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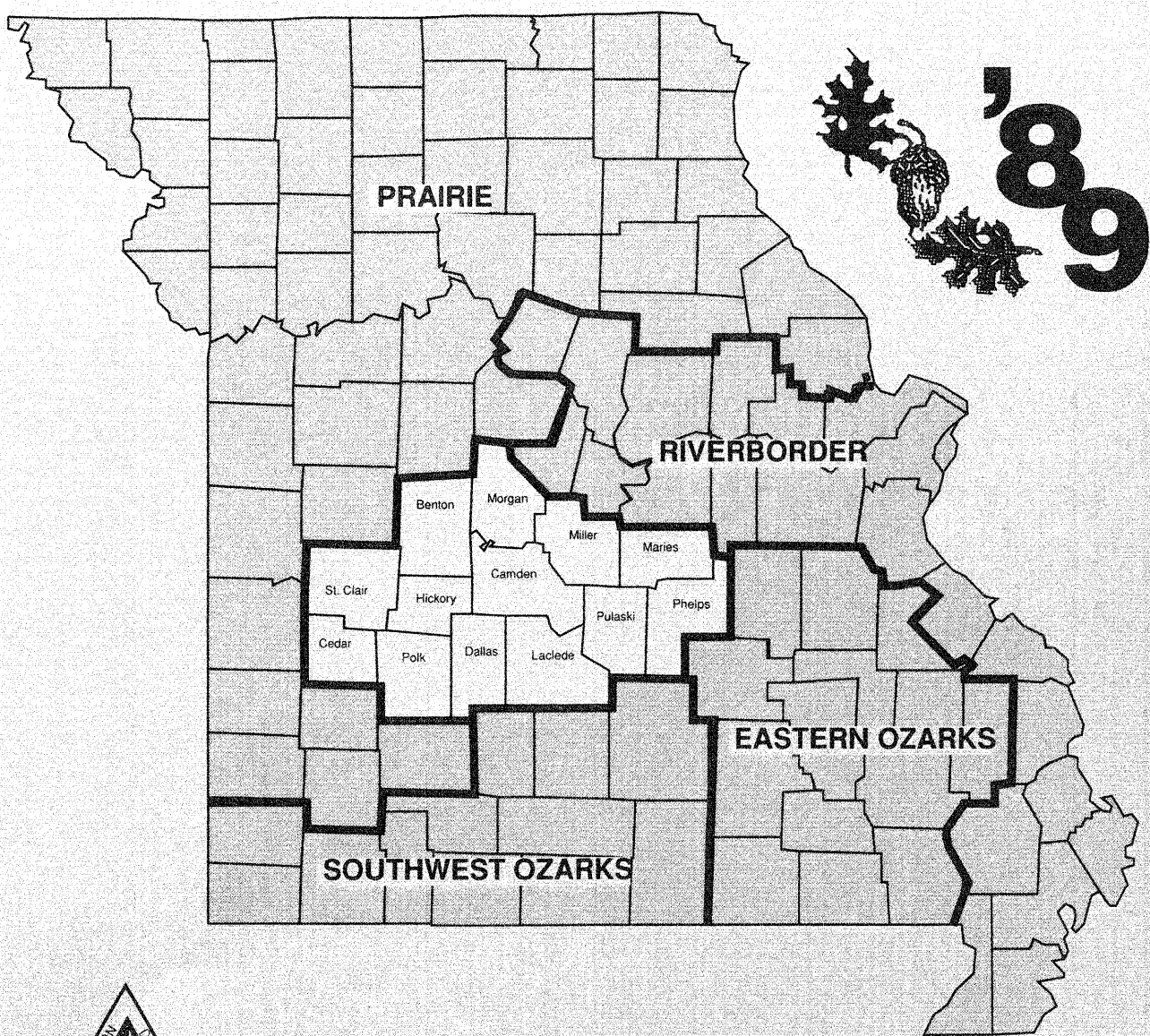
North Central Forest Experiment Station

Resource Bulletin NC-114

Timber Resource of Missouri's Northwest Ozarks

W. Brad Smith



CONSERVATION DEPARTMENT MISSOURI

North Central Forest Experiment Station
Forest Service—U.S. Department of Agriculture
1992 Folwell Avenue
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This report includes the most commonly used Forest Inventory and Analysis statistics. However, additional forest resource data can be provided to interested users. Persons requesting additional information that can be provided from the raw inventory data are expected to pay the retrieval costs. These costs range from less than $100 for a relatively simple request to $2,000 for a complex retrieval involving the services of a Forest Inventory and Analysis computer programmer. Requests will be filled so as to minimize the impact on the Forest Inventory and Analysis Work Unit.

Requests for unpublished information may be directed to:

Project Leader
Forest Inventory and Analysis
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1992 Folwell Avenue
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Phone: (612) 649-5140

Area served: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin

Requests for unpublished information from the Missouri inventory may also be directed to:

State Forester
Missouri Department of Conservation
Forestry Division
P.O. Box 180
Jefferson City, Missouri 65102
Phone: (314) 751-4115

FOREWORD

Forest Inventory and Analysis (FIA) is a continuing endeavor as mandated by the Renewable Forest and Rangeland Resources Planning Act of 1974. Prior inventories were mandated by the McSweeney-McNary Forest Research Act of 1928. The objective of FIA is to periodically inventory the Nation's forest land to determine its extent, condition, and volume of timber, growth, and removals. Up-to-date resource information is essential to frame forest policies and programs. USDA Forest Service regional experiment stations are responsible for conducting these inventories and publishing summary reports for individual States. The North Central Forest Experiment Station is responsible for forest resource evaluation in Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin.

Fieldwork for the Missouri Statewide forest inventory was begun in January 1987 and completed in June 1989. Reports on the three previous inventories of Missouri's timber resource are dated 1947, 1959, and 1972.

More accurate survey information was obtained during the 1989 survey than otherwise would have been feasible because of intensified field sampling. Such sampling was made possible by additional funding provided by the Missouri Department of Conservation. The Department also surveyed primary wood-using plants in the State. Data from this survey were used to help estimate the quantity of timber products harvested in the State. Missouri Department of Conservation personnel have also assisted in training field personnel, analyzing information obtained from the survey, and preparing this report.

Aerial photos used in the Missouri Forest Inventory were furnished by the USDA Agricultural Stabilization and Conservation Service and the Missouri Department of Natural Resources Geology and Land Survey.

CONTENTS

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HIGHLIGHTS

NOTE: *Data from new forest inventories are often compared with data from earlier inventories to determine trends in forest resources. However, for the comparisons to be valid, the procedures used in the two inventories must be similar. As a result of our ongoing efforts to improve the efficiency and reliability of the inventory, several changes in procedures and definitions have occurred since 1972. Because some of these changes will make it inappropriate to directly compare the 1989 data with those published for 1972, data from the 1972 inventory will be reprocessed using the 1989 procedures and will be published in part in the State statistical report. Please refer to the Appendix section labeled "Comparing Missouri's fourth inventory with the third inventory" for more details.*

General

The Northwest Ozarks survey unit comprises a 13-county area in south-central Missouri (see cover). Short, steep slopes, common in the eastern reaches, give way to lesser hills and rolling prairie as one moves west and southwest. Much of the land is hard and stony with hardpans underlying most of the flat ridges. Most of the land not suited for crop farming is forested. Dam construction by the Army Corp of Engineers in the 1960's and 1970's created Lake of the Ozarks, Truman Lake, Stockton Lake, and Pomme de Terre Lake with a combined surface area of more than 145,000 acres. Although these projects inundated many lowland forests, the current shores are lined with rugged hills, scenic bluffs, and hardwood forests that highlight the region's natural beauty.

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Forest Area

The counties in the north and east of the Northwest Ozarks Unit (Camden, Maries, Miller, Morgan, Phelps, and Pulaski) remain the most heavily forested (fig. 1). Even though these counties comprise only 46 percent of the Unit's total area, they garner 56 percent of the forest cover.

The 2.2 million acres of timberland reported in 1989 is nearly 13 percent more than the 1.9 million acres reported in 1972. Gains of 30 thousand acres or more occurred in Phelps, Pulaski, and St. Clair Counties.

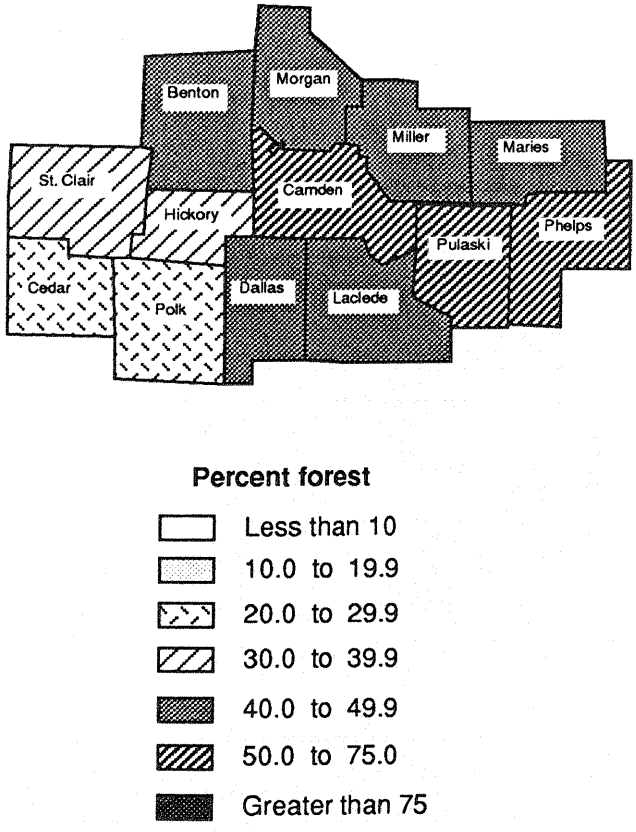

Figure 1.—*Forest land as a percent of land area by county, Northwest Ozarks, 1989.*

Reserved forest land declined nearly 50 thousand acres between surveys. The reason for this decline was the re-classification of land surrounding Lake of the Ozarks (Camden, Miller, and Morgan Counties), Truman reservoir (Benton, St. Clair, and Hickory Counties), Stockton Lake (Cedar and Polk Counties), and Pomme de Terre Lake (Hickory and Polk counties) administered by the U.S. Army Corps of Engineers. Because Management plans for these areas include timber removals, this land has been re-classified as timberland. Forested areas that are designated as public use recreation areas where tree removals are only for recreational facility improvement or safety remain classified as reserved forest land. This classification is not imposed by the Corp of Engineers, which rarely precludes commmercial timber management from any forested area. However, we classified all designated recreation areas as reserved to maintain consistency with other public recreation areas such as State, county, and municipal parks where commercial timber harvesting is restricted.

Eighty-eight percent of the timberland area is held by non-industrial private owners. These are private owners who do not operate wood processing plants (fig. 2).

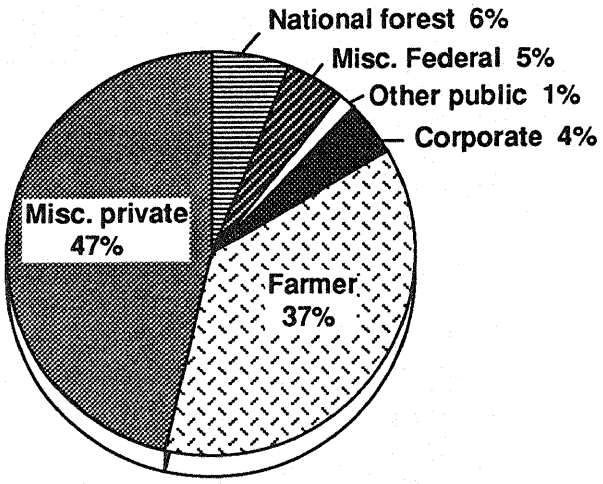

Figure 2.—*Area of timberland by owner class, Northwest Ozarks, 1989.*

The black-scarlet oak forest type (812 thousand acres) and the post-blackjack oak type (697 thousand acres) still dominate the Unit's timberland base. Steady gains by the white oak type (currently 374 thousand acres) and the maple-beech type (78 thousand acres), however, are indicative of the continuing succession of the second-growth oak forests.

Volume

Volume of growing stock totaled 1.15 billion cubic feet in 1989 or 531 cubic feet per acre.

Oak species account for 76 percent (879 million cubic feet) of the growing-stock volume in the Unit (fig. 3).

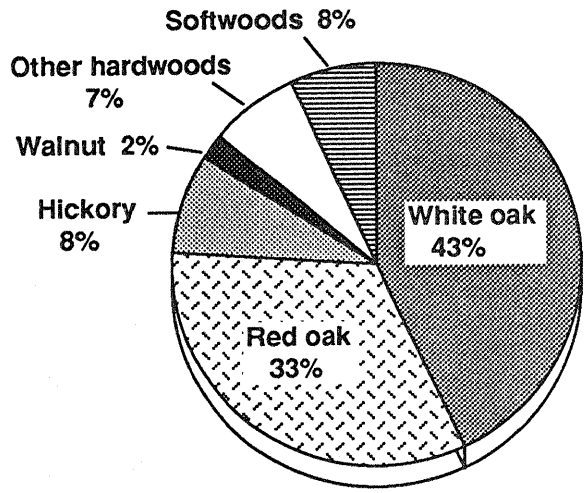

Figure 3.—*Volume of growing stock by major species group, Northwest Ozarks, 1989.*

Because many trees in Missouri are short or have poor form, volumes per acre are quite low. Thirty-seven percent of the live tree volume is in short-log and rough trees (146 million and 623 million cubic feet, respectively). If all short-log and rough trees were included, volume per acre in the Northwest Ozarks would jump from 531 cubic feet per acre for growing stock to 886 cubic feet per acre (fig. 4).

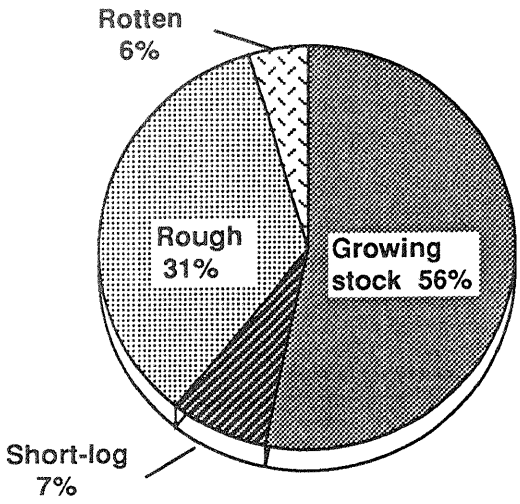

Figure 4.—*Distribution of all live volume of hardwood species by tree class, Northwest Ozarks, 1989.*

Sawtimber volume totaled 2.91 billion board feet in 1989 or 1,340 board feet per acre.

Fifty-six percent (1.6 billion board feet) of hardwood sawtimber volume is in trees 11 to 15 inches d.b.h., 30 percent (1.0 billion board feet) is in trees 15 to 21 inches d.b.h., and 7 percent (0.2 billion board feet) is in trees more than 21 inches d.b.h. (fig. 5).

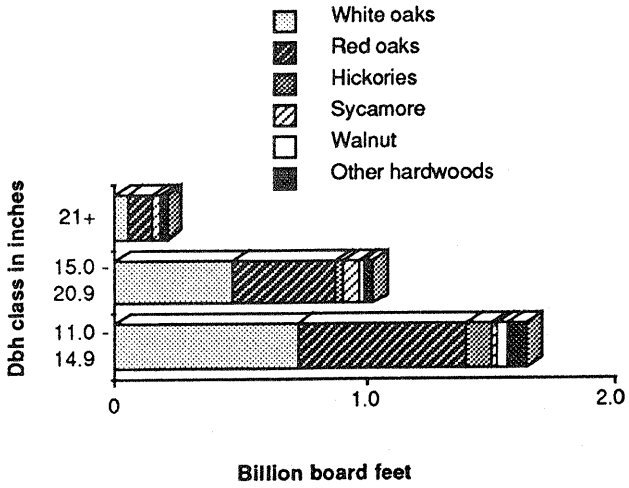

Figure 5.—*Hardwood sawtimber volume by species group and diameter class, Northwest Ozarks, 1989.*

Species of white oaks contain the most sawtimber with just over 1.2 billion board feet; red oak species are second with just under 1.2 billion board feet.

Stand Conditions and Timber Use

Stocking of growing-stock trees is 18 percent better on National Forest land (87 percent stocked) than on private land (69 percent stocked). A stand with minimal full stocking is said to be 100 percent stocked (see definitions).

Sixty-two percent of the timberland in the Unit is not capable of growing 50 cubic feet or more of wood per acre per year. Net annual growth of growing stock totaled 29.9 million cubic feet in 1988 or 13.8 cubic feet per acre. Sawtimber growth totaled 80.7 million board feet in 1988.

Growing-stock mortality averaged 8.5 million cubic feet per year between surveys or 0.7 percent of inventory. Nearly half of all mortality occurred in the red oak group (fig. 6). The recent decline in scarlet oak has been a significant factor.

The 9.0 million cubic feet of average annual removals of growing stock are only 30 percent of net annual growth (29.9 million cubic feet) in the Unit.

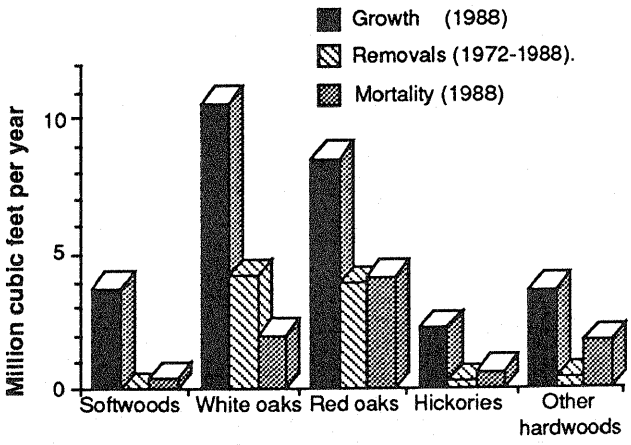

Figure 6.—*Annual growth, removals, and mortality of growing stock on timberland by major species group, Northwest Ozarks.*

APPENDIX

ACCURACY OF THE SURVEY

Forest Inventory and Analysis information is based on a sampling procedure designed to provide reliable statistics at the State and Survey Unit levels. Consequently, the reported figures are estimates only. A measure of reliability of these figures is given by sampling errors. These sampling errors mean that the chances are two out of three that if a 100-percent inventory had been taken, using the same methods, the results would have been within the limits indicated.

For example, the estimated growing-stock volume in the Unit in 1989, 1,152.6 million cubic feet, has a sampling error of ±2.6 percent (±30.0 million cubic feet). The growing-stock volume from a 100-percent inventory would be expected to fall between 1,122.6 and 1,182.6 million cubic feet (1,152.6 ± 30.0), there being a one in three chance that this is not the case.

The following tabulation shows the sampling errors for the 1989 Northwest Ozarks Forest Inventory:

Item	Unit totals	Sampling error
Growing stock	(Million cubic feet)	(Percent)
Volume (1989)	1,152.6	2.6
Growth (1988)	29.9	3.8
Average annual removals (1972-1988)	9.0	14.7
Sawtimber	(Million board feet)	
Volume (1989)	2,906.2	3.7
Growth (1988)	80.7	5.6
Average annual removals (1972-1988)	23.4	18.1
Timberland	(Thousand acres)	
Area (1989)	2,169.6	1.5

As survey data are broken down into sections smaller than Survey Unit totals, the sampling error increases. For example, the sampling error for timberland area in a particular county is higher than that for total timberland area in the Unit. For data smaller than Unit totals, use the following formula to compute error estimates:

$$E = \frac{(SE)\ \sqrt{\text{(Unit total area or volume)}}}{\sqrt{\text{(Volume or area smaller than Unit total)}}}$$

where:

E = sampling error in percent
SE = Unit total error for area or volume

For example, to compute the error on the area of timberland in the black-scarlet oak type in the Unit, proceed as follows:

The total area of black-scarlet oak type in the Unit from table 3 = 812,000 acres

The total area of all timberland in the Unit from table 3 = 2,169,600

The Unit total error for timberland area from the preceding tabulation = 1.5 percent

Using the above formula:

$$\text{Error} = \frac{(1.5)\ \sqrt{2{,}169{,}600}}{\sqrt{812{,}000}}$$

$$= \pm 2.45 \text{ percent}$$

SURVEY PROCEDURES

The 1989 Missouri survey used a growth model-enhanced, two-phase sample design. This sampling scheme and associated estimators is similar to sampling with partial replacement (SPR), in that a set of randomly located plots is available for remeasurement and a random set of new plots is established and measured. A significant feature of the new Missouri design is stratification for disturbance on the old sample and

use of a growth model to improve regression estimates made on old undisturbed forest plots (fig. 7). The growth model used in the Missouri survey design was the Central States Stand and Tree Evaluation and Modeling System (STEMS).[1]

These were the major steps in the new survey design:

1. Aerial photography (Phase 1)

In this phase two sets of random points were located on current aerial photography: a set of new photo plots and a set of relocated old photo plots (ground plot locations from the previous inventory). Photos were 1:20,000 and 1:40,000 scale black and white panchromatic prints provided by the ASCS and the Missouri Department of Natural Resources Geology and Land Survey. The year of photography for each county in the Unit is shown below.

County	Date	County	Date
Benton	1979	Miller	1979
Camden	1981	Morgan	1979
Cedar	1979	Phelps	1981
Dallas	1982	Polk	1977
Hickory	1979	Pulaski	1981
Laclede	1981	St. Clair	1977
Maries	1979		

[1]*Shifley, S.F. 1987. A generalized system of models forecasting Central States tree growth. Res. Pap. NC-279. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 10 p.*

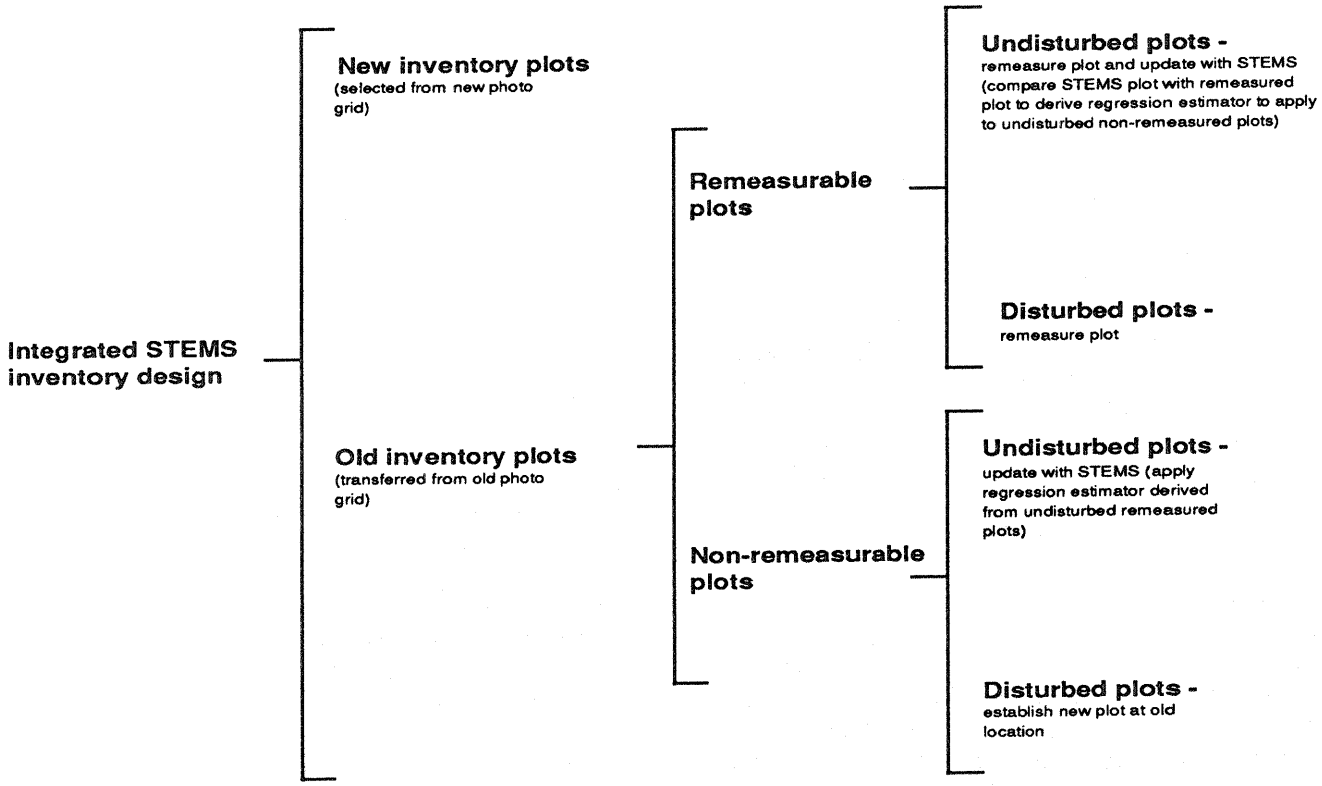

Figure 7.—*Overview of the Missouri sample design.*

The locations of the plots used in the 1972 inventory were transferred to these new photographs. The photographs were then assembled into township mosaics, and a systematic grid of 121 1-acre photo plots (each plot representing approximately 190.4 acres) was overlaid on each township mosaic. Each of these plots (both the new systematic grid points and the old sample plots) was examined by aerial photogrammetrists and classified stereoscopically by land use. If trees were present, forest type and stand size-density class were recorded. Then all the old sample locations and a sample of the new photo plots were sent to the field for the field crew to verify the photo classification and to take further measurements. In all, 27,511 photo plots (26,616 new and 895 old) were examined stereoscopically, as shown in the following tabulation.

Photo land class	Photo plots
Timberland	12,546
Reserved forest land	123
Questionable	380
Nonforest with trees	1,535
Nonforest without trees	12,301
Census water	626
All classes	27,511

2. Plot measurements (Phase 2)

On plots classified as timberland, wooded pasture, or windbreak (at least 120 feet wide), a ground plot was established, remeasured, or modelled. A ground plot consists of a 10-point cluster covering approximately 1 acre. At each point, trees 5.0 inches or more in d.b.h. were sampled on a 37.5 Basal Area Factor (BAF) variable-radius plot, and trees less than 5.0 inches d.b.h. were sampled on a 1/300-acre fixed-radius plot.

From the new photo plots, a random sample of ground plots was established, and measures of land use, volume, mortality and cutting were recorded. These locations were monumented for future remeasurement. The procedures for the old inventory photo plots (old plot locations) was somewhat different. Old plots were classed as remeasurable (monumented) or nonremeasurable (not monumented and thus difficult to relocate in the field). Within both of these groups, old plots can additionally be identified as undisturbed or disturbed. Ground plots corresponding to remeasurable old inventory photo plots that were classified as undisturbed forest land were remeasured to obtain current land use, volume, growth and removals information.

All undisturbed remeasurable forest plots were projected to the current time using STEMS, which yields projected estimates of current volume and growth. The comparison of the projected and observed values for these plots provided local calibration data to adjust the projected values of the undisturbed nonremeasurable plots. The adjustment procedure is described by Smith[2] in a separate publication. All disturbed remeasurable plots were remeasured on the ground to assess changes since the last inventory. Disturbance refers to any change on a plot that can be detected on aerial photos and that the STEMS growth processor cannot predict, such as catastrophic mortality, cutting, seedling stands, and land use change.

Although not monumented during the 1972 inventory, nonmeasurable forest plots play a crucial role in the new survey design. These locations were carefully examined, comparing past and current aerial photography to determine which plots were undisturbed and which had conditions that could be simulated by STEMS. For those plots that could be updated, past and current photography was examined to determine that only normal growth and mortality had occurred. STEMS was then used to "grow" the old plot and tree data to produce an estimate of current data. Thus, these plots were treated as ground plots, even though they were never visited. The plot record for each updated plot was sent to the field for verification of current ownership information. For plots classified as disturbed, a new ground plot was established as close to the old location as possible. This allows information about land use trends to be recorded even though it may not be possible to locate the old plot exactly.

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[2]*Smith, W. Brad. 1983. Adjusting the STEMS regional growth models to improve local predictions. Res. Note NC-297. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 5 p.*

Ground land use class	Old plots remeasured	Old plots updated	Old plots replaced	New plots	Total plots
Timberland	205	61	104	361	731
Reserved timberland	0	0	2	25	27
Woodland	11	0	13	20	44
Reserved woodland	0	0	0	0	0
Nonforest with trees	22	16	19	49	106
Nonforest without trees	175	238	18	399	830
Census water	4	6	1	34	45
Total	417	321	157	888	1,783

The estimation procedure for computing statistics from this sampling design was more complicated than the simple two-phase estimation procedure used in the past. In fact, this procedure yielded two independent samples, one coming from the new photo points and the other coming from the old photo points that are remeasured or updated. The tabulation on top of this page summarizes the distribution of ground plots for the new inventory design.

3. Area estimates

Area estimates were made using two-phase estimation methods. In this type of estimation, a preliminary estimate of area by land use is made from the aerial photographs (phase 1) and corrected by the plot measurements (phase 2). A complete description of this estimation method is presented by Loetsch and Haller (1964)[3].

4. Volume estimates

Estimates of volume per acre were made from the trees measured or modelled on the 10-point plots. Estimates of volume per acre were multiplied by the area estimates to obtain estimates of total volume. Net cubic foot volumes are based on equations developed by Hahn and Hansen (In prep.)[4] for use in the Central States.

The Forest Service reports all board foot volume in International 1/4-inch rule. In Missouri, the Doyle log rule is commonly used. Doyle log rule conversion factors were derived from full tree measurements taken throughout the Central States (Illinois, Indiana, Iowa, and Missouri), and an equation was developed by Wiant and Castenaeda (1977)[5]. The factors (multipliers) used here to convert board foot International volumes to the Doyle rule are shown in the following tabulation:

D.B.H. (inches)	Doyle rule conversion factor Softwoods	Hardwoods
9.0-10.9	0.3455	--
11.0-12.9	0.4780	0.4172
13.0-14.9	0.5992	0.5118
15.0-16.9	0.6908	0.5882
17.0-18.9	0.7685	0.6569
19.0-20.9	0.8573	0.7180
21.0-22.9	0.8645	0.7829
23.0-24.9	0.9276	0.8324
25.0-26.9	0.9493	0.8736
27.0-28.9	0.9710	0.9473
29.0+	1.1065	1.1349

5. Growth and mortality estimates

On remeasured plots, estimates of growth and mortality per acre come from the remeasured diameters of trees and from observation of trees that died between inventories. Growth is reported for 1988, the last year before the inventory, and is based on an assumption of constant basal area growth over the remeasurement

[3] *Loetsch, F.; Haller, K.E. 1964. Forest inventory, volume I, statistics of forest inventory and information from aerial photographs. BLV Verlagsgesellschaft Munch Basle Vienna. 436 p.*

[4] *Hahn, Jerold T.; Hansen, Mark H. (In prep.). Tree volume equations for the Central States. Res. Pap. NC-. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station.*

[5] *Wiant, Harry V., Jr.; Castenaeda, Froylan. 1977. Mesavage and Girard's volume tables formulated. BLM4. Denver, CO: U.S. Department of Interior, Bureau of Land Management, Denver Service Center: 1-4.*

period. Mortality is reported for 1988 also, and is based on an assumption of constant volume mortality over the remeasurement period. On new plots, where trees were not remeasured, estimates of growth and mortality were obtained by using STEMS to project the growth and mortality of trees for 1 year. Growth and mortality estimates for old undisturbed plots that were updated were derived in the same manner as remeasured plots. The STEMS growth model was adjusted by Survey Unit to meet local conditions. As with volume, total growth and mortality estimates were obtained by multiplying the per acre estimates by area estimates.

6. Average annual removals estimates

Average annual growing-stock and sawtimber removals (1972 to 1988) were estimated from only the remeasured plots; new plots were not used to estimate removals. These estimates were obtained from trees measured in the last survey and cut or otherwise removed from the timberland base. Because remeasurement plots make up about one-half of the total ground plots, average annual removals estimates have greater sampling errors than volume and growth estimates.

COMPARING MISSOURI'S FOURTH INVENTORY WITH THE THIRD INVENTORY

The following paragraphs highlight some of the procedural changes since the last inventory to assist the reader in analyzing data from this report:

New volume equations were developed for the Central States, and these equations were used to compute the 1989 volumes and also to recompute the 1972 volume for growth calculations. Although the adjustment differs by Survey Unit the recomputed 1972 growing-stock and board foot volumes will generally be greater than those shown in the 1972 report.

Mortality figures published in the 1972 inventory report were based on field estimates from a limited number of remeasurement plots. Information gathered on a larger number of remeasurement plots during the current inventory was used to adjust the 1972 mortality figures. This adjustment will also affect the estimate of net growth for the 1972 inventory.

Past surveys used only growing-stock trees to determine stand-size class. Current survey procedures require that stand-size class be determined on the basis of all live trees. Therefore, direct comparisons of current inventory data to old inventory data by stand-size class may be misleading.

The basic building block for estimating forest area and timber volume has been changed from the Survey Unit to the county. In the past, the statistics were developed at the Unit level and prorated back to the county on the basis of photo-interpretation points. Direct development of county-level data helps users interested in more precise local data, but can make the outcome of comparisons with past estimates uncertain.

LOG GRADE

In Missouri the butt log of every sawtimber sample tree was graded for quality on approximately one-third of the sample plots. The volume yield by log grade for species in this sample was used to distribute the volume of trees in the ungraded sample into log-grade classes by species group.

Logs were graded on the basis of external characteristics as indicators of quality. Hardwood species were graded according to "A guide to hardwood log grading" (1973)[6]. The best 12-foot section of the lowest 16-foot hardwood log, or the best 12-foot upper section if the butt log did not meet minimum log-grade standards, was graded as follows:

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[6]*Rast, Everette D.; Sonderman, David L.; Gammon, Glenn L. 1973. A guide to hardwood log grading. Gen. Tech. Rep. NE-1. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 31 p.*

Forest Service standard grades for hardwood factory saw logs

Grading factors		Specifications							
		Log grade 1			Log grade 2				Log grade 3
Position in tree		Butts only	Butts & uppers		Butts & uppers				Butts & uppers
Scaling diameter, inches		13-15[1]	16-19	20+	11+[2]		12+		8+
Length without trim, feet			10+		10+	8-9	10-11	12+	8+
Required clear cuttings[3] of each of three best faces[4]	Min. length, feet	7	5	3	3	3	3	3	2
	Max. number	2	2	2	2	2	2	3	No limit
	Min. proportion of log length required in clear cutting	5/6	5/6	5/6	2/3	3/4	2/3	2/3	1/2
Maximum sweep & crook allowance	For logs with less than one-fourth of end in sound defects		15 percent				30 percent		50 percent
	For logs with more than one-fourth of end in sound defects		10 percent				20 percent		35 percent
Maximum scaling deduction			40 percent[5]				50 percent[6]		50 percent

[1]Ash and basswood butts can be 12 inches if they otherwise meet requirements for small #1's.
[2]Ten-inch logs of all species can be #2 if they otherwise meet requirements for small #1's.
[3]A clear cutting is a portion of a face, extending the width of the face, that is free of defects.
[4]A face is one-fourth of the surface of the log as divided lengthwise.
[5]Otherwise #1 logs with 41-60-percent deductions can be #2.
[6]Otherwise #2 logs with 51-60-percent deductions can be #3.

Forest Service standard specifications for hardwood construction logs (tie and timber logs)[1]

Position in tree	Butts and uppers
Min. diameter, small end	8 inches +
Min. length without trim	8 feet
Clear cuttings	No requirements
Sweep allowance	One-fourth of the diameter at the small end for each 8 feet of length.
Sound surface defects:	
Single knots	Any number, if no one knot has an average diameter above the callus in excess of one-third of the log diameter at point of occurrence.
Whorled knots	Any number, if the sum of knot diameters above the callus does not exceed one-third of the log diameter at point of occurrence.
Holes	Any number, provided none has a diameter over one-third of the log diameter at point of occurrence and none extends more than 3 inches into included timber[2].
Unsound surface defects :	Same requirements as for sound defects if they extend into included timber. No limit if they do not.
End defects:	
Sound	No requirements.
Unsound	None allowed; log must be sound internally, but will admit one shake not to exceed one-fourth the scaling diameter and will admit one longitudinal split not extending more than 5 inches into included timber.

[1]These specifications are minimum for the class. If, from a group of logs, factory logs are selected first, thus leaving only nonfactory logs from which to select construction logs, then the quality range of the construction logs so selected is limited, and the class may be considered a grade. If selection for construction logs is given first priority, it may be necessary to subdivide the class into grades.

[2]Included timber is always square, and dimension is judged from small end.

Log grades for southern pine logs

Grade 1: logs with three or four clear faces[1] and 16 inches minimum d.i.b.

Grade 2: logs with one or two clear faces and 12 inches minimum d.i.b.

Grade 3: logs with no clear faces and 6 inches minimum d.i.b.

After the tentative log grade is established from above, the log will be degraded one grade for each of the following, except that no log can be degraded below grade 3. Net scale after deduction for defect must be at least 50 percent of the gross contents of the log.

1. *Sweep.* Degrade any tentative 1 or 2 log one grade if sweep amounts to 3 or more inches and equals or exceeds one-third of the diameter inside bark at small end.

2. *Heart rot.* Degrade any tentative 1 or 2 log one grade if conk, massed hyphae, or other evidence of advanced heart rot is found anywhere in it.

[1]A face is one-fourth of the circumference in width extending full length of the log. Clear faces are those free of: knots measuring more than 1 inch in diameter, overgrown knots of any size, and holes more than one inch in diameter. Faces may be rotated to obtain the maximum number of clear ones.

Log grades for eastern redcedar (Missouri special use)

Position in tree	Butts and uppers
D.B.H.	6 inches +
Min. diameter(ob), small end	5 inches +
Length without trim	7 feet
Clear cuttings	No requirements
Sweep allowance	Reasonably straight
Sound surface defects permitted:	
Single knot	Any number less than one-half of the log diameter at point of occurrence.
Whorled knots	Any number provided the sum of the diame ter of knots 2 inches or larger in a 1-foot section does not exceed the diameter at that point.
Unsound defects permitted:	Any number, provided defect is not greater than one-half of the volume at any one point of occurrence.

METRIC EQUIVALENTS OF UNITS USED IN THIS REPORT

1 acre = 4,046.86 square meters or 0.405 hectare.
1,000 acres = 405 hectares.
1 cubic foot = 0.0283 cubic meter.
1 foot = 30.48 centimeters or 0.3048 meter.
1 inch = 25.4 millimeters, 2.54 centimeters, or 0.0254 meter.
1 pound = 0.454 kilograms.
1 ton = 0.907 metric tons.

TREE SPECIES GROUPS IN MISSOURI[7]

SOFTWOODS

Shortleaf pine ..... *Pinus echinata*
Virginia pine ..... *Pinus virginiana*
Baldcypress ..... *Taxodium distichum*
Eastern redcedar ..... *Juniperus virginiana*
Other softwoods
  Scotch pine ..... *Pinus sylvestris*

HARDWOODS

Select white oak[8]
  White oak ..... *Quercus alba*
  Swamp white oak ..... *Quercus bicolor*
  Bur oak ..... *Quercus macrocarpa*
  Swamp chestnut oak ..... *Quercus michauxii*
  Chinkapin oak ..... *Quercus muehlenbergii*
Other white oak[8]
  Overcup oak ..... *Quercus lyrata*
  Chestnut oak ..... *Quercus prinus*
  Post oak ..... *Quercus stellata*
Select red oak[8]
Cherrybark oak ..... *Quercus falcata* var. *pagodifolia*
Northern red oak ..... *Quercus rubra*
Shumard oak ..... *Quercus shumardii* var. *shumardii*
Other red oak[8]
  Scarlet oak ..... *Quercus coccinea*
  Northern pin oak ..... *Quercus ellipsoidalis*
  Southern red oak ..... *Quercus falcata*
  Shingle oak ..... *Quercus imbricaria*
  Black oak ..... *Quercus velutina*
  Blackjack oak ..... *Quercus marilandica*
  Pin oak ..... *Quercus palustris*
  Willow oak ..... *Quercus phellos*
Select hickory[8]
  Pecan ..... *Carya illinoensis*
  Shellbark hickory ..... *Carya lacinosa*
  Shagbark hickory ..... *Carya ovata*
  Mockernut hickory ..... *Carya tomentosa*
Other hickory[8]
  Bitternut hickory ..... *Carya cordiformis*
  Pignut hickory ..... *Carya glabra*
  Black hickory ..... *Carya texana*
River birch[8] ..... *Betula nigra*
Hard maple[8]
  Sugar maple ..... *Acer saccharum*
Soft maple[9]
  Red maple ..... *Acer rubrum*
  Silver maple ..... *Acer saccharinum*
Ash[8]
  Blue ash ..... *Fraxinus quadrangulata*
  White ash ..... *Fraxinus americana*
  Green ash ..... *Fraxinus pennsylvanica*
Cottonwood[9] ..... *Populus deltoides*
Basswood[9] ..... *Tilia americana*
Beech[8] ..... *Fagus grandifolia*
Black walnut[8] ..... *Juglans nigra*
Black cherry[9] ..... *Prunus serotina*
Butternut[9] ..... *Juglans cinerea*
Elm
  Winged elm[9] ..... *Ulmus alata*
  American elm[9] ..... *Ulmus americana*
  Slippery elm[9] ..... *Ulmus rubra*
  Rock elm[8] ..... *Ulmus thomasii*
Hackberry[9] ..... *Celtis occidentalis*
Sycamore[9] ..... *Platanus occidentalis*
Yellow-poplar[8] ..... *Liriodendron tulipifera*
Black willow[9] ..... *Salix nigra*
Sweetgum[9] ..... *Liquidambar styraciflua*
Tupelo[9]
  Black tupelo ..... *Nyssa sylvatica* var. *sylvatica*
  Swamp tupelo ..... *Nyssa sylvatica* var. *biflora*
Persimmon[8] ..... *Diospyros virginiana*
Sassafras[9] ..... *Sassafras albidum*
Other hardwoods
  Ohio buckeye[9] ..... *Aesculus glabra*
  Boxelder[9] ..... *Acer negundo*

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[7] *The common and scientific names are based on: Little, Elbert L. 1979. Check list of native and naturalized trees of the United States. Agric. Handb. 541. Washington, DC: U.S. Department of Agriculture, Forest Service. 375 p.*

[8] *This species or species group is considered a hard hardwood, with an average specific gravity greater than 0.50.*

[9] *This species or species group is considered a soft hardwood, with an average specific gravity of 0.50 or less.*

Kentucky coffeetree[8] ..... *Gymnocladus dioicus*
Black locust[8] ..... *Robinia pseudoacacia*
White mulberry[9] ..... *Morus alba*
Red mulberry[9] ..... *Morus rubra*
Honeylocust[8] ..... *Gleditsia triacanthos*
Northern catalpa[8] ..... *Catalpa speciosa*

Noncommercial species
Osage-orange ..... *Maclura pomifera*
Eastern hophornbeam ..... *Ostrya virginiana*
Apple ..... *Malus* spp.
American hornbeam ..... *Carpinus caroliniana*
Wild plum ..... *Prunus* spp.
Eastern redbud ..... *Cercis canadensis*
Pawpaw ..... *Asimina triloba*
Hawthorn ..... *Crataegus* spp.

DEFINITION OF TERMS

Average annual removals from growing stock.—The average net growing-stock volume in growing-stock trees removed annually for forest products (including roundwood products and logging residues) and for other uses (see Other removals). Average annual removals of growing stock are reported for a period of several years (1972 to 1988 in this report) and are based on information obtained from remeasurement plots (see Survey Procedures in Appendix).

Average annual removals from sawtimber.—The average net board foot sawtimber volume of live sawtimber trees removed annually for forest products (including roundwood products and other uses [see Other removals]). Average annual removals of sawtimber are reported for a period of several years (1972 to 1988 in this report) and are based on information obtained from remeasurement plots (see Survey Procedures in Appendix).

Basal area.—The area in square feet of the cross section at breast height of a single tree. When the basal area of all trees in a stand is summed, the result is usually expressed as square feet of basal area per acre.

Commercial species.—Tree species presently or prospectively suitable for industrial wood products. (Note: Excludes species of typically small size, poor form, or inferior quality such as hophornbeam, osage-orange, and redbud.)

Commercial forest land.—(See Timberland).

Cord.—One standard cord is 128 cubic feet of stacked wood, including bark and air space. Cubic feet can be converted to standard cords by dividing by 79.

County and municipal land.—Land owned by counties and local public agencies or municipalities, or land leased to these governmental units for 50 years or more.

Cropland.—Land under cultivation within the past 24 months; including cropland harvested, crop failures, cultivated summer fallow, idle cropland used only for pasture, orchards, and land in soil improvement crops, but excluding land cultivated in developing improved pasture.

Cull.—Portions of a tree that are unusable for industrial wood products because of rot, missing or dead material, or other defect.

Diameter class.—A classification of trees based on diameter outside bark, measured at breast height (d.b.h.). Two-inch diameter classes are commonly used in Forest Inventory and Analysis, with the even inch the approximate midpoint for a class. For example, the 6-inch class includes trees 5.0 through 6.9 inches d.b.h.

Diameter at breast height (d.b.h.).—The outside bark diameter at 4.5 feet (1.37 m) above the forest floor on the uphill side of the tree. For determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

Farm.—Any place from which $1,000 or more of agricultural products were produced and sold during the year.

Farmer-owned land.—Land owned by farm operators whether part of the farmstead or not. (Note: Excludes land leased by farm operators from nonfarm owners, such as railroad companies and States.)

Forest land.—Land at least 16.7 percent stocked by forest trees of any size, or formerly having

had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparing specified standards with basal area and/or number of trees, age or size, and spacing.) The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas shall be classed as forest if less than 120 feet wide. (See Tree, Land, Timberland, Reserved forest land, Other forest land, Stocking, and Water.)

Forest industry land.—Land owned by companies or individuals that operate a primary wood-using plant.

Forest type.—A classification of forest land based on the species forming a plurality of live tree stocking. Major forest types in the State are:

Shortleaf pine.—Forests in which shortleaf pine comprises a plurality of the stocking. (Common associates include oak, hickory, and gum.)

Eastern redcedar.—Forests in which eastern redcedar comprises a plurality of the stocking. (Common associates include oak and hickory.)

Eastern redcedar-hardwood.—Forests in which hardwoods (usually upland oaks), comprise a plurality of the stocking but where eastern redcedar comprises 25 to 50 percent of the stocking. (Common associates include gum, hickory, and yellow-poplar.)

Shortleaf pine-oak.—Forests in which hardwoods (usually white, scarlet, chestnut, northern red, or black oaks), singly or in combination, comprise a plurality of the stocking but where shortleaf pine comprises 25 to 50 percent of the stocking.

Post-blackjack oak.—Forests in which post or blackjack oaks, singly or in combination, comprise a plurality of the stocking, and less than 25 percent of the stocking is in pines or eastern redcedar.

Black-scarlet oak.—Forests in which black oak or scarlet oaks, singly or in combination, comprise a plurality of the stocking, and less than 25 percent of the stocking is in pines or eastern redcedar. (Common associates include yellow-poplar, elm, maple, and black walnut.)

White oak.—Forests in which white oak species, singly or in combination, comprise a plurality of the stocking, and less than 25 percent of the stocking is in pines or eastern redcedar.

Oak-gum-cypress.—Bottomland forests in which bottomland oaks such as pin, swamp white, and shingle oaks along with tupelo, blackgum, sweetgum, or cypress, singly or in combination, comprise a plurality of the stocking. (Common associates include cottonwood, willow, ash, elm, hackberry, and maple.)

Elm-ash-soft maple.—Forests in which lowland elm, ash, soft maple, and cottonwood, singly or in combination, comprise a plurality of the stocking. (Common associates include boxelder, willow, sycamore, and beech.)

Cottonwood.—Forests in which cottonwood comprises at least 50 percent of the stocking. (Associates include willow, elm, soft maple, and ash.)

Maple-beech.—Forests in which hard maple or beech, singly or in combination, comprises a plurality of the stocking. (Common associates include soft maple, elm, and basswood.)

Growing-stock tree.—A live tree of commercial species that meets specified standards of size, quality, and merchantability. (Note: Excludes rough, rotten, and dead trees.)

Growing-stock volume.—Net volume in cubic feet of growing-stock trees 5.0 inches d.b.h. and over, from 1 foot above the ground to a minimum 4.0-inch top diameter outside bark of the central stem or to the point where the central stem breaks into limbs.

Hard hardwoods.—Hardwood species with an average specific gravity greater than 0.50 such as oaks, hard maple, hickories, and ash.

Hardwoods.—Dicotyledonous trees, usually broad-leaved and deciduous. (See Soft hardwoods and Hard hardwoods.)

Idle farmland.—Includes former cropland, orchards, improved pastures, and farm sites not tended within the past 2 years and presently less than 16.7 percent stocked with trees.

Improved pasture.—Land currently improved for grazing by cultivating, seeding, irrigating, or clearing of trees or brush and less than 16.7 percent stocked with live trees.

Industrial wood.—All roundwood products, except fuelwood.

Land.—A. *Bureau of the Census.* Dry land and land temporarily or partly covered by water such as marshes, swamps, and river flood plains (omitting tidal flats below mean high tide); streams, sloughs, estuaries, and canals less than one-eighth of a statute mile wide; and lakes, reservoirs, and ponds less than 40 acres in area.

B. *Forest Inventory and Analysis.* The same as the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Log grade.—A log classification based on external characteristics as indicators of quality or value. (See Appendix for specific grading factors used.)

Marsh.—Nonforest land that characteristically supports low, generally herbaceous or shrubby vegetation and that is intermittently covered with water.

Merchantable.—Refers to a pulpwood or saw-log section that meets pulpwood or saw-log specifications, respectively.

Miscellaneous Federal land.—Federal land other than National Forest and land administered by the Bureau of Land Management or Bureau of Indian Affairs.

Miscellaneous private land.—Privately owned land other than forest-industry and farmer-owned land.

Mortality.—The volume of sound wood in growing-stock and sawtimber trees that die annually.

National Forest land.—Federal land that has been legally designated as National Forest or purchase units, and other land administered by the USDA Forest Service.

Net annual growth of growing stock.—The annual change in volume of sound wood in live sawtimber and poletimber trees and the total volume of trees entering these classes through ingrowth, less volume losses resulting from natural causes.

Net annual growth of sawtimber.—The annual change in the volume of live sawtimber trees and the total volume of trees reaching sawtimber size, less volume losses resulting from natural causes.

Net volume.—Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Noncommercial species.—Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Nonforest land.—Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses. (Note: Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1- to 40-acre areas of water classified by the Bureau of the Census as land. If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 feet wide and more than 1 acre in area to qualify as nonforest land.)

a. *Nonforest land without trees.*—Nonforest land with no live trees present.

b. *Nonforest land with trees.*—Nonforest land with one or more trees per acre at least 5 inches d.b.h.

Nonstocked land.—Forest land less than 16.7 percent stocked with all live trees.

Other forest land.—Forest land not capable of producing 20 cubic feet per acre per year of

industrial wood crops under natural conditions and not associated with urban or rural development. These sites often contain tree species that are not currently utilized for industrial wood production or trees of poor form, small size, or inferior quality that are unfit for industrial products. Unproductivity may be the result of adverse site conditions such as sterile soil, dry climate, poor drainage, high elevation, and rockiness. This land is not withdrawn from timber utilization.

Pasture.—Land presently used for grazing or under cultivation to develop grazing.

Pastured timberland.—Timberland for which the primary use is wood production, but is presently used for grazing.

Physiographic class.—A measure of soil and water conditions that affect tree growth on a site. The physiographic classes are:

Xeric sites.—Very dry soils where excessive drainage seriously limits both growth and species occurrence. Example: cedar barrens.

Xeromesic sites.—Moderately dry soils where excessive drainage limits growth and species occurrence to some extent. Example: dry oak ridge.

Mesic sites.—Deep, well-drained soils. Growth and species occurrence are limited only by climate.

Hydromesic sites.—Moderately wet soils where insufficient drainage or infrequent flooding limits growth and species occurrence to some extent. Example: better drained bottomland hardwood sites.

Hydric sites.—Very wet sites where excess water seriously limits both growth and species occurrence. Example: frequently flooded river bottoms and cypress swamps.

Poletimber stand.—(See Stand-size class.)

Poletimber tree.—A growing-stock tree of commercial species at least 5.0 inches d.b.h. but smaller than sawtimber size.

Reserved forest land.—Forest land withdrawn from timber utilization through statute, administrative regulation, designation, or exclusive use for Christmas tree production, as indicated by annual shearing.

Rotten tree.—A tree that does not meet regional merchantability standards because of excessive unsound cull. May include noncommercial tree species.

Rough tree.—A tree that does not meet regional merchantability standards because of excessive sound cull. May include noncommercial tree species.

Salvable dead tree.—A standing or down dead tree considered merchantable by regional standards.

Sapling.—A live tree 1.0 to 5.0 inches d.b.h.

Sapling-seedling stand.—(See Stand-size class.)

Saw log.—A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight and with a minimum diameter outside bark (d.o.b.) for softwoods of 7.0 inches (9.0 inches for hardwoods) or other combinations of size and defect specified by regional standards.

Saw-log portion.—That part of the bole of sawtimber trees between the stump and the saw-log top.

Saw-log top.—The point on the bole of sawtimber trees above which a saw log cannot be produced. The minimum saw-log top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber stand.—(See Stand-size class.)

Sawtimber tree.—A growing-stock tree of commercial species containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9.0 inches d.b.h. Hardwoods must be at least 11.0 inches d.b.h.

Sawtimber volume.—Net volume of the saw-log portion of live sawtimber in board feet, International 1/4-inch rule (unless specified

otherwise) from stump to a minimum 7.0 inches top d.o.b. for softwoods and a minimum 9.0 inches top d.o.b. for hardwoods.

Seedling.—A live tree less than 1.0 inch d.b.h. that is expected to survive. Only softwood seedlings more than 6 inches tall and hardwood seedlings more than 1 foot tall are counted.

Short-log (rough tree).—Sawtimber-size trees of commercial species that contain at least one merchantable 8- to 11-foot saw log but not a 12-foot saw log.

Site class.—A classification of forest lands in terms of inherent capacity to grow crops of industrial wood. The class identifies the potential growth in merchantable cubic feet/acre/year at culmination of mean annual increment of fully stocked natural stands.

Site index.—An expression of forest site quality based on the height of a free-growing dominant or codominant tree of a representative species in the forest type at age 50.

Soft hardwoods.—Hardwood species with an average specific gravity less than 0.50 such as gum, yellow-poplar, cottonwood, red maple, basswood, and willow.

Softwoods.—Coniferous trees, usually evergreen, having needles or scale-like leaves.

Stand.—A group of trees on a minimum of 1 acre of forest land that is stocked by forest trees of any size.

Stand-age class.—Age of the main stand. Main stand refers to trees of the dominant forest type and stand-size class.

Stand-size class.—A classification of stocked (see Stocking) forest land based on the size class of live trees on the area; that is, sawtimber, poletimber, or seedlings and saplings.

Sawtimber stands.—Stands with half or more of live stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands.—Stands with half or more live stocking in poletimber and/or sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands.—Stands with more than half of the live stocking in saplings and/or seedlings.

State land.—Land owned by States or leased to them for 50 years or more.

Stocking.—The degree of occupancy of land by trees, measured by basal area and/or the number of trees in a stand by size or age and spacing, compared to the basal area and/or number of trees required to fully utilize the growth potential of the land; that is, the stocking standard.

A stocking percent of 100 indicates full utilization of the site and is equivalent to 80 square feet of basal area per acre in trees 5.0 inches d.b.h. and larger. In a stand of trees less than 5.0 inches d.b.h., a stocking percent of 100 would indicate that the present number of trees is sufficient to produce 80 square feet of basal area per acre when the trees reach 5.0 inches d.b.h.

Stands are grouped into the following stocking classes:

Overstocked stands.—Stands in which stocking of live trees is 133 percent or more.

Fully stocked stands.—Stands in which stocking of trees is from 100.0 to 132.9 percent.

Medium stocked stands.—Stands in which stocking of trees is from 60.0 to 99.9 percent.

Poorly stocked stands.—Stands in which stocking of trees is from 16.7 to 59.9 percent.

Nonstocked areas.—Commercial forest land on which stocking of trees is less than 16.7 percent.

Timberland.—Forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of industrial wood crops under natural conditions, that is not withdrawn from timber utilization, and that is not associated with urban or rural development. Currently inaccessible and inoperable areas are included.

Tree.—A woody plant usually having one or more perennial stems, a more or less definitely formed crown of foliage, and a height of at least 12 feet at maturity.

Tree size class.—A classification of trees based on diameter at breast height, including sawtimber trees, poletimber trees, saplings, and seedlings.

Upper stem portion.—That part of the bole of sawtimber trees above the saw-log top to a minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs.

Urban and other areas.—Areas within the legal boundaries of cities and towns; suburban areas developed for residential, industrial, or recreational purposes; school yards; cemeteries; or other nonforest land not included in any other specified land use class.

Urban forest land.—Forest land closely associated with or in such proximity to urban nonforest land uses that is not likely to be managed for the production of industrial wood products on a continuing basis. Wood removed would be for land clearing, fuelwood, or aesthetic purposes. Such forest land may be associated with industrial, commercial, residential, or recreational nonforest uses. Residential subdivisions, industrial parks, golf course perimeters, airport buffer strips, and public urban parks that qualify as forest land are included.

Water.—Water Areas. Areas within a land mass persistently covered by water.

(a) *Bureau of the Census*.—Permanent inland water surfaces, such as lakes, reservoirs, and ponds at least 40 acres in area; and streams, sloughs, estuaries, and canals at least one-eighth of a statute mile wide.

(b) *Noncensus*.—Permanent inland water surfaces, such as lakes, reservoirs, and ponds from 1 to 39.9 acres in area; and streams, sloughs, estuaries, and canals from 120 feet to one-eighth of a statute mile wide.

Windbreak.—A group of trees whose primary use is to protect buildings currently in use.

Wooded pasture.—Improved pasture with more than 16.7 percent stocking in live trees but less than 25 percent stocking in growing-stock trees. Area is currently improved for grazing or there is other evidence of grazing.

Wooded strip.—An acre or more of natural continuous forest land that would otherwise meet survey standards for timberland except that it is less than 120 feet wide.

TABLES

SUPPLEMENTAL TABLES

Table 1.--Area of land by county and major land-use class, Northwest Ozarks Unit, Missouri, 1989

(In thousand acres)

County	Land area	Forest land					Nonforest land with trees	Nonforest land with trees, as a percent of land area
		All forest land	Timber-land	Timberland as a percent of land area	Other forest land	Reserved forest land		
Benton	466.8	202.9	188.6	40.4	13.0	1.3	41.6	8.9
Camden	410.3	263.4	235.4	57.4	16.1	11.9	26.7	6.5
Cedar	301.1	88.8	84.0	27.9	1.9	2.9	21.7	7.2
Dallas	347.3	142.1	136.9	39.4	4.7	0.5	20.9	6.0
Hickory	242.5	97.2	83.9	34.6	12.6	0.7	21.8	9.0
Laclede	491.2	210.4	207.0	42.1	3.4	--	32.3	6.6
Maries	338.1	160.5	137.2	40.6	23.3	--	38.3	11.3
Miller	379.3	187.9	173.4	45.7	4.6	9.9	27.9	7.4
Morgan	380.1	190.1	172.9	45.5	17.2	--	22.2	5.8
Phelps	431.1	269.3	262.9	61.0	6.4	--	15.0	3.5
Polk	407.1	109.4	105.0	25.8	4.4	--	17.1	4.2
Pulaski	351.9	220.7	220.7	62.7	--	--	15.2	4.3
St. Clair	447.0	170.7	161.7	36.2	9.0	--	25.1	5.6
All counties	4,993.8	2,313.4	2,169.6	43.4	116.6	27.2	325.8	6.5

Table 2.--Area of timberland by county and ownership class, Northwest Ozarks Unit, Missouri, 1989

(In thousand acres)

County	All owners	Ownership class							
		National forest	Misc. federal	State	County & municipal	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Benton	188.6	--	22.6	5.4	--	--	70.6	13.0	77.0
Camden	235.4	--	--	--	--	--	77.5	15.2	142.7
Cedar	84.0	--	1.7	--	--	--	48.0	1.9	32.4
Dallas	136.9	--	--	7.7	--	--	61.7	2.5	65.0
Hickory	83.9	--	10.5	--	--	--	38.5	5.7	29.2
Laclede	207.0	27.8	--	4.6	--	--	59.2	9.2	106.2
Maries	137.2	--	2.2	3.5	--	--	46.0	10.5	75.0
Miller	173.4	--	--	--	--	--	53.0	15.9	104.5
Morgan	172.9	--	--	--	--	--	70.3	8.6	94.0
Phelps	262.9	62.5	--	2.3	--	--	109.3	5.3	83.5
Polk	105.0	--	4.4	2.9	--	--	31.5	--	66.2
Pulaski	220.7	44.8	40.2	--	2.9	--	66.8	--	66.0
St. Clair	161.7	--	20.4	--	--	--	68.2	6.1	67.0
All counties	2,169.6	135.1	102.0	26.4	2.9	--	800.6	93.9	1,008.7

Table 3.--Area of timberland by county and forest type, Northwest Ozarks Unit, Missouri, 1989

(In thousand acres)

County	All types	Forest type											
		Short-leaf pine	Eastern redcedar	Eastern redcedar-hardwood	Shortleaf pine - oak	Post-blackjack oak	Black-scarlet oak	White oak	Oak-gum-cypress	Elm-ash-soft maple	Cotton-wood	Maple-beech	Non-stocked[1]
Benton	188.6	--	--	2.7	--	67.4	83.8	11.3	--	--	--	23.4	--
Camden	235.4	--	6.2	3.7	--	70.9	102.5	50.0	--	--	--	2.1	--
Cedar	84.0	--	--	--	--	51.0	20.3	1.7	1.9	4.8	--	4.3	--
Dallas	136.9	--	--	12.4	--	39.3	59.6	17.9	--	6.2	--	1.5	--
Hickory	83.9	--	2.5	10.7	--	25.1	28.2	6.3	--	5.0	--	6.1	--
Laclede	207.0	6.0	1.1	2.7	1.8	98.2	78.1	16.2	--	--	--	2.9	--
Maries	137.2	3.5	8.8	11.4	--	52.8	25.4	29.3	--	--	--	6.0	--
Miller	173.4	--	5.5	12.7	--	29.3	63.4	52.3	--	10.2	--	--	--
Morgan	172.9	--	2.2	3.4	--	32.4	84.5	50.4	--	--	--	--	--
Phelps	262.9	12.6	8.3	--	2.3	105.3	83.3	47.2	--	--	--	3.9	--
Polk	105.0	--	14.2	13.4	--	34.0	26.9	15.0	--	1.5	--	--	--
Pulaski	220.7	9.9	3.5	2.9	--	43.3	103.9	45.3	--	5.8	--	6.1	--
St. Clair	161.7	--	--	2.0	--	48.3	52.1	30.6	1.6	5.7	--	21.4	--
All counties	2,169.6	32.0	52.3	78.0	4.1	697.3	812.0	373.5	3.5	39.2	--	77.7	--

[1] Nonstocked with all live trees.

Table 4.--Area of timberland by county and stand-size class, Northwest Ozarks Unit, Missouri, 1989

(In thousand acres)

County	All stands	Stand-size class			
		Sawtimber	Poletimber	Seedling & sapling	Non-stocked [1]
Benton	188.6	76.2	80.3	32.1	--
Camden	235.4	152.4	46.8	36.2	--
Cedar	84.0	32.4	29.9	21.7	--
Dallas	136.9	59.1	36.1	41.7	--
Hickory	83.9	34.5	28.0	21.4	--
Laclede	207.0	85.8	80.1	41.1	--
Maries	137.2	63.4	47.7	26.1	--
Miller	173.4	97.5	46.4	29.5	--
Morgan	172.9	79.8	52.9	40.2	--
Phelps	262.9	82.6	95.0	85.3	--
Polk	105.0	38.3	39.3	27.4	--
Pulaski	220.7	96.8	55.5	68.4	--
St. Clair	161.7	67.1	64.0	30.6	--
All counties	2,169.6	965.9	702.0	501.7	--

[1] Nonstocked with all live trees.

Table 5.--Area of timberland by county and site class, Northwest Ozarks Unit, Missouri, 1989

(In thousand acres)

County	All classes	Site class (cubic feet of growth per acre per year)				
		165+	120-164	85-119	50-84	20-49
Benton	188.6	--	--	--	53.0	135.6
Camden	235.4	--	--	2.1	104.6	128.7
Cedar	84.0	--	--	2.4	40.3	41.3
Dallas	136.9	--	--	1.5	50.4	85.0
Hickory	83.9	--	2.9	--	23.2	57.8
Laclede	207.0	--	--	--	78.7	128.3
Maries	137.2	--	--	4.7	29.8	102.7
Miller	173.4	--	--	6.8	80.5	86.1
Morgan	172.9	--	--	--	53.7	119.2
Phelps	262.9	--	--	1.9	57.8	203.2
Polk	105.0	--	--	--	48.5	56.5
Pulaski	220.7	--	2.9	2.9	94.1	120.8
St. Clair	161.7	--	--	16.1	53.4	92.2
All counties	2,169.6	--	5.8	38.4	768.0	1,357.4

Table 6.--Area of timberland by county and stocking class of growing-stock trees[1], Northwest Ozarks Unit, Missouri, 1989

(In thousand acres)

County	All classes	Stocking percent of growing-stock trees				
		Non-stocked	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked
Benton	188.6	2.7	74.9	101.2	8.1	1.7
Camden	235.4	6.8	79.5	133.6	12.3	3.2
Cedar	84.0	--	42.1	41.9	--	--
Dallas	136.9	1.5	39.3	82.5	11.1	2.5
Hickory	83.9	2.1	24.0	47.1	10.7	--
Laclede	207.0	--	68.8	104.8	29.1	4.3
Maries	137.2	--	55.8	61.1	17.6	2.7
Miller	173.4	--	64.1	89.5	19.8	--
Morgan	172.9	3.4	68.2	85.9	12.0	3.4
Phelps	262.9	--	47.4	166.3	38.2	11.0
Polk	105.0	--	39.4	50.9	14.7	--
Pulaski	220.7	--	54.8	127.2	29.4	9.3
St. Clair	161.7	8.4	83.7	62.7	6.9	--
All counties	2,169.6	24.9	742.0	1,154.7	209.9	38.1

[1] This table is based on the stocking percent of growing-stock trees rather than that of all live trees, therefore, to use the definitions of stocking for this table, replace the term "all live" by "growing-stock".

Table 7.--Area of timberland by ownership class and stocking class of growing-stock trees[1], Northwest Ozarks Unit, Missouri, 1989

(In thousand acres)

Ownership class	All classes	Stocking percent of growing-stock trees				
		Non-stocked	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked
National forest	135.1	--	7.3	89.1	36.6	2.1
Miscellaneous federal	102.0	2.7	39.0	48.1	8.7	3.5
State	26.4	--	5.0	10.4	11.0	--
County and municipal	2.9	--	2.9	--	--	--
Forest Industry	--	--	--	--	--	--
Farmer	800.6	5.8	300.7	422.1	56.4	15.6
Miscellaneous private corporation	93.9	--	38.8	38.8	12.0	4.3
Miscellaneous private individual	1,008.7	16.4	348.3	546.2	85.2	12.6
All owners	2,169.6	24.9	742.0	1,154.7	209.9	38.1

[1] This table is based on the stocking percent of growing-stock trees rather than that of all live trees, therefore, to use the definitions of stocking for this table, replace the term "all live" by "growing-stock".

Table 8.--Area of timberland by forest type and ownership class, Northwest Ozarks Unit, Missouri, 1989

(In thousand acres)

Forest type	All owners	Ownership class							
		National forest	Misc. federal	State	County & municipal	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Shortleaf pine	32.0	25.0	3.5	3.5	--	--	--	--	--
Eastern redcedar	52.3	--	--	--	--	--	27.3	--	25.0
Eastern redcedar-hardwood	78.0	--	4.1	--	--	--	32.4	3.6	37.9
Shortleaf pine-oak	4.1	4.1	--	--	--	--	--	--	--
Post-blackjack oak	697.3	19.8	29.3	--	--	--	293.4	20.8	334.0
Black-scarlet oak	812.0	52.9	26.5	22.9	--	--	269.0	40.3	400.4
White oak	373.5	33.3	20.1	--	2.9	--	120.5	14.5	182.2
Oak-gum-cypress	3.5	--	--	--	--	--	1.6	--	1.9
Elm-ash-soft maple	39.2	--	9.4	--	--	--	16.5	3.4	9.9
Cottonwood	--	--	--	--	--	--	--	--	--
Maple-beech	77.7	--	9.1	--	--	--	39.9	11.3	17.4
Nonstocked	--	--	--	--	--	--	--	--	--
All types	2,169.6	135.1	102.0	26.4	2.9	--	800.6	93.9	1,008.7

Table 9.--Area of timberland by forest type and stand-size class, Northwest Ozarks Unit, Missouri, 1989

(In thousand acres)

Forest type	All stands	Stand-size class			
		Sawtimber	Poletimber	Seedling & sapling	Non-stocked [1]
Shortleaf pine	32.0	6.4	25.6	--	--
Eastern redcedar	52.3	5.4	7.8	39.1	--
Eastern redcedar hardwood	78.0	36.5	23.8	17.7	--
Shortleaf pine-oak	4.1	2.3	1.8	--	--
Post-blackjack oak	697.3	202.1	316.0	179.2	--
Black-scarlet oak	812.0	409.2	213.2	189.6	--
White oak	373.5	249.8	80.3	43.4	--
Oak-gum-cypress	3.5	1.6	--	1.9	--
Elm-ash-soft maple	39.2	30.9	4.7	3.6	--
Cottonwood	--	--	--	--	--
Maple-beech	77.7	21.7	28.8	27.2	--
Nonstocked	--	--	--	--	--
All types	2,169.6	965.9	702.0	501.7	--

[1] Nonstocked with all live trees.

Table 10.--Number of all live trees on timberland by species group and diameter class, Northwest Ozarks Unit, Missouri, 1989

(In thousand trees)

Species group	All classes	Diameter class (inches at breast height) 1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods													
Shortleaf pine	15,978	2,046	3,030	6,055	3,723	885	129	66	31	9	4	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	--	--	--	--	--	--	--	--	--	--	--	--	--
Eastern redcedar	93,423	59,583	21,646	7,404	3,459	770	366	147	32	13	--	3	--
Other softwoods	141	141	--	--	--	--	--	--	--	--	--	--	--
Total	109,542	61,770	24,676	13,459	7,182	1,655	495	213	63	22	4	3	--
Hardwoods													
Select white oak	122,307	49,794	23,546	15,235	11,289	8,027	5,843	3,665	2,685	1,154	560	464	45
Other white oak	181,463	66,139	43,432	32,227	19,353	9,044	5,160	2,957	1,784	767	337	259	4
Select red oak	17,201	5,718	3,637	1,571	1,451	1,344	1,376	796	559	343	160	233	13
Other red oak	227,897	111,220	46,869	23,572	18,055	11,007	6,943	4,553	2,635	1,461	727	771	84
Select hickory	63,974	39,946	12,481	5,568	3,128	1,437	682	363	212	94	43	20	--
Other hickory	123,034	85,521	22,099	8,114	3,669	2,404	714	329	107	56	18	3	--
Basswood	105	93	--	--	--	--	--	12	--	--	--	--	--
Beech	285	204	81	--	--	--	--	--	--	--	--	--	--
Hard maple	3,693	2,412	642	219	188	123	51	--	28	15	6	6	3
Soft maple	5,654	4,566	519	87	62	87	99	35	62	44	24	64	5
Elm	67,958	44,749	14,281	6,236	1,575	512	378	147	24	24	14	18	--
Ash	23,768	11,953	5,704	3,493	1,250	714	438	90	72	37	7	10	--
Sycamore	3,930	1,272	747	279	425	425	216	99	112	177	36	124	18
Cottonwood	134	--	--	42	34	--	28	19	9	--	--	--	2
Willow	705	309	--	101	142	47	32	47	27	--	--	--	--
Hackberry	12,575	8,757	1,815	1,046	361	135	106	241	37	51	15	11	--
Aspen	--	--	--	--	--	--	--	--	--	--	--	--	--
Birch	132	87	--	--	23	17	--	--	--	--	--	3	2
Sweetgum	--	--	--	--	--	--	--	--	--	--	--	--	--
Tupelo	1,318	801	228	84	30	54	56	26	8	29	--	--	2
Black cherry	11,969	8,016	2,586	755	400	143	29	--	21	11	4	4	--
Black walnut	13,144	4,140	3,518	1,757	1,295	1,069	695	388	141	96	22	23	--
Butternut	130	102	--	--	--	--	23	--	--	5	--	--	--
Yellow-poplar	141	141	--	--	--	--	--	--	--	--	--	--	--
Persimmon	26,557	21,252	4,065	1,012	209	--	10	--	--	9	--	--	--
Sassafras	28,159	23,607	3,282	1,099	121	34	16	--	--	--	--	--	--
Other hardwoods	79,135	60,666	15,351	1,382	674	447	325	86	87	60	29	26	2
Noncommercial sp.	36,913	30,249	4,794	1,218	452	167	--	--	11	7	13	--	2
Total	1,052,281	581,714	209,677	105,097	64,186	37,237	23,220	13,853	8,621	4,440	2,015	2,039	182
All species	1,161,823	643,484	234,353	118,556	71,368	38,892	23,715	14,066	8,684	4,462	2,019	2,042	182

Table 11.--Number of growing-stock trees on timberland by species group and diameter class, Northwest Ozarks Unit, Missouri, 1989

(In thousand trees)

Species group	All classes	Diameter class (inches at breast height) 1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods													
Shortleaf pine	15,285	2,046	2,928	5,787	3,496	789	129	66	31	9	4	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	--	--	--	--	--	--	--	--	--	--	--	--	--
Eastern redcedar	89,639	59,277	20,208	6,617	2,617	623	206	80	6	5	--	--	--
Other softwoods	141	141	--	--	--	--	--	--	--	--	--	--	--
Total	105,065	61,464	23,136	12,404	6,113	1,412	335	146	37	14	4	--	--
Hardwoods													
Select white oak	96,313	47,369	19,824	10,070	6,752	4,672	3,247	1,982	1,532	507	224	121	13
Other white oak	138,050	62,148	33,990	21,012	11,622	4,869	2,399	1,234	579	156	36	3	2
Select red oak	12,747	5,130	3,054	926	947	802	939	430	263	118	36	100	2
Other red oak	186,007	106,827	38,108	15,111	11,490	6,168	3,914	2,361	1,204	495	186	129	14
Select hickory	55,846	37,390	10,239	4,321	2,079	976	507	202	60	52	12	8	--
Other hickory	106,799	79,176	17,314	6,258	2,235	1,259	279	184	58	29	4	3	--
Basswood	93	93	--	--	--	--	--	--	--	--	--	--	--
Beech	204	204	--	--	--	--	--	--	--	--	--	--	--
Hard maple	3,147	2,412	480	108	64	57	10	--	6	10	--	--	--
Soft maple	5,216	4,464	519	57	--	18	78	24	22	7	--	27	--
Elm	56,961	43,920	10,110	2,362	273	200	48	45	--	--	--	3	--
Ash	16,221	10,139	3,685	1,262	567	308	168	60	29	--	--	3	--
Sycamore	3,436	1,272	747	153	363	370	146	67	79	131	30	69	9
Cottonwood	32	--	--	--	--	--	14	9	9	--	--	--	--
Willow	559	309	--	74	100	20	--	47	9	--	--	--	--
Hackberry	10,282	8,553	762	537	174	36	50	107	23	33	4	3	--
Aspen	--	--	--	--	--	--	--	--	--	--	--	--	--
Birch	104	87	--	--	--	17	--	--	--	--	--	--	--
Sweetgum	--	--	--	--	--	--	--	--	--	--	--	--	--
Tupelo	1,025	801	108	--	--	16	45	26	8	19	--	--	2
Black cherry	9,316	7,812	1,281	43	156	10	--	--	14	--	--	--	--
Black walnut	8,191	3,858	1,833	894	420	569	342	179	52	32	12	--	--
Butternut	112	102	--	--	--	--	10	--	--	--	--	--	--
Yellow-poplar	141	141	--	--	--	--	--	--	--	--	--	--	--
Persimmon	24,345	20,742	3,105	458	40	--	--	--	--	--	--	--	--
Sassafras	25,808	23,505	1,944	331	28	--	--	--	--	--	--	--	--
Other hardwoods	68,585	58,962	9,057	274	114	105	45	16	--	12	--	--	--
Total	829,540	525,416	156,160	64,251	37,424	20,472	12,241	6,973	3,947	1,601	544	469	42
All species	934,605	586,880	179,296	76,655	43,537	21,884	12,576	7,119	3,984	1,615	548	469	42

Table 12.--Net volume of timber on timberland by class of timber and species group, Northwest Ozarks Unit, Missouri, 1989

(In thousand cubic feet)

Class of timber	All species	Species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
Live trees					
Growing-stock trees					
Sawtimber					
Saw-log portion	493,862	10,760	7,434	38,014	437,654
Upper stem portion	105,683	1,811	1,335	5,263	97,274
Total	599,545	12,571	8,769	43,277	534,928
Poletimber	553,082	31,351	23,369	18,765	479,597
All growing-stock trees	1,152,627	43,922	32,138	62,042	1,014,525
Cull trees					
Short-log trees	145,652	318	1,172	9,125	135,037
Rough trees					
Sawtimber	336,405	319	3,686	16,599	315,801
Poletimber	285,772	1,426	4,862	19,624	259,860
Total	622,177	1,745	8,548	36,223	575,661
Rotten trees					
Sawtimber	106,504	--	--	6,009	100,495
Poletimber	13,361	--	--	694	12,667
Total	119,865	--	--	6,703	113,162
All cull trees	887,694	2,063	9,720	52,051	823,860
All live trees	2,040,321	45,985	41,858	114,093	1,838,385
Salvable dead trees					
Sawtimber	7,425	--	--	103	7,322
Poltetimber	3,950	--	--	137	3,813
Total	11,375	--	--	240	11,135
All classes of timber	2,051,696	45,985	41,858	114,333	1,849,520

Table 13.--Net volume of growing-stock trees on timberland by species group and diameter class, Northwest Ozarks Unit, Missouri, 1989

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height) 5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods											
Shortleaf pine	43,922	14,093	17,258	7,122	1,939	1,723	1,099	459	229	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	--	--	--	--	--	--	--	--	--	--	--
Eastern redcedar	32,138	12,947	10,422	4,627	2,492	1,346	138	166	--	--	--
Other softwoods	--	--	--	--	--	--	--	--	--	--	--
Total	76,060	27,040	27,680	11,749	4,431	3,069	1,237	625	229	--	--
Hardwoods											
Select white oak	275,520	22,902	33,127	41,985	46,800	42,210	45,949	20,570	11,401	8,839	1,737
Other white oak	217,736	45,015	52,929	40,198	31,728	24,106	15,727	5,875	1,711	244	203
Select red oak	61,040	2,061	5,033	7,841	13,949	9,304	7,692	4,836	1,985	8,059	280
Other red oak	324,964	33,817	55,159	53,861	55,476	50,119	35,437	19,583	9,576	9,838	2,098
Select hickory	46,930	9,192	10,268	9,180	7,905	4,722	2,032	2,247	751	633	--
Other hickory	47,580	12,951	10,841	11,582	4,427	4,341	1,810	1,193	255	180	--
Basswood	--	--	--	--	--	--	--	--	--	--	--
Beech	--	--	--	--	--	--	--	--	--	--	--
Hard maple	1,974	308	315	542	175	--	201	433	--	--	--
Soft maple	5,727	144	--	210	1,240	647	757	311	--	2,418	--
Elm	9,222	4,464	1,243	1,686	643	861	--	--	--	325	--
Ash	12,997	2,673	2,511	2,751	2,541	1,327	910	--	--	284	--
Sycamore	32,229	474	2,274	3,994	2,466	1,698	2,912	6,937	2,094	7,070	2,310
Cottonwood	725	--	--	--	219	252	254	--	--	--	--
Willow	2,430	201	674	184	--	1,021	350	--	--	--	--
Hackberry	7,611	1,194	724	302	701	2,178	725	1,298	222	267	--
Aspen	--	--	--	--	--	--	--	--	--	--	--
Birch	150	--	--	150	--	--	--	--	--	--	--
Sweetgum	--	--	--	--	--	--	--	--	--	--	--
Tupelo	2,626	--	--	134	614	549	258	742	--	--	329
Black cherry	1,321	84	678	101	--	--	458	--	--	--	--
Black walnut	20,457	1,979	1,858	4,859	4,627	3,744	1,578	1,188	624	--	--
Butternut	151	--	--	--	151	--	--	--	--	--	--
Yellow-poplar	--	--	--	--	--	--	--	--	--	--	--
Persimmon	1,059	862	197	--	--	--	--	--	--	--	--
Sassafras	678	577	101	--	--	--	--	--	--	--	--
Other hardwoods	3,440	484	545	943	683	320	--	465	--	--	--
Total	1,076,567	139,382	178,477	180,503	174,345	147,399	117,050	65,678	28,619	38,157	6,957
All species	1,152,627	166,422	206,157	192,252	178,776	150,468	118,287	66,303	28,848	38,157	6,957

Table 14.--Net volume of growing stock in the saw-log portion of sawtimber trees on timberland by species group and diameter class, Northwest Ozarks Unit, Missouri, 1989

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Shortleaf pine	10,760	5,734	1,714	1,604	1,044	442	222	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--
Baldcypress	--	--	--	--	--	--	--	--	--
Eastern redcedar	7,434	3,720	2,194	1,232	130	158	--	--	--
Other softwoods	--	--	--	--	--	--	--	--	--
Total	18,194	9,454	3,908	2,836	1,174	600	222	--	--
Hardwoods									
Select white oak	147,679	--	34,100	34,462	39,967	18,574	10,533	8,354	1,689
Other white oak	61,871	--	22,079	19,142	13,403	5,250	1,570	231	196
Select red oak	39,091	--	10,462	7,698	6,720	4,397	1,850	7,692	272
Other red oak	149,879	--	40,247	40,952	30,768	17,670	8,856	9,338	2,048
Select hickory	14,478	--	5,605	3,803	1,766	2,007	698	599	--
Other hickory	9,721	--	3,181	3,516	1,551	1,069	235	169	--
Basswood	--	--	--	--	--	--	--	--	--
Beech	--	--	--	--	--	--	--	--	--
Hard maple	698	--	131	--	174	393	--	--	--
Soft maple	4,696	--	905	543	662	281	--	2,305	--
Elm	1,429	--	443	672	--	--	--	314	--
Ash	3,967	--	1,834	1,076	787	--	--	270	--
Sycamore	23,174	--	1,826	1,404	2,567	6,366	1,963	6,772	2,276
Cottonwood	605	--	166	218	221	--	--	--	--
Willow	1,082	--	--	779	303	--	--	--	--
Hackberry	4,489	--	499	1,735	632	1,163	205	255	--
Aspen	--	--	--	--	--	--	--	--	--
Birch	--	--	--	--	--	--	--	--	--
Sweetgum	--	--	--	--	--	--	--	--	--
Tupelo	2,040	--	411	432	223	655	--	--	319
Black cherry	395	--	--	--	395	--	--	--	--
Black walnut	9,135	--	3,179	2,973	1,354	1,057	572	--	--
Butternut	104	--	104	--	--	--	--	--	--
Yellow-poplar	--	--	--	--	--	--	--	--	--
Persimmon	--	--	--	--	--	--	--	--	--
Sassafras	--	--	--	--	--	--	--	--	--
Other hardwoods	1,135	--	477	249	--	409	--	--	--
Total	475,668	--	125,649	119,654	101,493	59,291	26,482	36,299	6,800
All species	493,862	9,454	129,557	122,490	102,667	59,891	26,704	36,299	6,800

Table 15.--Net volume of sawtimber trees on timberland by species group and diameter class, Northwest Ozarks Unit, Missouri, 1989

(In thousand board feet)[1]

Species group	All classes	Diameter class (inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Shortleaf pine	64,172	35,562	10,080	9,040	5,764	2,472	1,254	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--
Baldcypress	--	--	--	--	--	--	--	--	--
Eastern redcedar	46,537	25,688	12,858	6,612	638	741	--	--	--
Other softwoods	--	--	--	--	--	--	--	--	--
Total	110,709	61,250	22,938	15,652	6,402	3,213	1,254	--	--
Hardwoods									
Select white oak	842,328	--	229,001	203,067	217,428	95,373	51,837	38,710	6,912
Other white oak	389,374	--	155,885	117,856	76,945	28,373	8,204	1,216	895
Select red oak	228,575	--	69,294	46,575	38,645	24,174	9,818	38,802	1,267
Other red oak	901,420	--	275,974	249,814	176,348	96,894	46,906	46,720	8,764
Select hickory	88,670	--	38,278	22,880	9,865	10,931	3,634	3,082	--
Other hickory	60,408	--	21,892	21,506	8,954	5,900	1,266	890	--
Basswood	--	--	--	--	--	--	--	--	--
Beech	--	--	--	--	--	--	--	--	--
Hard maple	3,829	--	831	--	955	2,043	--	--	--
Soft maple	23,273	--	5,388	2,840	3,320	1,366	--	10,359	--
Elm	8,233	--	3,013	3,883	--	--	--	1,337	--
Ash	23,248	--	11,499	6,133	4,276	--	--	1,340	--
Sycamore	115,667	--	10,905	7,686	13,421	32,635	9,918	32,736	8,366
Cottonwood	3,326	--	971	1,171	1,184	--	--	--	--
Willow	6,292	--	--	4,666	1,626	--	--	--	--
Hackberry	24,138	--	3,229	10,018	3,250	5,578	930	1,133	--
Aspen	--	--	--	--	--	--	--	--	--
Birch	--	--	--	--	--	--	--	--	--
Sweetgum	--	--	--	--	--	--	--	--	--
Tupelo	11,278	--	2,869	2,534	1,196	3,395	--	--	1,284
Black cherry	2,096	--	--	--	2,096	--	--	--	--
Black walnut	55,924	--	22,092	17,860	7,463	5,599	2,910	--	--
Butternut	700	--	700	--	--	--	--	--	--
Yellow-poplar	--	--	--	--	--	--	--	--	--
Persimmon	--	--	--	--	--	--	--	--	--
Sassafras	--	--	--	--	--	--	--	--	--
Other hardwoods	6,761	--	3,161	1,467	--	2,133	--	--	--
Total	2,795,540	--	854,982	719,956	566,972	314,394	135,423	176,325	27,488
All species	2,906,249	61,250	877,920	735,608	573,374	317,607	136,677	176,325	27,488

[1] International 1/4-inch rule.

Table 16.--Net volume of growing stock and sawtimber on timberland by county and species group, Northwest Ozarks Unit, Missouri, 1989

County	Growing stock					Sawtimber				
		Species group					Species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	Thousand cubic feet					*Thousand board feet* [1]				
Benton	91,779	--	2,194	3,744	85,841	213,013	--	3,482	11,137	198,394
Camden	131,621	--	2,572	1,333	127,716	413,360	--	10,403	2,545	400,412
Cedar	53,106	--	488	4,538	48,080	122,260	--	-	14,036	108,224
Dallas	78,237	--	1,162	6,056	71,019	218,107	--	1,206	21,387	195,514
Hickory	31,557	--	4,322	4,180	23,055	73,304	--	6,879	16,075	50,350
Laclede	107,300	6,761	1,969	3,085	95,485	236,329	2,639	961	8,123	224,606
Maries	70,887	5,027	3,314	5,795	56,751	170,463	10,957	4,216	9,307	145,983
Miller	102,715	--	3,651	4,279	94,785	298,067	--	5,183	14,652	278,232
Morgan	99,531	--	1,875	1,298	96,358	270,212	--	2,012	5,198	263,002
Phelps	147,140	22,081	2,421	5,237	117,401	320,811	31,111	6,055	20,738	262,907
Polk	54,119	--	5,864	1,988	46,267	121,284	--	2,420	2,386	116,478
Pulaski	116,468	10,053	1,250	12,843	92,322	282,191	19,465	-	43,821	218,905
St. Clair	68,167	--	1,056	7,666	59,445	166,848	--	3,720	25,598	137,530
All counties	1,152,627	43,922	32,138	62,042	1,014,525	2,906,249	64,172	46,537	195,003	2,600,537

[1] International 1/4-inch rule.

Table 17.--Net volume of live trees and growing stock on timberland by ownership class and species group, Northwest Ozarks Unit, Missouri, 1989

(In thousand cubic feet)

Ownership class	Live trees					Growing stock				
		Species group					Species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
National forest	147,902	37,617	203	2,211	107,871	103,064	35,554	203	1,598	65,709
Miscellaneous federal	98,238	3,341	3,126	15,886	75,885	55,538	3,341	2,252	11,093	38,852
State	26,186	5,027	--	1,051	20,108	18,902	5,027	--	373	13,502
County and municipal	2,876	--	--	--	2,876	890	--	--	--	890
Forest industry	--	--	--	--	--	--	--	--	--	--
Farmer	718,382	--	19,750	59,705	638,927	398,401	--	14,313	33,033	351,055
Miscellaneous private corporation	77,926	--	1,143	3,337	73,446	40,570	--	770	870	38,930
Miscellaneous private individual	968,811	--	17,636	31,903	919,272	535,262	--	14,600	15,075	505,587
All owners	2,040,321	45,985	41,858	114,093	1,838,385	1,152,627	43,922	32,138	62,042	1,014,525

Table 18.--Net volume of sawtimber trees on timberland by species group and butt log grade, Northwest Ozarks Unit, Missouri, 1989

(In thousand board feet)[1]

Species group	All grades	Butt log grade			
		1	2	3	Tie and timber
Softwoods					
Shortleaf pine	64,172	--	3,016	61,156	--
Other yellow pines	--	--	--	--	--
Baldcypress	--	--	--	--	--
Eastern redcedar	46,537	--	--	46,537 [2]	--
Other softwoods	--	--	--	--	--
Total	110,709	--	3,016	107,693	--
Hardwoods					
Select white oak	842,328	4,231	85,491	280,706	471,900
Other white oak	389,374	--	17,070	99,501	272,803
Select red oak	228,575	8,048	6,772	59,800	153,955
Other red oak	901,420	4,542	17,632	182,623	696,623
Select hickory	88,670	--	25,708	22,244	40,718
Other hickory	60,408	--	2,418	9,207	48,783
Basswood	--	--	--	--	--
Beech	--	--	--	--	--
Hard maple	3,829	--	--	1,795	2,034
Soft maple	23,273	--	--	10,913	12,360
Elm	8,233	--	--	--	8,233
Ash	23,248	--	23,248	--	--
Sycamore	115,667	22,945	7,205	69,979	15,538
Cottonwood	3,326	--	--	870	2,456
Willow	6,292	--	3,330	2,962	--
Hackberry	24,138	--	--	6,317	17,821
Aspen	--	--	--	--	--
Birch	--	--	--	--	--
Sweetgum	--	--	--	--	--
Tupelo	11,278	--	--	3,313	7,965
Black cherry	2,096	--	--	--	2,096
Black walnut	55,924	--	5,464	37,631	12,829
Butternut	700	--	68	471	161
Yellow-poplar	--	--	--	--	--
Persimmon	--	--	--	--	--
Sassafras	--	--	--	--	--
Other hardwoods	6,761	--	--	--	6,761
Total	2,795,540	39,766	194,406	788,332	1,773,036
All species	2,906,249	39,766	197,422	896,025	1,773,036

[1] International 1/4-inch rule.

[2] Includes 2,239 thousand board feet of volume from sawtimber-sized, Grade 5 eastern redcedar trees graded for specieal use. (See Log Grades for Eastern Redcedar in the Appendix.)

Table 19.--Net annual growth of growing stock and sawtimber on timberland by county and species group, Northwest Ozarks Unit, Missouri, 1988

County	Growing stock					Sawtimber				
	All species	Species group				All species	Species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	Thousand cubic feet					*Thousand board feet*[1]				
Benton	2,853	--	221	246	2,386	6,249	--	87	375	5,787
Camden	3,141	--	140	8	2,993	8,992	--	299	53	8,640
Cedar	1,125	--	18	189	918	2,277	--	--	568	1,709
Dallas	1,620	--	133	118	1,369	6,693	--	295	367	6,031
Hickory	1,121	--	246	136	739	2,289	--	321	797	1,171
Laclede	2,992	299	165	161	2,367	6,649	334	15	-38	6,338
Maries	2,239	181	358	288	1,412	5,466	742	137	500	4,087
Miller	2,535	--	353	132	2,050	6,843	--	177	691	5,975
Morgan	2,253	--	131	95	2,027	6,918	--	169	75	6,674
Phelps	3,500	339	144	145	2,872	10,714	2,109	188	287	8,130
Polk	1,755	--	489	144	1,122	3,510	--	127	193	3,190
Pulaski	2,750	388	162	344	1,856	6,369	780	--	888	4,701
St. Clair	1,981	--	35	382	1,564	7,726	--	250	822	6,654
All counties	29,865	1,207	2,595	2,388	23,675	80,695	3,965	2,065	5,578	69,087

[1] International 1/4-inch rule.

Table 19.--Net annual growth of growing stock and sawtimber on timberland by county and species group, Northwest Ozarks Unit, Missouri, 1988

County	Growing stock					Sawtimber				
		Species group					Species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	Thousand cubic feet					*Thousand board feet*[1]				
Benton	2,853	--	221	246	2,386	6,249	--	87	375	5,787
Camden	3,141	--	140	8	2,993	8,992	--	299	53	8,640
Cedar	1,125	--	18	189	918	2,277	--	--	568	1,709
Dallas	1,620	--	133	118	1,369	6,693	--	295	367	6,031
Hickory	1,121	--	246	136	739	2,289	--	321	797	1,171
Laclede	2,992	299	165	161	2,367	6,649	334	15	-38	6,338
Maries	2,239	181	358	288	1,412	5,466	742	137	500	4,087
Miller	2,535	--	353	132	2,050	6,843	--	177	691	5,975
Morgan	2,253	--	131	95	2,027	6,918	--	169	75	6,674
Phelps	3,500	339	144	145	2,872	10,714	2,109	188	287	8,130
Polk	1,755	--	489	144	1,122	3,510	--	127	193	3,190
Pulaski	2,750	388	162	344	1,856	6,369	780	--	888	4,701
St. Clair	1,981	--	35	382	1,564	7,726	--	250	822	6,654
All counties	29,865	1,207	2,595	2,388	23,675	80,695	3,965	2,065	5,578	69,087

[1] International 1/4-inch rule.

Table 20.--Average annual timber removals of growing stock and sawtimber on timberland by county and species group, Northwest Ozarks Unit, Missouri, 1988

County	Growing stock					Sawtimber				
		Species group					Species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	Thousand cubic feet					*Thousand board feet* [1]				
Benton	1,447	--	--	58	1,389	3,312	--	--	255	3,057
Camden	727	--	--	--	727	2,601	--	--	--	2,601
Cedar	373	--	--	175	198	1,783	--	--	836	947
Dallas	624	--	--	--	624	1,939	--	--	--	1,939
Hickory	760	--	--	--	760	1,399	--	--	--	1,399
Laclede	186	--	--	--	186	658	--	--	--	658
Maries	230	--	--	--	230	357	--	--	--	357
Miller	1,217	--	--	--	1,217	1,689	--	--	--	1,689
Morgan	828	--	--	--	828	3,006	--	--	--	3,006
Phelps	902	--	--	--	902	1,966	--	--	--	1,966
Polk	318	--	--	--	318	778	--	--	--	778
Pulaski	1,089	--	16	32	1,041	2,648	--	--	144	2,504
St. Clair	334	--	--	--	334	1,299	--	--	--	1,299
All counties	9,035	--	16	265	8,754	23,435	--	--	1,235	22,200

[1] International 1/4-inch rule.

Table 21.--Net annual growth and average annual removals of growing stock and sawtimber on timberland by species group, Northwest Ozarks Unit, Missouri, 1988

Species group	Growing stock		Sawtimber	
	Growth	Removals	Growth	Removals
	Thousand cubic feet		*Thousand board feet* [1]	
Softwoods				
Shortleaf pine	1,207	--	3,965	--
Other yellow pines	--	--	--	--
Baldcypress	--	--	--	--
Eastern redcedar	2,595	16	2,065	--
Other softwoods	--	--	--	--
Total	3,802	16	6,030	--
Hardwoods				
Select white oak	6,900	1,596	22,457	5,186
Other white oak	4,374	2,723	8,901	4,143
Select red oak	1,471	352	6,844	1,588
Other red oak	7,550	3,617	24,557	10,532
Select hickory	949	159	1,857	192
Other hickory	1,284	140	2,227	329
Basswood	--	--	--	--
Beech	--	--	--	--
Hard maple	43	--	330	--
Soft maple	220	--	1,222	--
Elm	599	--	215	--
Ash	339	19	495	--
Sycamore	947	233	2,287	1,091
Cottonwood	26	--	134	--
Willow	113	--	409	--
Hackberry	327	--	1,175	--
Aspen	--	--	--	--
Birch	--	--	--	--
Sweetgum	--	--	--	--
Tupelo	14	32	102	144
Black cherry	138	--	-32	--
Black walnut	467	94	1,352	230
Butternut	4	--	66	--
Yellow-poplar	--	--	--	--
Persimmon	18	--	--	--
Sassafras	50	20	-60	--
Other hardwoods	230	34	127	--
Total	26,063	9,019	74,665	23,435
All species	29,865	9,035	80,695	23,435

[1] International 1/4-inch rule.

Table 22.--Net annual growth and average annual removals of growing stock on timberland by ownership class and species group, Northwest Ozarks Unit, Missouri, 1988

(In thousand cubic feet)

Ownership class	Growth					Removals				
		Species group					Species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
National forest	1,899	899	11	14	975	361	--	--	--	361
Miscellaneous federal	1,293	127	92	276	798	249	--	--	--	249
State	751	181	--	2	568	--	--	--	--	--
County and municipal	-1	--	--	--	-1	--	--	--	--	--
Forest industry	--	--	--	--	--	--	--	--	--	--
Farmer	10,581	--	1,254	1,221	8,106	3,997	--	16	32	3,949
Miscellaneous private corporation	1,475	--	90	98	1,287	1,382	--	--	58	1,324
Miscellaneous private individual	13,867	--	1,148	777	11,942	3,046	--	--	175	2,871
All owners	29,865	1,207	2,595	2,388	23,675	9,035	--	16	265	8,754

Table 23.--Net annual growth and average annual removals of sawtimber on timberland by ownership class and species group, Northwest Ozarks Unit, Missouri, 1988

(In thousand board feet)[1]

Ownership class	Growth					Removals				
		Species group					Species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
National forest	4,008	3,223	--	101	684	1,178	--	--	--	1,178
Miscellaneous federal	4,932	--	209	928	3,795	639	--	--	--	639
State	1,783	742	--	19	1,022	--	--	--	--	--
County and municipal	56	--	--	--	56	--	--	--	--	--
Forest industry	--	--	--	--	--	--	--	--	--	--
Farmer	24,591	--	857	3,155	20,579	9,395	--	--	144	9,251
Miscellaneous private corporation	2,965	--	23	62	2,880	3,227	--	--	255	2,972
Miscellaneous private individual	42,360	--	976	1,313	40,071	8,996	--	--	836	8,160
All owners	80,695	3,965	2,065	5,578	69,087	23,435	--	--	1,235	22,200

[1] International 1/4-inch rule.

Table 24.--Annual mortality of growing stock and sawtimber on timberland by species group, Northwest Ozarks Unit, Missouri, 1988

Species group	Growing stock	Sawtimber
	Thousand cubic feet	*Thousand board feet*[1]
Softwoods		
Shortleaf pine	316	71
Other yellow pines	--	--
Baldcypress	--	--
Eastern redcedar	67	142
Other softwoods	--	--
Total	383	213
Hardwoods		
Select white oak	544	1,128
Other white oak	1,437	2,859
Select red oak	319	1,196
Other red oak	3,865	9,531
Select hickory	303	686
Other hickory	341	344
Basswood	--	--
Beech	--	--
Hard maple	12	18
Soft maple	41	124
Elm	327	407
Ash	140	164
Sycamore	425	1,473
Cottonwood	9	40
Willow	14	42
Hackberry	29	85
Aspen	--	--
Birch	--	--
Sweetgum	--	--
Tupelo	15	66
Black cherry	26	74
Black walnut	197	455
Butternut	--	--
Yellow-poplar	--	--
Persimmon	21	--
Sassafras	16	--
Other hardwoods	55	99
Total	8,136	18,791
All species	8,519	19,004

[1] International 1/4-inch rule.

Table 25.--Area of nonforest land with trees by county and land use class, Northwest Ozarks Unit, Missouri, 1989

(In thousand acres)

County	All classes	Land use class							
		Cropland with trees	Improved pasture with trees	Wooded strips	Idle farmland with trees	Marsh with trees	Urban and other with trees	Windbreaks	Wooded pasture
Benton	41.6	--	33.2	--	--	--	8.4	--	--
Camden	26.7	--	10.2	6.0	--	--	8.4	--	2.1
Cedar	21.7	--	7.7	4.3	--	--	--	--	9.7
Dallas	20.9	--	14.7	1.5	--	--	--	--	4.7
Hickory	21.8	--	9.5	--	--	--	5.3	2.4	4.6
Laclede	32.3	--	23.6	--	3.5	--	2.7	--	2.5
Maries	38.3	--	18.9	9.1	--	--	3.3	--	7.0
Miller	27.9	--	14.6	--	--	--	3.9	3.9	5.5
Morgan	22.2	--	18.8	--	--	--	3.4	--	--
Phelps	15.0	--	5.7	3.8	--	--	3.6	--	1.9
Polk	17.1	--	10.8	--	--	--	--	--	6.3
Pulaski	15.2	--	6.7	1.7	--	--	3.7	--	3.1
St. Clair	25.1	--	14.8	--	--	--	--	5.7	4.6
All counties	325.8	--	189.2	26.4	3.5	--	42.7	12.0	52.0

Table 26.--Net volume of short-log trees on timberland by species group and diameter class, Northwest Ozarks Unit, Missouri, 1989

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Shortleaf pine	318	318	--	--	--	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--
Baldcypress	--	--	--	--	--	--	--	--	--
Eastern redcedar	1,172	101	621	--	450	--	--	--	--
Other softwoods	--	--	--	--	--	--	--	--	--
Total	1,490	419	621	--	450	--	--	--	--
Hardwoods									
Select white oak	51,871	--	7,864	12,066	12,381	8,049	5,417	5,796	298
Other white oak	27,449	--	7,328	7,920	7,271	2,798	1,117	1,015	--
Select red oak	7,901	--	1,884	915	1,277	1,825	498	1,112	390
Other red oak	35,573	--	6,700	10,639	6,573	3,664	2,816	5,048	133
Select hickory	2,671	--	649	770	626	--	626	--	--
Other hickory	1,911	--	693	505	277	268	168	--	--
Basswood	--	--	--	--	--	--	--	--	--
Beech	--	--	--	--	--	--	--	--	--
Hard maple	--	--	--	--	--	--	--	--	--
Soft maple	2,271	--	--	--	186	606	209	406	864
Elm	2,066	--	1,154	688	--	224	--	--	--
Ash	2,125	--	730	508	509	177	--	201	--
Sycamore	2,937	--	198	227	829	177	--	1,293	213
Cottonwood	188	--	--	188	--	--	--	--	--
Willow	404	--	137	--	267	--	--	--	--
Hackberry	727	--	276	136	--	315	--	--	--
Aspen	--	--	--	--	--	--	--	--	--
Birch	--	--	--	--	--	--	--	--	--
Sweetgum	--	--	--	--	--	--	--	--	--
Tupelo	154	--	154	--	--	--	--	--	--
Black cherry	262	--	--	--	--	--	--	262	--
Black walnut	4,247	--	1,585	845	854	669	--	294	--
Butternut	116	--	116	--	--	--	--	--	--
Yellow-poplar	--	--	--	--	--	--	--	--	--
Persimmon	--	--	--	--	--	--	--	--	--
Sassafras	204	--	204	--	--	--	--	--	--
Other hardwoods	1,085	--	436	158	144	148	199	--	--
Total	144,162	--	30,108	35,565	31,194	18,920	11,050	15,427	1,898
All species	145,652	419	30,729	35,565	31,644	18,920	11,050	15,427	1,898

Table 27.--Net volume of short-log trees on timberland by species group and diameter class, Northwest Ozarks Unit, Missouri, 1989

(In thousand board feet) [1]

Species group	All classes	Diameter class (inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Shortleaf pine	1,424	1,424	--	--	--	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--
Baldcypress	--	--	--	--	--	--	--	--	--
Eastern redcedar	4,695	465	2,719	--	1,511	--	--	--	--
Other softwoods	--	--	--	--	--	--	--	--	--
Total	6,119	1,889	2,719	--	1,511	--	--	--	--
Hardwoods									
Select white oak	152,077	--	24,682	36,976	36,649	23,212	15,111	14,814	633
Other white oak	89,401	--	26,207	26,664	23,099	8,138	2,923	2,370	--
Select red oak	22,704	--	5,765	2,764	3,779	5,305	1,381	2,905	805
Other red oak	108,538	--	22,429	34,504	20,450	10,939	7,886	12,320	10
Select hickory	7,525	--	2,060	2,265	1,770	--	1,430	--	--
Other hickory	5,930	--	2,277	1,586	821	789	457	--	--
Basswood	--	--	--	--	--	--	--	--	--
Beech	--	--	--	--	--	--	--	--	--
Hard maple	--	--	--	--	--	--	--	--	--
Soft maple	5,662	--	--	--	482	1,575	540	1,040	2,025
Elm	6,596	--	3,709	2,224	--	663	--	--	--
Ash	6,560	--	2,329	1,614	1,580	529	--	508	--
Sycamore	6,845	--	422	517	1,760	413	--	3,184	549
Cottonwood	415	--	--	415	--	--	--	--	--
Willow	922	--	276	--	646	--	--	--	--
Hackberry	2,291	--	907	433	--	951	--	--	--
Aspen	--	--	--	--	--	--	--	--	--
Birch	--	--	--	--	--	--	--	--	--
Sweetgum	--	--	--	--	--	--	--	--	--
Tupelo	446	--	446	--	--	--	--	--	--
Black cherry	618	--	--	--	--	--	--	618	--
Black walnut	14,493	--	5,848	3,005	2,868	2,107	--	665	--
Butternut	337	--	337	--	--	--	--	--	--
Yellow-poplar	--	--	--	--	--	--	--	--	--
Persimmon	--	--	--	--	--	--	--	--	--
Sassafras	593	--	593	--	--	--	--	--	--
Other hardwoods	3,088	--	1,268	455	414	411	540	--	--
Total	435,041	--	99,555	113,422	94,318	55,032	30,268	38,424	4,022
All species	441,160	1,889	102,274	113,422	95,829	55,032	30,268	38,424	4,022

[1] International 1/4-inch rule.

Table 28.--Net volume of growing stock on timberland by species group and forest type, Northwest Ozarks Unit, Missouri, 1989

(In thousand cubic feet)

Species group	All types	Forest type											
		Short-leaf pine	Eastern redcedar	Eastern redcedar-hardwood	Shortleaf pine - oak	Post-blackjack oak	Black-scarlet oak	White oak	Oak-gum-cypress	Elm-ash-soft maple	Cotton-wood	Maple-beech	Non-stocked[1]
Softwoods													
Shortleaf pine	43,922	38,298	--	--	2,879	627	850	1,268	--	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	--	--	--	--	--	--	--	--	--	--	--	--	--
Eastern redcedar	32,138	203	11,305	9,253	--	5,463	3,044	1,906	83	145	--	736	--
Other softwoods	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	76,060	38,501	11,305	9,253	2,879	6,090	3,894	3,174	83	145	--	736	--
Hardwoods													
Select white oak	275,520	--	435	1,244	960	27,015	86,941	157,159	--	--	--	1,766	--
Other white oak	217,736	402	1,169	6,315	101	160,729	39,862	8,588	--	--	--	570	--
Select red oak	61,040	406	--	528	114	6,212	34,976	17,939	--	324	--	541	--
Other red oak	324,964	2,066	437	2,448	929	63,299	223,465	30,363	153	589	--	1,215	--
Select hickory	46,930	386	--	583	--	14,805	21,315	6,530	--	1,914	--	1,397	--
Other hickory	47,580	248	--	347	97	20,799	19,586	5,180	--	227	--	1,096	--
Basswood	--	--	--	--	--	--	--	--	--	--	--	--	--
Beech	--	--	--	--	--	--	--	--	--	--	--	--	--
Hard maple	1,974	--	--	--	--	--	334	1,640	--	--	--	--	--
Soft maple	5,727	--	--	--	--	--	617	--	--	4,791	--	319	--
Elm	9,222	124	--	500	--	1,108	2,745	2,122	--	1,315	--	1,308	--
Ash	12,997	--	199	--	--	1,255	1,954	1,899	--	2,810	--	4,880	--
Sycamore	32,229	--	--	476	--	603	6,872	7,438	--	11,065	--	5,775	--
Cottonwood	725	--	--	--	--	--	--	--	--	--	--	725	--
Willow	2,430	--	--	--	--	--	--	--	--	2,430	--	--	--
Hackberry	7,611	--	--	--	--	693	398	3,123	--	3,286	--	111	--
Aspen	--	--	--	--	--	--	--	--	--	--	--	--	--
Birch	150	--	--	--	--	--	--	--	--	150	--	--	--
Sweetgum	--	--	--	--	--	--	--	--	--	--	--	--	--
Tupelo	2,626	--	--	--	--	--	998	1,443	--	--	--	185	--
Black cherry	1,321	--	--	--	--	396	631	84	--	210	--	--	--
Black walnut	20,457	--	194	184	--	2,156	7,332	5,227	--	829	--	4,535	--
Butternut	151	--	--	--	--	--	151	--	--	--	--	--	--
Yellow-poplar	--	--	--	--	--	--	--	--	--	--	--	--	--
Persimmon	1,059	--	--	68	--	--	376	498	--	--	--	117	--
Sassafras	678	--	--	258	--	101	234	85	--	--	--	--	--
Other hardwoods	3,440	--	198	--	--	140	1,788	218	--	455	--	641	--
Total	1,076,567	3,632	2,632	12,951	2,201	299,311	450,575	249,536	153	30,395	--	25,181	--
All species	1,152,627	42,133	13,937	22,204	5,080	305,401	454,469	252,710	236	30,540	--	25,917	--

[1] Nonstocked with all live trees.

Table 29.--Net volume of sawtimber on timberland by species group and forest type, Northwest Ozarks Unit, Missouri, 1989

(In thousand board feet) [1]

Species group	All types	Forest type: Shortleaf pine	Eastern redcedar	Eastern redcedar-hardwood	Shortleaf pine - oak	Post-blackjack oak	Black-scarlet oak	White oak	Oak-gum-cypress	Elm-ash-soft maple	Cotton-wood	Maple-beech	Non-[2] stocked
Softwoods													
Shortleaf pine	64,172	43,125	--	--	11,104	--	3,396	6,547	--	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	--	--	--	--	--	--	--	--	--	--	--	--	--
Eastern redcedar	46,537	--	21,741	12,787	--	2,765	7,048	1,579	--	--	--	617	--
Other softwoods	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	110,709	43,125	21,741	12,787	11,104	2,765	10,444	8,126	--	--	--	617	--
Hardwoods													
Select white oak	842,328	--	1,101	--	1,882	76,582	244,095	511,024	--	--	--	7,644	--
Other white oak	389,374	--	1,448	10,942	--	256,386	93,413	25,808	--	--	--	1,377	--
Select red oak	228,575	--	--	1,262	--	16,677	136,577	70,431	--	1,586	--	2,042	--
Other red oak	901,420	2,402	1,502	4,183	1,947	123,908	652,537	108,029	761	2,586	--	3,565	--
Select hickory	88,670	--	--	1,183	--	21,378	43,804	8,515	--	9,258	--	4,532	--
Other hickory	60,408	--	--	1,176	--	25,907	22,987	9,072	--	--	--	1,266	--
Basswood	--	--	--	--	--	--	--	--	--	--	--	--	--
Beech	--	--	--	--	--	--	--	--	--	--	--	--	--
Hard maple	3,829	--	--	--	--	--	--	3,829	--	--	--	--	--
Soft maple	23,273	--	--	--	--	--	2,058	--	--	19,837	--	1,378	--
Elm	8,233	--	--	--	--	--	--	3,293	--	2,486	--	2,454	--
Ash	23,248	--	--	--	--	1,340	1,508	4,985	--	12,053	--	3,362	--
Sycamore	115,667	--	--	802	--	1,543	21,895	25,863	--	42,998	--	22,566	--
Cottonwood	3,326	--	--	--	--	--	--	--	--	--	--	3,326	--
Willow	6,292	--	--	--	--	--	--	--	--	6,292	--	--	--
Hackberry	24,138	--	--	--	--	2,599	--	9,860	--	11,679	--	--	--
Aspen	--	--	--	--	--	--	--	--	--	--	--	--	--
Birch	--	--	--	--	--	--	--	--	--	--	--	--	--
Sweetgum	--	--	--	--	--	--	--	--	--	--	--	--	--
Tupelo	11,278	--	--	--	--	--	3,762	6,677	--	--	--	839	--
Black cherry	2,096	--	--	--	--	--	1,137	--	--	959	--	--	--
Black walnut	55,924	--	890	867	--	6,272	16,713	16,254	--	3,985	--	10,943	--
Butternut	700	--	--	--	--	--	700	--	--	--	--	--	--
Yellow-poplar	--	--	--	--	--	--	--	--	--	--	--	--	--
Persimmon	--	--	--	--	--	--	--	--	--	--	--	--	--
Sassafras	--	--	--	--	--	--	--	--	--	--	--	--	--
Other hardwoods	6,761	--	--	--	--	--	4,785	1,013	--	--	--	963	--
Total	2,795,540	2,402	4,941	20,415	3,829	532,592	1,245,971	804,653	761	113,719	--	66,257	--
All species	2,906,249	45,527	26,682	33,202	14,933	535,357	1,256,415	812,779	761	113,719	--	66,874	--

[1] International 1/4-inch rule.

[2] Nonstocked with all live trees.

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In 1989 the fourth forest inventory of the Northwest Ozarks found 2.2 million acres of timberland, an increase of nearly 13 percent since 1972. This bulletin presents highlights and statistics on area, volume, growth, removals, and mortality.

KEY WORDS: Area, volume, growth, removals, mortality.