

Forests of Nebraska, 2015

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 2015 inventory, estimates for current variables such as area, volume, and biomass are based on 8,243 field plot samples collected from 2010-2015. Change variables, such as net growth, removals, and mortality, are based on 8,231 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. (2013) for definitions and technical details.

Overview

Nebraska is home to more than 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 and net volume of live trees increased since 2010; however, net growth has decreased as a result of increased mortality. The recent increase in mortality is mainly attributed to severe weather events, such as flooding and drought, as well as disease and fire. Disease primarily affected American elm and other elm species while fire was the leading cause of ponderosa pine and bur oak mortality.

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

	2010 estimate	Sampling error (percent)	2015 estimate	Sampling error (percent)	Change since 2010 (percent)
Forest land					
Area (thousand acres)	1,521	4.3	1,532	4.0	0.8
Number of live trees ≥1 in diameter (million trees)	394	6.7	403	6.7	2.3
Net volume of live trees ≥5 in diameter (million ft ³)	2,021	7.1	2,125	6.6	5.2
Live-tree aboveground biomass (thousand oven-dry tons)	44,603	6.4	47,196	5.9	5.8
Net growth of live trees ≥5 in (thousand ft ³ /yr)	57,421	14.8	28,715	30.9	-50.0
Annual harvest removals of live trees ≥5 in (thousand ft ³ /yr)	17,698	43.3	15,244	48.6	-13.9
Annual other removals of live trees ≥5 in (thousand ft ³ /yr)	2,213	51.5	1,996	64.8	-9.8
Annual mortality of live trees ≥5 in (thousand ft ³ /yr)	26,127	15.8	47,642	15.5	82.3
Timberland					
Area (thousand acres)	1,400	4.5	1,403	4.3	0.2
Number of live trees ≥1 in diameter (million trees)	362	7.0	369	7.2	2.0
Net volume of live trees ≥5 in diameter (million ft ³)	1,907	7.4	2,002	7.0	5.0
Net volume of growing-stock trees ≥5 in diameter (million ft ³)	1,111	10.6	926	11.8	-16.6
Live-tree aboveground biomass (thousand oven-dry tons)	41,837	6.7	44,228	6.3	5.7
Net growth of growing-stock trees (thousand ft ³ /yr)	19,146	26.2	2,287	317.5	-88.1
Annual harvest removals of growing-stock trees (thousand ft ³ /yr)	11,999	57.8	10,717	65.6	-10.7
Annual other removals of growing-stock trees (thousand ft ³ /yr)	2,459	48.2	219	93.7	-91.1
Annual mortality of growing-stock trees (thousand ft ³ /yr)	14,618	23.0	26,364	24.2	80.4



Forest Area

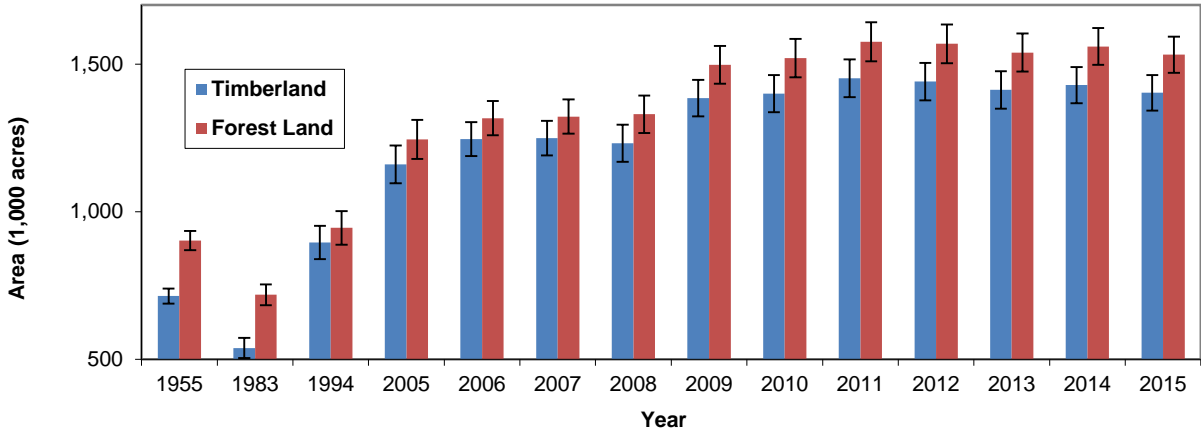


Figure 1.—Area of timberland and forest land by year, Nebraska.

After increasing steadily since the 1980s, the area of forest land in Nebraska has remained 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 nearly 1.4 million acres, of forest land is privately owned. Private forest lands are dominated by hardwoods (61 percent) while publicly owned forest land is more evenly distributed amongst hardwoods (50 percent) and softwoods (41 percent).

Sixty-one 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, 19 and 12 percent, respectively. Ponderosa pine is the most prevalent forest type in Nebraska (Fig. 2) and surpassed the eastern redcedar forest type as the dominant forest type for the first time since 2009. Land use change data indicates that some areas dominated by eastern redcedar were cleared for nonforest land uses, such as pasture land. The area of forest land classified as eastern redcedar/hardwood is also showing a downward trend: the 2013 estimate was nearly 113,000 acres while the 2015 estimate is about 105,000 acres.

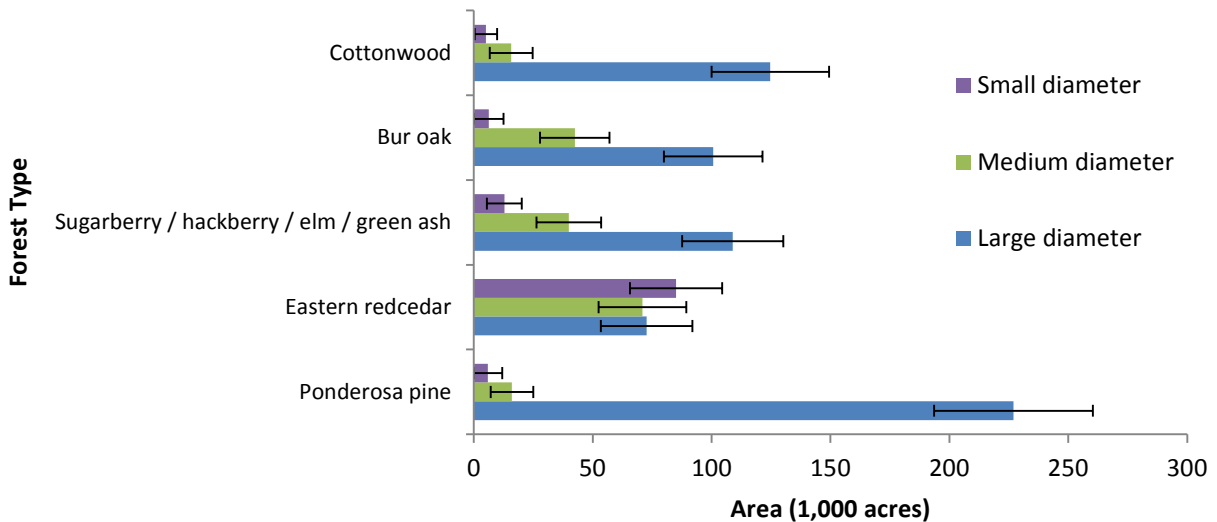


Figure 2.—Forest land by stand-size class for the top five forest types by acreage, Nebraska, 2015.

Volume, Biomass, and Trends

Nebraska's forests contain approximately 403 million live trees according to the 2015 inventory, or an average of 263 trees per acre of forest land, which is a decrease of about 4 trees per acre compared to the most recent estimate from the 2014 inventory. Two species, eastern redcedar and ponderosa pine, comprise over half (52 percent) of the total of live-tree resource in Nebraska. Eastern redcedar, alone, makes up nearly 39 percent of all trees; however, the total number of eastern redcedar trees decreased by approximately 10 million compared to the estimate from the 2014 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 nearly one-fourth (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 rate but the rates of mortality and removals have increased since 2014. Ponderosa pine continues to have negative net growth and has the highest rate of mortality, followed closely by cottonwood. Cottonwood had the highest rate of removals followed by ponderosa pine and eastern redcedar.

Table 2.—Number, volume, biomass, growth, mortality, and removals of live trees on forest land for the top 12 tree species by number, Nebraska, 2010-2015.

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>	155.0	213.4	4,870.3	11,385.9	1,866.3	1,275.9
Ponderosa pine	<i>Pinus ponderosa</i>	54.2	290.5	5,357.0	-9,875.6	11,958.3	2,362.9
Green ash	<i>Fraxinus pennsylvanica</i>	34.0	127.4	3,589.6	540.6	4,214.0	544.4
Hackberry	<i>Celtis occidentalis</i>	31.8	79.4	2,015.2	4,411.3	1,160.2	83.5
Bur oak	<i>Quercus macrocarpa</i>	24.7	311.0	8,648.1	5,542.2	3,543.2	447.5
Red mulberry	<i>Morus rubra</i>	24.0	86.1	2,533.3	3,754.8	1,178.4	307.6
American elm	<i>Ulmus americana</i>	15.5	72.1	1,663.5	3,124.1	2,244.8	64.6
Eastern cottonwood	<i>Populus deltoides</i>	10.0	603.1	10,793.4	2,498.7	11,354.3	8,744.5
Siberian elm	<i>Ulmus pumila</i>	7.0	49.0	1,269.6	2,912.9	222.2	--
Honeylocust	<i>Gleditsia triacanthos</i>	5.7	27.2	860.6	604.6	248.8	--
American basswood	<i>Tilia americana</i>	3.3	84.9	1,276.8	1,130.9	945.7	--
Black walnut	<i>Juglans nigra</i>	2.3	28.9	665.6	1,453.5	929.5	686.3

^a Trees ≥ 1 -inch diameter

^b Trees ≥ 5 -inches diameter

Note: Table cells without data are indicated by --

Threats to Nebraska's Forest Resources

Changes in the frequency and severity of climate-related events can have serious impacts on forest resources. It is important to understand what is threatening forests and what this means for the future of the resource.

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. Animal damage leading to tree death is most often caused by livestock grazing. In addition, the causal agents are often interrelated. For example, insect activity or disease may initially kill trees making the whole forest susceptible to fire, which may be more severe than normal due to fuel build-up. Examination of these data provides insights about the threats to forest resources but note that 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.

There was a 111 percent increase in the number of trees killed between the 2010 and 2015 inventories. Fire and weather had the largest increases. Examination of the spatial locations of the plots where weather caused tree deaths revealed that flooding was likely the culprit due to the close proximity to rivers (Fig. 3). Table 3 shows the most common causes of tree deaths in Nebraska and the tree species most affected.

Table 3.—Most common causes of tree mortality and the tree species most affected, Nebraska, 2015.

Cause of death	Species most affected
Insect	Ponderosa pine, eastern redcedar
Disease	Green ash, American elm, other elms
Fire	Ponderosa pine, eastern redcedar, bur oak
Weather	Green ash, bur oak, elms, eastern redcedar, cottonwood, red mulberry, black willow

The significant effects on ponderosa pine and bur oak are reflected in the most recent inventory data. In addition, mortality rates have also increased for eastern redcedar, American elm, cottonwood, and red mulberry, which impacts net growth and overall sustainability of these resources.

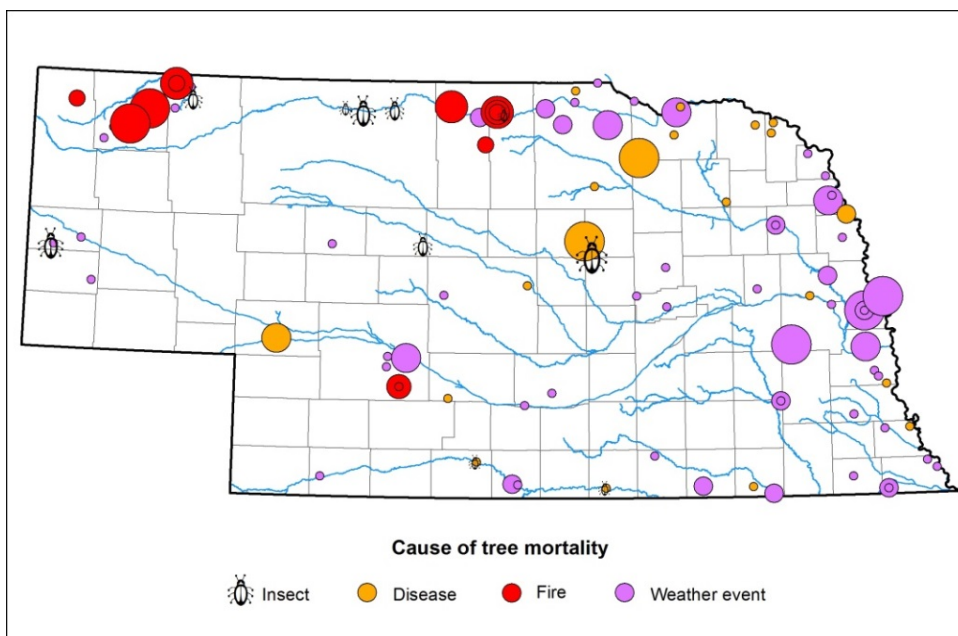


Figure 3.—Tree mortality by cause of death on FIA plots, Nebraska, 2015. Depicted plot locations are approximate. Larger symbol sizes indicate more occurrences of tree mortality on the plot.

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 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

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.

Meneguzzo, D.M.; Crocker, S.J.; Nelson, M.D.; Barnett, C.J. [et al.]. 2012. **Nebraska's Forests 2010**. Resour. Bull. NRS-68. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 47 p.

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/database-documentation/>.

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