

Forests of Kansas, 2015

This resource update provides an overview of forest resources in Kansas based on inventories conducted by the U.S. Forest Service, Forest Inventory and Analysis (FIA) program of the Northern Research Station. For annual inventory years 2001-2013, the sample length was equal to 5 years. Beginning in 2014, the cycle length was changed to 7 years. For the 2015 inventory, estimates for current variables such as area, volume, and biomass are based on 8,732 field plot samples collected from 2010-2015. Change variables, such as net growth, removals, and mortality, are based on 8,682 samples collected in 2004-2010 and resampled in 2010-2015. Estimates from earlier annual and periodic inventories are shown for comparison. See Bechtold and Patterson (2005) and O'Connell et al. (2014) for definitions and technical details. Sampling errors and error bars shown in tables and figures in this report represent 68 percent confidence intervals.

Overview

Kansas is home to 2.5 million acres of forest land, a gain of 3.7 percent since 2010 (Table 1). Timberland accounts for 95 percent of all forest land, while the remaining 5 percent of forest land is reserved or unproductive. Mortality has decreased since 2010 while area of forest land, number of trees, volume, biomass, net growth, and removals (on forest land only) have all experienced gains.

Note: when comparing estimates on forest land versus timberland, please note that timberland estimates are often for growing-stock trees, which are live trees (5 inches diameter at breast height [d.b.h.] or larger) of commercial species and are not rough or rotten trees. As such, they are a subset of all live trees and the estimates will likely be smaller. See page 5 for more definitions.

Table 1.—Kansas forest statistics, 2010 and 2015.

	2010 Estimate	Sampling error (percent)	2015 estimate	Sampling error (percent)	Change since 2010 (percent)
Forest Land					
Area (thousand acres)	2,437	3.1	2,527	2.8	3.7
Number of live trees ≥1 in diameter (million trees)	803	4.8	840	4.3	4.7
Net volume of live trees ≥5 in diameter (million ft ³)	3,101	4.8	3,394	4.5	9.4
Live-tree aboveground biomass (thousand oven-dry tons)	82,781	4.1	90,159	3.8	8.9
Net growth of live trees ≥5 in (thousand ft ³ /yr)	79,296	9.6	102,828	10.2	29.7
Annual harvest removals of live trees ≥5 in (thousand ft ³ /yr)	16,100	23.9	18,201	26.7	13.0
Annual other removals of live trees ≥5 in (thousand ft ³ /yr)	3,619	42.5	6,965	33.8	92.5
Annual mortality of live trees ≥5 in (thousand ft ³ /yr)	47,354	10.3	42,761	10.1	-9.7
Timberland					
Area (thousand acres)	2,318	3.2	2,393	3.0	3.2
Number of live trees ≥1 in diameter (million trees)	758	4.8	791	4.4	4.4
Net volume of live trees ≥5 in diameter (million ft ³)	3,007	4.9	3,301	4.7	9.8
Net volume of growing-stock trees ≥5 in diameter (million ft ³)	1,445	6.9	1,436	7.3	-0.6
Live-tree aboveground biomass (thousand oven-dry tons)	79,884	4.2	87,195	4.0	9.2
Net growth of growing-stock trees (thousand ft ³ /yr)	37,463	10.2	39,627	18.1	5.8
Annual harvest removals of growing-stock trees (thousand ft ³ /yr)	8,246	38.4	5,770	33.6	-30.0
Annual other removals of growing-stock trees (thousand ft ³ /yr)	4,682	51.9	2,945	41.8	-37.1
Annual mortality of growing-stock trees (thousand ft ³ /yr)	15,064	15.8	14,504	20.0	-3.7

Forest Area

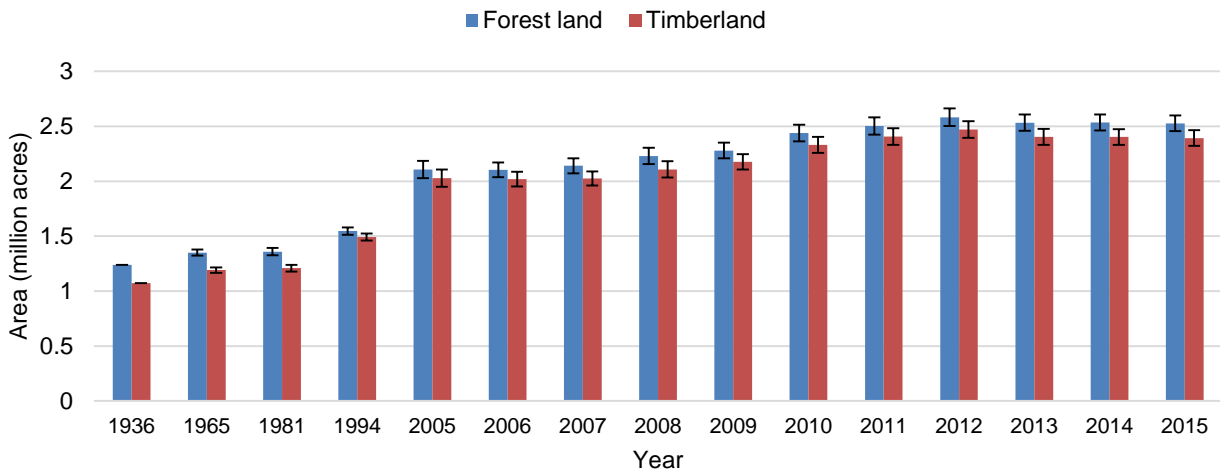


Figure 1.—Area of timberland and forest land by year, Kansas, 1936-2015.

Generally, forest land in Kansas has increased since the earliest inventory but has remained steady since 2013 (Fig. 1). Ninety-three percent of forest land is privately owned and occupied by hardwood forest types; only 2 percent of forested lands are nonstocked. Public lands are dominated by hardwood forest types as well.

In terms of stand-size class, large diameter stands comprise nearly half of all forest land area while medium and small stands occupy 28 and 19 percent of forest land area, respectively. The six most frequently occurring forest types (Fig. 2) occupy 74 percent of all forest land; 59 percent of the forest land is composed of the elm/ash/black locust and sugarberry/hackberry/elm/green ash forest types alone. Eastern redcedar is the only forest type with most of its area composed of small diameter trees. Given the ability of eastern redcedar to outcompete most native tree species, this may impact future forest composition.

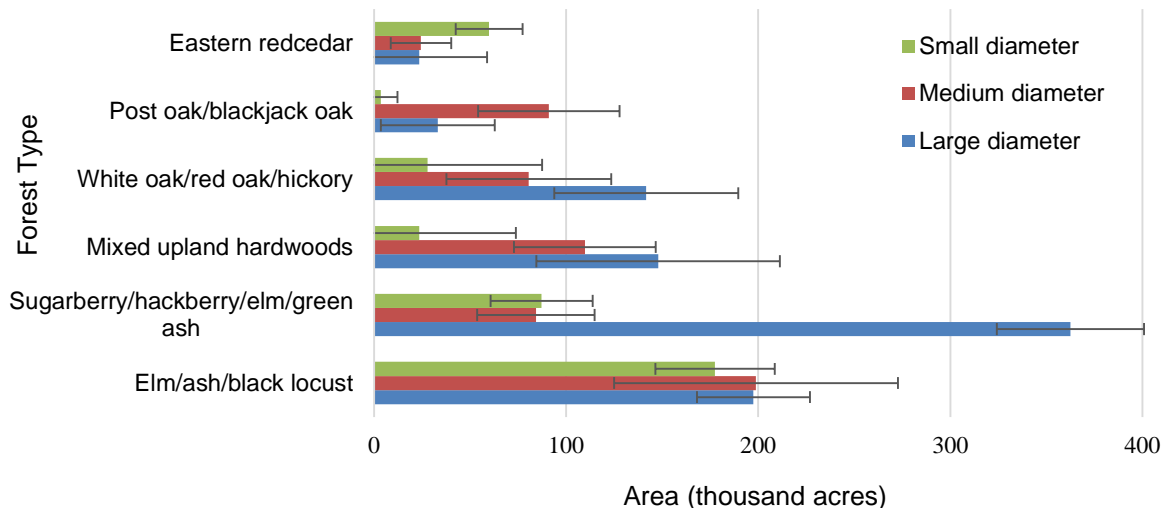


Figure 2.—Forest land by stand-size class for the top six forest types by acreage, Kansas, 2015.

Volume, Biomass, and Trends

Kansas forests contain approximately 840 million live trees (≥ 1 inch diameter) and nearly 3.4 billion cubic feet of net volume (live trees ≥ 5 inches diameter). Fifty-two percent of all trees are composed of five species: hackberry, American elm, Osage-orange, eastern redcedar and green ash (Table 2). The five most voluminous species (cottonwood, hackberry, green ash, American elm and Osage-orange) contain 49 percent of total net volume. Cottonwood is the most voluminous species in the state but ranks 10th in number of trees ranks and 3rd in biomass behind hackberry and Osage-orange, respectively. Eastern redcedar is 4th in terms of number of trees but ranks 10th in volume.

There are more than 90 million oven-dry tons of biomass in Kansas forests, most of which is contained in non-growing-stock trees (56%), followed by growing-stock trees (38%) and live trees 1 to 5 inches diameter (6%). Nearly one-third of all biomass is found in three species: hackberry, Osage-orange, and cottonwood.

Overall, the growth rate of Kansas trees remains positive, with hackberry, cottonwood and American elm having the highest growth rates, followed closely by Osage-orange and black walnut. Harvest removal rates are highest for Osage-orange, hackberry, and American elm. American elm continues to have the highest rate of mortality followed by green ash, hackberry, cottonwood, and honeylocust. Despite the high rate of mortality, American elm has one of the highest net growth rates and is the second most numerous species in the state. Hackberry and cottonwood have the highest net growth rates, respectively.

Table 2.—Number, volume, biomass, growth, mortality, and removals of live trees on forest land by species of the top 12 tree species by number, Kansas, 2015

Common name	Latin name	Number of trees ^a (millions)	Net volume ^b (million ft ³)	Aboveground biomass ^a (thousand dry tons)	Average net growth ^b (thousand ft ³ /yr)	Average mortality ^b (thousand ft ³ /yr)	Average harvest removals ^b (thousand ft ³ /yr)
Hackberry	<i>Celtis occidentalis</i>	114.5	444.9	10,982.3	14,171.2	3,879.5	2,056.2
American elm	<i>Ulmus americana</i>	106.6	257.4	6,516.6	9,233.4	6,212.5	1,983.9
Osage-orange	<i>Maclura pomifera</i>	85.5	241.8	9,639.7	9,030.1	1,091.1	2,167.6
Eastern redcedar	<i>Juniperus virginiana</i>	85.1	107.4	2,455.1	5,633.1	882.1	595.4
Green ash	<i>Fraxinus pennsylvanica</i>	41.9	259.2	6,969.2	6,342.4	4,261.0	174.4
Honeylocust	<i>Gleditsia triacanthos</i>	36.6	129.9	4,110.0	5,667.8	3,269.6	867.4
Red mulberry	<i>Morus rubra</i>	34.4	163.3	4,711.1	6,921.0	1,978.7	317.3
Black walnut	<i>Juglans nigra</i>	23.6	202.3	4,829.1	8,152.8	2,475.7	1,114.9
Chinkapin oak	<i>Quercus muehlenbergii</i>	20.0	95.6	2,897.9	777.1	720.7	--
Eastern cottonwood	<i>Populus deltoides</i>	9.5	463.1	8,326.2	13,777.8	3,355.8	--
Bur oak	<i>Quercus macrocarpa</i>	8.1	151.2	4,080.3	2,501.9	954.8	1,252.0
Northern red oak	<i>Quercus rubra</i>	7.9	106.6	3,029.7	2,956.3	295.0	--

^a Trees ≥ 1 inch diameter ^b Trees ≥ 5 inches diameter Note: Table cells without data are indicated by --

Eastern Redcedar in Kansas

Eastern redcedar (*Juniperus virginiana*) (ERC) is a native conifer that has been widely planted in the Great Plains region as a windbreak species due to its hardy nature and ability to grow under extreme climatic conditions. However, the rapid and widespread expansion of this tree species has been an issue of ecological and economic concern for the past several decades. FIA data can be used to quantify and monitor how the ERC resource has changed over time.

ERC has expanded in terms of area and density. The number of FIA plots with ERC present increased by 82 percent in span of only 10 years (Fig. 3). Table 3 compares estimates from the 2005 and 2015 FIA inventories that describe the ERC resource in Kansas. The area of forest land occupied by ERC has increased as well as the density, as indicated by the number of trees per acre and volume estimates. For more information on ERC expansion in Kansas and other states in the central United States, see Meneguzzo and Liknes (2015).¹

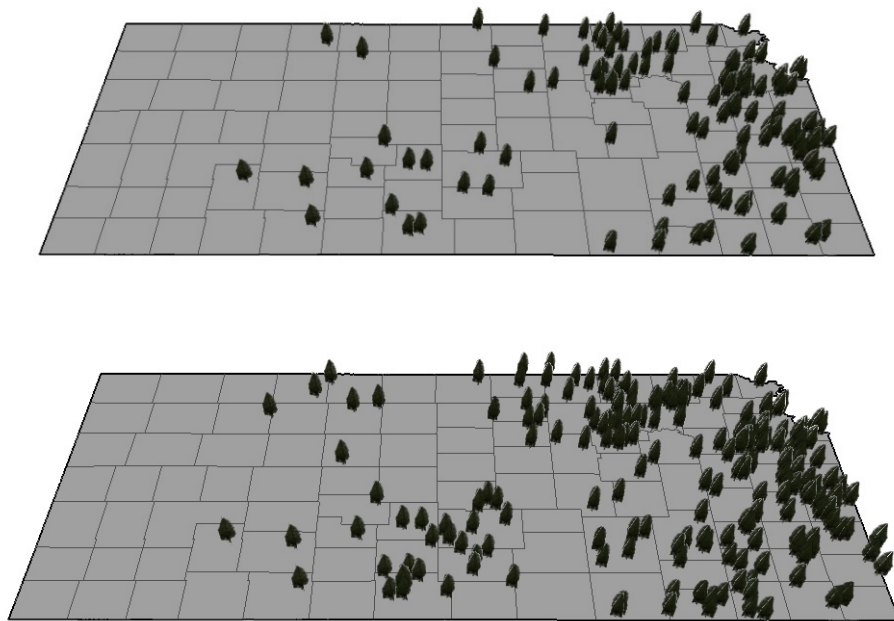


Figure 3.—FIA plots with eastern redcedar trees present, Kansas, 2005 (top) and 2015 (bottom). Depicted plot locations are approximate.

Table 3.—Area, number, volume, and biomass of live eastern redcedar trees on forest land, Kansas, 2005 and 2015

FIA attribute	2005 estimate	2015 estimate	Percent change
Area of the eastern redcedar forest type (acres)	85,000	108,000	27
Area of forest land with eastern redcedar trees present (acres)	566,000	789,000	39
Number of eastern redcedar trees on forest land (at least 1 inch d.b.h.)	55,858,000	85,088,000	52
Eastern redcedar trees per acre of forest land (at least 1 inch d.b.h.)	27	34	26
Gross volume of live eastern redcedar trees 5 inches d.b.h. or large on forest land (cubic feet)	73,701,000	110,622,000	50
Aboveground dry weight of live eastern redcedar trees at least 1-inch d.b.h. (short tons)	1,668,000	2,455,000	47

¹Meneguzzo, D.M.; Liknes, G.C. 2015. Status and trends of eastern redcedar (*Juniperus virginiana*) in the central United States: Analyses and observations based on Forest Inventory and Analysis data. *Journal of Forestry*. 113(3): 325-334.

Definitions

Average annual mortality—The average cubic foot volume of sound wood in growing-stock trees that died in 1 year.

Average annual removals—The average net growing-stock volume in growing-stock trees removed annually for roundwood forest products, in addition to the volume of logging residues and the volume of other removals.

Biomass—The aboveground weight of wood and bark in live trees 1.0 inch (2.5 cm) d.b.h. and larger from the ground to the tip of the tree, excluding all foliage. The weight of wood and bark in lateral limbs, secondary limbs, and twigs under 0.5 inch (1.3 cm) in diameter at the point of occurrence on sampling-size trees is included but is excluded on poletimber and sawtimber-size trees. Biomass is typically expressed as green or oven-dry weight and the units are tons.

Forest land—Land that has at least 10 percent canopy cover of live trees of any size or formerly having had such tree cover and is not currently developed for nonforest uses. The area with trees must be at least 1 acre and at least 120 feet wide.

Forest type—A classification of forest land based upon and named for the tree species that forms the plurality of live-tree stocking. A forest type classification for a field location indicates the predominant live-tree species cover for the field location; hardwoods and softwoods are the first group to be determine predominant group, and forest type is selected from the predominant group.

Net annual growth—The average annual net increase in the volume of trees during the period between inventories. Components include the increment in net volume of trees at the beginning of the specific year surviving to its end, plus the net volume of trees reaching the minimum size class during the year, minus the volume of trees that died during the year, and minus the net volume of trees that became cull trees during the year.

Net volume in cubic feet—The gross volume in cubic feet less deductions for rot, roughness, and poor form. Volume is computed for the central stem from a 1-foot stump to a minimum 4.0-inch top diameter outside bark, or to the point where the central stem breaks into limbs.

Nonstocked—Land that currently has less than 10 percent stocking but formerly met the definition of forest land. Forest conditions meeting this definition have few, if any, trees sampled.

Reserved forest land—Land permanently reserved from wood products utilization through statute or administrative designation. Examples include national forest wilderness areas and national parks and monuments.

Timberland—Forest land that is producing or is capable of producing in excess of 20 cubic feet per acre per year of industrial wood in natural stands and is not withdrawn from timber utilization by statute or administrative regulation.

Additional Inventory Sources

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.

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O'Connell, B.M.; LaPoint, E.B.; Turner, J.A. [et al.]. 2014. **The Forest Inventory and Analysis database: database description and user guide version 6.0.1 for Phase 2**. Washington, DC: U.S. Department of Agriculture, Forest Service. 748 p.
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