USDA

United States Department of Agriculture

Forests of North Dakota, 2016

This resource update provides an overview of forest resources in North Dakota based on an inventory conducted by the USDA Forest Service, Forest Inventory and Analysis (FIA) program within the Northern Research Station in cooperation with the North Dakota Forest Service. Estimates are based on field data collected using the FIA annualized sample design and are updated yearly. Information about the national and regional FIA program is available at http://fia.fs.fed.us. For the 2016 inventory, estimates for variables such as area, volume, and biomass are based on 7,595 plot samples collected from 2011-2016. Change variables such as net growth, removals, and mortality are based on 7,588 samples collected in 2006-2011 and 2011-2016.

Estimates from earlier annual and periodic inventories are shown for comparison. See Bechtold and Patterson (2005) and O'Connell et al. (2016) for definitions and technical details.

Overview

Total land area of North Dakota is 44.1 million acres of which an estimated 1.8 percent, or 806,300 acres, are forested (Table 1). The number of live trees on North Dakota's forest land in 2016 was estimated at 357.1 million trees, an increase of about 2.7 percent from 2011. Net volume increased about 8.6 percent between 2011 and 2016. Live tree aboveground biomass is estimated at 19.8 million oven-dry tons. Net growth and removals by harvest of live trees decreased on forest land, while annual mortality increased in 2016.

Table 1.—North Dakota forest statistics and changes between 2011 and 2016. Volumes are for trees ≥5 inches diameter. Number of trees and biomass are for trees ≥1 inch diameter. Sampling errors represent a 68-percent confidence intervals around the estimate.

	2011 Estimates	Sampling error (percent)	2016 Estimate	Sampling error (percent)	Percent change since 2011
Forest Land					
Area (thousand acres)	759.9	6.2	806.3	5.8	6.1
Number of live trees ≥1 in diameter (million trees)	347.6	8.5	357.1	8.8	2.7
Net volume live trees ≥ 5 in diameter (million ft^3/yr)	715.9	10.0	777.5	9.5	8.6
Live tree aboveground biomass (thousand oven-dry tons)	18,626.7	8.5	19,777.2	8.2	6.2
Net growth live trees ≥5 in (thousand ft^3/yr)	17,934.0	17.0	12,508.2	38.3	-30.2
Annual mortality of live trees ≥5 in (thousand ft^3/yr)	10,136.2	15.8	16,533.4	26.9	63.1
Harvest removals of live trees ≥5 in (thousand ft^3/yr)	1,147.5	76.4	569.8	56.5	-50.3
Annual other removals of live trees ≥5 in (thousand ft^3/yr)	1,179.1	77.5	900.9	70.8	-23.5
Timberland					
Area (thousand acres)	476.1	8.3	484.4	8.5	1.7
Number of live trees ≥1 in diameter (million trees)	213.3	11.7	214.8	11.9	0.7
Net volume live trees ≥5 in diameter (million ft^3/yr)	571.8	12.5	613.4	12.2	7.2
Live tree aboveground biomass (thousand oven-dry tons)	14,343.5	11.0	15,056.5	10.9	4.9
Net growth of growing-stock trees ≥5 inches (thousand ft^3/yr)	7,778.3	23.3	3,333.6	125.5	-57.1
Annual mortality of growing-stock trees ≥5 inches (thousand ft^3/yr)	4,806.7	22.9	8,621.5	46.6	79.3
Harvest removals of growing-stock trees ≥5 inches (thousand ft^3/yr)	600.2	80.4	83.9	97.5	-86.0
Annual other removals of growing-stock trees (thousand ft^3/yr)	254.9	75.3	581.9	86.8	128.2

Forest Area

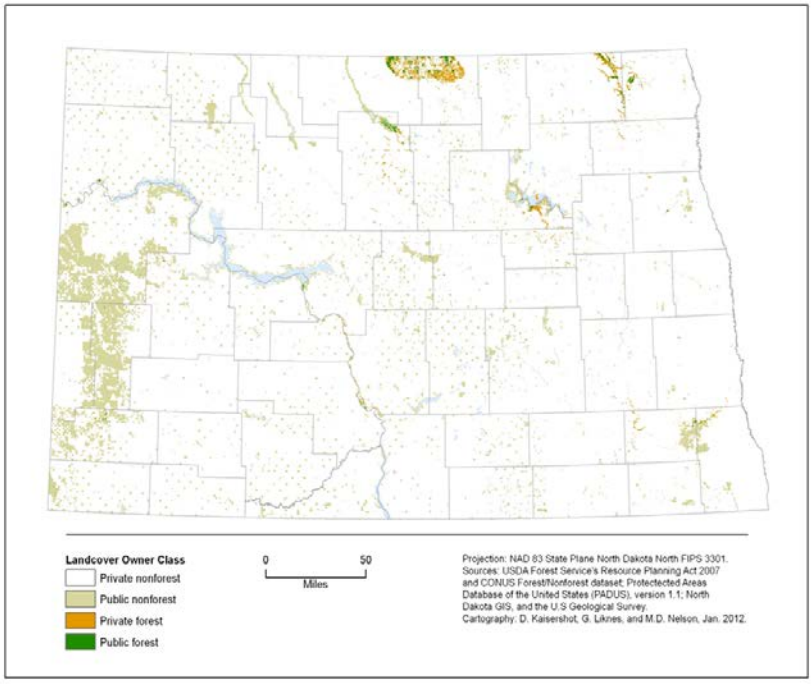

Figure 1.—North Dakota land cover by ownership class.

Seventy percent, or 563,300 acres, of North Dakota forest land is privately owned. Public agencies hold the remaining forest land area (Fig. 1). Although forests cover less than 2 percent of the State's land area, they are an important resource. North Dakota's forests provide watershed protection, wildlife habitat, recreational opportunities, and protect crops, soil and livestock. In 2016, 84 percent of the forest land area was dominated by hardwood forest types while conifer types accounted for 15 percent, with the remaining 1 percent falling into the nonstocked category (Fig. 2). Of the eight major forest-type groups in the State, the oak/hickory, elm/ash/cottonwood, and aspen/birch groups account for 73 percent or 591,300 acres of forest land. The pinyon/juniper forest-type group occupies about 111,200 acres of forest land area, most of it scattered in the western part of the State.

In 2016, there was an estimated 484,400 acres of timberland in North Dakota compared to an estimated 517,800 acres in 2011, a decrease of 6.9 percent (Fig. 3). Roughly 95 percent of trees on timberland areas in North Dakota are of natural origin with an estimated 25,600 acres of timberland area planted.

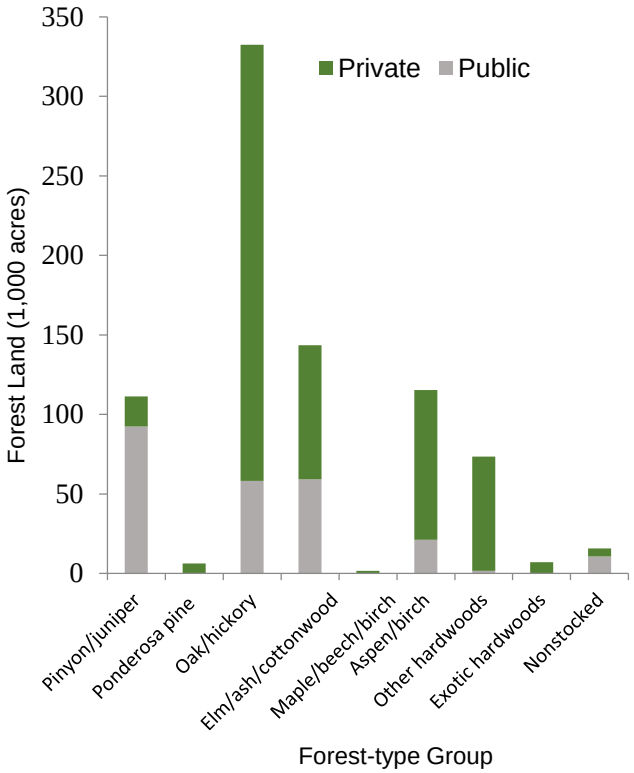

Figure 2.—Area of forest land by forest-type group and ownership class, North Dakota, 2016.

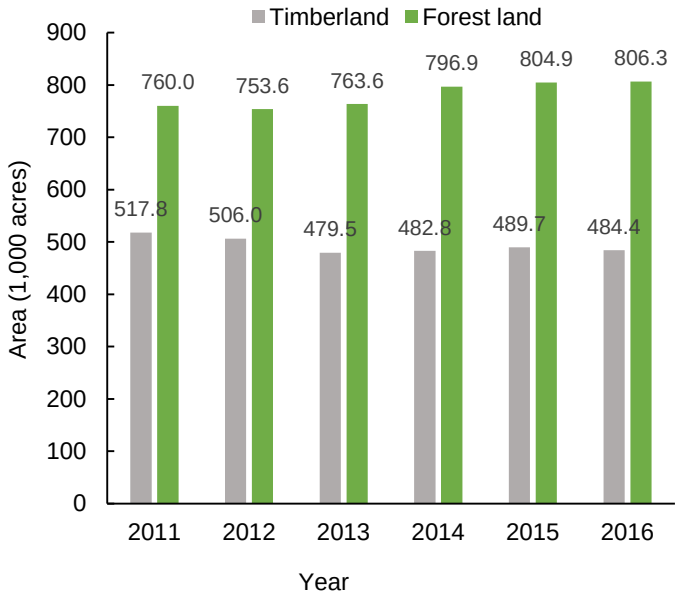

Figure 3—Area of timberland and forest land by year, North Dakota.

Volume, Biomass, and Trends

Twenty-eight tree species were recorded on North Dakota forest land in 2016. Green ash (*Fraxinus pennsylvanica*), quaking aspen (*Populus tremuloides*), bur oak (*Quercus macrocarpa*), and Rocky Mountain juniper (*Juniperus scopulorum*) are the most numerous species in North Dakota (Table 2).

Eastern cottonwood accounts for 24 percent of North Dakota's live tree volume found on forest land across the state. Hardwood species accounted for 92 percent of North Dakota's 777 million cubic feet of live tree volume. Rocky Mountain juniper accounted for almost 8 percent of total volume found in the State.

North Dakota has 19.8 million dry tons of live-tree biomass on forest land (Fig. 4). That equates to about 9.85 million tons of carbon. Only 22 percent of that biomass is on public land. This emphasizes the importance of private landowners in the management of North Dakota's forest resource.

In 2016, average annual net growth of all live trees on forest land was 12.5 million cubic feet (Fig. 5). Average annual tree mortality was 16.5 million cubic feet.

Removals were 1.5 million cubic feet, for a growth-to-removal ratio of about 8:1. North Dakota annual tree mortality is roughly 2 percent of the total standing volume per year. Over half of the removals are from green ash. Removal by harvesting for all species was 5.7 million cubic feet in 2016.

Table 2.—Number, volume, biomass, growth, mortality, and removals of live trees on forest land by species of the top 10 tree species by net volume, North Dakota, 2016.

Common Name	Latin Name	Number of trees[a] (millions)	Net volume[b] (million ft³)	Aboveground biomass[a] (1,000 dry tons)	Average annual Net growth[b] (1,000 ft³)	Average annual mortality[b] (1,000 ft³)	Average annual harvest removals[b] (1,000 ft³)
E. cottonwood	*Populus deltoides*	7,127	188.1	3,466	1,373	4,229	--
Bur oak	*Quercus macrocarpa*	54,446	178.9	5,738	2,546	1,885	--
Green ash	*Fraxinus pennsylvanica*	92,413	141.9	4,703	3,960	1,503	340
Quaking aspen	*Populus tremuloides*	66,434	88.5	2,139	1,205	3,098	--
Rocky Mountain juniper	*Juniperus scopulorum*	45,081	59.7	950	2,777	227	--
Boxelder	*Acer negundo*	11,825	51.3	1,144	403	2,505	174
American elm	*Ulmus americana*	15,314	26.3	700	-211	1,900	54
American basswood	*Tillia americana*	2,156	20.7	318	430	--	--
Peachleaf willow	*Salix amygdaloides*	722	5.5	109	201	--	--
Siberian elm	*Ulmus pumila*	552	5.4	140	131	110	--

[a] Trees ≥1 inch diameter [b] Trees ≥5 inches diameter
Note: Table cells without observation are indicated by –.

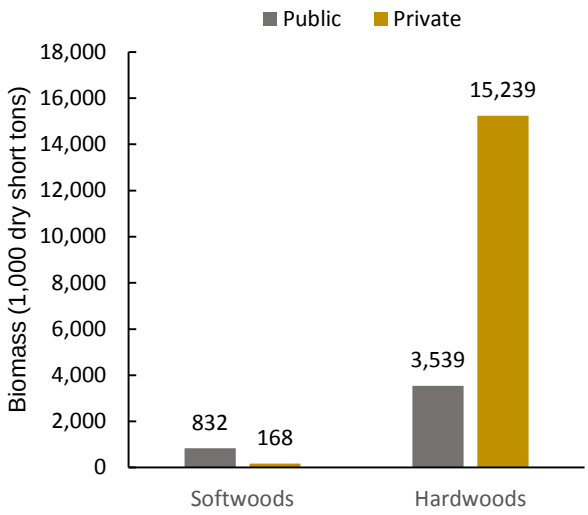

Figure 4.—Dry weight of aboveground biomass of live trees in thousand dry short tons, on forest land by ownership class, and major species group, North Dakota, 2016.

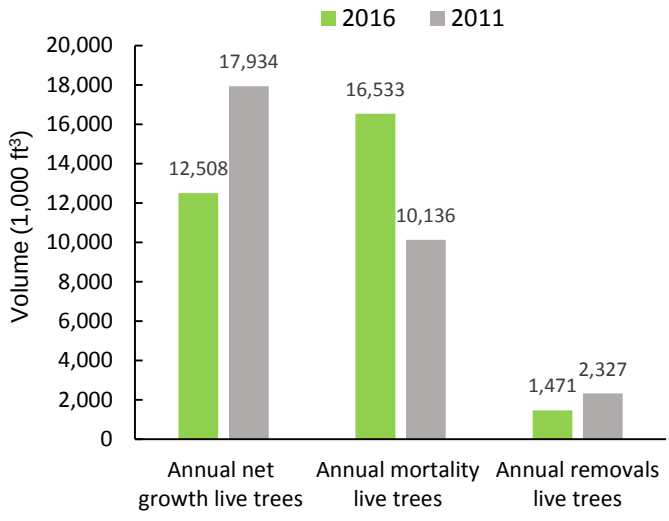

Figure 5.—Average annual net growth, mortality, and removals of all live trees on forest land, North Dakota, 2011 and 2016.

Tree Mortality is on the Rise in North Dakota

Tree mortality in North Dakota has increased by 63 percent since 2011 while net growth has decrease by over 30 percent over the same time period (Table 1). As a percentage of current volume, the annual mortality rate averages 2.1 percent on forest land while growth is at 1.6 percent which is similar to morality and growth rates in Nebraska and South Dakota. The highest mortality rates by cubic-foot volume are for eastern cottonwood (25.5 percent), quaking aspen (18.7 percent) and boxelder (15.1 percent), American elm (11.5 percent), and bur oak (11.4 percent) (Fig. 6). In North Dakota, eastern cottonwood and quaking aspen species account for 44 percent of average annual mortality, 35 percent of the net volume, and 21 percent of the average annual net growth. Weather events have been a major contributor to tree mortality across the State (Fig. 7). Flooding over the last few years has had quite an effect on the riparian forests especially along the Missouri and Souris River basins. Tree diseases including *Hypoxylon* canker, *Cytospora* canker, and Dutch elm disease, and insect agents like *Ips* beetle, forest tent caterpillar, and fall webworm also have had an impact on the trees across North Dakota. Aspen stands have been hit hard by both disease and insect pests. Nearly two-thirds of the aspen forest type is in the 40-year age category or older. Mature stands of aspen tend to be more susceptible to insect and disease out breaks, which can lead to higher mortality rates.

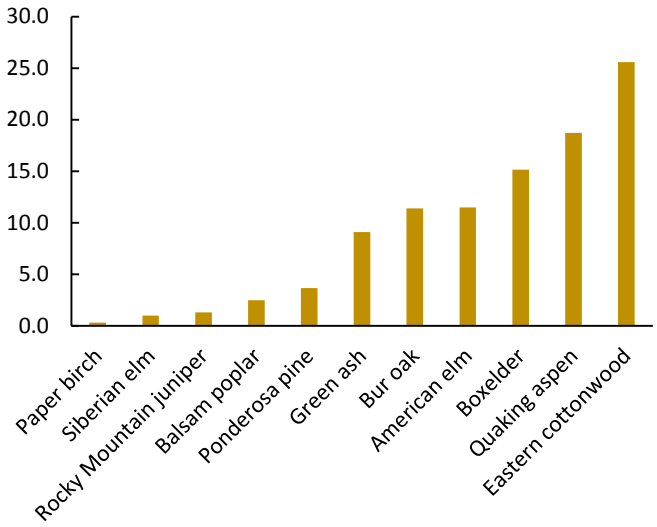

Figure 6.—Average annual mortality of trees, shown as a percentage of mortality, by species, North Dakota, 2016.

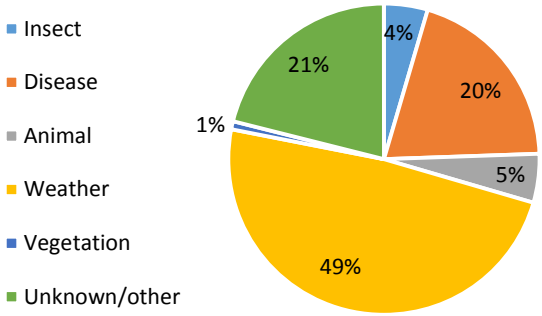

Figure 7.—Average annual mortality of trees by percent, on forest land by cause of death, North Dakota, 2016.

Additional Inventory Information

Haugen, D.E.; Harsel, R.; Bergdahl, A.; Claeys, T.; Woodall, C.W. [et al.]. 2012. **North Dakota's forests 2010**. Resour. Bull. NRS-76. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 52 p.

Haugen, D.E.; Harsel, R.A. 2013. **North Dakota timber industry—an assessment of timber product output and use, 2009**. Resour. Bull. NRS-77. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 33 p.

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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.

O'Connell, B.M.; Conkling, B.L.; Wilson, A.L. [et al.]. 2016. **The Forest Inventory and Analysis database: Database description and user guide version 6.1.1 for Phase 2**. U.S. Department of Agriculture, Forest Service. 870 p. (https://www.fia.fs.fed.us/library/database-documentation/current/ver611/FIADB_User_Guide_P2_6-1-1_final.pdf)

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Northern FIA: http://nrs.fs.fed.us/fia/
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