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RESOURCE UPDATE FS-16

Forests of Maine, 2013

This publication provides an overview of the forest resources in Maine based upon inventories conducted by the U.S. Forest Service, Forest Inventory and Analysis (FIA) program of the Northern Research Station. Information about the national and regional FIA program is available online at http://fia.fs.fed.us

Since 1999, FIA has implemented an annual inventory measuring data on 20 percent of sample plots each year. For the 2013 inventory, estimates for current variables, such as area, volume, and biomass, are based on 3,156 plots inventoried from 2009-2013. Change variables, such as net growth, removals, and mortality, are based on 3,075 samples collected in 2004-2008 and resampled in 2009-2013. There are additional tables available online (http://www.nrs.fs.fed.us/fia/data-tools/state-reports/ME/default.asp). Estimates from earlier annual and periodic inventories are shown for comparison.

See Bechtold and Patterson (2005) and O'Connell et al. (2014) for definitions and technical details.

Overview

Maine contains more than 17.6 million acres of forest land (Table 1). The acreage of forest land has been quite stable since 1960, covering more than 85 percent of the total land area (Ferguson and Longwood 1960). The number of live trees greater than 1-inch in diameter are approaching 24.5 billion trees.

Aboveground biomass of all live trees has increased slightly since 2008. Over the same period, the average annual volume for tree growth has increased 30 percent and tree mortality has decreased 15 percent. Tree harvest levels have remained flat since 2008 (McCaskill et al. 2011).

Table 1.—Maine forest statistics, 2013 and 2008. Volumes are for 5-inch and larger diameter trees. Number of trees and biomass are for 1-inch and larger diameter trees. Sampling errors and error bars shown in tables and figures in this report represent 68-percent confidence intervals.

	2013 Estimate	Sampling error (percent)	2008 Estimate	Sampling error (percent)	Change since 2008 (percent)
Forest Land					
Area (thousand acres)	17,636	0.4	17,656	0.4	-0.1
Number of live trees (million trees)	24,495	1.5	23,320	1.5	5.0
Aboveground biomass of live trees (thousand oven-dry tons)	693,848	1.0	664,201	1.0	4.5
Net volume of live trees (million ft^3)	26,356	1.2	25,474	1.2	3.5
Annual net growth of live trees (thousand ft^3/yr)	753,238	2.1	574,700	2.6	31.1
Annual mortality of live trees (thousand ft^3/yr)	293,377	3.2	345,269	2.8	-15.0
Annual harvest removals of live trees (thousand ft^3/yr)	573,035	5.2	600,856	5.4	-4.6
Annual other removals of live trees (thousand ft^3/yr)	9,304	38.9	1,907	59.3	387.9
Timberland					
Area (thousand acres)	17,022	0.5	17,001	0.5	0.1
Number of live trees (million trees)	23,711	1.6	22,510	1.6	5.3
Aboveground biomass of live trees (thousand oven-dry tons)	669,040	1.0	640,636	1.0	4.4
Net volume of live trees (million ft^3)	25,327	1.2	24,517	1.2	3.3
Net volume of growing stock trees (million ft^3)	23,570	1.3	22,896	1.3	2.9
Annual net growth of growing stock trees (thousand ft^3/yr)	699,875	1.9	542,983	2.3	28.9
Annual mortality of growing stock trees (thousand ft^3/yr)	223,810	3.5	263,905	3.1	-15.2
Annual harvest removals of growing stock trees (thousand ft^3/yr)	501,640	5.3	530,912	5.4	-5.5
Annual other removals of growing stock trees (thousand ft^3/yr)	16,575	43.6	11,227	44.3	47.6

Forest Area

Maine's forest land area has been very stable since 1960 (Fig. 1). Commercial timberland makes up 97 percent of the forest land area while public ownership including some reserved lands has remained below 8 percent of the total forested area (Fig. 2).

The stand-size classes for the timberland area at the state-level have come into balance since the spruce budworm salvage operations of the 1980s and 1990s (Fig. 3). But individually, the area of timberland in the white-red-jack pine forest-type group is dominated with large diameter-sized trees (Fig. 4).

Only 44,000 acres (4 percent) are considered small diameter stands. Less than 25 percent of the timberland area for the maple-beech-birch forests are considered small diameter-sized stands.

On the other hand, the area of aspen-birch forests dominated with large diameter-sized trees is less than 15 percent of the total area for this forest-type group. The intensely managed spruce-fir forest-type group contains a higher percentage in smaller diameter stands. Small diameter stands make up 40 percent of the total area, while medium diameter-sized stands and large diameter-sized stands contain 30 and 28 percent, respectively.

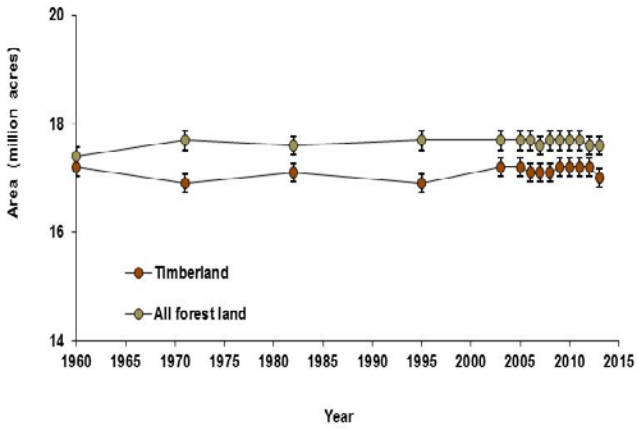

Figure 1.—Forest land and timberland by year, Maine.

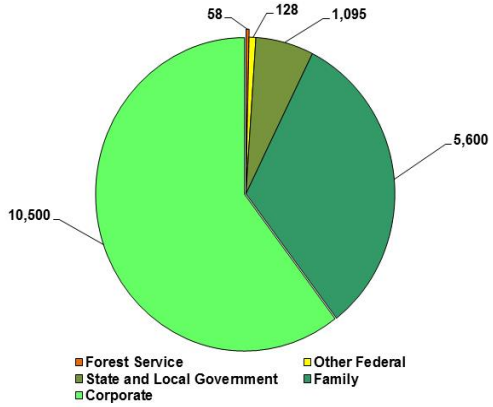

Figure 2.—Major ownership groups on forest land (thousand acres), Maine, 2013.

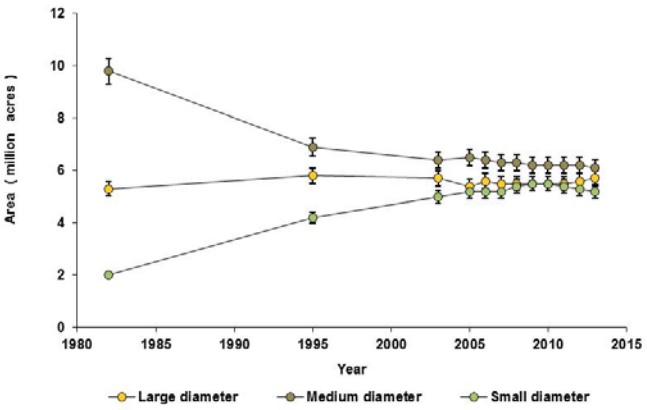

Figure 3.—Timberland by stand-size class and survey year, Maine, 1982-2013.

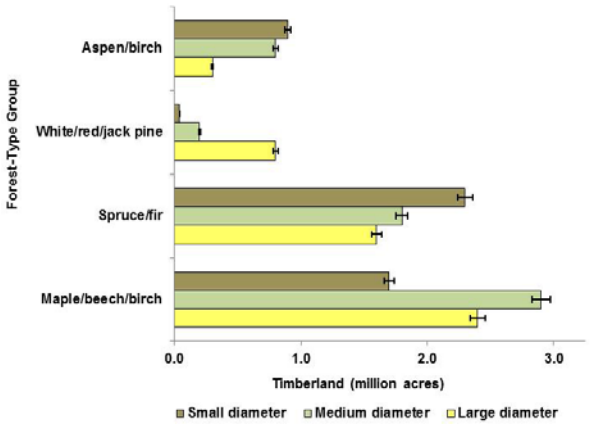

Figure 4.—Timberland by stand-size class for the major forest-type groups in acres, Maine, 2013.

Volume, Biomass, and Trends

Maine contains more than 26 billion cubic feet of wood within its forests, an increase of 3.5 percent since 2008. This wood volume is almost evenly split between softwood and hardwood tree species. Even though most of the biomass is found in the hardwood species, most of the annual growth is found in the softwood species. Both the annual mortality rate and harvest levels are similar between the softwood species group and the hardwood species group.

There are major differences between individual species which are highlighted below (Table 2). Eastern white pine, eastern hemlock, and northern white-cedar have greater than 40 percent of their growing stock tree numbers in saw log-sized trees. In contrast, less than 10 percent of the paper birch, American beech, and balsam-fir tree numbers are saw log-sized trees. Red maple and red spruce have the highest growing stock volumes, while eastern white pine has the highest saw log volumes within the state of Maine.

Red maple followed by a distant balsam-fir contain the most biomass, while northern red oak and American beech contain the least for the major 11 species.

Statewide, the overall net growth rate as percent of standing volume is 2.7 percent. The species with the highest growth rates are balsam fir (4.7 percent), northern red oak (3.9 percent), and eastern white pine (3.3 percent); species with the lowest net growth rates are sugar maple (1.9 percent), paper birch (1.0 percent), and northern white-cedar (0.8 percent).

The species with the highest mortality as percent of gross growth are paper birch (65.7 percent) and northern white-cedar (54.9 percent), while the lowest mortality rates found in eastern hemlock (5.3 percent) and northern red oak (4.4 percent).

The interacting effects of growth rates and harvesting on net volume can be calculated over a 5-year cycle from the annual inventory data:

$$V_c = \frac{5(G-H)}{V_n}$$

where V_c is the volume change, G is annual net growth, H is annual harvest removals, and V_n is ending net volume. The largest accruals (gains in volume) are observed in northern red oak (13.4 percent), balsam fir (12.7 percent), and eastern white pine (8.8 percent). By contrast, the largest depletions (losses in volume) are observed in sugar maple (-5.0 percent), American beech (-1.8 percent), and red spruce (-0.8 percent).

Table 2.—Number, live tree volume, sawlog volume, oven-dry biomass, net growth, mortality, and harvest removals of growing stock (GS) trees on forest land, by major species, Maine 2013.

Species	GS trees (million trees)	Net volume GS trees (million ft^3)	Net volume sawlog trees (million bd.ft.)	Aboveground biomass (thousand tons)	Net growth (thousand ft^3/yr)	Net mortality (thousand ft^3/yr)	Harvest Removals (thousand ft^3/yr)
Red maple	369	3,276	5,055	106,280	94,921	23,195	70,168
Red spruce	356	3,103	8,563	60,854	88,294	26,535	93,266
Eastern white pine	157	2,956	11,331	53,370	102,073	15,925	50,077
Balsam fir	565	2,477	2,834	71,203	118,112	66,879	55,171
Northern white-cedar	257	2,237	4,963	34,701	16,999	20,668	13,639
Eastern hemlock	165	2,032	5,894	39,878	68,496	3,859	44,610
Sugar maple	137	2,014	5,661	66,136	38,962	18,979	59,081
Yellow birch	125	1,634	3,725	55,771	40,352	14,670	40,252
Paper birch	169	1,136	1,174	40,419	12,638	24,172	22,610
Northern red oak	68	928	2,599	31,106	38,819	1,790	14,002
American beech	106	867	975	32,350	21,751	19,462	36,952
Other softwood species	198	1,500	3,493	31,296	34,146	24,443	22,521
Other hardwood species	217	2,197	4,413	70,484	77,675	32,800	50,686
All species	**2,889**	**26,356**	**60,680**	**693,848**	**753,238**	**293,377**	**573,035**

Regeneration of Northern White-cedar

Northern white-cedar (*Thuja occidentalis*) is an important tree species for the production of rot-resistant wood products. In addition, it provides important habitat for deer and other wildlife species, especially during winter. The range for northern white-cedar stretches from Minnesota, through Wisconsin and Michigan, to the Atlantic coast of Maine. There is currently concern about the regeneration of northern white-cedar since the wildlife that depends on it is having an impact on the number of saplings available for recruitment into the canopy (Boulfroy et al. 2012).

White-cedar sapling numbers were analyzed based upon the FIA periodic inventories conducted during the 1980s and 1990s, along with the annual inventories from 1999-2013. Cedar sapling numbers for Maine have increased from 28 percent of the regional total to 39 percent, while Michigan's cedar numbers have decreased from 50 percent to 36 percent. For Minnesota, cedar sapling numbers have increased moderately from 12 percent to 18 percent of the regional total, while decreasing from 10 percent to 6 percent within Wisconsin.

The data indicates there may be a problem in the upper peninsula of Michigan as well as adjacent Wisconsin forests, but cedar regeneration in Maine looks promising.

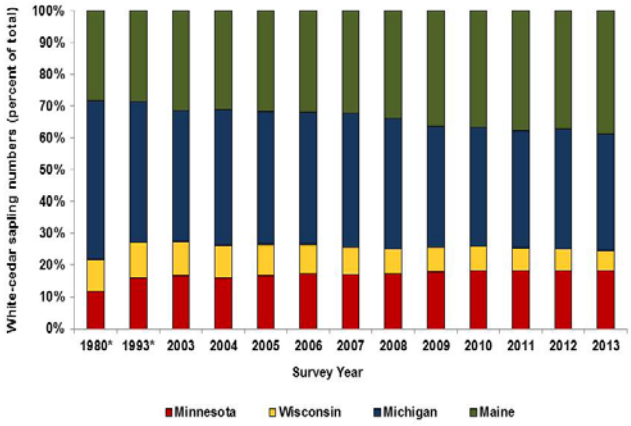

Figure 5.—The number of northern white-cedar saplings by state, as a percentage of the total, 1980-2013. Asterisks (*) indicates periodic inventory.

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Contact Information

George L. McCaskill, Research Forester
USDA Forest Service, Northern Research Station
11 Campus Blvd; Suite 200,
Newtown Square, PA 19073
Ph: 610-557-4045/ Fax:610-4200
georgemccaskill@fs.fed.us
Northern FIA: http://nrs.fs.fed.us/fia/
National FIA: http://fia.fs.fed.us

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