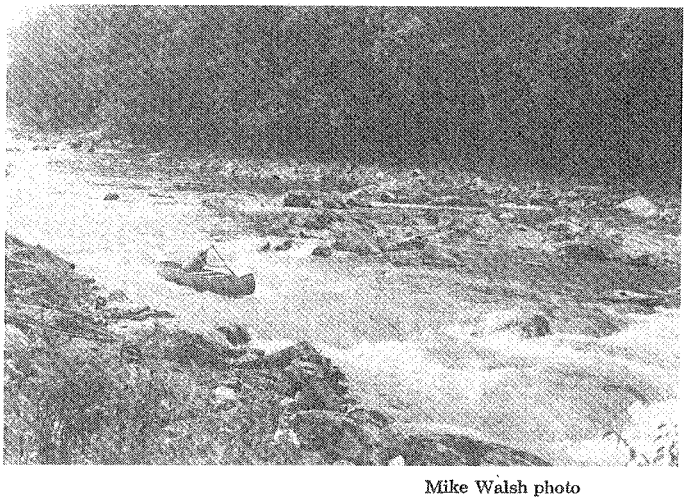
Another overriding concern is the public's lack of understanding of wildlife management. For example, attempts at instituting antlerless deer seasons or liberalizing geese limits meet with stiff opposition. As the population expands and grows more urban in its orientation, public attitudes may shift farther away from acceptance of sound management policies and practices. The percentage of hunters in the population has decreased as the number of licenses sold has not kept pace with the rapidly expanding population. Already, 13 percent of the private forest-land owners post their land—some 366,700 acres—just to control hunting. Hunting is a vital tool in modern game management and must be continued to maintain the health and vitality of this forest resource.

In an effort to cope with this problem, the Maryland Wildlife Administration has created a wildlife information and education project. Its activities include information dissemination through printed media and correspondence, public contact and input into programs having public contact, and use of radio, television, and film media to educate the public. The State hopes that such activities will foster concern and increase the awareness and understanding of its citizens toward wildlife.

Outdoor recreation

The forests of Maryland, with their abundant natural resources, offer residents and nonresidents alike many varied outdoor recreation experiences. Beside such generally recognized activities as fishing, hunting, picnicking,

Each spring, white-water streams flowing free through forested land provide recreationists with many thrills and pleasures.



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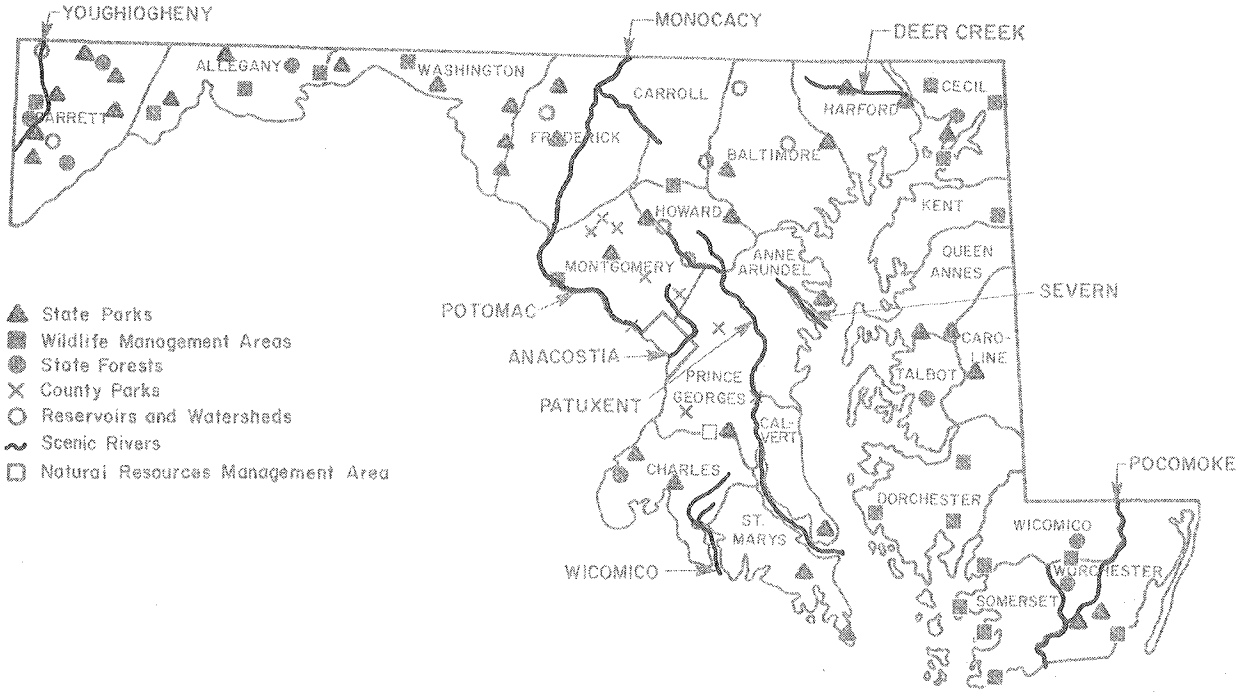

Figure 18.—Major public recreation areas with associated forest land.

sightseeing, camping, and hiking, the quiet and beauty of the woods bestow a certain peace and tranquility on the weary visitor. The forest environments provide unique opportunities to get in touch with nature and to refresh and restore the soul as well as the body. As the population increases and the forest-land base dwindles, forest recreation will continue to be one of the most valuable and popular uses of Maryland's forests.

The variety in climate, topography, forest type, and population distribution within Maryland means the recreational activities will differ from one area to another. The Western Unit, with its mountainous terrain and extensive forested area, offers the most wilderness-like experience available in Maryland. Four of the nine State forests and eight of the 35 State parks with forest land are located in this region (Fig. 18). Deep Creek Lake offers all the pleasures of a clear mountain lake, and the Youghiogheny River, a Maryland Scenic and Wild River, adds another dimension to the water-oriented recreation sites of the area. Besides sightseeing, hunting, fishing, hiking and picnicking, some activities that are common only in this part of Maryland are primitive camping, backpacking, snowmobiling, skiing and sledding, and white-water canoeing. Forest recreational use of this region is intense since highway travel time from the urban Baltimore-Washington area generally is 3 hours or less.

The forest land in the Central Unit is relatively scattered, accessible, and close to the homes of well over 4 million people. This large and diverse area is characterized by rolling hills, dissected by an intensive network of stream valleys interspersed through farm, urban, and suburban development. The woodland around these streams is the main forest recreational focus of the region. Many municipal watersheds and reservoirs are available to people seeking forest recreation experiences. However, too much recreational use may conflict with management for high-quality water. Wise management is needed to balance these uses of the forest land. This unit has a variety of State and County parks in wooded settings.

The Southern Unit has several opportunities for public forest recreation. There are five State parks, one State forest, two State Scenic Rivers (The Patuxent and Wicomico), and the

Cedarville Natural Resources Management Area. This last area is unique in the state, and may be a trend-setter in public land management. A comprehensive management plan has been drawn up for the area, which was formerly a State park and a State forest. This plan calls for complete and integrated multiple-use management of the forest for water, wildlife, recreation, and timber. The area serves as a showcase where people can see how compatible these diverse uses of the forest land can be under the watchful care of well-trained land managers.

The Lower Eastern Shore Unit offers a different recreational environment. The weather is generally warm and humid; the land is flat to gently rolling and marked by vast wetlands; and the forests are dominated by loblolly pine. Opportunities for observing, photographing, and hunting migrating waterfowl are ideal here, with many unique habitats available to them for nesting and wintering. Year-round camping is possible here as it is across Chesapeake Bay in the Southern Unit. The Pocomoke River, a Maryland Scenic River, provides the forest recreationist with enjoyable canoeing and different vantages for viewing the areas pine forests and fascinating cypress swamps.

The Maryland Department of Natural Resources, through the forests, wildlife management areas, and parks that it is charged with managing and administering, controls about three-quarters of the publicly owned forest land available for outdoor recreation. Each area has forest resources that offer a different set of recreational opportunities; taken together, they meet the needs of nearly everyone.

But there are problems on these areas, and they usually result from overuse. The parks alone provide recreation for 8 million people, almost twice the number of Maryland residents, and these numbers are increasing daily. Crowded conditions not only lessen the quality of the experience but also damage the resources. Streams and reservoirs become polluted; soil becomes compacted and infertile; trees lose vitality, are weakened, and eventually die; and fish and wildlife habitats and food chains are disrupted. People are already being turned away from some areas in an effort to minimize these problems. Where can these people go for recreation in a forested setting?

Again, the answer, in part, is the privately owned forest land of Maryland. This major resource of nearly 2.3 million acres is not nearly being used to its recreational capacity. Not all of this land is suited or even available for public recreational use. But the results of our woodland ownership survey show that 26 percent of the private owners—24,600—would permit public use of their 973,700 acres of forest land. This is more than four times the total amount of public forest land available for recreation. The activity permitted most often on private land was hunting, followed by hiking, picnicking, fishing, camping, and snowmobiling. With demand for forest recreation increasing, these private woodlands are certain to play a more dominant role in meeting the recreational needs of Maryland and her neighbors.

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APPENDIX

Definition of terms

Acceptable trees. Growing-stock trees of commercial species that meet specified standards of size and quality, but do not qualify as desirable trees.

Accretion. The estimated growth for the period between inventories of growing-stock trees that were measured during the previous inventory. It includes the growth on trees that were cut during the period, plus those trees that died and were used.

Annual mortality trend-level. The estimated mortality of growing stock or sawtimber for a specific year (1975 for Maryland) that is based on average rates of diameter growth and mortality for the period. This estimate is consistent with the average annual change during the period between surveys and with the current inventory.

Annual net growth trend-level. The estimated growth of growing stock or sawtimber for a specific year (1975 for Maryland) that is based on average rates of diameter growth and mortality for the period. This estimate is consistent with the average annual change during the period between surveys and with the current inventory.

Annual removals trend-level. The estimated removals of growing stock or sawtimber for a specific year (1975 for Maryland) that is obtained from a trend line for the period. This line is established by fitting a curve to actual removals data for several years during the period. The actual removals for the year given may vary from the trend estimate due to fluctuations in market conditions and other factors.

Area-condition class. A classification of commercial forest land based on stocking of acceptable and desirable trees and other conditions affecting current and prospective timber growth.

Average annual ingrowth of growing stock. The net cubic-foot volume of trees now classed as growing stock that were less than 5.0-inches dbh on the previous survey, divided by the length of the period between surveys.

Average annual ingrowth of sawtimber. The net board-foot volume of trees now classed as sawtimber that were not tallied as such on the previous survey, divided by the length of the period between surveys.

Average annual net growth. The change, resulting from natural causes, in growing-stock or sawtimber volume of sound wood in growing-stock or sawtimber trees during the period between surveys, divided by the length of the period. Components of average annual net growth include the increment in net volume of trees present at the beginning of the period and surviving to its end (accretion), plus average annual ingrowth, minus average annual mortality, minus the net volume of trees that became rough or rotten during the period (cull increment).

Average annual removals. The net growing-stock or sawtimber volume of growing-stock or sawtimber trees harvested or killed in logging, cultural operations such as timber stand improvement, land clearing, or changes in land use during the period between surveys, divided by the length of the period.

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

Board foot. A unit of lumber measurement 1 foot long, 1 foot wide, and 1 inch thick, or its equivalent.

Coarse residues. Manufacturing residues suitable for chipping, such as slabs, edgings, and veneer cores.

Commercial forest land. Forest land producing or capable of producing crops of industrial wood (more than 20 cubic feet per acre per year) and not withdwrawn from timber utilization.

Commercial species. Tree species presently or prospectively suitable for industrial wood products. Excludes species of typically small size, poor form, or inferior quality, such as hawthorn and sumac.

Cord equivalent. A unit of measure that is applied to forms of wood other than roundwood, such as chips, slabs, edgings, and other manufacturing residues. In terms of solid wood, it is equivalent to a standard pulpwood cord of 85 cubic feet.

County and municipal lands. Lands owned by counties and local public agencies or municipalities or leased to them for 50 years or more.

Cull increment. The net volume of growing-stock trees on the previous inventory that became rough or rotten trees in the current inventory.

Desirable trees. Growing-stock trees of commercial species: (a) having no serious quality defects that limit present or prospective use for timber products; (b) of relatively high vigor, and (c) containing no pathogens that may result in death or serious deterioration before rotation age.

Diameter at breast height (dbh). The diameter outside bark of a standing tree measured at 4½ feet above the ground.

Farmer-owned lands. Lands owned by farm operators, whether part of the farmstead or not. Excludes land leased by farm operators from nonfarm owners.

Federal lands. Lands (other than National Forests) administered by Federal agencies.

Fine residues. Manufacturing residues not suitable for chipping, such as sawdust and shavings.

Forest industry lands. Lands owned by companies or individuals operating wood-using plants.

Forest land. Land stocked with at least 7.5 square feet of basal area per acre of any size forest trees or that formerly had such tree cover and is not currently developed for nonforest use. The minimum area for classification of forest land is 1 acre.

Forest trees. Woody plants that have well-developed stems and are usually more than 12 feet in height at maturity.

Forest type. A classification of forest land based on the species forming a plurality of live-tree stocking. The many forest types in Maryland were combined into the following major forest type groups:

(a) *white and red pine*—forests in which eastern white pine, red pine, or hemlock, singly or in combination, comprise a plurality of the stocking; in Maryland, common associates include oak, maple, and yellow-poplar.

(b) *spruce/fir*—forests in which spruce or fir, singly or in combination comprise a plurality of the stocking; in Maryland, this group is composed mainly of white and Norway spruce plantations.

(c) *loblolly and shortleaf pine*—forests in which loblolly, shortleaf, or other southern yellow pines (except longleaf or slash pine), singly or in combination, comprise a plurality of the stocking; in Maryland, major species include loblolly, Virginia, and pitch pines and eastern redcedar. Hardwood associates include oaks, red maple, and blackgum.

(d) *oak/pine*—forests in which hardwoods (usually white, northern red, black, scarlet, or chestnut oaks) comprise a plurality of stocking but where pines or eastern redcedar comprise 25 to 49 percent of the stocking; in Maryland, common associates besides those listed above include Virginia and loblolly pine, southern red oak, hickory, and blackgum.

(e) *oak/hickory*—forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking and in which pines and eastern redcedar comprise less than 25 percent of the stocking; in Maryland, common associates include hard pines, maple, beech, ash, yellow-poplar, sweetgum, blackgum, and elm.

(f) *oak/gum/cypress*—bottomland forests in which wet-site oaks, sweetgum, or baldcypress, singly or in combination, comprise a plurality of the stocking and in which pines comprise less than 25 percent of the stocking; in Maryland, common associates include American elm, red maple, blackgum, and green ash.

(g) *elm/ash/red maple*—forests in which American elm, black ash, red maple, willow, or sycamore, whether singly or in combination, comprise a plurality of the stocking; in Maryland, common associates include bottomland oaks, river birch, blackgum, and silver maple.

(h) *maple/beech/birch*—forests in which sugar maple, beech, yellow birch, black cherry, or black walnut, either singly or in combination, comprise a plurality of the stocking; in Maryland, common associates include northern red oak, red maple, white ash, basswood, and hemlock.

Growing-stock trees. Live trees of commercial species classified as sawtimber, poletimber, saplings, and seedlings; that is, all live trees of commercial species except rough and rotten trees.

Growing-stock volume. Net volume, in cubic feet, of growing-stock trees 5.0 inches dbh and larger, from a 1-foot stump to a minimum 4.0-inch top diameter outside bark of the central

stem, or to the point where the central stem breaks into limbs. Net volume equals gross volume less deduction for cull.

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

Industrial wood. All roundwood products except fuelwood.

Ingrowth. The estimated volume of growing-stock trees that became 5.0 inches dbh or larger during the period between inventories.

International ¼-inch rule. A log rule, or formula, for estimating the board-foot volume of logs. The mathematical formula is: $[(D^2 \times 0.22) - 0.71\ D] \times 0.904762$ for 4-foot sections, where D = diameter inside bark at the small end of the section. This rule is used as the U.S. Forest Service Standard Log Rule in the Eastern United States.

Land area. (a) Bureau of Census: The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than ⅛ statute mile wide; and lakes, reservoirs, and ponds less than 40 acres in area; (b) Resources Evaluation: same as (a), except that the minimum width of streams, etc., is 120 feet, and the minimum size of lakes, etc., is 1 acre.

Logging residues. The unused portions of growing-stock trees harvested or killed in the process of logging.

Manufacturing plant residues. Wood materials that are generated when converting round timber (roundwood) into wood products. This includes slabs, edgings, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and pulp screening. If these residues are used, they are referred to as plant byproducts.

Miscellaneous private lands. Privately owned lands other than forest-industry and farmer-owned lands.

National Forest lands. Federal lands legally designated as National Forests or purchase units and other lands administered as part of the National Forest System by the Forest Service.

Noncommercial forest land. Productive-reserved, urban, and unproductive forest land.

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

Nonforest land. Land that has never supported forests, or land formerly forested but now in nonforest use such as cropland, pasture, residential areas, and highways.

Nonstocked areas. Commercial forest land that has fewer than 12.5 square feet of basal area per acre of growing-stock trees.

Other removals. The growing-stock volume of trees that were removed from the inventory by cultural operations (weeding, thinning, etc.), land clearing, or reclassification of some commercial forest land as noncommercial forest land and were not used for products.

Plant byproducts. Wood products, such as pulp chips, recycled from manufacturing plant residues.

Poletimber stands. Stands stocked with at least 12.5 square feet of basal area per acre of growing stock with half or more or such stocking in poletimber or sawtimber trees or both, and in which the stocking of poletimber exceeds that of sawtimber.

Poletimber trees. Live trees of commercial species meeting regional specifications of soundness and form and at least 5.0 inches in dbh, but smaller than sawtimber trees.

Productive-reserved forest land. Forest land sufficiently productive to qualify as commercial forest land, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas tree production.

Primary wood manufacturing plant. A plant that converts round timber into wood products such as woodpulp, lumber, veneer, cooperage, and dimension.

Pulpwood. Roundwood converted into 4- or 5-foot lengths or chips, and chipped plant byproducts that are prepared for manufacture into woodpulp.

Rotten trees. Live trees of commercial species that do not contain at least one 12-foot sawlog or two noncontiguous sawlogs, each 8 feet or longer, now or prospectively, and do not meet regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume in a tree is rotten.

Rough trees. (a) The same as rotten trees, except that rough trees do not meet regional specifications for freedom from defect primarily because of roughness or poor form, and (b) all live trees of noncommercial species.

Roundwood products. Logs, bolts, or other round timber generated by harvesting trees for industrial or consumer uses.

Saplings. Live trees 1.0 through 4.9 inches dbh.

Sapling-seedling stands. Stands stocked with at least 12.5 square feet of basal area per acre of growing stock with half or more of such stocking in saplings or seedlings or both.

Sawlog. A log meeting regional standards of diameter, length, and defect, including a minimum 8-foot length and a minimum diameter inside bark of 6 inches for softwoods and 8 inches for hardwoods. (See specifications under Log Grade Classification.)

Sawlog portion. That part of the bole of a sawtimber tree between the stump and the sawlog top; that is, the merchantable height.

Sawlog top. The point on the bole of a sawtimber tree above which a sawlog cannot be produced. The minimum sawlog top is 7.0 inches diameter outside bark (dob) for softwoods and 9.0 inches dob for hardwoods.

Sawtimber stands. Stands stocked with at least 12.5 square feet of basal area per acre of growing stock with half or more of such stocking in poletimber or sawtimber trees or both, and in which the stocking of sawtimber is at least equal to that of poletimber.

Sawtimber trees. Live trees of commercial species at least 9.0 inches dbh for softwoods of 11.0 inches for hardwoods containing at least one 12-foot sawlog or two noncontiguous 8-foot sawlogs, and meeting regional specifications for freedom from defect.

Sawtimber volume. Net volume in board feet, International ¼-inch rule, of sawlogs in sawtimber trees. Net volume equals gross volume less deductions for rot, sweep, and other defects that affect use for lumber.

Seedlings. Live trees less than 1.0 inch dbh that are expected to survive.

Site class. A classification of forest land in terms of inherent capacity to grow crops of industrial wood. Classifications are based on the mean annual growth of growing stock attainable in fully stocked natural stands at culmination of mean annual growth.

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

Stand. A group of forest trees growing on forest land.

Stand-size class. A classification of forest land based on the size class (that is, seedlings, saplings, poletimber, or sawtimber) of growing-stock trees in the area.

Standard cord. A unit of measure for stacked bolts of wood, encompassing 128 cubic feet of wood, bark, and air space. Fuelwood cord estimates can be derived from cubic-foot estimates of growing stock by applying an average factor of 80 cubic feet of solid wood per cord. For pulpwood, a conversion of 85 cubic feet of solid wood per cord is used because of the more uniform character of pulpwood.

State lands. Lands owned by the State or leased to the State for 50 years or more.

Stocking. The degree of occupancy of land by trees, measured in basal area of tress in a stand compared to the basal area of trees required to fully use the growth potential of the land (or the stocking standard). In the Eastern States this standard, is 75 square feet of basal area per acre. The level of stocking, from a management perspective, is seen as a range of values rather than single points. An overstocked stand is stocked with at least 130 percent of the basal-area standard. A fully stocked stand lies within the range of 100 and 130 percent stocked. A medium-stocked stand is between 60 and 100 percent stocked. A poorly stocked stand is below 60 percent stocked.

Three categories of stocking are used:

All live trees—these are used to classify forest land and forest types.

Growing-stock trees—these are used to classify stand-size classes and area-condition classes.

Desirable trees—these are used to classify area-condition classes.

Timber products. Manufacturing plant byproducts and roundwood (round timber) products harvested from growing-stock trees on commercial forest land; from other sources, such as cull trees, salvable dead trees, limbs,

tops and saplings; and from trees on noncommercial forest and nonforest lands.

Timber removals. The growing-stock or sawtimber volumes of trees removed from the inventory for roundwood products, plus logging residues and other removals, for a specific year. (1975 for Maryland.)

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

Unused manufacturing residues. Plant residues that are dumped or destroyed and not recovered for plant byproducts.

Upper-stem portion. That part of the main stem or fork of a sawtimber tree above the sawlog top to a diameter of 4.0 inches outside bark or to the point where the main stem or fork breaks into limbs.

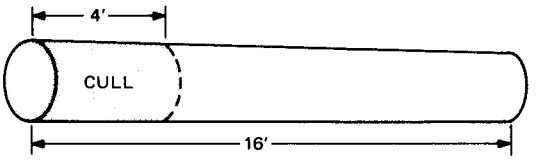
Urban forest land. Noncommercial forest land within urban areas that is completely surrounded by urban development (not parks), whether commercial, industrial, or residential.

Log-grade classification

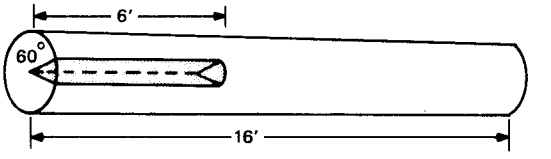
Log grades are a classification of logs based on external characteristics as indicators of quality or value. The log-grade standards and grading systems for softwoods and hardwoods used in this forest survey are shown in the following specifications:

Methods of determining scaling deduction.

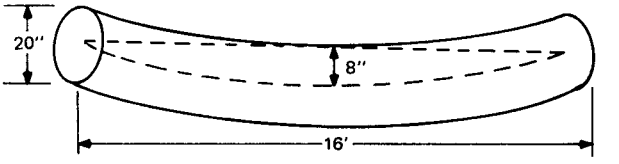
(Examples based on a 16-foot log with 20-inch scaling diameter)



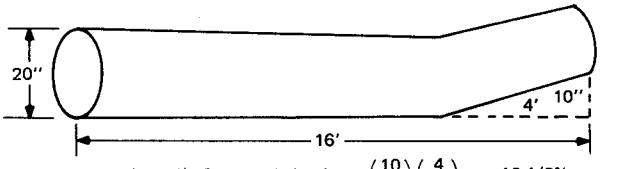
Defect section (rule 1): Percent deduction = $\frac{4}{16}$ = 25%



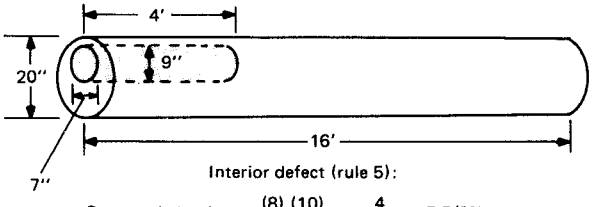
Defect section (rule 2): Percent deduction = $\left(\frac{6}{16}\right)\left(\frac{60}{360}\right)$ = 6-1/4%



Sweep (rule 3): Percent deduction = $\frac{8-2}{20}$ = 30%



Crook (rule 4): Percent deduction = $\left(\frac{10}{20}\right)\left(\frac{4}{16}\right)$ = 12-1/2%



Interior defect (rule 5):

Percent deduction = $\frac{(8)\,(10)}{(20-1)^2} \times \frac{4}{16}$ = 5-5/9%

In practice each elipse axis can be divided by (20–1)

Thus $\frac{8}{19}$ = .4, $\frac{10}{19}$ .5, and (.4) (.5) $\left(\frac{4}{16}\right)$ = 5%

From: Grosenbaugh, L.R. 1952. Shortcuts for cruisers and scalers. U.S. Dep, Agric. For. Serv. South. For Exp. Stn. Occas. Pap. 126.

SOUTHERN PINE SAWLOGS

Grade 1. Logs with 3 or 4 clear faces.[1] Code 1.

Grade 2. Logs with 1 or 2 clear faces. Code 2.

Grade 3. Logs with no clear faces. Code 3.

After the tentative log grade is established from above, the log will be degraded one grade for each of the following, except that no log can be degraded below grade 3.

1. *Sweep.* Degrade any tentative 1 or 2 log one grade if sweep amounts to 3 or more inches and equals or exceeds one third (1/3) the diameter inside bark at small end. This is the final grade if there is no evidence of heart rot.

2. *Heart rot.* Degrade any tentative 1 or 2 log one grade if conk, massed hyphae, or other evidence of advanced heart rot is found anywhere in it.

[1] A face is one-fourth of the circumference in width extending full length of the log. Clear faces are those free of: knots measuring more than one-half inch in diameter, overgrown knots of any size, holes more than one-fourth inch in diameter. The faces may be rotated if necessary to obtain the maximum number of clear ones.

From: Schroeder, J. G., R. A. Campbell, and R. C. Rodenbach. 1968. Southern pine sawlogs for yard and structural lumber. USDA For. Serv. Res. Pap. SE-39.

EASTERN WHITE PINE SAWLOG GRADE SPECIFICATIONS

GRADING FACTOR	LOG GRADE 1	LOG GRADE 2	LOG GRADE 3	LOG GRADE 4
(1) MINIMUM SCALING DIAMETER (inches)	14[1]	6	6	6
(2) MINIMUM LOG LENGTH (feet)	10[2]	8	8	8
(3) MAXIMUM WEEVIL INJURY (number)	None	None	2 injuries[3]	No limit
(4) MINIMUM FACE REQUIREMENTS	Two full length or four 50% length good faces.[4] (In addition, log knots on balance of faces shall not exceed size limitations of grade 2 logs.)	No GOOD FACES REQUIRED. Maximum diameter of log knots on three best faces: SOUND RED KNOTS not to exceed 1/6 scaling diameter and 3 inch maximum. DEAD OR BLACK KNOTS including overgrown knots not to exceed 1/12 scaling diameter and 1½ inch maximum.	SOUND RED KNOTS not to exceed 1/3 scaling diameter and 5 inch maximum. DEAD OR BLACK KNOTS including overgrown knots not to exceed 1/6 scaling diameter and 2½ inch maximum.	Includes all logs not qualifying for No. 3 or better and judged to have at least one-third of their gross volume in sound wood suitable for manufacture into standard lumber.
(5) MAXIMUM SWEEP OR CROOK ALLOWANCE (percent)	20	30	40	66⅔
(6) MAXIMUM TOTAL SCALING DEDUCTION (percent)	50	50	50	66⅔

After the tentative log grade is established from face examination, the log will be reduced in grade whenever the following defects are evident:

(7) CONKS, PUNK KNOTS, AND PINE BORER DAMAGE ON BARK SURFACE[5]

Degrade one grade if present on one face.
Degrade two grades if present on two faces.
Degrade three grades if present on three or more faces.

(8) LOG END DEFECTS: RED ROT, RING SHAKE, HEAVY STAIN AND PINE BORER DAMAGE OUTSIDE HEART CENTER OF LOG[5]

Consider log as having a total of 8 quarters (4 on each end) and degrade as indicated below:
Degrade one grade if present in 2 quarters of log ends.
Degrade two grades if present in 3 or 4 quarters of log ends.
Degrade three grades if present in 5 or more quarters of log ends.

[1] 12 and 13 inch logs with four full length good faces are acceptable.
[2] 8 foot logs with four full length good faces are acceptable.
[3] 8 foot No. 3 logs limited to one weevil injury.
[4] Minimum 50% length good face must be at least 6 feet.
[5] Factors 7 and 8 are not cumulative (total degrade based on more serious of the two). No log to be degraded below grade 4 if net scale is at least one-third gross log scale.

From: Ostrander, M. D., and R. L. Brisbin, 1971. Sawlog grades for eastern white pine. USDA For. Serv. Res. Pap. NE-205.

SPRUCE, FIR, HEMLOCK, TAMARACK, AND CEDAR LOG GRADE

(Minimum merchantability specifications)

Log grade	Minimum size		Defect allowance		Other requirements
	Diameter[1]	Length[2]	Sweep or crook	Total deduction	
	Inches	*Feet*	*Percent*	*Percent*	
1	10-12	8-16 in 2-foot multiples	25	50	Sound knots not over 2 inches in diameter permitted. Shake permitted up to 20 percent of gross scale if not combined with other serious defects.
	13+	8-16 in 2-foot multiples	25	50	Sound knots not over 3 inches in diameter permitted. Shake permitted up to 20 percent of gross scale if not combined with other serious defects.

[1]At small end of log.
[2]Without trim.

From: U.S. Forest Service Northeastern Timber Salvage Administration Report. 1943. Boston, Mass.

STANDARD GRADES FOR HARDWOOD FACTORY LUMBER LOGS

Grading Factors		Log grades							
		F1			F2				F3
Position in tree		Butts only	Butts & uppers		Butts & Uppers				Butts & uppers
Scaling diameter, inches		13-15[a]	16-19	20+	11+[b]	12+			8+
Length without trim, feet		10+			10+	8-9	10-11	12+	8+
Required clear cuttings[c] of each of 3 best faces[d]	Min. length, feet	7	5	3	3	3	3	3	2
	Max. number	2	2	2	2	2	2	3	No limit
	Min. proportion of log length required in clear cutting	5/6	5/6	5/6	2/3	3/4	2/3	2/3	1/2
Maximum sweep & crook allowance	For logs with less than ¼ of end in sound defects	15%			30%				50%
	For logs with more than ¼ of end in sound defects	10%			20%				35%
Maximum scaling	deduction	40%[e]			50%[f]				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. D 1737.

[a]Ash and basswood butts can be 12 inches if they otherwise meet requirements for small #1's.
[b]Ten-inch logs of all species can be #2 if they otherwise meet requirements for small #1's.
[c]A clear cutting is the portion of a face, extending the width of the face, that is free of defects.
[d]A face is ¼ of the surface of the log as divided lengthwise.
[e]Otherwise #1 logs with 41-60% deductions can be #2.
[f]Otherwise #2 logs with 51-60% deductions can be #3.

From: Vaughan, C. L., A. C. Wollin, K. A. McDonald, and E. H. Bulgrin. 1966. Hardwood log grades for standard lumber. USDA For. Serv. Res. Pap. FPL-63.

STANDARD SPECIFICATIONS FOR HARDWOOD CONSTRUCTION LOGS.[a]

Position in tree		Butt & upper
Min. diameter, small end		8 inches +
Min. length, without trim		8 feet
Clear cuttings		No requirements.
Sweep allowance, absolute		1/4 diameter small end for each 8 feet of length.
Sound surface defects	Single knots	Any number, if no one knot has an average diameter above the callus in excess of 1/3 of log diameter at point of occurrence.
	Whorled knots	Any number if sum of knot diameters above the callus does not exceed 1/3 of log diameter at point of occurrence.
	Holes	Any number provided none has a diameter over 1/3 of log diameter at point of occurrence, and none extends over 3 inches into included timber.[b]
Unsound surface defects		Same requirements as for sound defects if they extend into included timber.[b] No limit if they do not.
End defects	Sound	No requirements.
	Unsound	None allowed; log must be sound internally, but will admit 1 shake not to exceed 1/4 the scaling diameter and a longitudinal split not extending over 5 inches into the contained timber.

[a]These specifications are minimum for the class. If, from a group of logs, factory logs are selected first, thus leaving only non-factory logs from which to select construction logs, then the quality range of the construction logs so selected is limited, and the class may be considered a grade. If selection for construction logs is given first priority, then it may be necessary to subdivide the class into grades.

[b]Included timber is always square, and dimension is judged from small end.

From: Rast, E. D., D. L. Sonderman, and G. L. Gammon. 1973. A guide to hardwood log grading (Revised). USDA For. Serv. Gen. Tech. Rep. NE-1.

Forest survey methods

The Resources Evaluation unit of the Northeastern Forest Experiment Station used the sampling with partial replacement (SPR) design in the inventory of the timber resources of Maryland. This design and procedure was described by C. A. Bickford, C. E. Mayer, and K. D. Ware in 1963: An efficient sampling design for forest inventory—The Northeastern Forest Resurvey, J. For. 61:826-833; and by J. E. Barnard in 1978: *Example of a specific regional inventory: The United States Northeastern double sampling with partial replacement design, In* the Proceedings of the joint meeting of the groups on forest resource inventory and forest management planning and managerial economics of the International Union of Forestry Research Organizations held in Bucharest, Romania, June 18-24, 1978.

This design estimates forest area and timber volume by combining a new independent photo and ground-plot inventory with a regression updating of previous inventories based on a subsample of remeasured plots. Thus the SPR design, by combining two independent estimates of the inventory, yields a statistically more accurate estimate of the timber resource than other methods for the same cost. Such comparisons were made by J. E. Barnard in 1974: *Sampling with partial replacement contrasted with complete remeasurement inventory designs: An empirical examination; In* the Proceedings of the symposium on monitoring forest environment through successive sampling held at the State Univ. N.Y. College of Environmental Sciences and Forestry, Syracuse.

The source of the new independent estimates of volume and forest area was a new aerial-photo stratification with a subsample of ground measurements. This photo sample in Maryland consisted of 18,793 points on the latest available aerial photography (1970-72). A subset of 939 of these photo plots (including 573 on commercial forest land, 363 on nonforest land, and 3 on unproductive forest land) was located on the ground. Land use was verified and tree-measurement data were recorded on the forested plots. These plots consisted of a cluster of 10 prism points systematically arranged to cover approximately 1 acre. At each point trees were selected for tally by using a prism with a basal-area factor of 37.5.

The other set of independent estimates, based on the updating of the 1964 survey, required the remeasurement of 183 ⅕-acre plots, originally established during the first survey, and 257 10-point plots (similar to the new 10-point plots), originally established during the second survey.

When the two independent estimates of area and volume are combined, the results are totals by geographic unit, the sum of which results in totals for the state.

Many users of Resources Evaluation data, however, need county information. To provide such information, within the framework of the survey design, tables for counties have been developed, based on a survey-unit partitioning technique.

First, the geographic unit means and variances for the various photo-plot strata were applied to the photo-plot data for each county within the unit. This yielded an estimate of total volume or total commercial forest-land area for each county. Second, the data from all the new-ground plots in each unit were used to partition the county totals into the various components. For example, if a table of cubic-foot volume by softwoods and hardwoods is to be made for a county, the estimate of total cubic-foot volume for that county is partitioned into softwood and hardwood totals according to the proportion of softwoods and hardwoods for the new-ground plots within the unit.

The units used for computing county data are the same as those described in Figure 2 with one exception. The Central Unit was divided into three subunits, which, in turn, acted as units for the particular counties within each subunit. Subunit A included Baltimore, Carroll, Cecil, Frederick, Harford, Howard, Montgomery, and Washington Counties; Subunit B included Anne Arundel, Kent, Prince Georges, and Queen Annes Counties; and Subunit C consisted of Caroline and Talbot Counties. We felt that this subdivision grouped similar counties best for computing county data.

Field-tally data consisting of plot and individual-tree information were processed and compiled into tables using FINSYS—Forest Inventory System—on modern, large-capacity, high-speed computers.

FINSYS is a data-processing system consisting primarily of a series of computer programs developed by the Northeastern Forest Experiment Station to process and compile a large volume of forest-inventory data. The system consists of an editing subsystem that edits field-tally data for errors; a table-compiling subsystem that compiles tables from edited field data; and an output subsystem that expands the plot data to geographic unit or statewide estimates and prints the final tables.

FINSYS was described in a series of research papers by R. W. Wilson and R. C. Peters in 1967: The Northeastern Forest Inventory Data Processing System. USDA For. Serv. Res. Pap. NE-61 and NE-70 to 80.

FINSYS has several features that make it unique. One of these is its flexibility. The system is not restricted to the Northeastern forest survey but can be used for any large-scale forest inventory. Also, the system does not produce a standard set of tables. The user specifies the tables that he desires. Thus, at any stage in the data processing phase, or at a later date, a specific table can be developed with minimum effort.

Another feature of FINSYS is its ability not only to calculate inventory estimates but also to calculate the variance and sampling error for each estimate. This feature provides the user a measure of the reliability of each statistic, and the ability to determine the reliability of a new estimate based on any data combination.

Comparisons between inventories

Data comparisons are made when information on a given resource is available for several points in time. Four inventories of the forest resource in Maryland have been made since 1914. The analysis in this report concentrates on the last three inventories that were conducted by the USDA Forest Service between 1950 and 1976. In these resource inventories, forest sampling procedures were used to estimate area and timber volume.

When making comparisons using information based on sampling two or more different populations at two or more different points in time, one must be aware of several sources of variation in the data. First, the sample estimates are subject to the natural variation within the population. This variation is measurable and is expressed as the sampling error of a particular estimate (see Reliability of the Estimates in the appendix). Changes in the intensity of sampling or in the sampling design enable the inventory planner to minimize the sampling errors of the various inventory estimates. A second source of variation is the differences in procedures (known as "technique differences") used to collect the data for the different surveys. This type of variation can be very important in the comparison of several inventories but is difficult to measure accurately.

The three forest resource inventories of Maryland that have been conducted by the Northeastern Forest Experiment Station, in cooperation with the Maryland Forest Service, have several kinds of technique differences. First, the technical definitions of terminology have undergone changes and modifications. Most of the major changes of this type were made in the late 1950's and early 1960's, but some changes have occurred more recently. A second kind of technique difference results from changes in field plot design and individual-tree measurement procedures. Good training and quality-control procedures help to minimize the effect of these differences. Finally, data compilation and processing procedures can introduce technique differences in the form of computational changes.

The forest resource analyst needs to identify and, where possible, quantify all the above forms of variation to isolate these differences between inventories from the differences due to real changes in the resource population. This process is called a consistency check. For volume evaluation, the TRAS (Timber Resource Analysis System) model serves as a guide in this process. Information obtained from the model is modified and supplemented with other available resource information, research studies, and knowledgeable technical opinion from a variety of reliable sources. The result of this process is a realistic evaluation of resource inventory trends.

The Maryland inventory data presented several analytical problems. The sampling designs, intensity of application, and field measurement and compilation techniques varied with each inventory. Because of these variations between surveys, a consistency check was made.

This began by using TRAS to help reduce the large amount of data to manageable units. Taking the numbers of softwood and hardwood trees by diameter class for a previous survey and then applying our current standards to this data yields estimates of softwood and hardwood volume. This, in effect, puts the data from the previous survey on a comparable basis with the latest survey. Then, using this data for two points in time, with the additional inputs of annual growth, mortality, and removals for the period between inventories, TRAS incrementally moves the softwood and hardwood inventories through the period between surveys. Thus estimates of volume can be made for any or all years between the surveys. This information helps to identify inconsistencies in estimates of volume, growth, mortality, or removals that require further study and evaluation.

In Maryland, TRAS was first run from 1964 to 1976. Doing this gave some figures for 1964 softwood volume that were unacceptably low. After an exhaustive analysis of the 1964 and 1976 surveys, some problems with the softwood data from the 1964 survey were identified. The manner in which the photo- and ground-plot samples were taken in 1964 led to an undersampling of the softwood forest types. The result was a very conservative estimate of the volume of softwoods in 1964.

Having identified the possible cause of the problem, TRAS was run from 1950 to 1976. This produced softwood and hardwood volumes for 1950 and 1964 that were more indicative of the trend in the resource. Because this quarter-century trend seemed more reasonable and was based on more resource information, 1950 was used as the starting point for species consistency. Thus, in certain instances, the 1950/1976 comparisons have been emphasized in this report.

The TRAS estimates for 1950 softwood and hardwood volume required refinement for more detailed analysis, so these two broad groups were divided into nine species groups using the reported data for 1950 and 1964 as a base. The softwood and hardwood data for 1950 from TRAS was so close to the reported data that the TRAS volume was simply apportioned to the species based on their 1950 proportions. For 1964, the figures were different enough from TRAS that another technique was used to develop species volume. This involved using change rates developed from the fixed-radius plots to discount the 1976 volumes back to 1964 by species. These proportions were then adjusted to the 1964 TRAS totals for softwoods and hardwoods.

The trends indicated by these TRAS-adjusted volumes for 1950 and 1964 were then compared with those that the reported data indicated. In all but two cases—loblolly pine and red maple—the differences in figures and trends were insignificant, so the TRAS-adjusted figures were accepted. After a detailed analysis involving study of industry trends, the stand tables generated for the last two inventories, and the silvical characteristics of loblolly pine and red maple, it was determined that the most realistic trends for these species came by making slight adjustments in the reported figures for 1950 and 1964. (For a discussion of these trends see Timber Volume.)

Thus, the species consistency effort incorporated information from the TRAS model as well as more species-specific data from a variety of sources. The resulting figures are the best estimates for growing-stock volume for these nine species groups for three points in time. They should be useful to readers interested in analyzing trends between inventories.

Reliability of the estimates

The forest-area and timber-volume data presented in this report were based on a carefully designed sample of forest conditions throughout the state. However, since neither every acre nor every tree in the state was measured, the data presented in this report are estimates. A measure of the reliability of these estimates is given by a sampling error. An associated sampling error was calculated for each estimate in this report. Many of these appear in the data tables.

Here is an example of how to use sampling errors. The total growing-stock volume estimate of Maryland, 3,492.1 million cubic feet, is our best estimate. It has an associated sampling error of 2.3 percent, or 80.3 million cubic feet. This means that if there are no errors in procedure, the odds are 2 to 1 that if we repeated the survey in the same way, the resulting estimate of growing-stock volume, in millions of cubic feet, would be between 3,411.8 and 3,572.4 or 3,492.1 $\pm$80.3. Similarly, the odds are 19 to 1 that it would be within $\pm$160.6 and 300 to 1 that it would be within $\pm$240.9 million cubic feet.

Because of the nature of sampling, estimates for the state are most reliable (that is, have the smallest sampling errors), followed by unit estimates, and then county estimates. For example, our estimate of commercial forest land for the state has an associated error of 1.7 percent; the error for the Central Unit estimate is 3.4 percent; and the error for the Talbot County estimate is 23 percent.

While county estimates are often desired, they are the least reliable estimates in this report. They are intended for use in compiling forest resource estimates for groups of counties. Because the sampling procedure was intended primarily to furnish inventory data for the survey unit as a whole, individual county estimates have limited and variable accuracy. As county totals are broken down by various subdivisions, the magnitude of the error increases and is greatest for the smallest items. Sampling errors in state and unit tables also behave this way, but the situation is not as serious since the errors for the table totals are smaller to start with.

This computed sampling error is not a complete measure of reliability. There are other sources of error that this term does not include. There could be imperfections in volume tables and equations and errors in field measurement. Procedural errors were kept to a minimum by careful training of all personnel, frequent inspection of field work, and application of the most reliable survey methods.

Commercial Tree Species of Maryland

Scientific Name[1]	*Common Name*	*Occurrence*[2]
	Softwoods	
Chamaecyparis thyoides	Atlantic white-cedar	r
Juniperus virginiana	eastern redcedar	r
Picea abies	Norway spruce[3]	r
Pinus echinata	shortleaf pine	vr
P. pungens	Table-mountain pine	vr
P. resinosa	red pine[3]	r
P. rigida	pitch pine	r
P. serotina	pond pine	r
P. strobus	eastern white pine	c
P. sylvestris	Scotch pine[3]	vr
P. taeda	loblolly pine	vc
P. virginiana	Virginia pine	vc
Taxodium distichum var. *distichum*	baldcypress	vr
Tsuga canadensis	eastern hemlock	r
	Hardwoods	
Acer rubrum	red maple (soft)[4]	vc
A. saccharinum	silver maple	vr
A. saccharum	sugar maple (hard)	c
Betula alleghaniensis	yellow birch	r
B. lenta	sweet birch (black)	c
B. nigra	river birch	r
Carya spp.	hickory	c
Castanea dentata	American chestnut	r
Celtis occidentalis	hackberry	r
Cornus florida	flowering dogwood	c
Diospyros virginiana	common persimmon	r
Fagus grandifolia	American beech	c
Fraxinus americana	white ash	c
F. nigra	black ash	vr
F. pennsylvanica	green ash	r
Ilex opaca	American holly	c

Continued

Scientific Name[1]	*Common Name*	*Occurrence*[2]
Juglans cinerea	butternut	vr
J. nigra	black walnut	r
Liquidambar styraciflua	sweetgum	vc
Liriodendron tulipifera	yellow-poplar	vc
Magnolia acuminata var. *acuminata*	cucumbertree	r
M. virginiana	sweetbay	r
Nyssa sylvatica	blackgum (black tupelo)	c
Platanus occidentalis	American sycamore	r
Populus deltoides	eastern cottonwood	vr
P. grandidentata	bigtooth aspen	r
P. tremuloides	quaking aspen	vr
Prunus serotina	black cherry	c
Quercus alba	white oak	vc
Q. bicolor	swamp white oak	r
Q. coccinea	scarlet oak	c
Q. falcata var. *falcata*	southern red oak	c
Q. falcata var. *pagodaefolia*	cherrybark oak	r
Q. imbricaria	shingle oak	vr
Q. lyrata	overcup oak	r
Q. macrocarpa	bur oak	vr
Q. michauxii	swamp chestnut oak	r
Q. muehlenbergii	chinkapin oak	vr
Q. nigra	water oak	c
Q. palustris	pin oak	r
Q. phellos	willow oak	c
Q. prinus	chestnut oak	c
Q. rubra	northern red oak	c
Q. stellata var. *stellata*	post oak	r
Q. velutina	black oak	c
Robinia pseudoacacia	black locust	c
Salix nigra	black willow	r
Tilia americana	American basswood	r
Ulmus americana	American elm	r
U. rubra	slippery elm	r

[1]Names according to: Little, Elbert, L., Jr. 1953. Checklist of native and naturalized trees of the United States (including Alaska). U.S. Dep. Agric., Agric. Handb. 41. 472 p.

[2]Occurrence is based on the frequency of tally of commercial species, 5.0 inches dbh or larger, on Resource Evaluation field plots: vr = very rare (<0.05 percent), r = rare (0.05 to 0.49 percent), c = common (0.5 to 4.9 percent), and vc = very common (≥5.0 percent).

[3]Species introduced into Maryland.

[4]Names in parentheses are other frequently used common names.

Index to Tables[a]

Statistical Tables for the State

[a]All tables with area, number of trees, and volume data are dated January 1, 1976. All tables with growth, removals, mortality, and output of timber products data are dated December 31, 1975.

Statistical Tables for Geographic Units

FOREST LAND

NUMBER OF TREES

TIMBER VOLUME

GROWTH AND REMOVALS

Statistical Tables for Counties

FOREST LAND

TIMBER VOLUME

Table 1.—Area by land class, Maryland, 1976

Land class	Area	
	Thousand acres	*Percent*
Forest land:		
Commercial	2,522.7	40
Productive reserved	108.9	2
Urban	21.0	[a]
Unproductive	0.6	[a]
Total forest land	2,653.2	42
Nonforest land:		
Cropland[b]	1,513.7	24
Pasture	423.5	7
Other[c]	1,739.8	27
Total nonforest land	3,677.0	58
Total area[d]	6,330.2	100

[a]Less than 0.5 percent.
[b]Source: 1974 Census of Agriculture. Excludes croplands used only for pasture.
[c]Includes swampland, industrial and urban areas, other nonforest land, and 48,000 acres, classed as water by Resources Evaluation standards, but defined by the Bureau of the Census as land.
[d]Source: United States Bureau of the Census, U.S. Census of Population: 1970, Vol. I and Area Measurement Reports, Series GE-20, No. 1.

Table 2.—Area of commercial forest land, by ownership class, Maryland, 1976

Ownership class	Area	
	Thousand acres	*Percent*
Other Federal	24.9	1
State	185.2	8
County and Municipal	32.6	1
Total public	242.7	10
Forest industry	139.2	5
Farmer-owned	1,028.2	41
Miscellaneous private:		
Individual	734.6	29
Corporate	248.9	10
Other	129.1	5
Total private	2,280.0	90
All ownerships	2,522.7	100

Table 3.—Area of commercial forest land, by stand-size and ownership class, Maryland, 1976
(In thousands of acres)

Stand-size class	All ownerships	Other public	Forest industry	Farmer and other
Sawtimber stands	1,413.1	139.2	48.9	1,225.0
Poletimber stands	665.5	72.7	47.3	545.5
Sapling-seedling stands	438.2	30.8	43.0	364.4
Nonstocked areas	5.9	—	—	5.9
All classes	2,522.7	242.7	139.2	2,140.8

Table 4.—Area of commercial forest land, by stand-volume and ownership class, Maryland, 1976
(In thousands of acres)

Stand-volume per acre (board feet) [a]	All ownerships	Other public	Forest industry	Farmer and other
Less than 1,500	798.2	68.7	46.1	683.4
1,500 to 5,000	1,031.5	110.9	71.2	849.4
More than 5,000	693.0	63.1	21.9	608.0
All classes	2,522.7	242.7	139.2	2,140.8

[a]International ¼-inch rule.

Table 5.—Area of commercial forest land, by stocking class based on selected stand components, Maryland, 1976
(In thousands of acres)

Stocking class[a] (percent)	Stocking classified in terms of—				
	All trees	Growing-stock trees			Rough and rotten trees
		Total	Desirable	Acceptable	
160	5.6	—	—	—	—
150 to 159	152.9	50.4	—	41.3	—
140 to 149	323.3	108.6	—	105.7	—
130 to 139	439.8	237.9	—	196.6	—
Overstocked	921.6	396.9	—	343.6	—
120 to 129	537.5	278.3	—	248.5	—
110 to 119	433.1	293.1	—	318.3	—
100 to 109	264.3	343.8	—	338.3	6.2
Fully stocked	1,234.9	915.2	—	905.1	6.2
90 to 99	172.3	363.5	—	350.3	—
80 to 89	47.9	272.6	—	314.8	47.6
70 to 79	32.0	146.5	—	168.8	31.9
60 to 69	24.2	142.0	—	141.6	37.3
Medium stocked	276.4	924.6	—	975.5	116.8
50 to 59	24.1	86.1	—	76.2	126.8
40 to 49	18.7	82.8	—	98.9	165.4
30 to 39	5.9	49.2	—	55.5	203.8
20 to 29	35.2	36.3	38.1	36.3	407.3
10 to 19	5.9	31.6	178.9	31.6	666.9
0 to 9	—	—	2,305.7	—	829.5
Poorly stocked	89.8	286.0	2,522.7	298.5	2,399.7
All classes	2,522.7	2,522.7	2,522.7	2,522.7	2,522.7

[a]100 percent stocking equals 75 square feet of basal area per acre.

Table 6.—Area of commercial forest land, by area-condition and ownership class, Maryland, 1976
(In thousands of acres)

Area-condition class[a]	All ownerships	Other public	Forest industry	Farmer and other
Class *10-40*	—	—	—	—
Class *50*	1,234.4	101.0	101.5	1,031.9
Class *60*	977.5	96.5	33.3	847.7
Class *70*	310.8	45.2	4.4	261.2
All classes	2,522.7	242.7	139.2	2,140.8

[a]Class *10* to *40*.—Areas medium to fully stocked with desirable trees.
Class *50*.—Areas poorly stocked with desirable trees, but fully stocked with growing-stock trees.
Class *60*.—Areas poorly stocked with desirable trees, but with medium to full stocking of growing-stock trees.
Class *70*.—Areas poorly stocked with desirable trees, and poorly stocked with growing-stock trees.

Table 7.—Area of commercial forest land, by potential site productivity and ownership class, Maryland, 1976
(In thousands of acres)

Growth-per-acre class (cubic feet)	All ownerships	Other public	Forest industry	Farmer and other
120 to 165	222.2	39.8	8.7	173.7
85 to 119	759.5	67.2	37.6	654.7
50 to 84	1,130.6	74.4	65.8	990.4
20 to 49	410.4	61.3	27.1	322.0
All classes	2,522.7	242.7	139.2	2,140.8

Table 8.—Area of commercial forest land, by forest-type group and ownership class, Maryland, 1976
(In thousands of acres)

Forest-type group	All ownerships	Other public	Forest industry	Farmer and other
White and red pine	43.4	16.2	—	27.2
Spruce/fir	11.2	5.8	—	5.4
Loblolly and shortleaf pine	522.0	39.1	47.1	435.8
Oak/pine	163.1	24.3	13.1	125.7
Oak/hickory	1,161.7	107.9	40.6	1,013.2
Oak/gum/cypress	98.7	4.7	16.5	77.5
Elm/ash/red maple	322.7	28.9	17.7	276.1
Maple/beech/birch	199.9	15.8	4.2	179.9
All groups	2,522.7	242.7	139.2	2,140.8

Table 9.—Area of commercial forest land, by forest-type group and stand-size class, Maryland, 1976
(In thousands of acres)

Forest-type group	All stands	Saw-timber stands	Pole-timber stands	Sapling-seedling stands[a]
White and red pine	43.4	6.3	18.6	18.5
Spruce/fir	11.2	4.6	—	6.6
Loblolly and shortleaf pine	522.0	274.1	167.5	80.4
Oak/pine	163.1	74.3	65.8	23.0
Oak/hickory	1,161.7	733.7	262.3	165.7
Oak/gum/cypress	98.7	56.0	27.6	15.1
Elm/ash/red maple	322.7	188.6	67.7	66.4
Maple/beech/birch	199.9	75.5	56.0	68.4
All groups	2,522.7	1,413.1	665.5	444.1

[a]Includes 5,900 acres of nonstocked land in the elm/ash/red maple group.

Table 10.—Area of commercial forest land by, forest type and forest-type group, Maryland, 1976

Forest type and forest-type group	Area	Sampling error
	Thousand Acres	*Percent*
Red pine	6.4	**
White pine	24.6	*
White pine/hemlock	6.2	**
Hemlock	6.2	**
TOTAL, WHITE AND RED PINE GROUP	43.4	37
White spruce	6.6	*
Norway spruce	4.6	**
TOTAL, SPRUCE/FIR GROUP	11.2	*
Loblolly pine	295.0	8
Virginia pine	217.9	14
Eastern redcedar	2.7	**
Pitch pine	6.4	**
TOTAL, LOBLOLLY AND SHORTLEAF PINE GROUP	522.0	7
Eastern redcedar/hardwood	2.7	**
Virginia pine/southern red oak	111.2	20
Loblolly pine/hardwood	49.2	24
TOTAL, OAK/PINE GROUP	163.1	15
Post or black oak	126.7	21
Chestnut oak	135.7	20
White oak/red oak/hickory	184.9	16
White oak	168.9	17
Northern red oak	38.1	39
Yellow-poplar/white oak/northern red oak	82.7	25
Sweetgum/yellow-poplar	257.0	13
Mixed hardwoods	167.7	21
TOTAL, OAK/HICKORY GROUP	1,161.7	5
Swamp chestnut oak/cherrybark oak	27.6	36
Sweetgum/willow oak	71.1	22
TOTAL, OAK/GUM/CYPRESS GROUP	98.7	19
Black ash/American elm/red maple	54.8	30
River birch/sycamore	25.9	46
Willow	5.9	**
Red maple (lowland)	58.7	23
Red maple (upland)	177.4	16
TOTAL, ELM/ASH/RED MAPLE GROUP	322.7	12
Sugar maple/beech/yellow birch	50.9	34
Black cherry	30.6	42
Black walnut	17.5	*
Mixed northern hardwoods	100.9	32
TOTAL, MAPLE/BEECH/BIRCH GROUP	199.9	19
Total, all types	2,522.7	1.7

*Sampling error of 50 to 99 percent.
**Sampling error of more than 99 percent.

Table 11.—Area of noncommercial forest land, by forest-type group, Maryland, 1976
(In thousands of acres)

Forest-type group	All areas	Productive-reserved	Urban	Unproductive
White and red pine	5.4	5.4	—	—
Spruce/fir	.4	.4	—	—
Loblolly and shortleaf pine	20.6	20.6	—	—
Oak/pine	11.4	11.4	—	—
Oak/hickory	67.0	45.4	21.0	0.6
Oak/gum/cypress	4.6	4.6	—	—
Elm/ash/red maple	15.9	15.9	—	—
Maple/beech/birch	5.2	5.2	—	—
All groups	130.5	108.9	21.0	0.6

Table 12.—Number of trees on commercial forest land by species group, and tree and diameter class, Maryland, 1976
(In thousands of trees)

Dbh class (inches)	Softwoods			Hardwoods		
	Growing-stock trees	Rough and rotten trees	Total	Growing-stock trees	Rough and rotten trees	Total
Saplings-seedlings:						
less than 1.0	46,421	181	46,602	360,695	60,456	421,151
1.0 to 2.9	52,603	19,910	72,513	390,499	385,210	775,709
3.0 to 4.9	42,176	6,534	48,710	148,108	86,687	234,795
Total	141,200	26,625	167,825	899,302	532,353	1,431,655
Poletimber:						
5.0 to 6.9	37,954	1,961	39,915	79,899	29,223	109,122
7.0 to 8.9	27,470	779	28,249	51,598	10,842	62,440
9.0 to 10.9	—	—	—	34,793	5,619	40,412
Total	65,424	2,740	68,164	166,290	45,684	211,974
Small sawtimber:						
9.0 to 10.9	14,394	581	14,975	—	—	—
11.0 to 12.9	7,747	403	8,150	21,842	3,748	25,590
13.0 to 14.9	4,173	97	4,270	14,951	2,168	17,119
Total	26,314	1,081	27,395	36,793	5,916	42,709
Large sawtimber:						
15.0 to 16.9	1,986	77	2,063	9,577	1,225	10,802
17.0 to 18.9	556	28	584	5,594	798	6,392
19.0 to 20.9	194	10	204	2,786	562	3,348
21.0 to 28.9	70	9	79	3,569	966	4,535
29.0 and larger	16	—	16	309	218	527
Total	2,822	124	2,946	21,835	3,769	25,604
All classes	235,760	30,570	266,330	1,124,220	587,722	1,711,942

Table 13.—Number of growing-stock trees on commercial forest land, by species and diameter class, Maryland, 1976
(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
White and red pine	6,232	3,490	2,046	599	—	25	48	14	10	—	—
Loblolly pine[a]	45,231	15,357	11,394	7,683	5,229	3,305	1,586	462	160	50	5
Virginia pine	39,556	17,632	13,132	5,655	2,167	619	286	56	9	—	—
Other yellow pines	1,143	362	145	179	216	186	31	24	—	—	—
Other softwoods	2,398	1,113	753	278	135	38	35	—	15	20	11
Total softwoods	94,560	37,954	27,470	14,394	7,747	4,173	1,986	556	194	70	16
Soft maples	32,507	14,708	8,555	4,254	1,873	1,264	775	502	244	316	16
Hard maples	3,112	1,244	628	674	218	140	120	26	44	18	—
Hickory	10,027	3,925	2,068	1,523	1,292	577	314	84	107	128	9
Beech	5,751	1,948	853	912	618	492	273	217	145	268	25
Sweetgum	22,627	8,897	5,897	3,219	2,143	1,177	705	286	110	185	8
Yellow-poplar	19,488	4,334	3,437	2,761	2,443	2,177	1,706	1,316	509	745	60
Blackgum	9,587	3,815	2,301	1,516	642	473	487	195	84	72	2
Ash-walnut-cherry	11,632	4,244	2,917	2,307	974	461	363	199	83	84	—
Select white oaks	32,109	11,331	6,839	5,420	3,360	2,136	1,302	754	360	540	67
Select red oaks	12,042	3,762	1,948	1,796	1,150	1,616	954	443	171	179	23
Other white oaks	16,544	4,946	4,873	2,440	1,827	1,135	509	414	215	170	15
Other red oaks	32,492	9,387	7,153	5,356	4,005	2,591	1,673	965	573	720	69
Black locust	3,871	1,285	1,094	808	421	179	33	31	14	6	—
Other hardwoods	13,129	6,073	3,035	1,807	876	533	363	162	127	138	15
Total hardwoods	224,918	79,899	51,598	34,793	21,842	14,951	9,577	5,594	2,786	3,569	309
All species	319,478	117,853	79,068	49,187	29,589	19,124	11,563	6,150	2,980	3,639	325

[a]Includes 1,003,000 pond pine and 239,000 shortleaf pine trees.

Table 14.—Net volume of timber on commercial forest land, by class of timber, softwoods and hardwoods, Maryland, 1976
(In millions of cubic feet)

Class of timber	All species	Softwoods	Hardwoods
Sawtimber trees:			
Sawlog portion	1,927.4	465.2	1,462.2
Upper-stem portion	393.6	65.0	328.6
All sawtimber trees	2,321.0	530.2	1,790.8
Poletimber trees	1,171.1	262.8	908.3
All growing-stock trees	3,492.1	793.0	2,699.1
Rough trees	285.0	20.7	264.3
Rotten trees	111.7	3.5	108.2
Total, all trees	3,888.8	817.2	3,071.6

Table 15.—Net volume of growing stock and sawtimber on commercial forest land, by ownership and stand-size class, softwoods and hardwoods, Maryland, 1976

Ownership or stand-size class	Growing stock (Million cubic feet)			Sawtimber (Million board feet)[a]		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
	BY OWNERSHIP CLASSES					
Other public	342.1	81.9	260.2	697.2	121.2	576.0
Forest industry	188.4	91.2	97.2	372.1	223.7	148.4
Farmer and other	2,961.6	619.9	2,341.7	7,097.3	1,381.5	5,715.8
All ownership	3,492.1	793.0	2,699.1	8,166.6	1,726.4	6,440.2
	BY STAND-SIZE CLASSES					
Sawtimber stands	2,557.9	522.3	2,035.6	7,047.6	1,403.8	5,643.8
Poletimber stands	798.8	235.3	563.5	907.6	272.1	635.5
Sapling-seedling stands	135.4	35.4	100.0	211.4	50.5	160.9
All classes	3,492.1	793.0	2,699.1	8,166.6	1,726.4	6,440.2

[a]International ¼-inch rule.

Table 16.—Net volume of growing stock and sawtimber on commercial forest land, by forest-type group, softwoods and hardwoods, Maryland, 1976

Forest-type group	Growing stock			Sawtimber		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
	(Million cubic feet)			*(Million board feet)*[a]		
White and red pine	43.0	40.0	3.0	24.9	23.5	1.4
Spruce/fir	4.8	3.4	1.4	9.5	8.2	1.3
Loblolly and shortleaf pine	829.8	594.6	235.2	1,720.4	1,326.7	393.7
Oak/pine	188.8	60.8	128.0	370.7	126.1	244.6
Oak/hickory	1,721.3	56.6	1,664.7	4,400.3	145.2	4,255.1
Oak/gum/cypress	148.0	12.4	135.6	351.3	30.1	321.2
Elm/ash/red maple	388.3	22.0	366.3	930.4	62.4	868.0
Maple/beech/birch	168.1	3.2	164.9	359.1	4.2	354.9
All groups	3,492.1	793.0	2,699.1	8,166.6	1,726.4	6,440.2

[a]International ¼-inch rule.

Table 17.—Net volume of growing stock on commercial forest land, by species and diameter class, Maryland, 1976
(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
White and red pine	42.1	17.8	15.2	6.3	—	.4	1.5	.4	.5	—	—
Loblolly pine[a]	482.9	36.5	67.7	88.7	99.5	91.3	61.2	23.2	10.0	4.1	.7
Virginia pine	236.8	44.9	72.3	56.4	34.6	15.4	9.9	2.7	.6	—	—
Other yellow pines	13.9	.9	.7	1.6	3.8	4.5	1.2	1.2	—	—	—
Other softwoods	17.3	3.3	3.5	2.5	1.8	.7	1.1	—	.9	1.3	2.2
Total softwoods	793.0	103.4	159.4	155.5	139.7	112.3	74.9	27.5	12.0	5.4	2.9
Soft maples	280.6	45.3	49.5	43.2	29.3	30.4	24.4	20.8	12.6	23.0	2.1
Hard maples	33.5	5.2	4.2	7.5	4.0	3.6	4.4	1.1	2.2	1.3	—
Hickory	114.8	12.4	12.6	16.8	23.2	15.4	11.2	4.5	6.7	10.8	1.2
Beech	95.2	5.4	4.7	9.0	10.1	12.1	10.0	10.0	8.3	22.1	3.5
Sweetgum	221.1	27.2	34.6	33.6	37.3	29.5	24.2	12.8	6.1	14.7	1.1
Yellow-poplar	350.5	13.8	20.5	28.5	39.4	51.4	54.1	54.0	26.9	52.4	9.5
Blackgum	98.8	11.1	13.7	16.0	10.7	11.4	16.6	8.8	4.7	5.5	.3
Ash-walnut-cherry	117.2	13.3	17.3	25.0	17.2	11.9	12.2	9.0	4.7	6.6	—
Select white oaks	399.5	29.6	38.1	56.0	57.9	53.8	47.0	35.8	22.5	47.6	11.2
Select red oaks	186.0	11.2	12.1	19.4	19.3	41.7	33.2	20.9	9.7	15.0	3.5
Other white oaks	180.2	16.3	28.7	24.4	28.6	25.2	15.2	16.9	10.9	12.0	2.0
Other red oaks	468.1	29.7	44.0	60.5	68.7	64.7	58.3	45.0	32.7	54.7	9.8
Black locust	32.8	3.8	6.1	7.6	7.1	4.2	1.1	1.5	.9	.5	—
Other hardwoods	120.8	16.3	16.5	17.6	15.1	14.0	12.2	7.8	6.9	11.7	2.7
Total hardwoods	2,699.1	240.6	302.6	365.1	367.9	369.3	324.1	248.9	155.8	277.9	46.9
All species	3,492.1	344.0	462.0	520.6	507.6	481.6	399.0	276.4	167.8	283.3	49.8

[a]Includes 9,500,000 cubic feet of pond pine and 3,000,000 of shortleaf pine.

Table 18.—Net volume of sawtimber on commercial forest land, by species and diameter class, Maryland, 1976

(In millions of board feet)[a]

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
White and red pine	29.1	18.6	—	1.2	5.3	1.8	2.2	—	—
Loblolly pine[b]	1,238.9	256.2	313.8	309.5	218.1	85.1	37.4	16.0	2.8
Virginia pine	378.1	164.8	111.7	54.0	36.0	9.7	1.9	—	—
Other yellow pines	42.3	5.1	12.5	15.9	4.5	4.3	—	—	—
Other softwoods	38.0	7.9	6.0	2.2	3.9	—	3.6	5.0	9.4
Total softwoods	1,726.4	452.6	444.0	382.8	267.8	100.9	45.1	21.0	12.2
Soft maples	515.3	—	90.0	102.3	89.4	81.6	49.5	92.8	9.3
Hard maples	50.5	—	11.4	10.9	13.3	3.7	7.1	4.1	—
Hickory	253.4	—	69.1	53.1	41.5	16.1	26.6	42.2	4.8
Beech	287.8	—	30.5	42.4	37.3	38.4	32.2	91.9	15.1
Sweetgum	454.8	—	114.1	106.5	91.7	50.9	24.8	62.2	4.6
Yellow-poplar	1,070.0	—	116.5	177.3	201.2	211.0	105.7	218.0	40.3
Blackgum	213.2	—	33.0	40.1	62.9	35.0	19.0	22.0	1.2
Ash-walnut-cherry	211.0	—	49.9	38.6	44.6	33.7	17.9	26.3	—
Select white oaks	1,005.4	—	177.5	187.0	171.4	135.3	88.5	198.7	47.0
Select red oaks	481.0	—	56.8	131.6	114.0	75.8	37.9	52.9	12.0
Other white oaks	381.5	—	83.2	82.6	52.8	64.4	42.7	47.3	8.5
Other red oaks	1,216.0	—	208.1	224.8	214.4	172.4	128.4	225.9	42.0
Black locust	49.8	—	20.5	14.0	4.1	5.6	3.3	2.3	—
Other hardwoods	250.5	—	44.3	46.3	44.5	29.5	26.3	48.3	11.3
Total hardwoods	6,440.2	—	1,105.3	1,257.5	1,183.1	953.4	609.9	1,134.9	196.1
All species	8,166.6	452.6	1,549.3	1,640.3	1,450.9	1,054.3	655.0	1,155.9	208.3

[a]International ¼-inch rule.
[b]Includes 20,400,000 board feet of pond pine and 6,800,000 of shortleaf pine.

Table 19.—Net volume of sawtimber on commercial forest land, by species and quality class, Maryland, 1976

(In millions of board feet)[a]

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4[b]
Softwoods:					
White and red pine	29.1	1.5	3.4	19.0[c]	5.2
Loblolly pine[d]	1,238.9	352.3	176.4	710.2	—
Virginia pine	378.1	7.8	12.5	357.8	—
Other yellow pines	42.3	—	4.8	37.5	—
Other softwoods[e]	38.0	—	—	—	—
Total softwoods	1,726.4	361.6	197.1	1,124.5	5.2
Hardwoods:					
Soft maples	515.3	30.4	61.0	309.0	114.9
Hard maples	50.5	5.1	6.5	19.3	19.6
Hickory	253.4	21.4	61.5	111.4	59.1
Beech	287.8	9.7	11.9	146.9	119.3
Sweetgum	454.8	64.0	71.5	183.3	136.0
Yellow-poplar	1,070.0	186.9	227.4	425.4	230.3
Blackgum	213.2	41.4	48.0	101.8	22.0
Ash-walnut-cherry	211.0	26.5	57.6	94.1	32.8
Select white oaks	1,005.4	127.3	202.5	409.8	265.8
Select red oaks	481.0	57.4	130.7	222.3	70.6
Other white oaks	381.5	44.8	84.6	164.1	88.0
Other red oaks	1,216.0	157.6	259.0	463.5	335.9
Black locust	49.8	1.9	4.4	32.7	10.8
Other hardwoods	250.5	31.9	56.1	127.2	35.3
Total hardwoods	6,440.2	806.3	1,282.7	2,810.8	1,540.4
			(In percent)		
Hardwood quality	100	12	20	44	24

[a]International ¼-inch rule.
[b]Grade 4 applies only to white pine. For hardwoods the volumes in this column are for construction logs.
[c]This includes 5.2 million board feet of red pine.
[d]This includes 20.4 million board feet of pond pine and 6.8 million board feet of shortleaf pine.
[e]Softwood species other than pine are not graded into standard-lumber grades.

Table 20.—Components of average annual net change of growing stock and sawtimber on commercial forest land, softwoods and hardwoods, Maryland 1950-75

Component	All species	Soft-woods	Hard-woods
	GROWING STOCK *Thousand cubic feet*		
Growth on initial growing-stock inventory[a]	93,347	20,479	72,868
Ingrowth—trees that became 5.0″ dbh or larger	31,670	10,496	21,174
Gross growth	125,017	30,975	94,042
Cull increment	− 6,817	− 825	− 5,992
Annual mortality	−14,950	−4,150	−10,800
Average annual:			
Net growth	103,250	26,000	77,250
Removals	−77,600	−24,700	−52,900
Inventory change	25,650	1,300	24,350
	SAWTIMBER *Thousand board feet*[b]		
Growth on initial sawtimber inventory[a]	125,599	31,647	93,952
Ingrowth—trees that became sawtimber size	181,417	48,526	132,891
Gross growth	307,016	80,173	226,843
Cull increment	−14,516	− 673	−13,843
Annual mortality	−22,500	−6,500	−16,000
Average annual:			
Net growth	270,000	73,000	197,000
Removals	−193,000	−66,000	−127,000
Inventory change	77,000	7,000	70,000

[a]Including growth on trees that were cut.
[b]International ¼-inch rule.

Table 21.—Annual net growth, removals, and mortality of growing stock and sawtimber on commercial forest land, by species, Maryland, 1975

Species	Growing stock			Sawtimber		
	Annual net growth	Annual timber removals[a]	Annual mortality	Annual net growth	Annual timber removals[a]	Annual mortality
	Thousand cubic feet			*Thousand board feet*[b]		
Softwoods:						
Loblolly and shortleaf pine	18,292	17,103	1,518	55,096	49,280	2,573
Other softwoods	6,608	6,497	2,682	19,904	18,720	4,427
Total softwoods	24,900	23,600	4,200	75,000	68,000	7,000
Hardwoods:						
White oaks	12,252	6,425	2,625	31,733	15,906	4,048
Red oaks	20,161	13,552	2,175	52,217	33,551	2,775
Yellow-poplar	11,473	8,762	1,878	29,715	21,692	3,809
Sweetgum	9,468	11,449	1,719	24,522	28,345	3,258
Hickory	2,450	1,635	986	6,345	4,048	1,603
Red maple	11,695	6,425	791	30,290	15,907	1,320
Other hardwoods	18,601	13,552	1,726	48,178	33,551	1,187
Total hardwoods	86,100	61,800	11,900	223,000	153,000	18,000
Total, all species	111,000	85,400	16,100	298,000	221,000	25,000

[a]Data for timber removals in this table are based on the trend from 1950 to 1975 and differ from those shown in table 27. Table 27 reports the results of a canvass of timber removals for 1975.
[b]International ¼-inch rule.

Table 22.—Annual net growth and removals of growing stock and sawtimber on commercial forest land, by ownership class, softwoods and hardwoods, Maryland, 1975

Ownership	Annual net growth			Annual timber removals[a]		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
	GROWING STOCK (*Thousand cubic feet*)					
Other public	8,773	978	7,795	1,784	910	874
Forest industry	6,785	3,842	2,943	9,311	7,799	1,512
Farmer and other	95,442	20,080	75,362	74,305	14,891	59,414
All ownerships	111,000	24,900	86,100	85,400	23,600	61,800
	SAWTIMBER (*Thousand board feet*)[b]					
Other public	22,034	3,541	18,493	4,786	2,622	2,164
Forest industry	16,530	11,338	5,192	26,215	22,472	3,743
Farmer and other	259,436	60,121	199,315	189,999	42,906	147,093
All ownerships	298,000	75,000	223,000	221,000	68,000	153,000

[a]Data for timber removals in this table are based on the trend from 1950 to 1975 and differ from those shown in table 27. Table 27 reports the results of a canvass of timber removals for 1975.
[b]International ¼-inch rule.

Table 23.—Annual mortality of growing stock and sawtimber on commercial forest land, softwoods and hardwoods, Maryland, 1975

Ownership and cause	Growing stock (Thousand cubic feet)			Sawtimber (Thousand board feet)[a]		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
			BY OWNERSHIP			
Other public	1,617	654	963	2,053	762	1,291
Forest industry	620	309	311	945	532	413
Farmer and other	13,863	3,237	10,626	22,002	5,706	16,296
All ownerships	16,100	4,200	11,900	25,000	7,000	18,000
			BY CAUSE			
Disease	3,337	613	2,724	5,136	1,564	3,572
Weather	5,050	1,116	3,934	2,105	2,105	—
Logging	392	135	257	1,001	193	808
Suppression	537	342	195	337	337	—
Unknown	6,784	1,994	4,790	16,421	2,801	13,620
All causes	16,100	4,200	11,900	25,000	7,000	18,000

[a]International ¼-inch rule.

Table 24.—Sampling errors for major forest-area and timber-volume classes, Maryland, 1976

Table No.	Item classification	Sampling error
	FOREST AREA	
		Percent
1	Forest-land area:	
	Commercial	1.7
	Unproductive	37
	Total forest	1.6
2	Ownership[a]:	
	Forest industry	18
	Farmer-owned	4
	Misc. private-individual	5
	corporate	8
	other	12
3	Stand-size class:	
	Sawtimber	4
	Poletimber	7
	Sapling-seedling	11
	Nonstocked areas	**
4	Stand-volume per acre (board feet):	
	Less than 1,500	7
	1,500 to 5,000	6
	More than 5,000	7
6	Area-condition class:	
	Class *50*	5
	Class *60*	6
	Class *70*	15
7	Growth-per-acre class (cubic feet):	
	120 to 165	15
	85 to 119	8
	50 to 84	6
	20 to 49	11

Table No.	Item classification	Sampling error	
		Percent	
		All trees	*Growing stock*
5	Stocking class (in percent):		
	160	*	—
	150 to 159	16	26
	140 to 149	11	18
	130 to 139	10	13
	Overstocked	6	9
	120 to 129	9	12
	110 to 119	10	12
	100 to 109	13	11
	Fully stocked	5	6
	90 to 99	21	11
	80 to 89	32	13
	70 to 79	37	18
	60 to 69	47	19
	Medium stocked	15	6
	50 to 59	46	25
	40 to 49	*	37
	30 to 39	**	34
	20 to 29	*	39
	10 to 19	**	*
	0 to 9	—	—
	Poorly stocked	34	16

Table No.	Item classification	Sampling error	
	NUMBER OF TREES		
		Percent	
		Soft-woods	*Hard-woods*
12	Growing-stock trees (dbh class):		
	5.0 to 6.9	12	5
	7.0 to 8.9	10	5
	9.0 to 10.9	—	4
	Poletimber	10	4
	9.0 to 10.9	8	—
	11.0 to 12.9	8	5
	13.0 to 14.9	10	5
	Small sawtimber	5	3
	15.0 to 16.9	13	5
	17.0 to 18.9	19	6
	19.0 to 20.9	22	8
	21.0 to 28.9	31	8
	29.0 and larger	47	15
	Large sawtimber	10	3
	All classes	8	3

Continued

Table 24.—Continued

Table No.	Item	Sampling error
		Percent
13	Species:	
	White and red pine	*
	Loblolly-shortleaf pine	9
	Virginia pine	13
	Other yellow pine	35
	Other softwoods	30
	All softwoods	8
	Soft maples	7
	Hard maple	28
	Hickory	12
	Beech	14
	Sweetgum	11
	Yellow-poplar	11
	Blackgum	11
	Ash-walnut-cherry	14
	Select white oaks	9
	Select red oaks	11
	Other white oaks	15
	Other red oaks	8
	Black locust	22
	Other hardwoods	12
	All hardwoods	3
	All species	3
	TIMBER VOLUME	
		Percent
		Cubic feet / *Board feet*
14	Class of timber:	
	Sawtimber trees	3 / —
	Poletimber trees	4 / —
	All growing stock	2 / —
	Rough trees	7 / —
	Rotten trees	7 / —
	All live trees	2 / —
15	Ownership and stand-size:	
	Other public	16 / 17
	Forest industry	19 / 22
	Farmer and other	3 / 4
	Sawtimber	3 / 3
	Poletimber	9 / 11
	Sapling-seedling	14 / 19
16	Forest-type group:	
	White and red pine	* / *
	Spruce/balsam fir	** / **
	Loblolly and shortleaf pine	7 / 9
	Oak/pine	17 / 18
	Oak/hickory	5 / 6
	Oak/gum/cypress	22 / 24
	Elm/ash/red maple	14 / 15
	Maple/beech/birch	21 / 24
17-18	Diameter class (inches):	
	5.0 to 6.9	6 / —
	7.0 to 8.9	5 / —
	9.0 to 10.9[b]	4 / 9
	11.0 to 12.9	4 / 5
	13.0 to 14.9	4 / 5
	15.0 to 16.9	5 / 5
	17.0 to 18.9	6 / 6
	19.0 to 20.9	7 / 7
	21.0 to 28.9	7 / 7
	29.0 and larger	40 / 14
	Species:	
	White and red pine	* / *
	Loblolly-shortleaf pine	7 / 8
	Virginia pine	12 / 14
	Other yellow pines	39 / 42
	Other softwoods	31 / 37
	All softwoods	6 / 7
	Soft maples	8 / 11
	Hard maple	31 / 42
	Hickory	11 / 14
	Beech	16 / 19
	Sweetgum	9 / 12
	Yellow-poplar	10 / 11
	Blackgum	10 / 14
	Ash-walnut-cherry	14 / 16
	Select white oaks	7 / 8
	Select red oaks	12 / 14
	Other white oaks	13 / 16
	Other red oaks	7 / 7
	Black locust	25 / 40
	Other hardwoods	13 / 17
	All hardwoods	3 / 4
	All species	2 / 3

Continued

Table 24.—Continued

Table No.	Item	Sampling error		Table No.	Item	Sampling error	
	GROWTH-REMOVALS				MORTALITY		
		Percent				*Percent*	
		Cubic feet	*Board feet*			*Cubic feet*	*Board feet*
20	Components of change:			23	By species group:		
	Gross growth	27	28		Softwoods	24	35
	Cull increment	19	27		Hardwoods	46	23
	Annual mortality	33	19				
	Annual net growth	31	42				
	Annual removals	18	20	23	By cause:		
	Inventory change	*	**		Disease	36	46
					Weather	*	*
22	Growth by:				Logging	40	*
	Softwoods	31	22		Suppression	38	**
	Hardwoods	36	49		Unknown	17	23
22	Removals by:						
	Softwoods	29	32				
	Hardwoods	20	23				

*Sampling errors of 50 to 99 percent.
**Sampling errors of 100 percent and over.
[a]Public ownership classes have no sampling errors.
[b]Board-foot sampling error for this class is for softwoods only.

Table 25.—Output of timber products, by source of material, softwoods and hardwoods, Maryland, 1975

Product and species group	Standard unit	Total output		Output from roundwood		Output from plant byproducts	
		Number of units	Thousand cubic feet	Number of units	Thousand cubic feet	Number of units	Thousand cubic feet
Sawlogs:							
Softwood	M bd ft[a]	31,268	5,251	31,268	5,251	—	—
Hardwood	M bd ft	121,371	18,325	121,371	18,325	—	—
Total	M bd ft	152,639	23,576	152,639	23,576	—	—
Veneer logs and bolts:							
Softwood	M bd ft[a]	16,487	2,770	16,487	2,770	—	—
Hardwood	M bd ft	5,303	801	5,303	801	—	—
Total	M bd ft	21,790	3,571	21,790	3,571	—	—
Pulpwood:							
Softwood	Std cords[b]	159,784	13,582	103,984	8,839	55,800	4,743
Hardwood	Std cords	106,345	9,039	61,203	5,202	45,142	3,837
Total	Std cords	266,129	22,621	165,187	14,041	100,942	8,580
Cooperage logs and bolts:							
Softwood	M bd ft[a]	158	27	158	27	—	—
Hardwood	M bd ft	1,372	207	1,372	207	—	—
Total	M bd ft	1,530	234	1,530	234	—	—
Piling:							
Softwood	M linear ft	2,615	1,049	2,615	1,049	—	—
Hardwood	M linear ft	240	144	240	144	—	—
Total	M linear ft	2,855	1,193	2,855	1,193	—	—
Poles:							
Softwood	M pieces	41	97	41	97	—	—
Hardwood	M pieces	—	—	—	—	—	—
Total	M pieces	41	97	41	97	—	—
Posts (round and split):							
Softwood	M pieces	—	—	—	—	—	—
Hardwood	M pieces	43	36	43	36	—	—
Total	M pieces	43	36	43	36	—	—
Mine timbers (round):							
Softwood	M ft³	—	—	—	—	—	—
Hardwood	M ft³	13	13	13	13	—	—
Total	M ft³	13	13	13	13	—	—
Other:[c]							
Softwood	M ft³	8	8	—	—	8	8
Hardwood	M ft³	833	833	25	25	808	808
Total	M ft³	841	841	25	25	816	816
Total industrial products:							
Softwood	M ft³		22,784		18,033		4,751
Hardwood	M ft³		29,398		24,753		4,645
Total	M ft³		52,182		42,786		9,396

Continued

Table 25.—Continued

Product and species group	Standard unit	Total output		Output from roundwood		Output from plant byproducts	
		Number of units	Thousand cubic feet	Number of units	Thousand cubic feet	Number of units	Thousand cubic feet
Fuelwood:							
Softwood	Std cords[d]	10,387	831	—	—	10,387	831
Hardwood	Std cords	17,048	1,364	4,460	357	12,588	1,007
Total	Std cords	27,435	2,195	4,460	357	22,975	1,838
All products:[e]							
Softwood	M ft³		23,615		18,033		5,582
Hardwood	M ft³		30,762		25,110		5,652
Total	M ft³		54,377		43,143		11,234

[a]International ¼-inch rule.
[b]Rough wood basis, includes chips converted to equivalent standard cords, 85 ft³ of solid wood.
[c]Includes hewn ties, excelsior bolts, shingle bolts, and chemical wood.
[d]Rough wood basis, includes chips converted to equivalent standard cords, 80 ft³ of solid wood.
[e]Does not include 1,076,000 ft³ of softwood and 3,740,000 ft³ of hardwood residues used for agricultural bedding.

Table 26.—Output of roundwood products, by source, softwoods and hardwoods, Maryland, 1975
(In thousands of cubic feet)

Product and species group	All sources	Growing-stock trees[a]			Rough and rotten trees[a]	Salvable dead trees[a]	Other sources[b]
		Total	Saw-timber	Pole-timber			
PRINCIPAL INDUSTRIAL PRODUCTS							
Sawlogs:							
Softwood	5,251	4,808	4,741	67	—	35	408
Hardwood	18,325	17,838	17,610	228	17	116	354
Total	23,576	22,646	22,351	295	17	151	762
Veneer logs and bolts:							
Softwood	2,770	2,554	2,518	36	—	—	216
Hardwood	801	785	775	10	—	—	16
Total	3,571	3,339	3,293	46	—	—	232
Pulpwood:							
Softwood	8,839	7,131	4,995	2,136	—	—	1,708
Hardwood	5,202	4,101	3,152	949	514	6	581
Total	14,041	11,232	8,147	3,085	514	6	2,289
MISCELLANEOUS INDUSTRIAL PRODUCTS							
Cooperage logs and bolts:							
Softwood	27	26	23	3	—	—	1
Hardwood	207	199	176	23	—	—	8
Total	234	225	199	26	—	—	9
Piling:							
Softwood	1,049	970	889	81	—	—	79
Hardwood	144	142	115	27	—	—	2
Total	1,193	1,112	1,004	108	—	—	81

Continued

Table 26.—Continued

Product and species group	All sources	Growing-stock trees[a]			Rough and rotten trees[a]	Salvable dead trees[a]	Other sources[b]
		Total	Saw-timber	Pole-timber			
Poles:							
Softwood	97	90	82	8	—	—	7
Hardwood	—	—	—	—	—	—	—
Total	97	90	82	8	—	—	7
Posts (round and split):							
Softwood	—	—	—	—	—	—	—
Hardwood	36	35	28	7	—	—	1
Total	36	35	28	7	—	—	1
Mine timbers (round):							
Softwood	—	—	—	—	—	—	—
Hardwood	13	10	8	2	1	—	2
Total	13	10	8	2	1	—	2
Other:							
Softwood	—	—	—	—	—	—	—
Hardwood	25	25	—	25	—	—	—
Total	25	25	—	25	—	—	—
TOTAL INDUSTRIAL PRODUCTS							
Softwood	18,033	15,579	13,248	2,331	—	35	2,419
Hardwood	24,753	23,135	21,864	1,271	532	122	964
Total	42,786	38,714	35,112	3,602	532	157	3,383
NONINDUSTRIAL PRODUCTS							
Fuelwood:							
Softwood	—	—	—	—	—	—	—
Hardwood	357	281	216	65	35	1	40
Total	357	281	216	65	35	1	40
ALL PRODUCTS							
Softwood	18,033	15,579	13,248	2,331	—	35	2,419
Hardwood	25,110	23,416	22,080	1,336	567	123	1,004
Total	43,143	38,995	35,328	3,667	567	158	3,423

[a]On commercial forest land.
[b]Includes trees less than 5.0 inches in diameter, tree tops and limbs from commercial forest areas, or any material from noncommercial forest land or nonforest land such as fence rows and suburban areas.

Table 27.—Timber removals from growing stock and sawtimber on commercial forest land, by item, softwoods and hardwoods, Maryland, 1975

Item	Growing stock			Sawtimber		
	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods
	Thousand cubic feet			*Thousand board feet*[a]		
Roundwood products:						
Sawlogs	22,646	4,808	17,838	107,698	17,491	90,207
Veneer logs and bolts	3,339	2,554	785	13,260	9,290	3,970
Pulpwood	11,232	7,131	4,101	23,343	15,672	7,671
Cooperage logs and bolts	225	26	199	991	89	902
Piling	1,112	970	142	3,660	3,168	492
Poles	90	90	—	292	292	—
Posts	35	—	35	120	—	120
Mine timbers	10	—	10	19	—	19
Other	25	—	25	—	—	—
Fuelwood	281	—	281	526	—	526
All products	38,995	15,579	23,416	149,909	46,002	103,907
Logging residues	12,280	2,901	9,379	8,902	1,817	7,085
Other removals	7,621	1,414	6,207	14,636	2,243	12,393
Total removals	58,896	19,894	39,002	173,447	50,062	123,385

[a]International ¼-inch rule.

Table 28.—Volume of unused residues at primary manufacturing plants, by industry and type of residue, softwoods and hardwoods, Maryland, 1975
(In thousands of cubic feet)

Species group and type of residue	All industries	Lumber	Veneer and plywood	Other
Softwoods:				
Coarse[a]	24	24	—	—
Fine[b]	10	10	—	—
Total	34	34	—	—
Hardwoods:				
Coarse[a]	151	148	—	3
Fine[b]	268	264	—	4
Total	419	412	—	7
All species:				
Coarse[a]	175	172	—	3
Fine[b]	278	274	—	4
Total	453	446	—	7

[a]Material, such as slabs, edgings, and veneer cores.
[b]Material, such as sawdust and shavings.

Table 29.—Projection of annual net growth, annual timber removals, and inventory of growing stock and sawtimber on commercial forest land in Maryland, 1976-2006[a]

Species group	1976 (inventory year)	1986	1996	2006
		GROWING STOCK (*Million cubic feet*)		
Softwoods:				
Removals	23	25	25	25
Growth	25	25	25	25
Inventory	793	801	806	808
Hardwoods:				
Removals	62	74	87	98
Growth	86	92	97	98
Inventory	2,699	2,910	3,043	3,086
Total:				
Removals	85	99	112	123
Growth	111	117	122	123
Inventory	3,492	3,711	3,849	3,894
		SAWTIMBER (*Million board feet*)[b]		
Softwoods:				
Removals	68	74	74	74
Growth	75	75	75	75
Inventory	1,727	1,744	1,755	1,760
Hardwoods:				
Removals	153	183	215	242
Growth	223	239	252	254
Inventory	6,440	6,943	7,261	7,363
Total:				
Removals	221	257	289	316
Growth	298	314	327	329
Inventory	8,167	8,687	9,016	9,123

[a]Based upon the following assumptions: The area of commercial forest land will remain constant at 2,522,700 acres. Total growing-stock growth and removals will be in balance at 3.2 percent of the inventory at the end of 30 years.
[b]International ¼-inch rule.

Table 30.—Projection of annual net growth, annual timber removals, and inventory of growing stock and sawtimber on commercial forest land in Maryland, 1976-2006[a]

Species group	1976 (inventory year)	1986	1996	2006
		GROWING STOCK (*Million cubic feet*)		
Softwoods:				
Removals	23	25	27	29
Growth	25	26	27	28
Inventory	793	804	807	802
Hardwoods:				
Removals	62	61	60	58
Growth	86	84	82	80
Inventory	2,699	2,809	2,920	3,023
Total:				
Removals	85	86	87	87
Growth	111	110	109	108
Inventory	3,492	3,613	3,727	3,825
		SAWTIMBER (*Million board feet*)[b]		
Softwoods:				
Removals	68	74	80	86
Growth	75	78	81	84
Inventory	1,727	1,751	1,757	1,747
Hardwoods:				
Removals	153	151	148	143
Growth	223	218	213	207
Inventory	6,440	6,702	6,967	7,213
Total:				
Removals	221	225	228	229
Growth	298	296	294	291
Inventory	8,167	8,453	8,724	8,960

[a]Based upon the following assumptions: The area of commercial forest land will decline from 2,522,700 acres in 1976 to 2,305,000 by 2006. Growth per acre will generally increase throughout the State, but increases will be larger on the Lower Eastern Shore with intensified management of loblolly pine stands. Removals per acre will increase in all regions except western Maryland where a modest decline is expected.
[b]International ¼-inch rule.

Table 31.—Land area of Maryland, by land class and geographic unit, 1976
(In thousands of acres)

Geographic unit	Commercial forest land	Productive-reserved forest land	Other land forest	Total forest land	Nonforest land	All land
Central	1,105.5	95.9	17.8	1,219.5	2,596.5	3,815.7
Southern	376.1	2.1	3.5	381.7	289.6	671.3
Lower Eastern Shore	523.0	3.1	—	526.1	621.4	1,147.5
Western	518.1	7.8	.3	526.2	169.5	695.7
Total, all units	2,522.7	108.9	21.6	2,653.2	3,677.0	6,330.2

Table 32.—Area of commercial forest land in Maryland, by ownership class and geographic unit, 1976
(In thousands of acres)

Ownership class	Central	Southern	Lower Eastern Shore	Western	Total
Federal	20.9	3.7	—	0.3	24.9
State	38.7	4.9	27.8	113.8	185.2
County and municipal	30.4	—	—	2.2	32.6
Total public	90.0	8.6	27.8	116.3	242.7
Forest industry	16.9	11.7	97.7	12.9	139.2
Farmer-owned	478.3	181.0	225.9	143.0	1,028.2
Miscellaneous private:					
Individual	316.8	125.9	124.1	167.8	734.6
Corporate	135.0	27.9	29.2	56.8	248.9
Other	68.5	21.0	18.3	21.3	129.1
Total private	1,015.5	367.5	495.2	401.8	2,280.0
All ownerships	1,105.2	376.1	523.0	518.1	2,522.7
Sampling error (in percent)	3	3	2	2	2

Table 33.—Area of commercial forest land in Maryland, by stand-size class and geographic unit, 1976
(In thousands of acres)

Geographic unit	Sawtimber stands	Poletimber stands	Other stands	All classes
Central	717.4	236.2	151.9	1,105.5
Southern	227.8	85.1	63.2	376.1
Lower Eastern Shore	273.0	172.1	77.9	523.0
Western	194.9	172.1	151.1	518.1
Total, all units	1,413.1	665.5	444.1	2,522.7

Table 34.—Area of commercial forest land in Maryland, by stand-volume class and geographic unit, 1976
(In thousands of acres)

Geographic unit	Stand-volume per acre (board feet)[a]			All classes
	Fewer than 1,500	1,500-5,000	More than 5,000	
Central	240.8	462.8	401.9	1,105.5
Southern	97.7	198.9	79.5	376.1
Lower Eastern Shore	156.3	194.1	172.6	523.0
Western	303.4	175.7	39.0	518.1
Total, all units	798.2	1,031.5	693.0	2,522.7

[a]International ¼-inch rule.

Table 35.—Area of commercial forest land in Maryland, by stocking-percent class and geographic unit, 1976
(In thousands of acres)

Geographic unit	Stocking class (growing-stock trees)				All classes
	Over-stocked	Fully stocked	Medium stocked	Poorly stocked	
Central	175.0	434.4	386.1	110.0	1,105.5
Southern	37.1	177.0	154.0	8.0	376.1
Lower Eastern Shore	178.4	215.8	113.0	15.8	523.0
Western	6.4	88.0	271.5	152.2	518.1
Total, all units	396.9	915.2	924.6	286.0	2,522.7

Table 36.—Area of commercial forest land in Maryland, by area condition class and geographic unit, 1976
(In thousands of acres)

Geographic unit	Area condition class			All classes
	Class 50	Class 60	Class 70	
Central	563.4	426.3	115.8	1,105.5
Southern	211.5	156.6	8.0	376.1
Lower Eastern Shore	391.1	116.1	15.8	523.0
Western	68.4	278.5	171.2	518.1
Total, all units	1,234.4	977.5	310.8	2,522.7

Table 37.—Area of commercial forest land in Maryland, by potential site productivity class and geographic unit, 1976
(In thousands of acres)

Geographic unit	Growth-per-acre class (cubic feet)				All classes
	120 to 165	85 to 119	50 to 84	20 to 49	
Central	111.3	368.5	478.6	147.1	1,105.5
Southern	13.1	108.5	182.9	71.6	376.1
Lower Eastern Shore	28.2	138.0	265.9	90.9	523.0
Western	69.6	144.5	203.2	100.8	518.1
Total, all units	222.2	759.5	1,130.6	410.4	2,522.7

Table 38.—Area of commercial forest land in Maryland, by forest-type group and geographic unit, 1976
(In thousands of acres)

Forest-type group	Central	Southern	Lower Eastern Shore	Western	Total
White and red pine	12.0	—	—	31.4	43.4
Spruce/fir	—	—	—	11.2	11.2
Loblolly and shortleaf pine	142.0	94.9	253.5	31.6	522.0
Oak/pine	47.3	52.8	44.0	19.0	163.1
Oak/hickory	680.1	172.8	68.8	240.0	1,161.7
Oak/gum/cypress	23.7	21.2	53.8	—	98.7
Elm/ash/red maple	116.3	26.4	96.8	83.2	322.7
Maple/beech/birch	84.1	8.0	6.1	101.7	199.9
Total, all groups	1,105.5	376.1	523.0	518.1	2,522.7

Table 39.—Number of growing-stock trees and rough and rotten trees on commercial forest land in Maryland, by diameter-class group, softwoods and hardwoods, and geographic unit, 1976
(In thousands of trees)

Diameter-class group (in inches)	Central	Southern	Lower Eastern Shore	Western	Total
GROWING-STOCK TREES					
Softwoods:					
5.0 - 8.9	23,377	11,389	24,087	6,571	65,424
9.0 - 18.9	7,358	4,518	15,345	1,635	28,856
19.0 and larger	47	40	193	—	280
Total	30,782	15,947	39,625	8,206	94,560
Hardwoods:					
5.0 - 10.9	70,481	22,070	41,189	32,550	166,290
11.0 - 18.9	28,107	7,973	8,089	7,795	51,964
19.0 and larger	4,429	1,009	732	494	6,664
Total	103,017	31,052	50,010	40,839	224,918
All species	133,799	46,999	89,635	49,045	319,478
Sampling error (in percent)	5	5	5	7	3
ROUGH AND ROTTEN TREES					
Softwoods:					
5.0 - 8.9	998	778	286	677	2,739
9.0 - 18.9	295	169	41	682	1,187
19.0 and larger	11	—	—	9	20
Total	1,304	947	327	1,368	3,946
Hardwoods:					
5.0 - 10.9	16,110	6,914	3,953	18,707	45,684
11.0 - 18.9	2,841	858	712	3,529	7,940
19.0 and larger	676	115	219	735	1,745
Total	19,627	7,887	4,884	22,971	55,369
All species	20,931	8,834	5,211	24,339	59,315
Sampling error (in percent)	9	8	10	9	5

Table 40.—Number of growing-stock trees on commercial forest land, in the Central Unit of Maryland, by species and diameter class, 1976
(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
White and red pine	4,190	2,302	1,477	353	—	—	48	—	10	—	—
Loblolly pine[a]	2,620	194	759	545	522	275	230	64	21	5	5
Virginia pine	22,744	10,398	7,455	3,241	1,111	376	125	38	—	—	—
Other yellow pines	764	258	145	39	129	138	31	24	—	—	—
Other softwoods	464	125	264	39	30	—	—	—	—	—	6
Total softwoods	30,782	13,277	10,100	4,217	1,792	789	434	126	31	5	11
Soft maples	9,489	4,302	2,547	1,158	495	350	281	149	86	121	—
Hard maples	154	—	51	80	—	—	—	12	11	—	—
Hickory	7,139	3,011	1,539	833	885	453	215	23	80	95	5
Beech	2,460	539	468	394	260	274	154	109	50	191	21
Sweetgum	7,438	2,777	2,203	723	848	382	291	114	11	81	8
Yellow-poplar	13,984	2,800	2,147	2,046	1,712	1,726	1,387	1,108	398	620	40
Blackgum	3,878	1,379	960	567	234	227	309	121	51	30	—
Ash-walnut-cherry	6,608	2,138	1,935	1,315	524	188	238	136	72	62	—
Select white oaks	11,733	3,502	2,033	2,053	1,450	1,003	695	401	213	341	42
Select red oaks	4,990	1,403	869	507	551	648	515	288	145	57	7
Other white oaks	10,158	3,331	2,732	1,317	1,198	662	277	332	181	113	15
Other red oaks	17,416	4,584	3,588	2,838	2,091	1,569	1,078	596	477	543	52
Black locust	1,826	290	619	395	313	135	33	25	10	6	—
Other hardwoods	5,744	2,478	1,200	830	369	314	262	97	70	111	13
Total hardwoods	103,017	32,534	22,891	15,056	10,930	7,931	5,735	3,511	1,855	2,371	203
All species	133,799	45,811	32,991	19,273	12,722	8,720	6,169	3,637	1,886	2,376	214

[a]Includes 522,000 pond pine and 44,000 shortleaf pine trees.

Table 41.—Number of growing-stock trees on commercial forest land, in the Southern Unit of Maryland, by species and diameter class, 1976
(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Loblolly pine[a]	4,108	1,352	1,209	539	502	315	147	30	5	9	—
Virginia pine	11,323	4,866	3,489	1,731	862	221	134	11	9	—	—
Other yellow pines	11	—	—	—	11	—	—	—	—	—	—
Other softwoods	505	334	139	15	—	—	—	—	—	12	5
Total softwoods	15,947	6,552	4,837	2,285	1,375	536	281	41	14	21	5
Soft maples	2,829	1,134	630	434	192	217	93	73	28	24	4
Hard maples	103	103	—	—	—	—	—	—	—	—	—
Hickory	1,081	198	283	178	214	55	72	34	27	16	4
Beech	1,800	541	319	335	188	162	67	80	62	42	4
Sweetgum	4,736	1,723	1,054	782	581	265	192	57	33	49	—
Yellow-poplar	4,915	1,472	1,116	715	731	289	194	180	100	102	16
Blackgum	1,170	301	421	209	134	28	30	35	5	7	—
Ash-walnut-cherry	1,597	533	235	421	178	122	80	28	—	—	—
Select white oaks	4,308	1,353	922	711	429	338	200	138	102	100	15
Select red oaks	377	45	35	97	48	47	37	35	14	19	—
Other white oaks	902	193	304	102	107	56	44	46	34	16	—
Other red oaks	4,771	1,646	981	556	642	397	244	162	63	76	4
Black locust	527	211	55	150	73	28	—	6	4	—	—
Other hardwoods	1,936	691	597	284	183	68	44	30	18	19	2
Total hardwoods	31,052	10,144	6,952	4,974	3,700	2,072	1,297	904	490	470	49
All species	46,999	16,696	11,789	7,259	5,075	2,608	1,578	945	504	491	54

[a]Includes 25,000 shortleaf pine trees.

Table 42.—Number of growing-stock trees on commercial forest land, in the Lower Eastern Shore Unit of Maryland, by species and diameter class, 1976
(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Loblolly pine[a]	38,503	13,811	9,426	6,599	4,205	2,715	1,209	368	134	36	—
Virginia pine	781	336	240	105	63	22	8	7	—	—	—
Other yellow pines	16	—	—	—	16	—	—	—	—	—	—
Other softwoods	325	198	76	—	—	12	16	—	15	8	—
Total softwoods	39,625	14,345	9,742	6,704	4,284	2,749	1,233	375	149	44	—
Soft maples	14,189	6,622	3,550	1,913	867	444	296	253	109	123	12
Hickory	364	166	30	116	43	—	9	—	—	—	—
Beech	881	388	66	82	141	56	52	28	33	35	—
Sweetgum	10,453	4,397	2,640	1,714	714	530	222	115	66	55	—
Yellow-poplar	221	62	55	—	—	31	42	13	—	14	4
Blackgum	4,096	1,699	920	740	274	218	148	39	28	28	2
Ash-walnut-cherry	1,035	659	228	38	29	44	26	7	—	4	—
Select white oaks	8,534	3,144	2,165	1,322	943	529	218	102	34	67	10
Select red oaks	173	—	53	72	33	10	—	—	—	5	—
Other white oaks	257	135	104	—	—	12	—	6	—	—	—
Other red oaks	7,125	2,498	1,916	1,170	727	426	182	109	21	68	8
Black locust	66	66	—	—	—	—	—	—	—	—	—
Other hardwoods	2,616	1,921	351	187	77	42	25	7	6	—	—
Total hardwoods	50,010	21,757	12,078	7,354	3,848	2,342	1,220	679	297	399	36
All species	89,635	36,102	21,820	14,058	8,132	5,091	2,453	1,054	446	443	36

[a]Includes 481,000 pond pine and 170,000 shortleaf pine trees.

Table 43.—Number of growing-stock trees on commercial forest land, in the Western Unit of Maryland, by species and diameter class, 1976

(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
White and red pine	2,042	1,188	569	246	—	25	—	14	—	—	—
Virginia pine	4,708	2,032	1,948	578	131	—	19	—	—	—	—
Other yellow pines	352	104	—	140	60	48	—	—	—	—	—
Other softwoods	1,104	456	274	224	105	26	19	—	—	—	—
Total softwoods	8,206	3,780	2,791	1,188	296	99	38	14	—	—	—
Soft maples	6,000	2,650	1,828	749	319	253	105	27	21	48	—
Hard maples	2,855	1,141	577	594	218	140	120	14	33	18	—
Hickory	1,443	550	216	396	150	69	18	27	—	17	—
Beech	610	480	—	101	29	—	—	—	—	—	—
Yellow-poplar	368	—	119	—	—	131	83	15	11	9	—
Blackgum	443	436	—	—	—	—	—	—	—	7	—
Ash-walnut-cherry	2,392	914	519	533	243	107	19	28	11	18	—
Select white oaks	7,534	3,332	1,719	1,334	538	266	189	113	11	32	—
Select red oaks	6,502	2,314	991	1,120	518	911	402	120	12	98	16
Other white oaks	5,227	1,287	1,733	1,021	522	405	188	30	—	41	—
Other red oaks	3,180	659	668	792	545	199	169	98	12	33	5
Black locust	1,452	718	420	263	35	16	—	—	—	—	—
Other hardwoods	2,833	983	887	506	247	109	32	28	33	8	—
Total hardwoods	40,839	15,464	9,677	7,409	3,364	2,606	1,325	500	144	329	21
All species	49,045	19,244	12,468	8,597	3,660	2,705	1,363	514	144	329	21

Table 44.—Net volume of timber on commercial forest land in Maryland, by class of timber and geographic unit, 1976

Geographic unit	Growing-stock trees			Rough trees	Rotten trees	All trees	Sampling errors
	Sawtimber	Poletimber	Total				
	Million cubic feet						*Percent*
Central	1,167.1	496.1	1,663.2	89.3	48.1	1,800.6	4
Southern	339.2	159.6	498.8	30.8	15.1	544.7	4
Lower Eastern Shore	559.6	305.8	865.4	17.4	15.5	898.3	4
Western	255.1	209.6	464.7	147.5	33.0	645.2	5
Total, all units	2,321.0	1,171.1	3,492.1	285.0	111.7	3,888.8	2

Table 45.—Net volume of growing stock and sawtimber on commercial forest land in Maryland, by ownership class and geographic unit, 1976

Geographic unit	Public	Forest industry	Farmer and other	Total	Sampling error
	Million cubic feet				*Percent*
Central	143.8	15.4	1,504.0	1,663.2	4
Southern	13.9	10.6	474.3	498.8	5
Lower Eastern Shore	50.9	147.2	667.3	865.4	4
Western	133.5	15.2	316.0	464.7	6
Total, all units	342.1	188.4	2,961.6	3,492.1	2
	Million board feet[a]				
Central	308.8	22.0	3,946.2	4,277.0	5
Southern	29.8	15.2	1,104.4	1,149.4	6
Lower Eastern Shore	115.1	309.3	1,545.7	1,970.1	5
Western	243.5	25.6	501.0	770.1	10
Total, all units	697.2	372.1	7,097.3	8,166.6	3

[a]International ¼-inch rule.

Table 46.—Net volume of growing stock and sawtimber on commercial forest land in Maryland, by stand-size class and geographic unit, 1976

Geographic unit	Sawtimber stands	Poletimber stands	Other stands	All stands
	Million cubic feet			
Central	1,298.7	323.3	41.2	1,663.2
Southern	375.1	91.9	31.8	498.8
Lower Eastern Shore	622.3	212.9	30.2	865.4
Western	261.8	170.7	32.2	464.7
Total, all units	2,557.9	798.8	135.4	3,492.1
	Million board feet[a]			
Central	3,839.1	345.4	92.5	4,277.0
Southern	981.3	122.8	45.3	1,149.4
Lower Eastern Shore	1,640.9	273.8	55.4	1,970.1
Western	586.3	165.6	18.2	770.1
Total, all units	7,047.6	907.6	211.4	8,166.6

[a]International ¼-inch rule.

Table 47.—Net volume of growing stock and sawtimber on commercial forest land in Maryland, by forest-type group and geographic unit, 1976

Forest-type group	Central	Southern	Lower Eastern Shore	Western	Total
	Million cubic feet				
White and red pine	26.6	—	—	16.4	43.0
Spruce/fir	—	—	—	4.8	4.8
Loblolly and shortleaf pine	205.7	126.5	474.4	23.2	829.8
Oak/pine	57.5	60.6	63.0	7.7	188.8
Oak/hickory	1,134.1	244.6	95.7	246.9	1,721.3
Oak/gum/cypress	45.2	24.5	78.3	—	148.0
Elm/ash/red maple	125.4	26.2	153.8	82.9	388.3
Maple/beech/birch	68.7	16.4	.2	82.8	168.1
Total, all groups	1,663.2	498.8	865.4	464.7	3,492.1
	Million board feet[a]				
White and red pine	10.6	—	—	14.3	24.9
Spruce/fir	—	—	—	9.5	9.5
Loblolly and shortleaf pine	389.3	240.7	1,058.0	32.4	1,720.4
Oak/pine	110.5	129.5	120.6	10.1	370.7
Oak/hickory	3,142.1	625.7	203.6	428.9	4,400.3
Oak/gum/cypress	88.6	58.0	204.7	—	351.3
Elm/ash/red maple	343.5	59.7	383.2	144.0	930.4
Maple/beech/birch	192.4	35.8	—	130.9	359.1
Total, all groups	4,277.0	1,149.4	1,970.1	770.1	8,166.6

[a]International ¼-inch rule.

Table 48.—Net volume of growing stock on commercial forest land in the Central Unit of Maryland, by species and diameter class, 1976
(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
White and red pine	29.2	11.9	11.1	4.2	—	—	1.5	—	.5	—	—
Loblolly pine[a]	40.6	.7	4.6	5.6	9.0	6.9	8.0	3.0	1.4	.7	.7
Virginia pine	137.4	29.1	42.7	32.3	17.5	9.4	4.6	1.8	—	—	—
Other yellow pines	10.0	.6	.7	.4	2.4	3.5	1.2	1.2	—	—	—
Other softwoods	3.5	.3	1.0	.2	.3	—	—	—	—	—	1.7
Total softwoods	220.7	42.6	60.1	42.7	29.2	19.8	15.3	6.0	1.9	.7	2.4
Soft maples	80.4	12.6	14.4	11.2	7.2	8.0	8.7	6.0	4.1	8.2	—
Hard maples	1.8	—	.4	.7	—	—	—	.4	.3	—	—
Hickory	77.6	9.4	9.5	8.8	15.7	11.9	7.6	1.3	5.0	7.8	.6
Beech	53.3	1.3	2.6	4.3	4.3	7.2	5.9	5.4	3.1	16.2	3.0
Sweetgum	76.5	8.1	12.5	7.4	15.3	9.8	10.3	5.3	.6	6.1	1.1
Yellow-poplar	271.2	9.5	13.1	21.6	28.2	40.2	43.0	45.2	20.6	43.1	6.7
Blackgum	46.6	3.7	5.7	6.2	3.8	5.7	10.6	5.6	2.9	2.4	—
Ash-walnut-cherry	66.8	6.7	10.8	13.7	8.6	4.3	8.0	6.0	3.9	4.8	—
Select white oaks	191.3	9.0	12.0	21.9	26.2	25.8	25.7	19.6	13.8	30.7	6.6
Select red oaks	85.2	3.8	5.4	5.6	9.4	16.5	17.5	13.3	8.3	4.4	1.0
Other white oaks	118.0	11.5	17.2	13.4	19.6	14.9	8.3	13.8	9.2	8.1	2.0
Other red oaks	285.9	14.2	21.8	32.5	36.7	39.7	38.1	27.9	27.1	40.3	7.6
Black locust	20.0	.9	3.6	3.7	5.3	3.1	1.1	1.2	.6	.5	—
Other hardwoods	67.9	6.9	7.3	8.5	7.1	8.5	8.9	4.8	3.8	9.7	2.4
Total hardwoods	1,442.5	97.6	136.3	159.5	187.4	195.6	193.7	155.8	103.3	182.3	31.0
All species	1,663.2	140.2	196.4	202.2	216.6	215.4	209.0	161.8	105.2	183.0	33.4

[a]Includes 4,300,000 cubic feet of pond pine and 1,000,000 of shortleaf pine.

Table 49.—Net volume of growing stock on commercial forest land in the Southern Unit of Maryland, by species and diameter class, 1976
(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Loblolly pine[a]	39.3	3.7	6.7	5.9	8.6	7.6	4.8	1.2	.2	.6	—
Virginia pine	73.9	11.7	19.5	17.6	14.2	5.4	4.4	.5	.6	—	—
Other yellow pines	.2	—	—	—	.2	—	—	—	—	—	—
Other softwoods	3.1	1.1	.7	.1	—	—	—	—	—	.7	.5
Total softwoods	116.5	16.5	26.9	23.6	23.0	13.0	9.2	1.7	.8	1.3	.5
Soft maples	28.2	3.2	3.4	4.0	2.9	5.0	2.9	3.0	1.5	1.8	.5
Hard maples	.4	.4	—	—	—	—	—	—	—	—	—
Hickory	16.8	.6	1.4	1.9	3.7	1.4	2.5	1.6	1.7	1.4	.6
Beech	26.0	1.4	1.7	2.9	3.0	3.6	2.4	3.5	3.5	3.5	.5
Sweetgum	50.0	5.4	5.9	7.9	9.6	6.5	6.3	2.6	1.8	4.0	—
Yellow-poplar	64.2	4.1	6.0	6.9	11.2	6.7	6.3	7.5	5.5	7.7	2.3
Blackgum	11.2	.8	2.3	2.0	2.1	.7	1.0	1.5	.3	.5	—
Ash-walnut-cherry	18.1	1.4	1.4	4.8	3.3	3.2	2.8	1.2	—	—	—
Select white oaks	62.0	3.7	4.9	7.1	7.1	8.6	7.2	6.3	6.2	8.5	2.4
Select red oaks	8.2	.1	.2	.9	.8	1.2	1.3	1.6	.8	1.3	—
Other white oaks	12.1	.5	1.5	1.1	1.5	1.3	1.4	1.8	1.7	1.3	—
Other red oaks	62.3	4.9	5.7	5.7	10.6	9.7	8.0	7.2	3.7	6.3	.5
Black locust	4.9	.5	.3	1.5	1.3	.7	—	.3	.3	—	—
Other hardwoods	17.9	2.0	3.1	2.7	3.0	1.6	1.4	1.3	1.1	1.4	.3
Total hardwoods	382.3	29.0	37.8	49.4	60.1	50.2	43.5	39.4	28.1	37.7	7.1
All species	498.8	45.5	64.7	73.0	83.1	63.2	52.7	41.1	28.9	39.0	7.6

[a]Includes 200,000 cubic feet of shortleaf pine.

Table 50.—Net volume of growing stock on commercial forest land in the Lower Eastern Shore Unit of Maryland, by species and diameter class, 1976
(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Loblolly pine[a]	403.0	32.1	56.4	77.2	81.9	76.8	48.4	19.0	8.4	2.8	—
Virginia pine	5.7	.7	1.4	1.2	1.1	.6	.3	.4	—	—	—
Other yellow pines	.3	—	—	—	.3	—	—	—	—	—	—
Other softwoods	3.4	.5	.4	—	—	.3	.7	—	.9	.6	—
Total softwoods	412.4	33.3	58.2	78.4	83.3	77.7	49.4	19.4	9.3	3.4	—
Soft maples	119.1	20.8	20.4	19.1	13.4	10.4	8.9	10.3	5.6	8.6	1.6
Hickory	2.8	.5	.2	1.1	.7	—	.3	—	—	—	—
Beech	12.9	1.2	.4	.9	2.2	1.3	1.7	1.1	1.7	2.4	—
Sweetgum	94.6	13.7	16.2	18.3	12.4	13.2	7.6	4.9	3.7	4.6	—
Yellow-poplar	4.7	.2	.4	—	—	.8	1.4	.6	—	.8	.5
Blackgum	39.2	5.4	5.7	7.8	4.8	5.0	5.0	1.7	1.5	2.0	.3
Ash-walnut-cherry	8.2	2.7	1.8	.6	.5	1.1	.9	.3	—	.3	—
Select white oaks	81.3	8.9	11.6	12.9	14.6	12.2	7.1	4.3	1.8	5.7	2.2
Select red oaks	2.2	—	.5	.6	.5	.3	—	—	—	.3	—
Other white oaks	1.5	.3	.6	—	—	.3	—	.3	—	—	—
Other red oaks	74.6	8.3	12.1	12.7	12.2	10.0	6.3	5.3	1.2	5.4	1.1
Black locust	.2	.2	—	—	—	—	—	—	—	—	—
Other hardwoods	11.7	4.9	1.7	1.6	1.1	1.0	.8	.3	.3	—	—
Total hardwoods	453.0	67.1	71.6	75.6	62.4	55.6	40.0	29.1	15.8	30.1	5.7
All species	865.4	100.4	129.8	154.0	145.7	133.3	89.4	48.5	25.1	33.5	5.7

[a]Includes 5,200,000 cubic feet of pond pine and 1,800,000 of shortleaf pine.

Table 51.—Net volume of growing stock on commercial forest land in the Western Unit of Maryland, by species and diameter class, 1976
(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
White and red pine	12.9	5.9	4.1	2.1	—	.4	—	.4	—	—	—
Virginia pine	19.8	3.4	8.7	5.3	1.8	—	.6	—	—	—	—
Other yellow pines	3.4	.3	—	1.2	.9	1.0	—	—	—	—	—
Other softwoods	7.3	1.4	1.4	2.2	1.5	.4	.4	—	—	—	—
Total softwoods	43.4	11.0	14.2	10.8	4.2	1.8	1.0	.4	—	—	—
Soft maples	52.9	8.7	11.3	8.9	5.8	7.0	3.9	1.5	1.4	4.4	—
Hard maples	31.3	4.8	3.8	6.8	4.0	3.6	4.4	.7	1.9	1.3	—
Hickory	17.6	1.9	1.5	5.0	3.1	2.1	.8	1.6	—	1.6	—
Beech	3.0	1.5	—	.9	.6	—	—	—	—	—	—
Yellow-poplar	10.4	—	1.0	—	—	3.7	3.4	.7	.8	.8	—
Blackgum	1.8	1.2	—	—	—	—	—	—	—	.6	—
Ash-walnut-cherry	24.1	2.5	3.3	5.9	4.8	3.3	.5	1.5	.8	1.5	—
Select white oaks	64.9	8.0	9.6	14.1	10.0	7.2	7.0	5.6	.7	2.7	—
Select red oaks	90.4	7.3	6.0	12.3	8.6	23.7	14.4	6.0	.6	9.0	2.5
Other white oaks	48.6	4.0	9.4	9.9	7.5	8.7	5.5	1.0	—	2.6	—
Other red oaks	45.3	2.3	4.4	9.6	9.2	5.3	5.9	4.6	.7	2.7	.6
Black locust	7.7	2.2	2.2	2.4	.5	.4	—	—	—	—	—
Other hardwoods	23.3	2.5	4.4	4.8	3.9	2.9	1.1	1.4	1.7	.6	—
Total hardwoods	421.3	46.9	56.9	80.6	58.0	67.9	46.9	24.6	8.6	27.8	3.1
All species	464.7	57.9	71.1	91.4	62.2	69.7	47.9	25.0	8.6	27.8	3.1

Table 52.—Net volume of sawtimber on commercial forest land in the Central Unit of Maryland, by species and diameter class, 1976

(In millions of board feet)[a]

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
White and red pine	19.7	12.2	—	—	5.3	—	2.2	—	—
Loblolly pine[b]	120.6	16.2	29.9	24.0	29.3	10.9	4.7	2.8	2.8
Virginia pine	206.8	94.2	56.2	32.9	16.7	6.8	—	—	—
Other yellow pines	30.5	1.4	8.1	12.2	4.5	4.3	—	—	—
Other softwoods	8.9	.7	.9	—	—	—	—	—	7.3
Total softwoods	386.5	124.7	95.1	69.1	55.8	22.0	6.9	2.8	10.1
Soft maples	154.4	—	21.4	27.3	32.1	23.3	16.1	34.2	—
Hard maples	2.6	—	—	—	—	1.4	1.2	—	—
Hickory	177.4	—	47.2	41.6	28.8	5.1	20.0	32.1	2.6
Beech	174.7	—	13.1	25.7	22.0	20.9	12.2	67.8	13.0
Sweetgum	173.2	—	46.1	34.9	39.1	20.6	2.3	25.6	4.6
Yellow-poplar	859.9	—	85.2	141.1	162.6	178.4	83.0	181.0	28.6
Blackgum	113.1	—	11.3	19.2	39.4	22.2	11.7	9.3	—
Ash-walnut-cherry	128.8	—	25.5	14.7	29.5	23.5	15.4	20.2	—
Select white oaks	555.3	—	79.8	90.0	96.0	76.9	55.1	129.5	28.0
Select red oaks	258.2	—	28.6	56.6	65.3	51.7	33.0	18.5	4.5
Other white oaks	272.6	—	57.8	51.5	31.0	53.7	36.2	33.9	8.5
Other red oaks	811.7	—	111.2	139.5	143.0	109.6	107.3	168.7	32.4
Black locust	39.5	—	15.7	10.4	4.1	4.7	2.3	2.3	—
Other hardwoods	169.1	—	21.4	29.2	32.8	19.1	15.3	41.0	10.3
Total hardwoods	3,890.5	—	564.3	681.7	725.7	611.1	411.1	764.1	132.5
All species	4,277.0	124.7	659.4	750.8	781.5	633.1	418.0	766.9	142.6

[a]International ¼-inch rule.
[b]Includes 7,600,000 board feet of pond pine and 3,200,000 of shortleaf pine.

Table 53.—Net volume of sawtimber on commercial forest land in the Southern Unit of Maryland, by species and diameter class, 1976

(In millions of board feet)[a]

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Loblolly pine	97.3	17.0	27.7	26.9	17.6	4.7	.9	2.5	—
Virginia pine	134.1	49.9	45.8	19.0	15.8	1.7	1.9	—	—
Other yellow pines	.6	—	.6	—	—	—	—	—	—
Other softwoods	5.3	.4	—	—	—	—	—	2.8	2.1
Total softwoods	237.3	67.3	74.1	45.9	33.4	6.4	2.8	5.3	2.1
Soft maples	59.0	—	8.1	15.3	10.0	11.2	5.6	6.7	2.1
Hickory	44.3	—	10.8	4.8	8.9	5.7	6.6	5.3	2.2
Beech	69.6	—	8.4	11.9	8.3	12.8	12.5	13.6	2.1
Sweetgum	102.6	—	26.9	21.3	22.0	9.8	6.8	15.8	—
Yellow-poplar	163.8	—	31.3	22.2	22.2	28.0	20.4	30.4	9.3
Blackgum	20.5	—	6.0	2.1	3.5	5.7	1.1	2.1	—
Ash-walnut-cherry	33.7	—	9.3	10.2	9.8	4.4	—	—	—
Select white oaks	163.9	—	20.6	28.5	25.2	23.2	23.4	33.6	9.4
Select red oaks	24.3	—	2.3	3.8	4.1	5.9	3.1	5.1	—
Other white oaks	31.6	—	4.2	4.3	5.0	6.3	6.5	5.3	—
Other red oaks	157.5	—	30.3	31.6	28.2	26.7	13.9	24.7	2.1
Black locust	7.8	—	3.6	2.3	—	.9	1.0	—	—
Other hardwoods	33.5	—	8.4	4.9	4.8	4.7	4.5	5.2	1.0
Total hardwoods	912.1	—	170.2	163.2	152.0	145.3	105.4	147.8	28.2
All species	1,149.4	67.3	244.3	209.1	185.4	151.7	108.2	153.1	30.3

[a]International ¼-inch rule.

Table 54.—Net volume of sawtimber on commercial forest land in the Lower Eastern Shore Unit of Maryland, by species and diameter class, 1976

(In millions of board feet)[a]

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Loblolly pine[b]	1,021.0	223.0	256.2	258.6	171.2	69.5	31.8	10.7	—
Virginia pine	11.6	3.6	3.5	2.1	1.2	1.2	—	—	—
Other yellow pines	.9	—	.9	—	—	—	—	—	—
Other softwoods	9.0	—	—	.9	2.3	—	3.6	2.2	—
Total softwoods	1,042.5	226.6	260.6	261.6	174.7	70.7	35.4	12.9	—
Soft maples	230.7	—	44.2	38.7	35.3	42.8	23.3	39.2	7.2
Hickory	3.6	—	2.4	—	1.2	—	—	—	—
Beech	41.8	—	7.3	4.8	7.0	4.7	7.5	10.5	—
Sweetgum	179.0	—	41.1	50.3	30.6	20.5	15.7	20.8	—
Yellow-poplar	17.3	—	—	2.9	5.7	2.5	—	3.8	2.4
Blackgum	78.1	—	15.7	18.8	20.0	7.1	6.2	9.1	1.2
Ash-walnut-cherry	12.2	—	1.8	4.0	3.7	1.3	—	1.4	—
Select white oaks	185.7	—	47.9	46.6	28.9	18.0	7.8	26.9	9.6
Select red oaks	4.1	—	1.7	1.1	—	—	—	1.3	—
Other white oaks	2.4	—	—	1.0	—	1.4	—	—	—
Other red oaks	159.8	—	40.4	37.5	24.9	22.0	5.0	24.6	5.4
Other hardwoods	12.9	—	3.5	3.5	3.5	1.2	1.2	—	—
Total hardwoods	927.6	—	206.0	209.2	160.8	121.5	66.7	137.6	25.8
All species	1,970.1	226.6	466.6	470.8	335.5	192.2	102.1	150.5	25.8

[a]International ¼-inch rule.
[b]Includes 12,800,000 board feet of pond pine and 3,600,000 of shortleaf pine.

Table 55.—Net volume of sawtimber on commercial forest land in the Western Unit of Maryland, by species and diameter class, 1976
(In millions of board feet)[a]

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
White and red pine	9.4	6.4	—	1.2	—	1.8	—	—	—
Virginia pine	25.6	17.1	6.2	—	2.3	—	—	—	—
Other yellow pines	10.3	3.7	2.9	3.7	—	—	—	—	—
Other softwoods	14.8	6.8	5.1	1.3	1.6	—	—	—	—
Total softwoods	60.1	34.0	14.2	6.2	3.9	1.8	—	—	—
Soft maples	71.2	—	16.7	21.0	12.0	4.3	4.5	12.7	—
Hard maples	47.9	—	11.4	10.9	13.3	2.3	5.9	4.1	—
Hickory	28.1	—	8.7	6.7	2.6	5.3	—	4.8	—
Beech	1.7	—	1.7	—	—	—	—	—	—
Yellow-poplar	29.0	—	—	11.1	10.7	2.1	2.3	2.8	—
Blackgum	1.5	—	—	—	—	—	—	1.5	—
Ash-walnut-cherry	36.3	—	13.3	9.7	1.6	4.5	2.5	4.7	—
Select white oaks	100.5	—	29.2	21.9	21.3	17.2	2.2	8.7	—
Select red oaks	194.4	—	24.2	70.1	44.6	18.2	1.8	28.0	7.5
Other white oaks	74.9	—	21.2	25.8	16.8	3.0	—	8.1	—
Other red oaks	87.0	—	26.2	16.2	18.3	14.1	2.2	7.9	2.1
Black locust	2.5	—	1.2	1.3	—	—	—	—	—
Other hardwoods	35.0	—	11.0	8.7	3.4	4.5	5.3	2.1	—
Total hardwoods	710.0	—	164.8	203.4	144.6	75.5	26.7	85.4	9.6
All species	770.1	34.0	179.0	209.6	148.5	77.3	26.7	85.4	9.6

[a]International ¼-inch rule.

Table 56.—Net volume of sawtimber on commercial forest land in the Central Unit of Maryland, by species and quality class, 1976

(In millions of board feet)[a]

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4[b]
Softwoods:					
White pine	19.7	1.5	2.5	11.3	4.4
Loblolly pine[c]	120.6	43.0	8.2	69.4	—
Virginia pine	206.8	6.5	7.6	192.7	—
Other yellow pines	30.5	—	2.7	27.8	—
Other softwoods[d]	8.9	—	—	—	—
Total softwoods	386.5	51.0	21.0	301.2	4.4
Hardwoods:					
Soft maples	154.4	3.6	17.5	102.3	31.0
Hard maples	2.6	1.7	.5	.3	.1
Hickory	177.4	17.8	41.1	81.9	36.6
Beech	174.7	9.2	9.7	83.7	72.1
Sweetgum	173.2	23.1	25.3	72.6	52.2
Yellow-poplar	859.9	161.3	185.5	346.3	166.8
Blackgum	113.1	22.3	27.8	51.0	12.0
Ash-walnut-cherry	128.8	16.2	37.1	58.7	16.8
Select white oaks	555.3	73.6	125.2	223.9	132.6
Select red oaks	258.2	41.0	80.6	111.0	25.6
Other white oaks	272.6	38.9	68.5	123.1	42.1
Other red oaks	811.7	118.1	183.3	309.4	200.9
Black locust	39.5	1.4	3.5	27.2	7.4
Other hardwoods	169.1	21.4	40.9	87.8	19.0
Total hardwoods	3,890.5	549.6	846.5	1,679.2	815.2
			(In percent)		
Hardwood quality	100	14	22	43	21

[a]International ¼-inch rule.

[b]Grade 4 applies only to white pine. For hardwoods the volumes in this column are for construction logs.

[c]This includes 7.6 million board feet of pond pine and 3.2 million board feet of shortleaf pine.

[d]Softwood species other than pine are not graded into standard-lumber grades.

Table 57.—Net volume of sawtimber on commercial forest land in the Southern Unit of Maryland, by species and quality class, 1976
(In millions of board feet)[a]

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4[b]
Softwoods:					
Loblolly pine	97.3	21.1	12.5	63.7	—
Virginia pine	134.1	1.3	4.3	128.5	—
Other yellow pines	.6	—	—	.6	—
Other softwoods[c]	5.3	—	—	—	—
Total softwoods	237.3	22.4	16.8	192.8	—
Hardwoods:					
Soft maples	59.0	3.4	11.7	35.4	8.5
Hickory	44.3	2.4	11.7	20.2	10.0
Beech	69.6	.2	.7	39.4	29.3
Sweetgum	102.6	9.4	19.5	41.8	31.9
Yellow-poplar	163.8	19.9	36.3	67.5	40.1
Blackgum	20.5	3.8	2.5	11.3	2.9
Ash-walnut-cherry	33.7	3.0	13.4	12.9	4.4
Select white oaks	163.9	19.4	37.3	68.6	38.6
Select red oaks	24.3	2.5	6.7	11.6	3.5
Other white oaks	31.6	4.7	6.2	13.0	7.7
Other red oaks	157.5	11.5	33.2	69.2	43.6
Black locust	7.8	.5	.9	5.5	.9
Other hardwoods	33.5	5.0	8.3	16.9	3.3
Total hardwoods	912.1	85.7	188.4	413.3	224.7
		(In percent)			
Hardwood quality	100	9	21	45	25

[a]International ¼-inch rule.
[b]Hardwood volumes in this column are for construction logs.
[c]Softwood species other than pine are not graded into standard-lumber grades.

Table 58.—Net volume of sawtimber on commercial forest land in the Lower Eastern Shore Unit of Maryland, by species and quality class, 1976
(In millions of board feet)[a]

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4[b]
Softwoods:					
Loblolly pine[c]	1,021.0	288.2	155.7	577.1	—
Virginia pine	11.6	—	.6	11.0	—
Other yellow pines	.9	—	.4	.5	—
Other softwoods[d]	9.0	—	—	—	—
Total softwoods	1,042.5	288.2	156.7	588.6	—
Hardwoods:					
Soft maples	230.7	19.4	25.4	139.2	46.7
Hickory	3.6	—	.4	1.9	1.3
Beech	41.8	.3	1.5	22.3	17.7
Sweetgum	179.0	31.5	26.7	68.9	51.9
Yellow-poplar	17.3	5.7	4.3	5.1	2.2
Blackgum	78.1	14.3	17.4	39.3	7.1
Ash-walnut-cherry	12.2	4.5	2.7	4.0	1.0
Select white oaks	185.7	30.3	30.5	76.9	48.0
Select red oaks	4.1	—	.8	2.9	.4
Other white oaks	2.4	—	.7	1.4	.3
Other red oaks	159.8	21.0	31.2	66.1	41.5
Other hardwoods	12.9	2.3	3.2	6.0	1.4
Total hardwoods	927.6	129.3	144.8	434.0	219.5
			(In percent)		
Hardwood quality	100	14	16	46	24

[a]International ¼-inch rule.
[b]Hardwood volumes in this column are for construction logs.
[c]This includes 12.8 million board feet of pond pine and 3.6 million board feet of shortleaf pine.
[d]Softwood species other than pine are not graded into standard-lumber grades.

Table 59.—Net volume of sawtimber on commercial forest land in the Western Unit of Maryland, by species and quality class, 1976
(In millions of board feet)[a]

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4[b]
Softwoods:					
White and red pine	9.4	—	0.9	7.7[c]	0.8
Virginia pine	25.6	—	—	25.6	—
Other yellow pines	10.3	—	1.7	8.6	—
Other softwoods[d]	14.8	—	—	—	—
Total softwoods	60.1	—	2.6	41.9	.8
Hardwoods:					
Soft maples	71.2	4.0	6.4	32.1	28.7
Hard maples	47.9	3.4	6.0	19.0	19.5
Hickory	28.1	1.2	8.3	7.4	11.2
Beech	1.7	—	—	1.5	.2
Yellow-poplar	29.0	—	1.3	6.5	21.2
Blackgum	1.5	1.0	.3	.2	—
Ash-walnut-cherry	36.3	2.8	4.4	18.5	10.6
Select white oaks	100.5	4.0	9.5	40.4	46.6
Select red oaks	194.4	13.9	42.6	96.8	41.1
Other white oaks	74.9	1.2	9.2	26.6	37.9
Other red oaks	87.0	7.0	11.3	18.8	49.9
Black locust	2.5	—	—	—	2.5
Other hardwoods	35.0	3.2	3.7	16.5	11.6
Total hardwoods	710.0	41.7	103.0	284.3	281.0
			(In percent)		
Hardwood quality	100	6	14	40	40

[a]International ¼-inch rule.
[b]Grade 4 applies only to white pine. For hardwoods the volumes in this column are for construction logs.
[c]This includes 5.2 million board feet of red pine.
[d]Softwood species other than pine are not graded into standard-lumber grades.

Table 60.—Annual net growth and removals of growing stock and sawtimber in Maryland, by species group and geographic unit, 1975[a]

Geographic unit	Softwoods		Hardwoods		Total	
	Growth	Removals	Growth	Removals	Growth	Removals
	Thousand cubic feet					
Central	1,129	2,622	48,991	26,749	50,120	29,371
Southern	4,833	2,660	12,182	12,460	17,015	15,120
Lower Eastern Shore	18,716	17,580	13,850	5,843	32,566	23,423
Western	222	738	11,077	16,748	11,299	17,486
Total, all units	24,900	23,600	86,100	61,800	111,000	85,400
	Thousand board feet[b]					
Central	7,283	7,424	152,507	67,249	159,790	74,673
Southern	11,357	8,876	28,740	33,358	40,097	42,234
Lower Eastern Shore	55,227	49,232	26,856	15,211	82,083	64,443
Western	1,133	2,468	14,897	37,182	16,030	39,650
Total, all units	75,000	68,000	223,000	153,000	298,000	221,000

[a]Based on trends of growth and removals for the period between inventories as estimated from remeasured plots.
[b]International ¼-inch rule.

Table 61.—Land area of Maryland, by land class and county, 1976

County	Total land area[a]	Nonforest land area	Forest-land area			
			Noncommercial[b]	Commercial		Sampling error[c]
	Thousand acres	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Percent*[d]	*Percent*
Anne Arundel	270.7	150.6	5.2	114.9	42	10
Baltimore[e]	432.7	308.3	10.9	113.5	26	12
Caroline	205.4	133.6	1.0	70.8	34	13
Carroll	291.9	227.2	1.9	62.8	22	21
Cecil	231.7	152.5	3.7	75.5	33	17
Frederick	425.6	294.9	12.8	117.9	28	12
Harford	289.9	182.3	21.6	86.0	30	16
Howard	160.6	107.0	6.0	47.6	30	16
Kent	179.8	135.2	1.1	43.5	24	19
Montgomery	316.8	229.4	16.6	70.8	22	18
Prince Georges	309.8	176.2	23.0	110.6	36	10
Queen Annes	240.0	182.5	1.3	56.2	23	20
Talbot	167.0	126.6	0.4	40.0	24	23
Washington	293.8	190.2	8.2	95.4	32	13
Central Unit	3,815.7	2,596.5	113.7	1,105.5	29	3.4
Calvert	138.9	62.5	1.8	74.6	54	6
Charles	293.7	113.6	1.3	178.8	61	4
St. Marys	238.7	113.5	2.5	122.7	51	5
Southern Unit	671.3	289.6	5.6	376.1	56	2.8
Dorchester	380.2	227.5	2.0	150.7	40	5
Somerset	217.0	118.1	0.1	98.8	46	6
Wicomico	243.8	129.9	[f]	113.9	47	4
Worcester	306.5	145.9	1.0	159.6	52	4
Lower Eastern Shore	1,147.5	621.4	3.1	523.0	46	2.2
Allegany	273.9	60.6	5.7	207.6	76	4
Garrett	421.8	108.9	2.4	310.5	74	3
Western Unit	695.7	169.5	8.1	518.1	74	2.3
State	6,330.2	3,677.0	130.5	2,522.7	40	1.7

[a]Source: U.S. Bureau of the Census, U.S. Census of Population: 1970, Vol. I.
[b]Includes productive-reserved, urban, and unproductive forest land.
[c]In percent for commercial forest land, at the 68-percent probability level.
[d]Commercial forest land as a percent of total land area.
[e]Includes Baltimore City.
[f]Fewer than 50 acres.

Table 62.—Net volume of growing stock on commercial forest land in Maryland, by county and species group, 1976[a]

County	Softwoods	Hardwoods	Total	Sampling error of total
	Million cubic feet			*Percent*
Anne Arundel	29.0	150.5	179.5	12
Baltimore	17.2	151.0	168.2	12
Caroline	32.0	72.4	104.4	15
Carroll	4.4	87.2	91.6	15
Cecil	12.8	100.2	113.0	16
Frederick	7.7	171.1	178.8	11
Harford	19.8	113.0	132.8	15
Howard	5.7	63.8	69.5	15
Kent	7.1	57.4	64.5	18
Montgomery	5.0	99.5	104.5	14
Prince Georges	30.7	144.1	174.8	12
Queen Annes	8.1	75.6	83.7	17
Talbot	21.4	38.4	59.8	21
Washington	19.8	118.3	138.1	13
Central Unit	220.7	1,442.5	1,663.2	3.8
Calvert	19.3	79.0	98.3	10
Charles	54.3	177.5	231.8	7
St. Marys	42.9	125.8	168.7	8
Southern Unit	116.5	382.3	498.8	4.5
Dorchester	105.0	122.5	227.5	8
Somerset	88.2	80.6	168.8	10
Wicomico	93.0	107.2	200.2	8
Worcester	126.2	142.7	268.9	7
Lower Eastern Shore Unit	412.4	453.0	865.4	3.6
Allegany	28.9	159.6	188.5	10
Garrett	14.5	261.7	276.2	8
Western Unit	43.4	421.3	464.7	6.2
State	793.0	2,699.1	3,492.1	2.3

[a]Direct comparisons of these county estimates with those published in previous reports is not recommended. If comparisons are desired, contact the Resources Evaluation Unit for assistance.

Table 63.—Net volume of sawtimber on commercial forest land in Maryland, by county and species group, 1976[a]

County	Softwoods	Hardwoods	Total	Sampling error of total
	Million board feet[b]			*Percent*
Anne Arundel	33.9	406.9	440.8	16
Baltimore	24.4	412.3	436.7	16
Caroline	96.2	169.5	265.7	20
Carroll	8.2	238.5	246.7	20
Cecil	17.8	273.6	291.4	21
Frederick	15.0	470.7	485.7	14
Harford	25.6	309.8	335.4	18
Howard	8.5	173.1	181.6	20
Kent	9.6	160.4	170.0	24
Montgomery	9.0	273.5	282.5	19
Prince Georges	39.9	384.2	424.1	15
Queen Annes	10.2	212.1	222.3	22
Talbot	60.8	85.9	146.7	27
Washington	27.4	320.0	347.4	17
Central Unit	386.5	3,890.5	4,277.0	4.9
Calvert	39.9	189.5	229.4	14
Charles	109.8	418.6	528.4	10
St. Marys	87.6	304.0	391.6	11
Southern Unit	237.3	912.1	1,149.4	5.5
Dorchester	256.9	247.9	504.8	12
Somerset	226.0	158.4	384.4	14
Wicomico	240.7	225.0	465.7	12
Worcester	318.9	296.3	615.2	10
Lower Eastern Shore Unit	1,042.5	927.6	1,970.1	5.0
Allegany	37.6	267.1	304.7	16
Garrett	22.5	442.9	456.4	14
Western Unit	60.1	710.0	770.1	10.2
State	1,726.4	6,440.2	8,166.6	3.1

[a]Direct comparisons of these county estimates with those published in previous reports is not recommended. If comparisons are desired, contact the Resources Evaluation Unit for assistance.
[b]International ¼-inch rule.

Metric Equivalents of Units Used in This Report

1 acre = 4,046.86 square meters or 0.404686 hectares
1,000 acres = 404.686 hectares
1,000,000 acres = 404,686 hectares
1,000 board feet = 3.48 cubic meters[a]
1 cubic foot = 0.028317 cubic meters
1,000 cubic feet = 28.317 cubic meters
1,000,000 cubic feet = 28,317 cubic meters
1 cord (wood, bark, and airspace) = 3.6246 cubic meters
1 cord (solid wood, pulpwood) = 2.4069 cubic meters
1 cord (solid wood, other than pulpwood) = 2.2654 cubic meters
1,000 cords (pulpwood) = 2,406.9 cubic meters
1,000 cords (other products) = 2,265.4 cubic meters
1 inch = 2.54 centimeters or 0.0254 meters
1 foot = 30.48 centimeters or 0.3048 meters
Breast height = 1.4 meters above ground level
1 mile = 1.609 kilometers
1 square foot = 929.03 square centimeters or 0.0929 square meters
1 square foot per acre basal area = 0.229568 square meters per hectare
1 cubic foot per acre = 0.069973 cubic meters per hectare

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[a]While 1,000 board feet is theoretically equivalent to 2.36 cubic meters, this is true only when a board foot is actually a piece of wood with a volume 1/12 of a cubic foot. The International ¼-inch log rule is used by the Forest Service in the East to estimate the product potential in board feet. The reliability of the estimate, using a conversion, will vary with the size of the log measure. The conversion given here, 3.48 cubic meters, is based on the cubic volume of a log 16 feet long and 15 inches in diameter inside bark (dib) at the small end. This conversion could be used for average comparisons when accuracy of ±10 percent is acceptable. Since the board foot unit is not a true measure of wood volume and since products other than dimension lumber are becoming important, this unit may eventually be phased out and replaced with the cubic meter unit.

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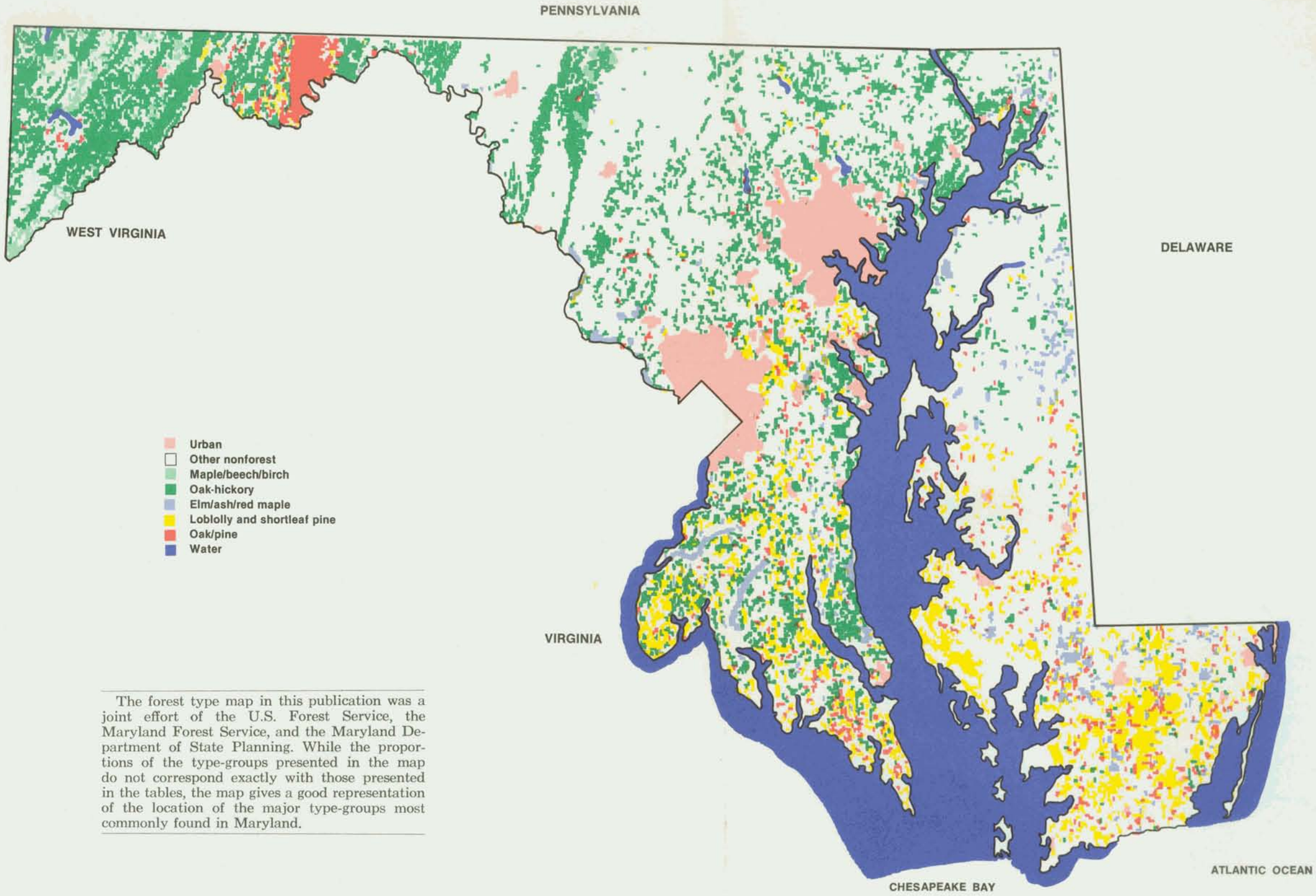

The forest type map in this publication was a joint effort of the U.S. Forest Service, the Maryland Forest Service, and the Maryland Department of State Planning. While the proportions of the type-groups presented in the map do not correspond exactly with those presented in the tables, the map gives a good representation of the location of the major type-groups most commonly found in Maryland.

Headquarters of the Northeastern Forest Experiment Station are in Broomall, Pa. Field laboratories and research units are maintained at:

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