



Forests of Nebraska, 2016

This resource update provides an overview of forest resources in Nebraska 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 2016 inventory, estimates for current variables such as area, volume, and biomass are based on 8,247 field plot samples (320 forested) collected from 2011-2016. Change variables, such as net growth, removals, and mortality, are based on 8,228 samples (307 forested) collected in 2006-2011 and resampled in 2011-2016. Estimates from earlier annual and periodic inventories are shown for comparison. See Bechtold and Patterson (2005), O’Connell et al. (2014) and Gormanson et al. (2017) for definitions and technical details.

Overview

Nebraska is home to approximately 1.5 million acres of forest land (Table 1). Timberland accounts for about 92 percent of all forest land, while the remaining 8 percent of forest land is reserved or unproductive. The area of forest land, number of trees, biomass, removals and net volume of live trees decreased since 2011 while mortality has increased. The recent increase in mortality is mainly attributed to severe weather events, fire and insects. Disease primarily affected American elm, other elm species, and ash while fire was the leading cause of ponderosa pine, eastern redcedar, and bur oak mortality. Ponderosa pine in particular has been heavily impacted by severe wildfires.

Table 1.—Nebraska forest statistics, 2011 and 2016. Estimates for growing-stock trees are impacted by changes in tree class (e.g., form) and, therefore, have comparatively higher sampling errors than estimates for all live trees. Sampling errors and error bars shown in this report represent 68 percent confidence intervals.

Forest Land	2011 Estimate	Sampling Error (percent)	2016 Estimate	Sampling error (percent)	Change since 2011 (percent)
Area (thousand acres)	1,576.5	4.2	1,509.7	4.1	-4.2
Number of live trees ≥1 inch diameter (million trees)	423.4	6.5	391.5	6.6	-7.5
Net volume of live trees ≥5 inches diameter (million ft ³)	2,081.5	6.9	2,065.5	6.7	-0.8
Live-tree aboveground biomass (thousand oven-dry tons)	46,271.8	6.2	46,225.3	6.0	-0.1
Net growth of live trees ≥5 inches (thousand ft ³ /yr)	58,110.2	14.4	22,107.7	38.2	-62.0
Annual harvest removals of live trees ≥5 inches (thousand ft ³ /yr)	19,905.0	38.7	8,945.0	28.5	-55.1
Annual mortality of live trees ≥5 inches (thousand ft ³ /yr)	27,863.3	15.7	49,053.2	15.2	76.0
Timberland					
Area (thousand acres)	1,452.2	4.4	1,382.7	4.4	-4.5
Number of live trees ≥1 inch diameter (million trees)	388.9	6.9	359.1	7.1	-7.5
Net volume of live trees ≥5 inches diameter (million ft ³)	1,964.6	7.2	1,937.1	7.1	-1.0
Net volume of growing-stock trees ≥5 inches diameter (million ft ³)	1,094.3	10.9	851.1	11.3	-22.1
Live-tree aboveground biomass (thousand oven-dry tons)	43,396.9	6.5	43,118.6	6.4	-0.2
Net growth of growing-stock trees (thousand ft ³ /yr)	19,782.2	28.9	-1,861.2	-382.3	-109.4
Annual harvest removals of growing-stock trees (thousand ft ³ /yr)	12,717.5	54.6	4,233.6	44.4	-66.7
Annual mortality of growing-stock trees (thousand ft ³ /yr)	14,760.3	23.9	28,172.7	23.0	90.9



Forest Area

After increasing steadily since the 1980s, the area of forest land in Nebraska has remained relatively stable since 2009 (Fig. 1). Most forest land area is associated with riparian systems. Hardwoods are more common in the eastern half of the State while ponderosa pine forests are dominant in the west. Overall, hardwood forest types occupy 60 percent of all forest land while softwoods comprise 32 percent; the remaining 8 percent is nonstocked. Eighty-nine percent, or 1.3 million acres, of forest land is privately owned. Private forest lands are dominated by hardwoods (61 percent), followed by softwoods (31 percent) and nonstocked areas (8 percent). Publicly owned forest

land is more evenly distributed amongst hardwoods (47 percent) and softwoods (42 percent), while the remaining 11 percent is nonstocked.

Sixty-two percent of forest land is occupied by large-diameter trees while most of the remaining forest land is comprised of medium and small diameter trees, 20 and 12 percent, respectively. Ponderosa pine is the most prevalent forest type in Nebraska but the estimate for the eastern redcedar forest type is within nine thousand acres and it dominates the medium and small diameter stand size classes (Fig. 2).

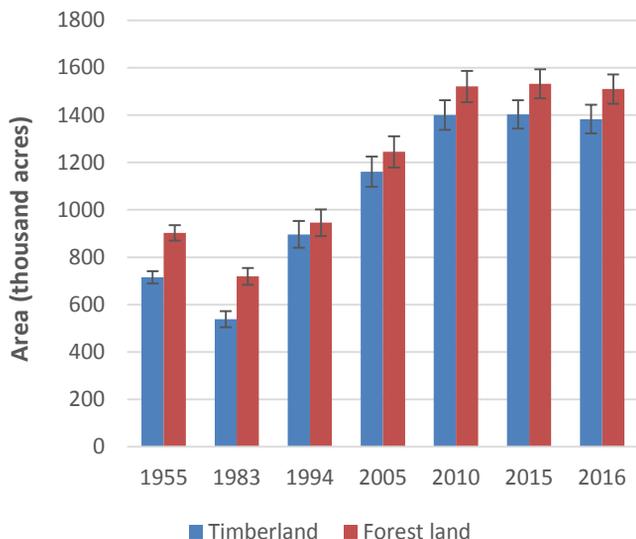


Figure 1.—Area of timberland and forest land by year, Nebraska.

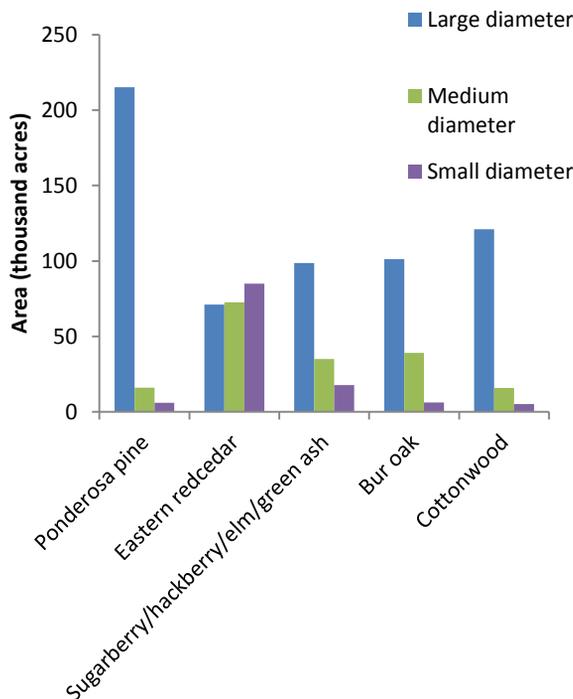


Figure 2.—Forest land by stand-size class for the top five forest types by acreage, Nebraska, 2016.

Volume, Biomass, and Trends

Nebraska’s forests contain approximately 392 million live trees according to the 2016 inventory, or an average of 259 trees per acre of forest land, which is a decrease of about 12 million trees total, or 4 trees per acre compared to the estimate from the 2015 inventory. Ponderosa pine had the largest decrease in number of trees, followed by red mulberry and hackberry. Together, these three species decreased by 11.8 million trees. Eastern redcedar remains the most numerous tree species, comprising nearly 40 percent of the total of live-tree resource in Nebraska, which is a slight increase since the 2015 inventory.

The top five species (Table 2) in terms of volume are cottonwood, bur oak, ponderosa pine, eastern redcedar, and green ash; they make up 73 percent of

net volume of live trees (≥ 5 inches d.b.h) on forest land. Cottonwood remains at the top for volume and biomass, comprising 28 percent of total net volume and 23 percent of aboveground biomass, which is more than the amount of biomass as ponderosa pine and eastern redcedar, the most numerous trees, combined.

Eastern redcedar has the highest net growth but mortality and removals have increased since 2015. Ponderosa pine continues to have negative net growth and has the highest mortality and harvest removals. Cottonwood now has negative net growth and mortality has increased and is close to that of ponderosa pine; harvest removals of cottonwood have declined significantly since the 2015 inventory.

Table 2.—Number, volume, biomass, growth, mortality, and removals of live trees on forest land for the top 12 tree species by number, Nebraska, 2011-2016

Common Name	Latin Name	Million Trees ^a	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)
Eastern redcedar	<i>Juniperus virginiana</i>	155.1	214.9	4,922.0	10,918.2	1,873.9	1,499.2
Ponderosa pine	<i>Pinus ponderosa</i>	46.9	272.0	5,011.0	-10,828.07	12,932.7	3,465.5
Green ash	<i>Fraxinus pennsylvanica</i>	34.8	128.4	3,623.5	74.82	4,134.3	577.3
Hackberry	<i>Celtis occidentalis</i>	29.6	81.2	2,052.6	3,665.7	1,182.7	106.4
Bur oak	<i>Quercus macrocarpa</i>	24.2	307.1	8,550.5	5,440.07	3,566.9	447.5
Red mulberry	<i>Morus rubra</i>	21.7	88.5	2,587.2	3,531.8	1,174.7	324.6
American elm	<i>Ulmus americana</i>	16.6	72.3	1,683.3	3,239.7	2,150.6	54.5
Eastern cottonwood	<i>Populus deltoides</i>	9.5	579.2	10,417.3	-222.2	12,729.7	1,355.5
Siberian elm	<i>Ulmus pumila</i>	6.9	49.1	1,269.3	2,677.3	220.3	26.3
Honeylocust	<i>Gleditsia triacanthos</i>	5.4	27.4	860.2	663.5	245.4	--
American basswood	<i>Tilia americana</i>	3.1	69.8	1,052.5	944.8	903.5	--
Black walnut	<i>Juglans nigra</i>	2.3	30.1	692.1	1,747.4	885.2	697.0

^a Trees ≥ 1 -inch diameter

^b Trees ≥ 5 -inches diameter

Note: Table cells without data are indicated by --

Ponderosa Pine Resource Update

Ponderosa pine is an important tree species in Nebraska, particularly in the western part of the state, that currently is at risk. Increased insect activity, climate-related events, such as drought, and wildfire are interrelated factors that are responsible for the recent decline in the ponderosa pine resource. Ponderosa pine makes up about 30 percent of all the mortality in the state.

When FIA plots are revisited, field crews determine what caused the death of trees that were alive at the time of previous inventory. The death-causing agents include insect, disease, fire, animal, weather (ice, wind, flooding, drought), vegetation (e.g., suppression, competition, vines/kudzu), unknown, or silvicultural or land-clearing activity. Examination of these data provides insights about the threats to forest resources. Determining cause of death can be difficult and there may be more than one agent on a plot but only the most severe is recorded for each individual tree that died.

Field data collected in 2016 reveals that fire was by far the most common agent responsible for ponderosa pine tree deaths (85 percent) since 2010. Looking at a 10-year history, fire-related deaths of ponderosa pine observed by FIA field crews increased in 2010 and have been a primary cause of death since then. This is reflected in Figures 3 and 4 which show an increase in the number and volume of standing dead ponderosa pine, respectively. Overall, the live ponderosa pine resource shows a gradual decline in number of trees (Fig. 5) and volume (Fig. 6) after 2009. Since FIA now remeasures plots on a 7-year basis, the recent increase in fire-related mortality may be a lingering effect of the heavy wildfire activity in 2012 that is still being captured on FIA plots. We will know more as time passes and the declining trend may stabilize depending on current and future fire activity.

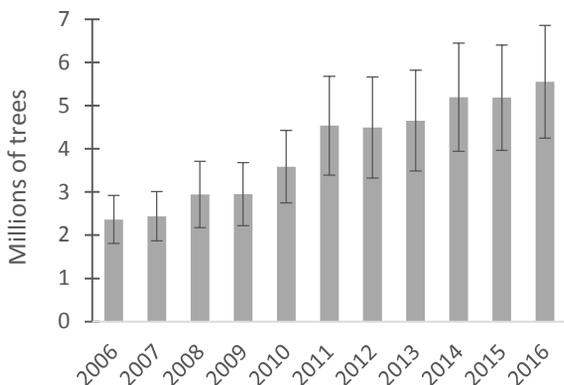


Figure 3.— Number of standing dead ponderosa pine (at least 5-inches d.b.h.) on forest land by year, Nebraska.

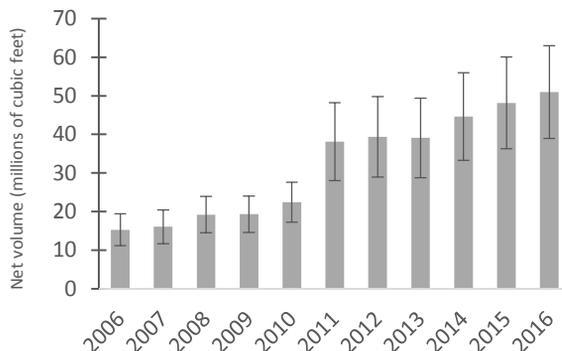


Figure 4.— Net volume of standing dead ponderosa pine (at least 5-inches d.b.h.) on forest land by year, Nebraska.

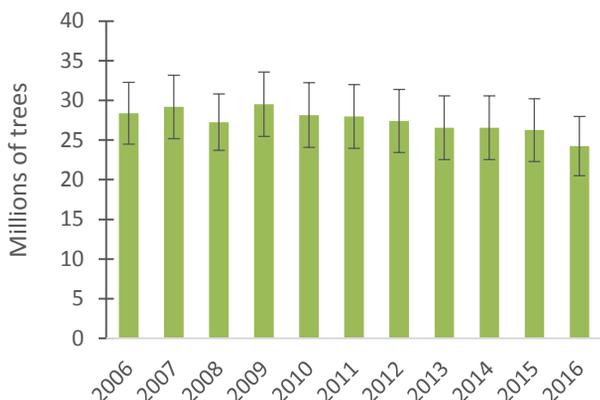


Figure 5.— Number of live ponderosa pine (at least 5-inches d.b.h.) on forest land by year, Nebraska.

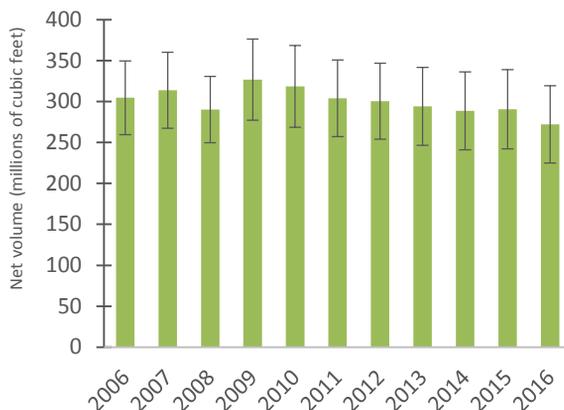


Figure 6.— Net volume of live ponderosa pine (at least 5-inches d.b.h.) on forest land by year, Nebraska.

Definitions

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

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

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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. <http://www.fia.fs.fed.us/library/databse-documentation/>.

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