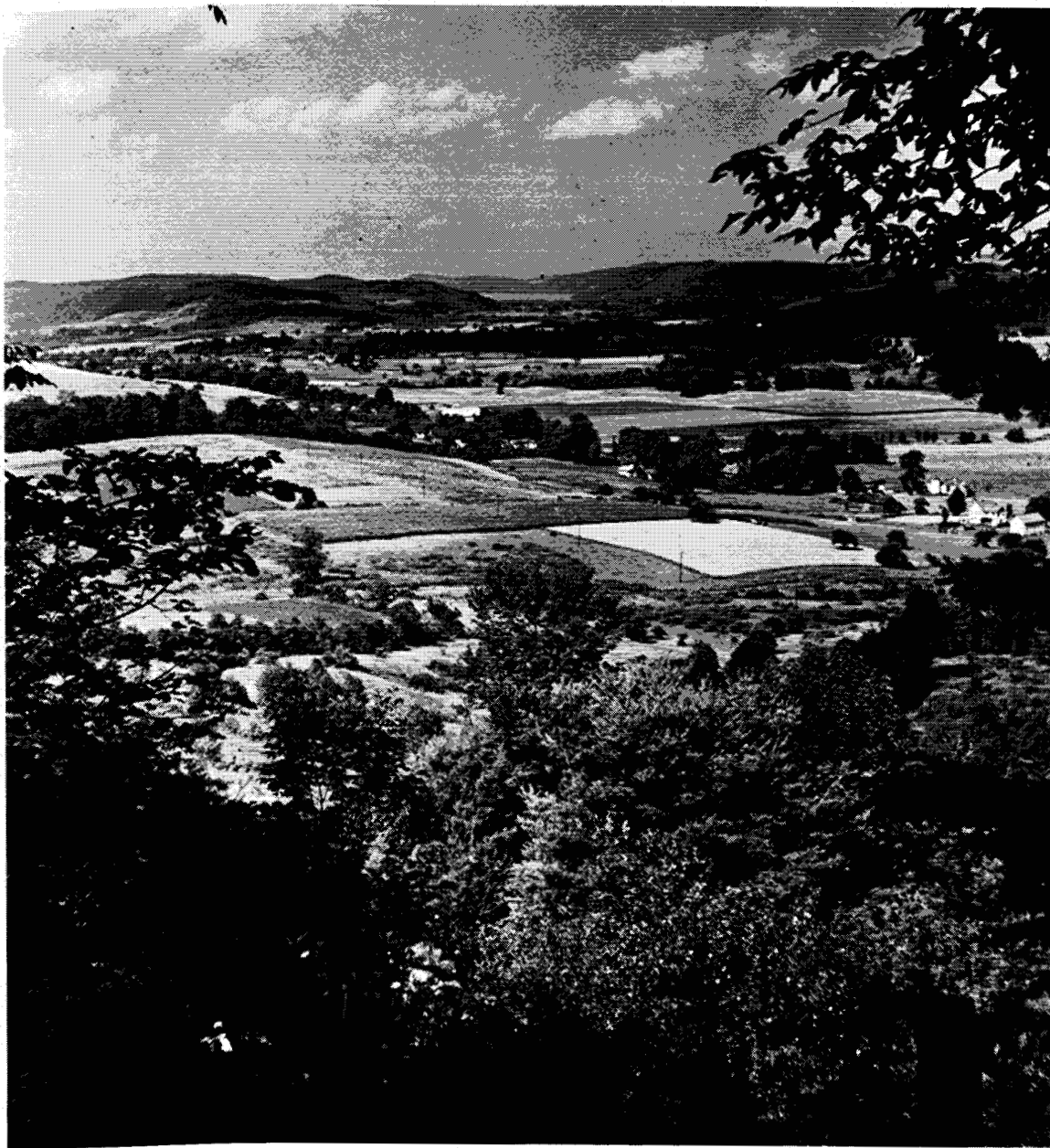


The Timber Resources of New York



NORTHEASTERN FOREST EXPERIMENT STATION

1956

FOREST SERVICE • U. S. DEPARTMENT OF AGRICULTURE • UPPER DARBY, PA.

RALPH W. MARQUIS, *DIRECTOR*

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Many former and present members of the Northeastern Forest Experiment Station staff took part in planning and making the survey and in compiling and analyzing the results.

A steering committee guided the writers of this report, reviewed the drafts, and offered many helpful suggestions. This committee consisted of Professor William A. Duerr, Chairman of the Department of Forest Economics, College of Forestry, State University of New York; Edward W. Littlefield, Assistant Director of Lands and Forests, State of New York Conservation Department; and John R. McGuire, Chief of the Division of Forest Economics, Northeastern Forest Experiment Station, Forest Service, U. S. Department of Agriculture.

The Timber Resources of New York

by

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NORTHEASTERN FOREST EXPERIMENT STATION

Preface

THIS REPORT presents the findings of the first comprehensive survey of the forests of New York, made in the period 1949 to 1952, by the Forest Service, U. S. Department of Agriculture, in cooperation with the New York Department of Conservation. The purposes of this survey were: (1) to make a field inventory of forest land and of the present supply of standing timber; (2) to ascertain the current rate of **timber** growth; (3) to determine how much the timber resource is being reduced through industrial and domestic uses, fire, and other causes; and (4) to interpret and correlate these findings so that they may be useful in formulating private and public forest policies.

Preliminary estimates of forest area and timber volume were shown for 1950 in a report, "**Forest** Statistics for New York," published in 1955 by the Northeastern Forest Experiment Station. These estimates have been adjusted to January 1, 1953 in this report. Sawtimber volume increased about 5 percent and growing stock volume about 7 percent in the 3-year period as a result of the excess of net annual growth over annual cut.

Estimates of the State's timber inventory, made in the past, were based largely on general knowledge and on the judgment of informed persons; the present survey is based on a scientifically designed procedure using aerial photographs and ground plots. Furthermore, some specifications used in this report are different from those used in previous studies. For these reasons, changes in forest conditions in New York cannot be determined by comparing the data in this report with previous estimates.

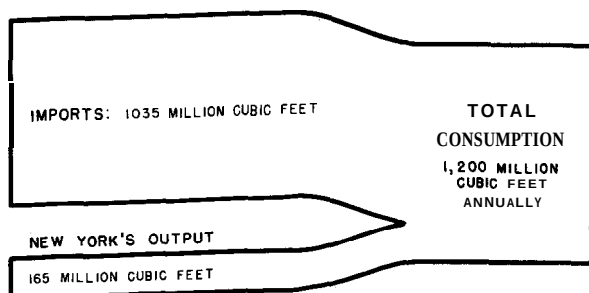
The Facts in Brief

Forests Are Important To New York

Forests cover almost half the land area of New York. In one way or another their use for timber, watershed protection, and recreation affects every one of the 15 million people in the State. Although water and recreation are of major importance to New York's highly urban and industrial economy, timber values are also high — higher than most people realize.

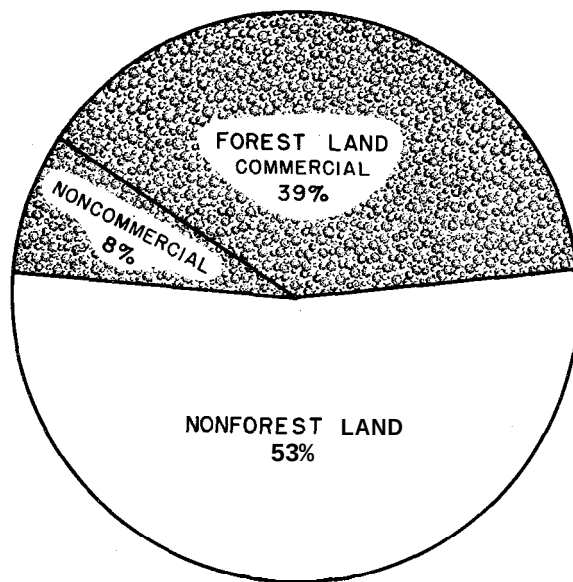
Timber-Based Industries Employ 100,000 Workers

Three percent of the Nation's sawmills, 15 percent of the pulp and paper mills, and one-sixth of the wood-using house-furniture plants are in New York. These and other timber-based industries employ more than 100,000 workers, pay almost 400 million dollars in yearly salaries and wages, and add almost 700 million dollars of value annually in converting their raw materials into fabricated goods.



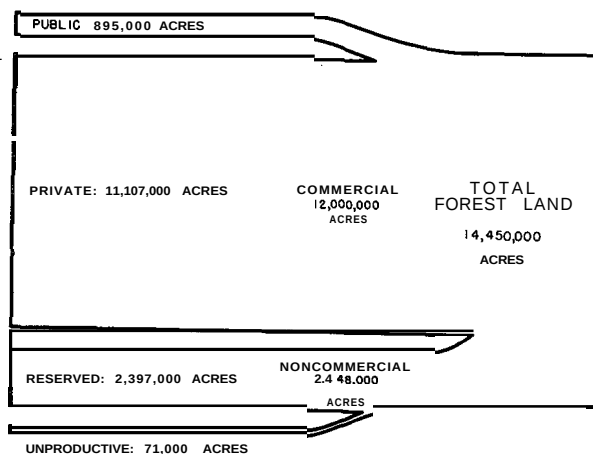
Ninety-Three Percent of the Commercial Forest is Privately Owned

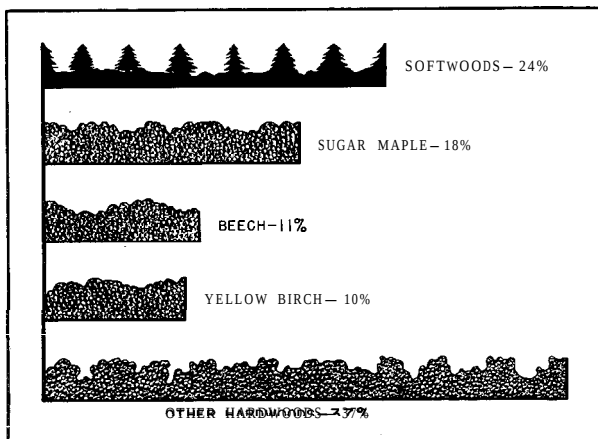
Commercial forest-land area amounts to 12 million acres. Ninety-three percent of this — or about 11 million acres—is in 255,000 private ownerships. Small holdings are the rule: more than nine-tenths of the forest holdings, accounting for 56 percent of the private commercial forest land, are less than 100 acres in size. Total forest-land area is 14½ million acres. Sixteen percent, or 2,377,000 acres, is reserved from timber cutting by law. Most of this is in the State Forest Preserve.



Demands For Wood Are High

New Yorkers probably consume the equivalent of 1,200 million cubic feet of wood annually; but only one-seventh of this comes from New York forests. Sawmills, pulp mills, and veneer mills in New York use more than 150 million cubic feet of logs and bolts. Paper mills, paper converters, and a great diversity of secondary wood manufacturers use an additional 750 million cubic feet of roundwood in the form of pulp, paper, lumber, veneer, and other material made of wood.



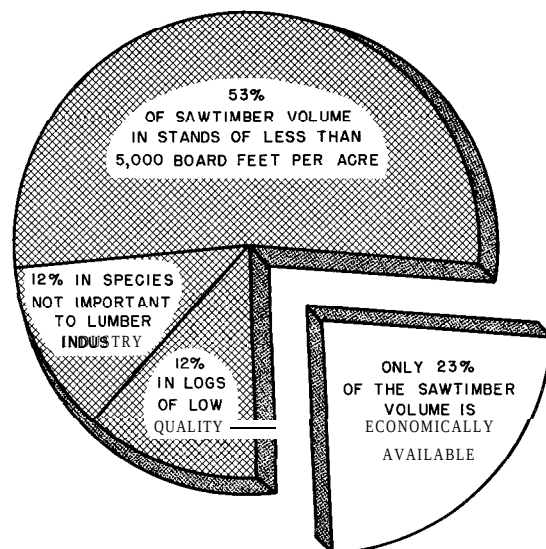


Less Than One-Fourth of the Sawtimber is Economically Available

Sawtimber stands averaging more than 5,000 board-feet per acre occur on 13 percent of the commercial forest land. Less than half of the sawtimber volume is in these stands. And about three-fourths of that operable volume is in the important lumber species. Also, much of the sawtimber volume is in trees that are of low quality because of small diameter and defects. Consequently less than one-fourth of the sawtimber is economically available for harvest as sawlogs or pulpwood.

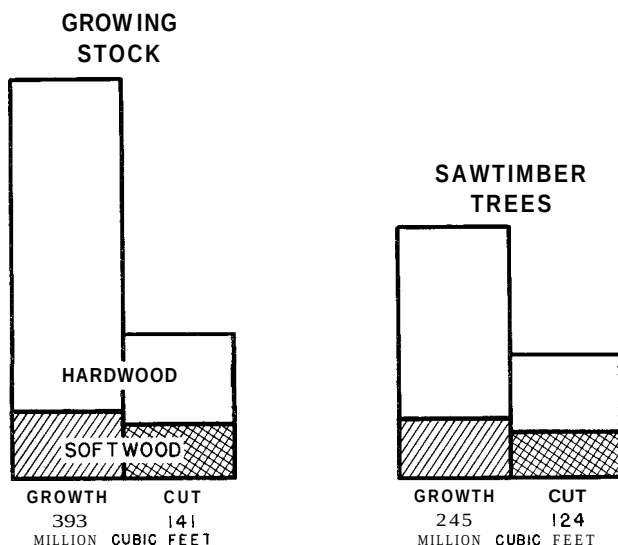
Sawtimber Volume is Mostly Hardwood

The commercial forest-land area supports more than 11½ billion cubic feet of growing stock, including almost 27 billion board-feet of sawlog material. About three-fourths of the sawtimber is hardwood, chiefly sugar maple, beech, and yellow birch.



Increasing Demands Present Increasing Opportunities

Public and private forest-resource programs in the realm of protection, rehabilitation, management, and utilization have been put into effect in New York State. Although much has been accomplished, there is much more to be done in each of these fields of endeavor. Finding ways of making more effective use of the increasing amounts of low-grade timber in New York is the greatest challenge and opportunity facing forest land managers in the State today.



Growth Exceeds Cut: But the Surplus is in Low-Quality Hardwoods

Net annual growth is more than twice the annual cut. In 1952, the growth was 393 million cubic feet and the cut from growing stock was 141 million cubic feet. However, much of the annual growth is on trees of small diameter, poor form, or low-value species. The rate of removal of the favored species, sizes, and grades exceeds the rate of replacement.

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FIGURE 1 — *Despite vast urban areas, nearly half of New York's land area (47 percent) is covered by forests. This aerial photo shows the general pattern of forest and farm lands in an agricultural area.*

Why Forests Are Important to New York

When the Dutch first settled New Amsterdam, what is now New York State was virtually blanketed by forests. These forests dominated the lives of the people and provided raw material which for years gave New York a prominent place in the Nation's timber market.

Today, after more than three centuries of social and economic change, forests are still of great importance to New Yorkers. In one way or another the use of forests for timber, watershed protection, and recreation affects everyone in the State. But the significance of the forest resource is to some extent overshadowed by the pre-eminence of the State along other lines. New York leads the Nation in population, income, employment, foreign and domestic trade, finance, and industrial development. All these are important factors in our economic world

today, and as such they tend to dominate the news.

The fact that forests still cover almost one-half of New York State is not widely recognized (fig. 1). Yet these extensive wooded areas, though unable completely to meet the needs of the urban economy that outshines them, are making significant daily contributions to the economy of the State and to the well-being of its people.

THE URBAN NATURE OF THE ECONOMY CALLS FOR MULTIPLE USE

Although social and economic conditions in New York have tended to obscure the importance of forests, they have also played a significant role in determining the present forest uses and values.



FIGURE 2 — Forests provide recreation for the people of New York; they provide food and cover for wildlife; and they serve the purposes of soil and water conservation.

Forest Recreation of Growing Importance

There are more than 15 million people in New York. Eighty-six of every hundred of them are urban dwellers (10)¹ and most of them live and work in the 19 counties that contain the larger cities. In 1950, their per capita income was 30 percent above the national average.

Such a concentrated urban population, with better-than-average income, creates a strong demand for the recreational opportunities that forests provide. In addition, shorter working hours and modern transportation facilities have enabled increasing numbers of vacationers from other areas to make use of New York forest lands.

No comprehensive studies have been made of the value of such vacation trade in New York, but it is generally conceded to be large. Recreation is so important to the people of the State that they have set aside on Forest Preserve lands and State Parks more than 2 million acres of forest land for recreational use.

Water Conservation A Vital Issue

Water is another important consideration in such a highly urban and industrial economy. New York supplies the water and power needs of close to 10 percent of the Nation's population and about one out of every five of the Nation's factories. In 1950, residents of the State consumed 9.6 billion gallons of water daily in businesses and homes (2). One-fifth of New York's electrical energy, about 5 billion kilowatt hours, is generated by water power (8). In no other state in the Nation are so many individuals and industrial plants dependent on water and on the forests that safeguard it.

Plenty of rain and snow falls on the land to meet all needs. The problem is one of timing. The role of the forests in water conservation is to help hold back water when it is overabundant and to release stored water when streams might otherwise run dry.

TIMBER VALUES RANK HIGH

While water, recreation, and other values are important (fig. 2), this report is concerned primarily with the present and potential timber values of New York forests. And there are significant timber values. Compared with other states, New

TABLE 1 — Number of employees, salaries and wages, and value added by manufacture in the timber-based industries. 1952.

Industry	Number of employees	Salaries and wages	Value added by manufactures
	Thousands	Millions of dollars	Millions of dollars
Forestry services (growing and protecting timber) ¹	1	2	..
Lumber and wood products ²	17	56	85
Furniture ³	23	86	157
Paper and allied products ³	65	246	447
All timber-based industries	106	390	689

¹ Estimated from 1950 Census of Population.

² U. S. Bureau of the Census. Annual Survey of Manufactures, 1952.

³ Estimated from data in 1952 Survey of Manufactures (11).

York has the sixth greatest volume of hardwood sawtimber in the Nation, even excluding stands on its noncommercial forest land.² Local hardwood forests contain one-fifth of all the yellow birch and sugar maple sawtimber in the United States (fig. 3) (13); and the commercial softwood timber volume exceeds that of every northeastern state except Maine.

These extensive timber stands provide a livelihood for many forest workers and part-time employment for many rural residents. They provide raw materials for forest industries as well as fuelwood, fence posts, and timbers for home use,

In recent years the stumpage value of all primary timber products extracted from the woodlands of New York has probably exceeded 10 million dollars annually. However, the value of raw materials before harvesting is always a minor part of the value of the finished product in the consumer's hands. It is in the processes of harvesting, transporting, manufacturing, and marketing that the greatest value is added and the largest part of income payments is generated.

In 1952, for example, timber-based industries in New York employed about 106,000 workers, paid about 390 million dollars in salaries and wages, and added more than 689 million dollars of value in converting raw materials into fabricated goods (II) (table 1). Such large totals are to be expected insofar

¹ Italic numbers in parentheses refer to Literature Cited, page 28.

² Forest land that is (a) withdrawn from timber utilization through statute, ordinance, or administrative order, but that otherwise qualifies as commercial forest land, or (b) incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

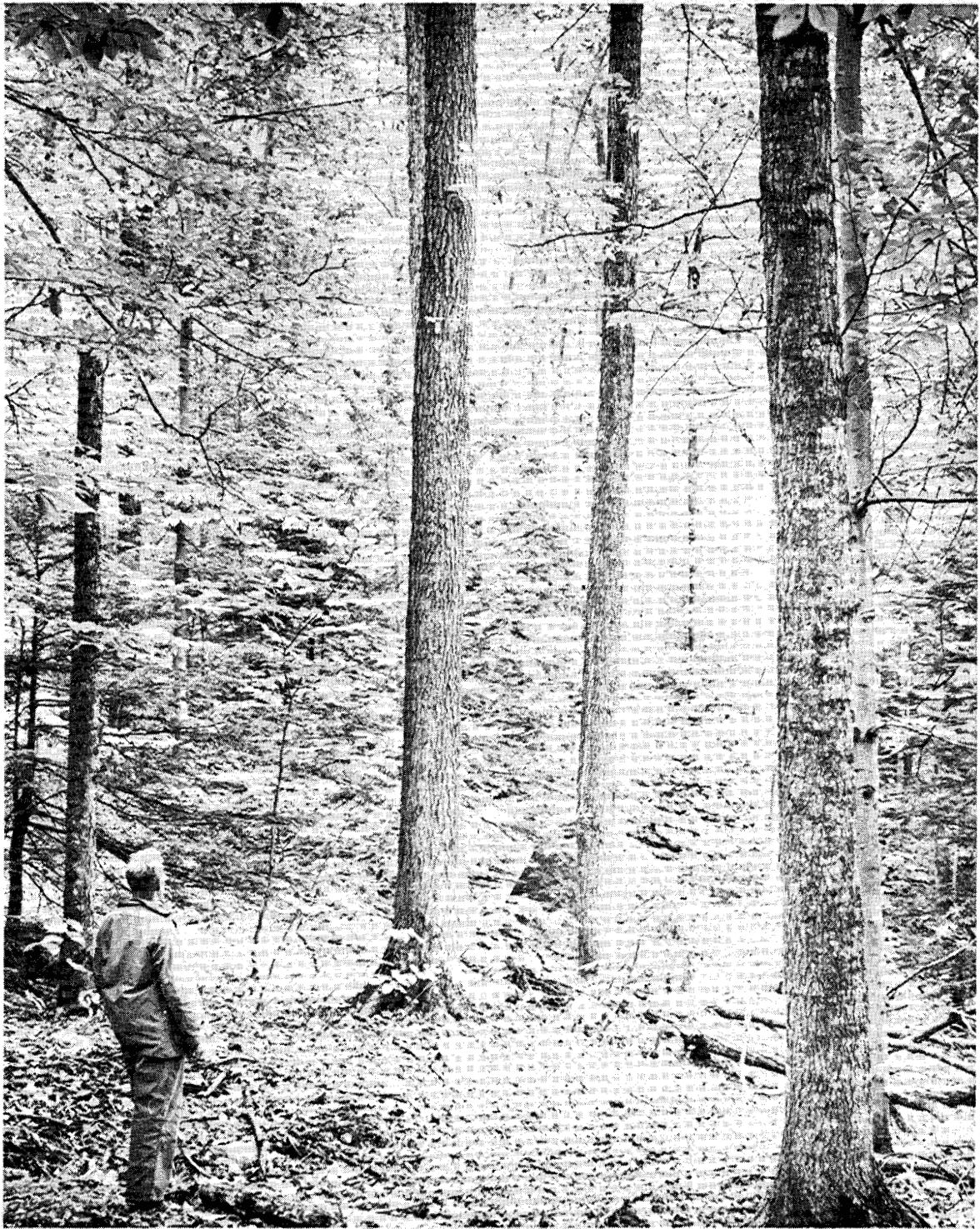


FIGURE 3 — *The hardwood forests of New York contain one-fifth of all the sugar maple and yellow birch sawtimber in the United States.*

as New York plays host to a large number of wood-manufacturing plants. More than 3 percent of the Nation's sawmills, one-sixth of its wood house-furniture plants, and 15 percent of its pulp and paper mills are located in the State (9).

In addition, timber-connected activities on farms and in construction, transportation, and trade probably generated 140,000 man-years of employment and 520 million dollars in salaries and wages. Thus total employment and income due to timber use represents about 4 percent of the total for the State.

FORESTS PRESENT BOTH PROBLEMS AND OPPORTUNITIES

This brief review indicates that local forests are still extensive and of manifold importance to New Yorkers. The large urban population, generally far removed in its field of activity from the forests, tends to think of the woodlands in terms of recreation and

preservation rather than in terms of conservation, a source of raw material, or personal income. At the same time, many firms, individuals, and communities are wholly dependent upon local forests for their existence. In other words, fundamental differences in land use and environment give the residents of each community different points of view with regard to resource use.

Because of such differences in emphasis, it is not a simple matter to decide how the timber resource should be handled to secure the greatest benefit for the individual, for the people of the State, and for the Nation. The first step is to describe and understand the significance of existing conditions. The following detailed description of the characteristics of the forests of New York, of their products, and of the ways in which they are being put to use provides a background for discussion of timber-resource issues and for policy and action decisions.

How Wood is Being Used in New York

In 1952 some 165 million cubic feet of logs, bolts, and other timber products were removed from the forests of New York, including 24 million cubic feet from other sources than growing stock (fig. 4). Some 70 percent of this output was sawlogs, pulpwood, and veneer logs and bolts. Another 26 percent was fuelwood. The balance, 4 percent, was posts, poles, piling, and various minor timber products.

CRUDE PRODUCTS MORE THAN ONE-FOURTH OF OUTPUT

Each year quantities of timber products are extracted from the forests of New York and used without substantial modification. These timber products are fuelwood, fence posts, poles, and piling. Their volume amounted in the aggregate to 46.5 million cubic feet in 1952.

Although the convenience of other fuels such as oil, gas, and coal has hastened substitution for wood, about 43 million cubic feet (533 thousand cords) of roundwood are still used annually for fuel. Not

much of it comes from the growing stock³ on commercial forest land. More than 355,000 cords, or 67 percent of the total, is cut from cull trees, dead trees, limbs, and other sources such as trees salvaged from noncommercial forest land. In addition, about 14.5 million cubic feet of plant residues from sawmills and veneer mills are used for domestic and industrial fuels. The portion taken from the growing stock consists almost entirely of hardwood species, chiefly beech, hard maple, and red oak.

About 6 million fence posts are cut each year, generally from the farm forests. More than 85 percent of them come from the growing stock. Oak, ash, black locust, and cedar make up four-fifths of the 3½ million cubic feet utilized.

A small amount of poles and piling is produced, but most of this demand is met by material from outside the State.

³ Growing stock is the net volume, in cubic feet, of live sawtimber trees and live poletimber trees from stump to a minimum 4-inch top (of central stem) inside bark.

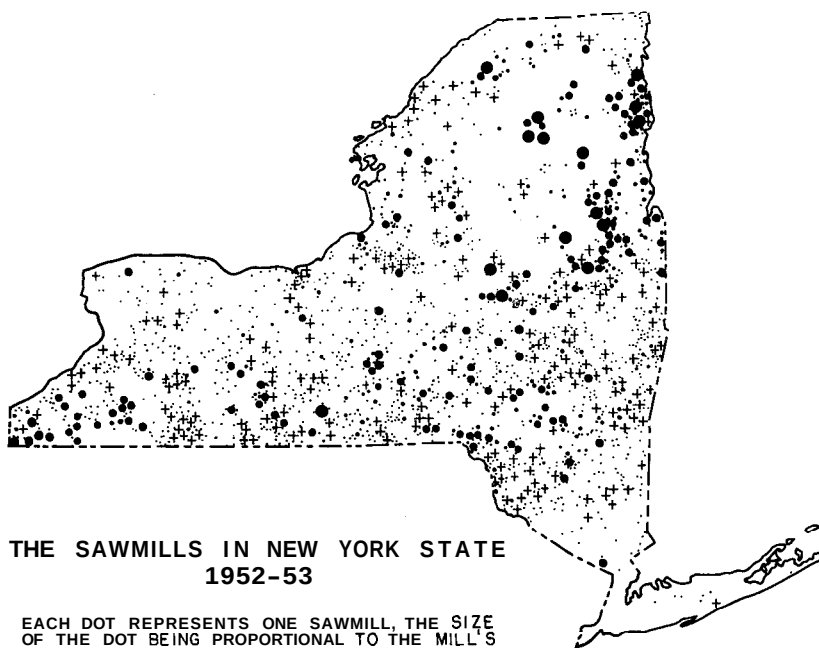
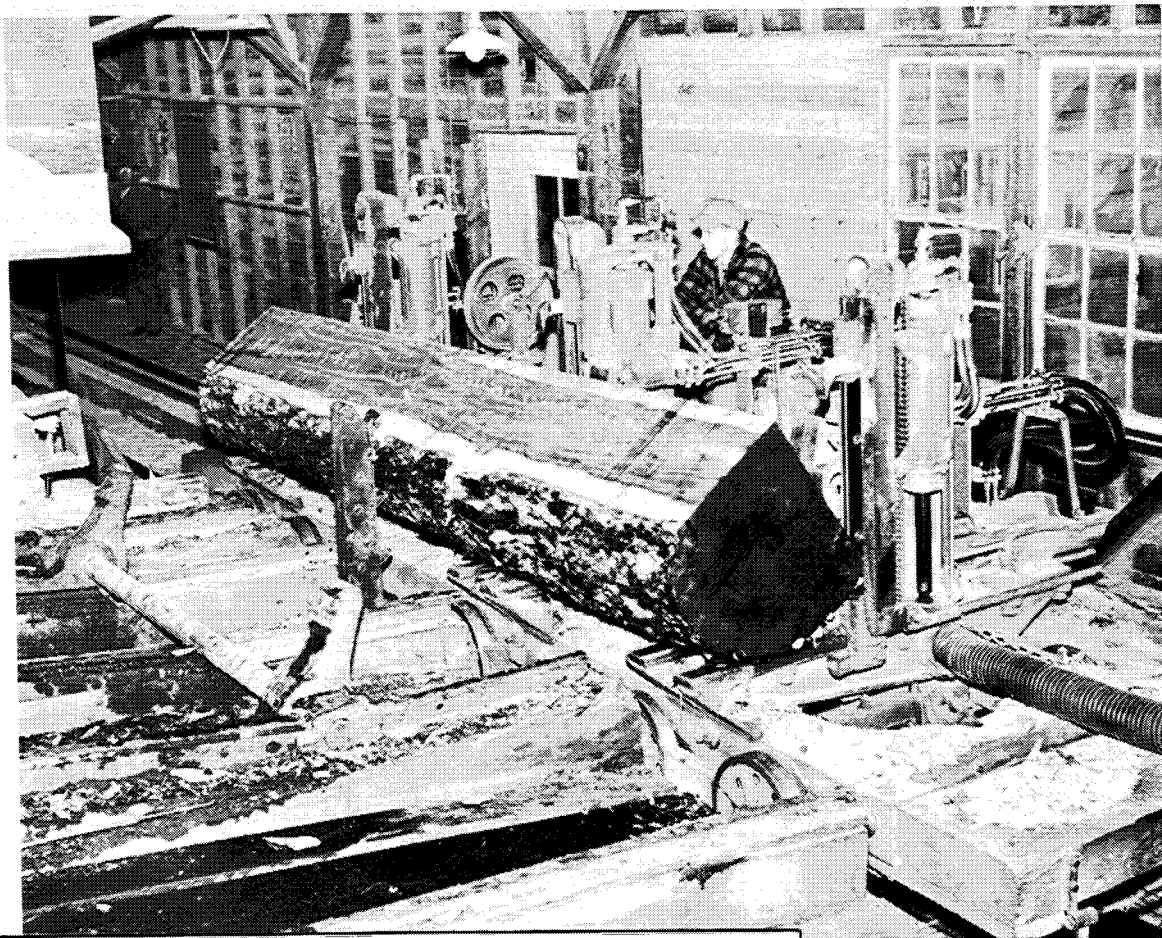


FIGURE 5 — There are 1,757 sawmills in New York. Sixty percent of the lumber is produced by only 118 mills. (Photograph courtesy of Northern Lumber Company, Poland, N. Y., and map courtesy of State University of New York College of Forestry, Syracuse, N. Y.)

PRIMARY MANUFACTURING USES NEARLY THREE-FOURTHS OF OUTPUT

Among primary wood-manufacturing plants — those that use logs or bolts as raw material—the most important are sawmills, pulp mills, and veneer plants. Because of the bulk and the comparatively low value of their raw materials, these plants are generally situated in or near the forests that supply them. Except for the smaller sawmills, they represent large capital investments, which tends to make them relatively stable and permanent in operation.

New York's primary wood-using plants are of considerable value to the economy because they provide a local market for New York's timber resource, provide employment for some 10,000 persons, and sometimes are the sole means of support for sizable communities.

In 1952 the sawmills, pulp mills, and veneer mills used 162 million cubic feet of sawlogs, pulpwood, and veneer logs, of which about two-thirds originated within the State. Eighty-five percent of this home-grown wood came from growing stock on commercial

forest land; the other 15 percent came from other sources such as trees salvaged from the noncommercial forest land in the Forest Preserve after the 1950 blowdown.⁴ One-third of all the pulpwood produced in the State in 1952 came from this latter source, as well as an unusually large share of sawlogs and veneer logs. For this reason, estimates of timber cut from commercial forest land, as used in this report, are probably somewhat lower than they otherwise would have been.

Sawmills Depend On Local Forests

Sawmills are by far the most numerous primary processing plants in New York (fig. 5). In 1952, there were 1,757 of them, including 200 idle mills (table 2). These mills, big and small, purchased 478 million board-feet (International 1/4-inch log rule) of sawlogs in that year—the equivalent of about half of the State's timber-products output. A small amount of the material used (about 6 million board-feet) came from other states and foreign countries; but 472 million board-feet, or about 99 percent, consisted of sawlogs harvested in New York forests.⁵

As in most states, a few large mills turned out the greater part of the lumber. Sixty percent was manufactured by the 118 mills that cut 1 million or more board-feet annually.

The large number of sawmills that cut less than 1 million board-feet annually is probably dictated largely by the fact that smaller mills are particularly well suited to the utilization of timber from the small and irregularly distributed properties that characterize a large portion of the forest lands of New York. Such mills often represent a minimum capital investment and may be operated only intermittently. The tendency toward intermittent operation spells temporary employment for many of the five to six thousand sawmill employees in the State or, looked at in another way, off-farm employment for many agricultural workers.

The proportion of the species used in sawmilling has varied from one period to another and even from year to year, depending on the demands of industry and on the availability of supply. For example, spruce made up 28 percent of the lumber produced

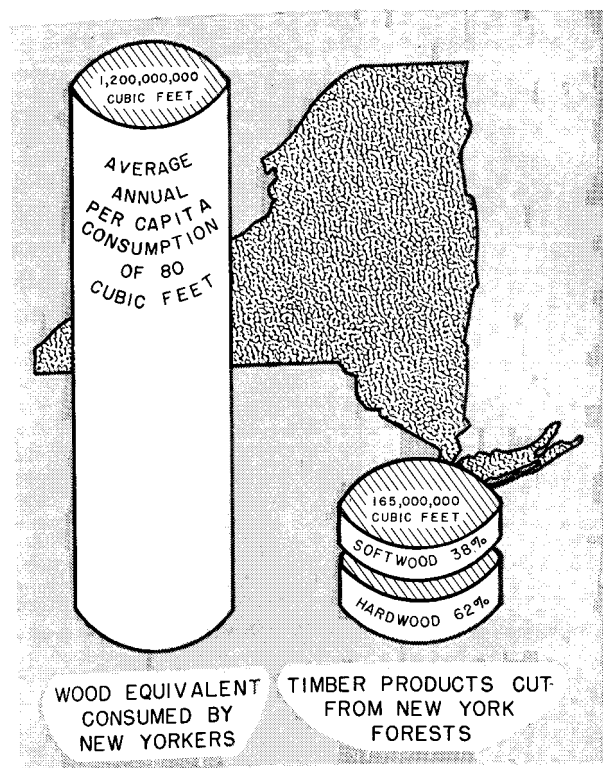


FIGURE 4 — The forests of New York provided about one-seventh of the wood that New Yorkers consumed in 1952.

⁴ This situation, which developed in 1952, prevailed also in 1953 and to a diminishing degree in 1954. By 1955 the pulpmills had practically stopped taking blowdown wood, leaving only sawlogs to be marketed. State-supervised blowdown operations were terminated on March 31, 1956.

⁵ About 12,000,000 of the 484,000,000 board-feet of New York sawlogs were shipped to out-of-state sawmills.

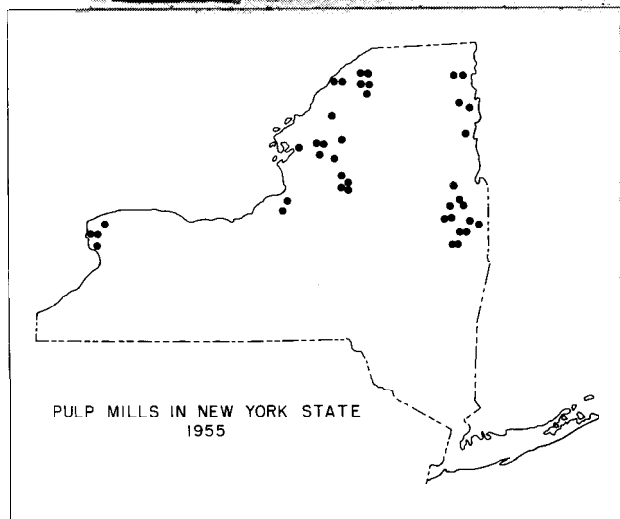


FIGURE 6 — There are 40 pulpmills in New York. Their annual pulpwood receipts exceed 1 million cords. (Photograph courtesy of St. Regis Paper Company.)

TABLE 2 — Number of sawmills in New York State, by annual production class, 1952.

Production class (in thousand board-feet)	Sawmills Number
Idle	200
0-49	817
50-199	334
200-499	189
500-999	99
1000-2999	97
3000+	21
	1,757

Source: Unpublished data supplied by the College of Forestry, State University of New York, Syracuse.

in New York in 1905. In succeeding years the volume of spruce harvested was gradually diverted almost wholly to the pulpwood market and by 1950 spruce made up little more than 1 percent of the lumber manufactured. Hemlock, on the other hand, was seldom used for lumber in the 1800's, when pine was most plentiful; but it is a major lumber species today.

During the past 35 years the two softwoods (white pine and hemlock) and the four hardwoods (maple, birch, oak, and beech) have been consistently the species most used for lumber in New York. And for at

least 25 years, these six species have represented between 80 and 90 percent of the lumber sawed in the State. This is reflected in the sawlog output for 1952, of which the northern hardwoods (beech, birch, and maple) made up 35 percent, oaks 11 percent, white pine 23 percent, and hemlock 14 percent. The remaining 17 percent of the sawlog volume harvested consisted of nearly equal amounts of other hardwoods and softwoods.

Pulpwood Requirements Three Times Output

There are now 40 commercial pulp mills (5) at 31 different locations in New York (fig. 6). In 1952 their pulpwood receipts totalled 1,011 thousand cords. Of this, New York forests provided 40 percent or 403 thousand cords, including about 3 thousand cords of sawmill and other plant residues." The other 60 percent, 608 thousand cords, was purchased in other parts of the United States and in Canada.

These figures reflect the effect of timber-salvage

"About 6,000 cords of pulpwood, cut in New York in 1952, were shipped to other states. Most of the shipments were hemlock, and most of it went to Pennsylvania.

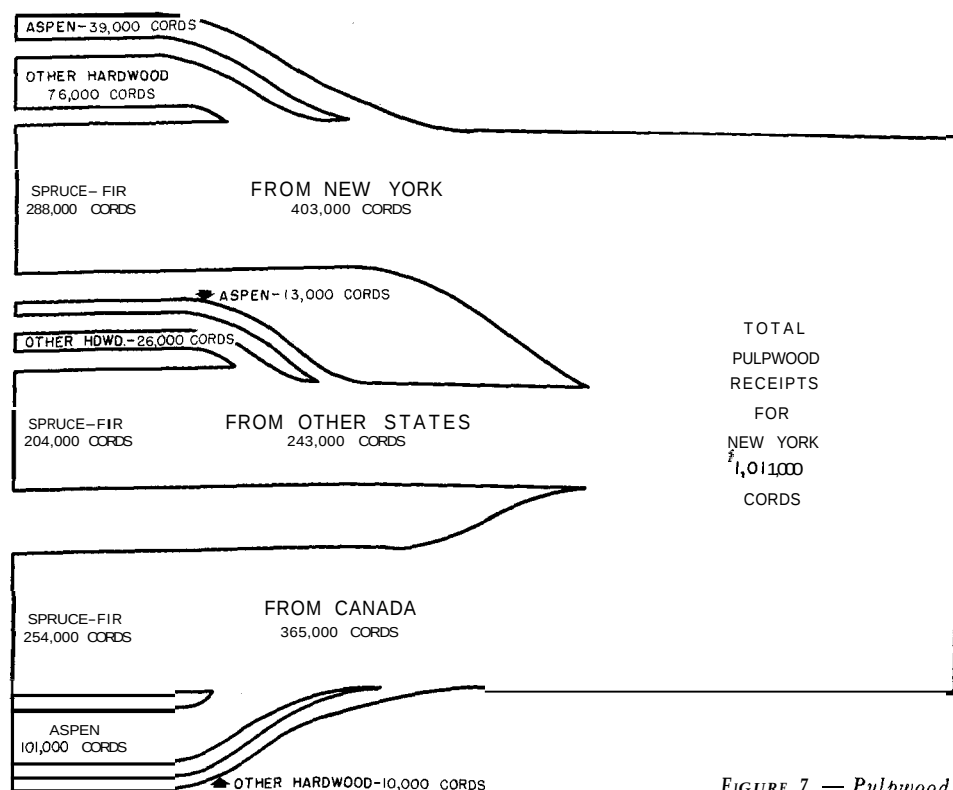


FIGURE 7 — Pulpwood receipts for New York in 1952.

operations in New York subsequent to the 1950 windstorm. Before 1952, pulpwood imports were more nearly 70 to 75 percent of the amount used in the State. Under normal conditions pulpwood requirements are more than three times the local output. Actually, in 1952 New York pulpwood production was up 50 percent compared to 1950, and imports from Canada dropped more than 35 percent. Out of 793 thousand cords received in 1950, 445 thousand were imported from Canada, compared to 365 thousand cords of such imports in 1952:

Source	Pulpwood receipts	
	1950 (Percent)	1952 (Percent)
New York State	27	40
Canada	56	36
New England and Pennsylvania.....	17	24
	100	100

The woodpulp industry in New York has undergone a number of radical changes since the first mill was established in 1866. Rapid expansion in the early years gave the State 98 pulp mills by 1910, and until 1914 the State led the Nation in pulp production.⁷

In both 1950 and 1952 about 75 percent of the pulpwood used by New York pulp mills was spruce and balsam fir. These are species that have been in limited supply in the commercial forests of the State for many years. In 1952, the New York forests supplied 38 percent of these species requirements, 35 percent was imported from Canada, and 27 percent was purchased in other states, chiefly Vermont, New Hampshire, and Maine. Aspen is another important pulp species, most of which was imported during those years. Of 153 thousand cords of aspen used in 1952, 101 thousand were imported from Canada, 39 thousand were cut in New York, and 13 thousand cords came from other states (fig. 7). Most of the other hardwood, hemlock, and pine pulpwood, which together made up about 10 percent of the pulpwood consumed, was produced locally.

Recent advances in the technology of hardwood pulping have made possible a shift to the more plentiful hardwoods as a source of raw material and have provided some incentive for investment in new plants' and equipment. With the adoption of hardwood pulping, New York is now better able than it has been for many years to provide the necessary woodpulp for its paper industry.

⁷ Hines, Willard R. B. *The pulp mills of New York State with special reference to the available supplies of pulpwood.* Unpublished thesis, Cornell Univ., Ithaca, 1921.

Veneer Industry Based On Northern Hardwoods

The veneer-manufacturing firms in the State constitute another important primary forest industry (fig. 8), though they are only 29 in number and process a relatively small amount of timber (14). New York veneer plants are of three kinds: those producing baskets, those producing higher grade rotary veneers for use in furniture and similar products, and those producing specialty veneers for use in such products as spoons and tongue depressors. The 14 basket-veneer plants produce about 23 percent of all veneer made in the State. They are concentrated, for the most part, in western New York where fruit and vegetable baskets are in greatest demand. The location of the other classes of veneer mills, on the other hand, seems to be dictated not so much by the market as by the availability of raw material. Most of the veneer industry requires logs of large size and high quality.

Veneer plants get about 85 percent of their raw material from the woodlands of the State — exclusively hardwoods. Veneer log and bolt output in 1952 totalled 21 million board-feet, of which about 2 million board-feet were shipped to out-of-state mills. About 4 million board-feet were purchased from Vermont, Pennsylvania, and other states—bringing the total veneer log and bolt consumption of New York mills to about 23 million board-feet in that year. Seventy-five percent of the native eastern hardwoods that they converted into veneer in 1952 were yellow birch, beech, and sugar maple.

SECONDARY WOOD-USING INDUSTRIES ARE IMPORTANT

New York's construction, paper, and secondary wood-manufacturing industries provide a substantial market for the output of the primary forest industries. They eventually use or process a large share of the lumber, woodpulp, and other products made from timber harvested in the State. However, in spite of their recognized importance in the State's timber economy, they are far less dependent on local timber resources than the primary manufacturing plants.

Construction Requirements

In 1952, when the value of construction contracts awarded in New York approached 2 billion dollars, more than 1.5 billion board-feet of lumber and mill-

work were used by the building industry. Roughly three-fourths of this material was softwood and more than four-fifths of it came from outside the State, principally from the South and West. Here is an established market in which New York softwood lumber producers could compete more strongly if they had the timber.

Paper and Paperboard Production

New York produced 1,736,000 tons of paper and paperboard in 1952—more than any other state (12). About 40 percent of the woodpulp used by the industry comes from outside the State.

Of 102 commercial paper mills in New York, in 1955, only one manufactures newsprint (fig. 9). Paperboard and specialty papers are the most important items. The industry is not closely integrated with the local pulp industry and 73 of the paper mills do not share their locations with the pulp mills that supply them. More than 40 percent of New York's paper and paperboard is made from waste paper, rags, and fibers other than wood (3).

New York also has more than 850 paper-converting plants, almost one-fourth of the Nation's total (1). Two-thirds of their output consists of paperboard boxes.

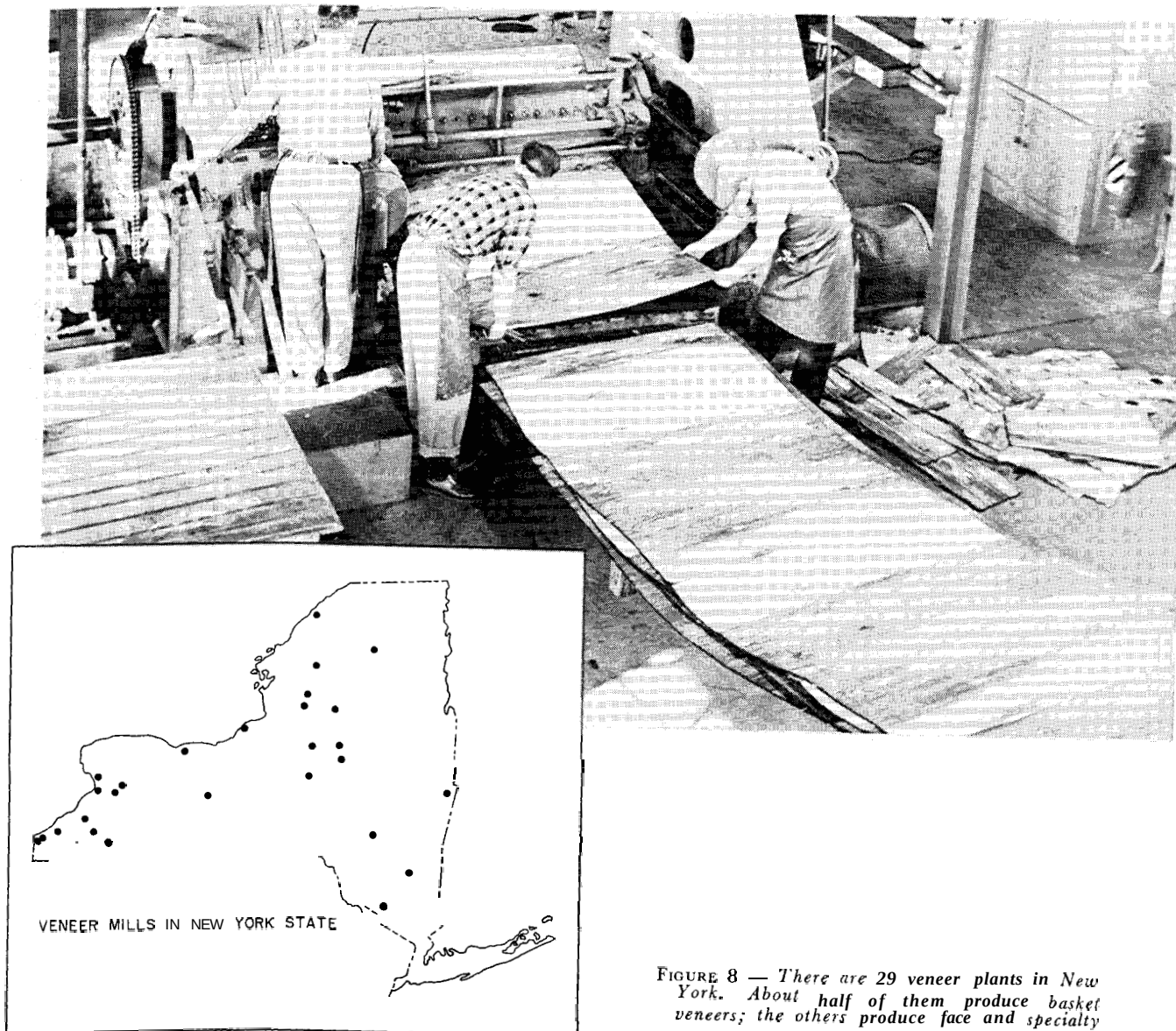


FIGURE 8 — There are 29 veneer plants in New York. About half of them produce basket veneers; the others produce face and specialty veneers.

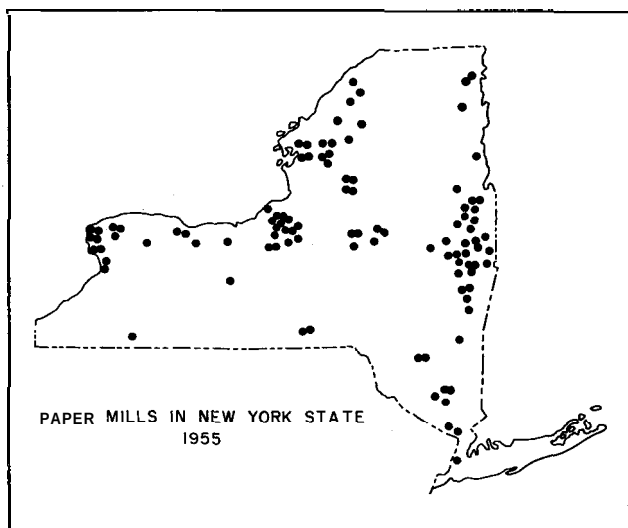
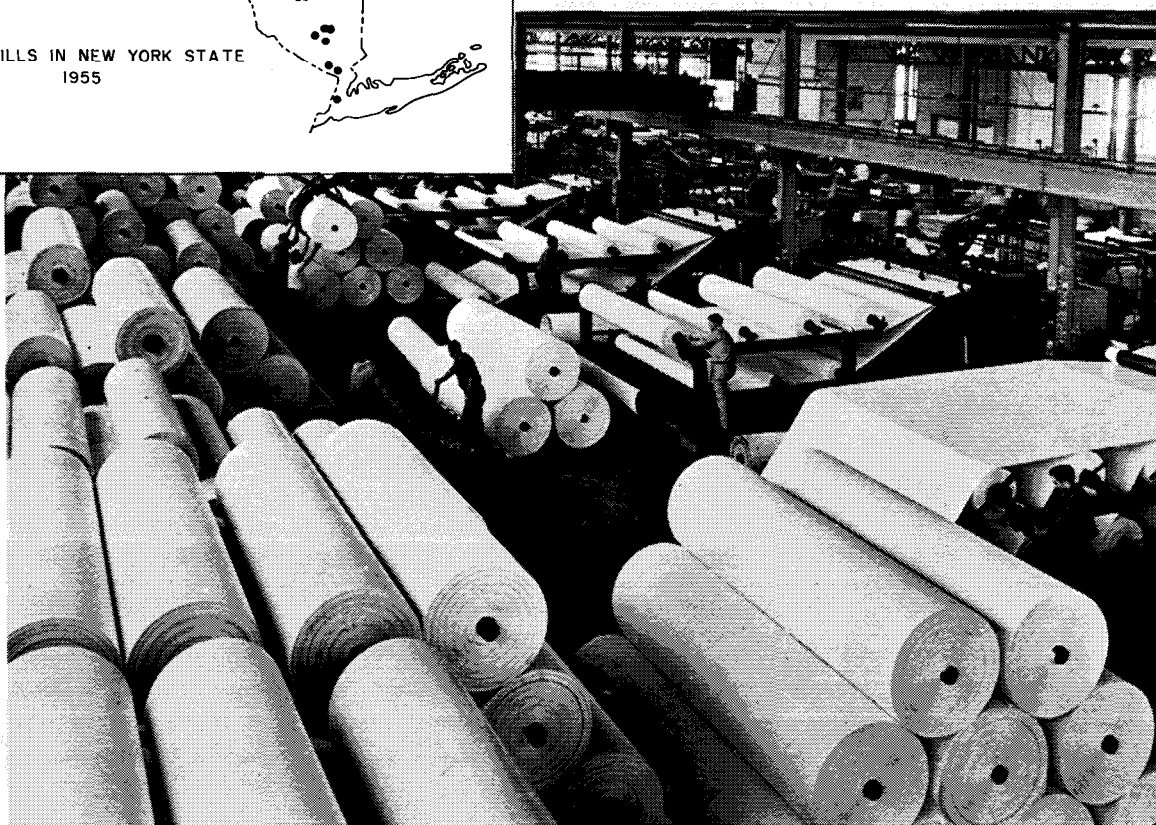


FIGURE 9 — There are 102 paper mills in New York. In 1952 they produced 1.7 million tons of paper and board—more than any other state. (Photograph courtesy of the West Virginia Pulp and Paper Company.)



Manufacturing Requirements

A 1954 survey found 1,336 secondary wood-manufacturing plants in New York (fig. 10), consuming the equivalent of more than 685 million board-feet of lumber, logs, bolts, veneer, and plywood, and making products in 53 different major categories (4). Six hundred twenty-five of these plants were making furniture, general millwork, boxes, and crating. The manufacture of these four products required 334 million board-feet—more than one-half of all the wood used for manufactured products.

In 1948, according to another study, out-of-state sources supplied more than 75 percent of the 869

million board-feet of lumber, bolts, and veneer used in manufacturing by New York industries. Only California used more wood in manufacturing than New York. The 1948 figures show that New York was the second largest user of wood for furniture; the fourth largest user of wood for containers; and the tenth largest user of wood for millwork (6).

Fifteen species accounted for 82 percent of the wood used in manufacturing in 1954. Nine of these are grown in the State and seven were used in greater quantity in 1954 than in 1946. In all, wood grown in New York constituted only about 27 percent of the total amount processed in 1954 by these secondary manufacturing plants.

CONSUMPTION MUCH GREATER THAN TIMBER-PRODUCTS OUTPUT

New York's 15 million people obviously require far more in the way of timber products than local forests can be expected to supply. In recent years, annual per capita consumption of roundwood (i.e., logs and bolts) has averaged close to 80 cubic feet (13). At that rate, the State probably consumes the equivalent of some 1,200 million cubic feet of roundwood annually, in the form of new houses and furniture, newspapers, and other commodities. This estimate of consumption is more than seven times greater than the volume of timber-products output in 1952.

The forests of New York are apparently meeting the present requirements of the primary wood-using industries, except for pulpwood. However, the numerous secondary industries depend chiefly on out-of-state timber. Trade in timber products is thus an important item in the State's economy. The freight bill alone is considerable: rough calculations indicate that just the rail and water transportation of forest products (net receipts only) in recent years has approached \$50 million annually.

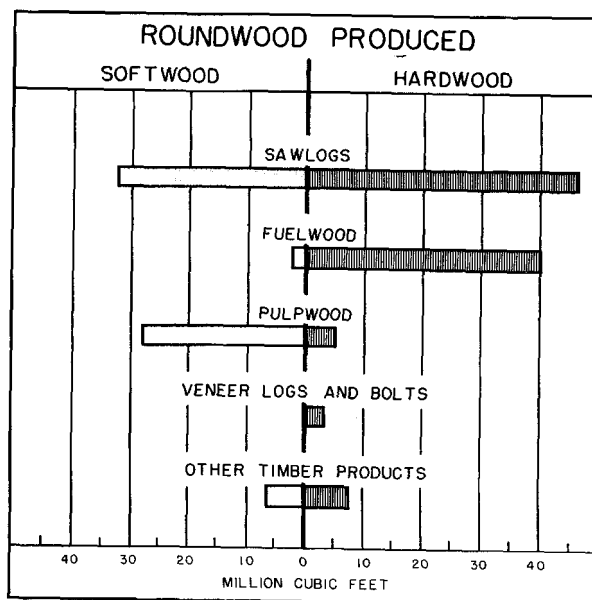


FIGURE 11 — Of timber-products output in 1952, 62 percent was hardwood.



FIGURE 10 — Of New York's 1,336 wood manufacturers, 625 make furniture, general millwork, boxes, and crating. (Photograph courtesy of W. H. Gunlocke Chair Company, Wayland, N. Y.)

Industrial requirements for lumber, veneer, wood-pulp, and other raw materials plus requirements for fuelwood, posts, poles, and piling totalled about 860 million cubic feet in 1952. The forests of New York contributed about one-fifth of these requirements.

Certainly there would be considerable savings involved and somewhat greater industrial stability if New York forests were able to meet local needs more adequately. And the market is open for locally pro-

duced wood whenever the forest lands of the State can supply it at competitive prices. A major consideration, however, is the fact that about 70 percent of the State's lumber and raw-wood requirements call for softwood, while in 1952 the local harvest was 62 percent hardwood (fig. 11). Some of the reasons for the difference and its implications are to be found in an examination of the present and potential timber supply.

New York's Timber Supply

As of January 1, 1953, New York's commercial forest land carried about 14.3 billion cubic feet of sound wood (table 3).

Almost a fifth of this sound wood is not counted as growing stock, though potentially it may be a source of raw material for fiber or chemical processes. Nearly 2 billion cubic feet are in cull trees, including noncommercial species like gray birch and pin cherry, and in trees that are too rough, too crooked, or otherwise too defective to grow into sawtimber trees. Hardwoods represent 88 percent of this volume; trees of sawtimber size, 65 percent. In addition, 0.8 billion cubic feet are in hardwood limbs.⁸

⁸ Softwood limbs, stumps, and tree sections smaller than 4.0 inches in diameter are not included in the estimate of sound wood volume.

TABLE 3 — *Net volume of all timber on commercial forest land by class of material and species group, New York, 1953.*

Class of material	Softwoods	Hardwoods	Total
	<i>Million cu. ft.</i>	<i>Million cu. ft.</i>	<i>Million cu. ft.</i>
Growing stock:			
Sawtimber trees	1,796	4,912	6,708
Poletimber trees	748	4,219	4,967
Total growing stock ...	2,544	9,131	11,675
Other material:			
Cull trees	233	1,642	1,875
Hardwood limbs	...	799	799
Total other material ...	233	2,441	2,674
Total, all timber	2,777	11,572	14,349

The remaining four-fifths of the sound volume on commercial forest land makes up the forest growing stock. Amounting to 11.7 billion cubic feet, it is the net volume found in the trees of commercial species that are 5.0 inches in diameter and larger. Most of the timber cut for industrial consumption comes from this inventory.

THE GROWING STOCK IS THREE-FOURTHS HARDWOOD

Of the total volume of growing stock, more than 9 billion cubic feet are in hardwoods. Many species contribute to this abundant hardwood volume; but sugar maple, beech, yellow birch, and the oaks account for more than half of it (fig. 12). They constitute almost two-thirds of the sawlog volume. Other hardwood species are red maple, elm, ash, basswood, black cherry, hickory, and aspen.

Softwood growing stock totals more than 2.5 billion cubic feet. Nearly all of the softwood volume is found in four species: hemlock, white pine, spruce, and balsam fir. Other softwoods present in lesser amounts include red and pitch pine, cedar, and tamarack.

Of the total growing stock, 42 percent is in pole-timber trees — hardwoods 5.0 to 11.0 inches in diameter, softwoods 5.0 to 9.0 inches. Nearly half the hardwood growing stock and a third of the softwood growing stock is in trees of this size (fig. 13).

The remaining 58 percent—6.7 billion cubic feet—of growing stock is in sawtimber trees. This volume

FIGURE 12 — *Hardwoods make up most of New York's timber volume.*

includes 5.4 billion cubic feet of sawlog material and more than a billion cubic feet of less valuable upper-stem material. Sawtimber trees provide nearly nine-tenths of the annual timber harvest.

Much of the board-foot volume is also in comparatively small trees. An average of about 46 percent for all species (41 percent of the hardwood sawtimber and 60 percent of the softwood) is in trees less than 16 inches d.b.h. Less than a fifth of the total sawtimber volume is found in trees larger than 20 inches in diameter.

Since sawlogs and pulpwood are the two most important forest products in New York, the total amount of wood in the forests that is technically suited for each has been estimated. Most trees are suitable for more than one product, hence the sawtimber estimate includes much of the material that is suitable for pulpwood, and the pulpwood estimate includes most of the trees that might be logged for lumber.

SAWTIMBER VOLUME TOTALS 27 BILLION BOARD-FEET

Even though there are almost 27 billion board-feet of sawtimber in the commercial forests, a lot of it is uneconomical to harvest, is of less desirable species, or is of low quality.

Less than half—13 billion board-feet—of the total sawtimber volume is in stands that can be considered economically operable for logging. These, by and large, are the medium and heavy sawtimber stands of 5,000 or more board-feet per acre. And about three-fourths of the operable volume or about 9½ billion board-feet, are in the important lumber species (fig. 14). Hardwoods are the most abundant: the operable volume in sugar maple alone is equal to about two-thirds of the total operable softwood volume.

When quality is considered, the amount of wood available for industrial use seems smaller still. A high proportion of better quality material is called for by the lumber industry; but among the preferred

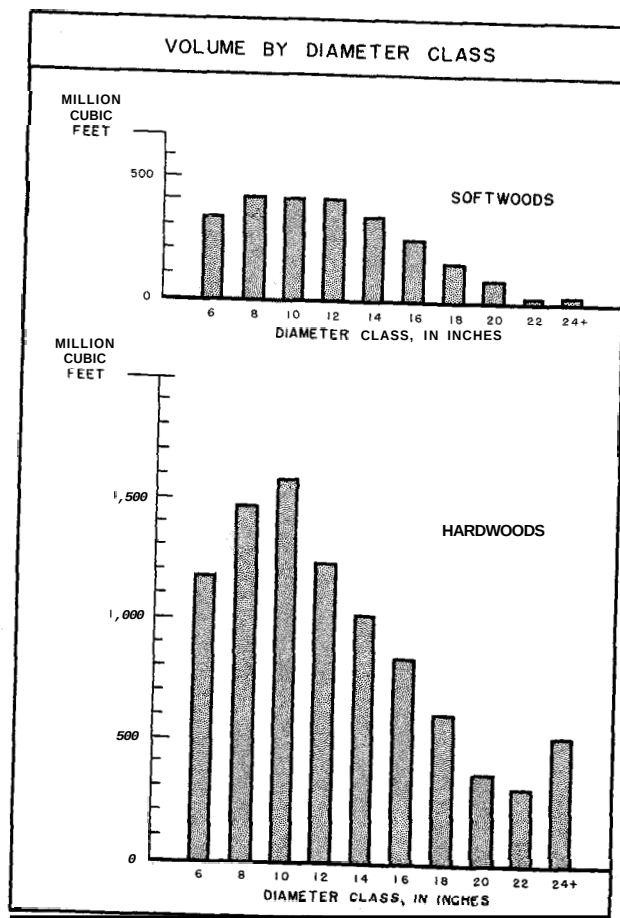
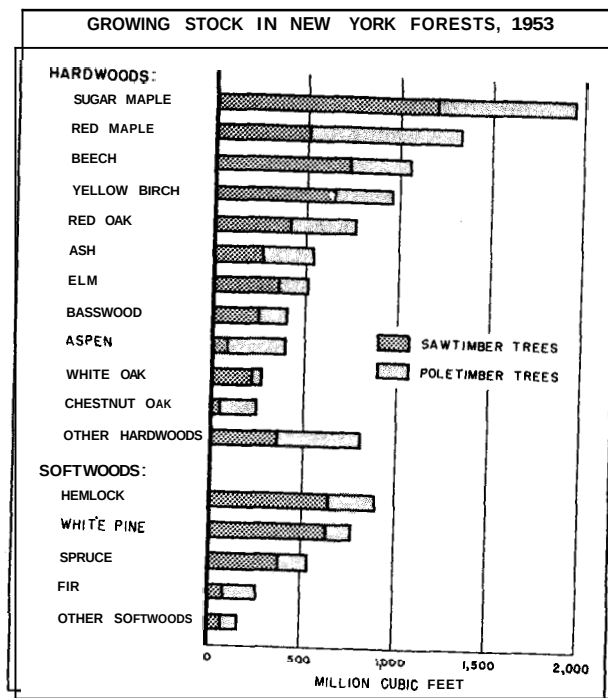


FIGURE 13 — *Much of the growing stock is in small trees.*

hardwood species only 54 percent of the volume of these species is in the better grade of logs — the standard factory-lumber log grades No. 1 and No. 2. Softwood sawlogs are graded on a different basis. Grade 3 softwood logs are roughly comparable to Grade 2 hardwood logs. This means that in white pine, for example, almost all of the sawlog material cut has some value to industry.

Such calculations show that about 6 billion board-feet of New York's sawtimber is in desirable species of good quality and in stands that are heavy enough to be readily operable by the lumber industry (fig. 15). If half the remaining sawtimber stands, containing 1,500 to 5,000 board-feet per acre, were also considered operable, the total available volume would rise to almost 8 billion board-feet—still less than 30 percent of the net volume on commercial forest land.

PULPWOOD INVENTORY MORE THAN 100 MILLION CORDS

It is estimated that there are 129 million cords of wood in New York forests that meet the pulp industry's specifications for pulpwood.⁹ Because pulpwood can be cut from poletimber as well as from sawtimber trees, tree size is not so great a limiting factor as it is in sawlog supply. Seventy-two percent of the commercial forest land carries at least 5 cords of pulpwood per acre; 36 percent of the area carries 15 cords or more per acre. This latter acreage bears two-thirds of the pulpwood volume and is economically operable for pulpwood logging.

The supply of pulpwood for individual mills is more stringently limited by species requirements than by tree size or stand size. It has already been pointed out that, in 1952, 90 percent of the pulpwood used by New York mills was spruce, fir, and aspen. However, three-fourths of the total volume of potential pulpwood in New York forests is hardwood. Of this less than 40 percent is in the "soft" hardwoods such as aspen and basswood, and slightly more than 60 percent is in the "hard" hardwoods such as sugar maple, beech, yellow birch, ash, the oaks, and the hickories.

Spruce, fir, and aspen currently represent less than one-tenth of the pulpwood volume in New York forests, and only about 8 million cords of these preferred species are to be found in the heavier

⁹ As developed by the Northeastern and Appalachian Technical Committees of the American Pulpwood Association.

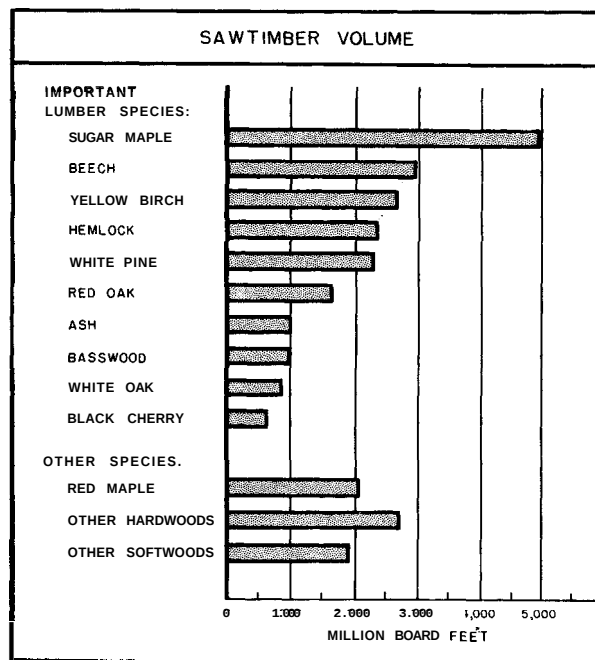


FIGURE 14 — About three-fourths of the operable sawtimber volume is in the important lumber species.

stands of more than 15 cords per acre of all species. Such stands are heavy enough for cutting at reasonable cost, but their annual growth at present is less than 300 thousand cords. This is one of the main reasons why so much of New York's pulpwood requirements are purchased outside the State.

Rapid changes in the pulp industry during the last 2 or 3 years have shifted attention from the softwoods and soft hardwoods to the hard hardwoods as a prime source of pulpwood in New York. The reservoir of hardwoods — more than 101 million cords, with excellent reproductive and recuperative powers—is already being tapped by some of the State's major pulp producers; and a growing number of mills are actively considering conversion to hardwood pulping processes. Hard hardwoods provide larger yields of pulp per cord than softwoods, and they can be used to produce a wide variety of papers.

SURPLUS SAWTIMBER GROWTH ENTIRELY HARDWOOD

In 1952 softwood sawtimber net growth and cut were approximately in balance: 214 million board-feet were grown; 225 million board-feet were cut (fig. 16). On the other hand, hardwood sawtimber

growth was twice the cut: 827 million as against 405 million board-feet. Looked at another way, the net annual growth of sawtimber, 1,041 million board-feet, was one-fifth softwood and four-fifths hardwood. However, the 1952 sawtimber cut of 630 million board-feet was more than one-third softwood and less than two-thirds hardwood.

These are the more significant over-all growth-cut comparisons because sawtimber trees furnish nine-tenths of the annual cut. Even before taking into account the forest industry's requirements for selected species, good quality, and moderately heavy stands, it is obvious that no expansion of the softwood timber-product output can be sustained under present conditions. The opportunities for expansion of output lie entirely with hardwoods.

Examination of the growing-stock situation reflects the large proportion of poletimber, so characteristic of New York forests. In both softwoods and hardwoods, 1952 net annual growth of growing stock exceeded annual cut (table 4). However, softwood growth was only 30 percent above the cut, whereas hardwood growth was 270 percent greater. The percentages are similar to these when the over-all comparison is made in terms of pulpwood.

Before considering species, quality, and stand size in relation to these estimates, it is important to

understand the major components of the growth-and-cut calculations. Net annual growth includes "ingrowth" — the entire volume (not just the annual growth) of small trees that reach-measurable size during the year. It also includes the growth on trees cut or killed during the year. "Mortality" — the entire volume of trees that died during the year — is deducted. The timber-cut estimate includes not only the timber-products output from inventory trees but also the volume of residues resulting from logging these trees.

In 1952, sawtimber ingrowth was 36 percent of gross softwood growth, and hardwood ingrowth was 46 percent:

Components of net growth	Softwood (Million) bd.-ft.)	Hardwood (Million) bd.-ft.)
Growth on initial inventory	176	490
Ingrowth	99	423
Gross growth	275	913
Mortality	61	86
Net growth	214	827

These sizable percentages show the large volume of poletimber trees that annually reach sawtimber diameters (9.0 inches in softwoods and 11.0 inches in hardwoods). They also indicate that much of the surplus growth today is due to the success of forest-

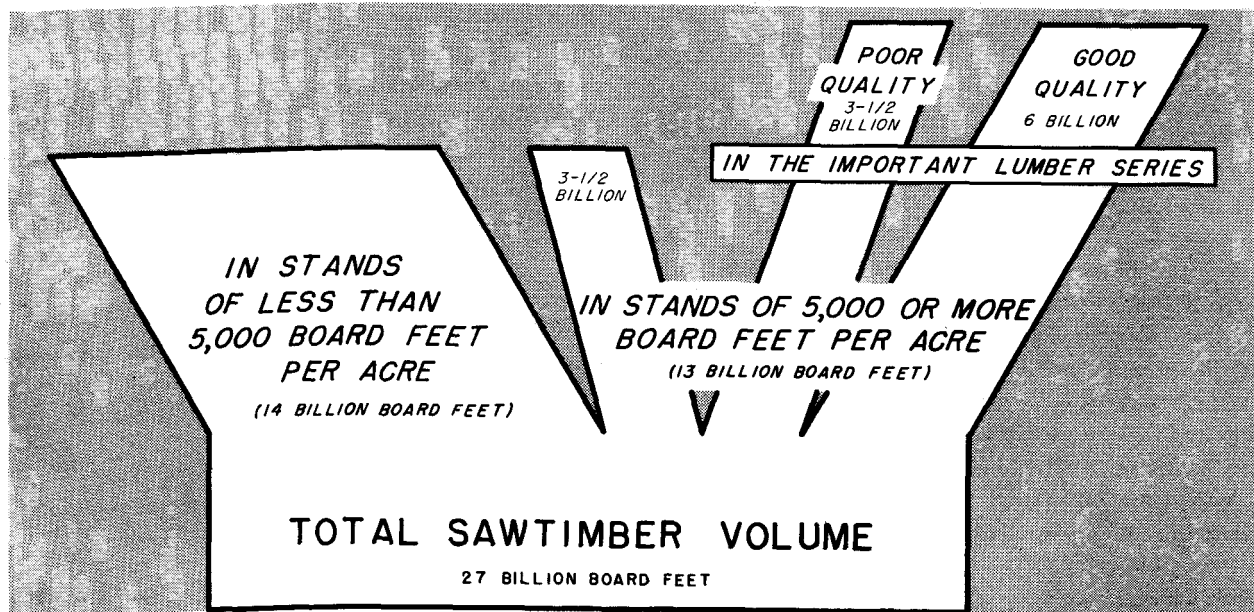


FIGURE 15 — Not even one-fourth of the total board-foot volume meets the species and quality requirements of the lumber industry when it is assumed that stands of less than 5,000 board-feet per acre are uneconomical to harvest.

protection measures taken during the past 50 years. The hardwood ingrowth percentage is particularly high—a sign of failure to take silvicultural measures to control species composition in the past.

Growing-stock—growth estimates contain somewhat lower proportions of ingrowth, slightly more than one-fourth. In these, ingrowth is the volume of saplings that reached a diameter of 5.0 inches during 1952:

Components of net growth	Softwood (Million cu. ft.)	Hardwood (Million cu. ft.)
Growth on initial inventor):	74	285
Ingrowth	26	112
Gross growth	100	397
Mortality	— 34	— 70
Netgrowth	66	327

Mortality removes nearly as much growing stock as timber cutting: 104 million cubic feet in 1952 as compared to 141 million cubic feet cut. In sawtimber the corresponding estimates are 147 million board-feet of mortality and 630 million board-feet cut. In both cases, softwood mortality was much greater, proportionately, than hardwood mortality. Fire, insects, disease, animals, and weather are all important destructive agents in New York. However, the chief losses are in trees of poletimber size; the chief cause is suppression due to overcrowding. Major reductions in mortality can be brought about by wider use of improvement cuttings and thinnings. Mortality losses can be reduced by salvage cuttings.

At first glance, the overall growth-cut comparisons indicate a relatively favorable situation. However,

TABLE 4 — Distribution of net annual growth and annual cut of growing stock in New York by tree-size class and species group, 1952.

Tree-size class and species group	Net annual growth	Annual cut
	Thousand cu. ft.	Thousand cu. ft.
Sawtimber trees:		
Softwood	58,200	45,800
Hardwood	186,800	78,400
	245,000	124,000
Poletimber trees:		
Softwood	8,200	5,500
Hardwood	140,100	10,900
	148,300	16,400
Sawtimber and poletimber trees:		
Softwood	66,400	51,300
Hardwood	326,900	89,300
	393,300	140,600

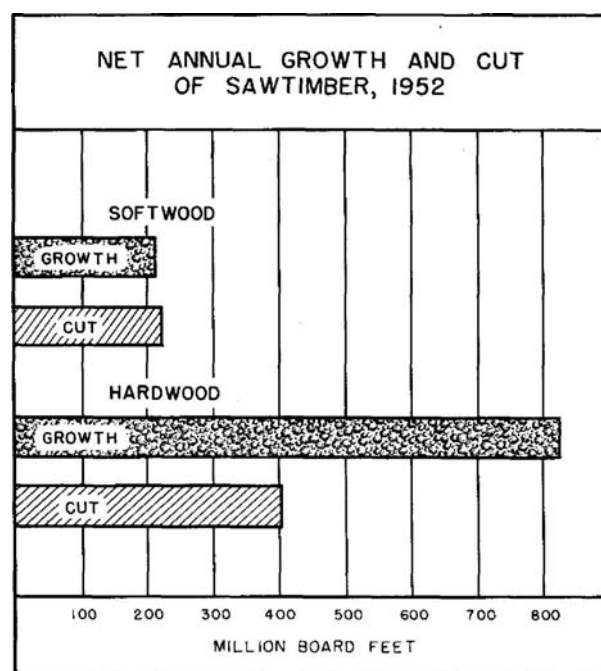


FIGURE 16 — Net annual growth and cut of sawtimber in 1952.

a large part of the raw material used came from the better and readily accessible trees of a relatively few species, while much of the growth was put on trees of low quality and of less desirable species, and on trees in economically inoperable stands. The inescapable conclusion is that the New York timber resource is rather rapidly increasing in volume but at the same time is deteriorating in quality.

A more realistic picture is seen when one considers only the growth on the 6 to 8 billion board-feet of sawtimber that satisfies the product requirements of the lumber industry. The growth rate for this material is less than 5 percent and the net annual growth about 300 to 400 million board-feet. The annual cut of sawtimber, on the other hand, exceeds 600 million board-feet. Since 36 percent of the board-foot cut was softwood sawtimber in 1952, while the preferred softwoods — white pine and hemlock—made up less than one-fifth of the total volume of sawtimber, the relation of growth to cut in these softwoods was even less equable than in hardwoods.

The net annual growth in terms of pulpwood amounted to about 4 million cords on an inventory volume of 129 million cords in 1953. This was 16 times the annual cut of pulpwood. But less than 3 percent was on spruce and fir sawtimber trees; The

net growth on these trees in 1950 amounted to roughly 120,000 cords; the cut for the same year was approximately 138,000 cords. Even though the comparison is for one year only, it indicates that spruce and fir sawtimber trees were being severely overcut. The more recent attention to hardwood pulping

bears heavily on this and other wood-use trends in New York. It represents a significant turning point not only for the industry but also in the management of commercial timberlands. It can be expected to exert a marked influence on the nature and condition of New York forests in years to come.

Condition and Ownership of New York Forests

New York has a total land area of 30.7 million acres, of which 14.5 million acres (47 percent of the land area) are forested (fig. 17). Agricultural land — cropland and open pasture — amounts to 11.6 million acres. About 4.6 million acres are divided among farmsteads, power lines, roads, urban areas, and similar land-use classes.

Not all the forest land is available for producing commercial timber crops. There are some 71 thousand acres of unproductive forest land. These are unproductive because of adverse site conditions: too wet, too dry, too rocky, too high in elevation. They will probably never yield sawtimber or other usable timber products.

In addition, there are nearly 2.4 million acres of forest land on which commercial timber harvesting is prohibited by law. These include 2,219,500 acres¹⁰ constituting the State Forest Preserve in the Adirondacks and Catskills and 161,000 acres in State and county parks.

COMMERCIAL FOREST LAND

The remaining 12,002,500 acres, comprising the commercial forest land, is the area from which future supplies of timber products will be harvested. In the following paragraphs, the composition, size, stocking, quality, and ownership of New York forest stands are discussed. Forest conditions in different sections of the State also are broadly outlined.

¹⁰ Land area only. Total Forest Preserve area, as shown in State reports, was 2,418,583.59 acres on September 30, 1952. This total included 199,079.42 acres of water. Of the Forest Preserve land area, 2,201,800 acres were classed as productive forest land and 17,700 were classed as non-productive forest land.

Hardwood Types Most Extensive

Hardwood species predominate on about 84 percent of all the commercial forest land in New York. The three major forest cover types—northern hardwood, oak, and aspen-gray birch—cover 70 percent of the area; but they are not evenly distributed over the State.

The northern hardwood type (sugar maple - beech - yellow birch) is the most extensive and is also one of the most valuable (fig. 18). It occurs on 43 percent of the commercial forest land. It is generally found at moderate elevations and on the better drained sites throughout the State. Half the acreage of this type is in the 15 northern counties of the State (shown as the Northern Region in Figure 19). About 40 percent of the acreage is found in the Western Region. Here, however, it occurs as a variation in which sugar maple and beech are the common species and yellow birch is a minor associate, frequently absent.

Oak types, predominantly red oak, occur on 14 percent of the commercial forest land. Though these types are found throughout the entire southern part of New York, they are most abundant in the Hudson River Valley and along the New York - New Jersey line. They also occur frequently in valleys and on southern exposures in Central and Western New York. Nearly two-thirds of the forest acreage in oak types is found in the Southern liegion; a third in the Western Region; and a negligible acreage in the Northern Region.

The aspen-gray birch type occupies 13 percent of the commercial forest area. More than half is in the Northern Region and a third in the Western liegion.

It is a temporary type often found on burned-over and clear-cut sites or on abandoned farm land. Other hardwood types, principally ash - elm - maple, are found on 14 percent of the forest land.

The commercial forest land in softwood types is almost equally divided among white pine types (6 percent of the commercial forest area), spruce - fir types (5 percent), and other softwood types, including hemlock (5 percent). Half the acreage in the white pine types and most of the acreage of the spruce - fir types is in the Northern Region.

Less Than Half of the Forest is in Sawtimber Stands

The commercial forests can be separated into various stand-size classes as well as forest types. Sawtimber stands, important because they provide most of the present wood supply, represent 42 percent of the total commercial forest land (fig. 20). Thirteen percent of the commercial forest land is in the medium and heavy sawtimber stands—stands that carry 5,000 board-feet or more per acre. Twenty-nine percent is in light sawtimber stands of 1,500 to 5,000 board-feet per acre.

On 58 percent of the total commercial forest-land area there is less than 1,500 board-feet per acre.

More than half of this land carries poletimber stands (36 percent). The rest carries seedling-and-sapling stands (20 percent) or is nonstocked (2 percent).

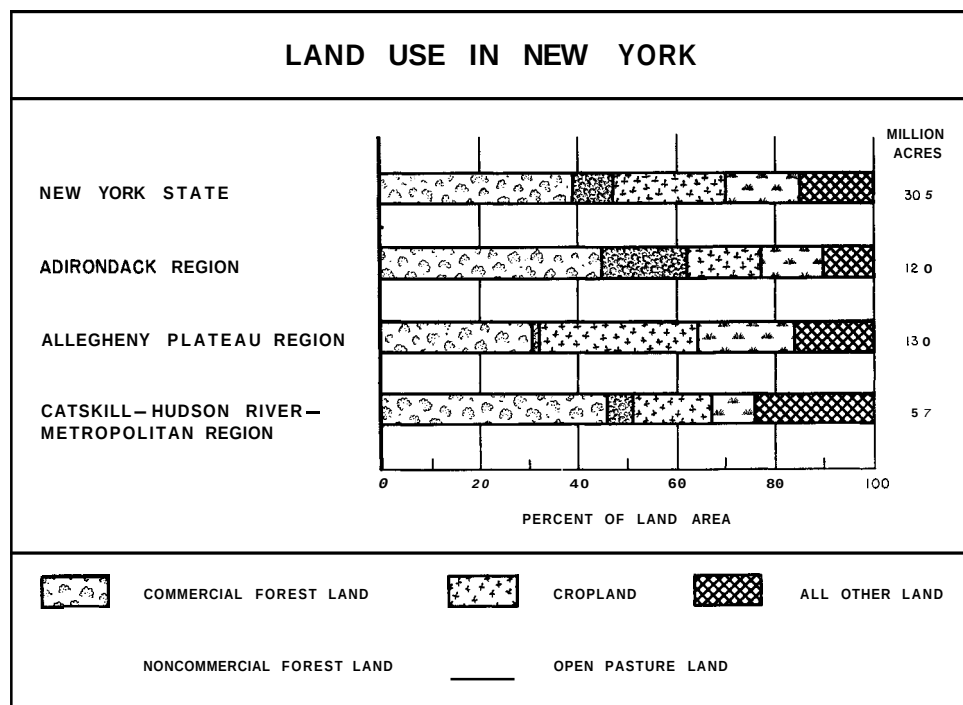
Stocking is Generally Heavy or Medium

Stocking is the extent to which the growing space is occupied by present or potential growing-stock trees. In this survey, four classes of stocking are recognized: Heavy—where the stand is 70 percent or more stocked with present or potential growing stock trees; medium—40 to 69 percent; light—10 to 39 percent; and nonstocked—less than 10 percent.

Heavy stocking was found on 50 percent of the commercial forest land in New York; medium stocking on 41 percent; light stocking on 7 percent; and 2 percent was nonstocked. The stocking of various kinds of stands is shown in table 5.

Thus, the stocking on 91 percent of the commercial forest land was heavy or medium and on 9 percent it was light or absent. This is a better-than-average achievement; nationally three-fourths of commercial forest land is 40 percent or more stocked and one-fourth is less than 40 percent (14) stocked. Stocking explains in part why overall annual growth in New York is as large as it is. It also indicates the results of past protection programs.

FIGURE 17 — Land use in New York, 1953.

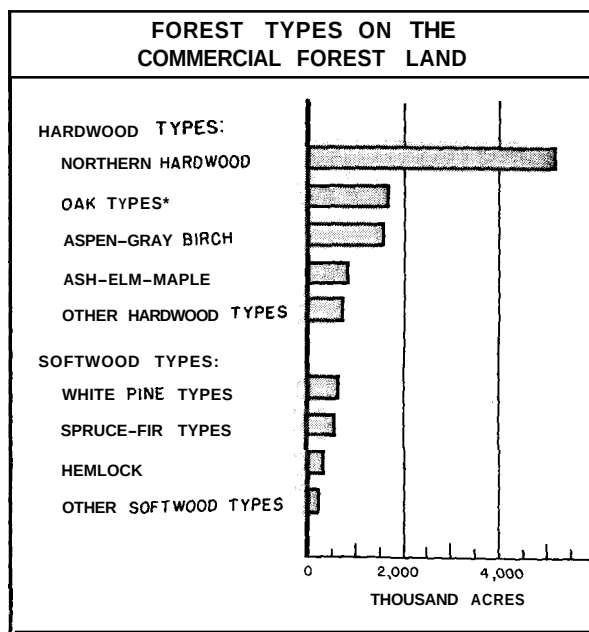


Nevertheless, stocking is still far from suitable for efficient use of the productive capacity of the forest land. Many stands are overcrowded because of heavy stocking; thinnings would help to concentrate growth on the better trees in these stands. On the other hand, light stocking and nonstocking—both often the result of recent cutting or burning on land

TABLE 5 — Stocking on commercial forest land by stand-size class and stocking class, New York, 1953.

Stand-size class	Stocking (percent)			
	70 or more	40 to 70	10 to 40	Less than 10
Sawtimber stands	51	48	1	..
Poletimber stands	53	44	3	..
Seedling-and-sapling stands	48	24	28	..
Nonstocked areas	..	..	..	100
All commercial forest land	50	41	7	2

capable of supporting a heavy stand of timber—also offer an opportunity for major gains in use of the land. Improvement in cutting practices can help to bring about adequate regeneration after harvesting. Increased protection from fire can further reduce stocking losses.



* DOES NOT INCLUDE THE DM-WHITE PINE FOREST TYPE

FIGURE 18 — The northern hardwood type occupies three times as much area as any other type.

THE FOREST DISTRICTS OF NEW YORK

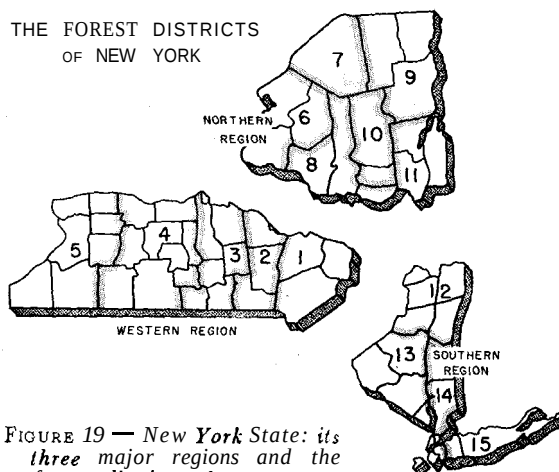


FIGURE 19 — New York State: its three major regions and the forest districts that comprise them.

Stand Quality Is Poor

Most of the hardwood sawtimber stands, though generally heavily stocked, are of low quality. About 7 percent of them fall into quality class 1, in which 50 percent or more of the sawtimber trees contain grade 1 or grade 2 logs (fig. 21). Seventy percent are in quality class 2; in these stands, 1 to 50 percent of the sawtimber trees contain grade 1 or 2 logs. Twenty-three percent are in class 3, in which there are no sawtimber trees containing logs of these grades.

Stand Volume Per Acre Is Low

Still another aspect of forest condition is what the average acre of commercial forest land carries in terms of net volume. In New York the average acre of forest carries 1,000 cubic feet of growing stock, which includes 2,200 board-feet¹¹ of sawtimber. Yet almost a fourth of the commercial forest land averages only 200 cubic feet (including 300 board-feet) and 6 acres out of 10 have 1,000 or less board-feet of sawtimber (fig. 22).

But even this tells only part of the story. There aren't many acres that are "average." Thirteen percent of the commercial forest land bears almost a third of the growing stock and nearly half of the sawtimber; 22 percent of the forest land carries 4 percent or less of the growing stock and sawtimber (table 6).

¹¹ Log scale, International 1/4-inch rule. In New York, the Scribner Decimal C and the Doyle log rules are more commonly used. The equivalent volume by the Scribner log rule averages 1,800 board-feet; by the Doyle rule, 1,300 board-feet.

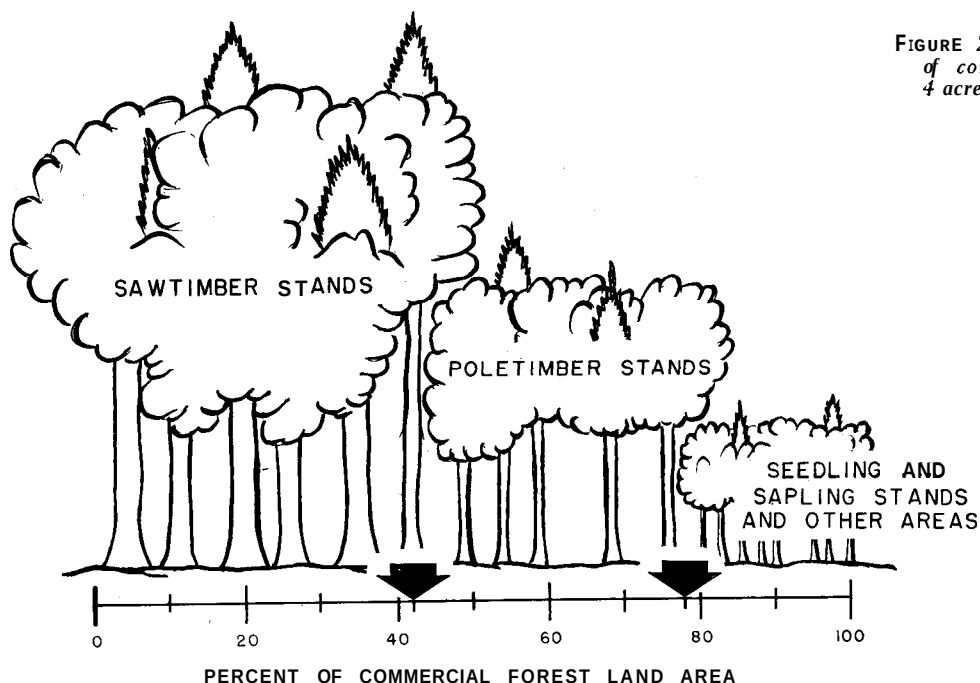


FIGURE 20 — Out of every 10 acres of commercial forest land about 4 acres carry sawtimber stands.

NINE OUT OF TEN FOREST ACRES ARE PRIVATELY OWNED

Ninety-three percent of the commercial forest area is in private ownership. The public owns the remaining 7 percent. Most of the public commercial forest land is held by the State in State Forest and Game Management areas.¹² Federal holdings and county and municipal are minor.

All but 67 of the 255,000 forest owners in New York have holdings of less than 5,000 acres. About half of the commercial forest land is in 238,000 private holdings of less than 100 acres (table 7). Practically all of the 67 larger holdings, containing about 14 percent of the commercial forest land, are in the northern counties. Many of these are owned by forest industries.

Forest industries own 10 percent of the State's 12 million acres of commercial forest land; 29 percent is in farm ownership; and 54 percent is in other private holdings.

Farm forests number about 83,000 and average about 42 acres in area. More than half of the 3.5 million farm forest acres are in the Western Region. Forest industry holdings, of which there are about 1,200 comprising 1.2 million acres, average about 1,000 acres apiece.

¹² The State Forest Preserve and other noncommercial forest land is not included in this percentage.

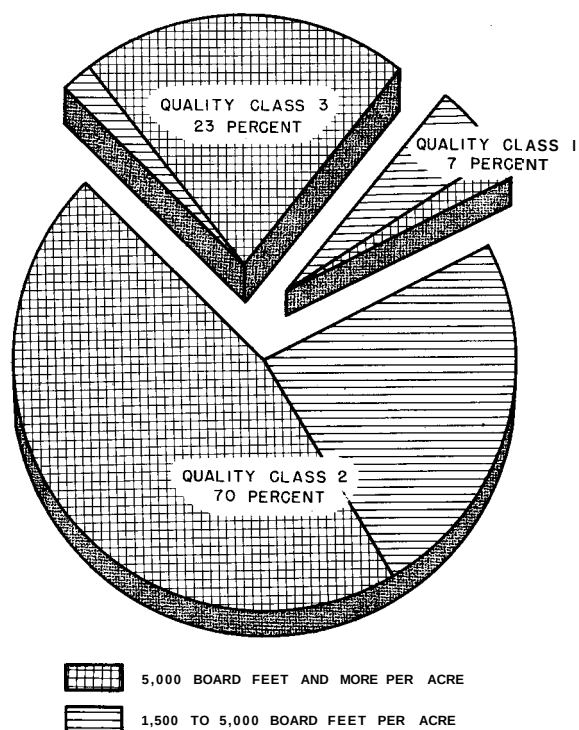


FIGURE 21 — Nearly a fourth of the sawtimber area is in stands of low quality.

Other private holdings are about twice as numerous as farm forests — 171,000; they average 38 acres in size. Included in this group are estates, sporting clubs, and resort properties as well as the holdings of a wide variety of persons whose motives in owning forest land are as diverse as their occupations. Some 6.4 million acres belong in this miscellaneous ownership class — more than half of the State's commercial forest land.

The distribution of timber volume among the various ownership classes is about the same as that of forest area shown in the following tabulation:

Ownership class	Area (Percent)	Growing stock (Percent)	Sawtimber volume (Percent)
Private:			
Farm	29	27	20
Forest industries and other private	64	64	72
Total private	93	91	92
Public	7	9	8
All ownerships	100	100	100

THE THREE REGIONS

The area descriptions that follow are based on the three regions previously shown (fig. 19). They indicate how variations in the topography, soil, climate, and land use have contributed to current differences in forest condition and how forest problems vary in significance from one area to another.

The Northern Region

This region, comprising 15 counties, has a total land area of 12 million acres, about 39 percent of the area of the State. More than 7 million acres are forested, of which 5.4 million acres are commercial.

The central and more heavily forested portion includes the Adirondack Mountains. It is characterized by rugged topography with a substantial area above 3,000 feet in elevation; light soils; a severe climate in which temperatures of 50° below zero and annual snowfall in excess of 200 inches have been recorded; and a relatively sparse population. It contains more than 2 million acres of State Forest Preserve lands.

Although those lands are concentrated in the "Adirondack Park" (fig. 23); they are not identical with it, being comprised of a large number of parcels that vary greatly in size and character and are located both within and without the Park boundary. The latter may be described as a "geographical expression" having little significance in regard to public

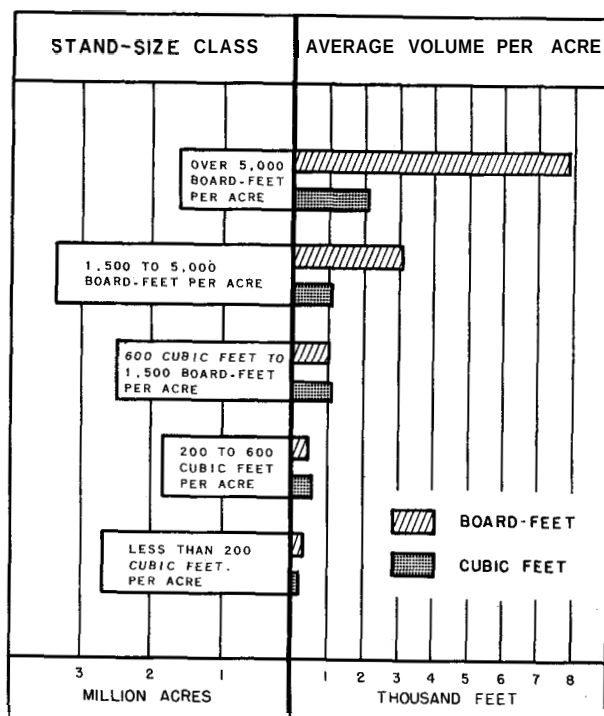


FIGURE 22 — Stand-size area and volume per acre.
(Cubic-foot volume includes both sawtimber and poletimber trees.)

ownership or control, except that no State Forests, for timber-production purposes, may be acquired within its boundaries as established by the 1938 constitutional amendment.

The extensive areas of wild forest land, the scenic beauty of the "High Peaks" centering around Mt. Marcy (5,344 feet), and the abundance of lakes and streams have served to attract a substantial, though seasonal, recreation business. Winter sports have

TABLE 6 — Percentages of forest area, growing stock and sawtimber volumes by stand-size class

Stand-size class	Area Percent of commercial forest land	Growing stock Percent of total volume	Saw- timber Percent of total volume
Sawtimber stands:			
More than 5,000 board-feet per acre	13	29	47
1,500 to 5,000 board-feet per acre	29	37	39
Poletimber stands:			
More than 600 cubic feet per acre	21	23	9
200 to 600 cubic feet per acre	15	7	2
Other stands	22	4	3
All stands	100	100	100

become increasingly important during the past 25 years.

Cutting operations have been carried on, at one time or another, over a large portion of the accessible forest stands. The early logging, which was chiefly for softwoods, left the old-growth hardwood standing. A quarter of a century later, many such areas had reverted to a condition resembling that of the virgin forest. Some lands have never passed out of public ownership and contain stands that may rightly be called virgin timber. Most of the area has never been cleared for agriculture, but extensive fires of great destructiveness occurred throughout the region in 1903 and again in 1908; and timber in enormous quantities (including, unfortunately, all but remnants of the existing old-growth spruce and white pine) was blown down in the great storm of November 25, 1950.

A majority of the large private and industrial forest ownerships of the State are in this area. Several of these are more than 50,000 acres in size.

The St. Lawrence and Chaplain valleys and the eastern shore of Lake Ontario border the mountains on three sides and make up 7 million acres of this Northern Region. These areas lie only a few hundred feet above sea-level and present a marked contrast to the central portion of the region in their milder climate, more intensive agriculture, and greater urbanization. The topography varies from level to gently sloping. Soils are predominantly thin, relatively low in fertility; and some are imperfectly drained. On the sandy soils, forest clearing and agricultural use have often been totally destructive of the topsoil. Consequently, much of this land has had no constructive use in the past half century except for reforestation. In this part of the region, outside the Adirondack Park, a number of State Forests, which are not subject to the constitutional provisions applying to the Forest Preserve, have been acquired and developed.

TABLE 7 — *Privately owned commercial forest area and number of owners by size-of-holding class, New York, 1953.*

Size-of-holding class	Forest area	Owners
	Thousand acres	Number
Under 100 acres	6,194	238,231
100 to 500 acres	2,305	15,470
500 to 5,000 acres	901	1,174
5,000 to 50,000 acres	843	59
50,000 acres and more	864	8
Total ¹	11,107	254,942

¹ Does not include 895,000 acres of publicly owned commercial forest land.

The major forest types of the region are northern hardwoods, spruce-fir, pine, and aspen-paper birch. Virtually all the State's pulp mills and many of its larger sawmills are located here.

The Western Region

The Western Region, including all of western New York and the south-central counties, is the largest of the three regions recognized. It has an area of 13 million acres or 43 per cent of the land area of the State. Forests, almost all commercial, cover 4 million acres. The very small proportion of noncommercial forest land is accounted for chiefly by Allegany and Letchworth State Parks.

This is hilly country characterized by narrow but relatively fertile valleys, lying mostly at elevations of 900 to 1,500 feet, with steep sides that terminate in broad, rolling ridges that do not generally reach elevations above 2,300 feet. The depression formed by the Finger Lakes in the north-central portion of the region, where elevations below 500 feet are found, represents the only major departure from the general topographic pattern. The soils of this region vary from the highly productive limestone soils of the Finger Lakes area to the less fertile sandstone and shale soils along the New York-Pennsylvania border. The climate, though in general it is milder than that of the Adirondacks, can be locally quite severe. At the higher elevations a combination of thin, imperfectly drained soils and excessive exposure to the prevailing winds often creates site conditions that are exceptionally unfavorable for agriculture and are somewhat limiting even for the practice of intensive forestry.

Much of the area at elevations above 1,500 feet that was cleared for agricultural use has since been abandoned. During the last half century it has reverted to forest through natural succession or reforestation. The State's program for acquisition and reforestation of submarginal agricultural lands has been concentrated here, and 60 percent of the half-million acres of State Forests is located in these counties.

Most of the forest area is in hardwood types where maple and beech predominate; but these species are mixed with hemlock, white pine, ash, cherry, and basswood. Some of the more southern hardwoods such as yellow-poplar and cucumber tree are found in the western part of the region. The oaks are found on the drier sites, especially on the south-facing slopes of the river valleys. On the better sites, excellent stands

of timber may be found; and such areas provide what are probably the best opportunities in the State for intensive woodlot management. The forests of the region help to support a large number of small saw-mills and secondary wood-using plants.

Forest fire has never been a hazard of major proportions here, but — as might be expected in a region characterized by dairy farming — the practice of heavy and continued grazing in the woodlands presents a serious problem.

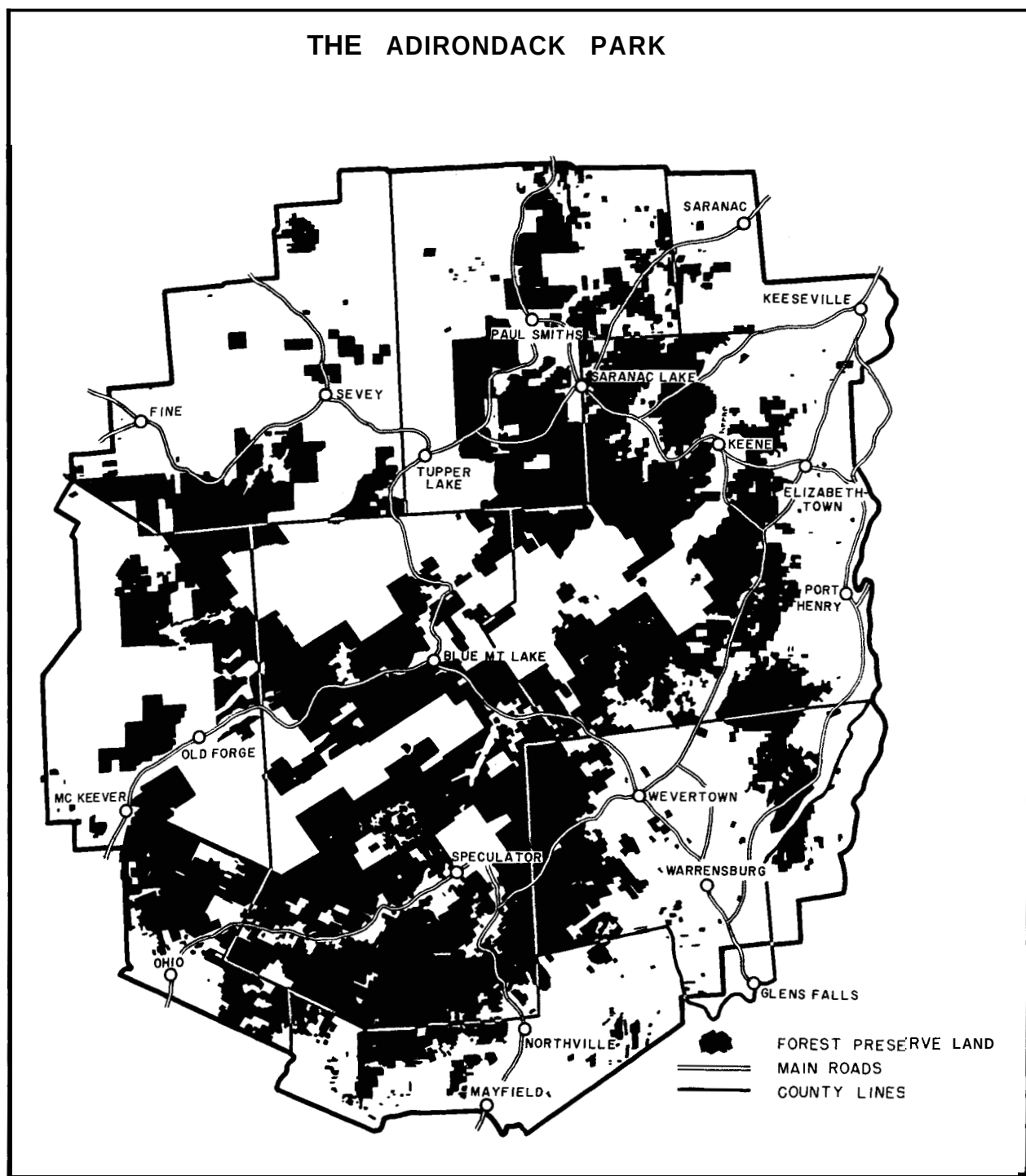


FIGURE 23 — *The Adirondack Park.* (Courtesy of the New York State Conservation Department and the New York State Conservationist.)

In the Lake Plains portion of the region — really a sub-region in itself — conditions are excellent for agriculture; fruit production is important; and forests are subordinate both in area and importance.

The Southern Region

The Southern Region encompasses all of the southeastern part of the State, including Long Island. It is the smallest of the three regions, and includes a little less than 6 million acres or 18 percent of the land area of the State. Somewhat more than half of the area — nearly 3 million acres — is forested, and 2.6 million of these are classified as commercial.

The region is divided approximately in half by the Hudson River, which remains at sea level as far north as Albany. To the east, ridges and valleys with short and moderately steep slopes characterize the area. West of the river, the topography is more rugged and is dominated by the massive eastern front of the Catskill Mountains, whose summits rise to elevations of 3,500 to 4,000 feet. The climate, except in the Catskill portion, is the mildest in the State.

Much of the land has been utilized for farming at one time or another. However, in some sections the

rough topography, stony character, and low fertility of the soil has led to land abandonment. Because of increasing urbanization, much of the land has been used for residential and industrial purposes. Many farms are becoming occupied as country homes for summer or year-round purposes.

A large proportion of the forest land in this region is in estates, club ownerships, or in public recreation areas such as the Palisades Interstate Park. The greatest area of forest land is in the Catskill counties, which contain more than 200,000 acres of State Forest Preserve. Here there is a well-developed summer resort business. ,

Forest types are extremely varied in this region, from the oak, pitch pine, and old-field white pine in the valley section to spruce in the higher parts of the Catskills. Almost pure stands of chestnut oak cover many of the poorer sites, especially ridges. On the better sites, yellow-poplar is locally abundant.

Primary wood-using plants are relatively few in number, although many secondary wood-using concerns, such as lumber manufacturers and paper converting plants, are concentrated to a considerable extent in the New York metropolitan area.

Attacking New York's Forest Problem

The foregoing examination of forest conditions has brought out some important considerations. There are 12 million acres of commercial forest land in the State and 14 billion cubic feet of wood growing on these acres. New York has a great forest potential, in fact much greater than many people realize.

New York's commercial forest lands vary greatly in productivity. There are substantial areas where opportunities for timber growing are meager — either because the site has always been poor or because it has deteriorated with land use. The deterioration has resulted from erosion, soil compaction, destruction of the humus layer, and nutrient losses through runoff and leaching. The areas on which growth can be rapid enough to make timber-growing an attractive enterprise are well under 12

million acres. Land rehabilitation is one major problem.

Rehabilitation of the timber resource is the other major problem suggested by this survey. On even the more productive forest lands, much growth is being wasted on cull trees and species of limited use and value.

Today's depleted woodlands are largely an inheritance, the result in most cases of a century or more of land-clearing, farming, grazing, fire, and lumbering. But many present-day practices invite further depletion and aggravate existing conditions. The rate of removal of the favored species, sizes, and grades now exceeds the rate of replacement—even though growth of all growing stock (in cubic feet) exceeds the cut.

Even if demands upon the forest land and timber resource were to remain unchanged, the outlook would not be promising. But the fact is that demands are increasing. There is pressing need to seek more efficient use of these resources.

EXISTING PROGRAMS ARE AIMED AT LAND AND TIMBER PROBLEMS

During the past 50 years, a number of public and private programs have been put into effect in New York State. All of them have been directed in some measure toward improvement of forest land and timber conditions. These efforts, for the most part, are of four kinds: protection, planting, management, and utilization.

Protection Program Emphasizes Fire Control

Protection has been a primary activity in the State for many years. Creation of the Forest Preserve in 1885 (by a statute that was further strengthened through the constitutional amendment of 1894) marks an early attempt to protect a significant portion of the wild forest land from commercial exploitation.

In 1909, a protection system against forest fire was organized. Since then, with Federal cooperation, the system has grown in size and has become more efficient through the use of better and more modern tools and techniques. In 1950, the State became a member of the Northeastern Forest Fire Protection Commission.

An important factor in the protection program is fire-hazard reduction. A good example of this is the handling of the timber blowdown that resulted from the severe windstorm of November 1950. This created a risk on some 255,000 acres that would not have disappeared of itself for years. The reduction of this hazard was aided greatly by commercial salvage operations under State supervision.

Protection from insects and disease has not assumed the same proportions as fire protection, although these destructive agencies cause as much or more damage. During the past decade, application of insecticides such as DDT by aerial spraying has made control against such pests as gypsy moth and forest tent caterpillar less expensive and many times more effective than by the older methods.

Control of white pine blister rust is maintained through a program in which local communities, the State, and the Federal Government cooperate.

Extensive Plantations Established

More than 500,000 acres of acceptable plantations have been established in New York: 285,000 acres on State land, 68,000 acres on county and municipal land, and 179,000 acres on private land. Most of the trees used have been produced in State nurseries.

The first plantings in the Forest Preserve were made in 1901. The following year, a State forest tree nursery was established for the production of trees to be planted on State-lands. Tree distribution to private landowners was initiated in 1908. In 1931 the State was authorized by a constitutional amendment to acquire submarginal farmland for reforestation. Lands acquired under this program now constitute the State Forests, as distinguished from the State Forest Preserve.

To date nearly 1 billion forest trees have been distributed for planting on public and private land. In the early stages of the program, most of the planting was done on public lands. However, in recent years, four-fifths of the planting has been done on private land.

Although New York is a leading state in reforestation and a large acreage has been planted, there is still a sizable job to be done. It is well to note that much of the planting on private lands has been done merely to provide a forest cover, or for short-term products such as Christmas trees, and cannot be expected to contribute much to the future timber resource.

1,200,000 Acres Under Forest Practice Act

The importance of cutting and cultural practices in improving forest productivity has also been recognized in various government and industrial programs. An outstanding example is the Forest Practice Act Program administered by the State. This voluntary cooperative program encourages forest-land owners to employ cultural operations such as weeding, thinning, and pruning as means of producing merchantable timber crops of superior quality. Minimum harvest-cutting-practice standards are established by local boards and a management plan is prepared by service foresters who also aid in the selection and marketing of the final

product. Since this act has been in effect, about 5,000 landowners have become cooperators. Currently about 1,200,000 acres of forest land are managed under this program.

Industrial forest-land owners most often depend upon their own forestry staffs or on private consulting foresters for the development and operation of good forest-management programs.

Utilization Becoming More Efficient

Private programs directed toward improved methods of harvesting have resulted in a rapid increase in the mechanization of woods work in recent years. New tools have been developed that increase harvesting efficiency. Good examples are small tractors, logging arches, and power saws. Chemical debarking of standing timber for pulpwood is a recent innovation.

New processes have permitted the use of heretofore undesirable species: the increased use of hardwoods for pulp is an example. Utilization of logging and milling residues is increasing with the adoption of debarkers and wood chippers; and this sometimes gives rise to new uses for wood. And integrated logging and grading have reduced the volume of high-quality timber being sold for purposes that could be met by poorer material.

WHAT NEEDS TO BE DONE

In spite of past accomplishments, there is still a great deal to be done as evidenced by present forest-land and timber conditions. More effort must go into rehabilitation of forest resources. This means research to find such particular things as an inexpensive and effective control for white pine weevil, a means of determining the growth potential of idle lands and the species best suited for planting on them, less expensive weeding and thinning methods, and markets for currently unmerchantable material.

The orientation of future research and action programs is indicated by the growing importance of the hardwood resource. It cannot be overemphasized that the hardwoods, which now make up such a large proportion of the forests of the State, repre-

sent a great opportunity and will necessarily receive the kind of attention in the years to come that the softwoods merited in time past. But the problems are different. It is no longer a question of crop replacement; the seeding and recuperative powers of the hardwood forest are excellent. Nor does the problem of accessibility loom so large; a new technology and a well-established network of roads and highways make the difference. Rather it is a question of high percentages of cull, excessive waste because of poor tree form, a wider range of species to deal with, and the economic superiority of only a few species. Such problems are not insuperable; but they call for increased industrial use of lower grade material and quality-improvement programs in the woods.

One basis for program adjustments can be provided by comprehensive studies of the objectives and motivations of private forest-land owners. Every private landowner is governed in his thinking and action by a different set of conditions. Income, type of employment, working hours, stability of tenure, aptitudes, knowledge, and interests all combine to create varying attitudes of landowners with regard to their forest lands and how they use them. For this reason, programs designed for the forest-land owner must take into account his particular circumstances.

Program adjustments also call for fuller understanding of soil, water, recreation, and wildlife values of forest land. In spite of their recognized importance, little has been done to measure these values. Yet there can be no wise balance in forest-resource use until their magnitudes are known.

Finally, existing programs themselves require careful re-examination. Are the original reasons for planting still valid and in what degree has the intent of the program been met? Is the scope of the program properly defined? Are technical guides adequate? Answers to these questions are needed to shape the future of forestry in the State.

Appraising forest conditions and trends can generate an awareness of goals that will lead to clear-cut forest policies, to concerted action, and ultimately to far wiser utilization of the forest resource than has been possible in the past.

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Appendix

DEFINITION OF TERMS

Forest Area

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

Commercial forest-land area. — Forest land that is: (a) producing, or physically capable of producing, usable crops of wood (usually sawtimber); (b) economically available now or prospectively; and (c) not withdrawn from timber utilization through statute, ordinance, or administrative order.

Noncommercial forest-land area. — Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order, but that otherwise qualifies as commercial forest land; or (b) incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

State Forest Preserve. — Forest land owned by the State of New York in the 16 Forest Preserve Counties of the Adirondack and Catskill regions, as defined by law.

Forest-Cover Types

Forest types are classified according to the predominant species or species group, as indicated by cubic volume for sawtimber and poletimber stands, and number of trees for seedling-and-sapling stands. All local forest types are keyed to these major types (table 10).

White-red pine. — Forcsts in which 50 per cent or more of the stand is eastern white or red pine, singly or in combination. (Common associates include hemlock, aspen, birch, and maple.)

Spruce-fir. — Forcsts in which 50 percent or more of the stand is in spruce and fir. (Common associates

include white-cedar, tamarack, maple, birch, and hemlock.)

Pitch pine. — Forcsts in which 50 percent or more of the stand is pitch pine or other yellow pine. (Common associates include oak, hickory, and blackgum.)

Oak-hickory. — Forests in which 50 percent or more of the stand is in the oak species, singly or in combination. (Common associates include yellow-poplar, elm, maple, and black walnut.) A small amount of eastern redcedar and oak pitch pine types are included in this type.

Elm-ash-maple. — Forcsts in which 50 percent or more of stand is in red maple, elm, or ash, singly or in combination. (Common associates include willow, sycamore, beech, and maple.) Included in this type is a small amount of Atlantic white-cedar.

Maple-beech-birch. — Forests in which 50 percent or more of the stand is maple, beech, or yellow birch, singly or in combination. (Common associates include hemlock, elm, basswood, and white pine.) Included in this type is a small amount of the hemlock forest type.

Aspen-birch. — Forests in which 50 percent or more of the stand is aspen, paper birch, or gray birch, singly or in combination. (Common associates include maple and balsam fir.)

Class of Timber

Sawtimber trees. — Trees of commercial species that contain at least one merchantable sawlog as defined by regional practice and that are of the following minimum diameters at breast height (d.b.h.): Softwoods 9.0 inches and hardwoods 11.0 inches. (A merchantable sawlog is a portion of a live tree that meets the minimum log-grade specifications, as defined under log-grade classification.)

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

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

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

FIGURE 24 — The hardwood log grades used as standards in the forest survey of New York.

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

Hardwood limbs. — Limbs of hardwood sawtimber trees and sawtimber-size cull hardwood trees to a minimum diameter of 4.0 inches inside bark.

Stand-Size Classes

Sawtimber stands. — Stands with sawtimber trees having a minimum net volume per acre of 1,500 board-feet, International 1/4-inch rule.

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

seedling-and-sapling stands. — Stands not qualifying as either sawtimber or poletimber stands, but having at least 10 percent stocking of trees of com-

mercial species, and with at least half the minimum stocking in seedling-and-sapling trees.

Nonstocked and other areas not elsewhere classified. — Areas that do not qualify as sawtimber, poletimber, or seedling-and-sapling stands.

Timber Volume

Growing stock. — Net volume, in cubic feet, of live sawtimber trees and live poletimber trees from stump to a minimum 4-inch top (of central stem) inside bark.

Live sawtimber volume. — Net volume in board-feet, International 1/4-inch rule, of live sawtimber trees of commercial species.

Net volume in cubic feet. — Gross volume in cubic feet, less deductions for rot.

Standard cord. — A unit of measure for stacked wood, encompassing 128 cubic feet of wood, bark, and air space. Cord estimates are derived from cubic-foot measurements by applying a factor of 80 cubic feet of wood (inside bark) per rough cord.

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

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

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

FIGURE 25 — The standards used for hardwood tie and timber logs in the forest survey of New York.

Net volume in board-feet. — Gross volume in board-feet (log scale, International 1/4-inch rule) less deductions for rot, sweep, and other defect affecting use for lumber.

Log Grades

The log grades used in the survey are outlined in figures 24, 25, and 26.

Pulpwood Suitability

The pulpwood specifications used in this report are those set up by the Northeastern and Appalachian Technical Committees of the American Pulpwood Association.

Pulpwood Trees

Live trees of commercial species, 5.0 inches d.b.h. and larger, containing at least two contiguous pulpwood bolts and with 50 percent or more of the main-stem volume usable for pulpwood. (A pulpwood bolt is a section of the main stem 4 feet long; 4.0 inches or larger inside bark at the small end; free from any indication of rot, charred wood, metal, or hollow center; and contiguous to one or more other bolts that meet the same requirements. Crotches are excluded; sweep or crook in any section shall exclude the bolt if a line from center of top cut to center of bottom cut passes outside the wood at any point.)

GRADE	DIAMETER inside bark (small end)	LENGTH (without trim)	Total DEDUCTION permitted*	SURFACE REQUIREMENTS
1	<u>Inches</u> 13+	<u>Feet</u> 8	<u>Percent</u> 0	Surface clear 100%
	13-16	12-16	25	Must be 2/3 surface-clear in lengths 8 feet long or longer or 50% surface-clear full length.
	17+	10-16	30	Must be 1/2 surface-clear in lengths 8 feet long or longer or 25% surface-clear full length.
2	9-16	10-16	30	Permits sound, tight knots not over 2½ inches in diameter. Larger, sound, tight knots permitted only if 50% of full-length surface has no sound, tight knots larger than 2 inches in diameter.
	17+	8-16	40	Permits sound, tight knots not over 3 inches in diameter. Larger, sound, tight knots permitted only if 50% of full-length surface has no sound, tight knots larger than 2½ inches in diameter.
3	6-7	8-16	25	Permits sound knots not over 1 inch in diameter or live knots not over 2 inches in diameter.
	8-13	8-16	30	No surface requirements except logs with knots 4 inches or more in diameter in whorls less than 2 feet apart will not be accepted unless 25% or more of full-length surface has no sound knots over 2 inches in diameter.
	14+	8-16	40	No surface requirements except that knots over 6 inches in diameter cannot be closer than 3 feet.

*Includes sweep, rot, and other cull.

FIGURE 26 — The grade standards for white pine logs.

Pulpwood Stands

0 to 5 cords per acre. — Stands containing trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and having a net volume per acre of less than 400 cubic feet. (Includes seedling-and-sapling stands and nonstocked areas.)

5 to 15 cords per acre. — Stands containing trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and having a net volume per acre ranging from 400 to 1,200 cubic feet.

15 cords or more per acre. — Stands containing

trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and having a net volume per acre of more than 1,200 cubic feet.

Pulpwood Volume

Net volume in standard cords (including bark) of the main stem of pulpwood trees, from stump to point where the top breaks up into branches or to a minimum top diameter of 4.0 inches (inside bark). Deductions are made for all portions of the stem that fail to meet pulpwood bolt requirements.

Growth and Annual Cut

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

Ingrowth of sawtimber. — The net board-foot volume of trees that entered live sawtimber during the inventory year as measured at the end of the year.

Annual mortality of sawtimber. — The net board-foot volume removed from live sawtimber on commercial forest land during a specified year through death from natural causes.

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

Ingrowth of growing stock. — The total net cubic-foot volume of trees that entered growing stock during the inventory year as measured at the end of the year.

Annual mortality of growing stock. — The net cubic-foot volume removed from growing stock during a specified year through death from natural causes.

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

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

FOREST SURVEY METHODS

These forest statistics are based on information obtained from aerial photographs and from sample plots examined on the ground. First, photo-interpretation plots were marked off on the aerial photographs. These plots were distributed uniformly by mechanical means over photographs of the entire State. Trained photo interpreters then classified each photo plot as either forest or nonforest. Forest plots were classified further according to stand size and forest type.

Field crews inspected some of the photo plots on the ground. Enough plots were selected at random to attain a specified level of statistical accuracy. Species and volume data were collected on these ground plots; and the photo classification of stand

size and forest type was verified or—if necessary—changed.

Growth was computed from measurements of radial growth and inventory data on numbers of trees by species and diameter class, after adjusting for cutting and expected mortality. Radial growth was measured on increment cores extracted from sample trees. The final estimate was of average annual periodic net growth at the time the inventory was made.

Estimates of timber cut in New York were based on production surveys and wood-utilization studies conducted by the Northeastern Forest Experiment Station. The production surveys yielded estimates of the output of all timber products. From studies conducted on all types of logging operations, estimates of logging residues were developed, which, when added to the volume of timber products, gave estimates of timber cut.

RELIABILITY OF THE ESTIMATES

The estimates in this report may contain two kinds of error. First, photo interpreters may make mistakes in classification and fieldmen may make mistakes in measuring or recording. There is no practical way of finding out just how often such errors occur. But they are kept to a minimum by closely checking all phases of the work.

The second kind of error is inherent in sampling procedures. The size of this sampling error can be measured. If there are no errors of the first kind, the probabilities are two out of three that the actual areas and volumes do not vary from the estimates by more than the following percentages:

<i>Item</i>	<i>Percent (Plus or minus)</i>
Commercial forest-land area	1.3
Sawtimber area	2.1
Poletimber area	2.1
Timber volume, board-foot basis	2.4
Timber volume in sawtimber stands, board-foot basis	2.6
Timber volume in poletimber stands, cubic-foot basis	2.6
Total timber volume, cubic-foot basis	1.4
Growth (board-foot basis)	8.9
Growth (cubic-foot basis)	4.9
Annual cut (cubic-foot basis)	7.9

In every case, total figures are more reliable than subtotals, and subtotals are more reliable than any of their component figures. Figures that are small in relation to totals are subject to larger sampling

errors. The actual range of errors for county data is as follows:

	Percent of error	
	Low	High
Commercial-forest area	± 1.2	± 11.6
Growing-stock volume	± 3.4	± 107.7

SPECIES TALLIED

The various tree species tallied¹³ in New York are listed below in the same order as shown in table 13.

Softwoods

Spruce:

Red spruce	<i>Picea rubens</i>
White spruce	<i>Picea glauca</i>
Black spruce	<i>Picea mariana</i>
Balsam fir	<i>Abies balsamea</i>
White pine (Eastern white pine)	<i>Pinus strobus</i>
Red Pine	<i>Pinus resinosa</i>
Hemlock (Eastern hemlock)	<i>Tsuga canadensis</i>

Other eastern softwoods:

Eastern redcedar	<i>Juniperus virginiana</i>
Tamarack	<i>Larix laricina</i>
Pitch pine	<i>Pinus rigida</i>
Northern white-cedar	<i>Thuja occidentalis</i>
Atlantic white-cedar	<i>Chamaecyparis thyoides</i>

Hardwoods

White oak	<i>Quercus alba</i>
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Red oak:

Northern red oak	<i>Quercus rubra</i>
Black oak	<i>Quercus velutina</i>
Scarlet oak	<i>Quercus coccinea</i>

Other white oak:

Bur oak	<i>Quercus macrocarpa</i>
Swamp white oak	<i>Quercus bicolor</i>
Chestnut oak	<i>Quercus prinus</i>
Yellow birch	<i>Betula alleghaniensis</i>
Sugar maple	<i>Acer saccharum</i>

Soft maple:

Red maple	<i>Acer rubrum</i>
Silver maple	<i>Acer saccharinum</i>
Beech (American beech)	<i>Fagus grandifolia</i>
Ash	<i>Fraxinus</i> species
Hickory	<i>Carya</i> species

Aspen:

Bigtooth aspen	<i>Populus grandidentata</i>
Quaking aspen	<i>Populus tremuloides</i>
Basswood (American basswood)	<i>Tilia americana</i>

Other eastern hardwoods:

Elm	<i>Ulmus</i> species
Black cherry	<i>Prunus serotina</i>
Sweet birch	<i>Betula lenta</i>

¹³ Little, Elbert L., Jr. check list of native and naturalized trees of the United States (including Alaska). U. S. Dept. Agr., Agr. Handb. 41. 472 pp. 1953.

Paper birch	<i>Betula papyifera</i>
Yellow-poplar	<i>Liriodendron tulipifera</i>
Sweetgum	<i>Liquidambar styraciflua</i>
Black tupelo	<i>Nyssa sylvatica</i>
Black walnut	<i>Juglans nigra</i>
Black locust	<i>Robinia pseudoacacia</i>
Butternut	<i>Juglans cinerea</i>
Black willow	<i>Salix nigra</i>
American sycamore	<i>Platanus occidentalis</i>
Flowering dogwood	<i>Cornus florida</i>
Cucumbertree	<i>Magnolia acuminata</i>
Balsam poplar	<i>Populus balsamifera</i>

Noncommercial Species

Gray birch	<i>Betula populifolia</i>
Pin cherry	<i>Prunus pensylvanica</i>
Eastern hophornbeam	<i>Ostrya virginiana</i>
American hornbeam	<i>Carpinus caroliniana</i>
Sassafras	<i>Sassafras albidum</i>
Downy serviceberry	<i>Amelanchier arborea</i>

NATIONAL STANDARD TABLES

To facilitate compilation of forest-survey data for any group of states, region, or the Nation as a whole, a standard set of tables is presented in the forest-survey report on each state. These tables contain information on forest area, ownership, timber volume, growth, and drain. The following tables present this information for the State of New York.

TABLE 8 — Land area, by major classes of land, New York, 1953.

Class of land	Area
	Thousand acres
Forest:	
Commercial	12,002
Noncommercial:	
Productive—reserved	2,377
Unproductive	71
Total	14,450
Nonforest ¹	16,234
Total, all classes	30,684

¹ Includes 111,500 acres of water according to Survey standards of area classification but defined by the Bureau of Census as land.

TABLE 9 — Commercial forest-land area by ownership and stand-size classes, New York, 1953.

Ownership class	Total	Saw-timber stands	Pole-timber stands	Seedling-and-sapling stands	Nonstocked and other area ¹
	Thousand acres	Thousand acres	Thousand acres	Thousand acres	Thousand acres
Public:					
Federally owned or managed	98	22	26	18	32
State	714	345	227	113	29
County and municipal	83	20	46	15	2
Total	895	387	299	146	63
Private:					
Farm	3,473	1,117	1,124	1,149	83
Forest industry	1,172	497	438	211	26
Other private	6,462	3,028	2,415	900	119
Total	11,107	4,642	3,977	2,260	228
All ownerships	12,002	5,029	4,276	2,406	291

¹ Includes areas not classified elsewhere.

TABLE 10 — Area of commercial forest land, by major forest types, New York, 1953.

Forest type	Area
	Thousand acres
White-red-jack pine ¹	1,045
Spruce-fir	735
Loblolly-shortleaf pine ³	161
Oak-hickory ⁴	1,942
Elm-ash-cottonwood ⁵	875
Maple-beech-birch ⁶	5,520
Aspen-birch ⁷	1,724
Total	12,002

¹ Includes the white pine, white pine-northern hardwood, and hemlock types.

² Includes the spruce-fir, spruce-fir-northern hardwood, and cedar-tamarack-spruce types.

³ Includes the pitch pine and pitch pine-oak types.

⁴ Includes the red oak, white oak, chestnut oak, oak-white pine, oak-pitch pine, eastern redcedar, and sweetgum-yellow-poplar types.

⁵ Includes the ash-elm-maple, river birch-sycamore and bottom-land hardwood types, and a small acreage of Atlantic white-cedar.

⁶ Includes the northern hardwood, northern hardwood-spruce-fir, and northern hardwood-white pine types.

⁷ Includes the aspen-gray birch and paper birch types.

TABLE 12 — Net volume of live sawtimber and growing stock on commercial forest land, by ownership class, New York, 1953.

Ownership class	Saw-timber	Growing stock
	Million bd.-ft.	Million cu. ft.
Public:		
Federally owned or managed	107	70
State	1,963	899
County and municipal	80	82
Total public	2,150	1,051
Private:		
Farm	5,270	3,210
Industrial and other	19,463	7,414
Total private	24,733	10,624
All ownerships	26,883	11,675

TABLE 11 — Net volume of live sawtimber and growing stock on commercial forest land, by stand-size class, New York, 1953.

Stand-size	Saw-timber	Growing stock
	Million bd.-ft.	Million cu. ft.
Sawtimber stands	23,048	7,660
Poletimber stands	3,120	3,528
Seedling-and-sapling stands	613	445
Nonstocked and other areas not elsewhere classified	102	42
Total	26,883	11,675

TABLE 13 — Net volume of live sawtimber and growing stock on commercial forest land, by species, New York, 1953.

Species ¹	Saw-timber	Growing stock
	Million bd.-ft.	Million cu. ft.
Softwoods:		
Spruce and balsam fir	1,655	710
White and red pines	2,287	772
Hemlock	2,314	901
Other eastern softwoods	261	161
Total	6,517	2,544
Hardwoods:		
White oaks ²	855	253
Red oaks ³	1,629	750
Other white oaks	143	237
Yellow birch	2,627	952
Sugar maple	4,969	1,954
Soft maples	2,057	1,328
Beech	2,953	1,045
Ash	1,018	522
Hickory	265	142
Cottonwood and aspen	265	381
Basswood	978	398
Other eastern hardwoods	2,607	1,169
Total	20,366	9,131
All species	26,883	11,675

¹ Species from the national standard list that do not appear here are either not present in New York or were found so infrequently that no reliable estimate of volume could be made.

² *Quercus alba* only.

³ *Quercus rubra* only.

TABLE 14 — *Net volume of live sawtimber on commercial forest land, by diameter-class group and species, New York, 1953.*
(In million board-feet)

Species	Diameter-class group (in inches)						Total
	10	12	14	16	18	20 and more	
Spruce and balsam fir	409	410	355	227	128	126	1,655
White and red pines	327	455	414	400	277	414	2,287
Hemlock	442	479	448	299			2,314
Other eastern softwoods	59	76	68	32	232	414	2,361
Total	1,237	1,420	1,285	958	649	968	6,517
White oak		231	203	152	80	189	855
Red oak		377	350	317	219	366	1,629
Other white oaks		61	40	23	8	11	143
Yellow birch		320	350	342	328	1,287	2,627
Sugar maple		855	854	820	770	1,670	4,969
Soft maples		565	421	355	233	483	2,057
Beech		570	676	638	502	567	2,953
Ash		321	280	152	108	157	1,018
Hickory		74	69	45	24	53	265
Cottonwood and aspen		139	67	38	21		265
Basswood		205	218	165	126	264	978
Other eastern hardwoods		585	543	432	312	735	2,607
Total		4,303	4,071	3,479	2,731	5,782	20,366
All species	1,237	5,723	5,356	4,437	3,380	6,750	26,883

TABLE 15 — *Net volume of all timber on commercial forest land by class of material and species group, New York, 1953.*

Class of material	Total	Softwoods	Hardwoods
	Million cu. ft.	Million cu. ft.	Million cu. ft.
Growing stock:			
Sawtimber trees:			
Sawlog portion	5,371	1,445	3,926
Upper stem portion ..	1,337	351	986
Total	6,708	1,796	4,912
Poletimber trees	4,967	748	4,219
Total growing stock	11,675	2,544	9,131
Other material:			
Sound cull trees	1,061	188	873
Rotten cull trees	814	45	769
Hardwood limbs	799		799
Salvable dead trees ...			
Total other material	2,674	233	2,441
Total, all timber	14,349	2,777	11,572

TABLE 16 — *Net annual growth, annual mortality, and annual cut of live sawtimber and growing stock on commercial forest land, by species group, New York, 1952.*

Item	Total	Sawtimber	Hardwoods	Total	Growing stock	Hardwoods
		Softwoods			Softwoods	
		Million board-feet			Million cubic feet	
Net annual growth	1,041	214	827	393	66	327
Annual mortality	147	61	86	104	34	70
Annual cut:						
Timber products	576	218	358	119	47	72
Logging residues	54	7	47	22	5	17
Total	630	225	405	141	52	89

Growth Rates

CF

5 feet

0.025943397

0.032837196

14 feet

0.035812069

0.040606893

TABLE 17 — Output of timber products and annual cut of live sawtimber and growing stock, New York, 1952.

Product	Output of timber products 1, Roundwood volume										
	Volume in standard units		Annual cut of sawtimber			Annual cut of growing stock					
	Standard units	Number	Total	Soft- woods	Hard- woods	Total	Soft- woods	Hard- woods	Total	Soft- woods	Hard- woods
			M cubic <i>feet</i>			M <i>board-feet</i>			M cubic <i>feet</i>		
Sawlogs	M. bd.-ft. ²	483,926	78,575	32,504	46,071	474,200	168,300	305,900	91,941	33,133	58,808
Veneer logs and bolts	M. bd.-ft. ²	19,118	3,083	....	3,083	20,652	....	20,652	3,970	....	3,970
Cooperage logs and bolts	M. bd.-ft. ²	....	....	....	....	....	....	....	....	....	....
Pulpwood	Std. cords ³	4411,262	32,710	27,800	4,910	68,848	54,765	14,083	22,218	17,225	4,993
Fuelwood	Std. cords ³	533,038	42,643	2,426	40,217	35,629	956	34,673	14,233	371	13,862
Piling	M. linear ft.	432	260	60	200	1,373	311	1,062	313	69	244
Poles	M. pieces	3	39	39	....	160	160	....	41	41	....
Posts	M. pieces	5,710	3,534	547	2,987	5,717	444	5,273	3,040	462	2,578
Hewn Ties	M. pieces	....	....	....	....	....	....	....	....	....	....
Mine timbers . . .	M. cu. ft.	18	18	....	18	34	....	34	19	....	19
Miscellaneous ⁶ ..	M. cu. ft.	73,877	3,877	....	3,877	23,802	....	23,802	4,795	....	4,795
Total . . . . .	....	....	164,739	63,376	101,363	630,415	224,936	405,479	140,570	51,301	89,269

1 Includes material from both growing stock and other miscellaneous sources.

2 International ¼-inch rule.

3 Rough wood basis.

4 Not including 210,000 cubic feet of wood from mill residues used for pulp.

5 Not including 14,483,000 cubic feet of wood from mill residues (at sawmills and veneer mills) used for domestic and industrial fuel.

6 Includes shingle bolts, excelsior, chemical wood, split products, etc.

7 Not including 964,000 cubic feet of wood from mill residues used for miscellaneous products.

MAJOR FOREST TYPES IN NEW YORK

0 10 20 30 40 50
MILES

