



# Forests of North Dakota, 2015

This resource update provides an overview of forest resources in North 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 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 online at <http://fia.fs.fed.us>. For the 2015 inventory, estimates for current variables such as area, volume, and biomass are based on 7,594 plot samples collected from 2010-2015. Change variables such as net growth, removals, and mortality are based on 7,587 samples collected in 2005-2010 and 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

Total land area of North Dakota is 44.1 million acres of which 1.8 percent, or 804,900 acres, are forested (Table 1). The number of live trees on North Dakota’s forest land in 2015 was estimated at 353.3 million trees, an increase of about 3.4 percent from 2010. Net volume experienced an increase of about 8.3 percent between 2010 and 2015. Live tree biomass (above ground) is estimated at 19.6 million oven-dry tons. Net growth and removals by harvest of live trees decreased on forest land, while annual mortality increased in 2015.

**Table 1.—North Dakota forest statistics, change between 2010 and 2015**

Volumes are for trees 5 inches and larger in diameter. Number of trees and biomass are for trees 1 inch and larger in diameter. Sampling errors in this report represent 68-percent confidence intervals.

|  | 2010<br>Estimates | Sampling<br>error<br>(percent) | 2015<br>Estimate | Sampling<br>error<br>(percent) | Percent<br>change<br>since 2010 |
|--|-------------------|--------------------------------|------------------|--------------------------------|---------------------------------|
| <b>Forest Land</b>   |                   |                                |                  |                                |                                 |
| Area (thousand acres)  | 772.4             | 6.1                            | 804.9            | 5.8                            | 4.2                             |
| Number of live trees ≥1 in diameter (million trees)                          | 341.6             | 9.1                            | 353.3            | 8.8                            | 3.4                             |
| Net volume live trees ≥ 5 in diameter (million ft <sup>3</sup> /yr)          | 711.2             | 9.9                            | 770.4            | 9.6                            | 8.3                             |
| Live tree aboveground biomass (thousand oven-dry tons)                       | 18,453.20         | 8.4                            | 19,635.50        | 8.2                            | 6.4                             |
| Net growth live trees ≥5 in (thousand ft <sup>3</sup> /yr)                   | 13,523.60         | 25.6                           | 13,039.10        | 37.3                           | -3.6                            |
| Harvest removals of live trees ≥5 in (thousand ft <sup>3</sup> /yr)          | 1,032.70          | 80.7                           | 569.8            | 56.5                           | -44.8                           |
| Annual mortality of live trees ≥5 in (thousand ft <sup>3</sup> /yr)          | 12,994.30         | 20.8                           | 16,985.90        | 26.3                           | 30.7                            |
| <b>Timberland</b>  |                   |                                |                  |                                |                                 |
| Area (thousand acres)  | 491.6             | 8.2                            | 489.7            | 8.4                            | -0.5                            |
| Number of live trees ≥1 in diameter (million trees)                          | 211.2             | 11.8                           | 216.2            | 11.9                           | 2.3                             |
| Net volume live trees ≥5 in diameter (million ft <sup>3</sup> /yr)           | 564.9             | 12.4                           | 608              | 12.3                           | 7.6                             |
| Live tree aboveground biomass (thousand oven-dry tons)                       | 14,123.30         | 10.8                           | 14,941.20        | 11                             | 5.8                             |
| Net growth of growing-stock trees ≥5 in (thousand ft <sup>3</sup> /yr)       | 8,485.70          | 22.59                          | 3,965.30         | 107.0                          | -53.2                           |
| Harvest removals of growing-stock trees ≥5 in (thousand ft <sup>3</sup> /yr) | 492.2             | 94                             | 83.9             | 97.5                           | -82.9                           |
| Annual mortality of growing-stock trees ≥5 in (thousand ft <sup>3</sup> /yr) | 4,413.80          | 22.9                           | 8,798.20         | 45.6                           | 99.3                            |



# Forest Area

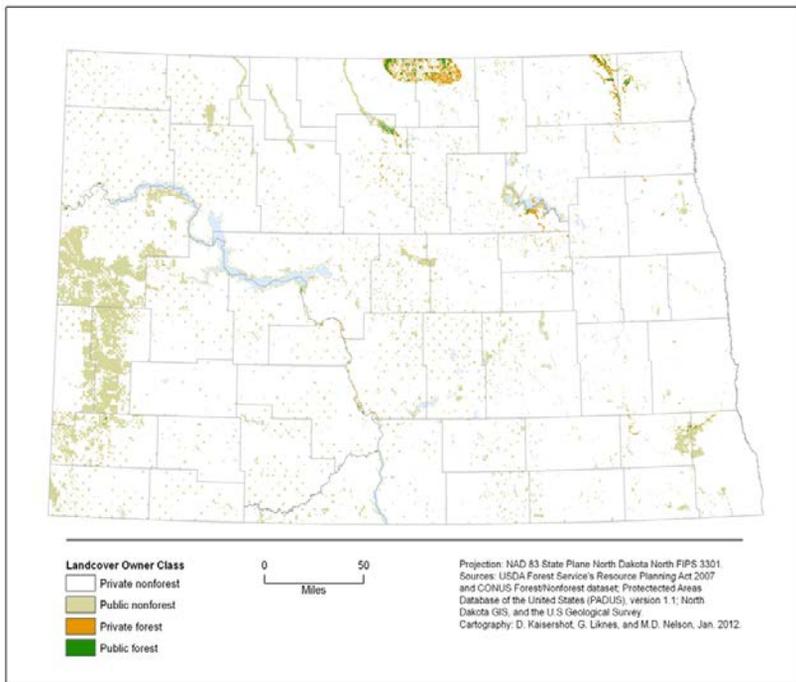


Figure 1.—North Dakota land cover by ownership class.

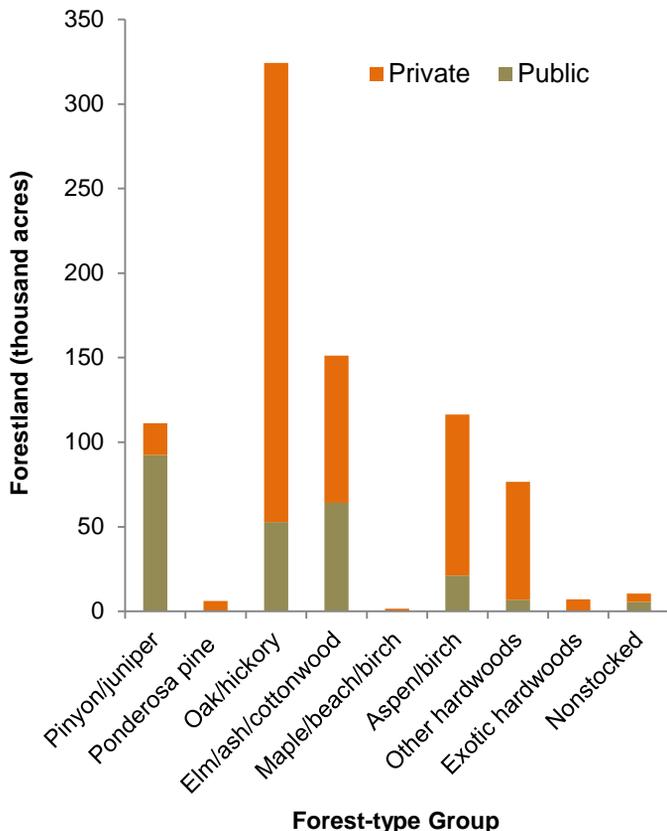


Figure 2.—Area of forest land, in thousand acres, by forest-type group, and ownership class.

Seventy percent, or 562,000 acres, of forest land is privately owned in North Dakota. 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 2015, 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 74 percent or 591,900 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.

Timberland, a component of forest land, had been increasing steadily since 1980s (Fig. 3). In 2015, there was an estimated 489,700 acres of timberland in North Dakota compared to an estimated 492,000 acres in 2010, a decrease of 0.5 percent. Roughly 95 percent of trees on timberland areas in North Dakota are of natural origin with an estimated 25,300 acres of timberland area planted.

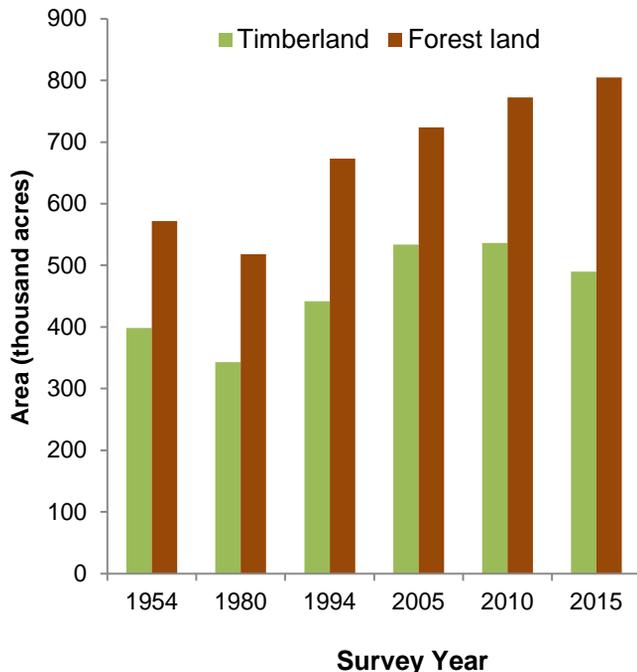


Figure 3.—Area of timberland and forest land by year.

## Volume, Biomass, and Trends

Twenty-eight different tree species were recorded on North Dakota forest land in 2015. 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).

The cottonwood species 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 770 million cubic feet of live tree volume. Rocky Mountain juniper accounted for 7 percent of total volume found in state.

North Dakota has 19.6 million dry tons of live-tree biomass on forest land across the state (Fig. 4). That equates to about 9.8 million tons of carbon. Only 23 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 2015, average annual net growth of all live trees on forest land was 13 million cubic feet (Fig. 5). Annual mortality was 17 million cubic feet on average. Removals were 1.5 million cubic feet, for a growth-to-removal ratio of about 8:1. North Dakota annual 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 5.70 million cubic feet in 2015.

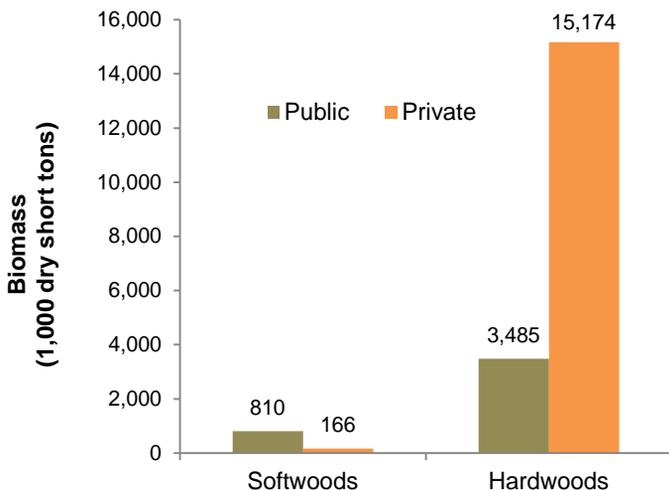
**Table 2.—Number, volume, biomass, growth, mortality, and removals of live trees on forest land by species of the top 10 tree species by net volume, North Dakota, 2015.**

| Common Name            | Latin Name                    | Number of Trees <sup>a</sup> (millions) | 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> ) |
|------------------------|-------------------------------|---|--|--|--|---|--|
| Cottonwood             | <i>Populus deltoides</i>      | 6,869                                   | 174.3  | 3,425  | 1,936  | 4,220   | --   |
| Bur oak                | <i>Quercus macrocarpa</i>     | 53,742                                  | 172.2  | 5,718  | 2,545  | 1,885   | --   |
| Green ash              | <i>Fraxinus pennsylvanica</i> | 89,846                                  | 138.6  | 4,614  | 3,611  | 1,852   | 339  |
| Quaking aspen          | <i>Populus tremuloides</i>    | 76,045                                  | 89.9   | 2,106  | 1,141  | 3,302   | --   |
| Rocky Mountain juniper | <i>Juniperus scopulorum</i>   | 41,315                                  | 56.4   | 925  | 2,801  | 227   | --   |
| Boxelder               | <i>Acer negundo</i>           | 12,358                                  | 50   | 1,164  | 646  | 2,475   | 174  |
| American elm           | <i>Ulmus americana</i>        | 15,336                                  | 25   | 707  | -257   | 1,984   | 54   |
| American basswood      | <i>Tilia americana</i>        | 2,028                                   | 20.3   | 318  | 430  | --  | --   |
| Balsam poplar          | <i>Populus balsamifera</i>    | 1,682                                   | 7  | 125  | 46   | 251   | --   |
| Peachleaf willow       | <i>Salix amygdaloides</i>     | 725                                     | 5.5  | 109  | 201  | --  | --   |

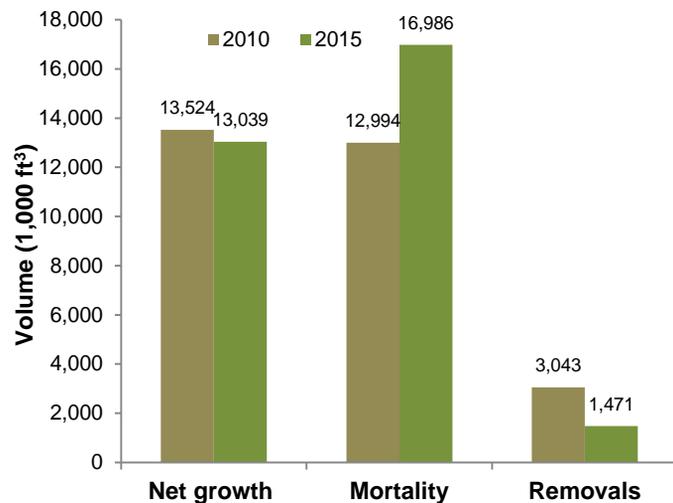
<sup>a</sup> Trees ≥1 inch diameter

<sup>b</sup> Trees ≥5 inches diameter

Note: Table cells without observation are indicated by --.



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



**Figure 5.—Average annual net growth, mortality, and removals of all live on forest land.**

## Standing Dead Trees in North Dakota

Standing dead trees (at least 5 inches diameter at breast height – d.b.h.) provide critical habitat features for many forest-associated wildlife species, and contain significantly more cavities per tree than occur in live trees. Standing dead trees large enough to meet habitat requirements for wildlife are referred to as ‘snags’ (typically at least 10 inches d.b.h.) (Fig. 6). Standing dead trees serve as important indicators not only of wildlife habitat, but also for past mortality events and carbon storage.

More than 12 million standing dead trees are present in North Dakota, with a density of 15 standing dead trees per acre of forest land. Five species contributed more than 1 million standing dead trees across the State, topping the list, quaking aspen, exceeding 3.7 million (Fig. 7). Standing dead trees result from a variety of potential causes, including diseases and insects, weather damage, fire, flooding, drought, competition, and other factors. Standing dead trees provide areas for foraging, nesting, roosting, hunting perches, and cavity excavation for wildlife, ranging from primary colonizers such as insects, bacteria, and fungi to birds, mammals, and reptiles. The size distribution of standing dead trees in North Dakota suggests that many are too small to support nesting or roosting for those wildlife species requiring larger cavities, e.g., wood ducks, owls. Providing a variety of forest structural stages and retaining specific habitat features on both private and public lands are ways that forest managers maintain abundance and quality of habitat for forest-associated wildlife species in North Dakota.

### 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.; 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**. U.S. Department of Agriculture, Forest Service. 748 p. (<http://www.fia.fs.fed.us/library/database-documentation/>)

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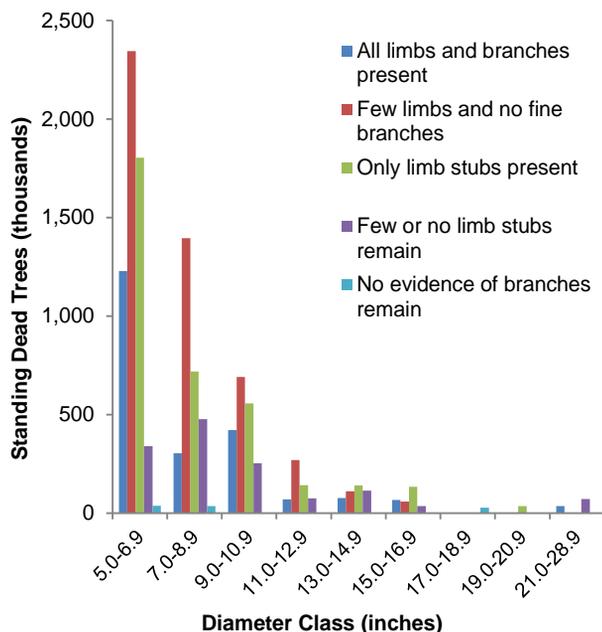


Figure 6.—Number of standing dead trees by diameter and decay class, North Dakota, 2015.

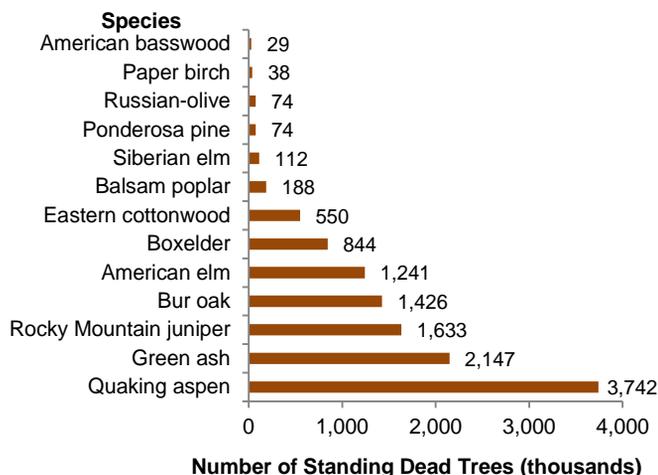


Figure 7.—Number of standing dead trees by species , North Dakota, 2015.