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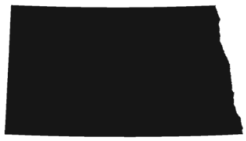
RESOURCE UPDATE FS-149



Forests of North Dakota, 2017

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 2017 inventory, estimates for variables such as area, volume, and biomass are based on 7,598 samples (204 forested) collected from 2012–2017. Change variables such as net growth, removals, and mortality are based on 7,588 samples (196 forested) collected in 2007–2012 and 2012–2017.

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. A complete set of inventory tables is available at https://doi.org/10.2737/FS-RU-149.

Overview

Land area of North Dakota is 44.1 million acres with an estimated 1.8 percent, or 814,900 acres, forested (Table 1). The number of live trees on North Dakota's forest land was estimated at 352 million trees. Net volume showed an increase between 2012 and 2017. Live-tree aboveground biomass is estimated at 20.2 million oven-dry tons. Estimates of net growth and other removals of live trees decreased on forest land, while estimates of annual mortality and harvest removals of live trees increased in 2017.

Table 1.—North Dakota forest statistics and changes between 2012 and 2017. Sampling errors represent a 68-percent confidence interval around the estimate.

	2017 Estimate	Sampling error (%)	2012 Estimate	Sampling error (%)	Percent change since 2012
Forest Land					
Area (thousand acres)	815	5.7	754	6.2	8.1
Number of live trees ≥1 inch diameter (million trees)	352	8.8	350	9.3	0.4
Net volume live trees ≥ 5 inches diameter (million ft^3/yr)	797	9.3	739	9.9	7.8
Live tree aboveground biomass (thousand oven-dry tons)	20,189	8.0	19,165	8.4	5.3
Net growth live trees ≥5 inches (thousand ft^3/yr)	13,992	36.9	17,747	16.5	-21.2
Annual mortality of live trees ≥5 inches (thousand ft^3/yr)	17,419	26.0	10,958	15.6	59
Harvest removals of live trees ≥5 inches (thousand ft^3/yr)	1,317	73.8	1,272	68.4	3.5
Annual other removals of live trees ≥5 inches (thousand ft^3/yr)	912	71.2	1,185	77.2	-23
Timberland					
Area (thousand acres)	478	8.5	460	8.4	3.9
Number of live trees ≥1 inch diameter (million trees)	205	12.0	211	11.8	-3.1
Net volume live trees ≥5 inches diameter (million ft^3/yr)	622	12.1	584	12.5	6.5
Live tree aboveground biomass (thousand oven-dry tons)	15,133	10.9	14,558	11.0	4.0
Net growth of growing-stock trees ≥5 inches (thousand ft^3/yr)	5,265	86.5	8,313	21.7	-36.7
Annual mortality of growing-stock trees ≥5 inches (thousand ft^3/yr)	8,790	46.0	4,623	23.8	90.1
Harvest removals of growing-stock trees ≥5 inches (thousand ft^3/yr)	630	97.2	574	81.8	9.8
Annual other removals of growing-stock trees (thousand ft^3/yr)	534	94.3	264	74.2	102.7

Forest Area

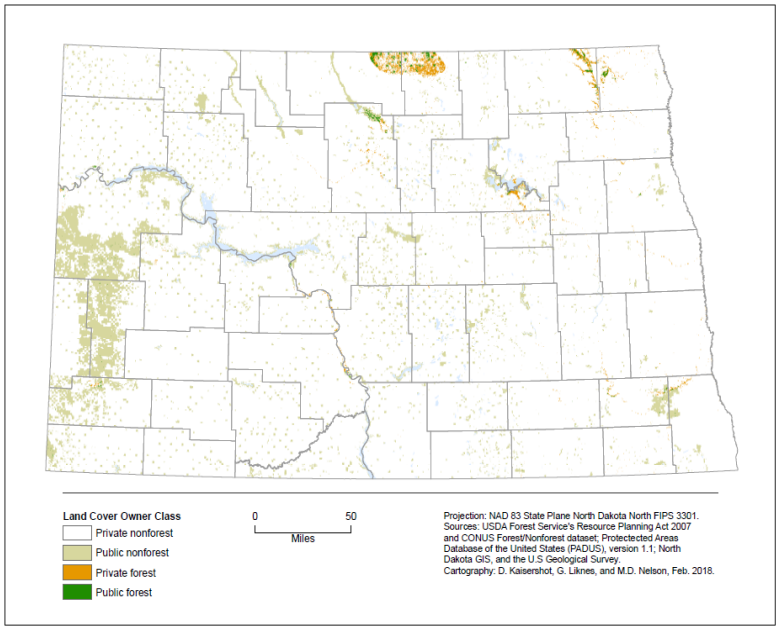


Figure 1.—North Dakota land cover by ownership class.

Seventy percent, or 567,800 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, they are an important resource. North Dakota's forests provide watershed protection, wildlife habitat, recreational opportunities, and protect crops, soil, and livestock. In 2017, 83 percent of the forest land area was dominated by hardwood forest types while conifer types accounted for 15 percent, with the remaining 2 percent falling into the nonstocked category (Fig. 2). The oak/hickory, elm/ash/cottonwood, and aspen/birch forest-type groups account for 586,800 acres (72 percent) of forest land. The pinyon/juniper forest-type group occupies about 111,700 acres of forest land area, most of it scattered in the western part of the State.

In 2017, there was an estimated 477,700 acres of timberland in North Dakota compared to an estimated 459,600 acres in 2012, an increase of 3.9 percent (Fig. 3). Roughly 95 percent of trees on timberland areas in North Dakota are of natural origin with an estimated 22,200 acres of timberland area planted.

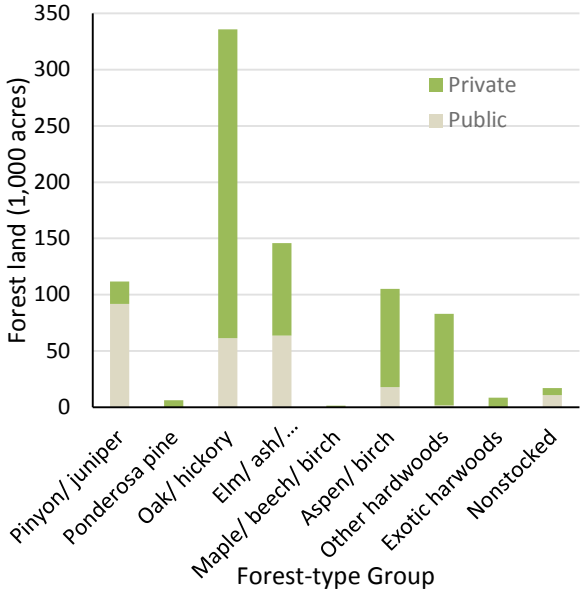


Figure 2.—Area of forest land by forest-type group and ownership class, North Dakota, 2017.

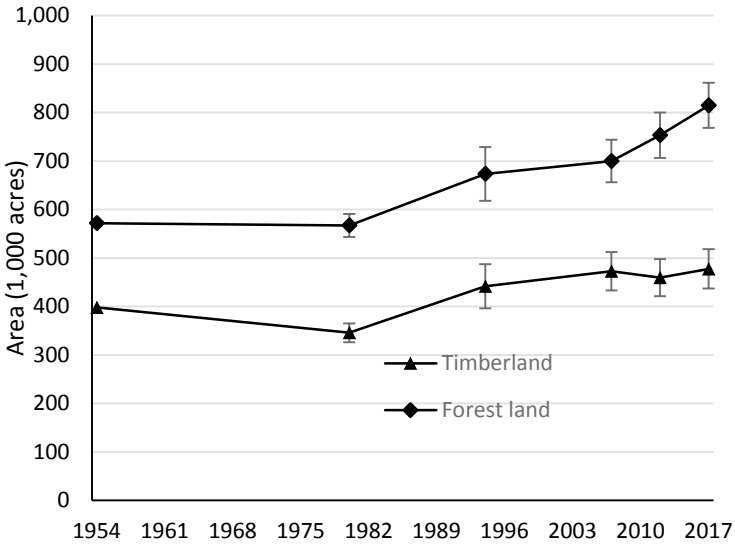


Figure 3.—Area of timberland and forest land by year, North Dakota. Error bars represent a 68 percent confidence interval around the mean.

Definitions

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.

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.

Volume, Biomass, and Trends

Twenty-six tree species were recorded on North Dakota forest land in 2017. Green ash, quaking aspen, bur oak, and Rocky Mountain juniper are the most numerous species in North Dakota (Table 2).

Eastern cottonwood accounts for 25 percent of North Dakota's live tree volume on forest land. Hardwood species accounted for 92 percent of North Dakota's 796.9 million cubic feet of live tree volume. Rocky Mountain juniper, the most voluminous softwood species, accounted for 7.6 percent of total volume found in state.

North Dakota has 20.2 million dry tons of live-tree biomass on forest land (Fig. 4), equating to about 10.1 million tons of carbon. Only 22 percent of that biomass is on public land, and emphasizes the importance of private landowners in the management of North Dakota's forest resource.

In 2017, average annual net growth of all live trees on forest land was 14.0 million cubic feet (Fig. 5). Average annual tree mortality was 17.4 million cubic feet. Removals were 2.2 million cubic feet, for a growth-to-removal ratio of about 7:1. North Dakota annual tree mortality is roughly 2 percent of the standing volume per year. Green ash and quaking aspen combined account for over half of the total removals in 2017 combined. Removal by harvesting for all species was 1.3 million cubic feet in 2017.

Five of the top six hardwood species had estimates of net growth decrease between 2012 and 2017. Green ash showed an increase. The greatest factor in the decrease of net growth was an increase of mortality estimates. Cottonwood and bur oak had the largest increases of mortality. Mortality in green ash remained relatively level, but the threat of emerald ash borer has increased.

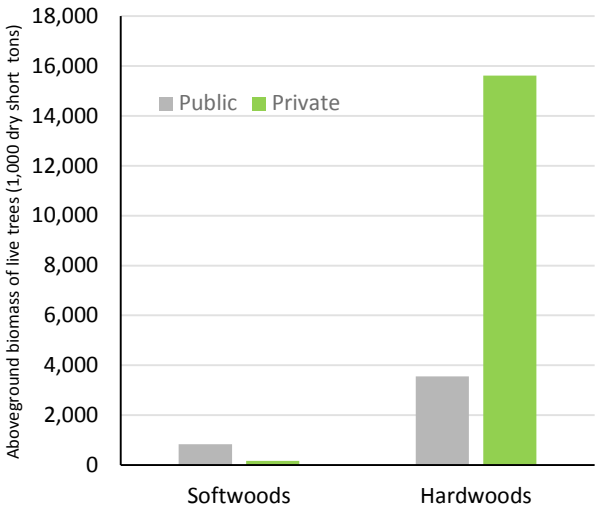


Figure 4.—Aboveground biomass of live trees in thousand dry short tons, on forest land by ownership class, and major species group, North Dakota, 2017.

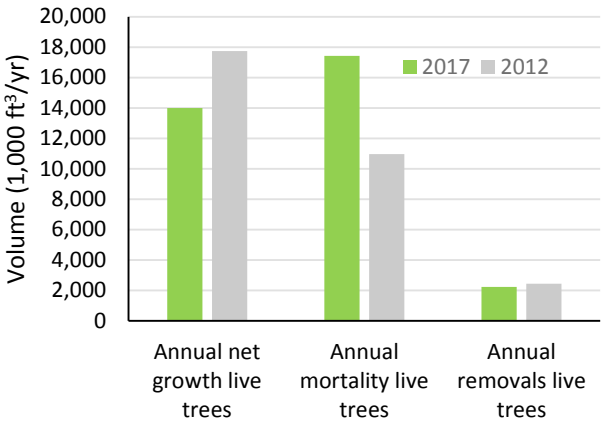


Figure 5.—Average annual net growth, mortality, and removals of live trees ≥5 inches diameter at breast height (d.b.h.) on forest land, North Dakota, 2012 and 2017.

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, 2017.

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*	7,212	199	3,647	3,117	4,233	-
Bur oak	*Quercus macrocarpa*	54,013	182	5,806	1,890	2,304	327
Green ash	*Fraxinus pennsylvanica*	89,970	147	4,847	4,151	1,623	149
Quaking aspen	*Populus tremuloides*	66,182	84	2,037	915	3,358	610
Rocky Mountain juniper	*Juniperus scopulorum*	45,142	61	963	2,840	228	-
Boxelder	*Acer negundo*	13,294	51	1,161	378	2,296	176
American elm	*Ulmus americana*	12,402	27	702	-262	2,041	55
American basswood	*Tillia americana*	2,041	21	319	428	-	-
Siberian elm	*Ulmus pumila*	732	11	250	902	111	-
Peachleaf willow	*Salix amygdaloides*	331	6	112	227	-	-

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

Emerald Ash Borer – A Threat to North Dakota's Forests

In 2017, emerald ash borer (*Agrilus planipennis*; EAB) was confirmed in Winnipeg, Manitoba, only 60 miles north and connected to North Dakota by the International Mid-Continent Trade Corridor and the Red River Valley riparian corridor. EAB is a highly invasive, exotic insect that attacks and kills all species of North American ash trees. EAB larvae tunnel through the conductive tissue under the bark and eventually killing the tree in as little as 3 years. Hundreds of millions of ash trees have been killed in 31 states and 3 Canadian provinces since EAB's introduction from Asia in the early 1990s. Surveys conducted in North Dakota in 2017 did not reveal evidence of EAB.

Ash (*Fraxinus* spp.) is the most abundant forest land tree species in North Dakota, with an estimated 90 million trees (≥1-inch diameter) estimated from the 2017 survey. Ash accounts for about 147 million ft^3 of live tree volume (≥5 inches d.b.h.), of which 78 percent is privately owned (Fig. 6), and is found on 64 percent of forested plots (Fig. 7) . Additionally, data collected by the Great Plains Tree and Forest Invasives Initiative (GPI) indicates that 41 percent of the State's rural nonforest and other land with trees is composed of ash. This includes narrow riparian areas where ash makes up about 65 percent of all species. Also, about 33 percent of the State's 55,000 miles of windbreaks are composed of ash. More information can be found at: http://www.ndinvasives.org/emeral-ash-borer.

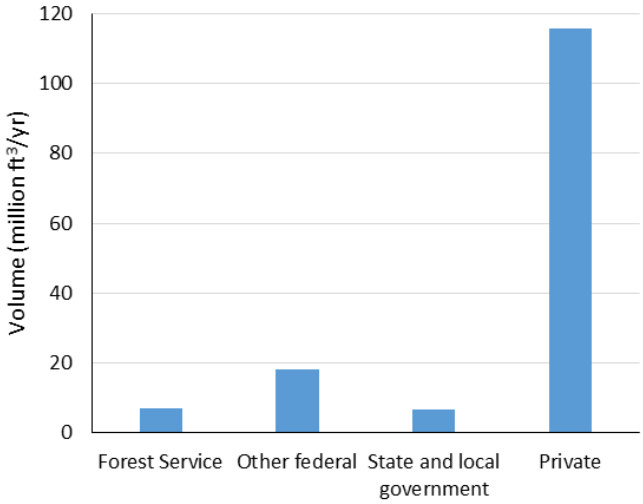


Figure 6.—Net volume of ash trees at least 5 inches d.b.h., by owner group, on forest land, North Dakota, 2017.

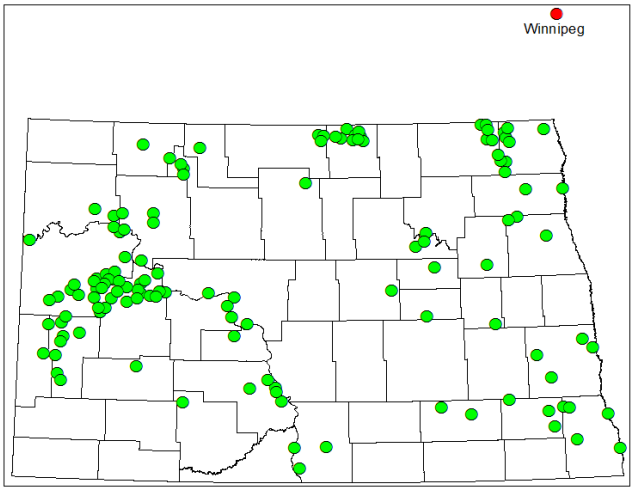


Figure 7.—Approximate plot locations with at least one ash tree (≥ 1 inch diameter), North Dakota, 2017.

Additional Inventory Information

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. https://doi.org/10.2737/NRS-RB-77.

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. https://doi.org/10.2737/NRS-RB-76.

References

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. Dept. of Agriculture, Forest Service, Southern Research Station. 85 p. https://doi.org/10.2737/SRS-GTR-80.

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 (accessed March 2, 2018).

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