



Forests of Missouri, 2017

This resource update provides an overview of forest resources in Missouri based on an inventory conducted by the USDA Forest Service, Forest Inventory and Analysis (FIA) program at the Northern Research Station in cooperation with the Missouri Department of Conservation. Estimates are based on field data collected using the FIA annualized sample design and are updated yearly. Information about the national and regional FIA program is available online at <http://fia.fs.fed.us>. For the 2017 inventory, estimates for current variables such as area, volume, and biomass are based on 7,517 plot samples collected from 2011–2017. Change variables, such as net growth, removals, and mortality, are based on 7,348 samples collected in 2006–2011 and 2011–2017. Estimates from earlier annual and periodic inventories are shown for comparison. See Bechtold and Patterson (2005), O’Connell et al. (2017), and Gormanson et al. (2017) for definitions and technical details.

Overview

The forest land area of Missouri in 2017 is estimated at 15.3 million acres (Table 1). Forest land and timberland area remain stable. While the number of trees has decreased by 4 percent since 2012, net volume and biomass increased. Net volume increased nearly 3 percent on both forest land and timberland. Average annual net growth decreased by 15.7 percent on forest land and 16.9 percent on timberland, largely the result of increased mortality. Average annual mortality increased by 31.6 percent on forest land and by 29.3 percent on timberland. Oak decline continues to be a driving force behind high mortality rates. All types of removals on both timberland and forest land decreased. Although the ratio of net growth to removals for forest land is 2:1, it is lower for certain key species. A complete set of inventory tables is available at <https://doi.org/10.2737/FS-RU-146>.

Table 1.—Missouri forest statistics, change between 2012 and 2017. Volumes are for trees 5 inches and larger in diameter. Number of trees and biomass are for trees 1 inch and larger in diameter. Sampling errors and error bars shown in tables and figures in this report represent 68 percent confidence intervals.

	2017 Estimate	Sampling error (percent)	2012 Estimate	Sampling error (percent)	Change since 2012 (percent)
Forest Land					
Area (thousand acres)	15,346.3	0.7	15,484.7	0.7	-0.9
Number of live trees (million trees)	7,988.8	1.2	8,309.2	1.3	-3.9
Aboveground biomass of live trees (thousand oven-dry tons)	653,814.9	1.0	641,017.3	1.0	2.0
Net volume of live trees (million ft ³)	21,517.3	1.1	20,928.3	1.1	2.8
Annual net growth live trees (thousand ft ³ /yr)	362,540.5	4.3	430,231.3	3.5	-15.7
Annual mortality of live trees (thousand ft ³ /yr)	343,062.1	3.5	260,672.3	3.6	31.6
Annual harvest removals of live trees (thousand ft ³ /yr)	156,343.0	8.2	184,675.2	8.0	-15.3
Annual other removals of live trees (thousand ft ³ /yr)	22,207.7	22.7	22,327.5	28.3	-0.5
Timberland					
Area (thousand acres)	14,791.4	0.8	14,941.7	0.8	-1.0
Number of live trees (million trees)	7,699.5	1.3	8,004.5	1.3	-3.8
Aboveground biomass of live trees (thousand oven-dry tons)	631,217.8	1.0	619,404.7	1.1	1.9
Net volume of live trees (million ft ³)	20,768.2	1.2	20,221.7	1.2	2.7
Net volume of growing-stock trees (million ft ³)	16,431.9	1.3	16,414.1	1.4	0.1
Annual net growth of growing-stock trees (thousand ft ³ /yr)	296,418.6	3.9	356,644.8	3.2	-16.9
Annual mortality of growing-stock trees (thousand ft ³ /yr)	218,974.8	4.0	169,397.3	4.1	29.3
Annual harvest removals of growing-stock trees (thousand ft ³ /yr)	129,386.0	8.9	157,241.2	8.4	-17.7
Annual other removals of growing-stock trees (thousand ft ³ /yr)	15,982.3	26.1	26,873.5	23.9	-40.5



Forest Area

At the time of the first forest inventory in 1947, the area of forest land in Missouri was estimated to be 15.2 million acres (Fig. 1). Forest land area reached an all time low in 1972 at 12.9 million acres. Since 1972 the area of forest land has increased steadily. Although the most recent survey shows a decrease of less than 1 percent, the area of forest land remains stable. Timberland area is currently estimated at 14.8 million acres, or 96 percent of total forest land. Two percent of forest land is on public land that is reserved from timber production. One percent is considered unproductive (unable to produce ≥ 20 cubic feet per acre per year). For context, the total area of land in Missouri is 44.6 million acres, making 34 percent of the state forested.

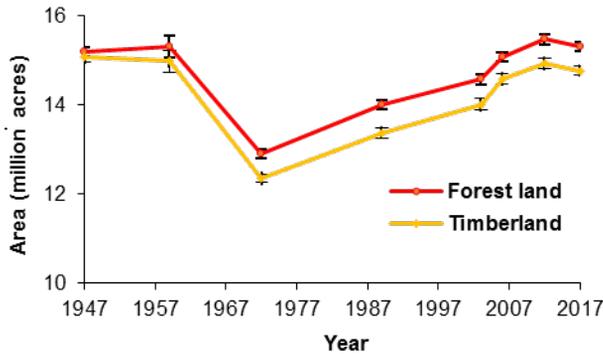


Figure 1.—Area of forest land and timberland in Missouri, 1947 to 2017.

Forest land in Missouri is 82 percent privately owned (Fig. 2). Twelve percent is federally owned with the bulk of that (10 percent) belonging to the Mark Twain National Forest. State and local government ownership accounts for the remaining 6 percent.

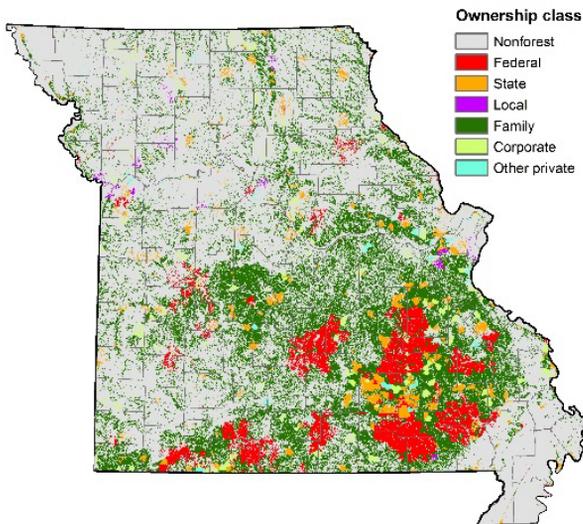


Figure 2.—Forest land area by ownership class, Missouri 2014.

Missouri’s timberland continues to mature as can be seen in the distribution of timberland by stand-size classes (Fig. 3). Between 2012 and 2017, the area of timberland in the large diameter stand-size class increased by 3 percent. The period from 2006 to 2012 showed a more dramatic increase of 11 percent. The decrease in timberland area of timberland in the medium diameter stand-size class also slowed, decreasing just 2 percent from 4.6 million acres in 2012 to 4.5 million acres in 2017. With a decrease of 14 percent, the area of timberland in the small diameter stand-size class continues to decrease at a similar rate as it did from 2006 to 2012.

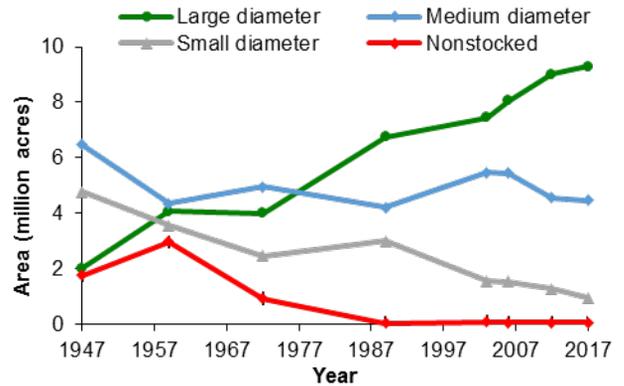


Figure 3.—Timberland area by stand-size class and year, Missouri, 1947 to 2017.

Eighty percent of the forest land area in the State is in the oak/hickory forest-type group (Fig 4). Nearly 8 million acres of that group is in the large diameter stand-size class. The other prominent forest-type groups in Missouri are elm/ash/cottonwood, oak/pine, other eastern softwoods (eastern redcedar), and loblolly/shortleaf pine.

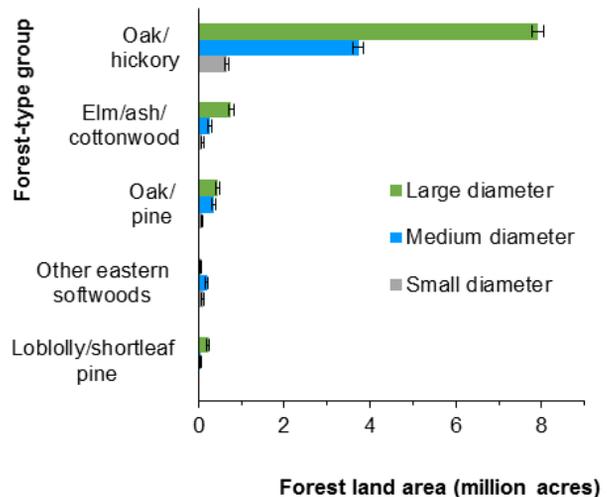


Figure 4.—Forest land area by stand-size class for top five forest-type groups Missouri, 2017. Note: Large diameter stands; 9.0 inches and above for softwoods and 11.0 inches and above for hardwoods. Medium: 5.0 to 8.9 inches for softwoods, 5.0 to 10.9 inches for hardwoods. Small: trees less than 5.0 inches in diameter.

Volume, Biomass, and Trends

The most numerous tree species in Missouri continues to be eastern redcedar (Table 2). The number of redcedar trees increased by 4 percent from 2012 to 2017. The number of white oak (*Quercus alba*) trees has decreased by 3 percent since 2012, but it continues to be the most voluminous species, and its volume increased by 1 percent.

Net volume increased on both forest land (2.8 percent) and timberland (2.7 percent) from 2012 to 2017. This was true for most major species as well. Notable exceptions were northern red oak (*Quercus rubra*) and scarlet oak (*Quercus coccinea*), which showed decreases of 7.3 and 19.3 percent in net volume on forest land, respectively. Although black oak (*Quercus velutina*) showed a decline in number of trees one would expect with high mortality, the species actually had a small increase in net volume. This is explained by a high number of trees in larger diameter classes.

Aboveground live tree biomass on forest land increased 2.0 percent to 653.8 million short tons from 2012 to 2017.

Timberland showed a similar increase of 1.9 percent to 631.2 million short tons.

Average annual mortality for white oak on timberland doubled to 39 million cubic feet from 2012 to 2017, resulting in a 29 percent decrease in annual net growth. Average annual removals of white oak decreased by 17 percent over this same period. Removals for black oak also decreased by 43 percent.

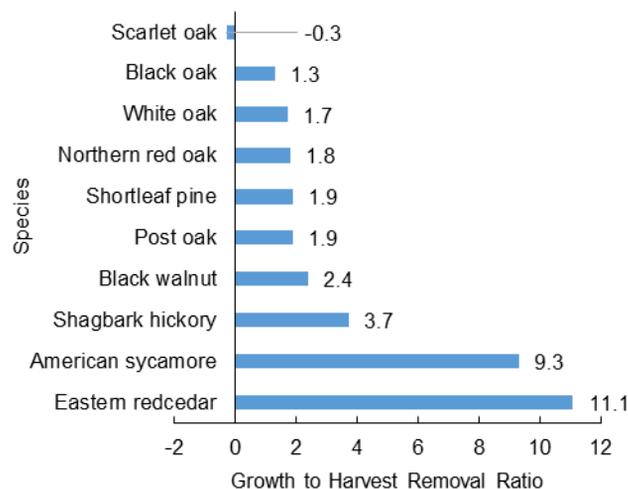


Figure 5.— Net growth to harvest removal ratio, of live trees on timberland, top ten species by volume, Missouri 2017. Ratio estimates are based on plot area that was timberland at both the beginning and end of the remeasurement period.

The large ratio of net growth to harvest removal for redcedar is explained by low mortality and harvest (Fig. 5, Table 2). Fifty-one percent of redcedar trees are in the medium diameter stand-size class. Scarlet oak continues to experience increasing levels of mortality. It was the only major species in the State with a negative ratio of annual net growth to harvest. Average annual net growth for scarlet oak decreased by 98 percent from 2012 to 2017.

Table 2.— Number, net volume, aboveground biomass of live trees on forest land and net growth, mortality, and removals of growing-stock trees on timberland, Missouri, 2017, for selected species of importance

Species	Forest land			Timberland		
	Trees (millions) ^a	Net volume (million ft ³) ^b	Aboveground biomass (thousand tons) ^a	Net growth (million ft ³ /yr) ^b	Mortality (million ft ³ /yr) ^b	Removals (million ft ³ /yr) ^b
White oak	708.8	4234.7	126,656.6	52.2	39.2	28.6
Black oak	412.4	2920.4	85,429.1	35.4	46.2	23.4
Post oak	420.7	2130.7	68,499.7	16.8	14.0	11.7
Shortleaf pine	130.9	997.9	20,685.0	17.0	7.9	8.9
Northern red oak	106.2	942.4	27,852.1	15.7	8.7	7.4
Eastern redcedar	817.4	822.6	20,753.6	9.2	1.4	1.4
Black walnut	112.5	734.7	18,777.7	19.5	2.5	10.4
Shagbark hickory	193.7	611.7	21,568.8	11.0	2.4	3.0
Scarlet oak	72.3	488.4	15,775.8	0.2	18.8	12.6
American sycamore	25.3	459.2	9,514.7	13.7	2.5	1.1
White ash	185.2	257.5	8,709.2	0.5	5.3	0.8
Green ash	88.3	209.4	6,202.9	4.6	1.2	3.3

^a Trees at least 1-inch in diameter. ^b Trees at least 5-inches in diameter.

Urban Forest Inventory

The USDA Forest Service is expanding its forest inventory program to include urban areas. New urban FIA protocols have been developed and are now being used to evaluate the composition and health of urban trees and forests. Urban trees provide shade, sequester carbon, and protect soil and water quality. Understanding the distribution and condition of urban trees and the associated trends will allow communities to make decisions that will ensure these benefits extend to future generations. See USDA Forest Service 2016 for details.

Urban FIA is being implemented by identifying Core Based Statistical Areas (CBSA) containing hub cities with a population greater than 200,000. The Office of Management and Budget (OMB) identifies a CBSA as an urban area with a population of at least 10,000 people and the surrounding areas that are socioeconomically tied to it through commuting.

Urban areas and urban clusters (UAUC's) are the two types of urban areas defined by the U.S. Census Bureau in its urban-rural classification system. The Census Bureau defines an urbanized area as one that contains an urban nucleus of 50,000 or more people. An urban cluster contains a nucleus of 2,500 people but less than 50,000. Within the UAUC, plots are sampled at the base rate of one plot per 6,000 acres. Hub cities containing more than 200,000 people are intensified to at least 200 plots. See USDA Forest Service 2017 for more details.

In 2015, the Northern Research Station's FIA program began sampling plots in the St. Louis metropolitan area. In 2016, Kansas City and Springfield were added to the sample. Cooperation from the Missouri Department of Conservation has allowed the first cycle of plots to be intensified above the base sample. Accelerated sampling will have the first cycle of the inventory completed by the end of September 2018. Once the first cycle is complete, remeasurement of those plots will begin. To date, 679 plots have already been sampled. The Kansas City and St. Louis sampling area includes parts of the cities in Kansas and Illinois respectively (Fig. 6).

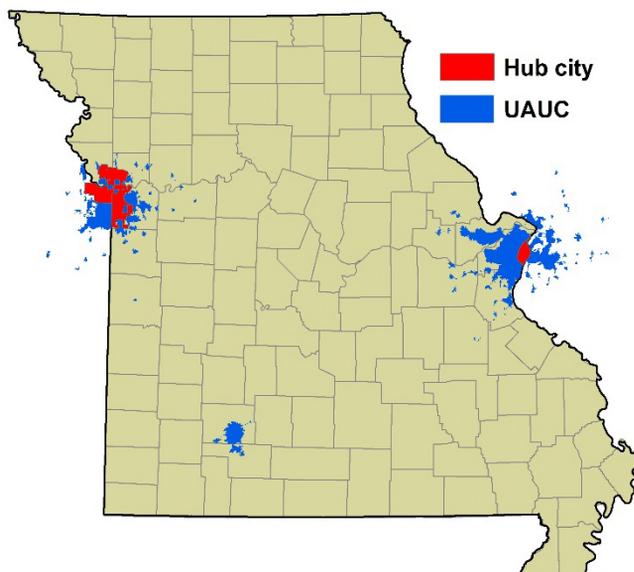


Figure 6.—Urbanized areas/urban clusters(UAUC) and hub cities, Kansas City, St. Louis, and Springfield, Missouri, 2017.

Literature Cited

- Bechtold, W.A.; Patterson, P.L., eds. 2005. **The enhanced Forest Inventory and Analysis program: national sampling design and estimation procedures.** Gen. Tech. Rep. SRS-80. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 85 p. <https://doi.org/10.2737/SRS-GTR-80>.
- Gomanson, D.D.; Pugh, S.A.; Barnett, C.J. [et al.]. 2017. **Statistics and quality assurance for the Northern Research Station Forest Inventory and Analysis program, 2016.** Gen. Tech. Rep. NRS-166. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 23 p. <https://doi.org/10.2737/NRS-GTR-166>.
- O'Connell, B.M.; Conkling, B.L.; Wilson, A.M. [et al.] 2017. **The Forest Inventory and Analysis database: Database description and user guide version 7.0 for Phase 2.** U.S. Department of Agriculture, Forest Service. 830 p. <http://www.fia.fs.fed.us/library/database-documentation/> (accessed December 13, 2017).
- USDA Forest Service. 2016. **Urban FIA urban Forest Inventory & Analysis.** Washington, DC: U.S. Department of Agriculture, Forest Service. <http://www.fs.fed.us/research/urban/fia> (accessed December 13, 2017).
- USDA Forest Service. 2017. **Forest Inventory and Analysis national urban FIA plot field guide volume I: field data collection procedures for urban FIA plots, version 7.1.** <https://www.nrs.fs.fed.us/fia/urban/> (accessed December 21, 2017).

How to Cite This Publication

Goff, Thomas C. 2018.

Forests of Missouri, 2017. Resource Update FS-146. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 4 p. <https://doi.org/10.2737/FS-RU-146>.

Northern FIA: <http://nrs.fs.fed.us/fia/>

National FIA: <http://fia.fs.fed.us>

Contact Information

Thomas Goff, Forester
USDA Forest Service, Northern Research Station
1301 S. Main
Salem, MO 65560
Ph: 573-729-6656
tgoff@fs.fed.us

USDA is an equal opportunity provider and employer

The published report is available online at <https://doi.org/10.2737/FS-RU-146>.