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*Pecan*



Forest Service

U. S. DEPARTMENT OF AGRICULTURE



# PECAN

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The pecan hickories belong to one of the two groups into which the eight species of hickory of commercial importance are divided. The pecan hickories include four commercial species. Three of these—pecan (sweet pecan),<sup>1</sup> water hickory (bitter pecan), and nutmeg hickory—grow principally in the lower Mississippi Valley. The remaining pecan—bitternut hickory—grows throughout nearly all the eastern United States. Sweet pecan is the largest of all the hickories,<sup>2</sup> sometimes reaching a height of 150 feet and a diameter of 6 feet. The other pecans are smaller in size—generally not over 100 feet high and 2 feet in diameter.

The wood of the pecans, although not equal to true hickory in strength, hardness, and toughness, nevertheless possesses these properties to the same high degree as commercial white oak, sugar maple, and white ash, and is suitable for many of the exacting purposes for which these woods are employed. The limited amount of pecan lumber produced goes principally into boxes and crating, automobile truck framing, furniture, and flooring.

There is considerable waste in producing pecan lumber and in manufacturing it into finished products partly because of the various defects common to both the pecan hickories and true hickories, but especially because of the prevalence of shake<sup>3</sup> in pecan timber. This defect can often be detected in the log, but sometimes does not become evident until the later stages of the manufacturing process.

The stand of the pecan hickories of saw-timber size is probably between one-third and one-half as great as the stand of true hickories. The average annual production of pecan lumber and dimension stock in former years was very small compared with the production of hickory lumber and dimension stock. In recent years, however, there has been probably from one-fifth to one-third as much sawed stock produced from the pecan hickories as from the true hickories.

**Nomenclature.**—Following are the names of the four pecan hickories of greatest commercial importance:

<i>Common name</i>	<i>Botanical name</i>	<i>Other names</i>
Pecan -----	<i>Carya illinoensis</i> syn. <i>Hicoria pecan.</i>	Sweet pecan.
Water hickory -----	<i>C. aquatica</i> syn. <i>H. aquatica.</i>	Bitter pecan. Pecan.
Nutmeg hickory -----	<i>C. myristicaeformis</i> syn. <i>H. myristicaeformis.</i>	Swamp hickory. Bitter water hickory.
Bitternut hickory -----	<i>C. cordiformis</i> syn. <i>H. cordiformis.</i>	Pecan. Swamp hickory. Bitternut. Pignut. Pecan. Swamp hickory.

<sup>1</sup> This tree produces the pecan nuts so well known throughout this country and abroad. These nuts come from both cultivated and wild (forest) trees.

<sup>2</sup> Including both pecan hickories and true hickories.

<sup>3</sup> A separation along the grain, most of which occurs between the rings of annual growth.

The name "pecan" is frequently applied to any of the commercial pecan hickories and also to the pecan hickories as a group. In the deep South, the names "sweet pecan" for pecan and "bitter pecan" for water hickory are commonly used. The true hickories of commercial importance include shagbark hickory (*Carya ovata* syn. *Hicoria ovata*), shellbark hickory (*C. laciniosa* syn. *H. laciniosa*), pignut hickory (*C. glabra* syn. *H. glabra*), and mockernut hickory (*C. tomentosa* syn. *H. alba*).

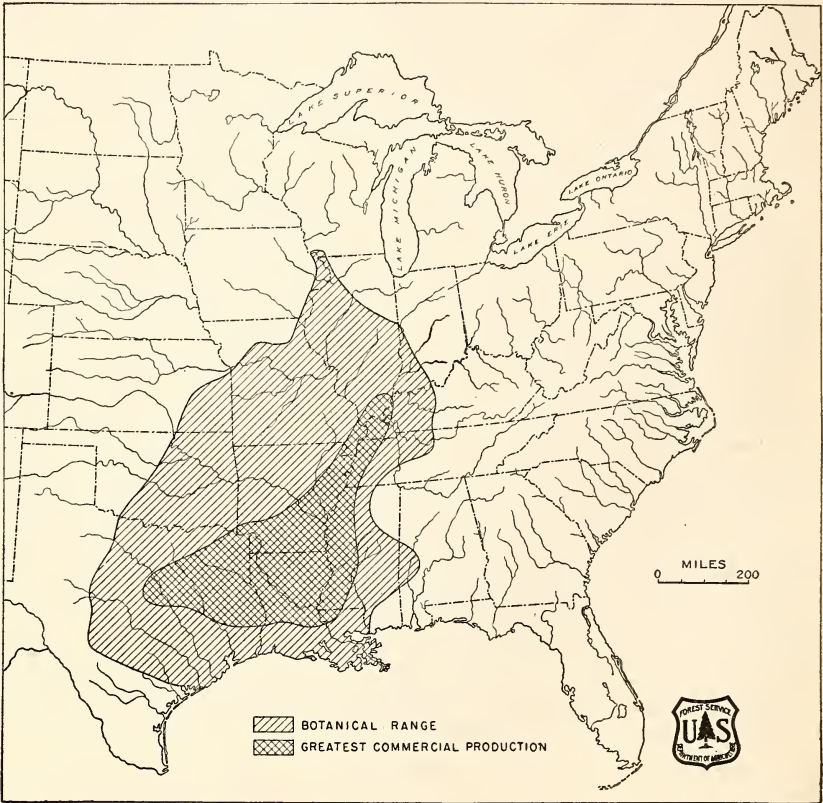


FIGURE 1.—Range of pecan (*Carya illinoensis* syn. *Hicoria pecan*).

**Distribution and growth.**—The ranges of the four pecan hickories of principal commercial importance are given in (Figs. 1, 2, 3, and 4.) Three of these species (pecan, water hickory, and nutmeg hickory) grow principally in the river bottoms of the lower Mississippi Valley and Gulf regions, their commercial ranges being confined largely to Louisiana and adjacent portions of bordering States. The remaining pecan hickory—bitternut—grows throughout nearly all the eastern part of the United States. Its commercial range is centered in Illinois, Indiana, and Ohio, and extends into adjacent States.

The hickories are reproduced both by seed and sprout. Some nuts are borne every year, but good seed crops occur no oftener than every other year. A thrifty hickory, standing in the open, will frequently

bear two to three bushels of husked nuts in a year.<sup>4</sup> Many of the nuts produced by several species of hickory are gathered by man for food. Many are eaten by squirrels or buried for future use, sometimes at a distance from the parent tree. Often the buried nuts are not recovered, and some sprout and grow into trees.

Hickory reproduction under forest conditions is made possible by the ability of the seedlings and young trees to endure dense shade. During their first few years seedlings expend most of their energy in developing a long, strong taproot. The seedlings are very hardy and will continue to grow after being burned and broken or cut back time after time.

Pecan (sweet pecan)<sup>5</sup> in its natural state does not grow in pure stands but is found mixed with sweetgum, American elm, water oak, persimmon, cottonwood, hackberry, and honey locust. It generally occurs on sandy or loamy soils along the ridges or higher portions of river bottoms, where there is considerable moisture, but where the ground is not swampy or subject to prolonged overflow. Pecan grows rather rapidly and is long-lived. It is the largest of the hickories. Mature trees are generally 200 to 300 years old and have a height of 110 to 140 feet and a diameter of 2 to 4 feet.

Water hickory (bitter pecan) generally grows in wet locations, and thrives in swamps subject to inundation for several months at a time. It is frequently associated with overcup oak. The most extensive stands of water hickory are located near the central part of Louisiana.<sup>6</sup> Here the species commonly makes up at least 20 percent of the standing timber and sometimes as much as 60 percent. Water hickory is the most prevalent species of hickory in Florida and along the Atlantic coast lowlands of Georgia and South Carolina. Practically the only other hickory that grows in this region is mockernut hickory—one of the true hickories. Water hickory is rarely over 2½ feet in diameter. The trunk is frequently clear of branches for some distance above the ground.

Nutmeg hickory has a very limited range of growth and is the least important of the four commercial pecans. It is found principally in northern Louisiana and southern Arkansas in moist locations near swamps and rivers. Mature trees grown under favorable conditions are generally from 80 to 100 feet high and about 2 feet in diameter.

Bitternut hickory, frequently known as "pignut," is the only one of the pecans that grows in commercial quantities in the Northern States. It is a moisture-loving species and makes its best growth along streams and in the rich, moist bottom lands. Bitternut generally grows in mixture with elm, oak, white ash, and shagbark, pignut, and shellbark hickory. Following are the results of measurements of normal second-growth bitternut trees of various ages grown under favorable conditions in the Ohio Valley:<sup>7</sup> age 10 years—diameter 2 inches, height 10 feet; 20 years—diameter 4 inches, height 24 feet; 50 years—diameter 9.2 inches, height 52 feet; 60 years—diameter 11.4 inches, height 69 feet. This growth, both in diameter

<sup>4</sup> Improved cultivated varieties of pecan may bear 15 bushels a year.

<sup>5</sup> Numerous cultivated varieties of sweet pecan have been developed from selected wild trees for nut-producing purposes. These improved varieties supply a considerable proportion of the pecan nuts found on the market, especially the "paper shell" pecans of large size. The average annual production of pecan nuts during the 4-year period 1928-32 was about 60,000,000 pounds. In 1940 it was about 87,000,000 pounds.

<sup>6</sup> In both cases about three-quarters of the total annual production was from wild trees.

<sup>7</sup> In the backwater areas at the junction of the Red, Atchafalaya, and Mississippi Rivers.

<sup>7</sup> BOISEN, A. and NEWLIN, J. A. THE COMMERCIAL HICKORIES. U. S. Forest Serv. Bul. 80, [66] pp., illus. 1910.

and height, is faster, especially in diameter, than that of normal associated trees of shagbark and pignut hickory.

**Supply.**—A rough estimate of the total stand of hickory in this country was made in 1919.<sup>8</sup> The combined stand of both true hickory

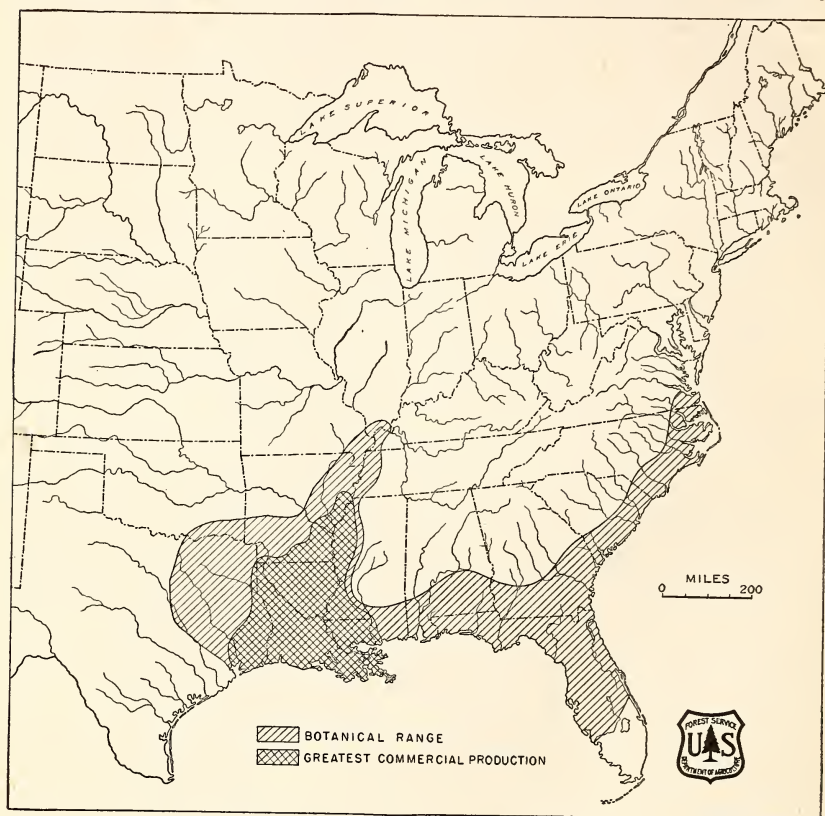


FIGURE 2.—Range of water hickory (*Carya aquatica* syn. *Hicoria aquatica*).

and pecan hickory was placed at 16,000,000,000 board feet, distributed as follows:

Region	Board feet
Lower Mississippi Valley	7, 000, 000, 000
Central (timber largely in wood lots)	3, 000, 000, 000
Southern Appalachians	2, 500, 000, 000
Atlantic and Gulf Coast	2, 500, 000, 000
Remainder of range	1, 000, 000, 000
<b>Total</b>	<b>16, 000, 000, 000</b>

A forest survey conducted in the Southeastern States<sup>9</sup> showed the occurrence of hickory of saw-timber size in sufficient quantities to be listed separately from other species in parts or all of the States of Louisiana, Arkansas, Mississippi, Texas, and Oklahoma, comprising

<sup>8</sup> SPARHAWK, W. N., SUPPLIES AND PRODUCTION OF AIRCRAFT WOODS. Fifth Ann. Rpt., Natl. Advisory Com. Aeronaut. Rpt. 67, pp. 409-471, illus. 1919.

<sup>9</sup> Conducted by the Southern Forest Experiment Station of the Forest Service, U. S. Department of Agriculture, in 1936-38, as part of a Forest Survey of the United States.



a region which closely approximates the lower Mississippi Valley in the 1919 estimates. The total stand of hickory reported in the States listed was 4,655,800,000 board feet<sup>10</sup> as compared with 7,000,000,000 board feet in the 1919 estimates. This is a reduction of about one-third and if applied to the 1919 estimate for total stand, would reduce it to 10,667,000,000 board feet.<sup>11</sup>

The forest-survey findings covering the stand of all hickory in the lower Mississippi Valley region include 2,967,800,000 board feet of the pecans, of which about 85 percent is water hickory (bitter pecan)<sup>12</sup> and 15 percent pecan (sweet pecan). Nutmeg hickory occurred in com-



FIGURE 3.—Range of nutmeg hickory (*Carya myristicaeformis* syn. *myristicaeformis*.)

paratively small quantities, and its stand was not recorded separately.

No figures are available on the stand of bitternut—the remaining pecan hickory. The wide range of this species extends into the Southeastern States, but it grows principally in the States farther north. It was not found by the forest survey in sufficient quantities in any one of the Southeastern States to justify recording its stand separately, although its total stand in the South is probably appreciable. If the stand of bitternut throughout its entire range is assumed to be

<sup>10</sup> Based on International ¼-inch log scale.

<sup>11</sup> Forest surveys covering regions where hickory grows in commercial quantities have been made only in the Southeastern States.

roughly 1,000,000,000 board feet, then the combined total stand of all the four pecan hickories of saw-timber size throughout their respective ranges would be approximately 4,000,000,000 board feet.

**Production.**—Pecan lumber was first listed as a separate item in the lumber production reports of the Bureau of the Census in 1913. In that year a production of 1,090,000 board feet was reported by sawmills in 9 States. Since then reported production has varied from a minimum of 140,000 board feet in 1916 to a maximum of 38,000,000 board feet in 1942 (see fig. 5). The marked increase in production since 1939 has been due principally to the demands brought about by the war but also in part to the more thorough coverage of the mills (both large and small) where pecan lumber is sawed. The 1942 production is by far the largest so far reached and is nearly 8 times that of 1939. For the 10-year period 1933–42 the average annual production of pecan lumber was approximately 10,000,000 board feet. The 1942 cut came from 12 States. Nearly all of it, however (over 97 percent), was furnished by 4 States—Mississippi, Louisiana, Arkansas, and Tennessee. Bitternut hickory, which grows much farther north than the other 3 pecans, is frequently cut and sold in mixture with the true hickories, especially the higher quality bitternut.

When pecan trees are felled, some are cut into logs which go to sawmills, from which reports of lumber production are obtained, and some are cut into short bolts which go direct to the plants where the final product is manufactured and hence are not included in the statistics of lumber production obtained from sawmills.<sup>12</sup> It is probable that the volume of the dimension stock and veneer cut from bolts is roughly one-quarter as much as the volume of the lumber produced by sawmills. A very rough estimate of the cut of the pecans for lumber and manufactured products in recent years would be 12,500,000 board feet annually. Indeterminate amounts are also used for firewood and for smoking meats. The average annual cut of pecan for all purposes in recent years is roughly estimated at 15,000,000 board feet.

**Properties.**—The sapwood of the pecan hickories is white, sometimes tinged with brown, and the heartwood pale brown to reddish brown. The sapwood makes up a considerable proportion of the cross section in the younger trees and a decreasing proportion as the trees grow older. Measurements made on second-growth bitternut trees 12 to 16 inches in diameter grown under forest conditions in Ohio showed about 1½ inches of sapwood. Similar measurements on one of the true hickories (pignut) in the same locality showed over 3 inches of sapwood.

The wood of the pecans<sup>13</sup> is rated as heavy,<sup>14</sup> strong, stiff, very hard, and very high in shock resistance. It is below the wood of the true hickories<sup>15</sup> in strength and other mechanical properties, especially in shock-resisting ability, and somewhat above white oak, sugar maple,<sup>16</sup> and white ash. The pecans average lighter in weight than the true hickories and have about the same average weight as white oak. They have a large shrinkage, which, however, is considerably

<sup>12</sup> Pecan lumber produced by sawmills is generally shipped to other plants for further manufacture into finished products. Some is used for construction purposes as it comes from the sawmill.

<sup>13</sup> Average of four species of commercial pecan hickories.

<sup>14</sup> The average weight of each of the four pecan hickories of commercial importance in an air-dry condition (12 percent moisture) is as follows: pecan—46 pounds per cubic foot; water hickory—43 pounds per cubic foot; nutmeg hickory—42 pounds per cubic foot; and bitternut hickory—46 pounds per cubic foot.

<sup>15</sup> Average of four species of commercial true hickories.

<sup>16</sup> Except in stiffness. In this property sugar maple rates slightly above the pecan hickories.

less than that of the true hickories and somewhat less than that of sugar maple and white oak but greater than that of white ash. Lumber cut from the pecans is somewhat difficult to season without warping and checking. Water hickory (bitter pecan) is more subject to wind shake than the other pecans, which accounts very largely for the greater waste in logging this species, since shaky logs are commonly left in the woods. This shake, a separation between the annual rings, is, however, not always evident in the logs until after the wood has been seasoned and the process of fabrication is well along.

In suitability for machining the pecans rank high. They can be readily planed, turned, bored, and mortised with but relatively few defective pieces resulting from the operations. They are also satisfactory for use with a shaper, ranking with black walnut and white oak in this respect but below maple and mahogany. In tendency to split in nailing, the pecans are classed with yellow birch and sugar maple—among the woods most liable to split. In nail-holding ability they rank high. The pecans can be glued satisfactorily with moderate care in the gluing operation. They have good finishing qualities and when used for flooring or furniture somewhat resemble black walnut in appearance. The pecans, like the true hickories, birch and maple, lack durability when exposed to conditions favorable to decay.

Hickory trees<sup>17</sup> frequently have holes drilled through the bark by woodpeckers. These holes or "birdpecks" bring about a discoloration of the wood known as "streaks," which, at least when they occur in moderation, have little if any effect on the mechanical properties of the wood but do affect its appearance and cause the rejection of considerable material. Hickory logs are liable to be attacked by a number of wood-boring beetles, and the sapwood, even after it has been seasoned and manufactured into various products, is still subject to damage from powder-post beetles.

Various methods of treating hickory to prevent insect attack or to check damage not too far advanced have been worked out.<sup>18</sup> The methods used to prevent attack include treatment with linseed oil and the application of varnish or paraffin. To check attack by killing the beetles in infested material not too badly damaged, saturation with kerosene and other chemicals and heating to 180° F., or steaming is recommended. More recent experiments have proved that dipping susceptible green lumber containing sapwood in borax at 180° F. or cold microfine sulfur water combinations for 10 seconds will prevent attack by *Lyctus* powder-post beetles. Dipping similar seasoned lumber for 5 minutes in a 5-percent solution of pentachlorophenol in light petroleum oil will not only kill all beetles within the wood, but will also prevent future attack.

**Principal uses.**—The wood of the pecans is used principally for lumber, dimension stock,<sup>19</sup> and fuel. The better grades of lumber are manufactured largely into parts for motor vehicles, furniture, and flooring. The poorer grades go mostly into boxes and crates. Dimension stock also goes into furniture parts as well as framing for automobile trucks and trailers, and is used to some extent in the manufacture of turned articles such as small handles, baseball bats, etc.

<sup>17</sup> Both true hickory and pecan hickory.

<sup>18</sup> SNYDER, T. E. PREVENTING DAMAGE BY LYCTUS POWDER-POST BEETLES. U. S. Dept. Agr. Farmers' Bul. 1477, (Rev.) 14 pp., illus. 1936.

<sup>19</sup> Dimension stock consists of pieces sawed directly from the log or bolt to the approximate sizes required for further manufacture into finished parts for furniture, automobile-truck frames, turned articles, etc.

A comparatively small amount of pecan veneer is used for face plies in plywood panels for interior finish.

The resemblance of the wood of the pecans to the more costly black walnut and its ability to take a pleasing finish have done much to further the use of pecan as a furniture wood. The use of pecan for flooring is rather recent, but the wood is reported to be giving satisfaction in public buildings, dance halls, and industrial plants, as well as in residences. The fact that pecan is harder and shrinks and swells less than sugar maple and white oak (both standard woods for high-class floors) indicates its fitness as a flooring material.

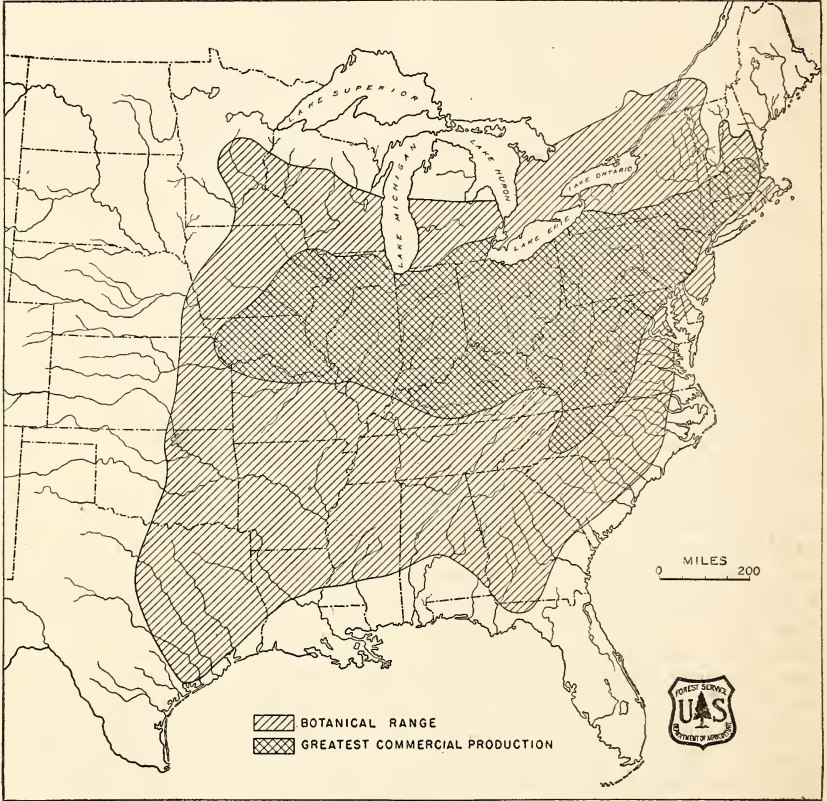


FIGURE 4.—Range of bitternut hickory (*Carya cordiformis* syn. *Hicoria cordiformis*).

The pecans, like the true hickories, are excellent fuel woods. They burn slowly and have a high heating value but do not produce such a quick fire as the lighter weight woods. The pecans, as well as the true hickories, are used for smoking meat, which is suspended above a slow fire of partially seasoned or green blocks and small pieces mixed with sawdust. Both flavor and keeping qualities of the meat are improved by the process.

Table 1 shows the amounts of pecan used in the manufacture of wooden products in 1928, 1933, and 1940. The table includes pecan

in the form of lumber, with a very small proportion of logs and bolts, and veneer.

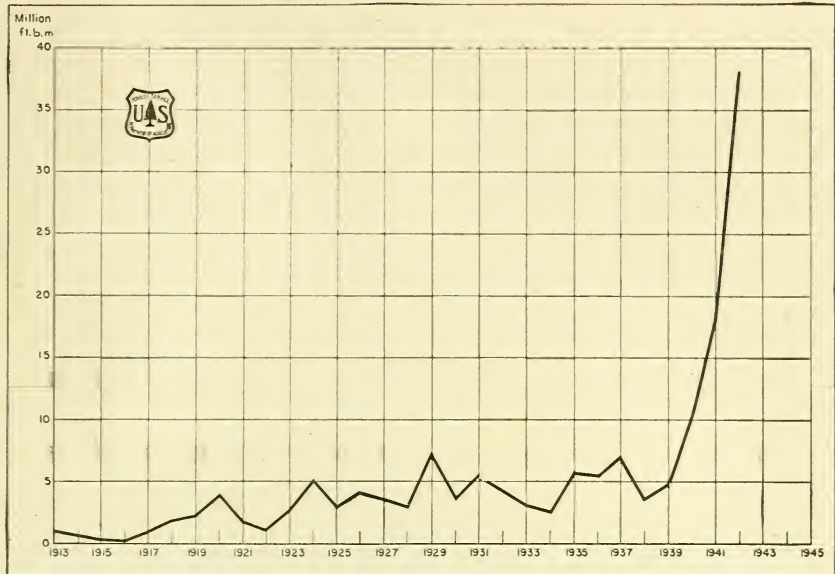


FIGURE 5.—Lumber production of pecan, 1913-42. (Includes pecan, water hickory, nutmeg hickory, and bitternut hickory.)

TABLE 1.—Pecan used in the manufacture of wooden products

Classes of products	Thousands of board feet		
	1923	1933	1940
Agricultural implements .....			151
Boxes, baskets, and crating .....		589	1,844
Dowels and skewers .....			18
Fixtures .....	3		
Flooring .....			486
Furniture .....	1,425	729	1,063
Instruments, musical .....			15
Sash, doors, general millwork .....	1		
Sewing machines .....	108	15	
Vehicles, motor .....	961	2,005	1,799
Vehicles, nonmotor .....	25		
Total .....	2,523	3,338	5,376

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