

Maple

(*Acer* species)

By H. S. Betts, *senior engineer, Division of Forest Products*¹

The maples that grow in the United States include 13 or fewer species and several additional varieties. Of these, sugar maple is by far the most important as well as the most abundant. Other maples of commercial importance are black maple, silver maple, red maple, boxelder, and bigleaf maple. The commercial maples grow throughout the eastern United States and in southeastern Canada, with the exception of bigleaf maple, which grows on the west coast. They form a very conspicuous and beautiful part of the landscape in the fall of the year, when their leaves turn red, crimson, or yellow. Since all the maples produce seed with ample wings, there is considerable seed distribution by wind. Sugar maple grows more slowly than the soft maples.

The heavy, hard wood of sugar and black maple resists abrasion especially well. Sugar maple flooring is widely used and gives excellent service under severe conditions, such as are found in dancehalls, bowling alleys, and shops. Considerable quantities of sugar maple also go into furniture, boxes and crates, shoe lasts, handles, woodenware, distillation, veneer, railroad ties, and pulpwood. Black maple is commonly cut and marketed with sugar maple and used for the same purposes without distinction.

About one-quarter of the maple lumber produced comes from Michigan, where more than one-fifth of the total stand is located. In the production of hardwood lumber, maple ranks third (1954), being exceeded only by oak and yellow-poplar. Maple sugar, made by boiling the sap of the sugar maple, has had much to do with the widespread popularity of the tree. Maples also are widely planted for shade and ornament. Sugar maple is the State tree of New York, Vermont, West Virginia, and Wisconsin, while maple is the State tree of Rhode Island.

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Nomenclature.—The six species of maple of commercial importance in the United States are as follows:

<i>Common name</i>	<i>Botanical name</i>	<i>Other names</i>
Sugar maple.....	<i>Acer saccharum</i>	Hard maple. Rock maple.
Black maple.....	<i>Acer nigrum</i>	Black maple. Hard maple.
Silver maple.....	<i>Acer saccharinum</i>	Black sugar maple. Sugar maple. White maple.
Red maple.....	<i>Acer rubrum</i>	Soft maple. River maple. Water maple. Swamp maple.
Boxelder.....	<i>Acer negundo</i>	Soft maple. Water maple. Scarlet maple.
Bigleaf maple.....	<i>Acer macrophyllum</i>	White maple. Swamp maple. Ash-leaf maple. Manitoba maple. Oregon maple.

Quite frequently the wood of the maples is divided into two classes, "hard maple" and "soft maple." Hard maple includes sugar maple and black maple. Black maple also is considered as a variety of sugar maple, and the two intergrade. Soft maple is made up largely of

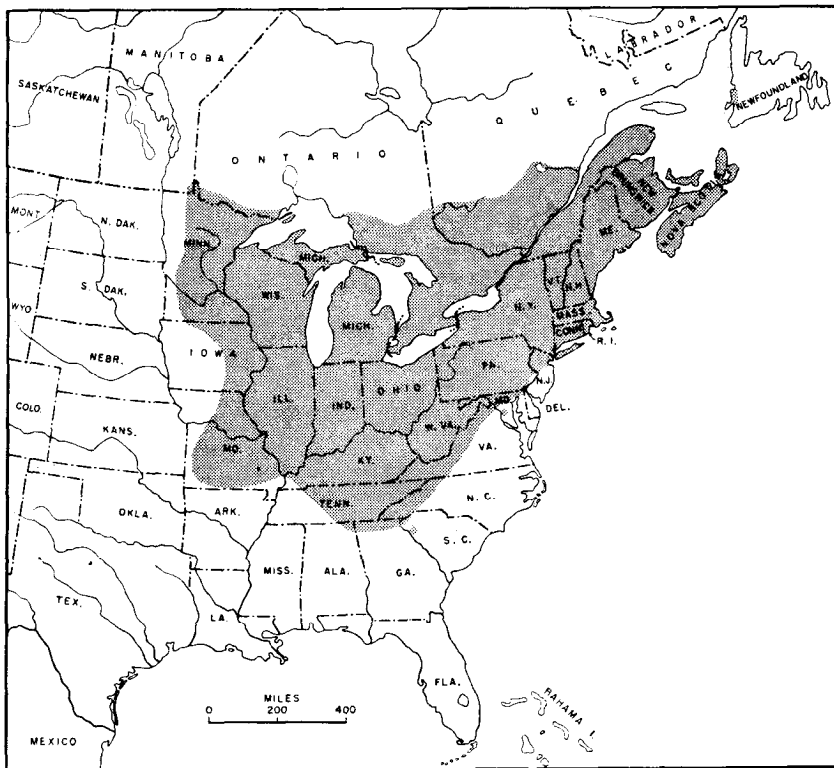


FIGURE 1.—Range of sugar maple (*Acer saccharum*; typical, excluding varieties).

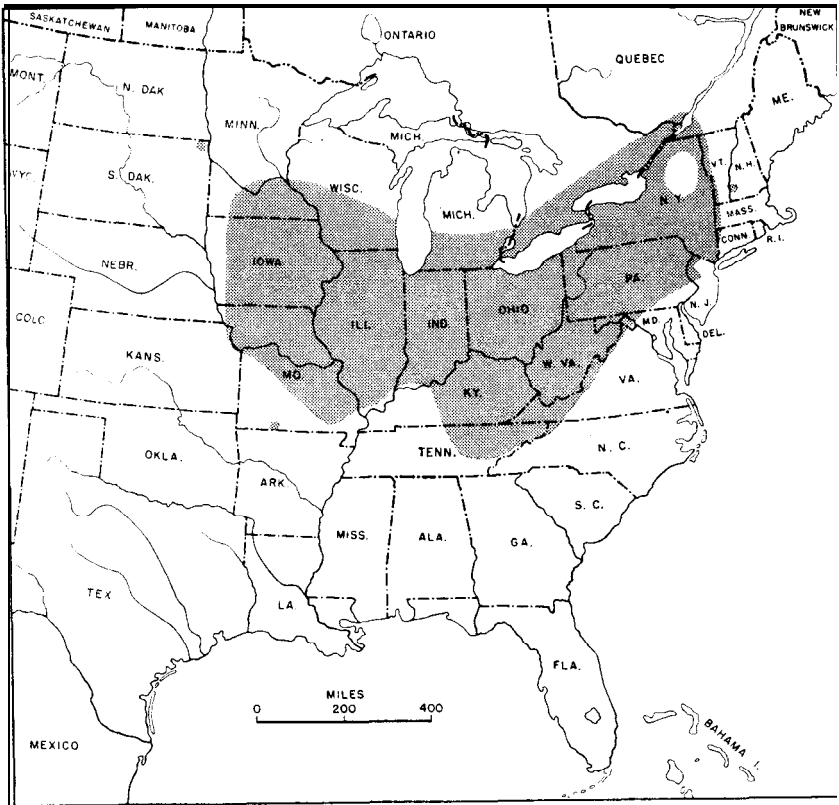


FIGURE 2.—Range of black maple (*Acer nigrum*).

silver maple and red maple with a very small proportion of box-elder. Bigleaf maple is used as such in the regions where it grows.

Distribution and growth.—Sugar maple grows from southeastern Canada and Maine to Minnesota and south to Missouri and Alabama (fig. 1). Southward it intergrades with Florida maple, which also is regarded as a variety. The largest quantities are in the Lake States and the Northeast. Sugar maple grows singly or in groups in mixed stands of hardwoods. Mature trees ordinarily are from 30 to 40 inches in diameter and 80 to 120 feet in height. Forest-grown trees may have a clear bole of 60 feet.

Sugar maple is a prolific seeder, endures shade, and grows well on reasonably good soil. It does not do well on poor soil and is not a fast grower at best. Growth of sugar maple is greatly influenced by environment. Densely stocked seedlings may grow as slowly as 1 inch in diameter and 14 feet in height in 20 years. Sprouts grow more rapidly. Average growth in diameter of timber-size trees may range from 10 to 25 rings per radial inch, depending upon stand density and site quality. Old-growth trees have recorded ages of 300 to 400 years or more, heights of 70 to 110 feet, and diameters of more than 40 inches.

Black maple has a more limited range than sugar maple. It grows from western New England westward to Minnesota, and southward

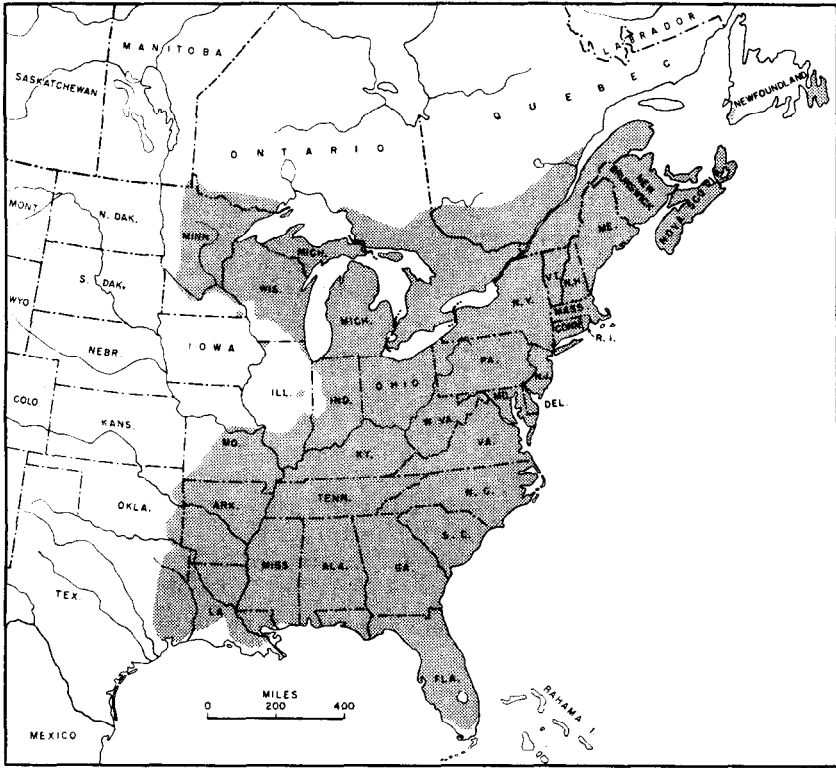


FIGURE 4.—Range of red maple (*Acer rubrum*).

moist situations. It is a short-lived tree, rarely attaining large diameters but grows under a wide range of temperature, elevation, and moisture. Boxelder is the only commercially important maple with a compound leaf. Full-grown trees are from 50 to 70 feet high and 1½ to 3 feet in diameter.

Bigleaf maple grows in a rather narrow strip along the western coast of the United States, from northwestern British Columbia to southern California (fig. 6). It grows best in Oregon and Washington and is generally found mixed with other species along the banks of streams and in fertile bottom lands. Under favorable conditions the tree reaches a height of 80 or 100 feet. The trunk, however, is generally rather short. The leaves are sometimes a foot wide.

Supply.—The total stand of maple of sawtimber size in the United States amounted to 37 billion board-feet in 1953. More than two-thirds of the total volume of the stand was located in the New England, Middle Atlantic, and Lake States regions :

Region:	Sugar maple (million bd.- ft.)	Soft maple (million bd.- ft.)	Total (million bd.- ft.)
New England.....	6,315	1,098	7,413
Middle Atlantic.....	7,289	4,304	11,593
Lake States.....	6,080	2,047	8,127
Central States.....	2,833	2,704	5,537
Other.....	412	3,760	4,172
Total.....	22,929	13,913	36,842

Sugar maple comprised about 62 percent of the total volume of maple sawtimber in 1953; soft maples the remaining 38 percent. The volume of sugar maple was about equally divided among the New England, Middle Atlantic, and Lake States regions. Maine, New York, Pennsylvania, Michigan, Wisconsin, and West Virginia were the leading States in terms of volume. Soft maple was concentrated in the Middle Atlantic and Central States, with a substantial volume located in the more southern States.

Properties.—The heartwood of sugar maple is light reddish brown. The sapwood is commonly white, sometimes with a slight, reddish-brown tinge. The average width of sapwood in logs cut in Vermont varied from 3.2 inches in S-inch logs to 5 inches in 19-inch logs, or about 90 percent sapwood in the logs measured. The annual rings are marked by a thin darker line of denser wood but are not very distinct.

Sugar maple has a fine, uniform texture, turns well on a lathe, is markedly resistant to abrasive wear, and is without characteristic odor or taste. It is harder to work with tools than the softer woods. The wood is heavy,² strong, stiff, hard, has a high resistance to shock, and ranks high in nail-holding ability. It has a large shrinkage and presents some difficulties in drying which can, however, be readily overcome by proper methods. The grain is generally straight. Occasionally, however, sugar maple occurs with curly, wavy, or bird's-eye grain.

²The average weight of sugar maple when thoroughly air-dry (12 percent moisture) is 44 pounds per cubic foot.

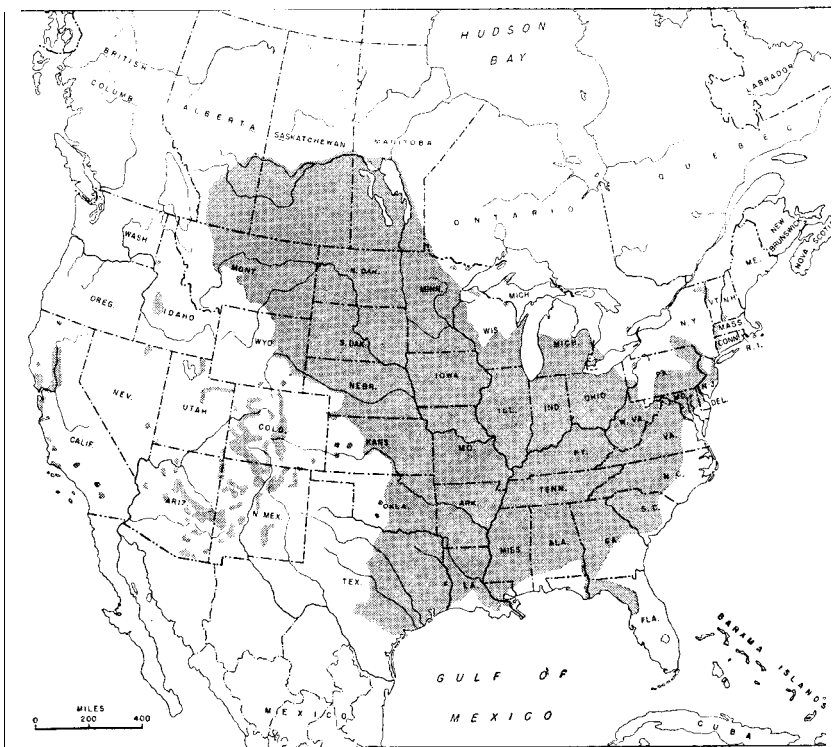


FIGURE 5.—Range of boreal maple (*Acer negundo*).

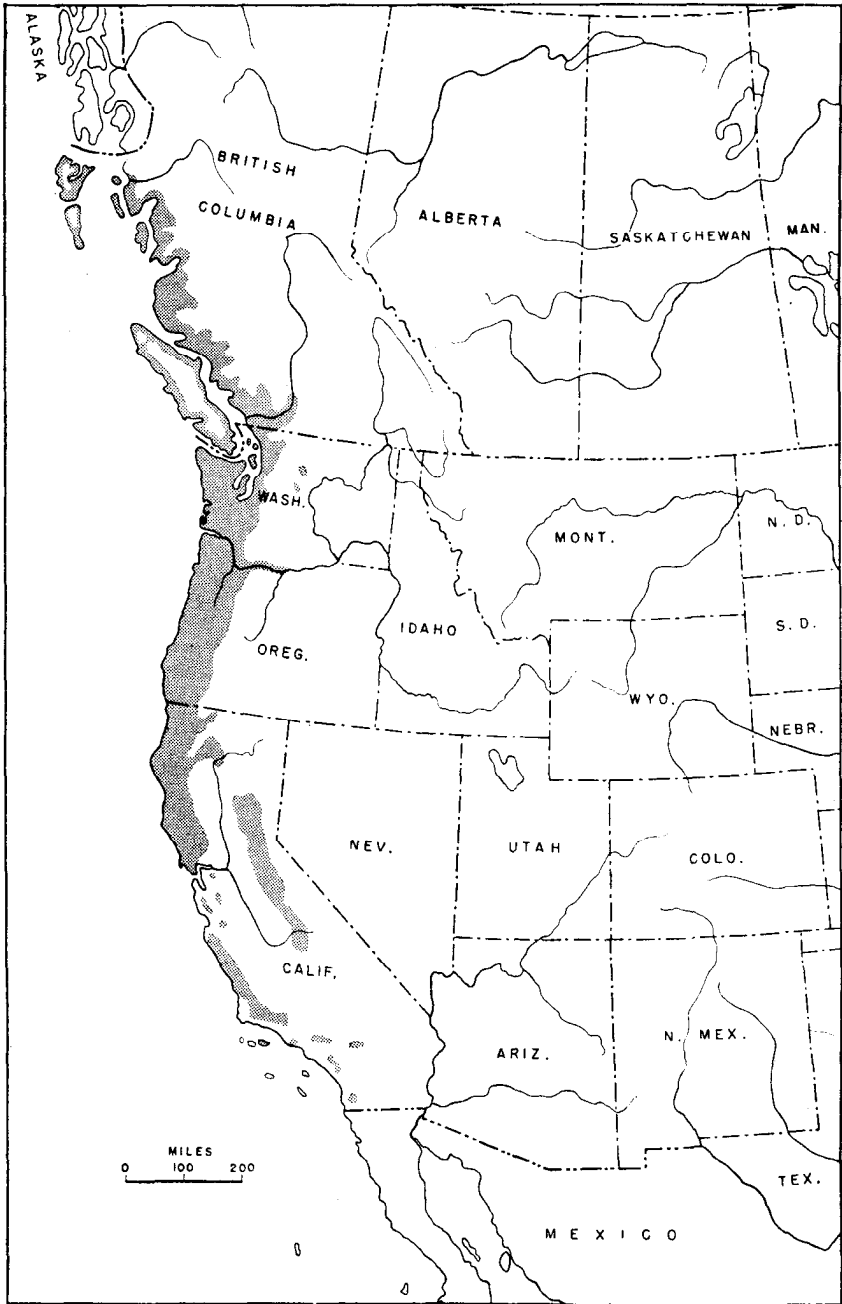


FIGURE 6.—Range of bigleaf maple (*Acer macrophyllum*).

Bird's-eye enhances the value of the wood. The cause of this phenomenon has not been determined. Bird's-eye may be recognized in the bark and outer wood of standing trees. Very slow growth in early life appears to be one common characteristic of trees with bird's-eye.

Maple lumber sometimes has olive or greenish-black discolored areas known as mineral stain or mineral streak; these areas may develop small cracks during seasoning. The cause of mineral stain is not definitely known, but it is thought by some to be traceable to injury.

The wood takes stain satisfactorily and is capable of a high polish. In ease of gluing, it has an intermediate rank. In resistance to decay it has a low rank, being classed with birch, ash, spruce, and hemlock in this respect. Black maple approaches sugar maple closely in its properties.

The wood of the soft maples, largely silver maple and red maple with a small proportion of boxelder, resembles that of the hard maples but is not so heavy,³ hard, and strong. Red maple is somewhat above silver maple in its strength properties⁴ The sapwood in the soft maples is considerably wider than in the hard maples and the heartwood lighter in color. Bigleaf maple ranks between these two soft maples in strength properties.

Both hard and soft maple are classed among the woods whose heartwood is moderately difficult to penetrate with a preservative.

Principal uses.—Maple is used principally for lumber, distillation, veneer, crossties, and paper pulp. A large proportion of maple lumber, probably as much as 90 percent, is further manufactured into a variety of products, including flooring, furniture, boxes and crates, shoe lasts, handles, woodenware, novelties, motor-vehicle parts, spools and bobbins. Light-colored maple furniture in simple designs and with a rubbed finish has been in vogue for years. The hardness, resistance to abrasion, and uniform texture of sugar maple make it especially suitable for flooring. For bowling alleys, dance floors, and factory floors, it is the outstanding wood.

The uniform texture of sugar maple combined with the necessary strength and hardness has made it a preferred wood for musical instruments, especially for piano frames. Other specialty uses for sugar maple are shoe lasts, for which it furnishes a large proportion of the wood used, bowling pins, billiard cues, Indian clubs, dumbbells, butcher's blocks, churns, chopping bowls, breadboards, cant-hook handles, croquet mallets and balls, and many turned products.

Maple is one of the principal woods used in the hardwood distillation industry for the production of charcoal, acetic acid, and methanol (wood alcohol). Veneer cut from maple is used to a considerable extent for fruit and vegetable packages and also in the manufacture of plywood. The maples are used in fairly large quantity in the manufacture of white printing and writing papers. They are generally pulped in mixture with other hardwoods like aspen, birch, beech, and oak. The soda, sulfate, and semichemical processes are used mostly for pulping.

Sugar maple is the source of maple sugar. The trees are tapped in the early spring by boring one or two half-inch holes in each trunk and inserting spouts or tubes, generally of metal. The sap flows from the spouts and is collected in buckets and boiled or evaporated to a

³The average weight of silver maple and red maple in a thoroughly air-dry condition (12 percent moisture) is 33 and 38 pounds per cubic foot, respectively.

⁴Data are not available on the strength of boxelder. It is commonly considered to be the lightest, softest, and weakest of the maples.

sirup. In "sugaring off," the concentration by evaporation is carried farther and the sirup becomes a sugar.

A single tree yields from a pint to a gallon of sirup, or from 1 to 8 pounds of maple sugar in a season. The average production per tree in a good sugar grove is about 2½ pounds of sugar or 2½ pints of sirup during a season. It usually takes 32 gallons of sap to make a gallon of sirup or 8 pounds of sugar. In 1860, 1,598,000 gallons of maple sirup and 40,120,000 pounds of maple sugar were produced in the United States from 23 States. For the 10-year period 1928-37, average annual production was 2,628,000 gallons of sirup and 1,548,000 pounds of sugar from an average of 12,390,000 trees tapped per year. During this 10-year period Vermont led in average annual production of sugar, with New York second and Pennsylvania third. Vermont also led in sirup produced, with New York second and Ohio third.

In 1940, 2,680,000 gallons of sirup and 550,000 pounds of sugar were produced from 10,288,000 trees. By 1950 the number of trees tapped had dropped to 8,146,000. That year sugar production was 257,000 pounds and sirup production 2,024,000 gallons. Production has continued to decrease. In 1956 only 5,979,000 trees were tapped; sugar that year amounted to 101,000 pounds and sirup 1,559,000 gallons. Vermont, New York, and Ohio led in production in the order named.

Table 1 shows the amounts of maple used in the manufacture of various classes of products in specified years. The figures include maple in the form of lumber with smaller amounts of logs, bolts, and veneer.

TABLE 1.—*Maple used in the manufacture of wooden products, by specified years, 1912-48.*

Product	1912	1928	1933	1940	1948
	<i>M bd.-ft.</i>	<i>M bd.-ft.</i>	<i>M bd.-ft.</i>	<i>M bd.-ft.</i>	<i>M bd.-ft.</i>
Airplanes.....		37	37	160	80
Agricultural implements.....	48,319	6,985	699	7,344	5,400
Boot and shoe findings.....	54,050	46,894	33,344	71,353	41,582
Boxes, cigar and tobacco.....	96		322		
Butchers' blocks.....	¹ 2,145	¹ 3,202	¹ 2,636	5,741	8,746
Car construction and repair.....	5,789	5,862	1,677	626	1,219
Caskets and burial boxes.....	110	318	120	691	1,888
Conduits, pumps, wood pipe.....	1,706	170	40	148	2
Containers (except cooper- age).....	² 96,832	² 94,535	45,187	155,591	47,554
Crossarms.....	(³)	(³)	(³)	(³)	7
Dairy, poultry, other sup- plies.....	(⁴)	136	2,847	7,818	230
Dowels, skewers, and wedges.....	⁵ 1,355	⁵ 2,039	⁵ 296	2,712	4,360
Electrical equipment.....	1,191	4,957	706	1,757	3,244
Fixtures.....	20,701	3,764	1,809	3,631	11,483
Flasks.....	(⁶)	(⁶)	(⁶)	(⁶)	86
Flooring.....	(⁷)	(⁷)	69,373	145,704	92,993
Furniture.....	134,837	93,703	71,118	144,789	226,552
Grain doors.....	(⁸)	(⁸)	(⁸)	(⁸)	728
Gunstocks, firearms.....					12
Handles.....	43,715	11,095	11,225	33,769	17,319
Housetrainers.....	(⁹)	(⁹)	(⁹)	(⁹)	140
Instruments, musical.....	45,483	9,542	1,543	5,774	14,465
Instruments, professional and scientific.....	4,425	5,476	705	1,742	4,344

See footnotes at end of table.

TABLE 1.—Maple used in the manufacture of wooden products, by specified years, 1912-48—Continued

Product	1912	1928	1933	1940	1948
Ladders.....	M bd.-ft. (4)	M bd.-ft. (4)	M bd.-ft. 2	M bd.-ft. 43	M bd.-ft. 101
Laminated structural members.....	(3)	(3)	(3)	(3)	8
Laundry appliances.....	14, 219	1, 836	49	9, 159	7, 056
Machinery.....	8, 995	1, 916	826	5, 707	3, 211
Matches.....	¹⁰ 1, 200	-----	162	17	538
Millwork.....	¹¹ 318, 084	¹¹ 202, 577	¹² 3, 258	¹² 6, 210	¹² 6, 308
Pallets.....	(¹³)	(¹³)	(¹³)	(¹³)	7, 426
Patterns.....	¹⁴ 118	¹⁴ 352	41	667	¹⁵ 2, 247
Pipes, tobacco.....	-----	60	33	36	47
Plumbers' woodwork.....	388	2, 180	1, 146	1, 400	5, 481
Prefabricated houses and house panels.....	(3)	(3)	(3)	(3)	113
Prefabricated structures except houses.....	(3)	(3)	(3)	(3)	57
Printing material.....	704	635	951	300	468
Radios, phonographs, sewing machines.....	¹⁶ 324	¹⁶ 1, 108	190	527	5, 446
Refrigerators.....	¹⁷ 6, 375	¹⁷ 4, 392	1, 241	6, 450	1, 224
Rollers, shade and map.....	880	120	20	273	695
Ship and boat building.....	1, 014	300	171	425	141
Shuttles, spools and bobbins.....	13, 531	10, 771	6, 973	22, 089	21, 811
Signs, scenery, displays.....	102	64	10	122	733
Sporting equipment, athletic and playground.....	5, 768	9, 523	1, 592	13, 644	41, 088
Surgical supplies.....	147	24	-----	40	219
Tanks.....	200	17	43	11	58
Toys.....	3, 964	4, 933	3, 588	10, 252	6, 435
Trunks and valises.....	5, 047	6	18	-----	2
Vehicles, motor.....	(¹⁸)	205, 455	14, 201	17, 626	5, 859
Vehicles, nonmotor.....	55, 863	5, 593	932	599	452
Venetian blinds.....	-----	-----	-----	41	66
Woodenware, novelties, and miscellaneous.....	41, 743	11, 794	10, 104	24, 654	25, 281
Total.....	939, 420	752, 371	289, 235	709, 642	625, 005

¹ Includes skewers.

² Does not include maple used for containers by plants not classified as manufacturers of wooden products and included in later surveys.

³ Included in "Millwork."

⁴ Included in "Woodenware and novelties."

⁵ Includes dowels only.

⁶ Included in "Patterns."

⁷ Included in "Millwork."

⁸ Included in "Car construction and repair."

⁹ Included in "Vehicles, nonmotor."

¹⁰ Includes toothpicks.

¹¹ Includes planing mill products such as flooring, siding, ceiling.

¹² Planing mill products not included as in 1912 and 1928.

¹³ Included in "Containers."

¹⁴ Does not include maple used for flasks and patterns by plants not classified as manufacturers of wooden products and included in later surveys.

¹⁵ Patterns and flasks combined in earlier reports.

¹⁶ Radio and phonograph cabinets included in "Furniture."

¹⁷ Includes kitchen cabinets.

¹⁸ Included in "Vehicles, nonmotor."

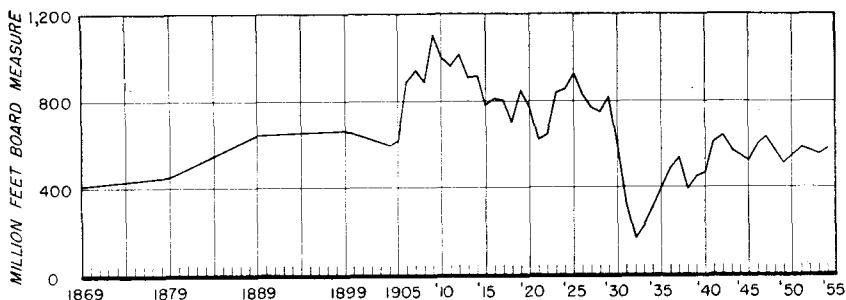


FIGURE 7.—Lumber production of maple (*Acer species*), 1869-1954.

Production.—The production of maple lumber amounted to 575 million board-feet in 1954 (fig. 7). This was slightly above the average annual production of 565 million board-feet in the 10-year period 1945-54.

In 1869, the earliest year for which data are available, the production of maple lumber amounted to about, 410 million board-feet. The cut increased gradually from 1869 to 1905 and then rose rapidly to a maximum of about 1.1 billion board-feet in 1909. Since then there has been a downward trend in production, although considerable fluctuation has occurred in response to the changing levels of business activities.

Before 1921 maple ranked second to oak in importance as a hardwood lumber species. Since 1921 maple has ranked third, with oak first and gum (sweetgum) second.

Michigan has been the leading State in the production of maple lumber since 1869. In 1909, the year of maximum production, approximately one-half of the maple lumber produced came from that State. In recent years, however, Michigan has declined in relative importance as a producer of maple and now furnishes about one-quarter of the total. Second, third, and fourth places have been occupied by Wisconsin, Pennsylvania, West Virginia, or New York, with Wisconsin holding second place from 1909 to 1945 (table 2).

TABLE 2.—Maple lumber production by States, 1945-54 ¹

Year	Total for United States	Michigan	Wisconsin	New York	Pennsylvania	West Virginia	Other States
1945.....	522, 100	149, 174	63, 699	43, 263	57, 772	44, 697	163, 505
1946.....	597, 995	159, 183	66, 106	64, 104	72, 839	41, 618	183, 145
1947.....	630, 495	169, 237	82, 322	74, 071	68, 841	46, 215	189, 809
1949.....	507, 554	-----	-----	-----	-----	-----	-----
1950.....	546, 178	-----	-----	-----	-----	-----	-----
1951.....	583, 726	-----	-----	-----	-----	-----	-----
1952.....	566, 000	-----	-----	-----	-----	-----	-----
1953.....	551, 000	-----	-----	-----	-----	-----	-----
1954.....	575, 344	107, 627	63, 872	89, 261	59, 704	37, 763	217, 117

¹ No survey made in 1948; surveys made for the years 1949-53, but species information not published by State. 10-year national average 1945-54—564, 488, 000 board-feet.

There was about 80 million board-feet of maple logs consumed annually in the manufacture of hardwood veneer in the period 1951-53. This represented about 8 percent of the wood used in the manufacture of hardwood veneer during those years.

The present level of maple consumption in veneer manufacture is considerably above earlier years for which data are available. In 1905, for example, about 26 million board-feet of maple was used in veneer manufacture. Since 1905 there has been a gradual upward trend, although considerable fluctuation has occurred. Increases in the use of maple for veneer in recent years probably reflects the wider acceptance of this species for face veneer.

In addition to lumber and veneer, a substantial volume of maple is consumed in the manufacture of charcoal, pulpwood, and cooperage. A considerable volume is also used in the form of short logs or bolts for the manufacture of small products; these logs are not sawed into lumber, but into blocks or pieces of the size or shape required for the products. Large amounts of maple are also used for fuel. While no exact data are available, it is estimated that the average annual cut of maple in recent years for all purposes has amounted to roughly 700 million board-feet.

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