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The Timber Resources of Connecticut



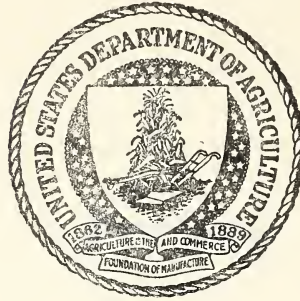
NORTHEASTERN FOREST EXPERIMENT STATION

1957

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annual growth and mortality of the
forest growing stock, and the extent
of timber cutting in 1952. The sur-
vey was made by the Forest Service,
U. S. Department of Agriculture, as
part of a nationwide survey of tim-
ber resources.

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An early forest survey of the State was made by the Connecticut Agricultural Experiment Station in 1914. At that time, estimates of forest area by ownership class and by broad forest types were obtained by traversing all roads and making maps. Rough estimates of timber volume were obtained from yield tables compiled from strip surveys on the state forests. Since then, other estimates of forest area as well as timber volume have been made. But because of differences in definitions, standards, and procedures, earlier estimates cannot be fairly compared with the data in this report.

The Timber Resources of Connecticut

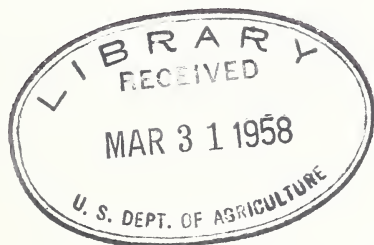
by

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and

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NORTHEASTERN FOREST EXPERIMENT STATION
FOREST SERVICE, U. S. DEPT. AGRICULTURE



Contents

Use of the forests	1
The timber volume	6
Condition of the forests	13
Opportunities & a challenge	17
Major forest types (map)	18
Appendix	21

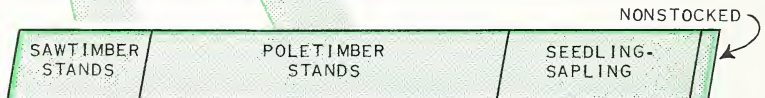
THE
HIGHLIGHTS
IN BRIEF



Forests occupy nearly two thirds of the land area in Connecticut. Practically all of the forest area is commercial forest land.



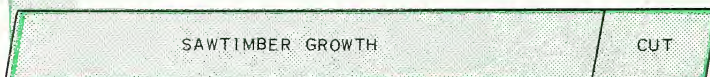
Private owners hold 92 percent of the 1,973,000 acres of commercial forest land. Small holdings of less than 100 acres account for 54 percent of the privately owned forest land.



Sawtimber stands average about 3,200 board feet per acre. They cover 17 percent of the commercial forest area and contain 57 percent of the total board-foot volume.



The total sawtimber volume is 86 percent hardwood in Connecticut. Two fifths of the growing stock is in sawtimber trees.



The net annual growth of sawtimber is more than 5 times the annual cut in Connecticut. The annual cubic-foot growth is $7\frac{1}{2}$ times the volume cut.

Use of the Forests

CONNECTICUT has never been one of the Nation's major timber producers. One of the smaller states in the Northeast, and located on the heavily populated Atlantic Seaboard between the great metropolitan centers of New York and Boston, Connecticut has become important for other reasons than timber. It has a long history of commerce and agriculture; it has a great variety of industries; and it has many suburban communities. These are hardly signs of big timber country.

Yet it would not do to undervalue the importance of Connecticut's forest resource. Today 2 million acres of land in Connecticut are growing timber. This is 63 percent of the total land area in the state. And this forest area is more than double the acreage of forest 100 years ago. The net annual growth of the forest growing stock is more than seven times the annual cut. Because of the limited number of high-quality trees, the output of timber products from the forests of Connecticut is relatively low at present. Nevertheless the forests are important to the economy of the state for many reasons other than timber use.

Multiple Use Of Forest Land

Forests can serve many purposes, and to produce timber products is not always foremost. In Connecticut, one of their major uses is to protect watersheds and help produce the huge quantities of pure clear water that are needed for domestic and industrial use. If the national average applies to Connecticut, the daily fresh water requirement is 8 million tons, or 4 tons of water per person.¹

¹Bello, Francis. How are we fixed for water? Fortune 49 (3): 120-125, 146, 148. 1954.



Forests help to protect Connecticut's watersheds. Barkhamsted Reservoir, main water supply for the city of Hartford, is well protected by forested slopes, as shown here.

Forested watersheds help to protect Connecticut's water supply. They prevent severe soil erosion and rapid silting of reservoirs; they reduce the occurrence and severity of devastating flash floods; and they stabilize stream-flow by holding back water when it is overabundant and releasing stored water when streams run low.

Outdoor recreation is also important to this densely populated state, which has a population of more than 400 persons per square mile. The woodlands and forest streams and lakes are used by millions of people for camping, hiking, picnicking, hunting, and fishing. Every year more than 3 million people visit the state parks that have been developed for recreation, and many more make use of the state forests and undeveloped parks. Sportsmen pay some \$500,000 annually for hunting and fishing licenses. Tourists spend an estimated \$100,000,000 annually, of which a sizeable share is attributable to recreational use of the forests.

Watershed protection and timber production can be carried out on the same area without interfering with each other. Recreation and timber growing are also compatible, with the minor exception of areas where timber must be reserved from cutting for aesthetic reasons. Thus multiple use of nearly all of Connecticut's forest land is a feasible policy.

Timber Products

In 1952, slightly more than 13 million cubic feet of timber products were harvested from the forests in Connecticut. About 9 million cubic feet² were cut from trees classed as growing stock.³ The other 4 million cubic feet were cut from cull trees, hardwood limbs, and trees from noncommercial forest land. Almost two-thirds of the output of timber products was fuelwood, 31 percent was sawlogs, and about 5 percent was pulpwood and other products.

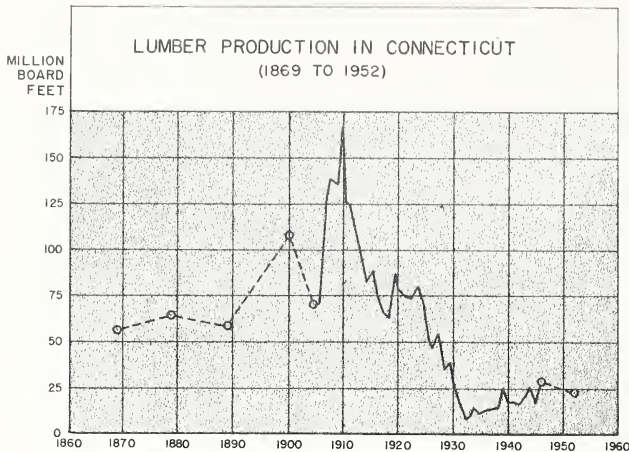
The forest resource began to grow in importance when the first sawmill was established in Connecticut, at Farmington, in 1645. Other sawmills were built in quick succession, until soon there was considerable production available for export. By 1800, in addition to lumber, large quantities of wood were made into charcoal for use in the iron furnaces and the brass industry, as well as in the manufacture of bricks and lime. Practically all this production came from second-growth stands because little, if any, virgin timber remained after 1800. After 1850 railroads also made heavy demands on the timber resource, not only for fuel but for ties and timbers.

The peak of lumber production was reached in 1909, when cuttings of blight-threatened chestnut were greatest. In that year 422 sawmills reported a total production of 168 million board feet.⁴ Then production declined rapidly; by 1918 it was down to 64 million board feet. Production re-

²The sampling error of this estimate of timber cut from growing stock is plus or minus 16 percent; that is, the probabilities are 2 out of 3 that the actual volume of timber cut in 1952 does not vary from the estimated volume by more than 16 percent.

³See Appendix for definitions of terms used in this report.

⁴Steer, Henry B. Lumber production in the United States, 1799-1946. U. S. Dept. Agr. Misc. Pub. 699. 233 pp. 1948.



Lumber production reached its peak in Connecticut in 1909.

vived somewhat in the early '20s, and then again it declined rapidly. In 1932, only 23 sawmills were active and about 8 million board feet of lumber were produced. Since the depression, and particularly after the hurricane of 1938 and during the World War II, lumber production has gradually increased.

Sawlog Output

In 1952, about 4.1 million cubic feet of sawlogs (31 percent of the total timber-products output) were cut from timber growing in Connecticut. This volume was equivalent to 23 million board feet (International $\frac{1}{4}$ -inch log rule). Softwood species, mainly white pine, made up a third of the volume; and nearly a half of the total production was in the oak species.

About 300 sawmills are located within the state; however, recent checks indicate that only 40 percent are active at any one time. Approximately one-tenth of their sawlog supply comes from Massachusetts. In 1952 the total amount processed by Connecticut sawmills was 26 million board feet. Of the 120 sawmills that were active that year, only three produced 1 million board feet or more. There are 15 sawmills that annually produce approximately $\frac{1}{2}$ million board feet each. The remaining sawmills operate sporadically; and their average annual production is usually well below 50,000 board feet.

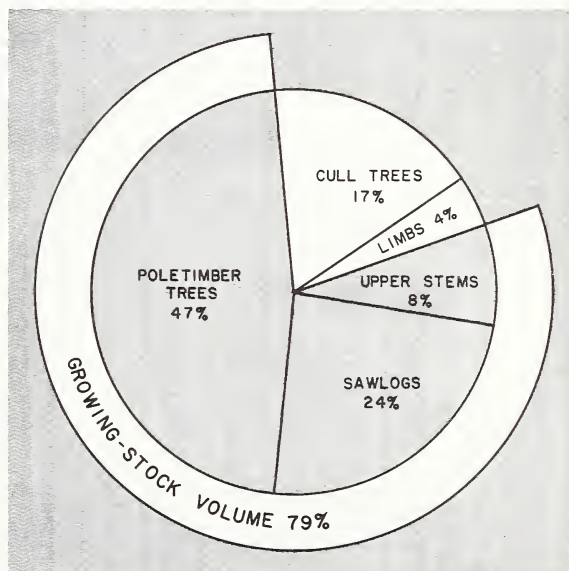
Fuelwood Almost Two Thirds Of Output

Fuelwood is an important outlet for Connecticut's wood supply, especially for poletimber-size trees of poor quality and of less desirable species. Sixty-four percent of the timber-products output in 1952 was accounted for by fuelwood, which is still widely used, but more than half of this amount came from material not classed as growing stock. Of the total amount of fuelwood produced (112,000 cords), about 52,000 cords were cut from growing stock:

<i>Source</i>	<i>Cords</i>	<i>Percent</i>
Growing stock	51,800	47
Cull trees and limbs	36,000	32
Trees on noncommercial forest land	12,800	11
Plant residues	6,900	6
Dead trees	4,400	4
Total fuelwood output		100
	111,900	100

Of the volume used for fuelwood, 93 percent came from the hardwood species and only 7 percent (8,000 cords) came from the softwoods. Of the 52,000 cords of fuelwood cut from growing stock, all but about 2,000 cords came from poletimber trees.

Connecticut forests contain some 1,645 million cubic feet of sound wood. Four fifths of this is growing stock.

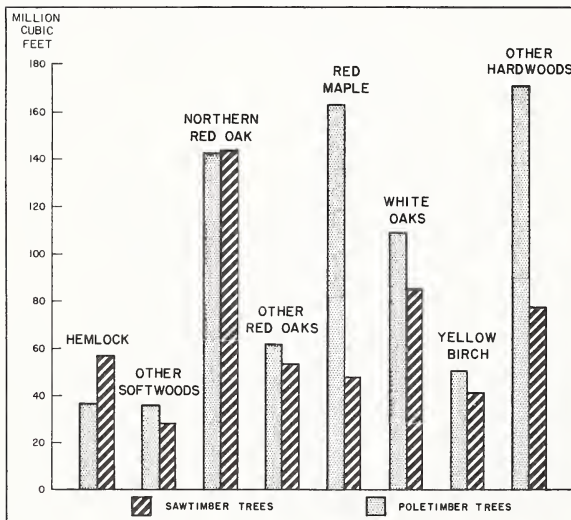


The Timber Volume

CONNECTICUT'S commercial forest land, as of January 1, 1953, had 1,645 million cubic feet of sound wood growing on it. (Some 341 million cubic feet of sound material, mostly in cull trees and hardwood limbs, is not included in growing-stock volume). Hardwood species make up 1,452 million cubic feet, or 88 percent of the total sound-wood volume.

Forest Growing Stock 1.3 Billion Cubic Feet

Growing stock is the volume of sound wood in the main stem of sawtimber and poletimber trees, from a 1-foot stump to a 4-inch top (inside bark). The growing-stock volume is estimated to be about 1,304 million cubic feet (plus or minus 4.9 percent). Of the total volume of growing stock, 1,146 million cubic feet (88 percent of the total) are in



The growing stock on Connecticut's forest land. Oak species make up over half of the hardwood volume.

hardwoods. More than half of the hardwood volume is in the various species of oak. Poletimber trees make up 771 million cubic feet--almost 60 percent of the total. Volume of poletimber trees exceeds that of sawtimber trees for all species except hemlock and northern red oak.

Small Trees Predominate

Small trees are characteristic of the timber stands in Connecticut. Forty-five percent of the cubic-foot volume is found in the 8- and 10-inch diameter classes. Almost three-fourths of the volume, 953 million cubic feet, is in trees of less than 13.0 inches d.b.h.

In hardwoods, 5 percent of the cubic volume is in trees 19.0 inches and larger in diameter; in the softwoods, the proportion of large trees is only slightly higher. These low proportions of volume in large trees are reflected in the limited quantity of high-quality sawlogs.

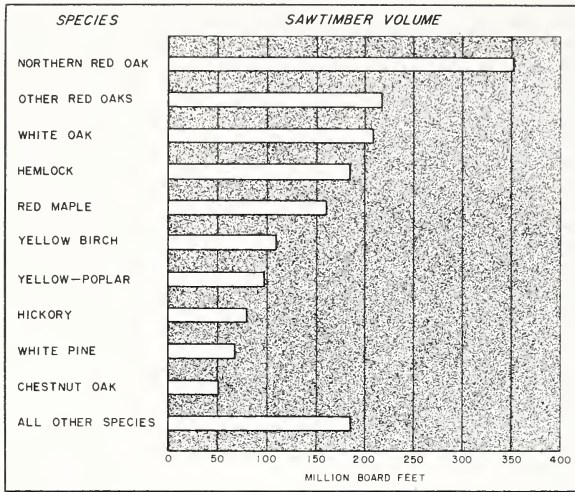
Sawtimber Volume 1.9 Billion Board Feet

The sawlog portion of sawtimber trees amounts to 405 million cubic feet of sound wood, not quite a third of the growing-stock volume. When measured by the International $\frac{1}{4}$ -inch rule, which approximates lumber tally, this material is equivalent to nearly 1.9 billion board feet log scale (plus or minus 8.0 percent).

The sawtimber volume is made up principally of hardwoods, which account for 86 percent of the board-foot volume. The oaks, principally northern red oak, make up more than half of this hardwood volume. Other hardwood species that have more than 100 million board feet are red maple and yellow birch.

Softwood species make up 14 percent of the board-foot volume. Hemlock is the major softwood species, having about three times as much volume as white pine.

The picture of the sawtimber supply is not so good as the figures would seem to indicate. The predominating oaks are less favored than other hardwoods in industry because of their relatively low quality. The major outlet at present



Most of the sawtimber volume in Connecticut forests is hardwood.

for oak sawtimber volume is in the form of railroad ties and timbers. On the other hand, pine is used heavily in construction and manufacturing; yet it makes up only about $3\frac{1}{2}$ percent of the sawtimber volume in Connecticut.

Other factors such as volume per acre and stand distribution also have an influence on the amount of sawlogs harvested. The average volume per acre of all sawtimber stands in the state is 3,200 board feet. Much of the sawtimber acreage barely meets the minimum standard of 1,500 net board feet per acre. Loggers are not interested in cutting the low-volume sawtimber stands. This is especially true of the hardwood stands. In addition, the operable stands are widely scattered, which makes logging operations more difficult.

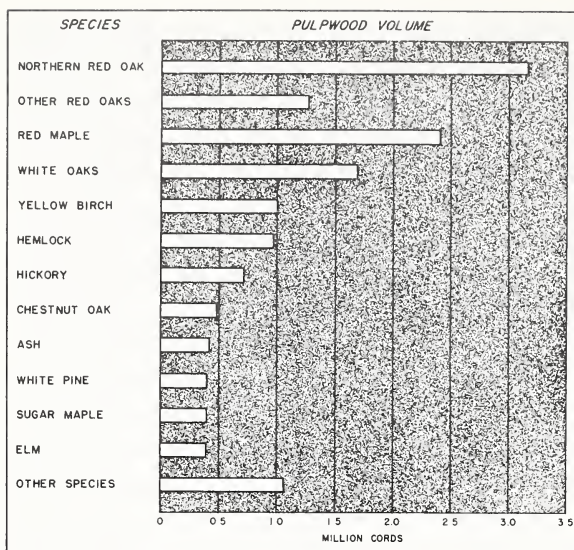
Another difficulty is the fact that about 43 percent of the sawtimber volume is scattered throughout poletimber and seedling-and-sapling stands, and is practically unavailable at present for sawlog production.

One Sixth Of Volume Is Of Good Quality

Generally, a tree has to attain fairly large size before it will have any appreciable volume in high-quality sawlogs. In Connecticut, about one-sixth of the hardwood sawtimber trees are 20 inches or more in diameter. More



A service forester marks a large white pine for cutting. White pines of this quality are scarce in Connecticut.



The timber volume suitable for pulp totals more than 14 million cords, most of it hardwood.

than 50 percent are 14 inches or less. Consequently the supply of high-quality hardwood sawtimber is small.

Hardwood sawlogs that meet the specifications for standard lumber log grades 1 and 2 make up 16 percent of the total net volume. Nearly half of the hardwood sawtimber volume is suitable only for ties and timbers.

High-quality white pine sawtimber is scarce. Only about 1 percent of the white pine sawtimber volume meets log grade 1 specifications. An additional 26 percent is grade 2. Almost three-fourths of all the white pine sawtimber is in grade 3. The better quality white pine is being cut more rapidly than it is being grown; meanwhile low-quality white pine volume seems to be increasing.

Growing Stock Suitable For Pulpwood

Most of the growing stock, nearly 88 percent, meets regional specifications for pulpwood.⁵ The volume suitable

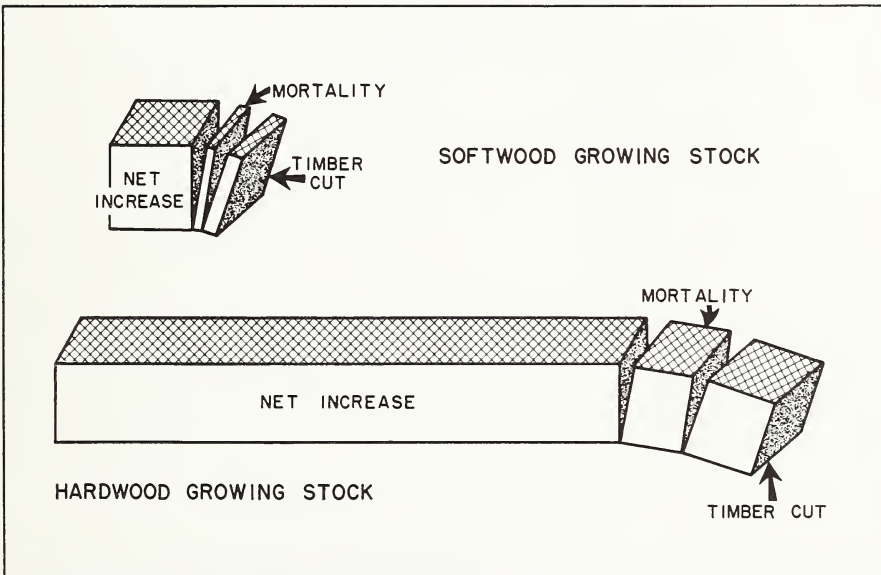
⁵Pulpwood specifications established by the Northeastern Technical Committee of the American Pulpwood Association.

for pulpwood is somewhat more than 14 million standard cords. But this pulpwood estimate must be qualified. For lack of a suitable market, only a small amount of pulpwood is produced in Connecticut--6,000 cords in 1952. And then too, most of the volume is in the hardwood species, which are less favored at present for making woodpulp. Red oaks alone make up more than 30 percent of the pulpwood volume.

Stands of timber containing 15 or more cords of pulpwood per acre are not plentiful. About 230,000 acres, 12 percent of the total forest area, support such stands. Two-thirds of the total volume suitable for pulpwood are found in stands of 5 to 15 cords per acre.

Volume Of Timber Is Increasing

The timber situation in Connecticut is changing rapidly because sawtimber is growing about five times as fast as it is being cut. This favorable growth-cut ratio implies



The forest growing stock in Connecticut is increasing rapidly. Only a fourth of the hardwood timber growth each year is removed by cutting and natural losses, and only a third of the softwood growth.

a build-up in the volume per acre, an increase in the percentage of volume in the larger diameter classes, and some improvement in the quality of the sawtimber. If this situation continues, the timber resource eventually can provide a much greater income than it provides now.

The 1,304 million cubic feet of growing stock in Connecticut is increasing by about 68 million cubic feet a year (plus or minus 12 percent). This rapid increase, less the small annual cut of approximately 9 million cubic feet, adds 59 million cubic feet annually to growing stock. More than 85 percent of the volume increase is made up of hardwoods.

Average annual losses due to fire, windthrow, insects, disease, and suppression amount to about $6\frac{1}{2}$ million cubic feet. These losses were deducted in the calculation of net annual growth. Ingrowth of saplings--the entire net volume of small trees that reach poletimber size during the year--is included in the estimate of net annual growth and accounts for almost a third of it:

	<i>Thousand cubic feet</i>
Growth on initial inventory	52,900
Ingrowth	21,400
	<hr/>
Gross growth	74,300
Mortality	-6,600
	<hr/>
Net growth	67,700

Sawtimber volume is also increasing. In 1952, net growth amounted to 106 million board feet, of which 88 million were in the hardwood species. In contrast, only 19 million board feet of sawtimber (13 million in the hardwoods) were cut during the year. The volume of hardwood sawtimber appears to be increasing more rapidly than that of softwoods, yet there is an increasing use of hardwoods.

Because of relatively small average volume per acre (about 950 board feet), the forests of Connecticut are growing about 54 board feet per acre per year. If the average growth rate of all stands (in percent) were applied to the volume in sawtimber stands, the growth would be approximately 200 board feet per acre per year.

Condition of the Forests

FOREST LAND in Connecticut amounts to almost 2 million acres. Included in this estimate are 17,000 acres of noncommercial forest land--11,000 acres reserved from timber cutting and 6,000 acres of nonproductive forest land. The commercial forest-land area, 1,973,000 acres (plus or minus 2 percent), represents 62 percent of the land area in the state.

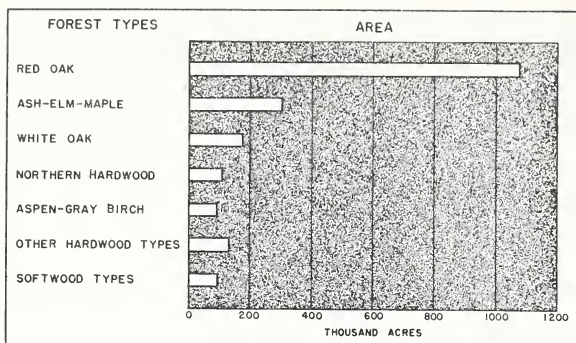
In the eight counties of the state, the commercial forest-land area ranges from 49 to 71 percent of the land area. Litchfield County has the largest forest acreage, and Middlesex County has the least:

<i>County</i>	<i>Thousand acres</i>
Fairfield	209
Hartford	233
Litchfield	401
Middlesex	169
New Haven	237
New London	308
Tolland	188
Windham	228
Total	<hr/> 1,973

Oak Stands Cover Two Thirds Of Area

Oak forests cover 1,333,000 acres, 67 percent of Connecticut's commercial forest-land area. In these stands, either the red oak or white oak species make up 50 percent or more of the net volume. Although conifers are found in some of these stands, the softwood volume is small.

Oak stands have replaced the far more valuable stands of chestnut. Between 1910 and 1925, the chestnut blight



Oak forest types occupy two thirds of the commercial forest land area in Connecticut.

eliminated chestnut as an important species. This was a tragic economic loss, for chestnut constituted half of the timber in the state. Oaks and certain undesirable species gradually took its place, but this resulted in a general lowering of the volume and quality of timber.⁶

The ash-elm-maple forest type occupies the next largest amount of land, nearly 300,000 acres. Predominantly red maple stands account for most of the area found in this type. The northern hardwood type (sugar maple-beech-yellow birch) covers 110,000 acres and is confined to northwestern Connecticut at the southern extreme of the Berkshire Mountains.

The acreage in softwood types is small--only 96,000 acres or 5 percent of the commercial forest land. One of the reasons for this small acreage can be attributed to the 1938 hurricane. Fairly extensive areas of pine were blown down. According to W. Foster Schreeder, the State Forester, the hurricane destroyed in 1 hour the finest 100 years of timber growth in southern and eastern Connecticut. Many of these areas did not restock with white pine.

One Sixth Of Forest Area Supports Sawtimber Stands

Sawtimber stands, with 1,500 board feet or more per acre, are relatively scarce. They cover 334,000 acres, 17

⁶Zumwalt, Eugene V. Taxation and other factors affecting private forestry in Connecticut. Yale Univ. School Forestry Bul. 58. 134 pp. 1953.

percent of the commercial forest land. However, these stands have more than half of the sawtimber volume and more than a third of the growing stock volume. Poletimber stands, which occupy 54 percent of the forest area, account for most of the remaining sawtimber volume and more than half of the growing stock volume.

Sawtimber stands make up a larger proportion of the forest area in the softwood types (39 percent), than they do in the hardwood types. The lowest proportion of sawtimber stands is found in the white oak and the ash-elm-maple forest types. Each of these has less than 10 percent of its area in sawtimber stands.

9 of 10 Forest Acres Are Privately Owned

Most of the commercial forest land in Connecticut is privately owned--1,818,000 acres, or 92 percent of the total. Three-fourths of the 155,000 acres of publicly owned forest land (nearly 122,000 acres) is held by the state--mostly in state forests. Municipalities own 32,000 acres of commercial forest land, principally in watersheds protecting their water supplies. Federal holdings are negligible.

Two-thirds of the commercial forest land is classified as "other private." There are about 35,000 such owners--businessmen, clerks, professional people, laborers, housewives, and others--who control the timber use on 1,289,000 acres.

There are about 526,000 acres of woodland on farms. The Census of Agriculture reported in 1950 that 9,157 farms out of the 15,615 in the state were commercial farms. Part-time farms, residential farms, and abnormal farms were excluded. It seems reasonable to assume that only 60 to 75 percent of the forest land classified as "farm woodland" is located on commercial farms.

Holdings by forest industries are negligible. There are about 100 such holdings, but the total forest land owned by forest industries is about 3,000 acres.

Ownership of timber volume is distributed about the same as the forest acreage. Private holdings amount to 1,167 million cubic feet of growing stock, including 1,700

million board feet of sawtimber. The state owns 110 million cubic feet, including 127 million board feet of sawtimber.

Half Of Forest Land Is In Small Holdings

Half of the commercial forest-land area in Connecticut is owned by thousands of persons who have 100 acres or less. The average size of the forest holding in this class is 24 acres. About 36 percent of the forest area consists of properties in the 100- to 500-acre class. Larger private holdings and public holdings account for the remaining 14 percent:

<i>Size class of holding</i>	<i>Thousand acres</i>
Private forests:	
3 to 100 acres	986
100 to 500 acres	717
500 acres or more	115
	<hr/>
Total, private	1,818
Public forests	155
	<hr/>
Total, commercial forests	1,973

About 45,700 people own the private commercial forest land in Connecticut. Almost 90 percent of the owners have small pieces--3 to 100 acres. Ownerships of 500 acres or more add up to only 42 owners, less than 1 percent of the total number. Not one of these larger holdings exceeds 25,000 acres.

Opportunities & a Challenge

CONNECTICUT'S forests lie in the heart of a great wood-consuming area. Based on the national average, Connecticut's people are consuming twelve times more wood than is currently being cut from their forests. Clearly, a healthy market awaits any feasible increase in forest-products output.

But can the volume and value of timber harvested from these forests be increased? The cold facts of the survey seem to answer "yes"; but common sense and forestry know-how would hasten to qualify that answer. For a number of reasons, past generations have seen the state's forest bank account grow smaller. The forest survey indicates that this situation has been reversed: timber capital (growing stock) is on the increase. This means that the interest that can be realized without depleting the timber bank account is also increasing. As long as growth continues to exceed drain, the volume of capital increases. And, as the individual trees grow larger, their value per unit of volume will also tend to increase, thus further increasing the value of Connecticut's timber capital and its annual growth value.

In managing their timber resource, the people of Connecticut will determine when to increase their forest income and at what level it will be maintained. Cultural treatments such as thinning, pruning, and improvement cuts will mean increased income. These practices will also mean that increased incomes can begin sooner. If cutting practices retain for future growth the more valuable species and individual trees, increased incomes will be postponed, but eventually should be much larger.

Citizens who don't own forest land also influence the amount of income from the forest resource. Will bankers be aware of the actual value of well-managed forests when discussing loans? Will tax assessors appraise forest properties fairly? Will local communities welcome the expansion of the timber-processing industries that will provide more diversi-

THE MAJOR FOREST TYPES



TYPES IN CONNECTICUT



RED MAPLE



NORTHERN HARDWOOD



NONTYPED

WHITE PINE

OK HICKORY

fied outlets for forest products? Will the public support effective protection programs aimed at fire and at the insect and disease enemies of forests? Will they provide funds for forestry research? And for technical forestry assistance to landowners?

Connecticut's timber resource presents a challenge to her citizens. Income from this source could be doubled in a few years and increased many fold within two or three decades. Recreation, water, and other forest benefits would occur simultaneously. The opportunities are evident; the challenge is clear. Let's see what comes of it.

Appendix

NATIONAL STANDARD TABLES

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

Table 1.--Land area by major classes of land, Connecticut, 1953

Class of land	Area
	<u>Thousand acres</u>
Forest:	
Commercial	1,973
Noncommercial:	
Productive-reserved	11
Unproductive	6
Total	1,990
Nonforest ¹	1,145
Total, all classes	3,135

¹Includes 23,200 acres of water according to survey standards of area classification, but defined by the Bureau of Census as land.

Table 2.--Commercial forest-land area, by ownership and stand-size classes, Connecticut, 1953

Ownership class	Total	Saw-timber stands	Pole-timber stands	Seedling-and-sapling-stands	Nonstocked and other areas ¹
	<u>Thousand acres</u>	<u>Thousand acres</u>	<u>Thousand acres</u>	<u>Thousand acres</u>	<u>Thousand acres</u>
Public:					
State	122	23	80	15	4
Other public ²	33	4	23	5	1
Total	155	27	103	20	5
Private ³	1,818	307	962	509	40
All ownerships	1,973	334	1,065	529	45

¹Includes areas not classified elsewhere.

²Consists of 32,000 acres of municipally owned and 1,000 acres of Federally owned commercial forest land.

³Includes 526,000 acres of farm woodland, 3,000 acres of forest land owned by forest industry, and 1,289,000 acres of forest land owned by "other private" class of ownership.

Table 3.--Area of commercial forest land,
by major forest types, Connecticut, 1953

Forest type	Area
	<u>Thousand acres</u>
White-red-jack pine ¹	96
Oak-hickory ²	1,375
Elm-ash-cottonwood ³	298
Maple-beech-birch ⁴	110
Aspen-birch ⁵	94
Total	1,973

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

²Includes the red oak, white oak, chestnut oak, eastern redcedar, oak-white pine, and oak-pitch pine types.

³Includes the red maple type.

⁴Includes the northern hardwood type.

⁵Includes the gray birch type.

Table 4.--Net volume of live sawtimber and growing stock
on commercial forest land, by stand-size class,
Connecticut, 1953

Stand-size class	Saw- timber	Growing stock
	<u>Million bd.ft.</u>	<u>Million cu.ft.</u>
Sawtimber stands	1,068	451
Poletimber stands	698	770
Seedling-and-sapling stands	39	41
Nonstocked and other areas not elsewhere classified	54	42
Total	1,859	1,304

Table 5.--Net volume of live sawtimber and growing stock
on commercial forest land, by ownership class,
Connecticut, 1953

Ownership class	Saw- timber	Growing stock
	<u>Million bd.ft.</u>	<u>Million cu.ft.</u>
PUBLIC:		
State	127	110
Other public ¹	32	27
Total	159	137
PRIVATE:		
Farm	399	254
Industrial and other ²	1,301	913
Total	1,700	1,167
ALL OWNERSHIPS	1,859	1,304

¹Nearly all this volume is on municipally owned forest land.

²Mostly "other private"; volume on forest industry holdings is negligible.

Table 6.--Net volume of live sawtimber and growing stock on commercial forest land, by species, Connecticut, 1953

Species ¹	Saw-timber	Growing stock
	Million bd.ft.	Million cu.ft.
SOFTWOODS		
Hemlock	184	94
White and red pines	71	41
Other eastern softwoods	8	23
Total	263	158
HARDWOODS		
Northern red oak	503	287
Other red oaks	217	115
White oaks ²	260	185
Other white oaks	27	9
Red maple	160	211
Yellow birch	108	91
Yellow-poplar	97	23
Hickory	79	64
Beech	42	21
Elm	33	35
Ash	31	38
Sugar maple	26	36
Other eastern hardwoods	13	31
Total	1,596	1,146
ALL SPECIES	1,859	1,304

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

²Quercus alba and Q. prinus.

Table 7.--Net volume of live sawtimber on commercial forest land, by diameter-class group, and species, Connecticut, 1953

Species ¹	Diameter-class group (in inches)						
	10	12	14	16	18	20+	Total
Million board feet							
White and red pines	6	8	11	10	7	29	71
Other eastern softwoods	29	26	49	33	7	48	192
Total	35	34	60	43	14	77	263
Northern red oak	--	135	99	100	58	111	503
Other red oaks	--	57	42	42	24	52	217
White oaks	--	81	98	28	29	24	260
Yellow birch	--	52	22	22	9	3	108
Yellow-poplar	--	4	28	14	15	36	97
Other eastern hardwoods	--	173	101	49	48	40	411
Total	--	502	390	255	183	266	1,596
All species	35	536	450	298	197	343	1,859

¹Species from the national standard list that do not appear here were found so infrequently that no reliable estimate of volume by diameter class could be made.

Table 8.--Net volume of all timber on commercial forest land,
by class of material and species group,
Connecticut, 1953

Class of material	Softwoods	Hardwoods	Total
	<u>Million</u> <u>cu.ft.</u>	<u>Million</u> <u>cu.ft.</u>	<u>Million</u> <u>cu.ft.</u>
GROWING STOCK			
Sawtimber trees:			
Sawlog portion	69	336	405
Upper stem portion	16	112	128
Total	85	448	533
Poletimber trees	73	698	771
Total growing stock	158	1,146	1,304
OTHER MATERIAL			
Sound cull trees	31	164	195
Rotten cull trees	4	73	77
Hardwood limbs	--	69	69
Total other material ¹	35	306	341
Total, all timber	193	1,452	1,645

¹ Salvable dead tree volume is negligible.

Table 9.--Net annual growth, annual mortality, and annual cut of live sawtimber and
growing stock on commercial forest land, by species group, Connecticut, 1952

Item	Sawtimber			Growing stock		
	Softwoods	Hardwoods	Total	Softwoods	Hardwoods	Total
	<u>Million board feet</u>			<u>Million cubic feet</u>		
Net annual growth	18	88	106	10	58	68
Annual mortality	1	3	4	1	6	7
Annual cut:						
Timber products	5	12	17	2	6	8
Logging residues	1	1	2	(¹)	1	1
Total	6	13	19	2	7	9

¹ Less than 0.5 million cubic feet.

Table 10.--Output of timber products and annual cut of live sawtimber and growing stock, Connecticut, 1952

Product	Output of timber products ¹				Annual cut of live sawtimber			Annual cut of growing stock				
	Volume, standard units		Number	Roundwood volume		Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	
	Standard units			Soft-woods	Hard-woods							Total
Sawlogs	M board feet ²	23,373		M cubic feet				M cubic feet				
Pulpwood	Standard cords ³	6,034		1,408	2,643	4,051	6,137	12,246	18,383	1,413	2,884	4,297
Fuelwood	Standard cords	⁴ 105,037		210	273	483	--	35	35	222	223	445
Piling	M linear feet	40		516	7,914	8,430	31	318	349	290	3,855	4,145
Posts	M pieces	133		1	23	24	5	108	113	1	24	25
Miscellaneous ⁵	M cubic feet	626		64	24	88	8	4	12	53	19	72
Total	--	--		2	24	26	10	--	10	2	24	26
				2,201	10,901	13,102	6,191	12,711	18,902	1,981	7,029	9,010

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

² International $\frac{1}{4}$ -inch rule.

³ Rough wood basis.

⁴ Does not include 555,000 cubic feet of wood from sawmill residues used for domestic and industrial fuel.

⁵ Includes chemical wood, excelsior, handle stock, shingle bolts, etc.

⁶ Does not include 455,000 cubic feet of mill residues used for miscellaneous products.

DEFINITIONS OF TERMS

Forest Area

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

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

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

Forest Types

All local types are keyed to certain major forest types to facilitate combining the Connecticut estimates with estimates made for other states. The forest-cover types are classified according to the predominant species or species group as indicated by cubic volume for sawtimber and pole-timber stands, and number of trees for seedling-and sapling stands.

The forest-cover type map (page 18) is highly generalized; therefore small scattered stands do not show. For example, although white pine stands are found scattered throughout the state, the map shows only the more extensive white pine areas in the northwestern part.

White pine.--Forests in which 50 percent or more of the stand is white pine, red pine, or hemlock, singly or in

combination. Common associates include oaks, gray birch, and red maple. Atlantic white-cedar occurs to a very minor extent. (This type is part of the white-red-jack pine major forest-type group.)

Red-oak and white oak.--Forests in which 50 percent or more of the stand is in the specified oak species, singly or in combination, except where pitch pine comprises 25 to 49 percent, in which case the stand would be classified as oak-pine. Common associates include hickory, yellow-poplar, and red maple. (Part of the oak-hickory major forest-type group.)

Red maple.--Forests in which 50 percent or more of the stand is in red maple, elm, or ash, singly or in combination, but predominantly red maple. Common associates are oaks, beech, and sugar maple. (Part of the elm-ash-cottonwood major forest-type group.)

Northern hardwood.--Forests in which 50 percent or more of the stand is sugar maple, beech, or yellow birch, singly or in combination. Common associates include red maple, hemlock, elm, basswood, and white pine. (Part of the maple-beech-birch major forest-type group.)

Gray birch.--Forests in which 50 percent or more of the stand is gray birch or paper birch, singly or in combination. Common associates are red maple, redcedar, and pitch pine. (Part of the aspen-birch major forest-type group.)

Other hardwood types.--Forests in which 50 percent or more of the stand is chestnut oak or other species. Included in this type are a small amount of the oak-pine forest type (pine making up 25 to 49 percent of the stand) and a small amount of the eastern redcedar forest type. (Part of the oak-hickory major forest-type group.)

Stand-Size Classes

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

Poletimber stands.--Stands that fail to meet the sawtimber stand specification but are at least 10 percent

stocked with poletimber and larger trees (5.0 inches d.b.h. and larger) and have at least half of the minimum stocking in poletimber trees. Poletimber stands carry at least 200 cubic feet per acre.

Seedling-and-sapling stands.--Stands that do not qualify as either sawtimber or poletimber stands but have at least 10 percent stocking of trees of commercial species and have 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.

Tree Classes

Sawtimber trees.--Trees of commercial species that contain at least one merchantable sawlog, as defined below, and that are of the following minimum diameters at breast height (d.b.h.): Softwoods 9.0 inches; hardwoods 11.0 inches.

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

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

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

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

Timber Volume

Growing stock.--Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a mini-

mum 4.0-inch top of central stem, inside bark.

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

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

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.

Pulpwood Suitability

The pulpwood specifications used in this report are those set up by the Northeastern Technical Committee 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 suitable 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.)

HARDWOOD LUMBER LOGS

GRADE FACTORS ²		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 ³ 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

²End 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.

³A 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.

¹Ash and basswood butts can be 12 inches if otherwise meeting requirements for small No. 1's.

²10-inch logs of all species can be No. 2 if otherwise meeting requirements for small No. 1's.

³Otherwise No. 1 logs with 51-60 percent cull can be No. 2.

⁴Otherwise No. 2 logs with 51-60 percent cull can be No. 3.

The grade standards used for hardwood standard lumber logs in the forest survey of Connecticut.

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.

TIE AND TIMBER LOGS

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.
<p>* 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.</p> <p>** 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.</p>	

The standards used for hardwood tie and timber logs in the forest survey of Connecticut.

WHITE PINE LOGS

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 $\frac{2}{3}$ surface-clear in lengths 8 feet long or longer or 50% surface-clear full length.
	17+	10-16	30	Must be $\frac{1}{2}$ 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 $2\frac{1}{2}$ 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 $2\frac{1}{2}$ 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.

*The grade standards used for white pine logs
in the forest survey of Connecticut.*

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 grew up into sawtimber size 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 became growing-stock size 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 Connecticut 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.

ACCURACY OF THE ESTIMATES

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

kind, the probabilities are two out of three that the actual areas and volumes do not vary from the estimated by more than the following percentages:

	<u>Percent</u> (Plus or minus)
Commercial forest-land area	2
Net volume of live sawtimber	8
Net volume of growing stock	5
Net annual growth of growing stock	12
Annual cut of growing stock	16

In each of the tables, the total figures are more reliable than the subtotals. The subtotals are more reliable than any of the individual figures. Figures that are small in relation to totals are subject to larger sampling errors. The actual range of errors for county data is as follows:

	<u>Percent of error</u>	
	Low	High
Commercial-forest area	±2.5	±13.7
Growing-stock volume	±8.6	±19.8

SPECIES TALLIED

The various tree species⁷ tallied in Connecticut are listed below. Approved common names are shown in parentheses if these differ from the brief name used in the tables. Other tree species occur within the state, but unless they were tallied on the field plots they were not included in the following list.

Commercial Softwood Species

Hemlock (Eastern hemlock)	- <u>Tsuga canadensis</u>
White pine (Eastern white pine)	- <u>Pinus strobus</u>
Other eastern softwoods:	
Red pine	- <u>Pinus resinosa</u>

⁷Little, 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.

Northern white-cedar	- <u>Thuja occidentalis</u>
Pitch pine	- <u>Pinus rigida</u>
Eastern redcedar	- <u>Juniperus virginiana</u>

Commercial Hardwood Species

Northern red oak	- <u>Quercus rubra</u>
Other red oaks:	
Black oak	- <u>Quercus velutina</u>
Scarlet oak	- <u>Quercus coccinea</u>
Pin oak	- <u>Quercus palustris</u>
White oaks:	
White oak	- <u>Quercus alba</u>
Chestnut oak	- <u>Quercus prinus</u>
Other white oaks:	
Swamp white oak	- <u>Quercus bicolor</u>
Swamp chestnut oak	- <u>Quercus michauxii</u>
Red maple	- <u>Acer rubrum</u>
Yellow birch	- <u>Betula alleghaniensis</u>
Yellow-poplar	- <u>Liriodendron tulipifera</u>
Hickory	- <u>Carya species</u>
Beech (American beech)	- <u>Fagus grandifolia</u>
Elm	- <u>Ulmus species</u>
Ash	- <u>Fraxinus species</u>
Sugar maple	- <u>Acer saccharum</u>
Other eastern hardwoods:	
Sweet birch	- <u>Betula lenta</u>
American basswood	- <u>Tilia americana</u>
Paper birch	- <u>Betula papyrifera</u>
Black locust	- <u>Robinia pseudoacacia</u>
Sweetgum	- <u>Liquidambar styraciflua</u>
River birch	- <u>Betula nigra</u>
Aspen	- <u>Populus species</u>
Black cherry	- <u>Prunus serotina</u>
Blackgum	- <u>Nyssa sylvatica</u>
Butternut	- <u>Juglans cinerea</u>

Noncommercial Species

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

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