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RESOURCE UPDATE FS-148

Forests of Wisconsin, 2017

This resource update provides an overview of forest resources in Wisconsin based on an inventory conducted by the USDA Forest Service, Forest Inventory and Analysis (FIA) program at the Northern Research Station in cooperation with the Wisconsin Department of Natural Resources. Estimates are based on field data collected using the FIA annualized sample design and are updated yearly. In Wisconsin, annual inventory years 2001–2013 had a cycle length equal to 5 years. Beginning in 2014, the cycle length was changed to 7 years. For the 2017 inventory, estimates such as area, volume, and biomass are based on 6,411 forested field plots collected from 2011–2017. The 2017 change variables, such as net growth, removals, and mortality, are based on plots collected in 2006 to 2011 and resampled in 2011 to 2017. See Bechtold and Patterson (2005) and O'Connell et al. (2015) for definitions and technical details.

Overview

Wisconsin is home to 17.0 million acres of forest land. Forested area has remained relatively stable since 2012 (Table 1). The number of live trees on Wisconsin's forest land in 2017 was estimated at 11.5 billion trees, an increase of 2.4 percent from 2012. Aboveground biomass and net merchantable bole volume increased by 5.0 and 5.4 percent, respectively. Average annual net growth and average annual mortality increased by 4.0 and 6.4 percent, respectively, since 2012. Harvest removals increased 0.8 percent, though it is important to note that this change is within the sampling error. Similar trends were observed on Wisconsin's timberlands (Table 1).

Table 1.—Wisconsin forest statistics, change between 2012 and 2017. Sampling errors in this and other tables represent 68 percent confidence intervals around the estimate.

	2017 Estimate	Sampling error (%)	2012 Estimate	Sampling error (%)	Change since 2012 (%)
Forest Land					
Area (thousand acres)	17,025.0	0.4	17,073.0	0.5	-0.3
Number of live trees ≥1 inch diameter (million trees)	11,504.0	1.1	11,238.0	1.1	2.4
Aboveground biomass of live trees ≥1 inch diameter (million oven-dry tons)	664.8	0.8	633.4	0.8	5.0
Net merchantable bole volume in live trees ≥5 inches diameter (million ft^3)	25,797.1	0.9	24,471.0	0.9	5.4
Annual net growth live trees ≥5 inches diameter (million ft^3/yr)	668.6	1.7	642.8	2.0	4.0
Annual harvest removals of live trees ≥5 inches diameter (million ft^3/yr)	336.4	4.6	333.9	4.7	0.8
Annual mortality of live trees ≥5 inches diameter (million ft^3/yr)	321.2	2.4	301.7	2.2	6.4
Timberland					
Area (thousand acres)	16,483.5	0.5	16,545.1	0.5	-0.4
Number of live trees ≥1 inch diameter (million trees)	11,166.5	1.1	10,922.0	1.2	2.2
Aboveground biomass of live trees ≥1 inch diameter (million oven-dry tons)	643.8	0.8	614.2	0.9	4.8
Net merchantable bole volume of live trees ≥5 inches diameter (million ft^3)	24,966.3	0.9	23,706.7	1.0	5.3
Net merchantable bole volume of growing growing-stock trees (million ft^3)	22,028.4	1.0	21,172.7	1.0	4.0
Annual net growth of growing-stock trees (million ft^3/yr)	567.2	1.7	554.7	2.0	2.3
Annual harvest removals of growing-stock trees (million ft^3/yr)	287.7	4.8	291.9	4.9	-1.4
Annual mortality of growing-stock trees (million ft^3/yr)	239.0	2.6	229.5	2.4	4.1

Forest Area

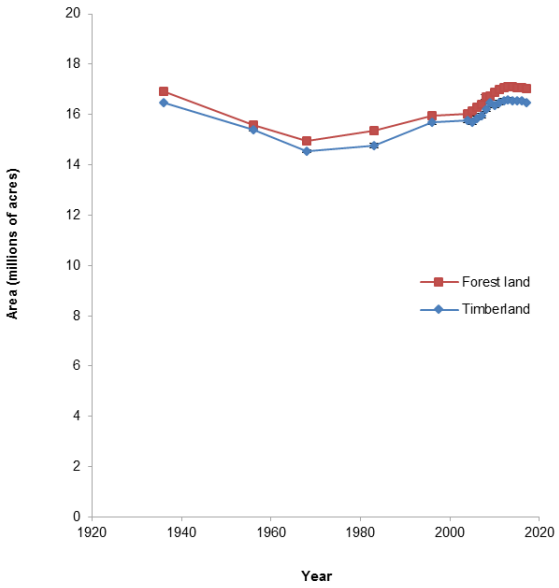

Figure 1.—Area of forest land and timberland by year, Wisconsin. Error bars in this and other graphs represent one standard error, the 68 percent confidence interval.

The total area of Wisconsin's forest land and timberland has remained relatively stable over the last decade (Fig. 1).

In Wisconsin, the 17.0 million acres of forest land area are divided into five survey units (Fig. 2). Of the FIA survey units, the highest percentage of forest occurs in the Northeastern Unit where nearly 75 percent of the region is forest. The two northern FIA survey units represent 10.1 million acres of forestland. The Central, Southwest, and Southeastern Units are areas with more agriculture and development.

Across Wisconsin's timberland, some forest-type groups are much more prevalent than others. The most common forest-type group is oak/hickory at 4.3 million acres of timberland. The second most abundant is the maple/beech/birch forest-type group at 3.7 million acres. The aspen/birch group consists of 2.9 million acres. The white/red/jack pine, elm/ash/cottonwood, and spruce fir groups each represent over 1 million acres and the oak/pine group is just over half a million acres. Among forest-type groups, there are differences in size distribution (Fig. 3). The oak/hickory and maple/beech/birch groups are strongly dominated by the large diameter class while the aspen/birch and spruce/fir groups have a greater number of acres in the small and medium diameter classes.

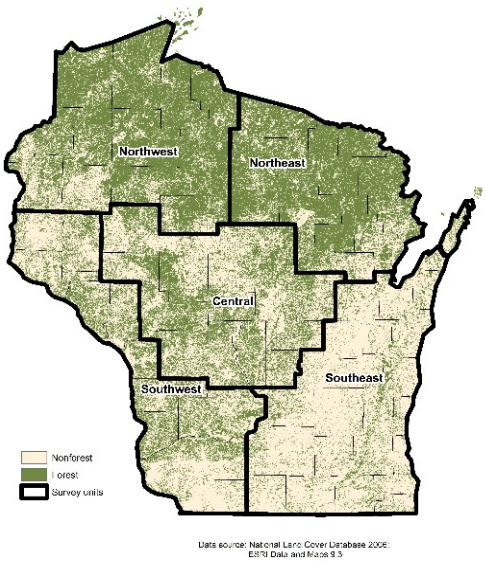

Figure 2.—Forest area by FIA survey unit, Wisconsin.

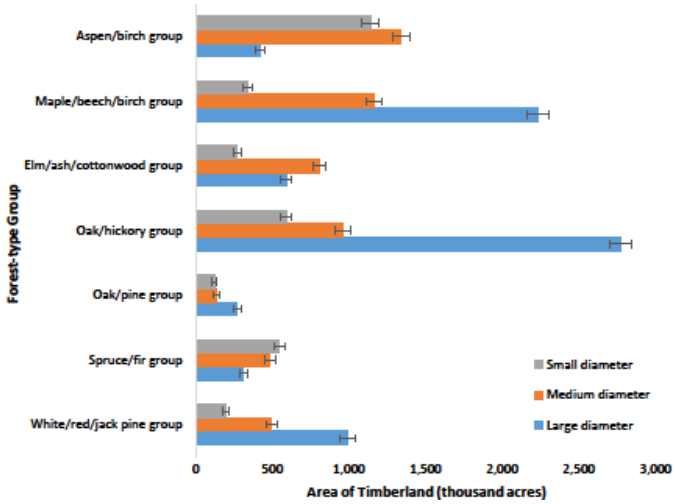

Figure 3.—Area of timberland by forest-type group and stand-size class, Wisconsin 2017. For the stand-size classes, large diameter stands have trees that are at least 11.0 and 9.0 inches in diameter for hardwoods and softwoods, respectively. Medium diameter stands have trees at least 5.0 inches in diameter but smaller than large trees. Small diameter stands have trees that are <5.0 inches in diameter.

Volume Trends on Forest Land and Timberland

As an annual inventory, the data collected by FIA offer the chance to document and evaluate forest trends.

Looking at live tree volume of the State's most common trees on forest land, sugar maple (*Acer saccharum*) is the most voluminous. Eastern white pine (*Pinus strobus*) had the greatest increase in volume between 2012 and 2017 (Table 2; 15.3 percent). The change in northern red oak (*Quercus rubra*) is also noteworthy, increasing by 11.2 percent in the past 5 years. Overall Wisconsin's live tree volume increased to 25.8 billion cubic feet, a 5.4 percent gain since 2012.

In regard to sawtimber volume on timberland, the top 10 species show a slightly different pattern. While sugar maple has the highest volume on forest land, eastern white pine has the most sawtimber volume on timberland. Comparing change from 2012, eastern white pine still has the largest percent gain of the top 10 species (15.6 percent), but northern red oak and red maple (*Acer rubrum*) follow closely with a 14.6 and 13.7 percent increase, respectively. Overall Wisconsin's sawtimber volume increased to 68.9 billion board feet, an 8.0 percent gain since 2012.

Sugar maple foliage. Sugar maple is the most voluminous species on Wisconsin forest land. Photo by Chris Kurtz, used with permission.

Table 2.—Top tree species by statewide volume estimates for forest land and timberland, Wisconsin, 2017.

Species	Volume of live trees on forest land (million ft³)	Sampling error (%)	Change since 2012 (%)	Volume of sawtimber trees on timberland (million bd ft)	Sampling error (%)	Change since 2012 (%)	Previous live tree volume on forest land (million ft³)	Previous sawtimber volume on timberland (million bd ft)
Sugar maple	2,763.9	3.2	4.2	6,662.3	4.3	7.2	2653.2	6,213.8
Red maple	2,720.5	2.6	6.6	5,215.6	4.0	13.7	2,552.3	4,588.9
Northern red oak	2,189.0	3.9	11.2	8,278.2	4.5	14.6	1,969.1	7,222.6
Eastern white pine	2001.6	5.3	15.3	9,090.8	6.0	15.6	1,736.1	7,862.1
Red pine	1,818.7	5.0	8.4	7,182.2	5.7	8.6	1,677.5	6,614.8
Quaking aspen	1,800.9	3.1	1.6	3,126.0	4.9	0.0	1,773.2	3,125.1
American basswood	1,296.9	3.9	2.3	4,001.5	4.6	5.0	1,268.1	3,810.6
Northern white-cedar	908.8	6.4	5.6	2,398.7	7.7	8.8	860.6	2,204.5
White oak	873.0	4.8	3.3	2,592	6.0	2.4	844.9	2,532.4
Black ash	686.6	4.9	3.1	921.1	7.9	2.4	665.7	899.8
Other softwoods	2,178.7	2.9	2.8	5,333.9	4.4	1.6	2,199.5	5,248.8
Other hardwoods	6,558.6	1.8	3.3	14,135.1	2.6	4.7	6,351	13,503.6
Total	25,797.1	0.9	5.4	68,937.5	1.5	8.0	24,471.0	63,826.8

Ash Mortality : Wisconsin's Ash Resource

Emerald ash borer (EAB) (*Agrilus planipennis*) is a slender, elongate beetle up to ½ inch long and ⅛ inch wide. It is dark, metallic green, and native to northeastern Asia. These beetles were first detected in Wisconsin in 2008 are now found throughout the State. Their presence is a concern because all of Wisconsin's native ash species are susceptible to mortality from this highly destructive pest.

Emerald ash borer has four life stages: egg, larva, pupa, and adult. The larval stage is most destructive because their galleries, which are just under the bark, interrupt the flow of nutrients. Beetles attack and kill both healthy and stressed trees. Signs of infestation are crown mortality and epicormic sprouts.

Ash have vast ecologic, economic, and cultural importance. Ash can grow on a variety of sites, ranging from upland to lowland, and is a common tree in urban areas. The species is valuable for flooring, paneling, furniture, baseball bats, tool handles, and cabinets. Additionally, Native Americans use ash for ceremony, medicine, and basket making.

Ash volume has been increasing since 1983, with the exception of green ash (*Fraxinus pennsylvanica*), which steadily increased from 1983 to 2007 followed by a decline in 2012 (Fig. 4). Over the past 10 years, the merchantable bole volume of standing dead ash has remained relatively constant for green ash and slightly increased for white (*F. americana*) and black ash (*F. nigra*; Fig. 5). These trends are important to monitor with EAB spreading across the state. Throughout Wisconsin, quarantines, the release of parasitoids, active management, and insecticides have been used to slow EAB spread. For more information on EAB visit http://dnr.wi.gov/topic/ForestHealth/EmeraldAshBorer.html.

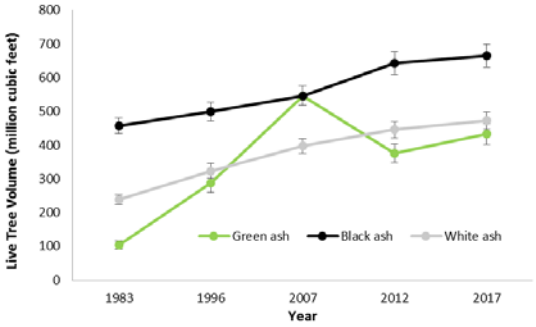

Figure 4.—Net merchantable bole volume of live green, black, and white ash ≥5 inches d.b.h. on timberland by inventory year, Wisconsin.

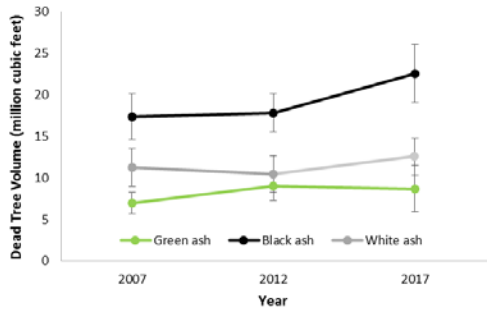

Figure 5.—Net merchantable bole volume of standing dead green, black, and white ash ≥5 inches d.b.h. on timberland by inventory year, Wisconsin.

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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. https://doi.org/10.2737/SRS-GTR-80.

O'Connell, B.M.; Conkling, B.L.; Wilson, A.M.; Burrill, E.A.; Turner, J.A. [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. http://www.fia.fs.fed.us/library/database-documentation/current/ver611/FIADB%20User%20Guide%20P2_6-1-1_final.pdf (accessed March 1, 2018).

Additional Inventory Resources

Kurtz, C.M.; Dahir, S.E.; Stoltman, A.M.; McWilliams, W.H.; Butler, B.J. [et al.]. 2014. **Wisconsin's forests 2014.** Resour. Bull. NRS-112. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 116 p. https://doi.org/10.2737/NRS-RB-112.

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