

THE SUPPLY AND DEMAND SITUATION FOR OAK TIMBER

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ABSTRACT. Twenty oak species in the eastern United States account for one-third of the hardwood sawtimber volume and almost 10 percent of both hardwood and softwood growing-stock volume. The oak-hickory and oak-pine forest types occupy about 38 percent of the forest land in the eastern United States. Oak timber volume is increasing. Annual growth exceeds annual removals by about 20 percent. In the next 30 years large increases in demand for oak timber are probable; and the better quality oak timber, particularly in the South, will probably be increasingly scarce.

THE OAKS are the most important hardwood trees in the North Temperate Zone. Fifty-eight different species reach tree size in the United States, and 20 of these are important timber trees in the Eastern States. Collectively the oaks account for about one-third of the hardwood sawtimber volume and almost 10 percent of the total volume of both hardwood and softwood growing stock in the United States.

(Oak growing stock is composed of live merchantable sawtimber and poletimber trees measured from the stump to a minimum 4-inch top diameter outside the bark of the central stem. Sawtimber trees are live merchantable trees 11.0 inches d.b.h. and larger. Poletimber trees are live merchantable trees 5.0 to 10.9 inches d.b.h.)

About 90 percent of the oak volume is found in the eastern United States. However, there are some oaks in Oregon, California, and Washington that attain commercial timber size. And some eastern oaks extend their range into southern Canada.

The oaks may be classified in a number of ways. In this symposium, most of the discussion will be concerned with five eastern upland oaks—white, chestnut, northern red, scarlet, and black—that are important in the Appalachian area.

My discussion is based on oak resource statistics collected by the Forest Survey (USDA Forest Service 1958 and 1965). Nationwide data also have been compiled on the 1968 situation, but they have not been published; Where applicable, they have been used. For the most part, Forest Survey statistics do not provide specific data on the five symposium species; so most of my discussion will be about the following four major eastern oak groups:

1. The select white oak group, of which white oak is the predominant species but which includes also chinkapin, bur, durand, swamp chestnut, and swamp white oaks.
2. The other white oak group, which includes chestnut oak and post, overcup, and live oaks.

3. The select red oak group, of which northern red is the predominant species, but which also includes cherry bark and shumard oaks.
4. The other red oak group, which includes black and scarlet oaks as major components, but also includes pin, southern red, laurel, nuttall, water, and willow oaks.

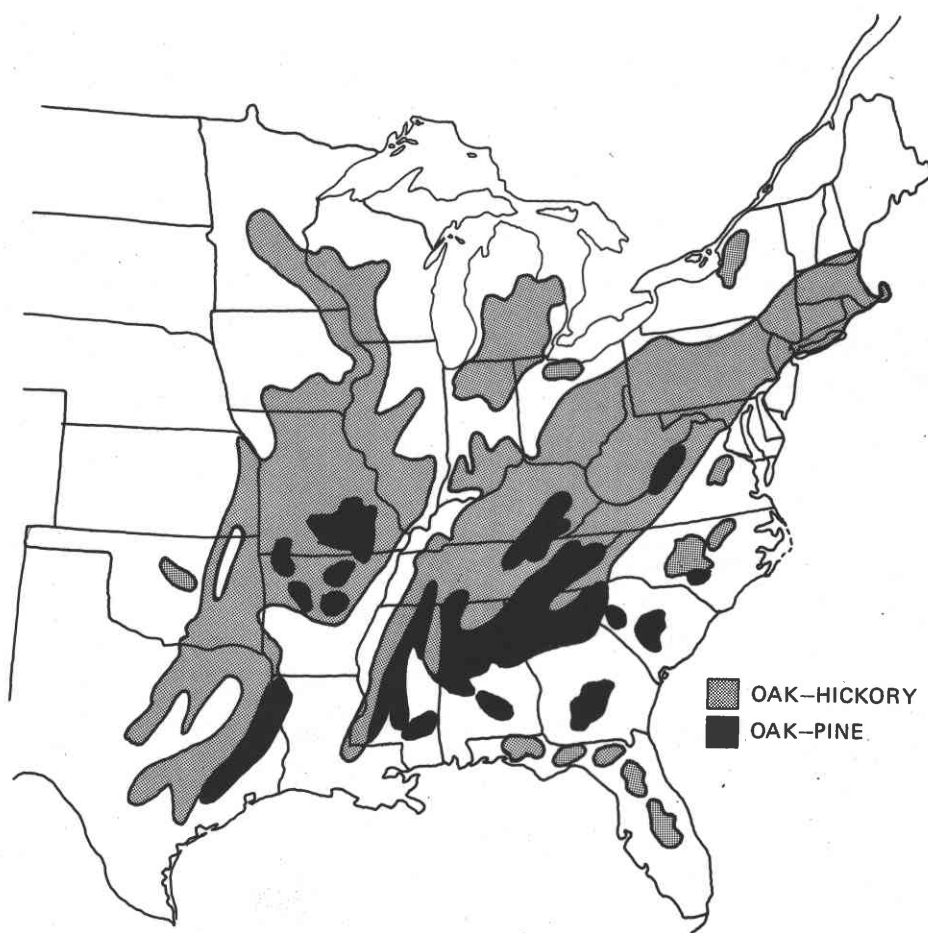
OAK COVER TYPES

The five oaks about which this symposium is concerned—along with chinkapin, post, and bur oaks—usually occur on the upland sites and for the most part in the oak-

hickory and oak-pine types. As defined in the national Forest Survey, the oak-hickory forests are those in which upland oak, or hickory, singly or in combination, comprise a plurality of the stocking except where pines comprise 25 to 50 percent, in which case the stand is classified as oak-pine (fig. 1). The other oak species are found mostly on the wetter or bottomland sites along with associated lowland species.

In the eastern United States, oak-hickory forests dominate the forest landscape, covering about 117 million acres. Along with oak-pine, which covers 27 million acres, they account for about 38 percent of the forest land area in the eastern United States.

Figure 1.—The oak-hickory and oak-pine forest types occupy 38 percent of the forest land in the eastern United States, 1963.



Oak types are important in all the regions established by the Forest Survey in the eastern United States (fig. 2). The Central States region, with 30 million acres, has the greatest area of oak-hickory and oak-pine forests. However, the four southern regions contain about 60 percent of all land in these types.

On a state basis, ten states contain two-thirds of the oak-hickory and oak-pine type acreage:

<i>State</i>	<i>Million Acres</i>
Missouri	12.0
Tennessee	10.7
Virginia	10.2
Arkansas	10.0
Alabama	9.9
Pennsylvania	8.8
Kentucky	8.0
North Carolina	7.8
Georgia	7.7
West Virginia	7.6

Missouri, Tennessee, and Kentucky have more than three-fourths of their forest land in the oak-hickory or oak-pine types; while West Virginia, Virginia, and Pennsylvania have from one-half to three-quarters of their forest land in these types. A number of states with less forest area also have more than 50 percent of their forest area in the oak-hickory or oak-pine types. They include Oklahoma, Ohio, Indiana, Illinois, Maryland, Connecticut, Kansas, and Rhode Island.

TIMBER VOLUME

The total oak volume is about 78 billion cubic feet. Of this, some 15 percent is in rough and rotten trees that are not now considered merchantable. The growing-stock volume in 1968 exceeded 66 billion cubic feet. Pennsylvania had more volume

Figure 2.—Million acres of oak-hickory and oak-pine timber types, by geographic regions, 1963.



than any other state ($7\frac{1}{2}$ billion cubic feet). But Virginia, West Virginia, North Carolina, Kentucky, Missouri, and Arkansas all had over 3 billion cubic feet each.

The oak sawtimber volume in the United States in 1968 was approximately 180 billion board feet. States that had more than 10 billion board feet each included Kentucky, Pennsylvania, Virginia, and West Virginia. These four—along with Arkansas, Georgia, Louisiana, Missouri, North Carolina, and Tennessee—accounted for almost two-thirds of the oak sawtimber volume in the United States. The select white oaks accounted for 26 percent of the oak volume, other white

oaks 18 percent, the select red oaks 22 percent, and the other red oaks 34 percent.

Almost 40 percent of the select red oaks are found in the Middle Atlantic States. One-third of the select white oak volume occurs in the Central States, and another one-third in the Middle and South Atlantic States. The Central and Gulf States contain more than two-thirds of the other red oak volume. The other white oaks are not present in the Lake States and New England, but are about equally distributed throughout the other regions (fig. 3).

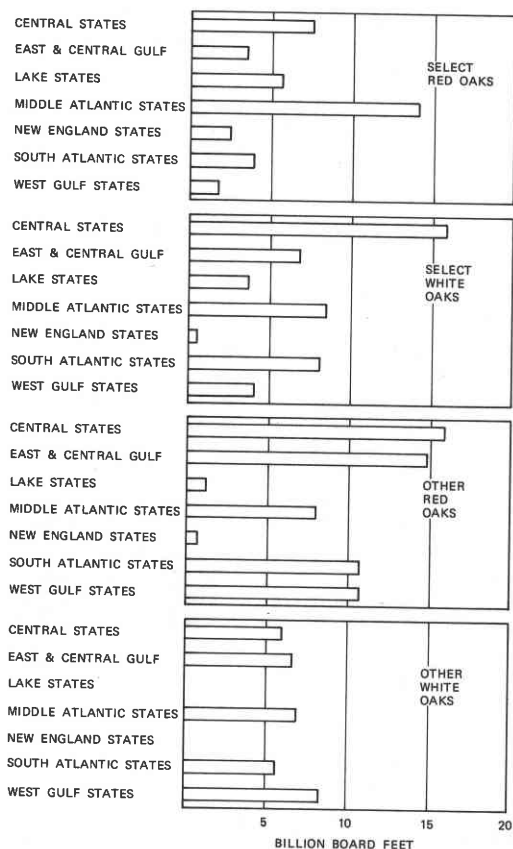
TIMBER QUALITY

Of the growing-stock volume, 42 percent is of poletimber size (5.0 to 11.0 inches d.b.h.), and about 28 percent is found in small sawtimber (11.0 to 15.0 inches d.b.h.) trees.

Thus only about 30 percent of the oak volume is in trees of a size having some volume suitable for high-value products such as veneer, barrel staves, and the better grades of factory lumber.

The quality of the sawtimber resource may be evaluated by quality classes based on factory-lumber log grade (*Ostrander 1965*). In 1963 about 10 percent of the oak sawtimber volume was in factory-lumber grade-one logs. These are logs from which two-thirds or more of the lumber is usually Number 1 Common or Better. Another 16 percent was in factory-grade 2 quality logs from which normally about 40 percent of the lumber is Number 1 Common or Better. Approximately 48 percent of the volume was in the lowest grade of factory-lumber logs, while 26 percent was suitable only for tie and timber production. The better quality oak timber was most plentiful in the Middle Atlantic States:

Figure 3.—Oak sawtimber volume, by regions and species groups, 1963.



Region	Volume in log grades 1 & 2 (million bd. ft.)
Middle Atlantic States	13
East & Central Gulf States	8
Lake & Central States	8
South Atlantic States	7
West Gulf States	7
New England States	1

CHANGES IN VOLUMES

The last three nationwide surveys have all indicated increases in oak timber volumes:

	<i>Oak growing stock (billion cu. ft.)</i>	<i>Oak sawtimber (billion bd. ft)</i>
1953	53	146
1963	61	163
1968	66	180

Between 1952 and 1963, oak sawtimber volume increased about 12 percent. And between 1963 and 1968 the increase was about 10 percent.

However, this general volume increase was concentrated in the smaller diameter-class trees. The volume in trees over 19 inches d.b.h. has changed little between 1952 and 1968. Oak sawtimber volume is increasing more rapidly in the North than in the South. In the North, between 1953 and 1963, oak sawtimber volume increased 16 percent, while in the South it increased only 7 percent.

GROWTH AND REMOVALS

In 1968, the growth on the growing stock amounted to about 2.4 billion cubic feet. Growth thus was at about a 4-percent rate. And it exceeded removals by 50 percent.

In the sawtimber size classes, annual growth was at a 3.5-percent rate; it amounted to about 6.4 billion board feet. It exceeded removals by 20 percent. But this growth-removal relationship was not uniform throughout the Nation (fig. 4).

In the South, oak sawtimber growth was only about 7 percent greater than removals. In the North, the sawtimber growth exceeded sawtimber removals by almost 50 percent.

Forest lands in different kinds of ownership also have different rates of removals. An increasing acreage of the privately owned nonindustrial forest land is being held for recreation, speculation, or other nontimber objectives. Cutting of timber from such lands is limited. Forest land in these kinds of ownerships is concentrated around large metropolitan areas in the northern United States.

Historically, cutting on forest-industry owned lands has been heavier than on other lands. For example, in 1962, hardwood saw-

timber removal from forest-industry lands was greater than the growth. In all other kinds of ownerships growth exceeded removals by substantial margins.

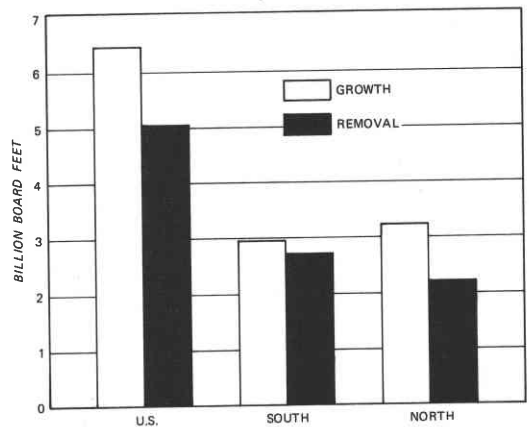
This ownership pattern helps to explain the heavier cutting taking place in the South, where timber industry controls 19 percent of the land. In contrast, in the North, only about 8 percent of the forest land is owned by forest industry.

More than half of the oak timber harvested goes into lumber and other sawed materials for eventual use in such products as flooring, dimension stock, furniture, pallets, cross ties, and cooperage. Almost 20 percent goes into the production of pulp and paper products. The remainder is distributed among many uses, including posts, mine timbers, veneer, fuelwood, and chemical wood.

TIMBER DEMAND

Now look at the demand side of the resource situation and consider the future

Figure 4.—Oak sawtimber growth-removal relationships, by regions, 1968.



supply-demand or growth-removal relationships. Two major determinants of demand are population and the gross national product (GNP).

Population growth from 1920 to 1968 and projections of population growth by the Bureau of the Census indicate that the population in the United States in 2000 will be somewhere near 280 million people—a 40 percent increase over the present population.

All projections of the gross national product likewise indicate that the output of goods and services in the decades ahead will increase tremendously, probably doubling by 2000. Projections of disposable personal income follow the same general trends. Residential construction is expected to grow rapidly.

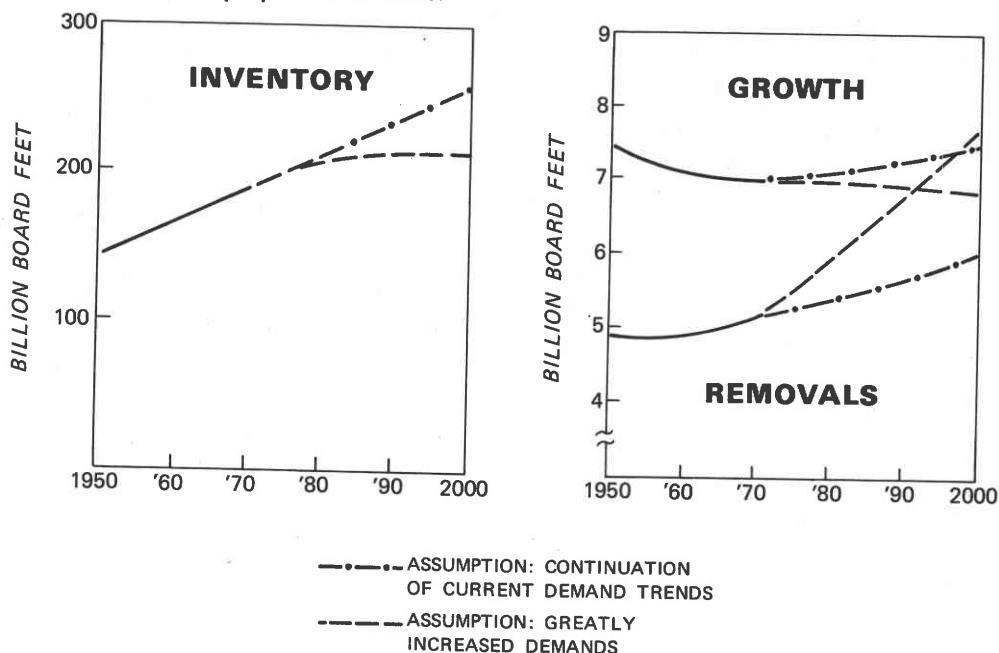
The projected increases in population, income, and housing indicate a large increase in demand for oak timber. However, increase in the demand for oak will also depend on many other factors such as prices, technological changes within the oak using and competing industries, and institutional changes.

But assuming that population and economic growth will rise about as described above, and that the price and technological trends will not differ significantly from those of competing materials, projected demand for hardwood sawtimber should rise about 40 percent by 2000 (*Hair 1970*). About three-fifths of the demand will be for railroad ties, pallets, containers, and flooring. These lumber products can be manufactured economically from relatively small or low-quality logs, but most of the remaining demand will be for lumber for use in cabinets, paneling, furniture, and other products where quality and surface appearances are important considerations.

The projected demand for pulpwood from oak timber is expected to almost triple by 2000. This demand can be met from the smaller sizes of oak timber, in which growth substantially exceeds removals. However, should large acreages of the oak timber types be withheld from commercial timber production, supply difficulties could develop in some areas.

On the basis of the assumptions just mentioned and on the assumption that cur-

Figure 5.—Oak sawtimber inventory, growth, and removals, 1950 to 1968 and projections to 2000.



rent levels of management for oak timber will continue, projections of possible oak supply-demand relationships were developed from data presented in *Timber Trends in the United States* for all hardwoods (USDA Forest Service 1965).

Under one assumption, current trends in demand for oak timber are projected to continue. Under the other, demands are projected to rise sharply to reflect major population increases, a doubling of the gross national product, price trends of oak timber products not differing significantly from competing product prices, and some substitution of oak and other hardwoods for softwood timber products.

These 30-year projections (fig. 5) indicate that oak sawtimber volume probably will continue to increase at least for the

next 20 years. After that, depending on the rate of removals, the oak timber resources may increase, stabilize, or even decrease.

The assumptions used in making any projection may not hold true for long in this fast-changing world. Therefore projections are probably more useful in evaluating the situation over the next decade or two

In the long run, it may be desirable to provide substantial increases in oak sawtimber volume. These could be obtained by improved management practices. Management should be directed toward providing increased supplies of the larger diameter and better quality oak trees, because it is this kind of material that is currently in strong demand and in which future shortages will probably develop most rapidly.

Literature Cited

Hair, Dwight.

1970. DEMAND, SUPPLY AND IMPORT SITUATION FOR HARDWOOD TIMBER PRODUCTS. *Forest Prod. J.* 20 (9): 36-39, illus.

Ostrander, M. D.

1965. A GUIDE TO HARDWOOD LOG GRADING (REVISED). USDA Forest Serv. NE Forest Exp. Sta. 50 pp., illus.

USDA Forest Service.

1958. TIMBER RESOURCES FOR AMERICA'S FUTURE. USDA Forest-Serv. Forest Resource Rep. 14. 713 pp., illus.

USDA Forest Service.

1965a. TIMBER TRENDS IN THE UNITED STATES. USDA Forest Serv. Forest Resource Rep. 17. 235 pp., illus.