

BIRCH TIMBER RESOURCES OF NORTH AMERICA

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THE GENUS *BETULA* is composed of about 40 species of trees and shrubs. This paper deals with two of the most important: paper birch and yellow birch—their geographic ranges, areas of importance, cover types in which they are found, cubic- and board-foot volumes, estimates of growth-allowable cut, removal, and future volume trends.

Our data are drawn from numerous timber-resource reports. Most information presented here is based on surveys and compilations made in the 1960's; but where no later data were available, information collected during the 1950's was used. In Canada, where no data were available, information on similar areas and conditions was used to develop approximations.

PAPER BIRCH

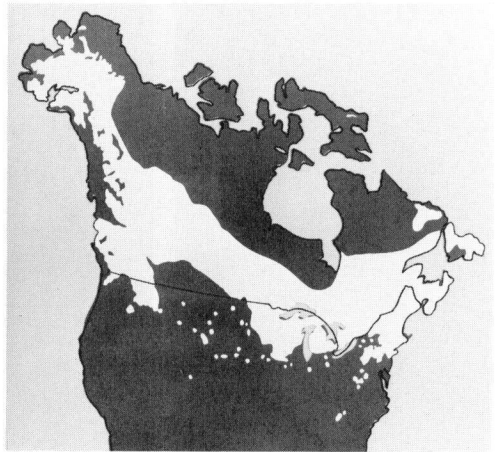
Range

Paper birch has a transcontinental range (fig. 1). It is a characteristic species of the Boreal Forest Region of Canada and Alaska, becoming shrublike as it approaches the northern limits of its range. Paper birch is also common in the states and provinces bordering the Great Lakes and the St. Lawrence River. It occurs in the United States in the northern border states, with outliers as far south as North Carolina, Colorado, and Oregon.

Cover Types

Paper birch is most commonly found in association with aspen, jack pine, red spruce, white spruce, balsam fir, hard maple, beech,

Figure 1.—The geographic range of paper birch in North America.



and yellow birch. Several birch cover types are recognized throughout its range. One of these, the paper birch type, includes forest land on which paper birch comprises a plurality of stocking. This cover type is most common in the Boreal Forest Region of Canada and Alaska. Paper birch also occurs commonly in the aspen-paper birch and maple-beech-birch types. In the United States, acreages in these types are estimated to be as follows:

	<i>Paper birch type (thousand acres)</i>	<i>Aspen-birch & maple-beech- birch type (thousand acres)</i>
Alaska	5,140	7,550
Lake States	1,600	27,270
Northeastern States	770	25,430
Other States	20	2,020
Total	7,530	62,270

Information about paper birch cover types in Canada is not available. However, the area occupied by hardwood and mixedwood stands similar to the aspen-birch and maple-beech-birch types is as follows:

	<i>(Thousand acres)</i>
Newfoundland	590
Maritime Provinces *	16,030
Quebec	65,600
Ontario	47,700
Prairie Provinces **	56,380
British Columbia	7,600
Total	193,900

* Nova Scotia, New Brunswick, and Prince Edward Island.

** Manitoba, Saskatchewan, and Alberta.

Volumes

Sawtimber.—The net volume of paper birch sawtimber in North America is estimated to be about 40 billion board feet (fig. 2). Of

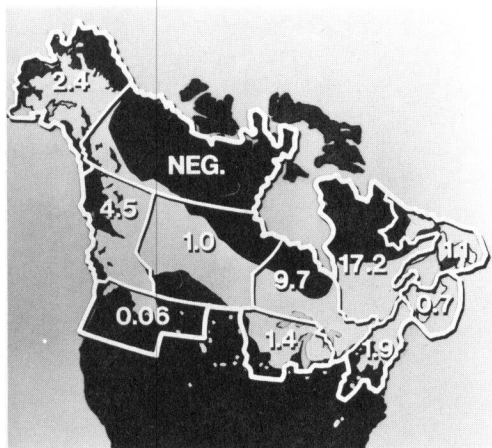


Figure 2.—Paper birch sawtimber volume, in billion board feet, by regions.

this, about 85 percent is in Canada and 15 percent is in the United States.

Approximately 42 percent of the United States volume is in Alaska, 34 percent in the Northeastern States, 23 percent in the Lake States, and 1 percent in the Pacific Northwest States. States having important sawtimber volumes of paper birch are:

<i>State</i>	<i>Million bd. ft. (Int. 1/4" rule)</i>
Alaska	2,430
Maine	990
Michigan	630
Minnesota	480
New Hampshire	360
New York	270
Wisconsin	240
Vermont	240
Other	140
Total	5,780

Half of the Canadian paper birch sawtimber volume occurs in Quebec, an additional 28 percent in Ontario, and 13 percent in British Columbia. After deductions for inaccessible stands and scattered and cull trees, the estimated paper birch sawtimber volume in Canada, in trees 10 inches d.b.h. and larger, is as follows:

	<i>Million board feet</i>
Quebec	17,150
Ontario	9,710
British Columbia	4,530
Newfoundland & Labrador	1,090
Prairie Provinces	990
Maritime Provinces	720
Total	34,190

Paper birch usually does not develop into a large or high-quality sawtimber tree. In states recently surveyed, 80 percent to almost 100 percent of the sawtimber volume was found to be in trees less than 17 inches d.b.h. Also in these states only 1 to 10 percent of the volume is in log grade 1—, and another 10 to 25 percent in log grade 2. Because of the generally low quality of the logs for lumber, most paper birch is harvested as boltwood and is used for sawed specialty products rather than for lumber.

Similar conditions are thought to prevail in Canada, where log diameter rather than defect is the controlling factor in log grade. Pockets of veneer-quality trees can be found

throughout the range, but for the most part sawlog quality is low. Cull volume increases rapidly on trees older than 100 years and the life expectancy of paper birch seldom exceeds 140 years.

Growing stock.—Paper birch growing-stock volume in North America is estimated to be about 36 billion cubic feet. Of this, about one-fifth is in the United States and four-fifths in Canada (fig. 3).

The growing-stock volume in the United States,¹ is approximately 7 billion cubic feet. Of this, 43 percent is in Alaska and is inaccessible to markets. Twenty-nine percent is in the Northeastern States, 27 percent in the Lake States and 1 percent in the Pacific Northwest States. The bulk of the volume is in poletimber-size trees. In some recently surveyed states, the distribution between the two size classes was as follows:

	<i>Poletimber</i> (percent)	<i>Sawtimber</i> (percent)
Alaska	78	22
Minnesota	88	12
New Hampshire	78	22
Vermont	72	28

¹ Growing stock is net volume of live merchantable sawtimber and poletimber trees from stump to a minimum 4-inch top diameter outside bark of central stem. Sawtimber trees are live merchantable trees 11.0 inches d.b.h. and larger. Poletimber trees are live merchantable trees 5.0 inches to 10.9 inches d.b.h.

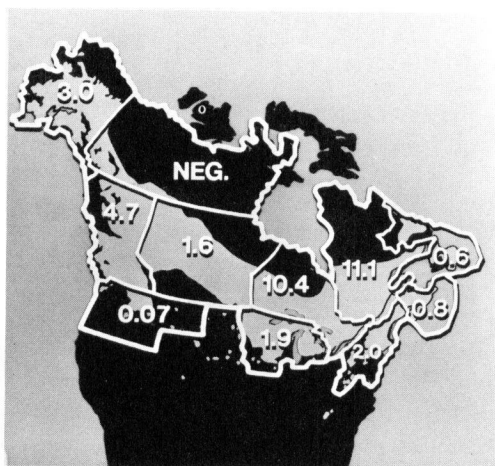


Figure 3.—Paper birch growing-stock volume, in billion cubic feet, by regions.

In addition to the growing-stock volume, rough and defective paper birch timber in the United States not now or prospectively merchantable would add another 10 to 15 percent (about 1 billion cubic feet) to the total volume figure.

In Canada the paper birch growing-stock volume² is estimated at 29 billion cubic feet. Of this total approximately 4.5 billion cubic feet are considered to be inaccessible for exploitation at present. Not included in these estimates are paper birch volumes in the Yukon and Northwest Territories, which do contain stands of small paper birch, but where both use and accessibility are extremely limited.

The bulk of the Canadian growing-stock volume, 74 percent, occurs in Quebec and Ontario, and British Columbia accounts for another 16 percent of the total. The relationship of poletimber volume to sawtimber volume varies widely across the country as a result of growing conditions, fire history, area exploitation, and prevalence of the birch dieback. The distribution between the two size classes is estimated to be as follows:

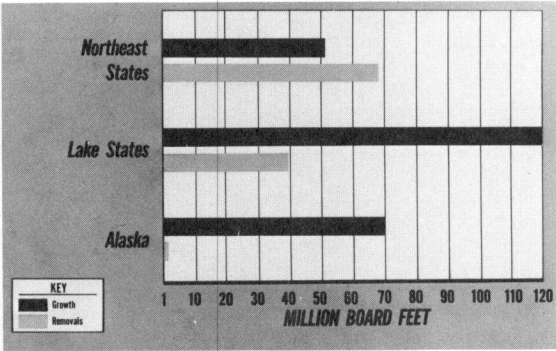
	<i>Poletimber</i> (percent)	<i>Sawtimber</i> (percent)
Newfoundland	58	42
Maritime		
Provinces	74	26
Quebec	28	72
Ontario	61	39
Prairie Provinces	79	21
British		
Columbia	42	58

Growth and Removal

The growth-removal relationship for paper birch sawtimber varies according to region (fig. 4). In Maine, the annual sawtimber removal is about double annual growth. However, in Alaska, where less than 1/2 million board feet are cut annually, the annual growth of paper birch sawtimber exceeds removal by over 100 times. Current growth on the growing stock in the United States is estimated to be at the rate of about 21 1/2 percent, and annual growth of paper birch growing stock timber is at least double the

² The Canadian Department of Forestry defines growing stock as the net volume in poletimber and sawtimber trees exclusive of top, stump, and cull. Poletimber trees are 3.5 to 9.4 inches d.b.h. Sawtimber trees are 9.5 inches d.b.h. and larger.

Figure 4.—Paper birch sawtimber growth-removal relationships for selected U.S. regions, 1967.



removal in every state (fig. 5). Overall growth of paper birch growing stock exceeds removal by about four times. Annual mortality of paper birch is of major importance; it almost equals annual removal.

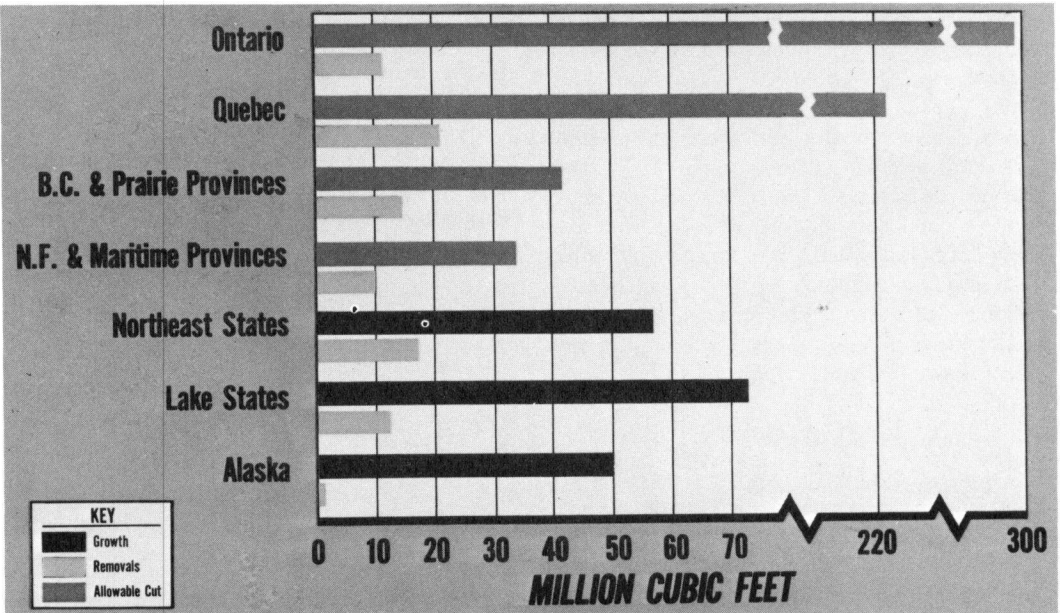
Growth data are not available for much of Canada. The fragmentary data that are available indicate that in the southern areas east of Lake Superior a 4-percent growth rate may be achieved if age-class distribution is more

or less normal. However, much of the Canadian paper birch is mature and even over-mature; therefore total net growth figures, if available, would probably indicate little net growth. For these reasons allowable annual removal has been calculated. This is related to actual removal in figure 5. Allowable annual removal for paper birch for Canada as a whole is 10 times greater than actual removal.

In Canada, present demand for paper birch is extremely limited. Besides some sawlogs and pulpwood cut in Ontario, Quebec, and the Maritime Provinces, the only product of significance is fuelwood. Generally, paper birch trees are bypassed in pulpwood and saw-log operations; and if not killed during the harvesting process, they form a major portion of many residual stands.

The steady decline during the last four decades in acreages burned in the Boreal Forest Region of Canada undoubtedly will reduce the acreage of paper birch stands in the future. The birch dieback of the 1940 era drastically reduced the sawtimber and growing-stock volumes in Quebec and the Maritime Provinces and to a lesser extent in Ontario. The total effect of the dieback has never

Figure 5.—Paper birch growing-stock relationships between annual allowable cut—actual removal and annual growth—removal, for selected Canadian and U.S. regions, 1960-68.



been calculated; however, standing dead-tree volume of paper birch on some 8 million acres of productive forest in New Brunswick in the 1950's was 2½ times larger than livetree volume. Most of the dead-tree volume was in the large diameter classes.

Outlook

Any projection of paper birch timber supply is subject to many uncertainties and must be based on a number of assumptions. The principal assumptions we are making are that: the current growth-removal relationships will remain fairly constant; forest land area that is growing paper birch will not increase or decrease significantly; and demand will increase for the better quality timber.

Our review shows that only in the North-eastern States do industrial removals have a significant effect on sawtimber volumes. In all other areas, cutting has had little effect on the size of the resource. Fire, insects, diseases, and climatic factors are likely to be the major determinants of future volume changes in these areas. A return of the die-back could result in a dramatic reduction of paper birch volumes in a short time, particularly in the sawtimber-size classes. In Alaska, expansion of population and transportation facilities will gradually bring a greater portion of the paper birch resource into industrial production.

For these reasons, we expect that in the United States both sawtimber and growing-stock volumes will increase at a moderate rate for the next 20 to 30 years. However, accessible high-quality sawtimber will be increasingly scarce.

In Canada, many of the mature and over-mature paper birch stands are approaching the end of their life expectancy. Without further disturbances by fire or heavy cutting, these stands may not be renewed. In areas now being harvested, the management objective is not to perpetuate paper birch. Because of these two factors the area and volume of paper birch in Canada may decline slowly in the future.

YELLOW BIRCH

Range

Yellow birch occurs in southeastern Canada and the northeastern United States (figure 6). In Canada, it occurs from Newfoundland and the St. Lawrence area westward through



Figure 6.—The geographic range of yellow birch in North America.

southern Quebec and Ontario to the north shore of Lake Superior. In the United States it occurs in New England, the Lake States, and southward in the Appalachian Mountains as far as eastern Tennessee and northern Georgia.

Cover Types

Yellow birch seldom occurs in pure stands. Common associates include beech, sugar maple, hemlock, red spruce, balsam fir, white pine, and a number of other hardwood species.

Much of the yellow birch timber is found in the maple-beech-birch cover type, defined by the U.S. Forest Service as forests in which maple, beech, or yellow birch, singly or in combination, comprise a plurality of the stocking. This type covers 32 million acres or about 9 percent of all the forest land in the eastern United States:

State	Million acres
New York	5.8
Michigan	5.2
Maine	5.1
Pennsylvania	3.5
Wisconsin	3.0
West Virginia	2.3
Vermont	2.0
New Hampshire	1.3
Other States	3.8
Total	32.0

In Canada, the maple-beech-birch cover type is not recognized. However, hardwood and mixedwood areas on which yellow birch may be found amount to about 74 million acres, distributed as follows:

Province	Million acres
Maritime Provinces	16.0
Quebec	34.0
Ontario	23.7
Total	73.7

Volumes

Sawtimber.—The net volume of yellow birch sawtimber in North America is estimated to be about 34 billion board feet. Of this, 25 percent is in the United States and 75 percent in Canada (fig. 7).

The largest volumes of yellow birch sawtimber are found in Quebec, Ontario, Maine, Michigan, New York, and New Brunswick. Other states and provinces having more than 100 million board feet of yellow birch sawtimber are New Hampshire, Wisconsin, Vermont, West Virginia, Nova Scotia, Pennsylvania, Connecticut, and Massachusetts.

The Canadian yellow birch sawtimber volume greatly exceeds that of the United States (fig. 7). The Province of Quebec contains more than half of the total United States and

Canadian volume. It should be noted that Canadian and United States figures are not exactly comparable because the Canadian sawtimber volumes are for trees 10 inches d.b.h. and over, while in the United States, sawtimber volume includes trees 11 inches d.b.h. and over.

Yellow birch is in strong demand for furniture, lumber, and veneer; as a result, the larger and better trees are usually the ones harvested. This results in a disproportionate volume in trees less than 17 inches at d.b.h. In several recently surveyed states, more than two-thirds of the volume was in trees less than 17 inches d.b.h.

For the same reasons, quality of yellow birch sawtimber is low. In Vermont, only 15 percent of the sawtimber volume was in log grade 1 while in Minnesota 20 percent was in grade 1. The quality of yellow birch sawtimber in Canada is also considered to be low, although there are very few statistics to bear this out. Cull studies carried out in the important yellow birch regions of Ontario show that only 12 percent of the gross merchantable volume of logs is Grade 1. Grade tends to decrease near the northern and western limits of the range.

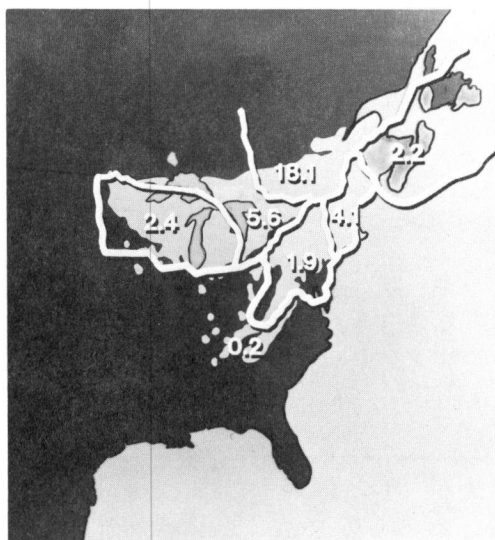
Growing stock.—Growing stock (all merchantable trees 5 inches d.b.h. and larger in the U.S.; 4 inches d.b.h. and larger in Canada) is estimated to be about 13 billion cubic feet. About 72 percent of this is in Canada and 28 percent is in the United States (fig. 8). Approximately half of the growing-stock volume in the United States is of less than sawlog size. States having more than half of their yellow birch volume in sawtimber-size trees are Michigan, Wisconsin, Maine, and New York. In other states, volume in pole-timber-size trees exceeds volume in sawtimber-size trees.

The provinces having the highest proportion of yellow birch in sawtimber-size trees are Quebec (84 percent) and Ontario (75 percent). It must be noted that growing-stock volume of Quebec accounts for about half of the total North American yellow birch volume.

Growth and Removal

Growing stock.—In the United States, yellow birch growing-stock volumes are increasing because overall the annual growth exceeds the annual removal (fig. 9). The annual rate

Figure 7.—Yellow birch sawtimber volume, in billion board feet, by regions.



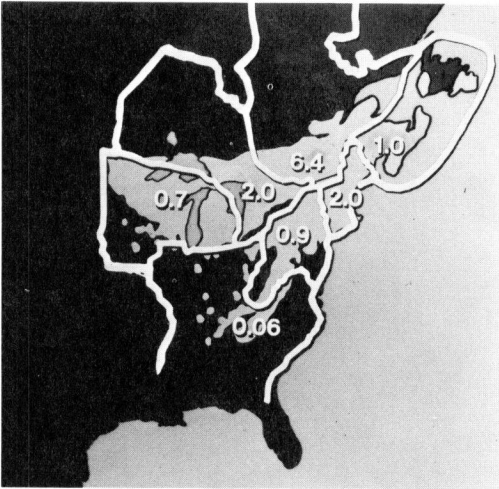


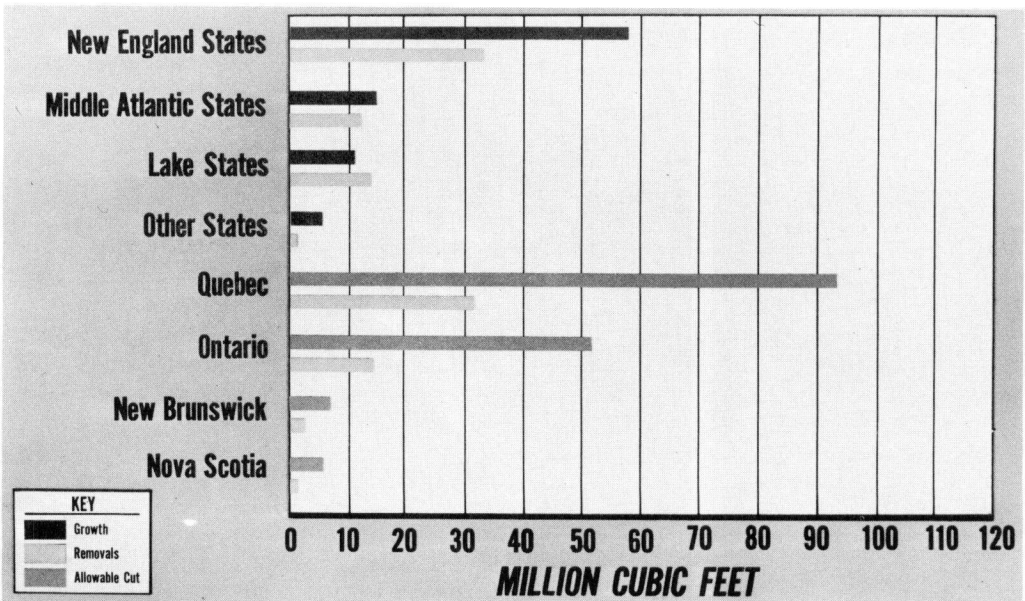
Figure 8.—Yellow birch growing-stock volume, in billion cubic feet, by regions.

of growth is approximately $2\frac{1}{2}$ percent of the volume, while annual cut is less than 2 percent of the total volume. However, the annual removals are increasing at a rapid rate and in some States — notably New York, Michigan, Wisconsin, and Vermont—removal now exceeds growth.

Limited information indicates that growth rate in Canada is about $2\frac{1}{2}$ percent in the southeastern portion of the range. The low growth rate may in part be due to premature mortality of many of the larger trees that were weakened by the dieback and are now dying from other causes. In part of Nova Scotia there has been a decided decrease in yellow birch growing stock over the last 10 years, and industrial removal does not account for all of this decrease. Throughout the remainder of the range, growing stock is either maintaining present volume or is on the increase.

Since reliable growth data are not available for Canada, allowable annual removal has been calculated. The overall actual removal-allowable removal relationship indicates that much greater annual removal could be sustained. Quebec, which accounts for the major supply of yellow birch, removed only about

Figure 9.—Annual relationships between growth—removals and allowable cut—removals for yellow birch growing stock in Canadian and U.S. regions.



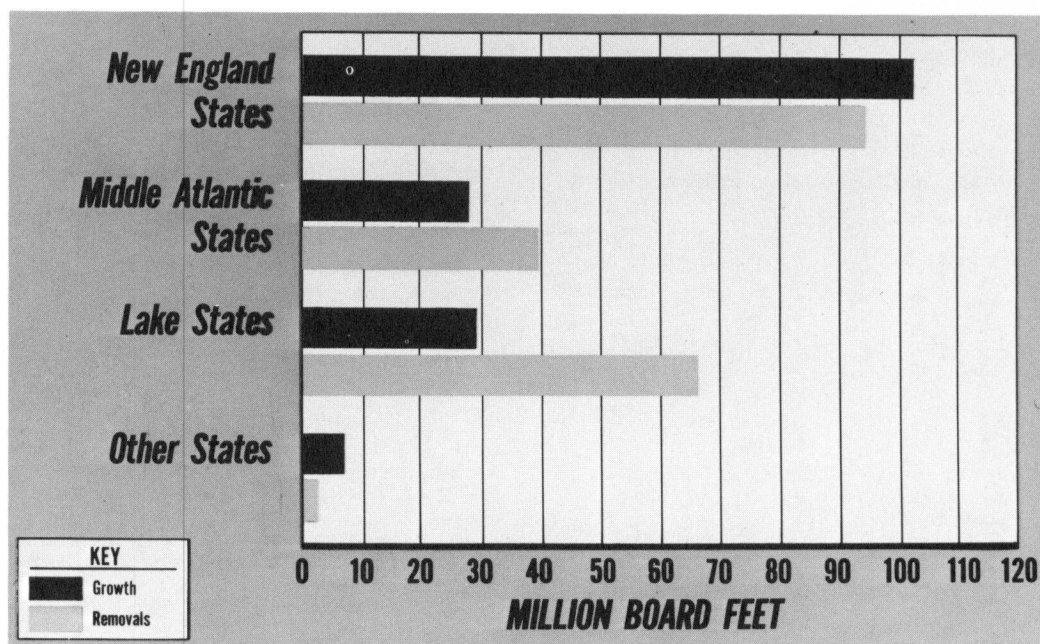


Figure 10.—Annual relationship between growth and removals for yellow birch sawtimber in U.S. regions, 1967.

35 percent of its estimated allowable removal. Ontario, New Brunswick, and Nova Scotia removed 23, 15, and 12 percent respectively of their estimated allowable removal volume.

The birch dieback dramatically reduced yellow birch growing stock, particularly in all of New Brunswick and the Gaspé and southern areas of Quebec. In 1948, it was estimated that there was a 40- to 90-percent kill of yellow birch in this area and an additional 15- to 40-percent mortality on an equal size adjacent area. Even by 1958 the volume of dead standing yellow birch in New Brunswick was more than twice that of live trees.

Sawtimber.—In contrast to the excess of annual growth over annual removal of all yellow birch growing stock in the United States, the annual removal of sawtimber-size yellow birch exceeds annual growth, according to recent estimates (fig. 10). Sawtimber growth is at a rate of about 2 percent annually while removal is estimated to be at a rate of 2½ percent annually. In Michigan, New York, Wisconsin, and Vermont annual sawtimber removal is more than double annual growth.

Outlook

Future demand for yellow birch will depend on such things as consumer preferences, population changes, consumer buying power, and substitution of other woods or material for products made of yellow birch. Changes in any of these factors will change the yellow birch supply-demand relationship.

In United States.—Yellow birch sawtimber is in strong demand for furniture and related uses. Current heavy removal is causing sawtimber volume to decline. The outlook is for increasing demand and a further reduction of volume in the areas accessible to the birch-using industries. Quality timber in accessible stands will become progressively scarcer.

In Canada.—Over the last 20 years yellow birch lumber production has shown a slightly declining trend. On the other hand, peeler log consumption is on the increase. In total it appears that the volume of yellow birch logs removed annually will be maintained at present levels at least over the short term. The quality of logs harvested appears to be declining. Undoubtedly this is a result of the dieback, which virtually eliminated all trees

above 24 inches d.b.h. and seriously depleted the other large diameter classes throughout most of the Canadian range. Thus present removal, although considerably below calculated allowable removal, is concentrated on a relatively small and abnormally distributed growing stock.

Evidence suggests a general build-up in yellow birch growing stock in Canada, and

over the long term there should be a corresponding increase of volumes in trees 10 inches d.b.h. and over. Assuming that the dieback does not recur, and given a reasonable level of management, it is conceivable that over the long term yellow birch may again become a significant feature in the forests of its Canadian range; but it is extremely unlikely that it will ever again be present in predieback volumes.

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