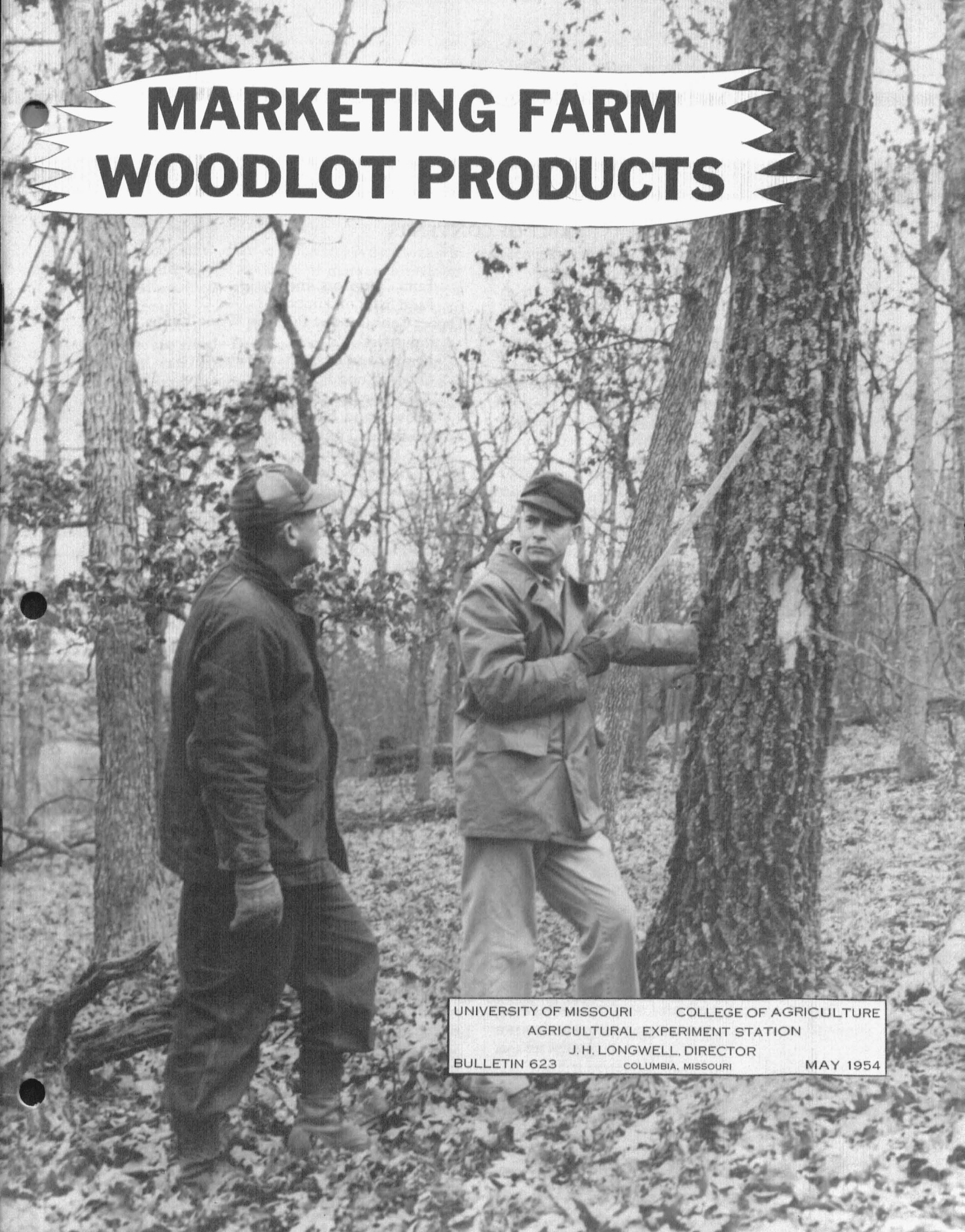
MARKETING FARM WOODLOT PRODUCTS



UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE
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Report on Department of Forestry Research Project
No. 107 Entitled "Marketing Timber."

Marketing Farm Woodlot Products

in

Franklin, Osage, and Gasconade Counties

RICHARD C. SMITH[1]

The successful practice of forestry is determined in large measure by the presence of markets for timber and wood products. Indeed, without markets there is little incentive for growing timber crops, other than for home or farm use. Intensive cultural practices in the forest are greatly facilitated when trees, both large and small, can be sold and used profitably by industries. The forest owner is able then to undertake stand improvement measures in which sales can cover costs of doing the work and still yield a profit.

With a number of diversified wood-using industries within economical transportation range, mature trees can be put to their most valuable use and yield the greatest possible income to forest owners. But where markets are not available to the small woodlot owner or are poorly organized, as in many parts of the United States, woodland management is poor or entirely lacking. Under these circumstances an owner soon discovers that woods management is expensive because of repeated investments of time and money with only sporadic opportunities for getting an income—usually from the sale of his best timber.

Farm woodlots occupy a large part of the most productive forest land in the United States and they contribute a great deal to the national forest economy. The Forest Service (1948) reports that small holdings, under 5,000 acres, comprise 76 percent of the privately owned timberlands, and that more than 4,222,000 owners hold this land. The average size of small forest properties is 62 acres. More than half of the small properties are farm woodlots; in fact, 40 percent of the 345,000,000 acres of forests in private ownership are farm woodlots. In eastern United States, farm woodlots support 38 percent of the saw-timber, more timber than do other private holdings. In Missouri, farm woodlots are probably even more important. King Roberts, and Winters (1949) report that 45 percent of the commercial forest area of the state is in farm woodlands which average 29 acres in size. It is apparent that the future of our forest resources depends greatly on how well these farm woodlots and other small, private woodlands are managed.

PURPOSE OF STUDY

The area bordering the Missouri River is regarded by foresters as one of relatively high potential for growing tree crops and for the development of industries which use wood as a raw material. However, desirable forest practices are not widely applied in many areas such as Franklin, Gasconade, and Osage Counties. Relatively few wood-using industries are located in the area; particularly there is a lack of plants that use low-grade wood or remanufacture rough wood into products for consumer use. It is believed that if markets for timber were available, forest management could progress more rapidly there than in many sections of the state because of better site quality and the short transportation distance to large population centers.

As an aid in improving marketing conditions for forest products, the following studies were undertaken to :(1) Estimate the amount, condition, and growth of the present timber resources; (2) study use of timber on farms, sales of timber by farmers, and farm woodlot management; (3) estimate industrial timber consumption; (4) determine whether the existing situation warrants specific effort to encourage better marketing facilities; and if so, (5) suggest possible means of improving forest management and marketing of timber products.

RELATED STUDIES IN MISSOURI

Sechrist and Peck (1942) described products made from Missouri woods and listed the species used for each. A list of manufacturers of wood products was compiled. Much of the information on wood-using industries was later brought up to date by Smith and McCormick (1952). An informative publication on how to sell timber was prepared by Peck, Sechrist, and Leach (1943). Intended for farm woodlot owners, it gives information on selecting timber to harvest, methods of estimating volume, and procedure and aids for selling.

The first systematic inventory of the timber resources and industries of Missouri was reported by King, Roberts, and Winters (1949). An important

[1]Much of the planning and collection of field data was done by Ross Hortin and W. J. O'Neil.

phase of their recommendations to place the state's forests in a productive, well-managed condition concerned marketing and utilization. They suggested that forest owners could learn how to sell timber through education, assistance, and cooperative effort. But the lack of suitable markets seriously handicaps timber producers, especially where stands are depleted and in less heavily forested sections of the state. Greater utilization of waste and low-grade woods and encouragement of secondary wood-using industries will do much to solve Missouri's forest problems.

Quigley (1950) studied timber markets and prices in a six-county area in southcentral Missouri. Most of the land is owned by farmers, and primary wood-using industries are well located throughout the area, especially for sawlogs and saw-timber stumpage. He concluded that timber products are not marketed as well as they could be because of low quality and the small amounts of timber that owners have to market at any one time. Inefficiency in manufacture and intermittent operations of plants also contributed to poor marketing.

To improve timber marketing, he suggested four areas of work: (1) Education and service to both woodland owners and plant operators; (2) research on harvesting methods, marketing procedures, and uses for low-grade woods; (3) expansion of certain industries, particularly those using low-grade woods; and (4) building up the forest resources through good forest management. In another study Quigley (1952) discussed present markets for pine timber and opportunities for establishing new pine-using industries, especially for products other than sawlogs, such as posts, pulpwood, and poles.

THE AREA STUDIED[2]

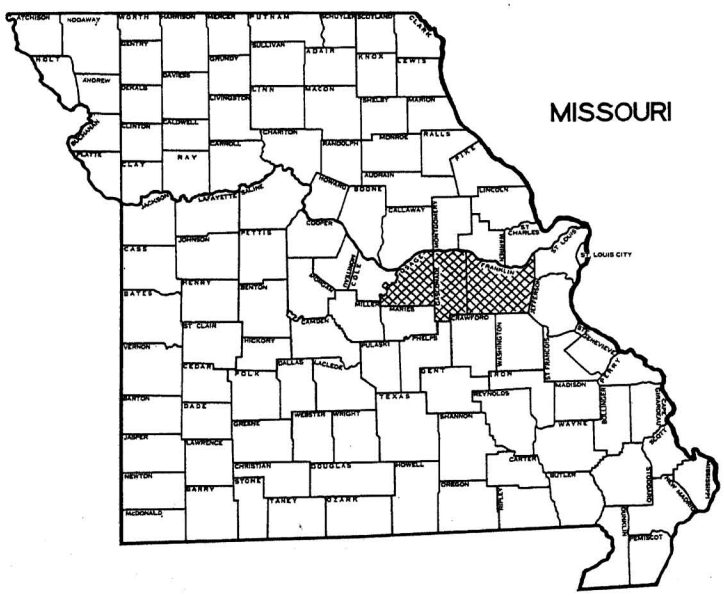


Figure 1—Osage, Gasconade, and Franklin County are shaded here to show location of the area studied.

Location—Franklin, Gasconade, and Osage Counties border the south bank of the Missouri River in a 25-mile band in the east central part of the state (Figure 1). Franklin County lies 30 miles west of St. Louis; Osage County is 10 miles east of Jefferson City; and Gasconade County is located between the others. This three-county area is a 2,000-square-mile northern extension of the Ozark Highland. It is rolling and hilly, though less so than the Ozark Highland proper. Its soils are less productive for farming than prairie soils to the north, but they are among the most productive in the Ozark region.

Present Development—Logging and lumber operations by large companies began in Missouri near the end of the nineteenth century. Much of the forest land in this area, however, was cleared during the course of agricultural development, and it is believed that cutting of timber over most of the original forested area extended over many decades rather than during a pronounced period of forest exploitation.

The area is largely rural. The Bureau of the Census (1951) classified only four towns as urban, that is, having a population of at least 2,500 persons. Nineteen other incorporated towns were listed. In addition, there are 14 unincorporated villages. A large part of the non-farm population is found in towns located along three east-west railroad lines. Of a total population of 59,689, it is estimated that 47 percent live on farms. This varies from Franklin and Gasconade Counties, where the towns are supported in part by industries and where almost 50 percent of the people live on farms, to Osage County, where there is little industrial enterprise and 74 percent of the people live on farms.

Transportation is well developed. The Missouri Pacific Railroad has a main line along the Missouri River. The Chicago, Rock Island, and Pacific Railroad runs east and west through the center of the area; and the St. Louis, San Francisco Railroad serves the southeast part of Franklin County. More than 560

[2]Much of the information was taken from: *Geography of the northern Ozark border region in Missouri* by J. E. Collier. The Univ. of Mo. Studies Vol. XXVI, No. 1. The Curators of the Univ. of Mo. 1953.

miles of hard-surfaced highway serve these counties, including three major transcontinental routes. In addition, there are 2,000 miles of other public roads, mostly surfaced with gravel or stone, which make many farms and forests readily accessible.[3]

Although not primarily an industrial region, 78 manufacturing plants are located here, according to the Bureau of the Census (1950). In 1947 they employed about 5,700 persons, and paid over $10,000,000 to wage earners. More than $15,000,000 was added to the value of products by processing. Most plants are small in size, employing an average of 70 workers. Major industries are shoe manufacturing, food processing, printing, and apparel manufacturing. More than half of these plants are in Franklin County where branch shoe factories are concentrated. In addition, 38 mines and quarries produce limestone, gravel, silica sand, and clay. From 19 pits in Gasconade County, refractory clay is shipped for the manufacture of bricks. Only 12 wood-using industries, each employing less than 20 persons, were listed.

Agriculture is of major economic importance, and half the population is engaged directly in farming. A general or mixed type of farming prevails, based on corn, wheat, hay, and livestock. In river-bottom areas, cash grain crops are of major importance, but in the remainder of the region, livestock production assumes a greater role. Approximately 40 percent of the 6,332 farms listed by the Bureau of the Census (1952) are classified as livestock farms and 18 percent are general farms. Dairying, fruit, poultry, and vegetable farming are emphasized near towns. More than a million acres are in farm ownership—83 percent of the total land area. More than 440,000 acres are in cropland and 550,000 acres are pasture. The total value of agricultural crops sold from the region in 1949 was $1,630,000, the value of livestock and livestock products was $13,257,126, and the value of all farm products sold was $15,034,240.

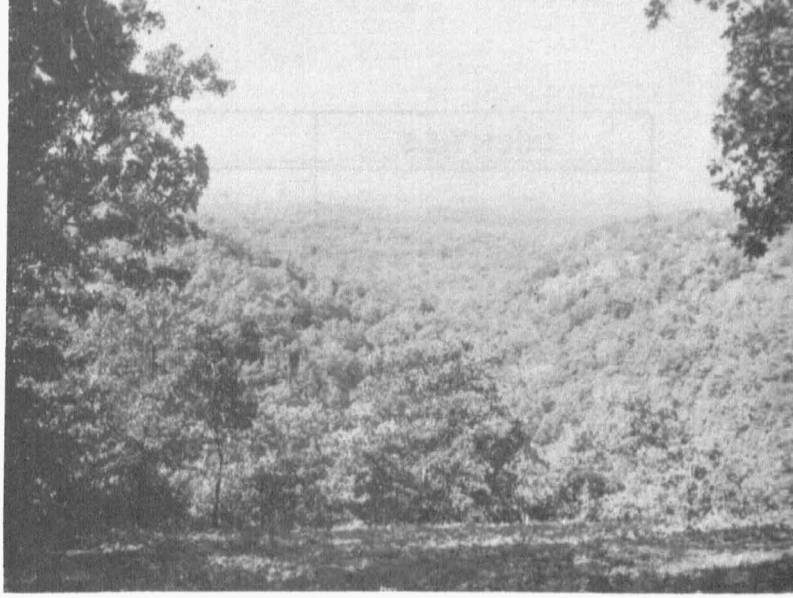


Figure 2—Relatively large forest areas like this one are found in the three-county area. About 50 percent, or 656,000 acres, of the land in the region remain in forest.

INVENTORY OF TIMBER RESOURCES

According to a random sampling design, points were designated on aerial photos taken for the Production and Marketing Administration, U. S. Department of Agriculture. At each location a field crew made a detailed inventory of trees on a 1/5-acre circular plot. Supplementary data were recorded on site quality, tree stocking, growth, grazing damage, and log grades. The field procedure and definitions of terms used were essentially those used by King, Roberts, and Winters (1949). It was thus possible to include similar data collected in the three counties by the Forest Survey in 1947.

Data were taken on 242 plots and combined with data for 109 plots furnished by the Forest Survey, making the total sample 351 plots or 70.2 acres. Thus, the inventory was based on a 1.07 percent sample of the commercial forest area.

Field data were stratified into populations represented by 6 stand-size classes, 11 forest types, and 5 site classes. The area of each population was estimated according to the percentage of the total number of plots classified in each one when applied to the total forest area. Total volume was computed by extending volume per acre by the area as determined above. Partial results of the inventory are presented as bar graphs and more detailed information is given in the appendix.

Forest Area—Forests once covered more than two-thirds of Missouri. The riverborder region, which includes Franklin, Gasconade, and Osage Counties, was at one time largely forested. During settlement and development of a predominantly agricultural economy, much land was cleared for farms, towns, and transportation routes; but 656,000 acres remain in forest—about 50 percent of the total land area of 1,314,000 acres. Franklin County contains a larger forest area than the other counties, but it constitutes only 44 percent of the land area of the county. Both Gasconade County and Osage County, with less total forest land, are 55 percent forested (Figure 3).

[3]Mileage data furnished by G. M. Threlkeld, Director of Information, Missouri State Highway Commission.

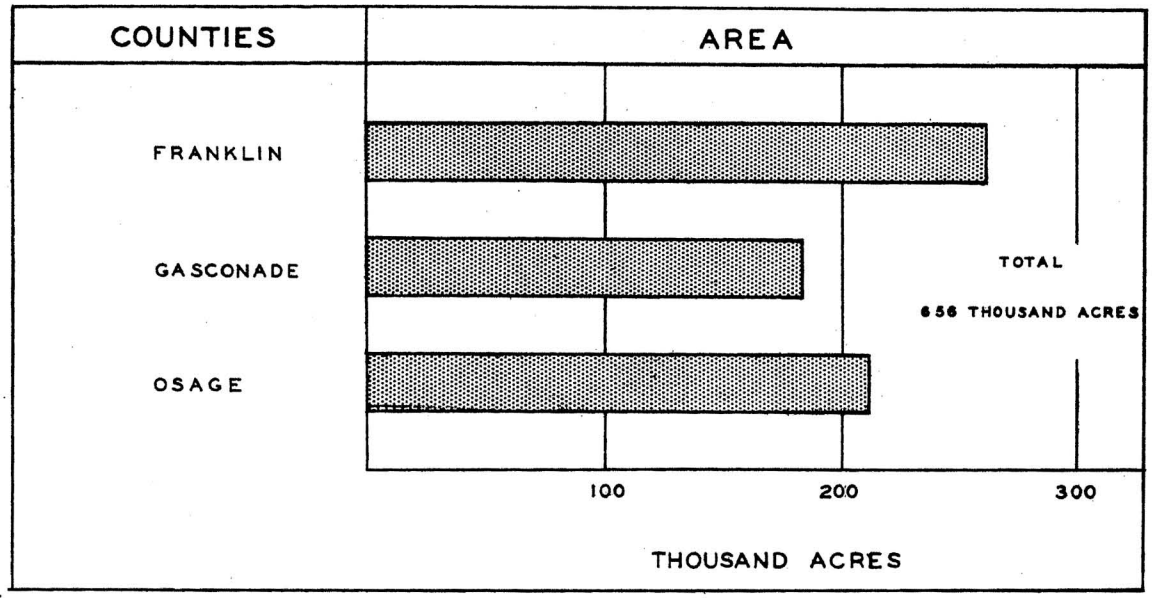


Figure 3. Commercial forest areas in the counties studied, 1951.

The oak-hickory forest type, consisting of stands in which at least 60 percent of the dominant and co-dominant trees are oaks and hickories, is the most extensive type in Missouri. It occupied 68 percent of the forest area in the three counties (Figure 4). Forest types including oaks in pure stands or in association with other species occupy more than 90 percent of the forest area. These species must be given greatest weight in a discussion of forest management and marketing.

Classification of forest area by stand-size class (Figure 5) provides a greater insight into management possibilities of this area. Ideal distribution for timber management purposes demands that about one-third of the area be occupied by each of three broad size classes: Saw-timber, pole timber, and smaller trees. The 656,000 acres of forest land do not fail seriously in meeting this requirement. Combined saw-timber classes occupy 30 percent of the area. There is an excess of pole-timber and a deficiency of young timber, a condition which is more conducive to proper management than if the conditions were reversed.

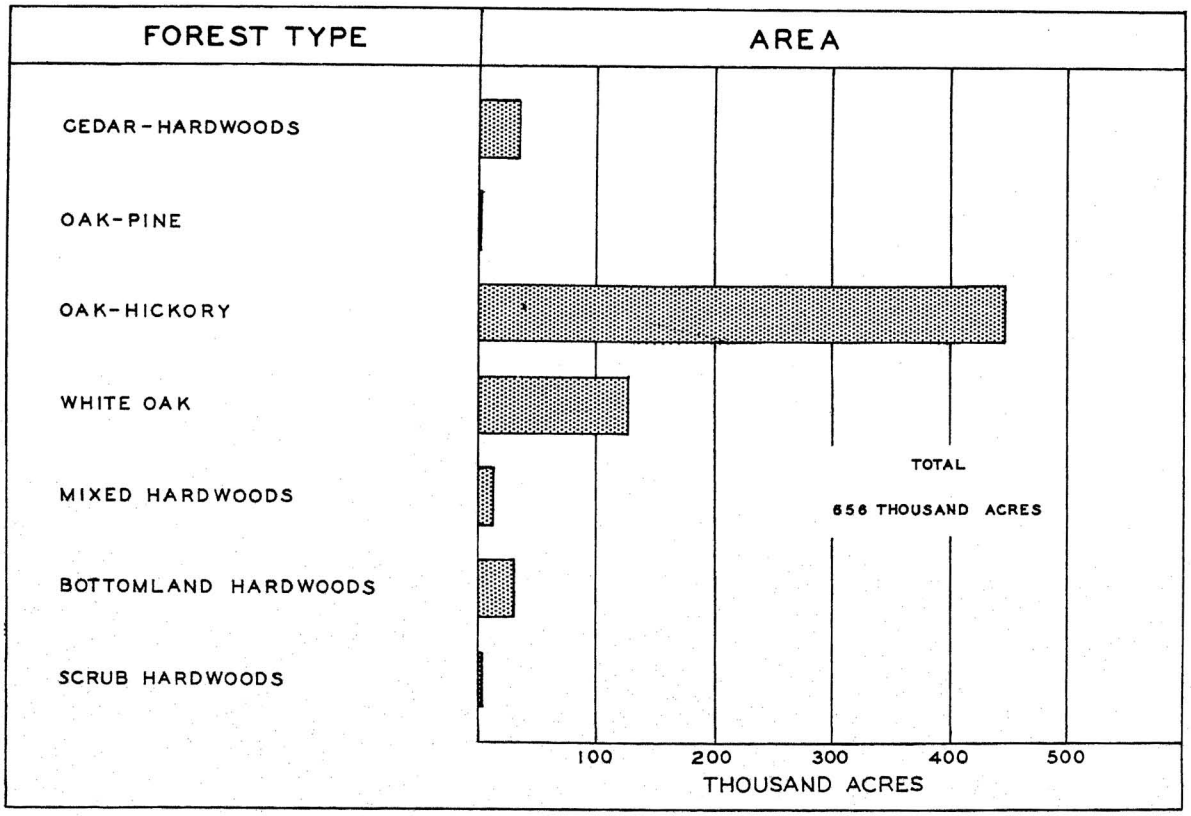


Figure 4. Commercial forest of the three-county area by forest types, 1951.

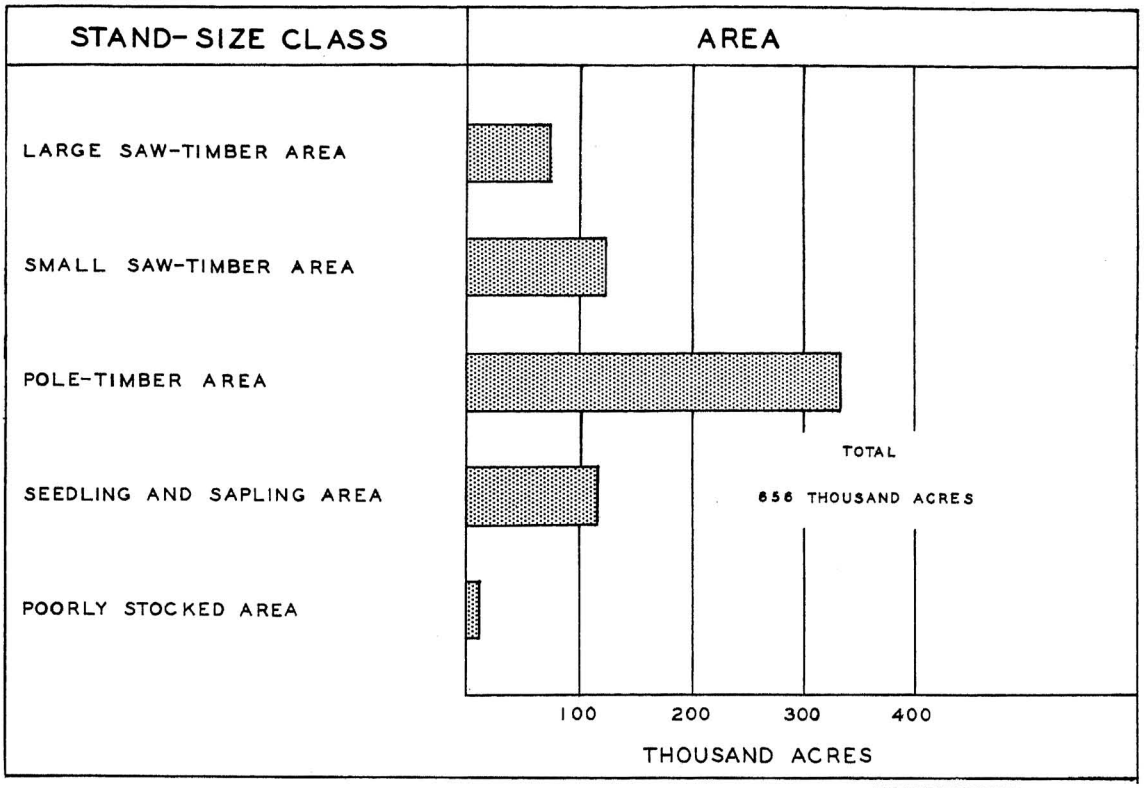


Figure 5. Commercial forest of the three-county area by stand-size class, 1951.

Figure 6 shows percentage relationships for area and volume which were found for the five stand-size classes. Similar figures for the entire state, reported by King, Roberts, and Winters (1949), show that 25 percent of the board-foot volume was in large saw-timber stands and 23 percent was found in small saw-timber stands, a total of 48 percent. It is apparent that similar stands in Franklin, Gasconade, and Osage

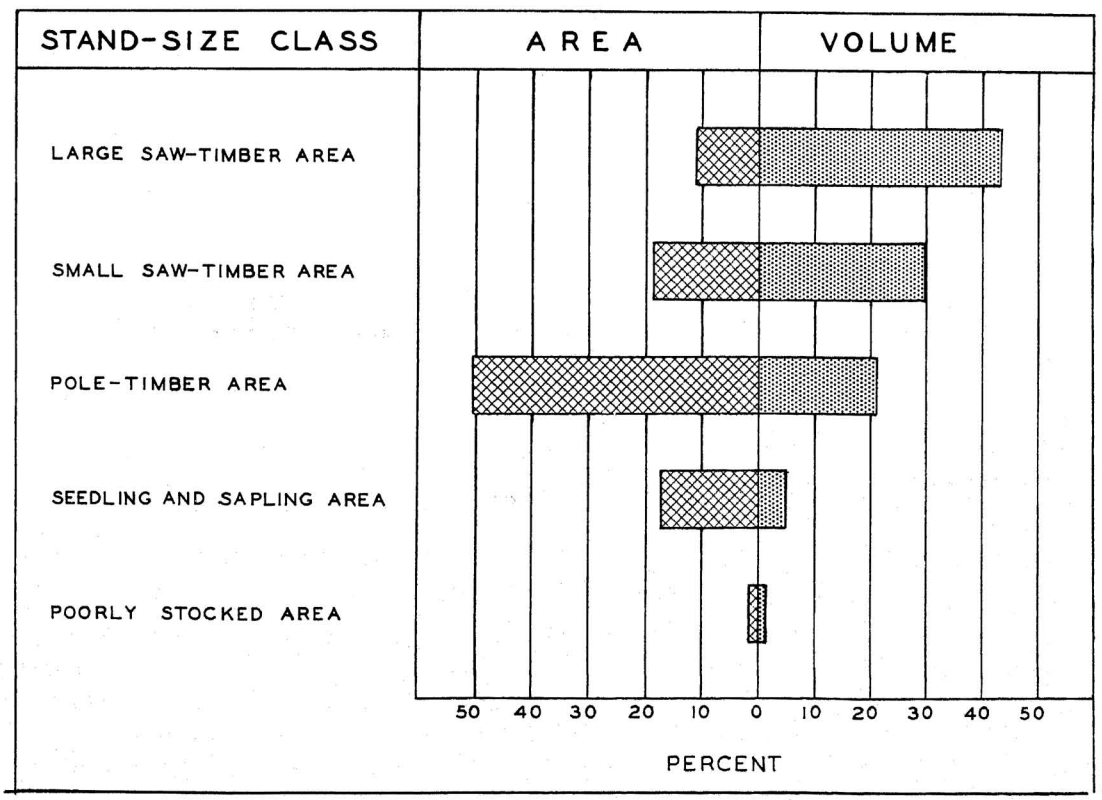


Figure 6. Distribution of area and net board-foot volume by stand-size class, 1951.

Counties contain 25 percent more of the total volume. King, Roberts, and Winters (1949) also show that 27 percent of the Missouri board-foot volume was found in pole-timber stands; but in the three counties, only 21 percent of the volume was found in pole-timber stands. Although this difference is not great, it indicates that improvement cuttings in pole-timber stands in the three counties may yield low per-acre volumes of merchantable material.

Site Quality—Sample plots were classified according to site quality or productivity (Figure 7). Site quality is defined by the average number of 16-foot logs produced by mature hardwood trees.[4] When mature trees were not present on an area, the number of 16-foot logs was estimated from soil and moisture conditions, topography, exposure, and appearance of existing vegetation. Less than half the area is of good timber-producing capacity (Sites 2 and 3); the remainder is fair to poor in productive capacity. Short-boled trees ordinarily yield not only less total volume but lower-quality wood, and their presence on large areas may be reflected in unsatisfactory marketing conditions.

Stocking—Three degrees of tree stocking were recognized on sample plots, based on the percentage of ground area covered by crowns of commercial tree species of all sizes.[5] Good stocking was found on 50 percent of the plots (Figure 7). If adequate protection from fire is given and grazing is restricted, it should not be difficult to increase stocking on the area classed as Fair so that 80 or 90 percent of the forest area could be considered as satisfactorily stocked for succesful woodland management.

Of greater relative importance to future woodland management is the present stocking of small trees, particularly in species composition, which will make up the next crop. The average number of trees per acre found in the 2- to 4-inch d.b.h. classes is given in Table 10 (Appendix). Adequate stocking is indicated on 69 percent of the plots, which supported at least one tree per 1/100 acre. White oak, black oak, northern redoak, red cedar, and black walnut are desirable components of a managed forest. They are capable of developing into trees of such form and quality that they are readily marketable if timber buyers are active. This group comprises 28 percent of the total. The post oak group, hickory, elm, maple, and non-commercial species are frequently difficult to sell because of undesirable form or physical characteristics, and they comprise 56 percent of the total number of stems. Although designation of every tree of a given species as undesirable is seldom warranted, it is apparent that the existing reproduction consists largely of species whose potential merchantability is doubtful.

Grazing—The use of forest land for grazing was once a general practice in Missouri, but the advent of improved pastures and better breeds of livestock made the relatively low profits associated with woods forage unattractive. The premise that woods grazing is declining is supported by classification of sample plots according to three intensities of grazing (Figure 7). On 65 percent of the plots, there was no evidence of grazing, or it was so light that it had not interfered with establishment of tree reproduction. Woodland pasture was found on 31 percent of the plots and 4 percent formerly pastured, was restocking with trees.

Net Board-Foot Volume—Volume of trees 11.0 inches d.b.h. and larger was computed in board feet, International ¼-inch log rule. In the field, trees of sawlog size which contained less than one 8-foot log or had less than 50 percent of their volume in sound material were classified as cull trees. To account for the decayed portions of otherwise merchantable trees, gross volume was reduced by 8 percent.

Franklin County contains almost half the sound board-foot volume, and Gasconade and Osage Counties each contain approximately one-fourth of the total volume of 820,679,000 board feet (Figure 8 and Table 11, Appendix). More than 78 percent of the volume was found in the oak-hickory and white oak forest types. Another 18 percent was found in the bottomland hardwoods type which included several species of oak. Four other forest types each contained less than 2 percent of the sound volume. More than 45 percent of the volume was found in white oak trees. Other oak species (red, black, and scarlet oaks) contained 21 percent of the volume. The post oak group contained 10 percent, but much of this 77,000,000 feet is of poor quality because of excessive limbiness.

As might be expected, most of the board-foot volume (73 percent) was found on areas classified as large saw-timber and small saw-timber, but on the pole-timber areas, scattered individual trees and groups of saw-timber size were found whose volume comprised 21 percent of the total (Table 12, Appendix). When reduced to a per-acre basis, average board-foot volume in each stand-size class may be compared readily:

Stand-size class	Average board-foot volume per acre
Large saw-timber	4,711
Small saw-timber	2,000
Pole-timber	524
Seedling and sapling	344
Poorly stocked	786

Many saw-timber areas support volumes sufficiently high to warrant silvicultural treatment and sale of products. The relatively high volume on poorly stocked areas resulted because, in Osage County, poorly stocked areas often contained scattered small saw-

[4]Site O—½ log; Site 1—1 to 1½ logs; Site 2—2 to 2½ logs; Site 3—3 to 3 1/2 logs.

[5]Good stocking—more than 70 percent; fair stocking—40 to 70 percent; poor stocking—less than 40 percent.

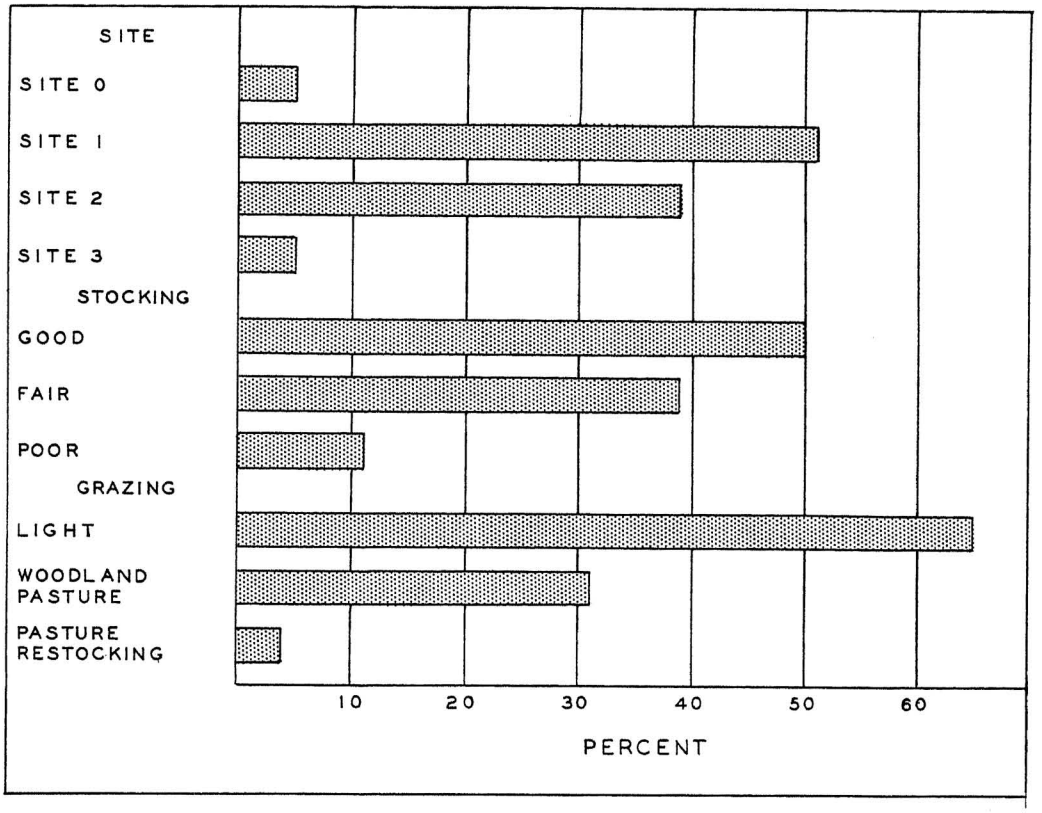


Figure 7. Classification of commercial forest area by site, stocking, and grazing intensity, 1951.

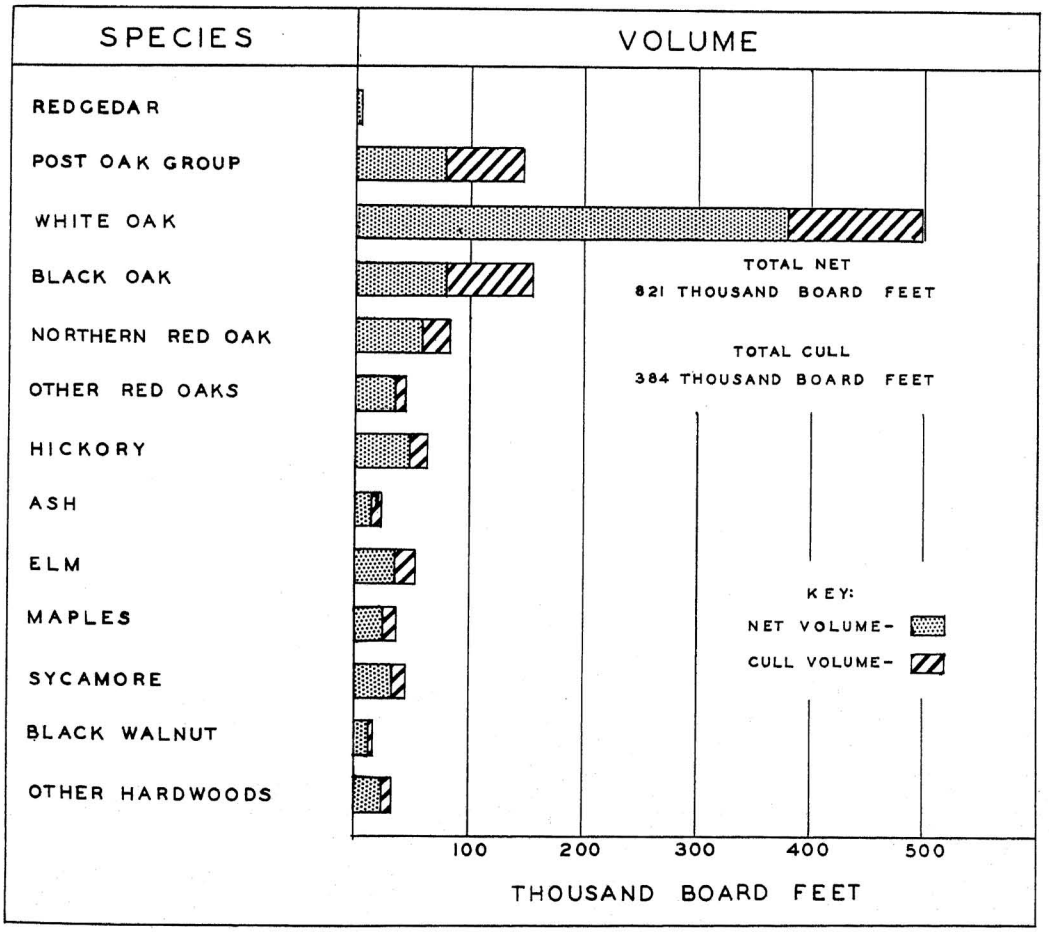


Figure 8. Net and cull board-foot volume by species, 1951.

timber trees, but their volume was not sufficiently high to classify the area as small saw-timber.

Board-Foot Volume of Cull Trees—In this region, as in most Missouri forests, there is a vast difference between gross and net volume. Many trees which are large enough to be sawed into lumber or other products are either too crooked or too limby to permit profitable utilization under existing economic conditions. Others contain too much decayed wood as a result of entry of fungous organisms through open wounds caused by fire, ice, or wind damage. If any one condition can be regarded as the greatest problem to Missouri forestry, it is the disposal of these now worthless trees and their replacement with vigorous, sound growing stock.

Almost 36 percent of the total board-foot volume was classified as cull. Thirty percent was in cull trees whose stems were too crooked or limby or contained too much decayed wood to be utilized. The other 6 percent was classified as decayed portions of otherwise merchantable trees (8 percent of the merchantable volume).

Cull volume by species and stand-size class is given in Table 13 (Appendix), and the proportion of net and cull volume by species is indicated in Figure 8. Post oak, black oak, and ash had between 40 and 50 percent of their toal volume in cull trees. Elm and maple had between 30 and 40 percent cull; and white oak, northern red oak, hickory, sycamore, black walnut, and other hardwoods had between 20 and 30 percent of their total volume in cull trees. It is unusual that the large saw-timber area contained only 14 percent of the cull trees (Table 13, Appendix). It may be inferred that overmaturity and stand degeneration are not serious. The pole-timber area contained more than 46 percent of the cull volume. It is probable that a high proportion of remaining saw-timber trees were culls at the time of previous logging. This is true also, but to a lesser extent, on the small saw-timber area. It is significant that more cull board-foot volume than net volume existed on both the pole-timber area and the seedling and sapling area.

Net Cordwood Volume—Volume of pole-sized trees, 5.0 to 10.9 inches d.b.h., was computed in cubic feet and converted to cords at the ratio of 80 cubic feet per cord.[6] Additional cordwood volume is to be found in the tops of saw-timber trees, but an estimate of its amount was not undertaken. A total of 1,990,783 cords of sound volume was found on the entire forest area (Figure 9 and Table 14, Appendix).

White oak comprised almost 36 percent of the volume, 10 percent less than its portion of net board-foot volume. The greatest increase was found in the post oak group, 19 percent of the cordwood volume, compared to 10 percent of the board-foot volume. The species composition of pole-sized trees is less desirable than the composition of saw-timber trees because species of low value, such as hickory and the post oak group, make up a larger part of the stand.

Cordwood Volume of Cull Pole-sized Trees—More than one-half million cords in cull pole-sized trees were found, 21 percent of the total cordwood volume (Figure 9 and Table 15, Appendix). Although it is less than the percentage of cull found for saw-timber, it is high for younger stands of trees. The elimination of these trees can greatly improve future growth, and the quality of the remaining stand will offer a better foundation for growing products requiring trees of larger sizes. The distribution of cull volume by stand-size classes closely parallels the volume of net cordwood volume.

Stand and Stock Table—Judging forest conditions from a compilation of average numerical characteristics may be grossly misleading, especially for large areas. However, some significant inferences can be drawn from Table 1. The average number of trees was 343 per acre. Of this number, 75 percent were less than 6 inches d.b.h. and very few trees were larger than 18 inches. The progressive decline of numbers of trees from small to large is orderly, however, which in general represents a satisfactory condition for continued forestry practice. The basal area of 49 square feet indicates a lower level of stocking than is desirable; 80 square feet per acre would be possible if cull trees could be replaced by sound growing stock.

The board-foot volume of 1,274 feet per acre represents a better condition than the 789 board-foot per acre average for the entire state reported by King, Roberts, and Winters (1949). The percentage of board-foot volume per diameter class shows that most of the saw-timber volume, 85 percent, is in trees between 12 and 20 inches d.b.h. Though volume of individual large trees is high, their number and contribution to total volume is small. The volume of all trees of 482 cubic feet is also greater than the statewide average of 289 cubic feet.

Volume Growth—Growth was computed by the use of growth rates expressed as annual percentage increases in volume by 2-inch diameter classes, for four species groups (Table 16, Appendix). From stand and stock data, volume in cubic feet by 2-inch diameter classes was separated into four species groups based on similar growth-rate characteristics. Growth percentages were applied to average volume per acre to obtain annual volume growth.

[6] 128 cubic feet of stacked volume.

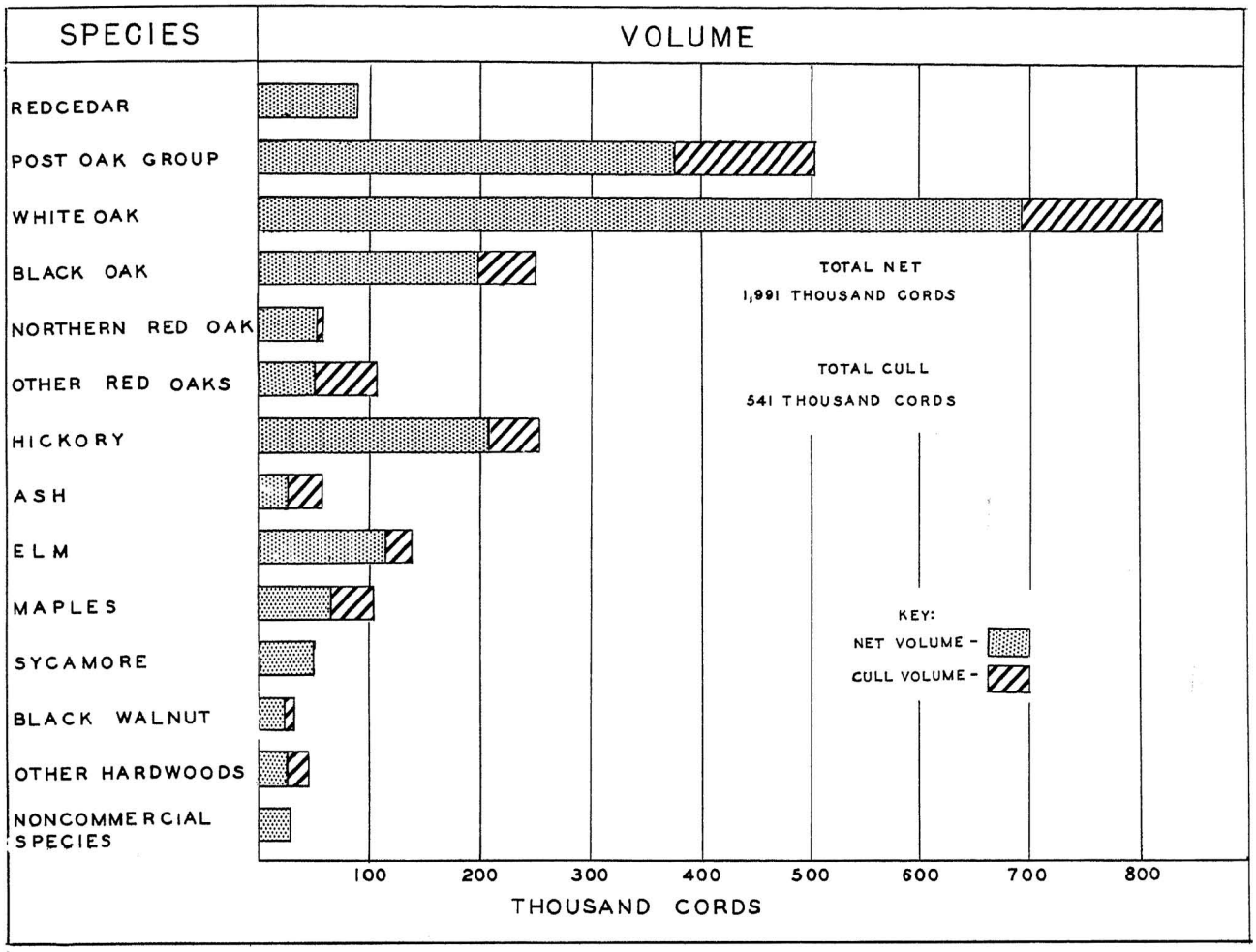


Figure 9—Net and cull cordwood volume by species, 1951.

TABLE 1 -- STAND AND STOCK TABLE, AVERAGE PER ACRE, FRANKLIN, GASCONADE, AND OSAGE COUNTIES, 1951

D.B.H.	Sound trees	Basal area	Volume			Board-ft. volume by dia. class
Inches	Number	Square feet	Cords	Board feet	Cubic feet	Percent
2	175.51	3.9				
4	82.05	7.1				
6	38.46	7.5	0.96		76.9	
8	19.71	6.9	1.23		98.6	
10	12.30	6.7	1.38		110.7	
12	8.04	6.3		386	63.5	30.3
14	3.75	4.0		266	40.9	20.9
16	1.73	2.4		195	30.4	15.3
18	0.98	1.7		149	22.3	11.3
20	0.45	1.0		88	12.9	6.9
22	0.21	0.6		52	7.4	4.1
24	0.09	0.3		28	3.9	2.2
26	0.05	0.2		22	3.0	1.7
28	0.07	0.3		36	4.9	2.8
30	0.03	0.1		18	2.4	1.4
32						
34	0.02	0.1		15	2.1	1.2
36	0.01	0.1		9	1.2	0.7
38	0.01	0.1		10	1.3	0.8
Total	343.47	49.3	3.57	1,274	482.4	100.0

Ingrowth of smaller trees into cordwood size and saw-timber size was based on average diameter growth rates of 4-inch trees and 10-inch trees, determined from field measurement of increment cores. The numbers of trees entering the 6-inch class and the 12-inch class were computed according to a modification of the "percent movement method" described as the *second option* by Wahlenberg (1941). After combining total growth by species groups, volume was converted to merchantable units of measurement (Table 2).

TABLE 2 -- ANNUAL VOLUME GROWTH, ALL SPECIES, BY COUNTIES, 1951

	Forest area	Volume	
	Acres	Cords	Board feet
			Per Acre
Gross Increment		0.3	71.6
Adjustment for mortality		mil	7.3
Net increment		0.3	64.3
		Entire Forest Area	
Franklin County	261,000	78,300	16,790,130
Gasconade County	183,000	54,900	11,772,390
Osage County	212,000	63,600	13,637,960
Total	656,000	196,800	42,200,480

Although 196,800 cords plus 42,200,480 board feet appears at first to be an optimistic estimate, it is not unreasonably so, because annual cordwood growth was 7.7 percent of the cordwood growing stock and board-foot growth was 3.5 percent of the board-foot growing stock. The estimate of 64.3 board feet per acre compares closely with 59.2 board feet for the entire riverborder region of Missouri reported by King, Roberts, and Winters (1949).

Quality of Saw-timber Growing Stock—The price received for a stumpage sale of hardwood timber depends on a number of physical factors in addition to several economic ones and relative bargaining abilities of buyer and seller. Important physical factors are size of area, volume per acre, logging conditions, and transportation distance; but perhaps the factor exerting the greatest influence on income to the seller is the quality of timber. Quality often determines whether a sale is possible when other factors are disadvantageous. Therefore, an attempt was made to classify the grades of logs contained in a random sample of saw-timber trees.

Merchantable logs were classified in one of three hardwood log grades for standard lumber described by the Forest Products Laboratory (1949). In general terms, Log Grade 1 admits a few widely spaced defects; Log Grade 2 is less stringent; and Log Grade 3 permits numerous closely spaced defects.

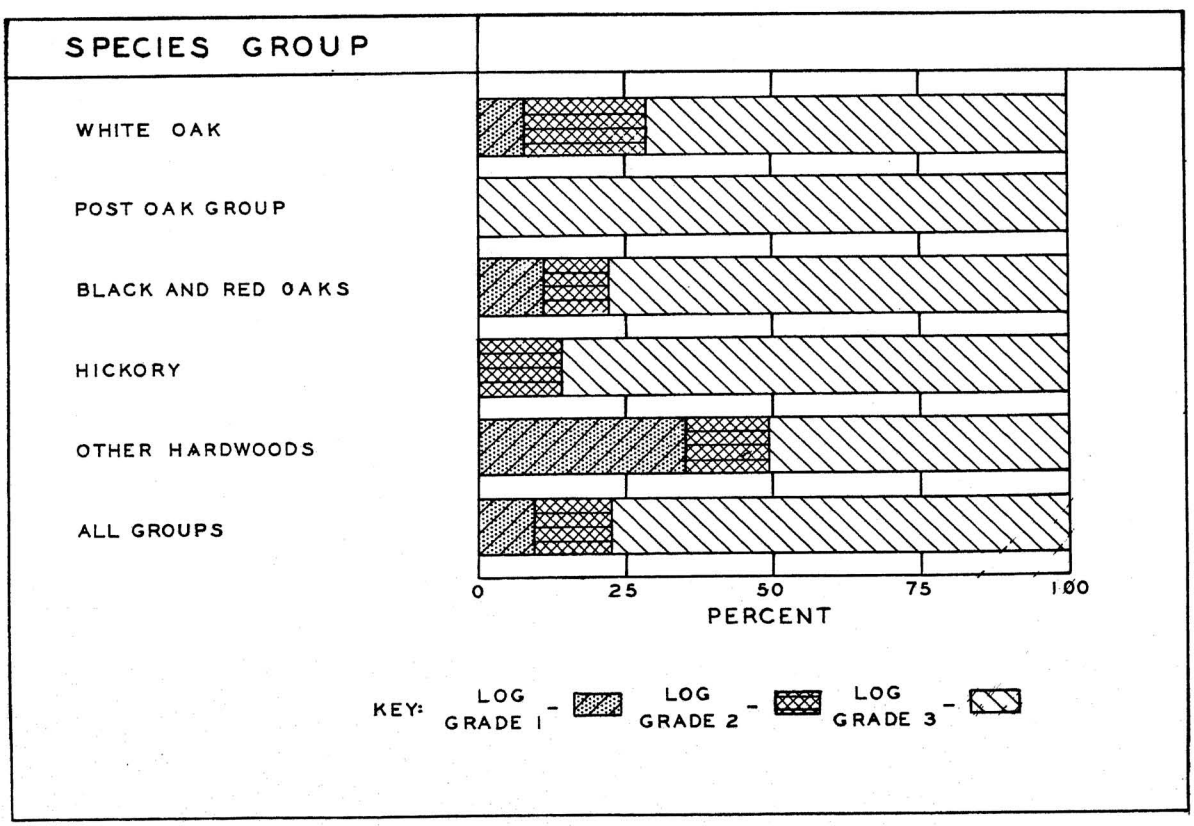


Figure 10—Percentage of merchantable volume of sample trees by log grade, 1951.

All species combined had 9 percent of their volume in Grade 1 logs, 13 percent in Grade 2 logs, and 78 percent in Grade 3 logs (Figure 10 and Table 17, Appendix). If these percentages are applied to the inventory of saw-timber, only 75,000,000 board feet are in Grade 1 logs; 106,000,000 board feet in Grade 2 logs; and 640,000,000 board feet in Grade 3 logs. It appears that timber owners in these counties will be faced with the problem of trying to market a huge volume of low-quality material with a relatively small amount of high-quality wood to sweeten the sales.

FARM WOODLOT MANAGEMENT

Information on farm use of timber, sales of timber, and forestry practices on farms was obtained by interviewing farm operators in each county. By the use of random sampling, names and farm locations were drawn from records for each civil township in the county office of the Production and Marketing Administration, U. S. Department of Agriculture. If the farmer was not available, the closest farm to the one drawn from P. M. A. records was substituted. Interviews with 112 farm operators in Franklin, Gasconade, and Osage Counties were completed, representing 19,870 acres out of a total of 1,090,264 acres of farm ownership. Based on number of farms, 1.4 percent were sampled; and based on total farm area, 1.8 percent of the area was sampled.

The farms sampled ranged in size from 3 to 786 acres and averaged 177 acres. The total woodlot area represented in the sample was 9,188 acres. Woodlots ranged in size from less than one acre to 400 acres and averaged 82 acres. Only two farms in the 112 had no woodlot. Of the total land area in the three counties, 50 percent is forested (King, Roberts, and Winters, 1949); and about 46 percent of the farm area sampled is forested.

Farm Use of Woodlot Timber—To what extent is wood still used for cooking and heating on farms? Our estimate shows that 97 percent of the farms sampled used wood for fuel at least 30 days during the year, and only 3 percent used other fuels, such as gas, coal, or oil, exclusively. Apparently, 89 percent of the farm families used wood for cooking during part of the year, but frequently it was burned for cooking only in cool weather when it provided supplemental heating. Bottled gas was used on many farms for cooking in warm weather. All farms sampled used wood for heating, and an average of 1.4 heating units per farm was reported. Less than 7 percent had wood-burning furnaces, and only 1 percent had fireplaces.

Annual wood fuel consumption ranged from 1 to 30 cords and averaged almost 13 cords per farm where wood was used. All wood consumed came from the farmer's own woodlot. A distinct preference was expressed for oaks as a fuel by 77 percent of those interviewed. They burned oaks exclusively. The other 23 percent burned a mixture of several species of hardwoods. Woodlot owners are justified in giving preference to oaks for fuel, particularly post oak, scarlet oak, and white oak (Table 18, Appendix). However, the heating value of a number of species other than oak is relatively high. If woodlot owners improved their timber stands by cutting fuel-wood from defective and crooked stems, particularly post oak and hickory, they would get almost as much heating value as from burning oaks exclusively.

Owners' estimates of the number of fence posts required annually for new construction and replacements varied from 10 to 1,000. This difference is partly accounted for by differences in size of farms. Over 60 percent of the farmers estimated requirements be-

Figure 11—A well-managed woodlot with adequate growing stock and satisfactory distribution of tree sizes.

Figure 12.—The Farm Forester can give valuable assistance to woodlot owners on many woodlot problems. This forester is advising owner on cutting logs for best grade. (Missouri Conservation Commission Photo.)

tween 100 and 300 posts annually, and the average annual requirement was 226 fence posts per farm.

Most fence posts were cut from the farmer's own woodlot, an average of 221 per farm. Approximately 3 percent of those interviewed purchased steel posts but no woodlot owner found it necessary to buy wood posts from others. Preference for Missouri timber species for use in fences is indicated by the percentage of farmers using the following tree species:

Species	Percentage
White oak	73
Post oak	12
Red oak	1
Cedar	10
Osage-orange	2
Mulberry	2
	100

It is apparent that oaks, particularly white and post oaks, are the favorite material being used by 86 percent of those interviewed.

Owners also estimated the amount of lumber required for farm use. Annual needs ranged from 50 to 8,000 board feet, and averaged 740 board feet per farm. More than 90 percent of the annual needs, or 669 board feet, was obtained from the farmer's own woodlot. Of this amount 93 percent was cut from several species of oaks and 7 percent came from other hardwoods. Most of this lumber was custom-sawn and used as unplaned boards, dimension stock, and rough timbers. Farmers bought about 10 percent of their annual lumber needs, or 70 board feet per farm. Purchases were primarily for surfaced lumber for finish purposes on buildings. Half the amount purchased consisted of softwoods; 43 percent, oaks; and 7 percent, other wood species. The average purchase price for all species was $70.41 per thousand board feet, and the average purchase cost the farmer $29.22. Apparently most farm buildings are being kept in good repair because practically all the estimated requirement is satisfied either by woodlot harvest or by purchase.

Farm Operators' Interest in Forest Management—An attempt was made to classify the types of cutting practiced in woodlots. Thirty percent of the responses indicated that wood products came from land-clearing operations to provide more crop or pasture land. Confining classification to cuttings in areas to remain in forest, it appeared that 11 percent of those interviewed practiced clearcutting, taking all trees sufficiently large to make a given consumer product. Another 46 percent high-graded their woodland, taking the best trees and leaving successively poorer growing stock on the land. Another 33 percent followed a plan of selective cutting in which only mature trees were cut, or less than 60 percent of the merchantable volume was removed. Ten percent indicated that some form of improvement cutting was done in which the primary purpose was to improve growing conditions for the remaining tree stand. This included removal of overmature trees, undesirable species, and trees containing decay, or those with poor form; and thinning crowded clumps of young trees.

Clearcutting frequently does not assure complete restocking of young trees of desirable species. Selective cutting may be poor forestry practice if insufficient attention is given to removal of defective trees or to the distribution of the stand reserved from cutting. If we assume that both types of cutting comprise satisfactory forestry practice, about half of the area cut over should result in improved woodlot condition. But it is more likely that much of the clearcutting and some of the selective cutting was done without regard for providing another crop of trees. In that case it is apparent that more than half the present cutting practice tends to decrease the quality of remaining timber and make growing conditions less favorable.

Since 1943, a full-time Farm Forester employed by the Missouri Conservation Commission[7] has been assigned to an area including the three counties studied. His work is to assist forest owners in managing their woodlands and in marketing timber, and to assist wood-using industries with marketing and processing problems. The activity of the Farm Forester during a 10-year period is indicated in Table 3.

[7]In cooperation with the Forest Service, U. S. Department of Agriculture, under provisions of the Cooperative Forest Management Act of 1950 (64 Stat. 473).

TABLE 3 -- ASSISTANCE GIVEN BY THE FARM FORESTER TO WOODLOT OWNERS AND MILL OPERATORS IN FRANKLIN, GASCONADE, AND OSAGE COUNTIES, 1944-1953

Year	Number of times assistance was provided	
	Woodlot owners	Mill operators
1944	57	
1945	95	
1946	100	77
1947	117	28
1948	97	37
1949	94	23
1950	75	11
1951	77	21
1952	89	31
1953[1/]	151	48

1/ First 10 months.

Source: D. L. Shaw, Farm Forester, Missouri Conservation Commission, Owensville, Missouri.

Interviews with farm operators in 1952 showed that 35 percent knew that free assistance in forest management was available, and of those who knew of this service, 18 percent had used or requested advice from the Farm Forester. A slightly larger number of farmers, 38 percent, knew that the Farm Forester was available to help them find buyers of stumpage or forest products and to assist with sales arrangements; but only 17 percent of these had secured marketing aid. Every farmer who had obtained help from the Farm Forester indicated that he was satisfied with the assistance, but it appears significant that less than 4 percent would pay for forestry advice given by the Farm Forester or a consulting forester. The farmers did not appear greatly concerned with managing woodlots or selling timber, and were not fully aware of the values attached to it.

Farm Sales of Timber—During interviews with farm operators, information was recorded concerning sales of timber from farm woodlots. Fifteen percent of those interviewed sold standing timber or rough timber products during the calendar year 1952. It might be expected that a larger number would have sold timber because 1952 was a year of active buying at relatively high prices. Most of the sales were of stave and heading material for tight cooperage stock (Table 4).

TABLE 4 -- FARM TIMBER SALES IN 1952

Species	Product	Total number of sales - %
White oak	Barrel staves and heading	76
Other oaks	Fuel	12
Cedar	Novelties, Closet lining	12
		100

Buyers of stave material apparently traveled throughout the area studied. Fuelwood was sold by farmers in nearby towns. The cedar market was restricted to Osage County and the southern part of Gasconade County.

Under almost any arrangement it is possible that the seller of timber may be left with less desirable growing stock than before the sale. If he sells timber with no restrictions on cutting, he usually is left with no merchantable timber, or if he sells certain species, the ones remaining usually are those more difficult to market. If he permits the buyer to cut all trees larger than a given diameter, he may be left with some growing stock and it may be in vigorous trees, but its distribution over the area is often patchy. Circumstances may occur when the above arrangements work out satisfactorily for the seller, even though he has little control over his timber during the sale. More often, they give every advantage to the buyer.

A marked-tree sale, in which each individual tree is designated for cutting, permits the seller to specify exactly what he is selling. It offers the least grounds for disputes, especially if an understanding is reached on how much of the stem material is to be utilized. In marking trees for sale, future reproduction and

Figure 13 – This is a typical example of neglected woodlot burdened with cull trees.

growth of the remaining stand must be remembered, as well as marking a sufficient volume of high-quality timber to attract buyers. To ignore the condition of the remaining stand results in high-grading. Every effort should be made to improve the remaining stand in species composition, spacing, and quality. Frequently, it is necessary to compromise the most desirable forestry practice in favor of selling sufficient volume to attract buyers. Basis for payment for this type of sale can either be in a lump sum or according to scaled volume. In any case it is desirable to offer timber to several reputable, prospective buyers.

Timber was sold under a number of different arrangements by farmers during 1952. Many in this area have learned to scale logs according to one of the commonly used log rules; and more than half the timber sold in 1952 was paid for according to an agreed price per thousand board feet, log scale. About 35 percent of the sales were paid for in a lump-sum, usually before cutting began. Another 13 percent of the sales were handled under some arrangement, often private, such as bartering timber for other goods or transactions between relatives.

In 66 percent of the sales, buyers were under no obligation to leave certain species or sizes of trees in the farmer's woodlot; they could cut either all the merchantable timber or all trees of a stated species. This was frequently the case in sales of white oak stumpage for cooperage stock. Of the remaining timber sales, 17 percent of the buyers were restricted to cutting to a minimum tree diameter, and another 17 percent of the sales were for marked trees.

A few farmers cut heading bolts themselves and delivered them to a mill or loading point and all fuelwood was cut and sold on a delivered basis but 75 percent of the timber marketed was sold on the stump.

Figure 14.—This woodlot contains an excess of growing stock. Some of it should be harvested. (Missouri Conservation Commission Photo).

White oak stumpage sales for staves and barrel heading material ranged from as small as 14 chord feet to 1,500 chord feet, but most transactions were for a small amount of timber, averaging 51 chord feet per sale. Owners who sold white oak stumpage on a marked tree or scaled volume basis received an average of 64.4 cents per chord foot. Those who sold all timber, or all trees of a given species, or sold on a diameter-limit basis received an average of 32.5 cents per chord foot. An owner who determines what he is selling by marking each tree offered, or who, in the course of scaling logs, supervises the logging tends to get a higher price than one who sells with a verbal contract or a weak written one with few or no restrictions on the buyer.

The average sale of fuelwood was 4 cords, which brought an average price of $7.25 per cord, delivered to the purchaser. Purchasers of white oak stumpage hauled bolts a distance of 15 to 40 miles by truck to a stave or heading mill; maximum hauling distance for fuelwood was 8 miles, usually to the nearest town.

What about the 85 percent of the farmers interviewed who sold no timber during 1952? Half of them have never sold timber. The other half made at least one sale between 1930 and 1951, classified as follows:

Product	Percentage of sales
Stave and heading stock	79
Sawtimber	7
Fuelwood	4
Crossties	2
Walnut veneer stock	2
Wagon bolsters	2
Not classified	4
	100

It is apparent that the principal market in this area is for cooperage stock, almost entirely for white-oak Bourbon whiskey barrels. The opportunities for selling sawtimber, the most commonly marketed product in many counties, are relatively few in this area. Only a small proportion of woodlot owners had marketed timber. The others preferred not to sell or they were unable to find a buyer.

TIMBER CONSUMED BY PRIMARY WOOD-USING INDUSTRIES

To estimate production of industries and activity of timber buyers within the three-county area, a complete canvass was made of industries which process rough forest products such as logs or bolts. Industries such as furniture factories were not included because they ordinarily obtain wood from a primary industry. Commercial firms in operation were principally small sawmills, but a number of veneer timber buyers and stave and heading bolt[8] buyers were active; and one charcoal plant was in operation.

Many of those contacted had few records or none to help recall information. Their estimates, based on average daily output and number of days worked, are subject to error. Part of the timber supply of mills located near the outer boundary lines of the three counties was obtained from other counties, and firms located elsewhere obtain part of their raw material from within the three counties. When possible, adjustment of information was made to account for such losses and gains with the help of mill operators. The data are useful to indicate the types of industries that consume timber from the three counties, approximate volume of production, and ability and interest of mill owners in running a stable, long-term operation.

Markets for different forest products were far from uniform over the three counties. Volume production of lumber and other sawed products in Franklin County exceeded the amount sawed in both Gasconade and Osage Counties. Much of the Franklin County lumber was sold for car blocking, but apparently none of the mills in the other counties were able to sell it, possibly because of increased transportation distance to St. Louis. The market for charcoal was confined to the western part of Osage County, where it was more important than sawmilling. A relatively cheap source of labor is an important factor in the survival of this industry. A market for charcoal would permit improvement cuttings to be made at a profit but no such cuttings were observed. The industry does consume much post oak, blackjack oak, and hickory of small diameters grown on poor sites. These trees offer small promise of growing into high-quality timber, and their utilization for charcoal is a desirable practice. Stave bolt buying, though encountered in all counties, was more concentrated in Gasconade County.

Lumber and Other Sawed Products—Total production during 1950 was almost 7,000,000 board feet. More than two-thirds came from Franklin County sawmills, and 22 percent was produced in Osage county. Mills in Gasconade County assumed a minor role, producing only 11 percent of the total. Ninety-one sawmills were found—36 in Franklin County, 27 in Gasconade, and 28 in Osage (Table 5). Only 18 sawmills were classified as permanent mills, whose equipment and plant layout were such that the mill could not be moved easily. Temporary mills are the ones that are set up to be moved frequently if desired.

TABLE 5 -- NUMBER OF SAWMILLS IN OPERATION, 1950

County	Total	Custom mills	Commercial mills: Accept custom work	Commercial mills: No custom work
Franklin	36	20	8	8
Gasconade	27	23	2	2
Osage	28	24	1	3
Total	91	67	11	13

Nine mills were operated regularly as a lumber manufacturing business (Table 6), but even in these mills, prolonged shut-downs were common. The mills were run for one or two months a year. Forty-nine part-time mills were run by farmers and 33 were run by persons employed seasonally in other businesses. Operators of such mills seldom were interested in buying stumpage or logs when an opportunity existed. They prefered to run a sawmill as a convenience to the community in getting timber custom sawed for home use. Several stated that their profits were small, but they enjoyed sawing timber. Ownership of small sawmills changed frequently. Only 52 sawmill operators had owned their mill for 5 years or longer.

TABLE 6 -- NUMBER OF SAWMILLS OPERATED PART-TIME AND FULL-TIME, 1950

County	Sawmills operated part-time: By farmers	Sawmills operated part-time: By others	Sawmills operated full-time
Franklin	12	18	6
Gasconade	18	8	1
Osage	19	7	2
Total	49	33	9

[8]Hereafter referred to as stave bolts.

More than 46 percent of the lumber produced during 1950 was custom work (3,190,000 board feet, Table 7). Approximately equal amounts were produced in Franklin and Osage counties. Volume of custom work in Gasconade was half that in the other counties. Production per mill in Gasconade County was similarly about half that in the other counties. More than 88 percent of the custom mill operators confined their work to sawing logs delivered to the mill, and less than 12 percent were equipped to load logs at woodlots and transport them to the mill.

TABLE 7 -- VOLUME OF SAWED PRODUCTS, CUSTOM WORK AND COMMERCIAL PRODUCTION, 1950

	Custom work		Commercial production	
County	Total	Av. per mill	Total	Av. per Mill
	Thousand board feet			
Franklin	1,254	46	3,295	206
Gasconade	607	24	112	28
Osage	1,329	53	200	50
Total	3,190		3,607	

More than 90 percent of the volume of commercial production came from mills in Franklin County. Average production per mill in Franklin County also was much higher, but the volume per mill indicates that many mills in the three counties should not be classed as full-time operations. Twenty-three timber buyers served 24 mills, but most of them were the mill operator or someone employed at a mill job, except for an occasional buying assignment when the mill was in short supply.

Only nine mill owners appeared to be in the lumber business in the usual sense, buying stumpage or logs and producing lumber for sale on an open market throughout the year. A number expressed a desire to give up their business. Industrial firms which were able to pay higher wage rates offered intense competition for labor. Difficulty in buying timber of sufficiently high quality to compete with sawmill operators in other counties who supply the same concentration yards added to their difficulties. The high price paid for stave bolt stumpage during 1950 also was a contributing factor. A few buyers had purchased upper portions of trees cut for staves, but the large proportion of low-quality lumber produced made the practice unprofitable.

Figure 15—Out of 91 sawmills in the three-county area 73 were classed as portable type mills. This is a portable mill with minimum equipment.

Prices of hardwood lumber in the St. Louis area appear to be governed in part by the cost of lumber shipped in from the Missouri Ozark region. In spite of higher transportation costs, Ozark mills appear able to sell lumber profiitably at relatively low prices because of lower labor costs. Few sawmills in this area sorted and sold lumber by grades, and none were prepared to grade according to standard lumber grading rules and sell by carload lots, even though it might have placed them in a better competitive position. The financial position of sawmill operators became more precarious in 1951 because costs, in general, increased more than the price of rough mill-run lumber.

Although the number of mills located in the three counties is sufficient to provide markets for woodlot owners, few are operated regularly as a lumber business. Those that are, appear to be confronted with financial difficulties and severe competition from other areas.

Other Wood Products—No veneer plants are located in this area but a number of veneer and furniture manufacturers located in other states buy veneer material in Missouri. They require logs of large diameter with few defects; veneer logs have more demanding specifications than any other forest product. Because of this and a scarcity of such material, high stumpage prices are paid, at times exceeding $200 per thousand board feet. Seven veneer buyers were active in the area during 1950 (Table 8), who bought a total of 90,000 board feet of logs (Table 9).

Twelve stave buyers were active in the latter half of 1950 (Table 8). They were competing for good

TABLE 8 -- NUMBER OF VENEER TIMBER AND STAVE AND HEADING BOLT BUYERS, 1950

County	Veneer timber buyers	Stave and heading bolt buyers
Franklin	1	4
Gasconade	2	5
Osage	4	3
Total	7	12

stave timber, and all were potential buyers for white oak stumpage, forest land, or white oak bolts. A total of 318,000 chord feet was purchased, more than half of it in Gasconade County (Table 9). Several

TABLE 9 -- TIMBER CONSUMED BY SAWMILLS AND OTHER PRIMARY INDUSTRIES, 1950

County	Sawed products	Veneer logs	Stave and heading bolts	Charcoal wood	All products Total*	All products Per Acre*
	M bd. ft.	M bd. ft.	M cord	Cords	M bd. ft.	Bd. ft.
Franklin	4,549	25	85		5,846	22.4
Gasconade	719	20	118		3,559	19.4
Osage	1,529	45	45	6,200	4,109	19.4
Total	6,797	90	318	6,200	13,514	20.6

*Converting factors:
1 cord foot = 15 board feet including unused portions of wood.
1 standard cord = 300 board feet.

buyers were able to satisfy their requirements by purchasing bolts delivered to plant yards outside this area. Approximately 40 percent of the total production was sold delivered to a stave mill yard.

The amount of charcoal wood consumed by a single 4-kiln plant was 6,200 cords of oak and hickory.

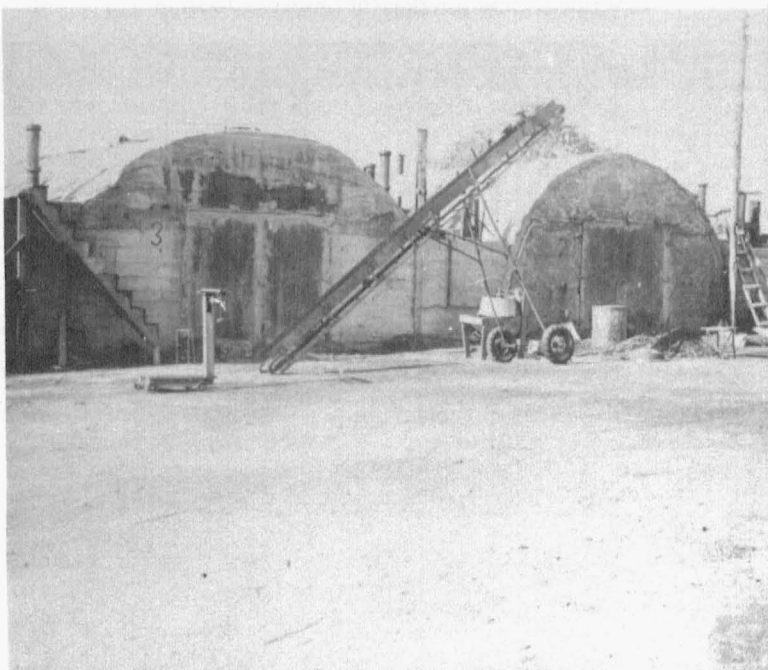
Total Consumption—Conversion of stave material and cordwood to equivalent board-foot units, when combined with sawed products and veneer logs, indicates total consumption to be 13,514,000 board feet (Table 9). Almost half came from Franklin County. The industrial harvest per acre was very similar, ranging from 19.4 to 22.4 board feet, in the three counties.

Growth and Drain Compared—Can the forests of Franklin, Osage, and Gasconade Counties withstand a larger annual harvest or should efforts be concentrated on building up growing stock to a more productive level? A comparsion of growth and drain may provide an answer. Conversion of the volume of small-diameter trees and products such as fence posts, fuelwood, and charcoal wood into board-foot equivalents may yield misleading results. Since existing markets are primarily for trees of saw-timber size, an analysis will be confined to trees and products whose volume is ordinarily expressed in board feet or can be converted accurately into board-foot units.

To state that predicted growth in excess of drain provides an additional amount that can be harvested would be optimistic with no allowance for sampling errors or risks. Estimated growth should be adjusted for probable losses from fire, insects, disease, and other contingencies. It is suggested that 10 percent of the annual growth reported in Table 2 will be lost to destructive physical agencies. The present level of productiveness probably can be increased greatly by building up the average growing stock from 1,274 board feet to 3,000 or more board feet. It is desirable, therefore, to reserve from cutting a large part of current growth to accomplish this as rapidly as possible without interfering with present utilization. It is proposed that 50 percent of net growth be reserved for addition to growing stock. To allow for other possible sources of commercial drain which were not reported in Table 9, it is proposed that total drain be increased by 20 percent. With the above adjustments, the balance of growth and drain may be estimated as follows:

	Total M bd. ft.	Per acre bd. ft.
Saw-timber growth, Table 2	42,200	64.3
Less assumed physical losses	4,220	6.4
Adjusted growth	37,980	57.9
Reserved for addition to growing stock	18,990	28.9
Growth available for harvest	18,990	29.0
Drain, except charcoal wood, Table 9	11,654	17.8
Add undetermined drain	2,331	3.6
Total drain	13,985	21.4
Available for additional harvest—(growth available for harvest minus total drain)	5,005	7.6

Figure 16—Charcoal kilns such as these can utilize low-quality wood. Charcoal wood buying activity was limited to western Osage county where it was more important than sawmilling.



With contingency allowances made to arrive at a reasonable estimate and with growing stock permitted to build up rapidly, it appears that existing harvest can be increased by 5,000,000 board feet. Such an estimate could be conservative if fuelwood were cut from cull trees and if fence posts were made from trees removed in thinning dense stands or trees which could not be utilized for more valuable products. It would not permit the charcoal industry to make great inroads in vigorous growing stock. That such favorable forest conditions will develop soon is improbable, but it is apparent that the present harvest can be increased without reducing the existing amount of growing stock.

TOWARD BETTER TIMBER MARKETING

The Farmer and His Woodlot—An attempt to analyze present practices and marketing conditions comprehensively would involve many economic factors and human relationships which are difficult, if not impossible, to assess acurately.

The area studied was heavily cut-over during and after the period of major farm settlement. Aside from land clearing, much timber has been cut from areas which have remained in forest cover. Continual high-grading and, to a lesser extent in this area, frequent uncontrolled fires and heavy grazing have resulted in a progressively poorer timber growing stock. In general, the existing woodlots are poor—stocked with far too many defective or poorly formed trees. Not only are they unmerchantable but they occupy space which could be growing desirable trees. Poor woodlots make poor marketing conditions, and poor markets discourage owners from making an effort to improve their stands.

Figure 17—This white oak tree was culled for stave bolts because of decay and twisted grain. Now the tree is unsuitable for other products. Wood-using industries lack integration for efficient timber utilization.

Through agricultural research, education, and experience, farmers learned to recognize submarginal lands for field crops and pasture, and the pressure to clear more and more land is approximately in balance with land reverting to forest. But a vestige of the pioneering agricultural tradition remains—farmers do not think of timber as another farm crop. As shown previously, the woodlot is appreciated and used as a source of material for farm construction, fencing, and fuel; but the farmer still does not recognize his woodland fully as an integral, income-producing part of his farm.

Lack of knowledge contributes greatly to this situation. The owner does not know what should be done to improve his woodlot. Too often his chief concern in selling timber has been to get the highest total amount of money regardless of the effect on his stand. He has little opportunity to learn to visualize the various products that might be cut from a given tree. His knowledge of complicated grades and specifications, yields and measures of volume does not match the knowledge of field crops and livestock that he has acquired over many years and uses daily. He sells timber at infrequent intervals, compared to other crops, and timber markets and product specifications may change markedly from year to year. More important, perhaps, he does not know where to turn for help.

The timber industries themselves are partially responsible for preventing the farmer from learning about timber marketing. They have seldom published or given wide distribution to timber product specications. Specifications in some cases are unnecessarily involved and exacting. Often specifications vary from one company to another and with minor changes in demand from remanufacturing industries and consumers. However, the entire blame for such disor-

ganized conditions cannot be placed on any one segment of the timber economy.

The wood-using industries of our country have been characterized by a lack of integrated utilization. This is particularly true of Missouri. A stave-bolt buyer may cut one or two 39-inch bolts from trees he buys and leaves the rest in the woods. The owner sees the waste and feels cheated. He cannot interest a sawlog buyer in buying the remains because of the high proportion of low-quality volume from which lumber can be sold only at low prices. The opportunity for two or more wood-using industries buying stumpage together on a share basis remains to be explored. As it is, each wants all of the high-grade volume. It may be possible to satisfy the product specifications of each industry at an average lower cost per unit of volume by designating each portion of the tree for its highest possible use.

Most small-woodlot owners have a relatively small volume of timber to sell at any one time, even if they offer all of their merchantable growing stock. Consequently, they possess limited bargaining power. Even if several bids are obtained for timber offered for sale, the buyers tend to submit low bids, unless the timber is of exceptionally high quality or they need the stumpage badly, because any one purchase is a small part of their total requirement. Purchasers are conscious also of the limited number of opportunities the seller has.

Unfair buying practices by some buyers in the past have laid the foundation for a general distrust of timber buyers by owners of small woodlots. Conversely, the far-sighted, honest timber buyer who attempts to buy only the trees he can use, with a view of returning periodically as other trees mature, is sometimes bitter about the woodlot owner who insists on selling all merchantable timber at one time to be done with it.

Woodlot owners frequently are advised to do their own logging during periods when other crops need little attention. By selling rough products at the roadside or delivered to a mill or railroad loading point, it is claimed that he can receive a high return for his labor. If he has the necessary tools and equipment and if he is able to work efficiently, he often can earn high wages by logging. In addition, he has complete control of the operation and can hold unnecessary damage to a minimum. But if his knowledge of logging is scanty, much effort and time may be spent to produce inferior products and cause considerable damage to remaining trees.

It is believed that many farmers make few timber sales because of a lack of interest in their woodlot. They are occupied with running other farm operations. The Bureau of the Census (1952) shows that the value of all farm products sold in 1949 from farms in the three counties was $15,034,240. The value of forest products sold during the same year was $146,960—only 1.0 percent of the total farm income. In Franklin County, sales of forest products comprised 0.6 percent of total farm income; in Gasconade County, 1.8 percent; and in Osage County, 1.1 percent.

Deposits of refractory clay have been discovered on many farms, and sales of clay have added substantially to farm income in this area. It is understandable that farmers are willing to devote little time, if any, to an activity which contributes such a small part to total income. Even if a farmer were able to increase productivity of his woodlot several fold, income from this source still would comprise a minor part of his cash crop.

It should be pointed out, however, that a change in the present economy might bring timber into a position of higher relative importance to the farmer. Burns (1950) has shown that Missouri farmers can obtain substantial permanent incomes from their woodlots which net $100 to $700 annually, depending on the volume of timber growing stock, its condition, and the time the farmer spends in harvesting his own products. Considering the small amount of time, expense, and effort required, the income received from timber is high. Aside from income consideration, the farm woodlot, if managed properly, can offer increased benefits in control of erosion, a habitat for upland game, and a major source of construction material for home use.

Organized Selling—Cooperative effort in selling forest products, as for other farm crops, has much to recommend its use by woodlot owners. Though it can hardly be considered a solution to all marketing problems, it would tend to place sellers in a stronger position. Cooperative action may be an informal arrangement by several neighbors who combine their timber into a single sale. However, to be most effective it should be done by a stable organization with services regularly available to both buyer and seller. It must be done by an organization in which forest owners have confidence, such as the established farmer associations in Missouri.

The Forest Service (1943) states that approximately 15 forest products marketing cooperatives are in existence in the United States. Few were organized earlier than 1937. Their form of organization and

functions vary greatly. Cope (1943) states that cooperatives are formed: (1) To sell stumpage; (2) To sell rough products at the roadside or concentration yard; or (3) to process timber for sale as finished products. In a cooperative formed to sell stumpage, the owners contribute standing trees to be marketed by the cooperative. Under the second form, owners contribute both stumpage and labor, or the cooperative may employ a logging crew for optional use by forest owners. Under a third form, the cooperative further processes rough products in sawmills or other plants, usually owned by the organization, selling finished items. It should be noted that only an organization which controls processing is a true cooperative enterprise. Other organizations are better termed "marketing associations."

Cope (1941) recommends that cooperative efforts be confined to harvesting and marketing of raw products, rather than engaging in the intricacies of processing and merchandising finished products. The necessarily heavy investment in plant and expense of salaries requires a large-scale operation. A number of woodland owner cooperatives in Finland failed when they attempted to combine timber growing and processing.

In any cooperative marketing arrangement, control of the timber offered for sale is essential; and this is achieved in large measure by marking. The expense of marking timber may be an item of cost to an association, or members could rely on public foresters for this service. In relating the successful operation of the West Virginia Forest Products Association, Holsoe (1948) states that contact between woodlot owners and public foresters is not frequent enough to result in good forest management. It should be pointed out that, in many cases, the reason for infrequent contact between the Farm Forester and the land owner is due to the heavy work load carried by farm foresters resulting from new requests for assistance. Holsoe suggests that public foresters can be of greatest service in demonstration of sound forest practice and in helping to organize marketing associations, but that marking timber and negotiating sales should be handled by foresters employed by the association.

Whether woodlot owners of Franklin, Gasconade, and Osage Counties are interested in a cooperative approach to marketing and would abide by association rules is not known. If an association is desirable, it appears that its initial function should be marketing stumpage. Later, the operation of an adequately financed concentration yard could contribute valuable service to both buyers and sellers.

Organized Buying—Buyers also stand to gain by organization of their field activity. By cooperation in issuing clearly written, widely distributed specifications and lists of products currently in demand, they could reach a greater number of interested potential sellers of timber. Integrated buying of timber for several different products in a single timber sale might reduce the cost of purchasing raw material. This could be accomplished through a cooperative buying organization or through independent brokers.

Wackerman (1945), in discussing marketing problems in North Carolina, suggests that if there were forest products dealers who would purchase stumpage and rough products from woodlot owners and then sell to mills, much of the uncoordinated buying and selling of timber would be eliminated. Dealers could concentrate products from a large number of small owners until marketable quantities were assembled. Their responsibility would lie in locating markets. They could perform useful services to industries by locating scarce items and accumulating them in quantities large enough to ship. By observing fair, farsighted practices in contacts with forest owners, a buying organization or dealer could establish confidence which would attract a larger volume of timber.

New Industries—Of at least equal importance at the present time, is the encouragement of new wood-using industries to locate in this area. Prospective industries must, first of all, be assured of an adequate supply of raw material. Because of the present condition of the timber resources, industries which use low-quality wood should be given greatest assistance. Those able to use short lengths probably can find a sufficient supply of wood for permanent location in these counties. The establishment of additional remanufacturing plants, of which there are but few, not only would furnish employment but also would stimulate a more stable and efficient sawmilling industry.

The attraction of additional wood-using industires is of sufficient public interest to justify subsidies in plant location and tax relief from local governments. Technical assistance in wood procurement and manufacturing techniques also is justified. The Farm Forester is qualified by wide acquaintance with local persons and conditions to serve as a central source of information on timber marketing. A widely publicized source of reliable information would be of help and encouragement to prospective new industries for this area.

An Intensified Educational Program—Much of the cutting in woodlots is not in accordance with sound forestry practice and frequently timber is sold

by methods which are detrimental to the owner's interests. A majority of owners do not know that assistance in woodlot management and marketing is available, and relatively few owners have used this service. An intensified educational program would contribute much to the success of future attempts to improve marketing facilities.

In general, county agricultural agents are not sufficiently informed in forestry to carry on educational work satisfactorily. Therefore, it appears that at least one forester should be assigned to the three-county area to develop an intensified forestry education and demonstration program among woodlot owners. This work will serve to interest owners in woodlot management and make the service of the Farm Forester more effective.

SUMMARY

A study of the timber marketing in Franklin, Gasconade, and Osage Counties was made to determine whether woodlot owners were able to sell timber for diversified products in a manner to make good forest management possible.

An inventory of the timber resource showed:

	Volume, cull trees	Net Volume
Cordwood, M cords	541	1,991
Sawtimber, M board feet	384,286	820,679
Annual growth, M cords		197
M board feet		42,200

Interviews with farm owners indicated that average annual use of timber per farm was:

Fuelwood, from woodlot	13 cords
Fence posts, from woodlot	221
Lumber from woodlot	669 board feet
Lumber purchased	70 board feet

Farm sales of timber were chiefly of barrel stave and heading material; markets for other products, including sawtimber, were inadequate. Those who sold timber for staves or heading on a marked-tree or scaled-volume basis received an average of 64 cents per chord foot, contrasted with 33 cents for owners who made lump-sum sales. More than half the owners never had sold timber from their woodlots.

Approximately half the cutting in farm woodlots could be classified as conforming to good forestry practice. About one-third of the owners knew that assistance in woodlot management and selling timber was available from a Farm Forester, but only 6 percent had used his services.

A survey of primary wood-using industries and timber buyers showed:

	Number	Annual Production or purchases
Custom sawmills	67	3,190 M bd. ft.
Commercial mills	24	3,607 M bd. ft.
Veneer stock buyers	7	90 M bd. ft.
Cooperage stock buyers	12	318 chord feet
Charcoal kiln	1	6,200 cords

A comparsion of sawtimber growth and drain indicated that with liberal contingency allowances and reservation of half the annual volume growth for building up growing stock, an additional harvest of 5,000,000 board feet is permissible.

Possible aids for improving timber marketing include the formation of marketing associations by woodlot owners, integration of timber buying by a number of wood-using industries through cooperative action, frequent publication and wide distribution of easily understood product specifications, and encouragement and assistance for timber industries and remanufacturing plants that are able to use relatively low-quality raw material.

The assignment of at least one forester to this area is proposed to develop an intensified forestry education program among woodlot owners.

APPENDIX

TABLE 10 -- STOCKING AND COMPOSITION OF TREES 2 AND 4 INCHES D.B.H., BY COUNTY, 1951

Species	Number of trees per acre			
	All counties	Franklin	Gasconade	Osage
Redcedar	15	10	20	16
Post oak group	70	78	56	75
White oak	32	38	22	37
Black oak	23	33	24	15
Northern red oak	7	4	4	12
Other red oaks	19	18	24	15
Hickory	40	25	29	63
Ash	10	12	9	9
Elm	19	12	31	13
Blackgum	1	3		2
Sugar maple	4	9	1	4
Soft maples	1	1	1	1
Black walnut	2	1		5
Other hardwoods	17	13	4	33
Non-commercial species	25	34	16	26
Total	285	291	241	326
Basis, number of 1/100-acre plots	351	104	117	130
Percentage of plots with 1 or more trees	69	67	63	76

TABLE 11 -- NET BOARD-FOOT VOLUME ON COMMERCIAL FOREST AREA BY SPECIES AND COUNTY, 1951

Species	All counties		Franklin	Gasconade	Osage
	Thousand bd. ft.	Percent	Thousand board feet		
Redcedar	4,371	0.5	1,964	1,582	825
Post oak group	77,056	9.5	26,149	20,658	30,249
White oak	373,609	45.5	169,684	95,178	108,747
Scarlet oak	8,417	1.0	2,556	3,339	2,522
Black oak	78,531	9.6	49,809	14,502	14,220
Northern red oak	57,940	7.1	9,500	31,220	17,220
Other red oaks	25,594	3.1	23,456	345	1,793
Hickory	47,801	5.8	38,603	2,403	6,795
Ash	15,069	1.8	6,853	4,052	4,164
Elm	34,068	4.2	18,777	8,209	7,082
Cottonwood	1,875	.2			1,875
Blackgum	374			374	
Sugar maple	4,709	.6		3,539	1,170
Soft maples	20,570	2.5	11,461	1,835	7,274
Sycamore	32,883	4.0	14,542	8,742	9,599
Black walnut	14,090	1.7	5,865	2,755	5,470
Other hardwoods	23,722	2.9	17,711	1,812	4,199
Total	820,679		396,930	200,545	223,204
Percent		100.0	48.4	24.4	27.2

TABLE 12 -- NET BOARD-FOOT VOLUME ON COMMERCIAL FOREST AREA BY SPECIES AND STAND-SIZE CLASS, THREE COUNTIES, 1951

Species	Total		Saw-timber area		Pole-timber area	Seedling and sapling area	Poorly stocked area
			Large	Small			
	Thousand bd. ft.	Percent	Thousand board feet				
Redcedar	4,371	0.5	262	719	2,432	948	
Post oak group	77,056	9.5	10,658	29,829	33,897	2,542	130
White oak	373,609	45.5	162,272	133,115	56,575	13,330	8,317
Scarlet oak	8,417	1.0	2,556	512	1,773	3,576	
Black oak	78,531	9.6	11,404	36,209	28,007	2,550	361
Northern red oak	57,940	7.1	20,479	24,091	12,049	1,321	
Other red oaks	25,594	3.1	21,137	2,080	345	2,032	
Hickory	47,801	5.8	27,260	6,602	12,342	1,597	
Ash	15,069	1.8	6,896	1,874	5,174	374	751
Elm	34,068	4.2	26,334	4,528	2,607	599	
Cottonwood	1,875	.2				1,875	
Blackgum	374				374		
Sugar maple	4,709	.6	2,649	906	1,154		
Soft maples	20,570	2.5	17,239		3,331		
Sycamore	32,883	4.0	22,243		4,201	6,439	
Black walnut	14,090	1.7	7,915	3,099	1,044	2,032	
Other hardwoods	23,722	2.9	14,224	555	8,344	599	
Total	820,679		353,528	244,119	173,649	39,824	9,559
Percent		100.0	43.0	29.7	21.2	4.9	1.2

TABLE 13 -- BOARD-FOOT VOLUME OF CULL TREES ON COMMERCIAL FOREST AREA BY SPECIES AND STAND-SIZE CLASS, THREE COUNTIES, 1951

Species	Total		Saw-timber area		Pole-timber area	Seedling and sapling area	Poorly stocked area
			Large	Small			
	Thousand bd. ft.	Percent	Thousand board feet				
Post oak group	67,801	17.7	3,860	9,969	44,716	8,372	884
White oak	123,787	32.5	18,563	49,874	40,487	13,721	1,142
Scarlet oak	8,927	2.3		556	2,683	5,688	
Black oak	76,144	19.8	3,319	15,598	42,941	13,315	971
Northern red oak	24,183	6.3	5,634	8,227	9,767	555	
Other red oaks	3,582	.9		891	2,691		
Hickory	13,975	3.6	2,123	3,126	7,552	1,174	
Ash	10,165	2.6	2,896	1,730	4,960	579	
Elm	16,654	4.3	2,187	2,975	9,625	1,867	
Sugar maple	1,077	.3		653	424		
Soft maples	12,859	3.3	4,528		8,331		
Sycamore	12,489	3.3	2,689	6,038	2,584	1,178	
Black walnut	3,741	1.0			2,388	1,353	
Other hardwoods	7,744	1.8	5,885	653		1,206	
Non-commercial species	1,158	.3	1,158				
Total	384,286		52,842	100,290	179,149	49,008	2,997
Percent		100.0	13.8	26.1	46.5	12.8	0.8

TABLE 14 -- NET CORDWOOD VOLUME OF POLE-SIZED TREES ON COMMERCIAL FOREST AREA BY SPECIES AND STAND-SIZE CLASS, THREE COUNTIES, 1951

Species	Total		Saw-timber area		Pole-timber area	Seedling and sapling area	Poorly stocked area
			Large	Small			
	Cords	Percent	Cords				
Redcedar	87,185	4.4	1,184	3,410	74,151	5,815	2,625
Post oak group	372,657	18.7	8,816	33,530	310,191	19,519	601
White oak	691,717	35.5	50,838	232,198	391,353	14,072	3,256
Scarlet oak	17,683	.9	375		15,112	577	1,619
Black oak	196,557	9.9	2,024	34,694	135,976	23,863	
Northern red oak	52,548	2.6	2,024	7,615	38,477	4,432	
Other red oaks	32,275	1.6		1,444	23,918	6,538	375
Hickory	207,443	10.4	14,335	45,590	136,823	10,695	
Ash	27,478	1.4	6,335	5,985	14,048	1,110	
Elm	112,900	5.6	46,758	3,475	50,111	12,556	
Blackgum	375	----				375	
Sugar maple	54,396	2.7	11,905	18,172	23,024		1,295
Soft maples	9,290	.1	2,591		6,699		
Sycamore	50,573	2.5	6,405	1,199	42,369	600	
Black walnut	22,777	1.1	1,619	6,568	12,327	1,687	576
Other hardwoods	27,084	1.3	1,313	5,515	19,506	375	375
Non-commercial	27,845	1.4		720	25,813	1,312	
Total	1,990,783		156,522	400,115	1,319,898	103,526	10,722
Percent		100.0	7.8	20.1	66.3	5.2	.5

TABLE 15 -- CORDWOOD VOLUME OF CULL POLE-SIZED TREES ON COMMERCIAL FOREST AREA BY SPECIES AND STAND-SIZE CLASS, THREE COUNTIES, 1951

Species	Total		Saw-timber area		Pole-timber area	Seedling and sapling area	Poorly stocked area
			Large	Small			
	Cords	Percent			Cords		
Redcedar	1,004	.2			1,004		
Post oak group	127,555	23.6		9,609	102,562	9,499	5,885
White oak	127,758	23.7	8,535	30,018	75,278	12,167	1,760
Scarlet oak	11,688	2.2			4,876	6,812	
Black oak	51,597	9.5	629	9,973	32,277	7,698	1,020
Northern red oak	7,366	1.4		1,369	5,997		
Other red oaks	44,298	8.2		628	37,232	6,438	
Hickory	44,623	8.2	1,817	5,663	34,086	3,057	
Ash	30,963	5.7	2,829	783	27,351		
Elm	25,991	4.8	7,027	626	12,441	3,244	2,653
Sugar maple	33,537	6.2	5,971	8,039	18,276		1,251
Soft maples	5,633	1.0	5,633				
Black walnut	8,230	1.5		6,453	1,369	408	
Other hardwoods	18,796	3.5	3,275	2,936	7,491	4,686	408
Non-commercial	1,842	.3			1,842		
Total	540,880		35,716	76,097	362,082	54,009	13,368
Percent		100.0	6.6	14.1	66.8	10.0	2.5

TABLE 16 -- ANNUAL CUBIC-FOOT GROWTH RATES BY SPECIES GROUPS, MISSOURI[1/]

D.B.H.	Species group*			
	1	2	3	4
Inches	Percent			
6	6.0	8.2	11.1	12.4
8	3.5	6.0	8.3	7.8
10	3.1	4.6	6.4	6.7
12	2.8	3.5	5.0	6.1
14	2.4	2.8	4.0	5.6
16	2.2	2.3	3.3	5.2
18	2.0	2.0	2.8	4.7
20	1.8	1.9	2.6	4.2
22	1.8	1.9	2.5	3.8
24	1.7	1.8	2.3	3.4
26	1.7	1.8	2.2	3.1
28	1.6	1.7	2.1	2.9
30	1.6	1.6	2.0	2.8
32	1.6	1.6	1.9	2.7
34	1.5	1.5	1.8	
36		1.5	1.7	
38		1.4	1.6	

*Group 1: White oak, post oak group, hickory, cedar.
Group 2: Northern red oak, elm, sugar maple, pine.
Group 3: Black oak, scarlet oak, other red oaks, walnut, ash.
Group 4: Cottonwood, sycamore, soft maples, other hardwoods.

1/ From compound interest tables using rates for 10-year volume growth. Based on sample trees from randomly located plots throughout the state. Source: Central States Forest Experiment Station, Columbus, Ohio.

TABLE 17 -- PERCENTAGE OF MERCHANTABLE VOLUME OF SAMPLE TREES BY LOG GRADE, 1951

Species groups	Basis, number of trees	Total	Log grade 1/		
			1	2	3
			Percent		
White oak	57	40.4	8.1	20.5	71.4
Post oak group	15	19.6			100.0
Black and red oaks	17	25.4	11.2	10.8	78.0
Hickory	6	6.3		14.5	85.5
Other hardwoods	21	8.3	35.8	12.3	51.9
All species	116	100.0	9.1	13.0	77.9

1/ Hardwood log grades for standard lumber, Forest Products Laboratory, Forest Service, U. S. Department of Agriculture.

TABLE 18 -- HEATING VALUE OF VARIOUS SPECIES OF WOOD USED FOR FUEL

Species	Available heat per cord-(million B.t.u.) 1/	Comparative heating value 2/
Black oak	21.2	82
Northern red oak	21.2	82
Post oak	25.8	100
Scarlet oak	25.8	100
White oak	25.8	100
Hickory (several spp.)	24.1	93
Ash	20.4	79
Elm	17.2	67
Cottonwood	13.5	52
Sugar maple	21.6	84
Soft maples	17.6	68
Sycamore	17.2	67
Black walnut	19.2	74

1/ Calorific value, less losses due to moisture at 20 percent of dry weight, water vapor formed, and heat carried away in chimney gas; British thermal units. Based on specific gravities reported by Markwardt (1930) and heating value of woods, Forest Products Laboratory (1942).
2/ White oak equals 100, as the standard for comparison.

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