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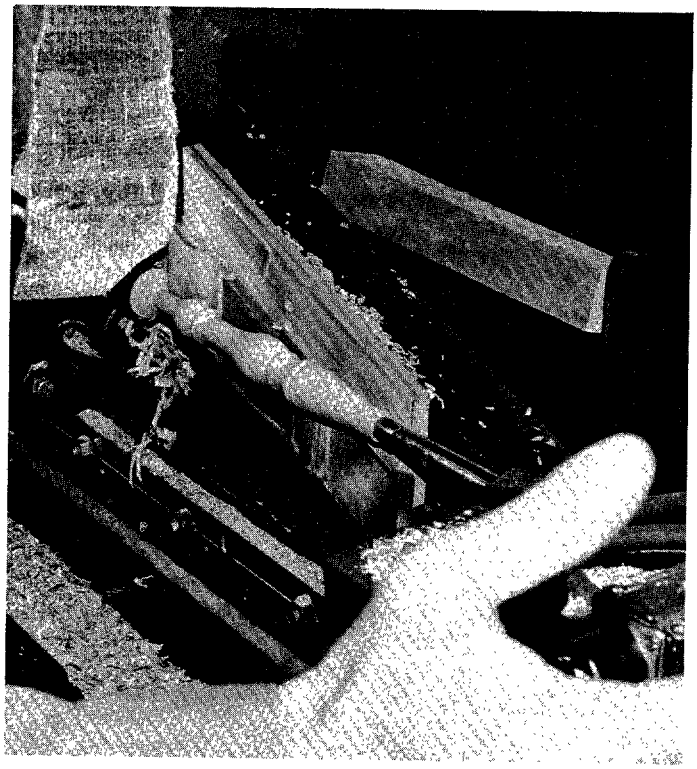
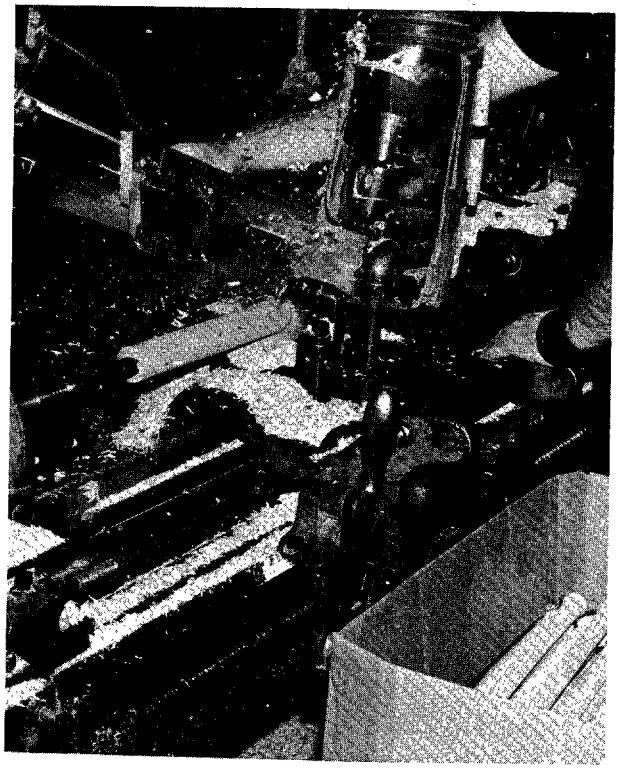
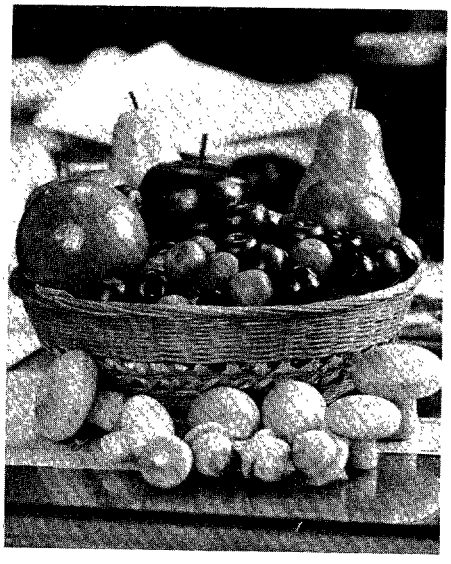
Supply and Demand of Timber for Wood Turning in Maine

Eric H. Wharton
Robert L. Nevel, Jr.
Douglas S. Powell







Abstract

Manufacturers of wood-turned products in Maine primarily use sugar maple, yellow birch, and paper birch. Other abundant and suitable species such as aspen and red maple grow in Maine, but are used to a limited extent by the state's turnery mills. The resource supply of the primary species used by turnery mills has increased since the last inventory, but the increase has been primarily in the small diameter classes, resulting in a decline of high-quality timber. The growth to removals ratios of sugar maple and yellow birch are much smaller than the ratio for paper birch. Paper birch is growing twice as fast as it is being removed for industrial forest products.

The Authors

ERIC H. WHARTON is resource analyst with the Forest Inventory and Analysis Unit, Northeastern Forest Experiment Station, Broomall, Pennsylvania. He received a B.A. degree from Lycoming College in 1974, and a M.F. degree from Duke University in 1975. He joined the Northeastern Station in 1978.

ROBERT L. NEVEL, JR. is forest products industry specialist with the Forest Inventory and Analysis Unit, Northeastern Forest Experiment Station, Broomall, Pennsylvania. He received a B.S. degree in forest technology from The Pennsylvania State University in 1965, and a M.F. degree in wood technology from Yale University in 1968. He joined the Northeastern Station in 1978.

DOUGLAS S. POWELL is principal resource analyst with the Forest Inventory and Analysis Unit, Northeastern Forest Experiment Station, Broomall, Pennsylvania. He received a B.S. degree in forestry from The University of Michigan in 1971, and a M.S. degree in forest ecology from West Virginia University in 1976. He joined the Northeastern Station in 1971.

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Background

Clothespins, dowels, and candlesticks: products so common, seldom are they given a second thought. Where do they come from? Who makes them? Many are manufactured by a wood-turning industry in Maine.

For the purpose of this report, wood turning is a process that converts harvested logs or bolts into a wood product by lathing, or a product that will eventually be lathed. All wood-turned products may be used as manufactured, or converted into a secondary product. Most of the wood-turning mills in Maine manufacture wood squares, dimension stock usually 50 inches long, varying in length from 1/2-inch to 4 1/2-inch square size.

From the dried wood squares, wood products are manufactured that range from plain dowels to ornate objects. Dowels can range in size from as small as 3/16-inch, used for cotton-tipped swabs, to as large as 3 inches, used for handrails. The final wood-turned product is shaped either manually or on an automatic lathe, using either clear precut sections of the square or the entire square.

Not all wood-turning mills in Maine produce squares as their sole manufactured product. Some mills produce squares as an additional product. Manufacturers of trapstock, for example, primarily produce material for lobster traps, but they also manufacture squares. If a mill saws only squares and sells them to someone else, it is usually classified as a square or bar mill. For convenience, any mill that has produced squares, or similar dimension stock, that will be turned either on-site or at some other establishment has been classified as a wood-turning mill in this report.

Many of the items manufactured by the wood-turning industry in Maine are components of goods later manufactured for general consumption. Dowels, chair rungs, glue pins, and plugs are manufactured for the furniture industry; handles are manufacured for tools and knives; and rings, balls, and beads are manufactured for many different types of secondary manufacturing. Products such as drumsticks, gavels, bowling pins, candlesticks, and novelty items that are manufactured for direct consumption comprise a very small portion of the wood-turning industry in Maine.

To manufacture wood-turned products, timber harvesters supply raw material to the wood-turning mills in the form of turnstock. Commonly referred to as turnery bolts, these are short log sections nominally 4 feet long—usually 50 inches—from which blanks are sawn and turned. Turnstock must meet stringent quality specifications, including specific size and form requirements.

Mills have traditionally used 50-inch lengths for turnstock, but these bolts are in short supply. High insurance rates, especially from workers' compensation, have forced many timber harvesters to mechanize, resulting in more tree-length harvesting. Boltwood is available, but lacking the price differential to extract usable wood from pulpwood piles, much of the material suitable for turnstock is sent to pulpmills. As a result, mills that manufacture wood-turned products have begun to accept multiples of 50-inch bolts: 8-foot, 12-foot, even up to 24-foot lengths, not including trim allowance.

Long-log sections also may be in short supply, according to recent trends. Statistics provided by Powell and Dickson (1984) show that supplies of high-quality timber that can be used for longer lengths are declining. Sawtimber volume has increased in Maine between 1971 and 1982, largely through increases in construction log-grade timber. The portion of all other grades, including high-quality timber, decreased by 5 percent.

How much timber is available for turnstock given: (1) the species, quality, size and form specifications required by manufacturers of wood-turned products, (2) the unavailability of short-log sections resulting from more tree-length harvesting, and (3) declining supplies of high-quality sawtimber? We will report on the volume of wood used by the wood-turning industry in Maine, and the current volume on timberlands that may be suitable for turnstock. We will also discuss how this industry has changed over time, and what its future may be.

The Forest Inventory and Analysis Unit conducts two pertinent surveys.[1] One is a forest resource survey on private and public forest land, and the other is an industry canvass of all operating mills in the state. We used specific data from these two surveys to analyze the volume of wood suitable for wood-turning and the demand for turnstock by wood turning mills in Maine.

Volume of Wood Used by the Wood-turning Industry

Timber harvesters in Maine supply a variety of roundwood products to wood manufacturers. Logs and bolts are roundwood, produced by harvesting trees for industrial or consumer use. The industry canvass for 1981 showed that

[1]For a complete description of the methods used, and definitions of terms used in USDA Forest Service surveys, refer to the appendix.

438.7 million cubic feet (5.2 million cords)[2] of roundwood were harvested from Maine timberlands for all industrial forest products (Nevel et al. 1985), including pulpwood harvested to supply the 16 pulpmills in Maine. Only 6.9 million cubic feet (81.2 thousand cords) were harvested for turnstock, less than 2 percent of the total timber harvest (Table 1). A small industry, wood turning uses little of the total timber available for forest products.

During 1981, 41 mills in Maine manufactured turnstock into some form of wood-turned product. With few establishments, the wood turning industry in Maine has achieved a certain degree of stability. Maufacturers of wood-turned products consumed 7.1 million cubic feet (83.8 thousand cords) of wood in 1958, increasing their consumption to 7.6 million cubic feet (89.0 thousand cords) in 1971 (Ferguson and Kingsley 1972). In the last decade, manufacturers in Maine have increased their consumption of wood for turned products only slightly—to 8.0 million cubic feet (94.3 thousand cords) in 1981 (Nevel et al. 1985).

Despite its size, the wood-turning industry is important to Maine. It is labor intensive, often the largest employer in small towns, and manufactures high value-added products. Also, manufacturers of wood-turned products consume large proportions of a few valuable species. A variety of species are suitable for turnstock, but only a few are preferred. The most preferred are sugar maple,[3] yellow birch, and paper birch. Combined, these species comprise almost 82 percent of the timber consumed in Maine for wood-turned products.

Paper birch is most preferred by the wood-turning industry in Maine. During 1981, timber harvesters supplied 3.1 million cubic feet (36.3 thousand cords) of paper birch turnstock to manufacturers, who imported an additional 278.1 thousand cubic feet (3.3 thousand cords) from outside the state. Altogether, 3.4 million cubic feet (39.6 thousand cords) of paper birch turnstock were consumed, 42 percent of the total consumption.

Next to paper birch, yellow birch is the most important species to the wood-turning industry in Maine. Demand for yellow birch is high, but much of it is imported from outside the state. Nearly 1.8 million cubic feet (20.8 thousand cords) of yellow birch were consumed in Maine during 1981, but only 1.1 million cubic feet (13.3 thousand cords) were harvested from Maine timberlands; approximately 36 percent was imported from other states, or from Canada. Manufacturers are finding that they must rely increasingly more on sources of yellow birch outside of the state.

Yellow birch is the only species imported to any extent by the wood-turning industry in Maine. This occurs because a majority of the State's wood-turning mills are close to timberlands in New Hampshire and Vermont. In many respects the necessity to import raw material characterizes the problems facing maufacturers of specialty products in Maine. High-quality logs or bolts are usually required for processing specialty products. Short logs and bolts are available, but extracting them at tree-length harvesting operations is expensive. With declining supplies of quality logs 12 feet and longer, hauling distances have been stretched to find adequate supplies.

The next three most important species—Beech, white ash, and aspen—in 1981 accounted for a little more than 1.0 million cubic feet (12.3 thousand cords), only 15 percent of the total timber harvested for turnstock. These three species are accepted to a certain extent, but not preferred. White ash and beech are strong, moderately heavy woods with properties acceptable for turning, but supplies of quality wood are limited in Maine. Also, beech shrinks easily, rendering it difficult to kiln dry (U.S. Forest Products Laboratory 1974); manufacturers prefer species that dry easily. Aspen, found in large volumes throughout Maine timberlands, also may be unacceptable because the wood is too soft to allow it to turn well[4] without special attention to kiln drying and slicing procedures such as knife pitch and sharpness. It is primarily used to manufacture spools for wreath wire and some inexpensive tool handles.

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[2]Volumes of roundwood used for industrial products are commonly expressed as board feet or cords in Forest Service publications. However, growing-stock volume used to quantify the timber supply is usually expressed in cubic feet. In this report, cubic feet is used as the common unit of measure; the quantity of turnstock produced and consumed in Maine is expressed as cubic feet along with the equivalent volume in cords (based on 85 cubic feet of solid wood per cord). A cubic foot of roundwood used for turnstock is roughly equivalent to 5.88 board feet (International 1/4-inch rule), 0.0118 standard cord (based on 85 cubic feet of solid wood per cord), or 0.0078 standard cord (based on 128 cubic feet of wood, bark, and air space per cord).

[3]In Maine, sugar maple (*Acer saccharum*) is also called hard maple, rock maple, and sometimes white maple. The soft maples include red maple (*A. rubrum*), silver maple (*A. saccharinum*), and mountain maple (*A. spicatum*). The soft maples group should not be confused with the single species soft maple, which in Maine is also called red maple, swamp maple, and sometimes white maple. Red maple is called white maple only in areas where sugar maple is *not* called white maple.

[4]Personal communication with Albert J. Bibeau, Executive Director, Wood Products Manufacturers Association, Gardner, Massachusetts.

Table 1.—Volume of turnstock[a] consumed, by species and final disposition of the roundwood, Maine, 1981

Species	Cut and retained within state[b]	Imported from other states or provinces	Total consumption
	Thousand cubic feet		
White pine	15.5	.0	15.5
Cedar	2.6	.0	2.6
Total softwoods	18.1	.0	18.1
Soft maples	141.4	34.0	175.4
Hard maples	1,325.8	86.9	1,412.7
Yellow birch	1,130.7	634.8	1,765.5
Paper birch	3,086.7	278.1	3,364.8
Beech	279.0	70.7	349.7
White ash	225.1	8.5	233.6
Aspen	537.9	.0	537.9
Red oak	90.3	.0	90.3
Other hardwoods[c]	64.8	.0	64.8
Total hardwoods	6,881.7	1,113.0	7,994.7
All species	6,899.8	1,113.0	8,012.8

[a]Includes bolts used to manufacture lathed products through a wood turning process, and squares that will eventually be turned.
[b]Lacking markets in other states and in Canada, timber harvesters in Maine export no turnery logs or bolts.
[c]Includes basswood, yellow-poplar, and other minor species.

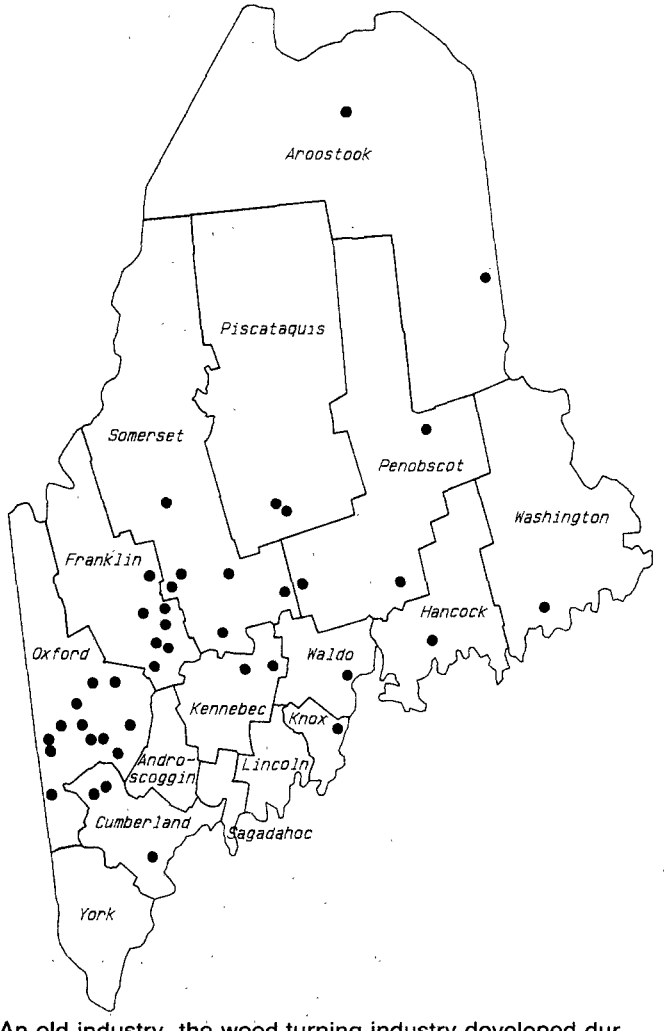
Of the soft maples, only red maple is currently used for wood-turned products in Maine; maufacturers produce billy clubs, fishing pole butts, and chair parts from red maple. The species is suitable for wood turning, yet its wood properties preclude it from being a preferred species. The wood of red maple turns well, but its light to heavy, reddish-brown coloring in both the heartwood and sapwood tend to make it less than a preferred species. Only 175.4 thousand cubic feet (2.1 thousand cords) of soft maples were consumed by the wood turning industry in Maine during 1981.

Location of Wood-turning Mills

The demand of all species for turnstock is greatest in western Maine. We found that nearly 48 percent of the mills were located in two counties: Franklin and Oxford (Fig. 1). Another 15 percent were located in the southern portion of adjacent Somerset County. Manufacturers of wood-turned products are concentrated in this region partially due to their proximity to population centers.

Wood-turned products fall primarily into one of two categories: products manufactured for direct consumption by the general public, or commodity products that are later remanufactured or included in products for consumption by the general public. In either case, manufacturing should be ideally located near population centers. Franklin, Oxford, and Somerset Counties are directly linked to the heaviest population and shipping centers in Maine through extensive highway systems.

Figure 1.—Location of wood-turning mills in Maine, 1981.



An old industry, the wood-turning industry developed during a time when the majority of household specialty items were manufactured from wood. Early records show that the wood-turning industry was firmly entrenched at the turn of the century, and that by the early 1940's, the industry was located primarily where it is today (Coolidge 1963). Many of the markets have disappeared, but an abundant supply of timber suitable for turnstock remains statewide, even though there have been some declines in quality.

Supply of Roundwood for Wood Turning

A previous analysis (Kingsley 1973) showed that 18 percent of the total growing-stock volume of sugar maple, yellow birch, paper birch, and beech was suitable for turnstock. We found that during 1981, almost 27 percent of the total growing-stock volume in these same four species plus red maple, ash, and aspen, was suitable for turnstock. Approximately 1.7 billion cubic feet (19.7 million cords) of growing stock in these selected hardwood species are hypothetically available to be harvested for turnstock in Maine (Table 2), many times more than the volume that is currently being harvested from these species.

Sugar maple contains the largest volume of any of the species suitable for turnstock; aspen is a close second. Both species account for 42 percent of the total growing-stock volume. Two important species to the wood-turning industry—paper birch and yellow birch—rank much lower.

We compared the growing-stock volume suitable for wood turning with the volume harvested for turnstock in 1981, for a number of selected hardwood species. Figure 2 shows this comparison (note that while the volumes are both expressed in millions of cubic feet, the scales of the axes are different). The volume harvested for each species is considerably less than the supply of each species, no species is being harvested at a level even approaching its supply. Only paper birch, with 3.1 million cubic feet (36.3 thousand cords) harvested, and a supply of 262.4 million cubic feet (3.1 million cords), is being harvested at a rate greater than 1 percent.

Figure 2.—Growing-stock volume suitable for turnstock on timberlands and volume of roundwood harvested from timberlands for turnstock by selected hardwood species, Maine, 1982.

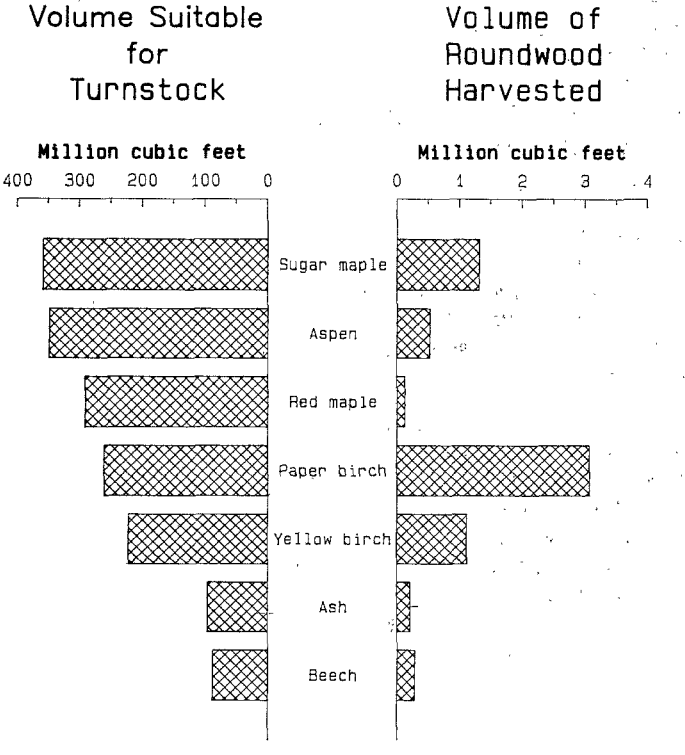


Table 2.—Net growing-stock volume of selected hardwood species suitable for turnstock on timberland by county and species, Maine, 1982

County	Red maple	Sugar maple	Yellow birch	Paper birch	Beech	Ash[a]	Aspen[b]	All species
	Million cubic feet							
Androscoggin	2.6	.0	.0	1.8	.8	.9	9.6	15.7
Aroostook	39.5	133.5	51.0	22.6	34.2	7.4	70.5	358.7
Cumberland	4.3	.0	1.2	4.5	1.5	2.3	1.4	15.2
Franklin	38.2	24.7	20.8	54.7	1.0	18.9	30.6	188.9
Hancock	4.1	.0	.0	4.6	.0	4.3	5.6	18.6
Kennebec	9.5	.2	1.3	6.1	1.9	7.6	9.9	36.5
Knox	1.4	.0	.0	1.9	.0	1.4	.0	4.7
Lincoln	2.2	.0	.0	1.4	.0	1.0	1.6	6.2
Oxford	31.5	16.3	34.6	42.1	12.6	15.5	33.8	186.4
Penobscot	32.9	32.4	10.2	16.1	1.5	5.6	40.8	139.5
Piscataquis	52.6	65.6	38.7	29.7	20.5	12.0	75.0	294.1
Sagadahoc	.8	.0	.0	.4	.0	1.3	.6	3.1
Somerset	35.3	80.6	56.5	34.5	10.0	8.2	36.3	261.4
Waldo	7.2	1.9	.5	4.9	.0	4.4	8.7	27.6
Washington	21.6	2.5	6.6	30.1	3.3	3.9	20.1	88.1
York	9.0	1.3	2.0	7.0	1.4	2.3	5.2	28.2
All counties	292.7	359.0	223.4	262.4	88.7	97.0	349.7	1,672.9

[a]Includes white and green ash.
[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

A number of constraints limit the volume that is actually available; constraints include landowner attitudes toward harvesting, size of woodlots, accessibility, terrain condition, and tree-length harvesting for pulpwood. Even though volumes are high, these constraints are one reason that manufacturers of wood-turned products must look to timberlands outside of Maine to supply some of their needs.

Geographic Variation

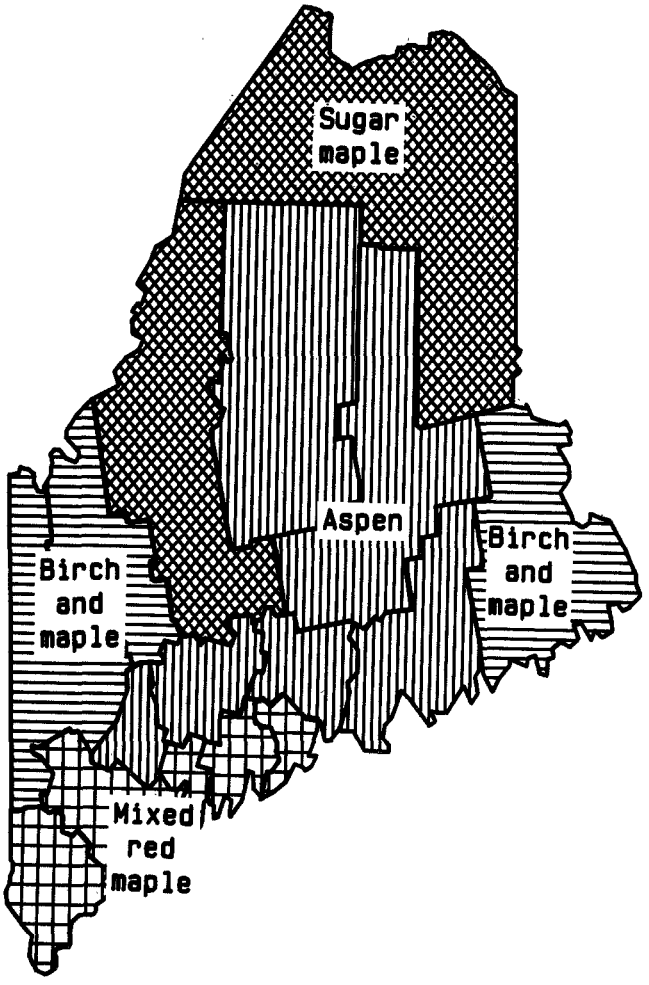
We developed detailed estimates of the timber suitable for turnstock at the county level (Appendix). To simplify our analysis, we segregated Maine into four regions, based on species that are suitable for wood turning. We called these regions birch-maple, sugar maple, aspen, and mixed red maple (Fig. 3).

Franklin, Oxford, and Washington Counties are located in the two birch-maple regions. The wood-turning industry settled in the western portion of Maine because paper birch and sugar maple are two of the three leading species in demand by the industry. There are 96.8 million cubic feet (1.1 million cords) of paper birch growing stock in Franklin and Oxford Counties, where 48 percent of the mills are located. That volume of paper birch is almost 37 percent of the total paper birch volume in the entire state.

Somerset and Aroostook Counties comprise the maple region; sugar maple alone predominates in these two counties. Here there are 214.1 million cubic feet (2.5 million cords) of sugar maple growing stock, or 60 percent of the total sugar maple growing-stock volume in Maine. Except for southern Somerset County, the bulk of this resource is located in remote locations far from population centers. Very little sugar maple is harvested from Aroostook County for wood turning because supplies of sugar maple are more readily available in western Maine, and transportation costs are prohibitive.

The remaining two regions are important in that they contain significant volumes of species suitable for wood turning, but these species are not preferred. Piscataquis and Penobscot Counties comprise the bulk of the aspen region. Hancock, Waldo, Kennebec, and Androscoggin Counties contain smaller but significant volumes of aspen. The counties throughout southwestern Maine (Knox, Lincoln, Sagadahoc, Cumberland, and York) contain a mixture of species important to the wood-turning industry. The common species is predominantly red maple.

Figure 3.—Regions of Maine based on the predominance of species suitable for turnstock.



Only 13 mills that manufacture a wood-turned product operate in the aspen and mixed red maple region, a small number of mills compared to the volume of timber acceptable for turnstock. For example, there are 158.4 million cubic feet (1.9 million cords) of aspen and 126.6 million cubic feet (1.5 million cords) of red maple growing-stock volume suitable for turnstock in these two regions. That is 45 percent of the total aspen volume and 43 percent of the total red maple volume in Maine. Much of this volume is close to population centers and possible markets.

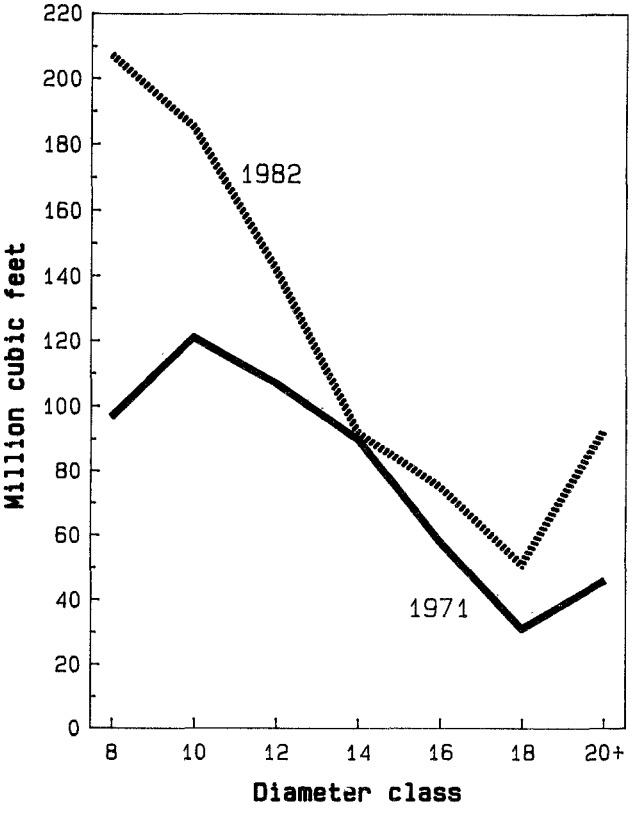
Many of the problems that faced the wood-turning industry in 1981 may have resulted from its dependence on only a few species. Adequate supplies of other species are available if the technology to use these species were commercially available and markets for end products using these species were developed. Red maple, for example, is in large supply, but used little.

Changes Over Time

Growing-stock volumes suitable for turnstock have increased since the last inventory. The three primary species used in the manufacture of wood-turned products—sugar maple, yellow birch, and paper birch—have increased from 550.2 million cubic feet (6.5 million cords) in 1971, to 844.8 million cubic feet (9.9 million cords) in 1982. A bright future for the wood-turning industry seems apparent, but underlying trends indicate disturbing problems.

Most of the increases in growing-stock volume have occurred in the smaller diameter classes: from the 8-inch to the 12-inch diameter classes. The important, larger diameter classes have shown only nominal increases (Fig. 4). These increases are not consistent with trends in the resource as a whole throughout the Northeast; curves of diameter-class distribution show a gradually maturing resource.

Figure 4.—Diameter-class distribution of growing stock for the primary hardwood species (sugar maple, yellow birch, and paper birch) suitable for turnstock in Maine, 1971 and 1982.



The greatest volume of timber suitable for turnstock in Maine occurs in the lowest diameter class, the 8-inch class. As more of the resource becomes comprised of smaller diameter trees, the quality of timber should decline, since grade is as much a function of tree size as condition of the tree bole. Table 3 shows that grade 2 and grade 3 material has remained essentially unchanged. Grade 1 material has decreased from 33 percent to 11 percent of the total, while construction log-grade material has increased from 6 percent to 21 percent of the total. Many smaller diameter trees are able to meet only construction log grade.

The distribution of volume by diameter class is similar throughout Maine. In most counties, the largest volumes occur in the smallest diameter classes. Only in Aroostook County and Somerset County are the greatest volumes found in the 12-inch diameter class; both counties fall in the sugar maple region. As mentioned previously, large volumes of sugar maple suitable for turnstock are available, yet these volumes are located in remote areas. For the most part, timber harvesters that supply wood-turning mills must select desirable trees from a scattered resource base.

Future of the Wood-turning Industry

In time, the resource should mature. Until then the industry will be hard pressed to avoid reducing supplies of timber below current levels, at least for sugar maple, yellow birch, and paper birch. Some manufacturers have begun to import a portion of their timber supplies, largely due to a decrease in the quality of these species, and a lack of markets in other states. The industry as a whole depends on certain select species, but there is no imminent danger that supplies will become depleted.

The species that are most important to the wood-turning industry in Maine are growing faster than they are being used. Figure 5 shows the growth and removals of sugar maple, yellow birch, and paper birch. As can be seen for each species, removals for all industrial forest products is less than growth. In fact, only sugar maple shows close to an equivalent rate of removals to growth, while paper birch removals are less than half its growth rate.

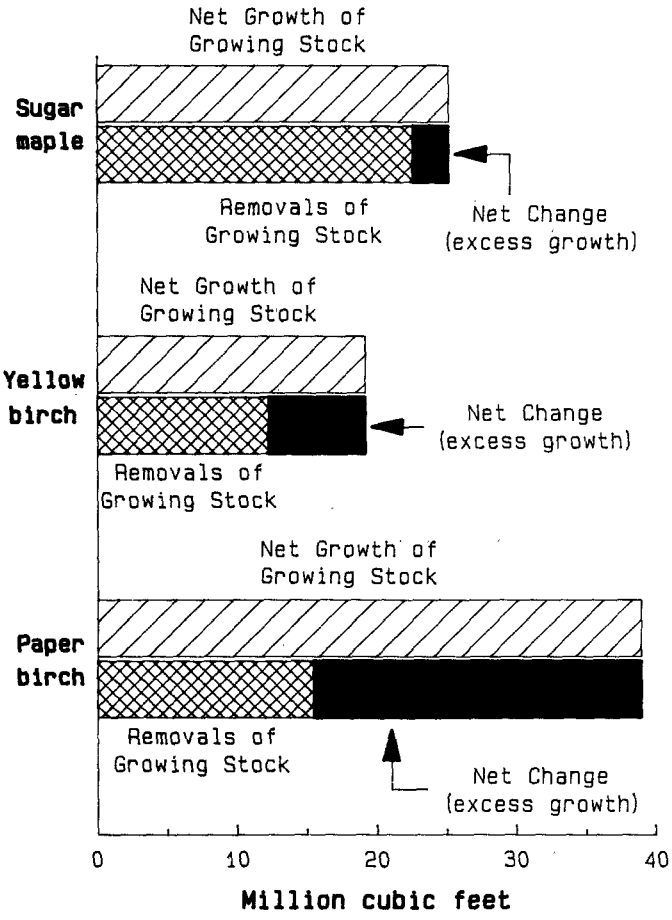
The danger of depleting supplies is more long-term in nature. Perhaps manufacturers of wood-turned products are just now beginning to feel the effects of this problem.

Table 3.—Net volume of sawtimber trees greater than 15.0 inches d.b.h. on timberland by species and standard-lumber log grade[a], Maine, 1971 and 1982

Species	Grade 1	Grade 2	Grade 3	Construction log	All grades
	Million board feet				
			1971		
Sugar maple	99.9	60.4	90.0	21.1	271.4
Yellow birch	70.3	60.8	100.1	8.4	239.6
Paper birch	19.9	14.7	23.2	4.6	62.4
All species	190.1	135.9	213.3	34.1	573.4
Percent	33	24	37	6	100
			1982		
Sugar maple	13.7	34.7	35.2	29.6	113.2
Yellow birch	28.5	99.3	156.5	82.6	366.9
Paper birch	21.8	31.7	32.6	6.4	92.5
All species	64.0	165.7	224.3	118.6	572.6
Percent	11	29	39	21	100

[a]Tree grades used in USDA Forest Service inventories are based on standard hardwood factory lumber grades developed by Vaughn, et al. (1966), and specifications for hardwood construction logs developed by Rast, et al. (1973). Grade specifications are applied to standing trees.

Figure 5.—Growth and removals of the primary hardwood species (sugar maple, yellow birch, and paper birch) used in the manufacture of wood-turned products in Maine, 1982.



Adequate supplies are available in general, but in local areas supplies may have become depleted, or simply locked up due to landowner constraints. If the industry is to maintain stability in the future, it must find ways to improve its utilization of nonpreferred species and lower grade material, since constraints currently imposed are not likely to improve.

Future declines in manufacturing for wood-turned products may come from outside sources, rather than any decrease of timber supplies. New England was once the center of the textile industry, with bobbin mills located throughout the region. Thirty years ago, 31 mills in New Hampshire and Vermont manufactured wood-turned products for the textile industry, today only 3 manufacture such products. When the textile industry moved south, the wood-turning industry lost many of its primary markets.

In the past, Maine may have remained unscathed because of the nature of its wood-turning industry. The bulk of the industry manufactured products for the furniture, tool, and novelty industry. During 1981, these secondary industries received more competition from plastic substitute products and foreign wood manufacturers.

Competition with manufacturers of plastic products is nothing new to the wood-turning industry. Such manufacturers have made inroads into the wood-turning industry in Maine over many years, and will probably continue to do so. The wood-turning industry has remained somewhat stable because some wood-based novelty and specialty products are preferred. Golfers prefer wooden tees because they do not shatter so easily on impact, and cigar smokers prefer wooden cigar tips because plastic tips tend to burn.

Cotton-tipped swabs are another example of a preferred wood-turned product. Plastic-stemmed swabs for consumer use have been on the market for a number of years; however, hospitals, which are an important market, prefer wooden swabs because they are easily sterilized. Markets that exist for these and similar products may always exist.

Competition from wood manufacturers abroad may most threaten the wood-turning industry in Maine. In some instances, wood from the United States is shipped overseas, where it is manufactured more cheaply. In other instances, foreign woods that are similar to accepted american woods are used. One such species is ramin (*Gonystylus bancanus*): a tropical wood found in Southeast Asia that is light-colored. It is used for furniture, mouldings, brush and broom handles, and toys (Rendle 1969).

Industry reports detailing United States' imports have been published quarterly by the U.S. Department of Commerce. Discontinued in 1982, these reports showed until then, that imports for a major wood-turned product such as dowel rods and pins rose between 1973 and 1980 (U.S. Department of Commerce 1979, 1982). Imports from the Pacific-rim countries of Japan, Indonesia, and Taiwan fluctuated, but increased from a low of 18 million lineal feet in 1973 to the highest point during that time period, 252 million lineal feet in 1979.

Since the cost of producing wood-turned products abroad is lower, foreign maufacturers can afford to sell their products at lower cost. These manufacturers have also been able to reduce costs of production by manufacturing a finished product. Goods shipped from overseas are more competitive because most manufacturers of wood-turned products in Maine produce items that are sent to establishments outside of the state to be assembled into the final finished product.

We believe that in the immediate future the wood-turning industry in Maine should remain relatively stable, much as it has for a number of decades. Supplies of timber are available to maintain and even promote growth in this industry. However, the industry's long-term future will hinge on its ability to: develop and implement technological improvements in processing, develop strategies to produce finished products, and identify new markets.

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Appendix

Methods and Specifications

Legislation passed by the United States Congress directs the USDA Forest Service to periodically collect resource information in every state of the Nation. The Forest Inventory and Analysis Unit of the Northeastern Forest Experiment Station collects this information in 14 northeastern states, which includes Maine. Since the original legislation, the forest resources of Maine have been measured three times: in 1958, 1971, and 1982.

The forest resource survey was conducted in the following manner: 62,801 pin-prick points were established on aerial photographs and classified into specific land-use and cubic-foot volume classes. A subsample of 2,475 plots were selected from this larger sample base and established on the ground. Field crews collected data on these field plots, and on 1,222 field plots established during earlier inventories.

The estimates of roundwood volume suitable for wood turning are a summary of information collected on the field plots. During the survey conducted in 1971 and the survey conducted in 1982, field crews collected information on the field plots that could be used to select trees suitable for turnstock. Specifications for selecting trees suitable for turnstock depended on (1) tree species, (2) evidence of rot in the tree bole, and (3) surface defects as evidence of sound wood in the tree bole.

Species was used to select trees suitable for turnstock because certain species are used by the wood-turning industry to the exclusion of all others. Paper birch, yellow birch, sugar maple, and beech were the most commonly used species of the wood-turning industry during the last survey. We included these four species in our analysis, but added red maple, ash, and aspen. The additional species were selected because they have been used more frequently by the wood-turning industry over the last decade.

Trees were also selected on both occasions by the condition of the tree bole. For turnstock, all rotten cull material in the tree bole is unacceptable. Most sound cull material is unacceptable because it will produce grade defect in the manufactured wood.

Some tree sections are used for boltwood if they contain usable wood to a 7-inch small-end diameter. We selected such trees that contained no rotten, and little sound cull material in the tree bole. To be selected, a tree must have had no more than 10 percent cull material in its bole, and all of this cull material must have been sound. Visual indicators of surface defect, such as knots and scars, were used to indicate unclear or unsound wood. A surface defect was assigned to each tree relating to the number of 2-foot clear cuttings in the first 16 feet of the tree bole. To be acceptable for turnstock, the tree must have had 8 clear feet.

An industry survey was conducted in conjunction with the resource survey, but only in 1982. The Maine Department of Conservation, Utilization and Marketing Division, assembled a list of all known primary wood manufacturing firms in Maine, firms that convert roundwood to wood products for industrial or consumer use. Those manufacturers that were operational during 1981 were asked to provide information on their wood consumption for that year, through a questionnaire mailed by the State. Possible out-of-state consumers of Maine roundwood were also sent questionnaires. Manufacturers who did not respond were contacted by telephone, resulting in a census of primary wood manufacturers.

The demand for wood-turned products was summarized from data collected for all wood manufacturers in Maine. Only those mills that converted roundwood to a turned-wood product, or that would be turned later, were used to analyze the production and consumption of roundwood for wood-turned products.

Definition of Terms

Forest land—Land that is at least 10 percent stocked with trees of any size, or that formerly had such tree cover and is not currently developed for nonforest use. The minimum area for classification of forest land is 1 acre.

Forest products—Roundwood supplied to primary manufacturing plants, or harvested for personal use.

Grade—A classification of the quality of sawtimber volume based on standard grades for factory lumber logs and standard specifications for hardwood construction logs, applied to standing trees.

Growing stock—The tree bole of live trees, 5.0 inches d.b.h. (diameter at breast height) or larger, that is presently or prospectively suitable for industrial forest products. Excludes species of typically small size, poor form, or inferior quality.

Growing-stock volume—Net volume, in cubic feet, of growing stock. Net volume equals gross volume, less deductions for cull.

Growth—The change, resulting from natural causes, in growing stock between inventories, divided by the number of growing seasons between inventories. Components of growth are accretion plus ingrowth minus cull increment and mortality. Accretion is the growth of growing stock between inventories; it does not include growth on trees cut between inventories, nor those trees that died. Ingrowth is the volume of growing stock that became 5.0 inches d.b.h. between inventories. Cull increment is the volume of growing stock from the previous inventory that became cull trees in the current inventory. Mortality is the volume of growing stock that died from natural causes between inventories.

Industrial forest products—Roundwood supplied to primary manufacturing plants. Does not include roundwood that has been harvested for personal use.

Primary wood manufacturers—Establishments that convert roundwood into wood products such as woodpulp, lumber, veneer, cooperage, and dimension products. The final product may be used as manufactured, or supplied to a secondary manufacturer.

Removals—Net growing-stock volume harvested or killed in logging, cultural operations, or land clearing. Also the net growing-stock volume growing on land that was reclassified from timberland to forest land withdrawn from utilization through administrative designation.

Roundwood—Logs, bolts, and other round timber generated by harvesting trees, or total tree chips.

Sawtimber—The tree sawlog of live trees, 9.0 inches d.b.h. or larger for softwoods and 11.0 inches d.b.h. or larger for hardwoods, containing at least one 12-foot sawlog or two noncontiguous 8-foot sawlogs, and meeting regional specifications for freedom from defect.

Sawtimber volume—Net volume, in board feet (International 1/4-inch rule), of sawtimber. Net volume equals gross volume less deductions for rot, sweep, and other defects that affect use for lumber.

Secondary wood manufacturers—Establishments that convert primary wood products such as woodpulp, lumber, veneer, cooperage, and dimension products into a finished product such as furniture or furniture parts, paper products, building materials, and so on.

Timberland—Forest land producing or capable of producing crops of industrial forest products (more than 20 cubic feet per acre per year) and not withdrawn from timber utilization.

Tree bole—The main stem of a tree between a 1-foot stump height and a 4-inch top d.o.b. (diameter outside bark), or until the main stem breaks into branches if that is before it reaches this top diameter.

Tree sawlog—The main stem of the tree between a 1-foot stump height and the sawlog top. The sawlog top is the point on the main stem above which a sawlog cannot be produced. The minimum sawlog top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b. for hardwoods, or until the main stem breaks into branches if that is before it reaches this top diameter.

Reliability of the Estimates

Tables in this appendix show the volume of selected hardwood species suitable for turnstock on timberland for each county, and include associated sampling errors for each estimate. The sampling errors are used as follows: the estimate of volume suitable for turnstock in Maine is 1,672.9 million cubic feet, but this estimate has an associated sampling error of 4.2 percent, or 70.3 million cubic feet. This means that if the survey were to be repeated, there is a 66 percent probability (2 to 1) that the resulting estimate would be 1,672.9 $\pm$ 70.3 million cubic feet, or between 1,602.6 and 1,743.2 million cubic feet; there is a 95 percent probability (19 to 1) that the estimate would be 1,672.9 $\pm$ 140.6 million cubic feet.

State-level estimates are more reliable beause they have the smallest sampling errors. As stated previously, the estimate of volume suitable for turnstock in Maine has a sampling error of 4.2 percent. The estimate of volume suitable for turnstock in Androscoggin County has a sampling error of 40.5 percent, or 15.7 $\pm$ 6.4 million cubic feet; county-level estimates are considerably less reliable than state-level estimates. In general, as the sample size used to derive an estimate decreases in relation to the total, the sampling error increases.

Some of the estimates presented in the tables have errors that are greater than 25 percent, and may not be reliable. An estimate with a sampling error of 50 percent or more would not be significantly different from zero at two standard deviations, and an estimate with an error between 25 and 50 percent would be suspect. Those estimates that have errors exceeding 25 percent should be used with caution.

To improve the reliability of the estimates, cell values may be combined. Data users may require combinations of counties, species, or diameter classes different from combinations that we may select. We have not attempted to combine any of the cell values with high sampling errors, but rather, have left that up to the discretion of the data user.

Combining cell values will not always reduce the sampling errors to acceptable levels. Sampling errors of combined estimates must be calculated to determine if the sampling errors have been reduced to acceptable levels. Because individual cell values are independent, the calculated sampling errors of combined cells will be approximations; they will underestimate the true sampling error, but will be sufficient to make judgments of acceptability. The technique to approximate the sampling errors of combined estimates is not difficult, and involves using the following formulas:

$$v(X_t) = (s_1 X_1)^2 + (s_2 X_2)^2 \quad (1)$$

$$s(X_t) = \sqrt{v(X_t)} / X_t \quad (2)$$

where;

- X_1 = first cell-value estimate
- X_2 = second cell-value estimate
- X_t = combined cell-value estimate
- s_1 = sampling error of first cell-value estimate
- s_2 = sampling error of second cell-value estimate
- $v(X_t)$ = variance of combined cell-value estimate
- $s(X_t)$ = sampling error of combined cell-value estimate

The formulas are used as follows: The estimate of total volume suitable for turnstock in Androscoggin county is 15.7 million cubic feet, with a sampling error of 40.5 percent. This estimate has a high sampling error. Combining the estimate for Androscoggin county with the estimate of 15.2 million cubic feet for Cumberland county, which has an error of 22.2 percent, yields an estimate of 30.9 million cubic feet. The variance of this estimate is approximately 518,170.976 (using equation 1), and the sampling error associated with the combined estimate is 23.3 percent (using equation 2). As a general rule, the sampling error of a combined estimate will be approximately equal to or less than the smallest sampling error of the estimates that are to be combined.

County Tables

The following tables show the volume of selected hardwood species suitable for turnstock for each county in Maine. Sampling errors are shown with each table.

Table

4 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Androscoggin County, Maine, 1982.

5 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Aroostook County, Maine, 1982.

6 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Cumberland County, Maine, 1982.

7 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Franklin County, Maine, 1982.

8 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Hancock County, Maine, 1982.

9 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Kennebec County, Maine, 1982.

10 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Knox County, Maine, 1982.

11 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Lincoln County, Maine, 1982.

12 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Oxford County, Maine, 1982.

13 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Penobscot County, Maine, 1982.

14 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Piscataquis County, Maine, 1982.

15 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Sagadahoc County, Maine, 1982.

16 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Somerset County, Maine, 1982.

17 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Waldo County, Maine, 1982.

18 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Washington County, Maine, 1982.

19 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, York County, Maine, 1982.

20 Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Maine, 1982.

Table 4.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Androscoggin County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	.8	.5	1.0	.3	.0	.0	.0	.0	.0	2.6
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Paper birch	1.2	.4	.2	.0	.0	.0	.0	.0	.0	1.8
Beech	.5	.3	.0	.0	.0	.0	.0	.0	.0	.8
Ash[a]	.5	.4	.0	.0	.0	.0	.0	.0	.0	.9
Aspen[b]	3.7	4.1	1.5	.3	.0	.0	.0	.0	.0	9.6
All species	6.7	5.7	2.7	.6	.0	.0	.0	.0	.0	15.7
	SAMPLING ERROR[c]									
	Percent									
Red maple	51.0	72.2	50.4	100.0	.0	.0	.0	.0	.0	34.8
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Paper birch	53.0	100.0	100.0	.0	.0	.0	.0	.0	.0	42.5
Beech	71.2	100.0	.0	.0	.0	.0	.0	.0	.0	70.6
Ash[a]	75.4	100.0	.0	.0	.0	.0	.0	.0	.0	60.3
Aspen[b]	45.2	82.6	70.9	100.0	.0	.0	.0	.0	.0	60.0
All species	30.3	66.6	40.6	70.9	.0	.0	.0	.0	.0	40.5

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 5.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Aroostook County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	6.8	6.2	9.7	10.7	2.5	3.6	.0	.0	.0	39.5
Sugar maple	14.1	18.5	19.7	20.1	15.8	17.2	12.1	12.2	3.8	133.5
Yellow birch	4.1	5.6	10.5	11.1	10.5	1.9	3.3	4.0	.0	51.0
Paper birch	5.9	6.6	7.6	.8	1.7	.0	.0	.0	.0	22.6
Beech	4.1	4.9	13.1	5.4	4.0	.0	.0	2.7	.0	34.2
Ash[a]	1.0	2.0	2.9	.0	.7	.0	.8	.0	.0	7.4
Aspen[b]	11.9	17.3	26.2	11.6	1.6	1.9	.0	.0	.0	70.5
All species	47.9	61.1	89.7	59.7	36.8	24.6	16.2	18.9	3.8	358.7
	SAMPLING ERROR[c]									
	Percent									
Red maple	30.2	33.1	24.7	30.0	58.1	58.0	.0	.0	.0	18.6
Sugar maple	23.8	23.7	20.5	19.7	23.7	26.5	42.0	55.5	100.0	13.9
Yellow birch	34.1	37.3	23.8	24.9	28.0	73.8	82.3	60.9	.0	14.2
Paper birch	39.5	40.1	31.0	100.0	70.8	.0	.0	.0	.0	23.5
Beech	42.1	42.7	25.2	37.6	50.6	.0	.0	100.0	.0	20.5
Ash[a]	71.5	57.7	45.4	.0	100.0	.0	100.0	.0	.0	31.5
Aspen[b]	33.8	29.2	18.3	27.4	70.8	71.5	.0	.0	.0	18.3
All species	13.7	12.9	9.7	13.0	15.9	21.7	36.9	40.5	100.0	7.9

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 6.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Cumberland County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	2.1	.4	1.6	.2	.0	.0	.0	.0	.0	4.3
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	.2	.6	.0	.4	.0	.0	.0	.0	.0	1.2
Paper birch	2.6	.7	.8	.4	.0	.0	.0	.0	.0	4.5
Beech	.0	.0	.8	.0	.0	.7	.0	.0	.0	1.5
Ash[a]	1.0	1.0	.2	.0	.0	.0	.0	.0	.0	2.2
Aspen[b]	.2	.7	.2	.3	.0	.0	.0	.0	.0	1.4
All species	6.1	3.4	3.6	1.3	.0	.7	.0	.0	.0	15.2
	SAMPLING ERROR[c]									
	Percent									
Red maple	39.4	100.0	42.9	100.0	.0	.0	.0	.0	.0	29.1
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	100.0	69.6	.0	100.0	.0	.0	.0	.0	.0	49.5
Paper birch	37.1	70.9	56.6	100.0	.0	.0	.0	.0	.0	31:1
Beech	.0	.0	56.2	.0	.0	100.0	.0	.0	.0	53.9
Ash[a]	55.9	74.0	100.0	.0	.0	.0	.0	.0	.0	59.3
Aspen[b]	100.0	100.0	100.0	100.0	.0	.0	.0	.0	.0	56.8
All species	26.7	41.2	27.9	50.0	.0	100.0	.0	.0	.0	22.2

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 7.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Franklin County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	14.2	9.9	8.7	2.5	.0	2.9	.0	.0	.0	38.2
Sugar maple	9.1	6.7	5.2	.9	.8	.0	2.0	.0	.0	24.7
Yellow birch	8.4	6.2	4.0	.9	1.3	.0	.0	.0	.0	20.8
Paper birch	27.9	15.2	7.0	2.3	1.4	.9	.0	.0	.0	54.7
Beech	.4	.6	.0	.0	.0	.0	.0	.0	.0	1.0
Ash[a]	7.1	5.7	2.4	2.6	.0	1.1	.0	.0	.0	18.9
Aspen[b]	11.2	5.4	11.0	.9	1.1	1.0	.0	.0	.0	30.6
All species	78.3	49.7	38.3	10.1	4.6	5.9	2.0	.0	.0	188.9
	SAMPLING ERROR[c]									
	Percent									
Red maple	26.8	38.9	41.0	57.5	.0	70.8	.0	.0	.0	28.4
Sugar maple	31.4	45.9	43.6	100.0	100.0	.0	100.0	.0	.0	34.6
Yellow birch	27.6	38.4	37.3	100.0	100.0	.0	.0	.0	.0	23.3
Paper birch	20.6	26.9	37.8	74.6	100.0	100.0	.0	.0	.0	19.1
Beech	100.0	100.0	.0	.0	.0	.0	.0	.0	.0	72.2
Ash[a]	45.3	52.4	75.5	73.4	.0	100.0	.0	.0	.0	42.2
Aspen[b]	67.2	51.8	40.6	100.0	100.0	100.0	.0	.0	.0	41.3
All species	15.0	18.5	19.1	37.3	50.2	44.8	100.0	.0	.0	13.3

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 8.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Hancock County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	.0	.7	2.4	.0	1.0	.0	.0	.0	.0	4.1
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Paper birch	.9	2.4	1.3	.0	.0	.0	.0	.0	.0	4.6
Beech	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Ash[a]	.4	1.5	1.0	1.4	.0	.0	.0	.0	.0	4.3
Aspen[b]	1.8	2.4	.5	.9	.0	.0	.0	.0	.0	5.6
All species	3.1	7.0	5.2	2.3	1.0	.0	.0	.0	.0	18.6
	SAMPLING ERROR[c]									
	Percent									
Red maple	.0	100.0	54.5	.0	100.0	.0	.0	.0	.0	43.2
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Paper birch	100.0	57.7	70.1	.0	.0	.0	.0	.0	.0	48.5
Beech	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Ash[a]	100.0	70.4	100.0	100.0	.0	.0	.0	.0	.0	74.4
Aspen[b]	100.0	74.3	43.8	100.0	100.0	.0	.0	.0	.0	57.7
All species	65.7	42.8	43.8	73.0	100.0	.0	.0	.0	.0	38.7

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 9.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Kennebec County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	3.2	2.9	3.0	.4	.0	.0	.0	.0	.0	9.5
Sugar maple	.0	.0	.2	.0	.0	.0	.0	.0	.0	.2
Yellow birch	.3	.4	.0	.6	.0	.0	.0	.0	.0	1.3
Paper birch	2.9	1.7	1.5	.0	.0	.0	.0	.0	.0	6.1
Beech	.6	1.3	.0	.0	.0	.0	.0	.0	.0	1.9
Ash[a]	2.4	3.3	.3	.7	.5	.0	.0	.4	.0	7.6
Aspen[b]	4.2	2.7	2.1	.0	.9	.0	.0	.0	.0	9.9
All species	13.6	12.3	7.1	1.7	1.4	.0	.0	.4	.0	36.5
	SAMPLING ERROR[c]									
	Percent									
Red maple	33.9	50.0	51.1	100.0	.0	.0	.0	.0	.0	37.4
Sugar maple	.0	.0	100.0	.0	.0	.0	.0	.0	.0	100.0
Yellow birch	70.9	100.0	.0	71.3	.0	.0	.0	.0	.0	67.6
Paper birch	41.5	45.4	53.1	.0	.0	.0	.0	.0	.0	28.1
Beech	59.2	81.1	.0	.0	.0	.0	.0	.0	.0	71.3
Ash[a]	41.4	34.7	100.0	70.7	100.0	.0	.0	100.0	.0	31.2
Aspen[b]	28.9	34.1	48.1	.0	71.2	.0	.0	.0	.0	22.4
All species	18.4	21.0	30.9	44.7	57.2	.0	.0	100.0	.0	15.8

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 10.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Knox County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	.3	.0	.6	.0	.0	.5	.0	.0	.0	1.4
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Paper birch	.8	.7	.2	.2	.0	.0	.0	.0	.0	1.9
Beech	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Ash[a]	.0	.7	.0	.0	.0	.7	.0	.0	.0	1.4
Aspen[b]	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
All species	1.1	1.4	.8	.2	.0	1.2	.0	.0	.0	4.7
	SAMPLING ERROR[c]									
	Percent									
Red maple	100.0	.0	100.0	.0	.0	100.0	.0	.0	.0	71.9
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Paper birch	73.9	100.0	100.0	100.0	.0	.0	.0	.0	.0	65.0
Beech	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Ash[a]	.0	100.0	.0	.0	.0	100.0	.0	.0	.0	70.7
Aspen[b]	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
All species	59.5	68.3	76.4	100.0	.0	72.3	.0	.0	.0	39.1

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 11.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Lincoln County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	1.5	.3	.4	.0	.0	.0	.0	.0	.0	2.2
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Paper birch	.3	.3	.8	.0	.0	.0	.0	.0	.0	1.4
Beech	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Ash[a]	1.0	.0	.0	.0	.0	.0	.0	.0	.0	1.0
Aspen[b]	1.3	.3	.0	.0	.0	.0	.0	.0	.0	1.6
All species	4.1	.9	1.2	.0	.0	.0	.0	.0	.0	6.2
	SAMPLING ERROR[c]									
	Percent									
Red maple	49.7	100.0	70.7	.0	.0	.0	.0	.0	.0	38.4
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Paper birch	100.0	100.0	74.8	.0	.0	.0	.0	.0	.0	70.3
Beech	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Ash[a]	70.9	.0	.0	.0	.0	.0	.0	.0	.0	70.9
Aspen[b]	61.3	100.0	.0	.0	.0	.0	.0	.0	.0	51.5
All species	29.2	56.9	59.8	.0	.0	.0	.0	.0	.0	26.6

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 12.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Oxford County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	13.1	11.5	1.6	2.9	.0	1.3	1.1	.0	.0	31.5
Sugar maple	6.2	3.6	3.1	1.1	1.2	1.1	.0	.0	.0	16.3
Yellow birch	5.4	11.0	5.5	3.3	1.4	3.0	1.9	3.1	.0	34.6
Paper birch	18.4	17.4	3.5	1.9	.0	.9	.0	.0	.0	42.1
Beech	6.1	3.5	3.0	.0	.0	.0	.0	.0	.0	12.6
Ash[a]	2.7	2.5	.6	1.0	.0	2.2	2.6	3.9	.0	15.5
Aspen[b]	14.1	14.5	3.4	1.8	.0	.0	.0	.0	.0	33.8
All species	66.0	64.0	20.7	12.0	2.6	8.5	5.6	7.0	.0	186.4
	SAMPLING ERROR[c]									
	Percent									
Red maple	25.1	36.0	56.6	72.9	.0	100.0	100.0	.0	.0	28.7
Sugar maple	35.7	49.6	65.4	100.0	100.0	100.0	.0	.0	.0	29.6
Yellow birch	44.2	48.7	40.6	49.2	100.0	70.7	100.0	100.0	.0	31.3
Paper birch	28.6	25.9	53.8	70.8	.0	100.0	.0	.0	.0	22.3
Beech	73.7	50.1	49.6	.0	.0	.0	.0	.0	.0	52.3
Ash[a]	51.0	77.6	100.0	100.0	.0	100.0	100.0	100.0	.0	70.1
Aspen[b]	35.7	47.0	44.2	70.0	.0	.0	.0	.0	.0	33.7
All species	16.7	18.4	22.8	30.5	70.8	41.7	60.7	71.1	.0	14.8

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 13.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Penobscot County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	10.1	8.0	5.1	4.1	.9	4.7	.0	.0	.0	32.9
Sugar maple	8.1	8.1	3.5	3.6	.9	3.5	2.7	2.0	.0	32.4
Yellow birch	3.6	5.3	.4	.0	.9	.0	.0	.0	.0	10.2
Paper birch	6.6	3.1	3.9	2.5	.0	.0	.0	.0	.0	16.1
Beech	1.0	.0	.0	.5	.0	.0	.0	.0	.0	1.5
Ash[a]	2.6	1.6	.4	.0	.0	.0	.0	1.0	.0	5.6
Aspen[b]	11.0	10.9	8.4	10.5	.0	.0	.0	.0	.0	40.8
All species	43.0	37.0	21.7	21.2	2.7	8.2	2.7	3.0	.0	139.5
	SAMPLING ERROR[c]									
	Percent									
Red maple	23.0	37.6	33.4	44.1	100.0	71.9	.0	.0	.0	19.2
Sugar maple	40.5	36.6	45.2	50.4	100.0	76.7	100.0	70.7	.0	24.5
Yellow birch	55.5	51.2	100.0	.0	100.0	.0	.0	.0	.0	46.9
Paper birch	50.2	49.8	52.7	57.4	.0	.0	.0	.0	.0	31.1
Beech	72.5	.0	.0	100.0	.0	.0	.0	.0	.0	58.5
Ash[a]	73.5	70.7	100.0	.0	.0	.0	.0	100.0	.0	48.9
Aspen[b]	35.4	38.3	31.0	37.0	.0	.0	.0	.0	.0	26.3
All species	17.9	18.8	19.4	25.1	57.5	52.6	100.0	57.6	.0	12.5

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 14.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Piscataquis County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	18.1	11.7	11.5	1.8	7.5	1.0	.0	1.0	.0	52.6
Sugar maple	9.4	10.5	11.3	5.5	5.2	11.0	8.7	4.0	.0	65.6
Yellow birch	4.6	7.9	5.1	3.5	9.7	3.7	.8	3.4	.0	38.7
Paper birch	9.4	9.6	4.2	1.7	4.8	.0	.0	.0	.0	29.7
Beech	3.2	4.3	6.3	3.5	2.2	1.0	.0	.0	.0	20.5
Ash[a]	6.7	2.8	1.2	.0	1.3	.0	.0	.0	.0	12.0
Aspen[b]	20.4	21.0	9.5	8.2	8.4	2.2	4.0	1.3	.0	75.0
All species	71.8	67.8	49.1	24.2	39.1	18.9	13.5	9.7	.0	294.1
	SAMPLING ERROR[c]									
	Percent									
Red maple	24.4	27.9	24.0	71.3	38.3	100.0	.0	100.0	.0	16.7
Sugar maple	45.1	31.9	30.2	40.7	44.7	41.2	52.5	61.5	.0	20.6
Yellow birch	36.9	31.6	33.0	44.5	36.7	59.8	100.0	76.7	.0	18.2
Paper birch	27.2	36.7	41.3	70.3	53.2	.0	.0	.0	.0	22.9
Beech	42.3	44.8	42.8	57.8	71.1	100.0	.0	.0	.0	24.9
Ash[a]	48.4	57.1	70.7	.0	100.0	.0	.0	.0	.0	41.9
Aspen[b]	39.7	39.7	37.7	38.6	50.9	70.7	70.7	100.0	.0	25.6
All species	17.4	16.2	15.0	21.0	19.9	28.5	39.9	42.6	.0	10.4

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 15.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Sagadahoc County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	.6	.0	.2	.0	.0	.0	.0	.0	.0	.8
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Paper birch	.0	.4	.0	.0	.0	.0	.0	.0	.0	.4
Beech	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Ash[a]	.6	.7	.0	.0	.0	.0	.0	.0	.0	1.3
Aspen[b]	.3	.3	.0	.0	.0	.0	.0	.0	.0	.6
All species	1.5	1.4	.2	.0	.0	.0	.0	.0	.0	3.1
	SAMPLING ERROR[c]									
	Percent									
Red maple	68.8	.0	100.0	.0	.0	.0	.0	.0	.0	55.0
Sugar maple	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Yellow birch	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Paper birch	.0	100.0	.0	.0	.0	.0	.0	.0	.0	100.0
Beech	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Ash[a]	68.8	100.0	.0	.0	.0	.0	.0	.0	.0	78.5
Aspen[b]	100.0	100.0	.0	.0	.0	.0	.0	.0	.0	68.8
All species	39.7	78.1	100.0	.0	.0	.0	.0	.0	.0	45.2

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 16.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Somerset County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	6.4	12.9	4.2	3.1	2.3	2.6	3.8	.0	.0	35.3
Sugar maple	9.4	13.3	16.5	14.5	8.6	3.0	5.5	9.8	.0	80.6
Yellow birch	5.4	8.4	7.8	8.9	6.8	4.9	5.4	8.9	.0	56.5
Paper birch	12.5	6.1	10.2	4.5	1.2	.0	.0	.0	.0	34.5
Beech	1.9	.0	5.3	.0	1.3	1.5	.0	.0	.0	10.0
Ash[a]	2.1	4.4	1.7	.0	.0	.0	.0	.0	.0	8.2
Aspen[b]	5.7	7.5	8.4	6.1	3.4	3.3	1.9	.0	.0	36.3
All species	43.4	52.6	54.1	37.1	23.6	15.3	16.6	18.7	.0	261.4
	SAMPLING ERROR[c]									
	Percent									
Red maple	35.1	36.4	41.5	50.3	70.7	71.0	70.4	.0	.0	24.8
Sugar maple	31.3	28.4	26.5	28.3	61.5	70.7	61.2	42.5	.0	21.8
Yellow birch	35.4	32.4	28.6	28.3	44.3	58.0	52.2	66.6	.0	19.9
Paper birch	29.2	35.2	37.1	62.3	100.0	100.0	.0	.0	.0	24.8
Beech	61.7	.0	44.0	.0	100.0	100.0	.0	.0	.0	35.0
Ash[a]	60.7	59.1	58.8	.0	.0	.0	.0	.0	.0	43.1
Aspen[b]	58.3	51.6	43.0	43.3	57.8	71.7	100.0	.0	.0	33.4
All species	16.3	16.2	15.0	17.4	30.4	30.9	32.5	38.3	.0	12.0

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 17.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Waldo County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	2.5	1.5	2.1	.7	.4	.0	.0	.0	.0	7.2
Sugar maple	1.4	.3	.2	.0	.0	.0	.0	.0	.0	1.9
Yellow birch	.5	.0	.0	.0	.0	.0	.0	.0	.0	.5
Paper birch	2.9	1.1	.9	.0	.0	.0	.0	.0	.0	4.9
Beech	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Ash[a]	2.3	.3	.3	.4	.0	1.1	.0	.0	.0	4.4
Aspen[b]	1.9	5.6	1.2	.0	.0	.0	.0	.0	.0	8.7
All species	11.5	8.8	4.7	1.1	.4	1.1	.0	.0	.0	27.6
	SAMPLING ERROR[c]									
	Percent									
Red maple	35.0	52.5	51.6	70.8	100.0	.0	.0	.0	.0	31.2
Sugar maple	51.0	100.0	100.0	.0	.0	.0	.0	.0	.0	41.5
Yellow birch	80.1	.0	.0	.0	.0	.0	.0	.0	.0	80.1
Paper birch	36.0	50.4	49.8	.0	.0	.0	.0	.0	.0	31.4
Beech	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Ash[a]	47.8	100.0	100.0	100.0	.0	72.6	.0	.0	.0	46.8
Aspen[b]	45.1	51.5	43.6	.0	.0	.0	.0	.0	.0	44.2
All species	20.3	34.9	27.8	56.1	100.0	72.6	.0	.0	.0	19.1

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 18.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Washington County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	10.4	3.8	5.5	1.9	.0	.0	.0	.0	.0	21.6
Sugar maple	.4	.8	1.3	.0	.0	.0	.0	.0	.0	2.5
Yellow birch	3.8	1.5	.6	.7	.0	.0	.0	.0	.0	6.6
Paper birch	14.2	7.7	3.6	2.2	2.4	.0	.0	.0	.0	30.1
Beech	.5	.0	.7	.8	1.3	.0	.0	.0	.0	3.3
Ash[a]	2.0	1.9	.0	.0	.0	.0	.0	.0	.0	3.9
Aspen[b]	6.2	2.8	4.4	5.3	1.4	.0	.0	.0	.0	20.1
All species	37.5	18.5	16.1	10.9	5.1	.0	.0	.0	.0	88.1
	SAMPLING ERROR[c]									
	Percent									
Red maple	31.2	64.1	43.1	70.7	.0	.0	.0	.0	.0	27.2
Sugar maple	100.0	100.0	100.0	.0	.0	.0	.0	.0	.0	84.8
Yellow birch	51.6	70.0	100.0	100.0	.0	.0	.0	.0	.0	36.8
Paper birch	25.9	36.2	52.4	100.0	69.9	.0	.0	.0	.0	24.2
Beech	100.0	.0	100.0	100.0	100.0	.0	.0	.0	.0	86.0
Ash[a]	61.9	70.9	.0	.0	.0	.0	.0	.0	.0	60.4
Aspen[b]	45.3	57.4	49.0	66.0	100.0	.0	.0	.0	.0	41.4
All species	17.6	26.1	30.2	39.6	49.5	.0	.0	.0	.0	17.6

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 19.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, York County, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	4.1	2.9	1.1	.9	.0	.0	.0	.0	.0	9.0
Sugar maple	1.1	.0	.2	.0	.0	.0	.0	.0	.0	1.3
Yellow birch	1.4	.4	.2	.0	.0	.0	.0	.0	.0	2.0
Paper birch	3.1	2.4	1.1	.4	.0	.0	.0	.0	.0	7.0
Beech	.8	.3	.3	.0	.0	.0	.0	.0	.0	1.4
Ash[a]	1.2	.0	.2	.0	.0	.4	.5	.0	.0	2.3
Aspen[b]	1.7	3.0	.5	.0	.0	.0	.0	.0	.0	5.2
All species	13.4	9.0	3.6	1.3	.0	.4	.5	.0	.0	28.2
	SAMPLING ERROR[c]									
	Percent									
Red maple	30.0	36.4	49.7	71.2	.0	.0	.0	.0	.0	22.9
Sugar maple	53.1	.0	100.0	.0	.0	.0	.0	.0	.0	51.4
Yellow birch	48.1	100.0	100.0	.0	.0	.0	.0	.0	.0	44.3
Paper birch	36.9	47.9	50.7	100.0	.0	.0	.0	.0	.0	26.3
Beech	79.1	100.0	100.0	.0	.0	.0	.0	.0	.0	71.2
Ash[a]	51.5	.0	100.0	.0	.0	100.0	100.0	.0	.0	52.9
Aspen[b]	53.0	49.0	70.5	.0	.0	.0	.0	.0	.0	40.0
All species	20.3	24.2	25.5	58.1	.0	100.0	100.0	.0	.0	16.6

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Table 20.—Net growing-stock volume and sampling error of selected hardwood species suitable for turnstock on timberland by species and diameter class, Maine, 1982

Species	Diameter class (in inches)									All classes
	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0+	
	GROWING-STOCK VOLUME									
	Million cubic feet									
Red maple	94.2	73.2	58.7	29.5	14.6	16.6	4.9	1.0	.0	292.7
Sugar maple	59.2	61.8	61.3	45.6	32.5	35.8	31.0	28.0	3.8	359.0
Yellow birch	37.7	47.3	34.1	29.4	30.6	13.5	11.4	19.4	.0	223.4
Paper birch	109.6	75.8	46.8	16.9	11.5	1.8	.0	.0	.0	262.4
Beech	19.1	15.2	29.5	10.2	8.8	3.2	.0	2.7	.0	88.7
Ash[a]	33.6	28.8	11.3	6.1	2.5	5.5	3.9	5.3	.0	97.0
Aspen[b]	95.6	98.5	77.3	45.9	16.8	8.4	5.9	1.3	.0	349.7
All species	449.0	400.6	319.0	183.6	117.3	84.8	57.1	57.7	3.8	1,672.9
	SAMPLING ERROR[c]									
	Percent									
Red maple	9.2	12.9	11.4	17.6	26.5	30.9	59.2	100.0	.0	7.7
Sugar maple	13.4	13.2	12.7	14.3	21.8	20.6	26.8	30.1	100.0	8.8
Yellow birch	14.0	16.6	13.7	15.5	19.3	32.7	38.7	39.1	.0	9.0
Paper birch	9.9	11.5	14.2	27.7	32.7	70.7	.0	.0	.0	8.0
Beech	27.6	23.5	17.5	29.5	35.8	60.6	.0	100.0	.0	13.5
Ash[a]	17.3	19.2	26.0	43.6	62.1	49.3	72.1	76.6	.0	16.7
Aspen[b]	15.1	14.7	11.9	16.5	31.0	38.9	57.8	100.0	.0	10.0
All species	5.7	6.1	5.7	7.8	11.0	12.9	18.9	21.6	100.0	4.2

[a]Includes white and green ash.

[b]Includes quaking aspen and bigtooth aspen; does not include poplar species.

[c]Sampling error is a measure of the reliability of an estimate, and is expressed as a percentage of the estimate. The sampling errors given here correspond to one standard deviation, and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. An estimate that has an associated sampling error greater than 25 percent, but less than 50 percent should be used with caution; an estimate that has an associated sampling error greater than or equal to 50 percent is not significantly different from zero, and is unreliable.

Wharton, Eric H.; Nevel, Robert L., Jr.; Powell, Douglas S. 1987. **Supply and demand of timber for wood turning in Maine.** NE–RP–599. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 29 p.

An analytical report on the volume of wood used by the wood-turning industry in Maine, and the volume of timber from the state's timberlands that may be suitable for turnstock. Findings are based on the third forest resource survey of Maine timberlands, and an industry canvass of primary manufacturing mills using wood from Maine timberlands, both conducted in 1982. Presents the volume of turnstock consumed by Maine mills, the volume produced from Maine timberlands, the volume suitable to be harvested for turnstock, and changes over time.

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