Carya - General #44

The Distribution and Volume of Hickory Timber

by James W. Cruikshank and J. F. McCormack

HICKORY TASK FORCE REPORT

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FOREWORD

Hickory (*Carya spp.*) has earned the reputation of being one of the world's toughest woods. In shock resistance it has no equal. The reputation earned by hickory is based on the performance of high quality material in products requiring a high degree of strength and toughness.

Today, a limited quantity of high-grade hickory is available and its value and scarcity are well recognized by the wood-using industries. There is, however, a large volume of low-grade hickory that was bypassed when loggers cut our hardwood forests, and many land managers are troubled by the increasing amount of growing space occupied by it. Although this low-grade hickory does not possess the quality or properties required in many products, it is a potentially valuable wood for many uses.

A conference of federal, state, university, and industrial representatives was held in Clemson, S. C., in April 1953, and the Hickory Task Force was organized to promote the utilization of hickory. Accomplishment of this objective will be reached through research and publication of known information.

The Southeastern Forest Experiment Station has assumed the responsibility to edit, publish, and distribute reports containing information which will be developed under this program.

Full acknowledgment is due the many cooperating agencies and individuals who are making the project possible. Subject Matter Committee Chairmen are:

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THE DISTRIBUTION AND VOLUME OF HICKORY TIMBER

by

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SUMMARY

Hickory grows in every state east of the Mississippi River and in several states west of the River. There are more than 30 species but only 8 of commercial importance: four species of true hickories and four of pecan hickories. There are 112 million acres of the oak-hickory type, one-fourth of it located in the Central States. The net volume of hickory sawtimber amounts to 24 billion board-feet, with Kentucky containing 12 percent of the total. There are also 60 million cords of hickory in sound trees below the sawtimber size limit, and the available supply is increasing rapidly.

INTRODUCTION

The name hickory as used in this report refers to all of the more than thirty species that grow in the eastern United States. There are, however, only eight species of commercial importance: four species of true hickories and four of pecan hickories. The true hickories furnish a very large proportion of the high-grade hickory used by industry. The wood of the pecans, though not equal to true hickory in strength, hardness, and toughness, is suitable for many of the exacting purposes for which white oak, sugar maple, and white ash are employed. The common names of the four species in each of these groups, together with scientific name (1) of each, are as follows:

True Hickories

Shagbark hickory *Carya ovata* (Mill.) K. Koch.
Shellbark hickory *Carya laciniosa* (Michx. f.) Loud.
Pignut hickory *Carya glabra* (Mill.) Sweet.
Mockernut hickory *Carya tomentosa* Nutt.

Pecan Hickories

Pecan *Carya illinoensis* (Wangenh.) K. Koch.
Water hickory *Carya aquatica* (Michx. f.) Nutt.
Nutmeg hickory *Carya myristicaeformis* (Michx. f.) Nutt.
Bitternut hickory *Carya cordiformis* (Wangenh.) K. Koch.

This report presents information on the location, quantity, and quality of hickory timber. Location maps are copies of those published in the American Woods series of the Forest Service (2, 3).[1/] The other data were obtained from the Timber Resource Review (4) of the Forest Service, supplemented by information from the Forest Survey.

THE DISTRIBUTION OF HICKORY

Hickory grows in every state east of the Mississippi River and in several states on the western side. Rarely growing in pure stands, it is most common in mixture with the oaks.

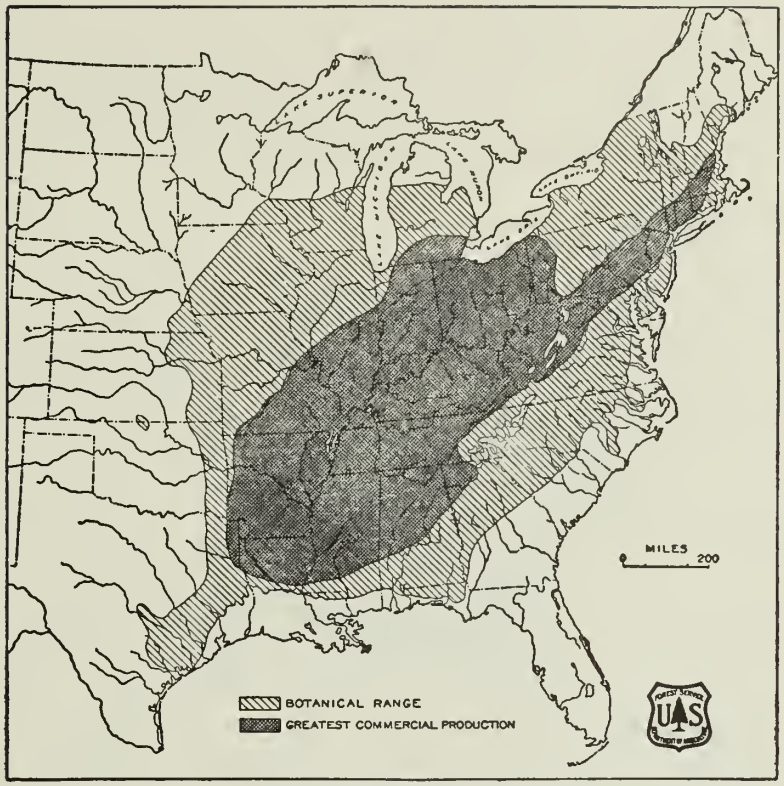
Distribution of the True Hickories

Shagbark is one of the most widely distributed of the hickories (fig. 1). Its commercial range once extended from southern New England through northern Ohio and Indiana into the lower Ohio Valley and down to the river bottoms of the lower Mississippi Valley. At present most of the commercial shagbark north of the Potomac River and east of the Allegheny Mountains has been cut. North of the Ohio River only a few scattered remnants of the original stands are left. The bulk of the present supply lies in the lower Mississippi Valley region.

Shellbark (fig. 2) is most prominent in the region around the lower Ohio River, south along the Mississippi to Central Arkansas, and northeast through the Wabash Valley to northern Indiana and Ohio.

The commercial distribution of pignut (fig. 3) corresponds closely to that of shagbark except that it does not extend as far south in the Mississippi Valley region. It is prominent in the Cumberland Mountains of Tennessee, Kentucky, and West Virginia, and on the hills of the Ohio Valley.

1/ Numbers in parentheses refer to literature cited at the end of this report.



Typical leaf
and nut

Figure 1.--Range of shagbark hickory.

Typical leaf
and nut

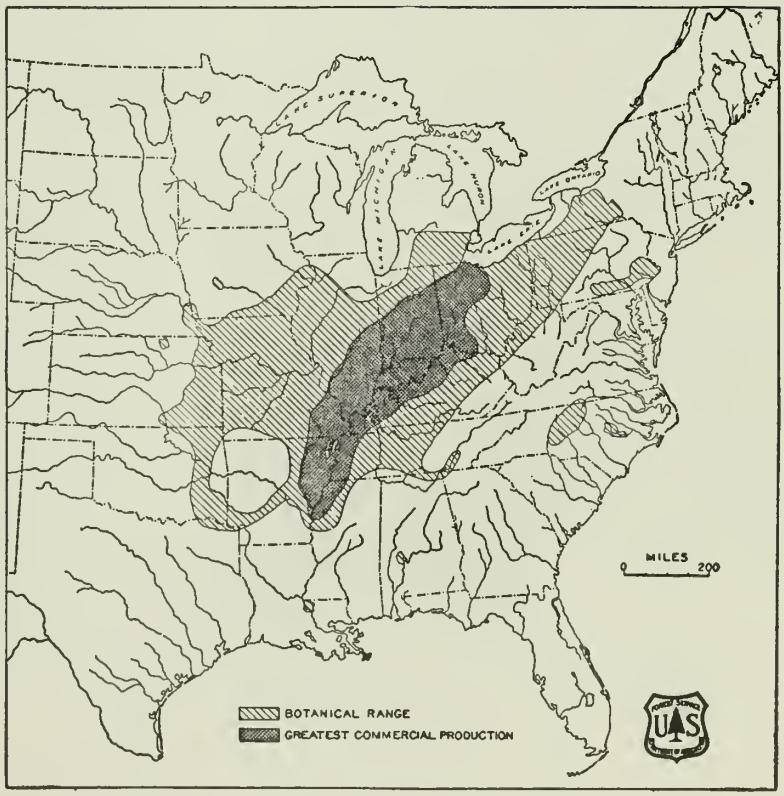


Figure 2.--Range of shellbark hickory.

Mockernut (fig. 4) is typically a southern species. It is fairly common in southeastern Pennsylvania and extends toward the South through Virginia, the Carolinas, Georgia, and into Florida. It is abundant in the lower Mississippi Valley but is commercially less important than shagbark.

Distribution of the Pecan Hickories

Three of these species, pecan (fig. 5), water hickory (fig. 6), and nutmeg hickory (fig. 7), 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 adjoining states. Bitternut hickory (fig. 8) grows throughout nearly all the eastern part of the United States, but its commercial range is centered in Illinois, Indiana, and Ohio.

Area of the Oak-Hickory Forest Type

A large part of the hickory timber is in the oak-hickory forest type. Altogether, there are 112 million acres of this type, which comprises 30 percent of all commercial forest area in the regions listed in table 1. The highest proportion of forest land in the oak-hickory type is in the Central States (fig. 9), but the Middle Atlantic and South Atlantic regions also have over 30 percent of their forest area in this type. The percentage of hickory volume in this type varies considerably; for example, in Virginia it is 8 percent; in Arkansas, 14 percent; and in Alabama, 20. Hickory is also prevalent in other types such as oak-pine with 5 to 10 percent, and oak-gum-cypress with up to 10 percent. This means that hickory occurs, rather scattered to be sure, on many more acres than support the oak-hickory type.

Table 1.--Extent of the oak-hickory forest type

Region	All forest types	Oak-hickory type	
	Thousand acres	Thousand acres	Percent
New England	30,658	3,180	10.4
Middle Atlantic	42,225	18,624	44.1
Lake	53,272	6,443	12.1
Central	42,394	28,994	68.4
Plains	5,492	1,333	24.3
South Atlantic	46,152	14,919	32.3
Southeast	94,985	24,104	25.4
West Gulf	52,151	14,617	28.0
Total	367,329	112,214	30.5

Typical leaf
and nut

Figure 3.--Range of pignut hickory.

Typical leaf
and nut

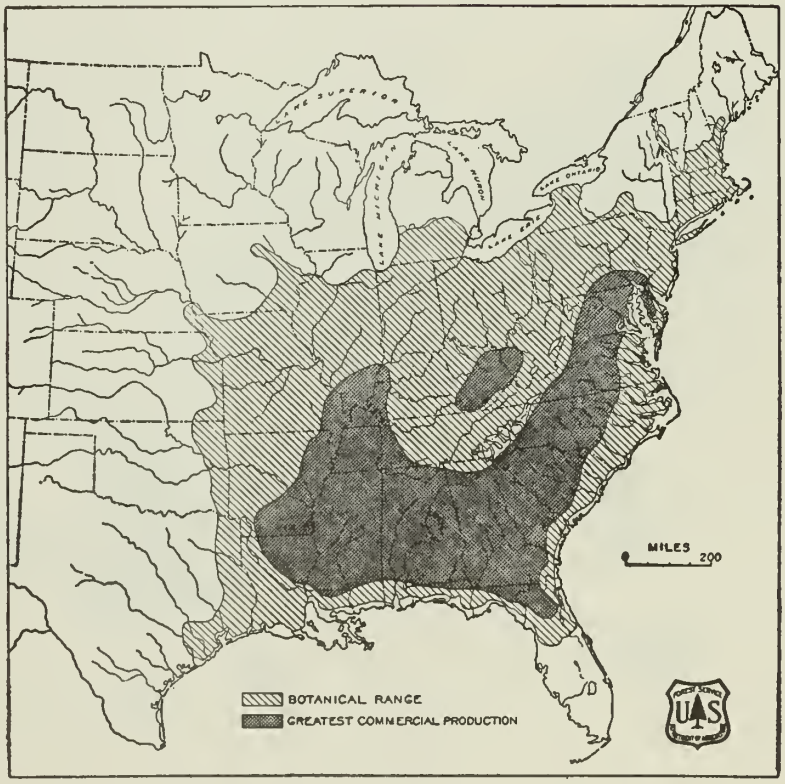
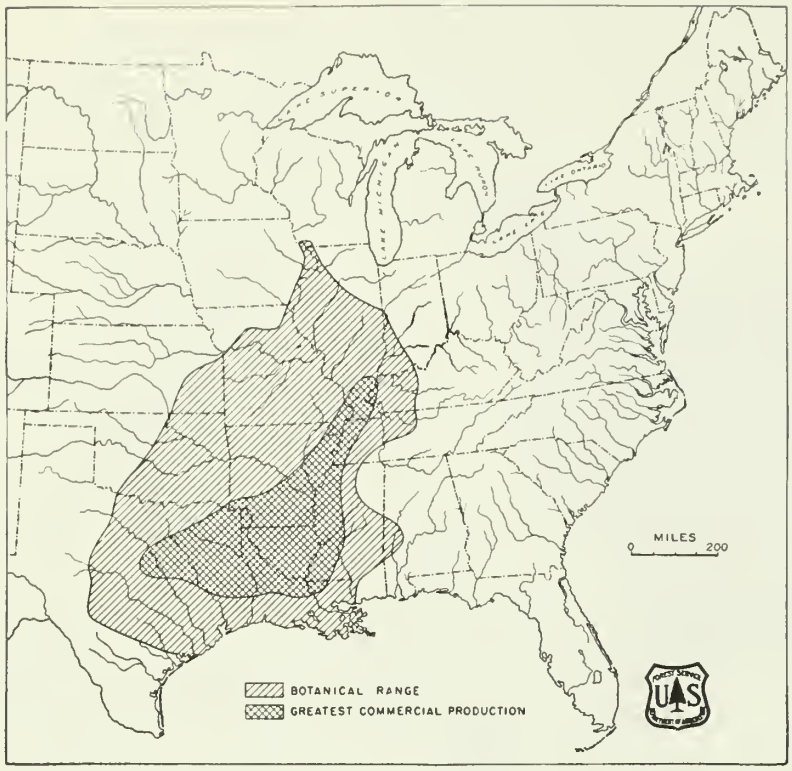


Figure 4.--Range of mockernut hickory.



Typical leaf
and nut

Figure 5.--Range of pecan.

Typical leaf
and nut

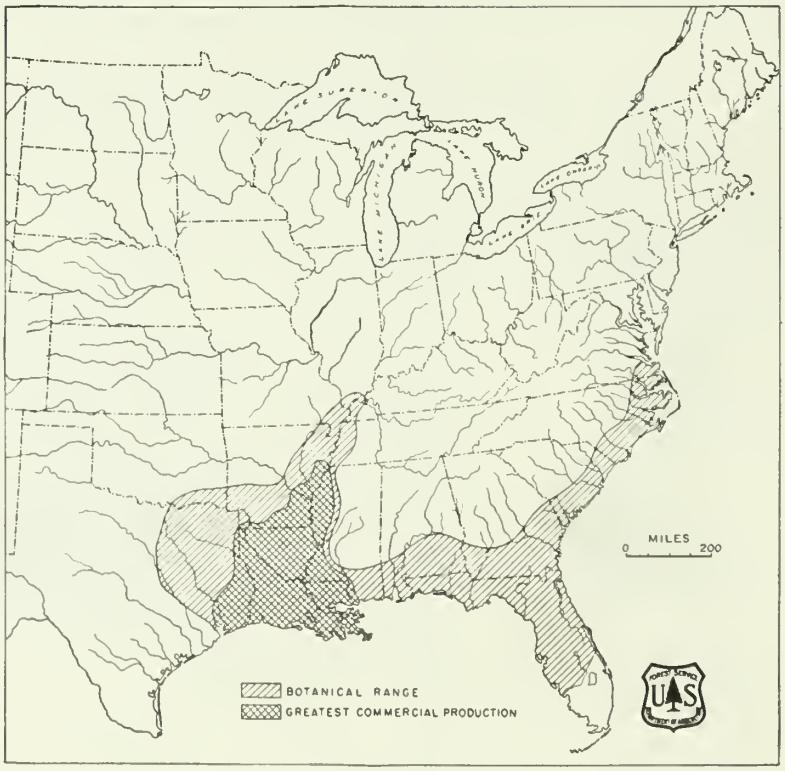
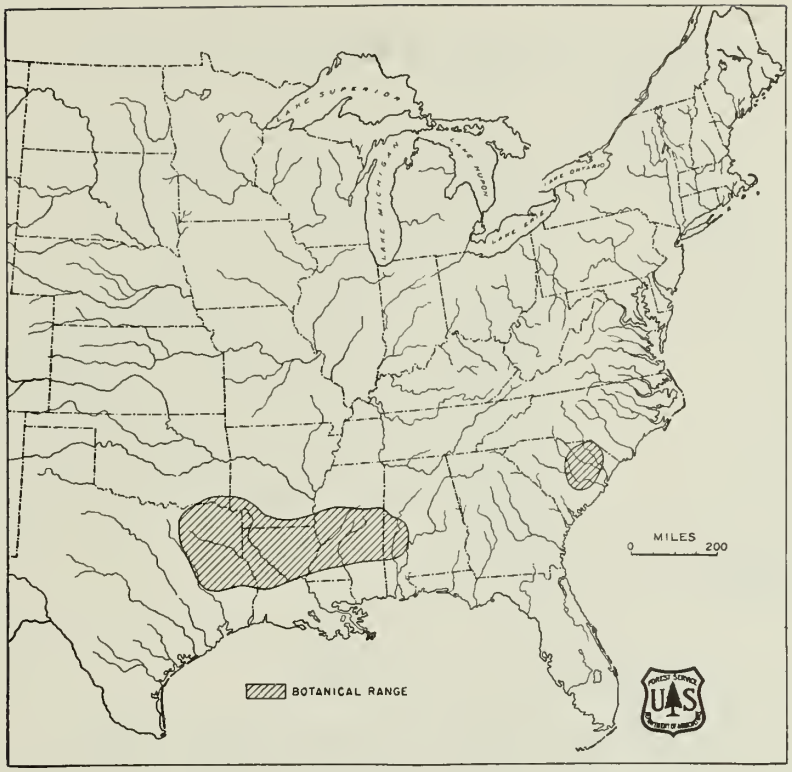


Figure 6.--Range of water hickory.



Typical leaf
and nut

Figure 7.--Range of nutmeg hickory.

Typical leaf
and nut

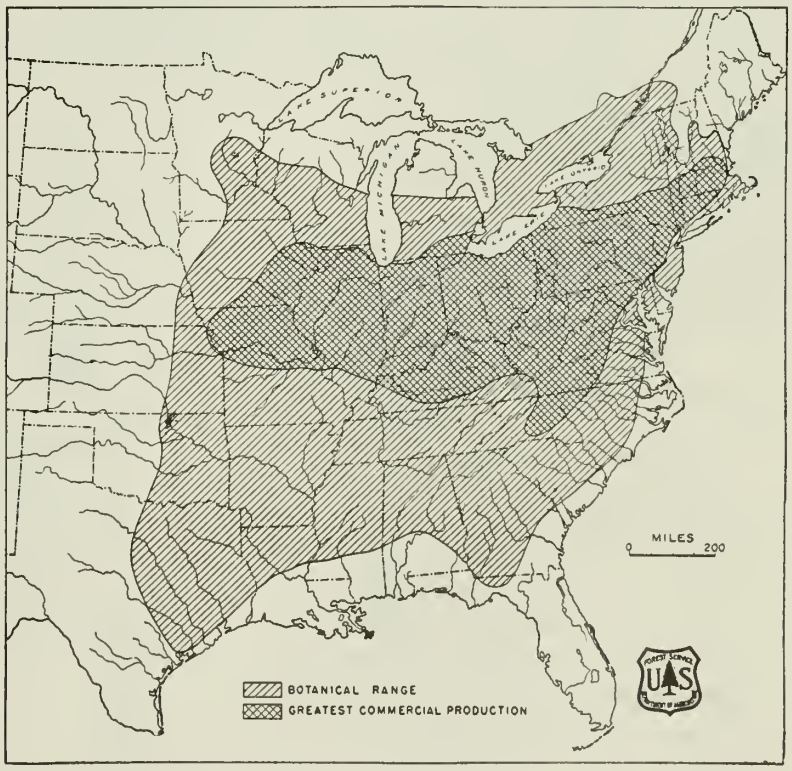


Figure 8.--Range of bitternut hickory.

Figure 9.--Forest Regions.

The distribution of the oak-hickory type by states is shown in figure 10. Missouri is the leading state from the standpoint of acreage, but hickory makes up a small component of the type volume as subsequent board-foot volume figures will show. Eight states--Pennsylvania, West Virginia, Virginia, North Carolina, Kentucky, Tennessee, Arkansas, and Mississippi--contain 5 to 10 million acres each; combined they comprise half of the total oak-hickory forest area.

THE VOLUME OF HICKORY SAWTIMBER

The net volume of all hickories of sawtimber size is 24 billion board-feet, six percent of the volume of all hardwoods in the eastern United States (table 2). Ninety percent of the volume is in four regions--the Central, Southeast, West Gulf, and South Atlantic. The Middle Atlantic region contains about two billion feet, but only minor quantities are found in New England, the Lake, and Plains region. In the four regions where hickory is most abundant, it makes up from 6 to 10 percent of the total stand of hardwood sawtimber. Volumes per average acre of commercial forest range from 158 board-feet in the Central region down to 3 board-feet in New England and the Lake States. The South Atlantic region averages 76 board-feet and the Southeast 64.

Volume by States

Kentucky contains more hickory than any other state, 2.9 billion board-feet, or 12 percent of the total. Louisiana ranks next with about 2 billion feet, chiefly pecan growing in the bottomlands along the Mississippi River. Together these two states contain 21 percent of the total supply of hickory sawtimber.

Figure 10.--Distribution of oak-hickory forest type by states.

Table 2.--Net volume of hickory sawtimber compared with all hardwoods, by regions

Region	All hardwoods	Hickory	
	Million bd.-ft.	Million bd.-ft.	Percent
New England	24,356	93	0.4
Middle Atlantic	61,023	2,046	3.4
Lake	35,435	150	0.4
Central	79,251	6,688	8.4
Plains	7,007	55	0.8
South Atlantic	55,714	3,535	6.3
Southeast	62,469	6,111	9.8
West Gulf	55,952	5,218	9.3
Total	381,207	23,896	6.3

Other states with over a billion feet include Alabama, Arkansas, Mississippi, Tennessee, North Carolina, Virginia, West Virginia, and Ohio (fig. 11). They contain about 12 billion feet, or half of all the hickory available. Thus, ten states, all but one south of the Ohio River, have 71 percent of the sawtimber volume.

Volume by Tree Diameter

Most of the hickory large enough for sawtimber is found in relatively small trees. In the four regions, the Central, South Atlantic, Southeast, and West Gulf, where hickory is an important species, about three-fourths of the volume is in trees less than 19 inches in diameter. These sizes are not large enough to contain many Grade 1 saw logs. The distribution of volume by tree size is about the same in three of the four regions, but the West Gulf Region contains a higher-than-average proportion in large trees (table 3).

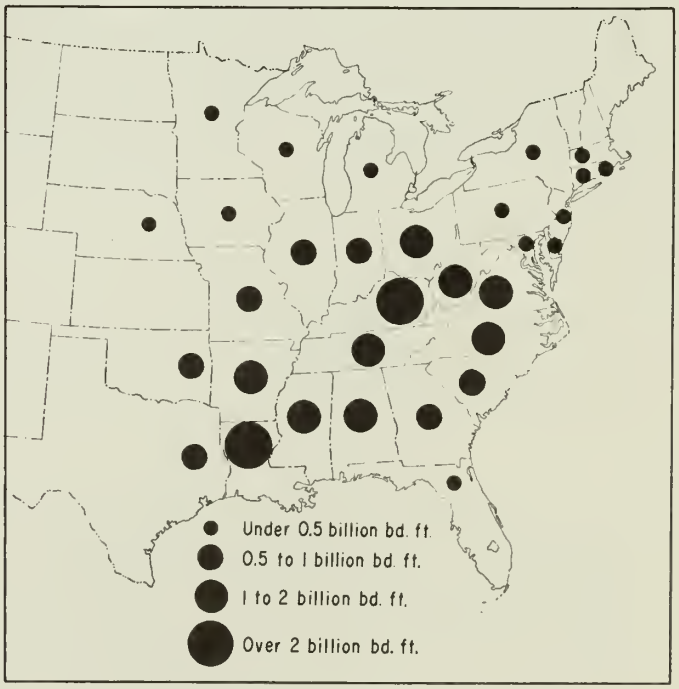


Figure 11.--Distribution of hickory sawtimber by states.

Table 3.--Net volume of hickory sawtimber by tree-diameter group in selected regions

Region	Total	11.0 to 18.9 inches		19.0 inches and larger	
	Million bd.-ft.	Million bd.-ft.	Percent	Million bd.-ft.	Percent
Central	6,688	5,217	78	1,471	22
South Atlantic	3,535	2,648	75	887	25
Southeast	6,111	4,583	75	1,528	25
West Gulf	5,218	3,444	66	1,774	34
Total	1/ 21,552	15,892	--	5,660	--
Percent	100	74	--	26	--

1/ This is 90 percent of the total volume in the eastern United States.

Volume by Log Grade

Log grades provide a means of expressing the quality of timber, as they take into account diameter, length, and amount and character of defects in individual logs. In five of the Central States and seven Southern States, the Forest Survey crews graded a sample of hickory trees on the field plots, using Hardwood Log Grades for Standard Lumber (5) developed by the Forest Products Laboratory. The percentage distribution by log grades was as follows:

	Percent
Standard lumber logs	
Grade 1	9
Grade 2	17
Grade 3	54
Tie and timber logs	20

Lumber grade yield studies by the Forest Products Laboratory and the Tennessee Valley Authority (6) show that Grade 1 logs yield between 60 and 65 percent of No. 1 Common and Better lumber, Grade 2 logs yield between 30 and 40 percent, and Grade 3 logs between 15 and 20 percent. In the TVA study, which involved 7,002 hardwood logs sawed at 58 randomly selected sawmills, lumber grade recovery for hickory was predominantly No. 2 and No. 3A Common. About one-fifth of the total yield was in No. 1 Common and Better grades.

THE TOTAL VOLUME OF HICKORY

The total volume of hickory in sound trees is 133 million cords (table 4). Seventy-three million cords are in sawtimber-size trees; the remainder in trees 5 to 11 inches in diameter. Nearly half the total volume in sound trees is in two regions--the Southeast and West Gulf.

Table 4.--Net volume of hickory by region and tree-diameter class
(In million cords)

Region	Sound trees					All sound cull trees 1/
	5.0 to 6.9 inches	7.0 to 8.9 inches	9.0 to 10.9 inches	11.0 inches and larger	Total	
New England	--	--	--	1.0	1.0	0.1
Middle Atlantic	2.0	2.0	2.0	7.0	13.0	0.3
Lake	0.2	0.3	0.2	0.4	1.1	--
Central	4.6	7.1	7.5	18.5	37.7	1.1
Plains	0.1	0.1	0.1	0.1	0.4	0.2
South Atlantic	2.0	2.4	3.6	9.2	17.2	1.6
Southeast	4.1	5.7	6.3	19.6	35.7	4.1
West Gulf	2.4	3.2	4.3	17.5	27.4	4.2
Total	15.4	20.8	24.0	73.3	133.5	11.6

1/ In addition, there are about 7.7 million cords of sound material in rotten cull trees.

The volume of sound wood in sound cull trees amounts to nearly twelve million cords. These trees are too crooked to make saw logs, but when cut in bolts will provide some usable material for handles or other short products.

TRENDS IN THE SUPPLY OF HICKORY

The supply of hickory timber available for industrial use is building up. Lumbermen and pulpwood producers rarely take hickory species in current logging operations. Adequate markets for the lumber have not been developed, and use of hickory for the manufacture of wood pulp, although entirely feasible, is precluded by barking difficulties at the present time. Hickory trees left standing after other species are cut are usually in a position to grow rapidly, and to spread out and occupy more space in residual stands. Another factor affecting the supply of hickory timber is the amount used for fuelwood. The superior burning qualities and heat value per cord of wood has always

made hickory a much sought-after tree when the wood pile was being replenished. The amount of fuelwood being produced in recent years, however, has been declining sharply because of large-scale conversions of heating units to oil and other fuels. Changes in utilization and marketing practices such as these have permitted the volume of hickory to increase.

Recurrent inventories made by the Forest Survey in southern states show that proportion of hickory in relation to total timber volume is making substantial gains. Instances of this change can be found in Central and North Georgia and in the Piedmont and Mountain Regions of North Carolina as well as other areas. In Georgia, the cubic volume of hickory, measured as a component of the entire stand, increased from 3 percent in 1936 to 4 percent in 1953. A similar change in North Carolina raised the proportion from 4 percent in 1938 to 6 percent in 1955. These proportional changes are small but they indicate hickory volumes are now one-fourth to one-half larger than they were in the late 1930's.

The proportion of larger, more mature hickories is, of course, also increasing. In the 1938 North Carolina survey, the board-foot volume found in hickories 13.0 inches and larger in diameter amounted to approximately one-half billion feet. In 1955, the volume was 1.2 billion board-feet having more than doubled in 17 years. Despite the problems involved in utilizing smaller trees and lower grades of hickory, the abundance of valuable raw material offers a challenge to potential users.

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