USDA
United States Department of Agriculture

RESOURCE UPDATE FS-76

Forests of Missouri, 2015

This resource update provides an overview of forest resources in Missouri based on an inventory conducted by the U.S. 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 2015 inventory, estimates for current variables such as area, volume, and biomass are based on 7,821 plot samples collected from 2010 to 2015. Change variables such as net growth, removals, and mortality are based on 7,351 samples collected in 2005-2010 and 2010-2015. Estimates from earlier annual and periodic inventories are shown for comparison. See Bechtold and Patterson (2005) and O'Connell et al. (2013) for definitions and technical details.

Overview

The forest land area of Missouri in 2015 is estimated at 15.4 million acres (Table 1). The small decrease in forest land area from 2010 to 2015 is within the margin of error, so it can be said that the area of forest land has remained unchanged. The number of live trees on Missouri's forest land in 2015 was estimated at 8.1 billion trees, a decrease of 4.2 percent from 2010. Live tree aboveground biomass increased by 2 percent on both forest land and timberland, and net volume increased by 3 percent on both forest land and timberland. Average annual net growth decreased by 30 percent on both forest land and timberland, largely the result of increased mortality. Average annual mortality increased by greater than 50 percent on both forest land and timberland. Average annual removals decreased by less than 1 percent on forest land and by 3 percent on timberland.

Table 1.—Missouri forest statistics and change between 2010 and 2015

	2015 Estimate	Sampling error (percent)	2010 Estimate	Sampling error (percent)	Change since 2010 (percent)
Forest Land					
Area (thousand acres)	15,408.7	0.68	15,492.0	0.71	-0.54
Number of live trees ≥1 in d.b.h (million trees)	8,064.2	1.24	8,415.1	1.30	-4.17
Aboveground biomass of live trees ≥ 1 in d.b.h (thousand oven-dry tons)	647,967.2	0.95	632,906.4	0.98	2.38
Net volume of live trees ≥5 in d.b.h (million ft^3)	21,251.5	1.08	20,615.0	1.13	3.09
Annual net growth live trees ≥5 in d.b.h (thousand ft^3/yr)	368,440.6	4.31	525,219.2	3.62	-29.85
Annual mortality of live trees ≥5 in d.b.h (thousand ft^3/yr)	331,713.5	3.56	218,785.5	4.24	51.62
Annual harvest removals of live trees ≥5 in d.b.h (thousand ft^3/yr)	174,550.2	8.20	170,327.1	8.02	2.48
Annual other removals of live trees ≥5 in d.b.h (thousand ft^3/yr)	19,904.5	23.62	24,664.1	25.83	-19.30
Timberland					
Area (thousand acres)	14,850.3	0.76	14,989.7	0.78	-0.93
Number of live trees ≥1 in d.b.h. (million trees)	7,779.3	1.31	8,125.1	1.36	-4.26
Aboveground biomass of live trees ≥1 in d.b.h. (thousand oven-dry tons)	625,457.7	1.03	612,940.3	1.05	2.04
Net volume of live trees ≥5 in d.b.h. (million ft^3)	20,504.5	1.16	19,959.5	1.19	2.73
Net volume of growing stock trees ≥5 in d.b.h. (million ft^3)	16,398.6	1.33	16,406.5	1.35	-0.05
Annual net growth of growing stock trees ≥5 in d.b.h. (million ft^3/yr)	303,435.4	3.81	435,630.8	3.28	-30.35
Annual mortality of growing stock trees ≥5 in d.b.h. (million ft^3/yr)	212,937.7	4.04	138,963.0	4.61	53.23
Annual harvest removals of growing stock trees ≥5 in d.b.h. (million ft^3/yr)	147,864.9	8.73	146,710.0	8.48	0.79
Annual other removals of growing stock trees ≥5 in d.b.h. (million ft^3/yr)	17,461.3	24.15	23,712.3	25.52	-26.36

Forest Area

Since plummeting after the 1959 inventory, both forest land and timberland area have been increasing since 1972. (Fig. 2). Even though there has been a less than 1 percent decrease in forest land area since 2010, there are still more acres of forest land then there were during the first inventory of Missouri forests in 1947. Timberland accounts for 96 percent of this forest land or 14.9 million acres. Two percent of forest land is reserved from timber production and 1 percent is other forest land identified as being unable to meet minimum productivity standards (unable to produce in excess of 20 cubic feet per acre per year of industrial wood in natural stands). Missouri's total area is 44.6 million acres (including land and water area).

The Eastern Ozarks Unit accounts for only 14 percent of Missouri's area but has 28 percent of the forests (Fig. 2). The Prairie Unit covers 44 percent of the State but only accounts for 22 percent of forests in Missouri. The Southwestern Ozarks Unit accounts for 18 percent of Missouri's forest land, and the Northwestern Ozarks and Riverborder Units each account for 16 percent.

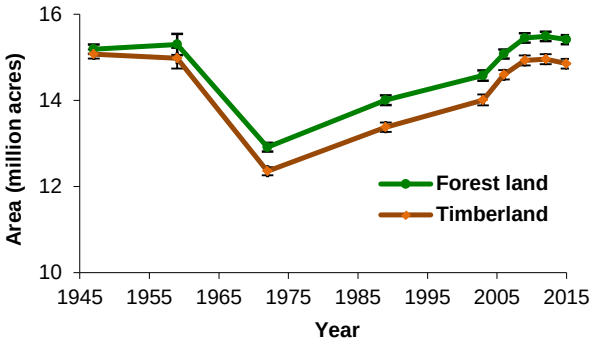


Figure 1.—Area of forest land and timberland in Missouri by year.

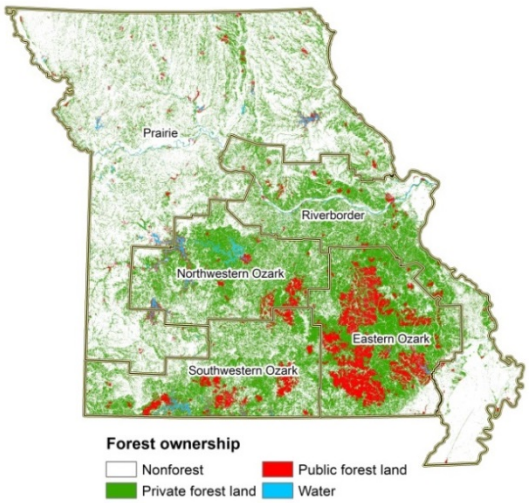


Figure 2.—FIA unit boundaries and area of forest/nonforest with forest identified by major ownership group, Missouri, 2015.

More than 80 percent of the forest land area in Missouri is comprised of the oak hickory forest-type group (Fig. 3). The elm/ash/cottonwood is the second largest forest-type group, but accounts for only 7 percent of the area. Nonstocked forest land accounts for less than 1 percent of the area.

Eighty-two percent of Missouri forest land area is privately owned. The Mark Twain National Forest accounts for 10 percent of the remaining forest land ownership; State and local governments account for 6 percent; and other federal ownerships account for 2 percent. Ownership of timberland almost mirrors that of forest land with 84 percent privately owned, 9 percent for the Mark Twain National Forest, 5 percent in State and local government ownership, and 2 percent for other federal ownerships.

Missouri's forests have been maturing as can be seen in the distribution of timberland by stand-size classes (Fig. 4). Between 2005 and 2015, the acreage of large-diameter stands increased by 23 percent while the acreage of medium diameter stands decreased by 13 percent and small diameter stands decreased by 19 percent.

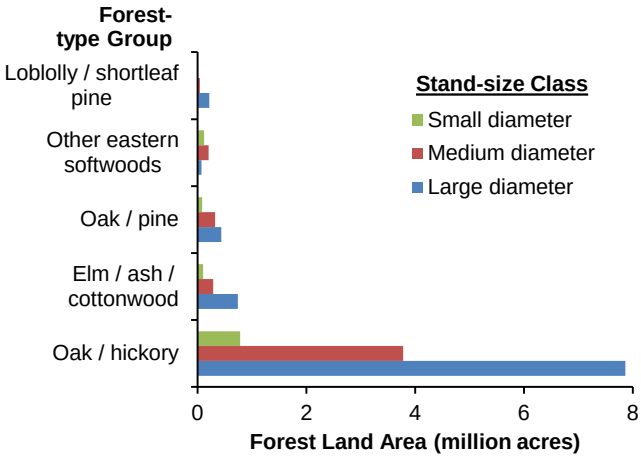


Figure 3.—Forest land area by stand-size class for top five forest-type groups, Missouri, 2015.

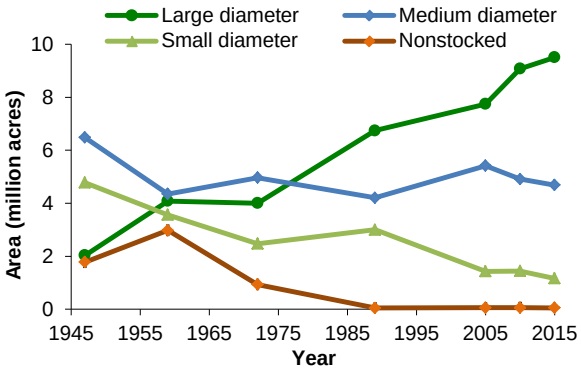


Figure 4.—Timberland area by stand-size class and year, Missouri.

Volume, Biomass, and Trends

FIA field crews recorded 89 tree species on Missouri forest land during 2010-2015. Two-thirds of Missouri's 21.3 billion cubic feet of live tree volume is represented by just 10 species (Table 2). Oak species make up 58 percent of the live tree volume, with white oak (*Quercus alba*) alone accounting for 20 percent of the total. Mortality, mostly due to disease and weather, resulted in an 8 percent decrease of live tree volume for northern red oak (*Quercus rubra*) and a 20 percent decrease for scarlet oak (*Quercus coccinea*). Even though eastern redcedar is the most numerous tree species in Missouri forests, and ranks 6th in terms of live volume on forest land, it is ranked 24th in terms of sawtimber volume on timberland.

The aboveground live tree biomass on forest land increased from 632.9 million short tons in 2010 to 648.0 million short tons in 2015. Most aboveground tree biomass is in the bole (70 percent), followed by tops and limbs (17 percent), saplings (9 percent), and stumps (4 percent) (Fig. 5).

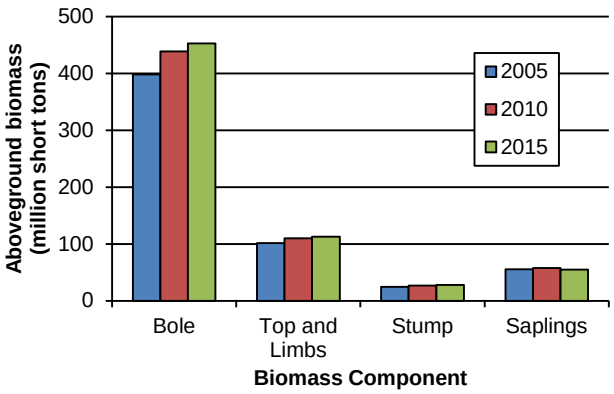


Figure 5.—Aboveground dry weight of live trees (at least 1 inch d.b.h./d.r.c.) on forest land by tree component and year, Missouri.

Average annual net growth (equivalent to annual gross growth less annual mortality) on forest land slowed from 525.2 million cubic feet per acre per year for 2005 to 2010 to 368.4 million cubic feet per acer per year for 2010 to 2015. The major reason for this decrease is the high mortality rate for some of the oak species, particularly, scarlet oak and black oak (*Quercus velutina*). Oaks accounted for 42 percent of the average annual net growth, but accounted for 60 percent of the mortality.

Annual net growth exceeds removals on forest land for all major species groups in Missouri. Growth, removals, and mortality are often expressed as a percent of current volume to facilitate comparisons (Table 3). Higher mortality rates in the soft hardwoods major species group are partially due to the short-lived nature of pioneer species found in this group.

Table 3.— Average annual net growth, mortality, and removals of growing-stock on timberland as a percent of current growing-stock volume on timberland, Missouri, 2015

Major species group	Average annual net growth	Average annual mortality	Average annual harvest removals	Average annual other removals
Pine	1.7	1	0.9	0
Other softwoods	3.9	0.3	1.2	0.1
Oaks	1.2	1.6	0.9	0.1
Other hard hardwoods	2.4	1.2	0.8	0.1
Soft hardwoods	2.5	2.4	0.5	0.1
Total	1.7	1.6	0.8	0.1

Table 2.—Top 10 tree species by statewide volume estimates on forest land and timberland, Missouri, 2015

Rank	Species	Number of live trees on forest land (million)	Change since 2010 (%)	Volume of live trees on forest land (million ft^3)	Change since 2010 (%)	Volume of sawtimber trees on timberland (million board feet)	Change since 2010 (%)
1	White oak	714.6	1.1	4,194.4	3.5	12,926.0	6.2
2	Black oak	437.1	17.2	2,919.8	1.7	9,395.2	3.1
3	Post oak	439.4	12.8	2,111.7	0.6	4,374.1	-2.0
4	Shortleaf pine	140.1	2.7	996.7	7.4	4,201.0	9.6
5	Northern red oak	119.1	20.3	981.6	-8.0	3,503.8	-5.5
6	Easter redcedar	779.0	-1.1	778.2	10.3	478.7	-26.2
7	Black walnut	111.7	-2.5	709.3	8.8	1,937.6	11.5
8	Shagbark hickory	192.5	4.7	601.5	9.3	1,514.7	13.0
9	Scarlet oak	72.1	29.2	516.8	-20.3	1,732.4	-17.4
10	American sycamore	25.7	-13.8	449.3	4.8	1,667.4	0.8
	Other softwoods	1.2	28.8	1,774.9	8.7	4,679.7	4.4
	Other hardwoods	5,031.6	3.3	12,484.4	0.9	37,051.2	2.1
	Total	8,064.2	4.4	21,251.5	3.1	56,201.4	2.8

The Status of White Oak in Missouri

White oak was the most numerous tree species in Missouri until 2009, when it was replaced by eastern redcedar (Fig. 6). The 693.1 million white oaks on timberland in 2015 account for 9 percent of the total number of trees State. Even though the number of white oak trees on timberland have decreased, the volume has increased.

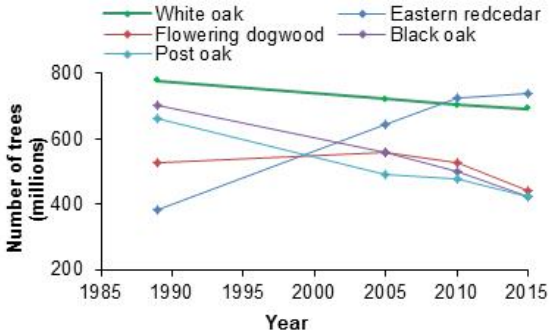


Figure 6.—Number of trees on timberland for top 5 species, by year, Missouri.

Between 2010 and 2015, the white oak volume of live trees greater the 5 inches in diameter on timberland has increased by more than 10 percent (Fig. 7). Sawtimber-size tree volume increased by nearly 16 percent over the period, while poletimber-size tree volume decreased by 3 percent. The average annual net growth of white oaks decreased from 94.6 million cubic feet per year in 2005 to 54.4 million cubic feet per year in 2015 (Fig. 8). Most of this decrease is the result of the increase in mortality over this time period. In 2015, volume losses due to mortality were greater than losses due to removals (harvest and other removals).

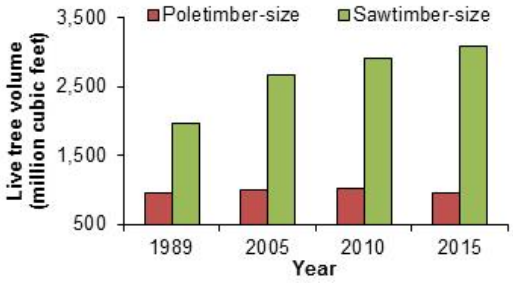


Figure 7.—Volume of live white oaks on timberland by tree-size and year, Missouri.

Disease accounted for 46 percent of the white oak growing stock volume mortality on timberland from 2010-2015 (Fig. 9). Other or unknown cause of death accounted for 33 percent, weather accounted for 19 percent, and fire for the remaining 2 percent.

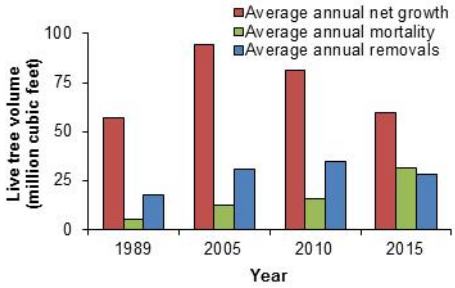
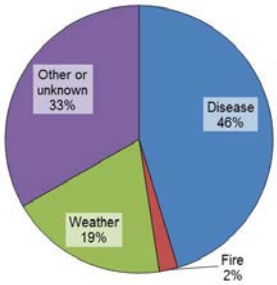


Figure 8.—Average annual net growth, mortality, and removals of white oaks on timberland by year, Missouri.

Figure 9.—White oak mortality of growing stock on timberland by cause of death, Missouri, 2010-2015.



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