



# Forests of South Dakota, 2013

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 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. The estimates presented in this update are for the measurement years 2009-2013 with comparisons made to 2004-2008. The sample plot population in South Dakota consists of 381 forested or partially forested plots, with about 20 percent of the plots measured each year. The data used in this publication were accessed from the FIA Database in March 2014.

## Overview

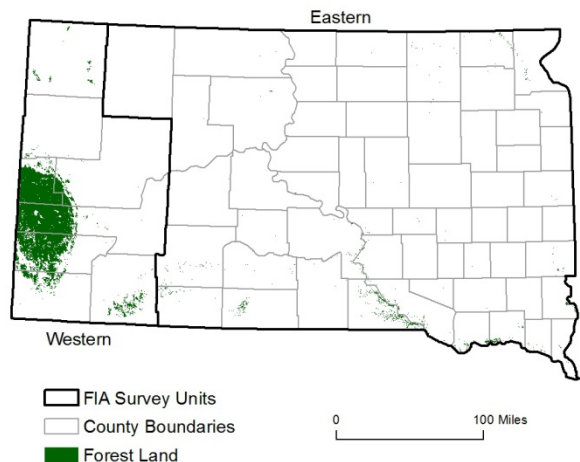
South Dakota is home to 1.9 million acres of forest land. Forested area has increased by about 3.6 percent (67,300 acres) since 2008 (Table 1). The number of live trees on South Dakota's forest land in 2013 was estimated at greater than 561 million trees, an increase of 4.6 percent from 2008. Both net volume of live trees ( $\geq 5$  in diameter) and aboveground biomass of live trees ( $\geq 1$  in diameter) experienced decreases of about 3.0 percent and 1.5 percent, respectively. Average annual net growth decreased 31.4 percent compared to the 2008 estimate, while average annual harvest removals increased by 81.9 percent and mortality increased by 31.3 percent (Table 1).

**Table 1.—South Dakota forest statistics, change between 2008 and 2013**

	2004-2008 Estimate	Sampling error (percent)	2009-2013 Estimate	Sampling error (percent)	Change since 2008
<b>Forest Land</b>					
Area (thousand acres)	1,861.8	2.9	1,929.1	2.8	+ 67.3
Number of live trees $\geq 1$ in diameter (million trees)	536.7	6.0	561.3	6.2	+ 24.6
Live tree ( $\geq 1$ in diameter) aboveground biomass (million oven-dry tons)	45.2	4.1	44.5	4.5	- 0.7
Net volume of live trees $\geq 5$ in diameter (million ft <sup>3</sup> )	2,281.0	4.0	2,213.3	4.5	- 67.7
Annual net growth of live trees $\geq 5$ in (million ft <sup>3</sup> /yr)	40.8	25.0	28.0	25.8	- 12.8
Annual harvest removals of live trees $\geq 5$ in (million ft <sup>3</sup> /yr)	23.7	31.7	43.1	19.8	+ 19.4
Annual mortality of live trees $\geq 5$ in (million ft <sup>3</sup> /yr)	27.8	17.4	36.5	14.5	+ 8.7
<b>Timberland</b>					
Area (thousand acres)	1,718.3	3.1	1,784.8	3.0	+ 66.5
Number of live trees $\geq 1$ in diameter (million trees)	500.2	6.3	528.3	6.5	+ 28.1
Live tree ( $\geq 1$ in diameter) aboveground biomass (million oven-dry tons)	41.7	4.4	41.7	4.7	+ 0.0
Net volume of live trees $\geq 5$ in diameter (million ft <sup>3</sup> )	2,118.5	4.4	2,091.0	4.7	- 27.5
Net volume of growing-stock trees (million ft <sup>3</sup> )	1,933.4	4.4	1,734.2	5.1	- 199.2
Annual net growth of growing-stock trees (million ft <sup>3</sup> /yr)	37.4	23.6	26.6	28.3	- 10.8
Annual harvest removals of growing-stock trees (million ft <sup>3</sup> /yr)	22.7	32.6	41.9	20.2	+ 19.2
Annual mortality of growing-stock trees (million ft <sup>3</sup> /yr)	20.7	18.5	26.8	16.9	+ 6.1



# Forest Area

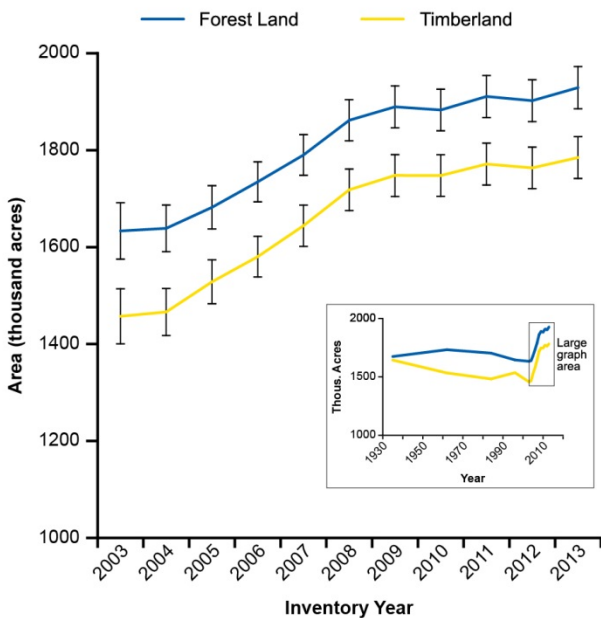


**Figure 1.—FIA survey units and area of forest land, South Dakota.**

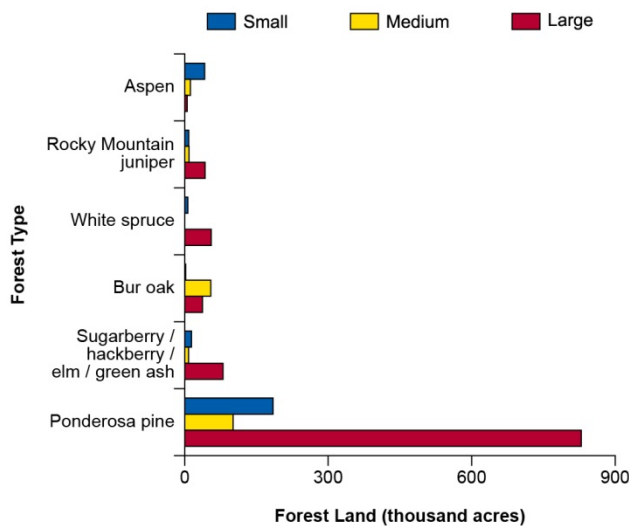
South Dakota is divided into two survey units (Fig. 1). Statewide forest land area is 1.9 million acres  $\pm$  54,000 acres, roughly 3.9 percent of total land area in the State. The Western survey unit, home to the Black Hills, supports most forest land area in South Dakota (about 1.47 million acres), and is 13.2 percent forested. The Eastern survey unit has considerably less forest land (about 464,000 acres) and is just 1.2 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 1.1 million acres (Fig. 3). The next most common forest types are sugarberry/hackberry/elm/green ash at 102,000 acres, bur oak at 94,000 acres, and white spruce at 62,000 acres.



**Figure 2.—Area of forest land and timberland by year, South Dakota. Error bars represent 68 percent confidence interval around the estimate.**



**Figure 3.—Area of forest land by top six forest types and stand size class, 2009-2013. 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-eight species (including unknowns identified to the genus level) were recorded on South Dakota forest land in 2013. Ponderosa pine, bur oak, green ash, white spruce, and Rocky Mountain juniper, are the most numerous species by number of live trees (Table 2).

Ponderosa pine continues to rank first for live tree volume on forest land with 1.6 billion cubic feet (Table 2), a decrease of about 7 percent from the 2004-2008 inventory. This species accounted for 73 percent of South Dakota’s live tree volume. Eastern cottonwood and bur oak were the next most voluminous species, each accounting for about 5 percent of the live tree volume on forest land. Statewide total cubic foot volume has decreased since 2008 (Table 1), which is mainly due to the loss of volume in ponderosa pine.

In 2013, average annual net growth on forest land was 28 million cubic feet (Table 1). Mortality was 36.5 million cubic feet on average, annually. Removals were 43.1 million cubic feet, for a growth to removal ratio of 0.65. South Dakota’s removals are, on average, about 2 percent of the total standing volume per year. The vast majority of removals are ponderosa pine (Table 2). An

epidemic of mountain pine beetle (MPB) is currently affecting ponderosa pine trees 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 had more than 44.5 million oven-dry tons of biomass on forest land. Ponderosa pine again accounted for the vast majority of that at 67 percent of the total. Bur oak and green ash had the next largest totals of biomass, 8 percent and 6 percent of the total, respectively. The 44.5 million dry tons of biomass equates to 22.3 tons of carbon in South Dakota’s forests. About 59 percent of that is on public land and 41 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, 2009-2013**

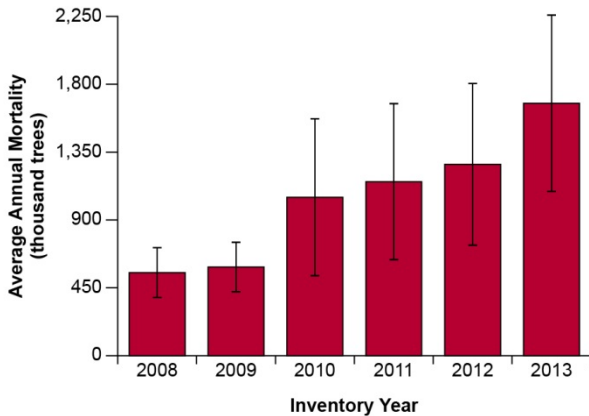
Common Name	Latin Name	Million Trees <sup>a</sup>	Net Volume <sup>b</sup> (million ft <sup>3</sup> )	Aboveground Biomass <sup>a</sup> (thousand dry tons)	Average Annual Net Growth <sup>b</sup> (thousand ft <sup>3</sup> )	Average Annual Mortality <sup>b</sup> (thousand ft <sup>3</sup> )	Average Annual Harvest Removals <sup>b</sup> (thousand ft <sup>3</sup> )
Ponderosa pine	<i>Pinus ponderosa</i>	343.82	1,616.37	29,951.49	12,532.14	26,989.72	40,737.66
Eastern cottonwood	<i>Populus deltoides</i>	1.96	114.34	2,074.32	3,260.41	840.12	0.00
Bur oak	<i>Quercus macrocarpa</i>	29.89	114.02	3,622.40	1,454.57	1,135.63	--
Green ash	<i>Fraxinus pennsylvanica</i>	28.38	89.50	2,634.65	3,578.25	1,383.79	17.49
White spruce	<i>Picea glauca</i>	26.2	82.54	1,473.07	1,758.15	851.50	1,801.53
American elm	<i>Ulmus americana</i>	6.40	45.88	1,025.71	-451.00	2,796.74	87.11
Boxelder	<i>Acer negundo</i>	8.40	32.50	766.00	1,307.63	476.22	38.98
Rocky Mountain juniper	<i>Juniperus scopulorum</i>	19.54	28.90	464.08	689.5	277.09	--
Eastern redcedar	<i>Juniperus virginiana</i>	16.68	21.03	509.18	1,492.74	0.00	325.99
Quaking aspen	<i>Populus tremuloides</i>	17.99	16.98	387.11	-656.89	1,246.59	127.22
Siberian elm	<i>Ulmus pumila</i>	2.81	15.53	405.67	747.49	73.68	0.00
Hackberry	<i>Celtis occidentalis</i>	1.89	7.36	185.65	245.92	216.59	--

<sup>a</sup> Trees ≥1 in diameter

<sup>b</sup> Trees ≥5 in diameter

Note: Table cells without observation are indicated by --. A value of 0.00 is due to rounding of a small value.

## Mountain Pine Beetle in the Black Hills



**Figure 4.—Average annual mortality of ponderosa pine trees caused by insect damage, 2008-2013. Error bars represent 68 percent confidence interval around the estimate.**

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 (Harris 2013). Currently, mountain pine beetle is active on 33,000 acres of forest in the Black Hills of South Dakota; including 14,000 acres of previously unmapped infested areas (U.S. Forest Service, 2014). FIA estimates of ponderosa pine mortality due to insect damage continued to increase in 2013 (Fig. 4). While the exact species of insect causing death is not recorded by FIA measurements, it is safe to assume that insect mortality in ponderosa pine is largely caused by MPB.

## Literature Cited

- Ball, J.J.; Taecker, C.A. 2013. **The survival of mountain pine beetle in unpeeled logs.** *Western Journal of Applied Forestry*. 28(4): 154-157.
- Harris, J. L., comp. 2013. **Forest health conditions, 2012, Rocky Mountain Region (R2).** R2-13-RO-31. Golden, CO: U.S. Forest Service, State & Private Forestry & Tribal Relations, Forest Health Protection. 68 p.
- U.S. Forest Service. 2014. **2013 Highlights from the Black Hills aerial photography interpretation.** Golden, CO: U.S. Forest Service, Region 2. Available at <http://www.fs.usda.gov/detail/r2/forest-grasslandhealth/?cid=stelprdb5447305>. (Accessed March 12, 2014).

## Additional Inventory Resources

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- Piva, R.J.; Walters, B.F.; Haugan, D.D.; Josten, G.J.; Butler, B.J.; et al. 2013. **South Dakota's forests 2010.** Resour. Bull. NRS-81. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 60 p.



**American bison (*Bison bison*) grazing in the Black Hills. Photo by Jennifer Crocker, used with permission.**

### How to Cite This Publication

Walters, Brian F. 2014.  
**Forests of South Dakota, 2013.**  
 Resource Update FS-2 Newtown Square, PA: U.S.  
 Department of Agriculture, Forest Service,  
 Northern Research Station. 4 p.

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