



# Forests of South Dakota, 2015

This resource update provides an overview of forest resources in South Dakota based on an inventory conducted by the U.S. Forest Service, Forest Inventory and Analysis (FIA) program at the Northern Research Station (NRS) in cooperation with the South Dakota Department of Agriculture, Resource Conservation and Forestry Division. Estimates are based on field data collected using the FIA annualized sample design and are updated yearly. For the 2015 inventory, estimates for current variables such as area, volume, and biomass are based on 8,272 plot samples collected from 2010 to 2015. Change variables, such as net growth, removals, and mortality are based on 8,259 samples collected in 2005-2010 and resampled in 2010 to 2015. See Bechtold and Patterson (2005) and O’Connell et al. (2013) for definitions and technical details.

## Overview

South Dakota is home to 1.95 million acres of forest land. Forested area has increased by about 3.5 percent since 2010 (Table 1). The number of live trees on South Dakota’s forest land in 2015 was estimated at greater than 538 million, an increase of 6.6 percent from 2010. Both net volume of live trees ( $\geq 5$  inches diameter) and aboveground biomass of live trees ( $\geq 1$  inch diameter) decreased slightly with volume decreasing 2.3 percent and biomass decreasing 1.5 percent. Average annual net growth decreased 69.3 percent compared to the 2010 estimate, while average annual harvest removals increased by 33.3 percent and mortality increased by 53.4 percent (Table 1).

**Table 1.—South Dakota forest estimates, change between 2010 and 2015**

	2010 Estimate	Sampling error (percent)	2015 Estimate	Sampling error (percent)	Change since 2010 (percent)
<b>Forest Land</b>					
Area (thousand acres)	1,883.0	2.9	1,949.2	2.7	+3.5
Number of live trees $\geq 1$ in diameter (million trees)	538.1	6.0	573.8	5.8	+6.6
Live tree ( $\geq 1$ in diameter) aboveground biomass (million oven-dry tons)	45.4	4.2	44.7	4.2	-1.5
Net volume of live trees $\geq 5$ in diameter (million ft <sup>3</sup> )	2,287.7	4.2	2,235.2	4.2	-2.3
Annual net growth of live trees $\geq 5$ in (million ft <sup>3</sup> /yr)	40.2	19.2	12.4	66.9	-69.3
Annual harvest removals of live trees $\geq 5$ in (million ft <sup>3</sup> /yr)	26.5	21.0	35.3	22.6	+33.3
Annual mortality of live trees $\geq 5$ in (million ft <sup>3</sup> /yr)	29.9	14.9	45.8	14.6	+53.4
<b>Timberland</b>					
Area (thousand acres)	1,753.4	3.1	1,798.8	3.0	+2.6
Number of live trees $\geq 1$ in diameter (million trees)	504.6	6.2	537.3	6.1	+6.5
Live tree ( $\geq 1$ in diameter) aboveground biomass (million oven-dry tons)	42.5	4.4	41.9	4.5	-1.2
Net volume of live trees $\geq 5$ in diameter (million ft <sup>3</sup> )	2,156.6	4.4	2,109.4	4.5	-2.2
Net volume of growing-stock trees (million ft <sup>3</sup> )	1,861.8	4.7	1,765.0	4.8	-5.2
Annual net growth of growing-stock trees (million ft <sup>3</sup> /yr)	36.9	22.1	10.98	63.7	-70.3
Annual harvest removals of growing-stock trees (million ft <sup>3</sup> /yr)	24.7	22.1	33.43	23.4	+35.3
Annual mortality of growing-stock trees (million ft <sup>3</sup> /yr)	22.8	17.5	32.55	17.5	+42.7



# Forest Area

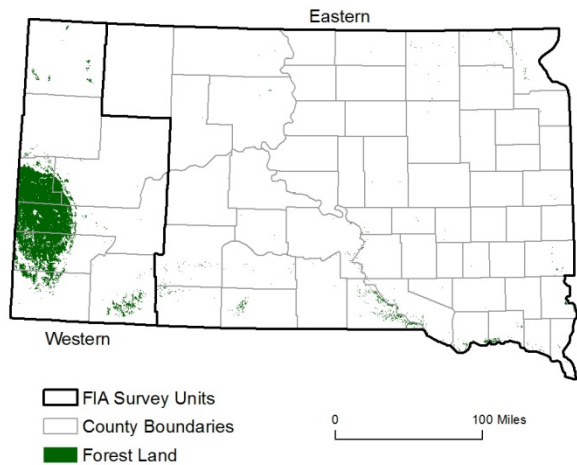


Figure 1.—Forest land in each of the two Survey Units, South Dakota.

South Dakota is divided into two survey units (Fig. 1). Statewide forest land area is 1.95 million acres  $\pm$  52,600 acres, roughly 4 percent of total land area in the State. The Western Survey Unit, home to the Black Hills, supports most of the forest land area in South Dakota (about 1.52 million acres), and is 13.6 percent forested. The Eastern Survey Unit has considerably less forest land (about 429,000 acres) and is just 1.1 percent forested.

Area of South Dakota forest land and timberland has remained relatively stable, with modest increases and decreases, over the last few years after a steady increase in the early 2000s (Fig. 2).

The ponderosa pine forest type occupies the largest proportion of forest land in South Dakota at 1.12 million acres (Fig. 3). The next most common forest types are sugarberry/hackberry/elm/green ash at 95,700 acres, bur oak at 88,400 acres, and white spruce at 77,000 acres. Area of nonstocked forest land amounted to 171,700 acres.

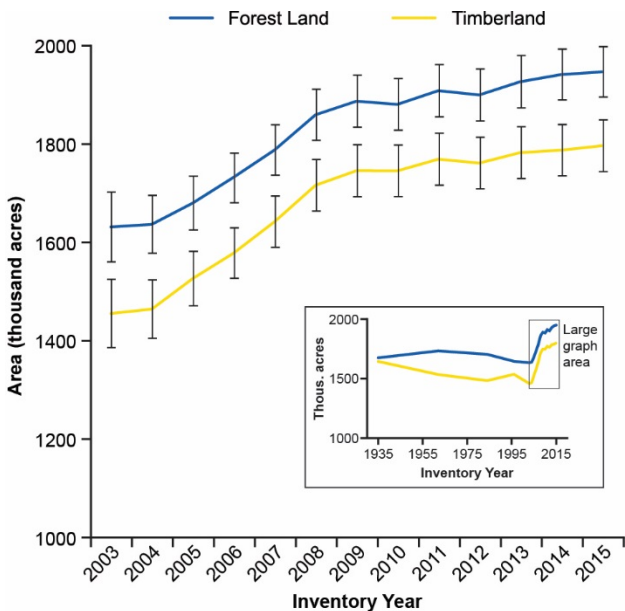


Figure 2.—Area of forest land and timberland by year, South Dakota.

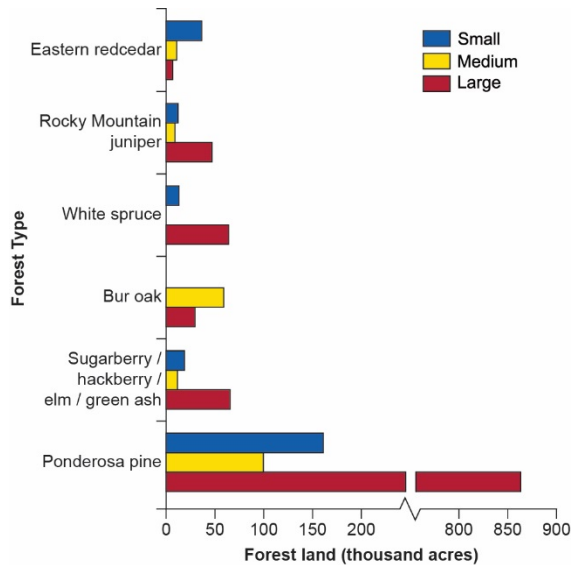


Figure 3.—Area of forest land by top six forest types and stand size class by area, 2015. Note: Large diameter trees are at least 11.0 inches diameter for hardwoods and at least 9.0 inches diameter for softwoods. Medium diameter trees are at least 5.0 inches diameter but not as large as large diameter trees. Small diameter trees are less than 5.0 inches diameter.

## Volume, Biomass, and Trends

Twenty-seven species (including unknowns collected to the genus level) were recorded on South Dakota forest land in 2015. Ponderosa pine, bur oak, white spruce, and green ash are the most numerous species by number of live trees (Table 2). Eastern hophornbeam (*Ostrya virginiana*) is also a common species found in South Dakota forests with over 28 million trees, making it the fourth most plentiful species by number of trees; however, it accounts for very little live tree volume.

Ponderosa pine continues to rank first for live tree volume on forest land with 1.65 billion cubic feet (Table 2), a decrease of about 5.4 percent from the 2010 inventory. This species accounts for 74 percent of South Dakota’s live tree volume. Bur oak and eastern cottonwood each account for about 5 percent of the live tree volume on forest land.

The average annual net growth on forest land was 12.4 million cubic feet (Table 1). Average mortality was 45.8 million cubic feet on average, annually. Removals were 35.3 million cubic feet, for a growth to removal ratio of 0.35.

South Dakota’s removals are, on average, about 1.5 percent of the total standing volume per year. The vast majority of removals are ponderosa pine (Table 2). An epidemic of mountain pine beetle (*Dendroctonus ponderosae*; MPB) is currently affecting ponderosa pine in the Black Hills. A key management strategy to slow the spread of MPB is felling infested trees, cutting the trunks into short logs, and leaving them in place on the ground, which can significantly reduce the number of beetles emerging compared to standing infested trees (Ball and Taecker 2013). Had infested trees not been treated this way, the estimates may have shown higher mortality and lower removals in ponderosa pine.

South Dakota has more than 44.7 million oven-dry tons of biomass on forest land. Ponderosa pine accounts for the vast majority—68 percent—of the total. The 44.7 million dry tons of biomass equates to 22.4 million tons of carbon in South Dakota’s forests. About 61 percent of the biomass is on public land and 39 percent on private land, stressing the important roles that both public land management agencies and private landowners have in the management and protection of South Dakota’s forest resource.

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

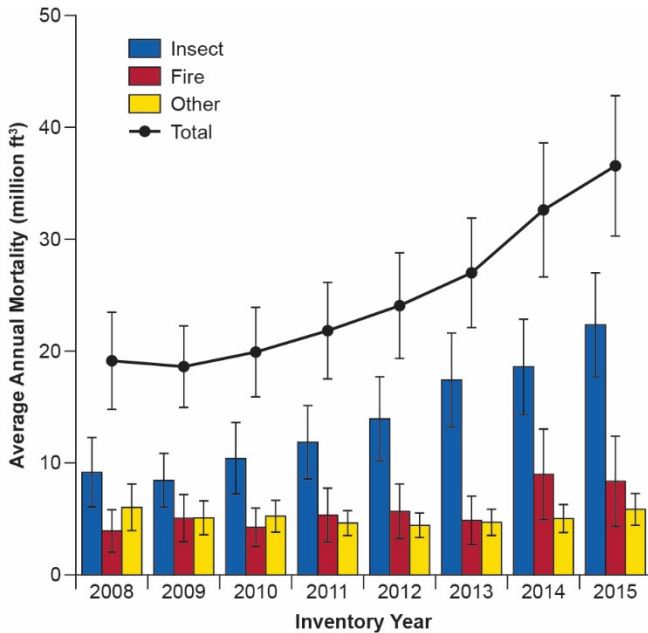
Common name	Latin name	Million trees <sup>a</sup>	Net volume <sup>b</sup> (million ft <sup>3</sup> )	Aboveground biomass <sup>a</sup> (thousand dry tons)	Average annual net growth <sup>b</sup> (thousand ft <sup>3</sup> )	Average annual mortality <sup>b</sup> (thousand ft <sup>3</sup> )	Average annual harvest removals <sup>b</sup> (thousand ft <sup>3</sup> )
Ponderosa pine	<i>Pinus ponderosa</i>	348.9	1,646.4	30,504.4	-613.4	36,549.9	33,069.7
Bur oak	<i>Quercus macrocarpa</i>	31.3	113.8	3,532.5	1,342.5	639.2	--
Eastern cottonwood	<i>Populus deltoides</i>	1.9	107.0	1,941.6	3,134.7	846.2	--
White spruce	<i>Picea glauca</i>	31.5	92.2	1,655.7	1,604.4	1,119.0	1,060.0
Green ash	<i>Fraxinus pennsylvanica</i>	28.8	82.1	2,452.5	1,164.2	1,803.4	12.9
American elm	<i>Ulmus americana</i>	5.7	35.7	809.9	612.4	1,707.6	213.6
Rocky Mountain juniper	<i>Juniperus scopulorum</i>	20.8	35.2	552.5	804.1	252.6	--
Boxelder	<i>Acer negundo</i>	8.1	31.1	717.3	1,592.5	418.5	626.2
Eastern redcedar	<i>Juniperus virginiana</i>	18.8	22.5	540.0	1,587.4	0.0	--
Siberian elm	<i>Ulmus pumila</i>	2.7	20.6	518.7	726.9	180.5	191.9
Quaking aspen	<i>Populus tremuloides</i>	18.0	16.5	379.0	-556.8	1,265.0	108.9
Hackberry	<i>Celtis occidentalis</i>	1.7	6.9	179.4	344.3	117.6	--

<sup>a</sup> Trees ≥1 inch diameter

<sup>b</sup> Trees ≥5 inches diameter

Note: Table cells without observation are indicated by --. A value of 0.0 is due to rounding of a small value.

# Status of South Dakota's Ponderosa Pine Resource



**Figure 4.—Average annual mortality of ponderosa pine trees in million cubic feet by cause of mortality, 2008-2015. Error bars represent 68 percent confidence interval around the estimate.**

The status of ponderosa pine in South Dakota has been an area of concern beginning in the mid-1990s when the current outbreak of mountain pine beetle began. FIA estimates show that ponderosa pine mortality has been increasing every year since 2009 (Figure 4). Mortality due to insect damage is the leading cause of death in ponderosa pine trees. While the exact species of insect causing death is not recorded by FIA measurements, it is safe to assume that insect mortality is largely caused by MPB with small amounts caused by the pine engraver beetle (*Ips* spp.).

Every year, Region 2 of the U.S. Forest Service conducts an aerial detection survey of tree damage caused by insects and disease. In the Black Hills, damage maps are made from interpreting high resolution aerial photographs and are supplemented by ground surveys done by entomologists (U.S. Forest Service 2016). This year's study indicates that the MPB epidemic is slowing, with fewer acres of trees being affected in 2015 than in 2014. Many infected areas visited by entomologists show populations of MPB in decline. Active forest management continues to have a positive effect on the ponderosa pine resource in South Dakota.

## Literature Cited

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**Northern Hills Ranger District signed a participating agreement with Lawrence County to reduce the mountain pine beetle epidemic in the Northern Hills. Photo by Ken Hehr, U.S. Forest Service.**

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