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FOREST RESOURCES  
OF THE  
NORTHWESTERN OZARK REGION  
IN  
MISSOURI

 **CENTRAL STATES**  
**FOREST EXPERIMENT STATION**  
*Columbus 13, Ohio*  
Harold L. Mitchell, Director

FOREST RESOURCES  
OF THE  
NORTHWESTERN OZARK REGION  
IN  
MISSOURI  
BY  
THE FOREST SURVEY ORGANIZATION  
at the  
Central States Forest Experiment Station

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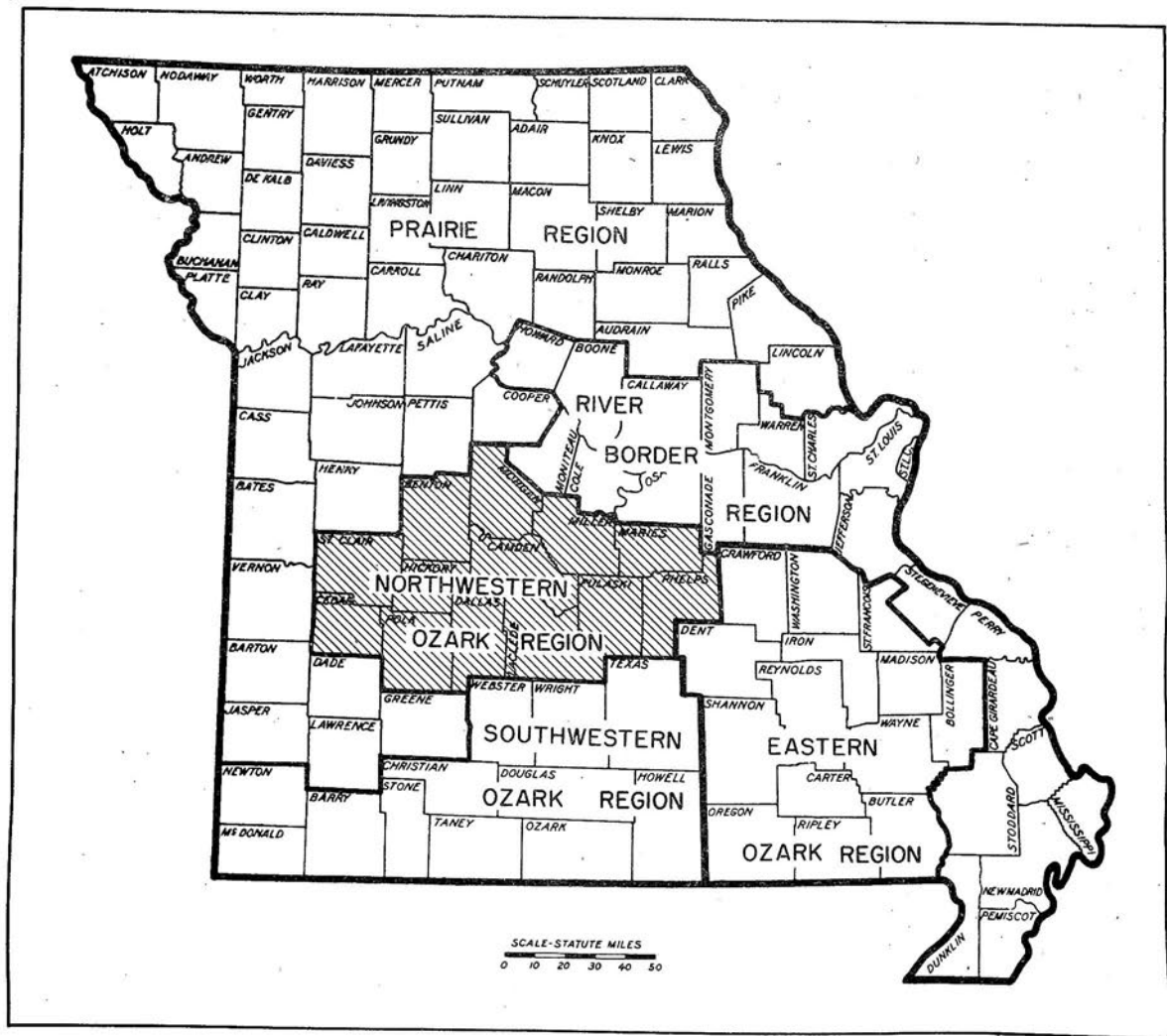
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## FOREWORD

The Forest Survey is a Nation-wide activity of the Forest Service. The fivefold purpose of the Forest Survey is (1) to make a field inventory of the present supply of standing timber; (2) to ascertain the rate at which this supply is being increased through growth; (3) to determine the rate at which it is being diminished through industrial and domestic uses, windfall, fire, disease, and other causes; (4) to determine the present consumption and the probable future trend in requirements for forest products; and (5) to interpret and correlate these findings with existing and anticipated economic conditions, as an aid in the formulation of both private and public policies for use of land suitable for forest production.

The Forest Survey is conducted in the various forest regions by the forest experiment stations of the Forest Service. In Missouri, the project is directed by the Central States Forest Experiment Station with headquarters in Columbus, Ohio. For Survey purposes, the State has been divided into five principal regions based on character of forest, topography, and other factors that influence tree growth.

This Survey Release presents the more significant statistics on forest area and timber volume in 13 counties in the Northwestern Ozark region of Missouri. Similar reports have been published for the Eastern Ozark and the Southwestern Ozark regions and releases for the other subdivisions of the State will be issued as soon as statistical tabulations have been completed. Later, an analytical report for the entire State will be prepared, which will interpret forest area, timber volume, growth, and drain statistics in the light of existing and anticipated economic conditions. This interpretation will focus attention on the principal forest problems and will suggest possible solutions.



LOCATION OF NORTHWESTERN OZARK REGION IN MISSOURI



SIGNIFICANT FACTS CONCERNING THE FOREST RESOURCES OF THE NORTH-  
WESTERN OZARK REGION

The Northwestern Ozark region (see map on opposite page) is almost entirely in the drainage of the Osage and Gasconade Rivers. In the eastern and central portions, short, steep hills are common. In the west and southwest the hilly country gradually gives way to rolling prairies. The rough portion of the region is heavily forested. In the west and southwest the proportion of forest land is considerably less. The total land area of the region is 5.0 million acres of which 2.6 million acres or 51 percent is forested.

Ninety-four percent of the commercial forest area is in private ownership. The Mark Twain National Forest and Fort Leonard Wood account for nearly all of the remainder.

The forests of the region are predominantly composed of the various species of oak and hickory. Seventy-nine percent of the commercial forest area supports forests of the oak-hickory type. The white oak type is found on an additional 9 percent of the forest area.

Saw-timber stands (see Explanation of Terms Used on page 15) occupy only 7 percent of the commercial forest area. Pole-timber stands make up 45 percent, seedling and sapling 35 percent, and poorly stocked 13 percent. These proportions are similar to those for the Southwestern Ozark region given in Forest Survey Release No. 2. The low proportion of saw-timber stands in both regions is attributed to: (1) repeated cuttings for ties, sawlogs, and farm timbers; (2) the prevalence of poor timber sites; (3) woodland grazing, and (4) frequent fires.

The total volume of saw timber is 1.4 billion board feet. The various oak species account for 80 percent, about equally divided between the white oak and red oak groups. Approximately one-third of the board-foot volume is in saw-timber stands. The remaining two-thirds occurs in scattered trees of sawlog size in pole-timber, seedling and sapling, and poorly stocked stands. Fifty-seven percent of the saw-timber volume is in trees in the 12-14-inch diameter class.

The cubic volume of pole-size trees and the sawlog portion of saw-timber trees is 551 million cubic feet. Fifty-eight percent of this cubic volume is in trees less than 11.0 inches in diameter.

The average saw-timber volume per forest acre is 527 board feet in contrast with 635 for the Southwestern Ozark region and 691 for the Eastern Ozark region. The average cubic-foot volume per acre is 214 cubic feet. This compares with 227 for the Southwestern Ozark region and 286 for the Eastern Ozark region.

The total cubic-foot volume of all material including tops and limbs of hardwoods, cull trees, and trees of non-commercial species is 1.2 billion cubic feet.

Table 1.--Forest and nonforest area by county, 1947

| County       | Total<br>land area <sup>1/</sup> | Forest area               |                      | Nonforest area            |                      |
|--------------|----------------------------------|---------------------------|----------------------|---------------------------|----------------------|
|              | <u>Thousand<br/>acres</u>        | <u>Thousand<br/>acres</u> | <u>Per-<br/>cent</u> | <u>Thousand<br/>acres</u> | <u>Per-<br/>cent</u> |
| Benton       | 475                              | 228                       | 48                   | 247                       | 52                   |
| Camden       | 419                              | 315                       | 75                   | 104                       | 25                   |
| Cedar        | 317                              | 91                        | 29                   | 226                       | 71                   |
| Dallas       | 344                              | 155                       | 45                   | 189                       | 55                   |
| Hickory      | 262                              | 149                       | 57                   | 113                       | 43                   |
| Laclede      | 493                              | 277                       | 56                   | 216                       | 44                   |
| Maries       | 337                              | 189                       | 56                   | 148                       | 44                   |
| Miller       | 386                              | 217                       | 56                   | 169                       | 44                   |
| Morgan       | 381                              | 213                       | 56                   | 168                       | 44                   |
| Phelps       | 433                              | 274                       | 63                   | 159                       | 37                   |
| Polk         | 411                              | 111                       | 27                   | 300                       | 73                   |
| Pulaski      | 353                              | 215                       | 61                   | 138                       | 39                   |
| St. Clair    | 448                              | 169                       | 38                   | 279                       | 62                   |
| All counties | 5,059                            | 2,603                     | 51                   | 2,456                     | 49                   |

<sup>1/</sup> Source: Area of the United States 1940, U. S. Bureau of Census

Table 2.--Commercial forest area by ownership class, 1947

| Ownership class | Commercial forest area <sup>1/</sup> |                |
|-----------------|--------------------------------------|----------------|
|                 | <u>Thousand<br/>acres</u>            | <u>Percent</u> |
| Federal:        |                                      |                |
| National forest | 92                                   | 3.6            |
| Other           | 50                                   | 1.9            |
| Total           | 142                                  | 5.5            |
| State           | 4                                    | .1             |
| Private         | 2,433                                | 94.4           |
| All ownerships  | 2,579                                | 100.0          |

<sup>1/</sup> Does not include 24,000 acres of forest land classified as noncommercial.



Table 3.-- Commercial forest area by forest type and stand-  
size class, 1947

| Forest<br>type      | Total          |                      | Saw-<br>timber<br>area | Pole-<br>timber<br>area | Seedling<br>& sapling<br>area | Poorly<br>stocked<br>area |
|---------------------|----------------|----------------------|------------------------|-------------------------|-------------------------------|---------------------------|
|                     | <u>M acres</u> | <u>Per-<br/>cent</u> | <u>M acres</u>         | <u>M acres</u>          | <u>M acres</u>                | <u>M acres</u>            |
| Cedar-hdwd.         | 48             | 1.9                  | 0                      | 17                      | 24                            | 7                         |
| Oak-hickory         | 2,036          | 78.9                 | 101                    | 906                     | 793                           | 236                       |
| White oak           | 238            | 9.2                  | 36                     | 157                     | 32                            | 13                        |
| Mixed hdwd.         | 63             | 2.5                  | 9                      | 35                      | 0                             | 19                        |
| Bottomland<br>hdwd. | 109            | 4.2                  | 41                     | 46                      | 16                            | 6                         |
| Scrub hdwd.         | 85             | 3.3                  | 0                      | 0                       | 40                            | 45                        |
| All<br>types        | 2,579          |                      | 187                    | 1,161                   | 905                           | 326                       |
| Percent             |                | 100.0                | 7.2                    | 45.0                    | 35.1                          | 12.7                      |

Table 4.--Saw-timber volume on commercial forest area by  
species and stand-size class, 1947

| Species          | Total              | Saw-timber area | Pole-timber area   | Seedling & sapling area | Poorly stocked area |
|------------------|--------------------|-----------------|--------------------|-------------------------|---------------------|
|                  | Million<br>bd. ft. | Percent         | Million<br>bd. ft. | Million<br>bd. ft.      | Million<br>bd. ft.  |
| Redcedar         | 1                  | .1              | 0                  | 1                       | 0                   |
| White oak        | 305                | 22.5            | 139                | 90                      | 57                  |
| Post oak group   | 257                | 18.9            | 19                 | 89                      | 108                 |
| Black oak        | 384                | 28.3            | 115                | 133                     | 107                 |
| Scarlet oak      | 31                 | 2.3             | 1                  | 5                       | 6                   |
| Northern red oak | 67                 | 4.9             | 13                 | 27                      | 3                   |
| Other red oaks   | 35                 | 2.6             | 16                 | 8                       | 0                   |
| Hickory          | 72                 | 5.3             | 16                 | 32                      | 14                  |
| Elm              | 53                 | 3.9             | 30                 | 15                      | 6                   |
| Sycamore         | 71                 | 5.2             | 69                 | 2                       | 0                   |
| Ash              | 13                 | 1.0             |                    |                         |                     |
| Black walnut     | 29                 | 2.1             | 36                 | 26                      | 7                   |
| Other hardwoods  | 40                 | 2.9             |                    |                         |                     |
| All species      | 1,358              |                 | 454                | 428                     | 308                 |
| Percent          |                    | 100.0           | 33.4               | 31.5                    | 22.7                |
|                  |                    |                 |                    |                         | 12.4                |

Table 5.--Saw-timber volume on commercial forest area by species and tree-diameter class, 1947

| Species          | Total              | Tree-diameter class |                    |                    |                    |
|------------------|--------------------|---------------------|--------------------|--------------------|--------------------|
|                  |                    | 10 1/2 inches       | 12-14 inches       | 16-18 inches       | 20 inches & larger |
|                  | Million<br>bd. ft. | Million<br>bd. ft.  | Million<br>bd. ft. | Million<br>bd. ft. | Million<br>bd. ft. |
| Redcedar         | 1                  | 1                   | 0                  | 0                  | 0                  |
| White oak        | 305                | --                  | 209                | 77                 | 19                 |
| Post oak group   | 257                | --                  | 151                | 83                 | 23                 |
| Black oak        | 384                | --                  | 222                | 102                | 60                 |
| Scarlet oak      | 31                 | --                  | 17                 | 1                  | 13                 |
| Northern red oak | 67                 | --                  | 24                 | 23                 | 20                 |
| Other red oaks   | 35                 | --                  | 5                  | 6                  | 24                 |
| Hickory          | 72                 | --                  | 57                 | 6                  | 9                  |
| Elm              | 53                 | --                  | 21                 | 16                 | 16                 |
| Sycamore         | 71                 | --                  | 5                  | 9                  | 57                 |
| Other hardwoods  | 82                 | --                  | 58                 | 14                 | 10                 |
| All species      | 1,358              | 1                   | 769                | 337                | 251                |
| Percent          | 100.0              | .1                  | 56.6               | 24.8               | 18.5               |

1/ Ten-inch diameter class shown separately because in this class saw-timber volume includes softwood trees but not hardwoods.

Table 6.--Cubic-foot volume on commercial forest area by species and stand-size class, 1947

| Species          | Total           |         | Saw-timber area | Pole-timber area | Seedling & sapling area | Poorly stocked area |
|------------------|-----------------|---------|-----------------|------------------|-------------------------|---------------------|
|                  | Million cu. ft. | Percent | Million cu. ft. | Million cu. ft.  | Million cu. ft.         | Million cu. ft.     |
| Redcedar         | 1.9             | .3      | .2              | 1.5              | .2                      | .0                  |
| White oak        | 129.0           | 23.4    | 29.8            | 76.1             | 18.4                    | 4.7                 |
| Post oak group   | 142.1           | 25.8    | 7.0             | 88.4             | 38.3                    | 8.4                 |
| Black oak        | 135.7           | 24.6    | 23.1            | 82.0             | 24.5                    | 6.1                 |
| Scarlet oak      | 9.3             | 1.7     | .2              | 4.6              | 1.4                     | 3.1                 |
| Northern red oak | 22.9            | 4.2     | 3.0             | 13.9             | 2.0                     | 4.0                 |
| Other red oaks   | 8.7             | 1.6     | 2.9             | 3.9              | .0                      | 1.9                 |
| Hickory          | 30.0            | 5.5     | 6.2             | 15.7             | 6.1                     | 2.0                 |
| Elm              | 20.4            | 3.7     | 8.9             | 9.0              | 1.9                     | .6                  |
| Sycamore         | 14.7            | 2.7     | 12.1            | 2.2              | .4                      | .0                  |
| Ash              | 4.5             | .8      | 8.7             | 18.7             | 4.8                     | 3.9                 |
| Black walnut     | 14.9            | 2.7     |                 |                  |                         |                     |
| Other hwdws.     | 16.7            | 3.0     |                 |                  |                         |                     |
| All species      | 550.8           |         | 102.1           | 316.0            | 98.0                    | 34.7                |
| Percent          |                 | 100.0   | 18.5            | 57.4             | 17.8                    | 6.3                 |

Table 7.--Cubic-foot volume on commercial forest area  
by stand-size class and tree-diameter class, 1947

| Stand-size class   | Total           | Tree-diameter class |                 |                 |                 |                      |
|--------------------|-----------------|---------------------|-----------------|-----------------|-----------------|----------------------|
|                    |                 | 6-8 inches          | 10 1/2 inches   | 12-14 inches    | 16-18 inches    | 20 inches and larger |
|                    | Million cu. ft. | Million cu. ft.     | Million cu. ft. | Million cu. ft. | Million cu. ft. | Million cu. ft.      |
| Saw timber         | 102.1           | 12.7                | 13.2            | 33.2            | 18.6            | 24.4                 |
| Pole timber        | 316.0           | 151.8               | 89.7            | 53.2            | 13.4            | 7.9                  |
| Seedling & sapling | 98.0            | 23.1                | 19.4            | 35.0            | 14.6            | 5.9                  |
| Poorly stocked     | 34.7            | 5.3                 | 2.3             | 12.4            | 9.3             | 5.4                  |
| All classes        | 550.8           | 192.9               | 124.6           | 133.8           | 55.9            | 43.6                 |
| Percent            | 100.0           | 35.0                | 22.6            | 24.3            | 10.2            | 7.9                  |

1/ Ten-inch diameter class shown separately because saw-timber volume includes softwood trees in this class, but not hardwoods.



Table 8.--Average volume per acre by stand-size class, 1947

| Stand-size class   | Average volume per acre |                   |
|--------------------|-------------------------|-------------------|
|                    | <u>Board feet</u>       | <u>Cubic feet</u> |
| Saw timber         | 2,428                   | 546               |
| Pole timber        | 369                     | 272               |
| Seedling & sapling | 340                     | 108               |
| Poorly stocked     | 515                     | 106               |
| All classes        | 527                     | 214               |

Table 9.--Total cubic-foot volume of sound wood on commercial forest area by species and class of material, 1947

| Species                  | Total           | Saw-timber trees |                 |                 | Pole-timber trees | Cull trees      |
|--------------------------|-----------------|------------------|-----------------|-----------------|-------------------|-----------------|
|                          |                 | Total            | Sawlog portion  | Tops & limbs 1/ |                   |                 |
|                          | Million cu. ft. | Million cu. ft.  | Million cu. ft. | Million cu. ft. | Million cu. ft.   | Million cu. ft. |
| Redcedar                 | 2.4             | .2               | .2              | 2/              | 1.7               | .5              |
| White oak                | 224.8           | 85.7             | 49.3            | 36.4            | 79.7              | 59.4            |
| Post oak group           | 317.7           | 91.7             | 51.7            | 40.0            | 90.4              | 135.6           |
| Black oak                | 278.0           | 113.1            | 63.8            | 49.3            | 71.9              | 93.0            |
| Scarlet oak              | 17.9            | 8.9              | 5.0             | 3.9             | 4.3               | 4.7             |
| Northern red oak         | 44.0            | 18.9             | 10.9            | 8.0             | 12.0              | 13.1            |
| Other red oaks           | 18.0            | 10.7             | 6.0             | 4.7             | 2.7               | 4.6             |
| Hickory                  | 62.5            | 21.0             | 11.9            | 9.1             | 18.1              | 23.4            |
| Elm                      | 45.8            | 15.7             | 8.8             | 6.9             | 11.6              | 18.5            |
| Sycamore                 | 28.5            | 22.1             | 12.5            | 9.6             | 2.2               | 4.2             |
| Other hwdws.             | 78.1            | 23.8             | 13.4            | 10.4            | 22.7              | 31.6            |
| Noncommercial species 1/ | 86.1            | --               | --              | --              | --                | 86.1            |
| All species              | 1,203.8         | 411.8            | 233.5           | 178.3           | 317.3             | 474.7           |
| Percent                  | 100.0           | 34.2             | 19.4            | 14.8            | 26.4              | 39.4            |

1/ Not included in the cubic-foot volumes shown in Tables 6 and 7.

2/ Less than .05 million cubic feet.



## EXPLANATION OF TERMS USED

Forest land - Land bearing forest growth or land from which the forest has been removed but which shows evidence of past forest occupancy and which is not now in other use. To qualify as forest, an area must: (1) be at least 100 feet wide; (2) be at least one acre in area; (3) have a sufficient number of trees to provide 10 percent crown coverage, or (4) lacking 10 percent crown coverage, be likely to remain in forest use.

Commercial forest land - Forest land bearing or capable of bearing timber of commercial character and economically available now or prospectively for commercial use and not withdrawn from such use.

Noncommercial forest land - Forest land not qualifying as commercial forest land. Two classes of forest area are included: (1) commercially valuable forest land withdrawn from timber use for such purposes as parks, game refuges, military reservations, or reservoir protection; and (2) forest land which because of poor growing conditions will not produce trees of commercial quality.

### Forest types

Cedar-hardwoods - Stands in which redcedar comprises at least 20 percent of the dominant and codominant trees.

Oak-hickory - Stands of hardwoods in which oaks and hickories comprise at least 60 percent of the dominant and codominant trees.

White oak - Stands in which white oak (*Quercus alba*) comprises at least 60 percent of the dominant and codominant trees.

Mixed hardwoods - Stands of mixed hardwood species not qualifying for other hardwood types. Principal species include elm, maple, basswood, and black walnut in mixture with oaks and hickories.

Bottomland hardwoods - Stands on the alluvial bottoms of rivers and streams. The principal species include sycamore, willow, elm, blackgum, sweetgum, soft maple, oaks, hickory, cottonwood, and cypress.

Scrub hardwoods - Stands in which scrub oak or other noncommercial tree species comprise 60 percent of the dominant and codominant trees.

## Tree classes

Sound saw-timber tree - A coniferous tree at least 9.0 inches d.b.h. (diameter outside bark at 4.5 feet above ground), or a hardwood tree at least 11.0 inches d.b.h., with a sound butt log at least 8 feet long, or with at least half of the gross volume of the tree in sound material.

Sound pole-timber tree - A tree at least 5.0 inches d.b.h. but less than saw-timber size, which now is or gives promise of becoming a sound merchantable tree.

Cull tree - A tree that does not qualify as a sound pole-timber or saw-timber tree because of poor form, limbiness, rot, or other defect.

## Volume estimates

Board-foot volume - Includes the volume of that portion of saw-timber trees merchantable for sawlogs. Volume deductions have been made for rot, crook, and other defects. Board-foot volumes are shown in the International 1/4 inch log rule, which approximates green lumber tally.

Cubic-foot volume - Except where specifically noted, includes the volume of sound wood inside bark in: (1) the saw-timber portion of sound trees, (2) the upper stems of saw-timber-size conifers to a minimum diameter of 4 inches inside bark, and (3) the sound pole-timber trees to the same minimum top diameter.

## Stand-size class

Saw timber - Stands having a minimum net volume of 1500 board feet per acre.

Pole timber - Stands having a net volume of less than 1500 board feet per acre but which are at least 10 percent stocked with pole-size and larger trees. At least one-half the minimum stocking must be in pole-size trees.

Seedlings and saplings - Stands not qualifying either for saw timber or pole timber but having at least 300 seedlings and saplings of commercial species per acre.

Poorly stocked - Commercial forest land not qualifying for any other class, including denuded areas.

Species listed

Redcedar - Eastern redcedar - Juniperus virginiana

White oak - Quercus alba

Post oak group includes:

Post oak - Quercus stellata

Swamp white oak - Quercus bicolor

Swamp chestnut oak - Quercus prinus

Overcup oak - Quercus lyrata

Bur oak - Quercus macrocarpa

Chinquapin oak - Quercus muehlenbergii

Post oak is the principal species.

Black oak - Quercus velutina

Scarlet oak - Quercus coccinea

Northern red oak - Quercus borealis

Other red oaks include:

Southern red oak - Quercus falcata

Pin oak - Quercus palustris

Willow oak - Quercus phellos

Water oak - Quercus nigra

Shingle oak - Quercus imbricaria

Hickory - includes all species of hickory (Carya)

Elm - includes all species of elm (Ulmus)

Sycamore - Platanus occidentalis

Ash - includes all species of ash (Fraxinus)

Black walnut - Juglans nigra

Other hardwoods - includes all other commercial hardwood species.

Noncommercial species - includes species which do not normally have commercial value such as blackjack oak, sassafras, blue beech, ironwood, alder, redbud and service berry.



## FOREST SURVEY PROCEDURE

The inventory of the forest resources of the Northwestern Ozark region was made in April and May 1947. A sampling procedure was used involving an office study of aerial photographs and a field examination of randomly selected forest and nonforest plots.

The proportion of forest land by counties was obtained by placing over each photograph a transparent template with four uniformly spaced dots and counting the number of dots falling on forest and on nonforest areas. The percentage of forest dots in a county applied to the total land area gave a preliminary estimate of the forest acreage.

The location of alternate dots falling on forest land was marked on the photograph. The acre surrounding each marked dot was examined under stereoscope and classified by stand-size class on the basis of the height, crown width, and density of trees on the plot.

Plots for field examination were selected from those photo classified as follows:

|                            |         |
|----------------------------|---------|
| Saw timber - - - - -       | 1 in 5  |
| Pole timber- - - - -       | 1 in 10 |
| Seedling and sapling - - - | 1 in 20 |
| Poorly stocked - - - - -   | 1 in 10 |

In addition, every 50th nonforest plot was selected for field examination to measure the movement of nonforest land to forest.

The locations of the selected plots were marked on the photographs which were then sent to the field. Crews of two men each located these points on the ground and at each established a  $1/5$  acre plot on which they recorded the species, size, condition, and growth rate of trees, and the forest type and site quality of plots. A field check of the photo interpreter's stand-size-class determination was also made. The field examination also provided a basis for adjusting the preliminary estimate of forest and nonforest area.

A total of 17,476 dots were counted on the photos for forest area determination. Stereoscopic examinations were made on 4,605 forest plots to determine stand-size class, and 575 plots were examined on the ground. These photo and field examinations provided the basic data for computation of forest area and timber volume statistics for the region.

### ACCURACY OF DATA

Forest area - Statistical analysis of the forest area data for the Northwestern Ozark region shows a sampling error of  $\pm 1.4$  percent of the total forest area or  $\pm 36,000$  acres, at a level of one standard deviation. The error of estimate increases with each subdivision of the total forest area so that small tabular acreages may have large errors and therefore indicate only relative magnitudes. The sampling error of the forest area estimate of individual counties is within  $\pm 10$  percent.

Timber volume - The sampling error of the total board-foot volume in the region is  $\pm 6.8$  percent or  $\pm 92$  million board feet. This does not include the errors of volume tables, cull factors, or other phases of the inventory work for which satisfactory methods of measuring accuracy have not been developed. All phases of field work and computations were closely supervised to keep these errors at a minimum. Again the error of estimate increases with each subdivision of the total volume so that small volumes indicate only relative magnitudes.



TERRITORY SERVED  
BY THE  
CENTRAL STATES FOREST EXPERIMENT STATION  
FOREST SERVICE  
UNITED STATES DEPARTMENT OF AGRICULTURE