USDA
United States Department of Agriculture

RESOURCE UPDATE FS-71

Forests of New Hampshire, 2015

This publication provides an overview of forest resources in New Hampshire based on inventories conducted by the U.S. Forest Service, Forest Inventory and Analysis (FIA) program of the Northern Research Station. For annual inventory years 2002-2013, the sample length was equal to 5 years. Beginning in 2014, the cycle length was changed to 7 years. For the 2015 inventory, estimates for current variables such as area, volume, and biomass are based on 1,218 plot samples collected from 2010-2015. Change variables, such as net growth, removals, and mortality, are based on 889 samples collected in 2004-2010 and resampled in 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

Currently, New Hampshire is home to nearly 4.8 million acres of forest land (Table 1), which make its land approximately 83 percent forested. Since the 1997 inventory, the estimate of forest land has been relatively stable. However, the volume and biomass of trees has risen (Table 1) (Morin et al. 2015). Average annual net growth, mortality, and removals have higher sampling errors, indicating higher uncertainty in trend estimates. Note that a 3-year period is presented for the estimates in Table 1 because 2012 was the first complete cycle available for growth, removals, and mortality. However, the trend estimates for regeneration presented later in the report show a 5-year remeasurement period.

Note that net volume is defined as gross volume in cubic feet less deductions for rot, roughness, and poor form from a 1-foot stump to a minimum 4.0-inch top diameter. Biomass is defined as the aboveground weight of wood and bark in live trees 1.0 inch diameter and larger from the ground to the tip of the tree, excluding all foliage.

Table 1.—New Hampshire forest statistics, 2015 and 2012. 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 and error bars shown in tables and figures in this report represent 68 percent confidence intervals.

	2015 Estimate	Sampling error (percent)	2012 Estimate	Sampling error (percent)	Change since 2012 (percent)
Forest Land					
Area (thousand acres)	4,758	0.9	4,833	1.0	-1.5
Number of live trees (million trees)	4,278	2.5	4,270	2.6	0.2
Aboveground biomass of live trees (thousand oven-dry tons)	286,669	1.6	285,084	1.8	0.6
Net volume of live trees (million ft^3)	11,036	1.8	11,023	1.9	0.1
Annual net growth of live trees (thousand ft^3/yr)	204,760	4.7	197,914	5.0	3.5
Annual mortality of trees (thousand ft^3/yr)	105,692	5.8	117,106	5.4	-9.7
Annual harvest removals of live trees (thousand ft^3/yr)	126,019	12.3	125,451	11.9	0.5
Timberland					
Area (thousand acres)	4,475	1.1	4,537	1.2	-1.4
Number of live trees (million trees)	3,928	2.7	3,928	2.9	0.0
Aboveground biomass of live trees (thousand oven-dry tons)	270,254	1.8	269,135	2.0	0.4
Net volume of live trees (million ft^3)	10,389	2.0	10,393	2.1	0.0
Net volume of growing stock trees (million ft^3)	9,353	2.1	9,565	2.2	-2.2
Annual net growth of growing stock trees (thousand ft^3/yr)	191,440	4.0	190,372	4.0	0.6
Annual mortality of growing stock trees (thousand ft^3/yr)	72,955	6.4	79,189	5.9	-7.9
Annual harvest removals of growing stock trees (thousand ft^3/yr)	104,669	12.6	105,184	12.1	-0.5

Forest Area

Although New Hampshire's current area of forest land has been relatively stable since the late 1990s, there has been a 1.5 percent decline in forest area since 2012 (Table 1, Fig. 1). Most of this decrease occurred in southern New Hampshire. Timberland accounts for 94 percent of this forest land or 4.5 million acres. Slightly more than 6 percent of forest land is reserved from timber production or unproductive. New Hampshire's total forest land area is 5.8 million acres (excludes census water, e.g., Lake Winnipesaukee).

The northern unit of New Hampshire has a larger area and greater proportion of forest land when compared to the southern unit (Fig. 2). The northern unit also has more than double the proportion of forest land in public ownership (38 percent) compared to the southern unit (14 percent).

Maple/beech/birch is the dominant forest-type group, covering 51 percent of the forest land (Fig. 3). In fact, the maple/beech/birch group makes up over 50 percent of the forest land area in all but the four southeastern most counties.

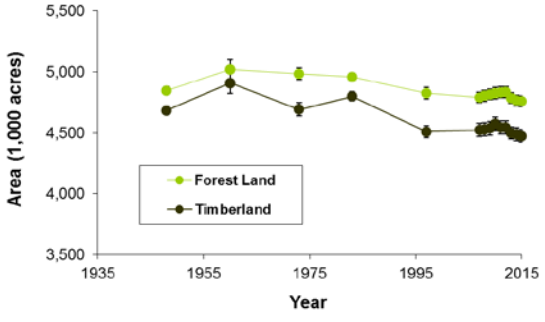

Figure 1.—Forest land and timberland by year, New Hampshire, 2015.

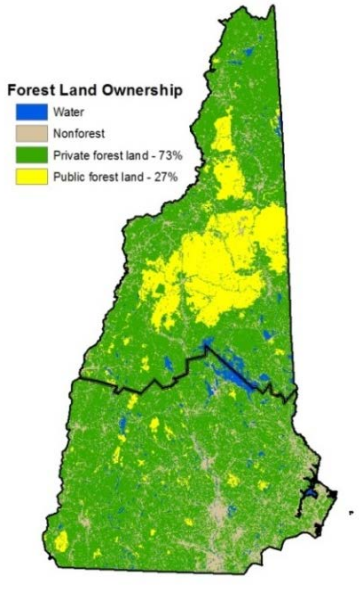

Figure 2.—Area of nonforest and forest land identified by major ownership group, New Hampshire, 2013. The boundary between the north and south FIA units is shown with a heavy black line.

White/red pine and spruce/fir are the most abundant softwood forest-type groups. Together they account for 21 percent of the forest land in the State.

The forest-type groups that are more widely distributed in the southern unit (e.g., oak/pine, oak/hickory, and white/red pine) generally have a higher proportion of private ownership. Statewide, families and individuals, corporations, and other private entities own most of the forest land (50, 17, and 5 percent, respectively). The state of New Hampshire, federal government, and local public entities own the remainder (4, 18, and 5 percent, respectively).

New Hampshire's forests have been maturing, as illustrated in the distribution of timberland by stand-size classes (Fig. 4). Since the 1960 inventory, the acreage of large-diameter stands has been increasing. Between 1960 and 1997, the acreage in small-diameter stands was declining, but since then the acreage has been stable. The acreage of medium-diameter stands has been declining since the 1960 inventory.

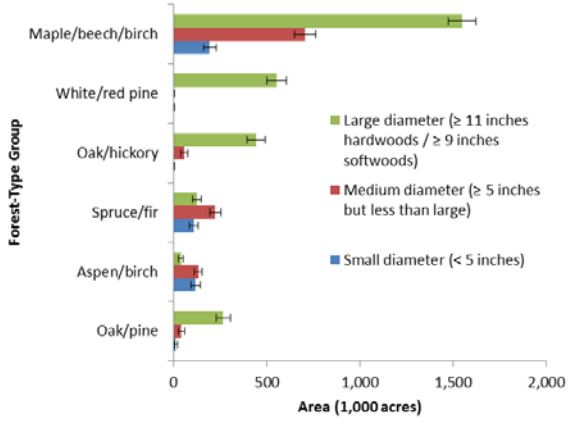

Figure 3.—Forest land by stand-size class (based on small, medium, and large trees) for the top six forest-type groups by acreage, New Hampshire, 2015.

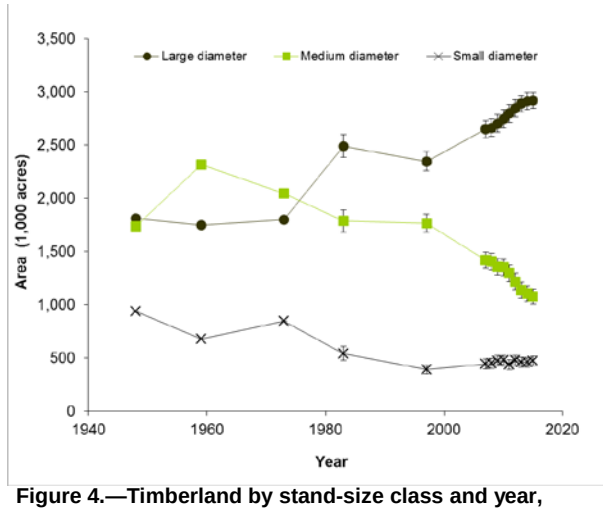

Figure 4.—Timberland by stand-size class and year, New Hampshire.

Volume, Biomass, and Trends

Red maple (*Acer rubrum*) continues to be the most numerous tree in New Hampshire (Table 1), but red maple volume has decreased more than 2 percent since 2012 (Fig. 5). Over the same period, red spruce (*Picea rubens*) volume increased by nearly 12 percent.

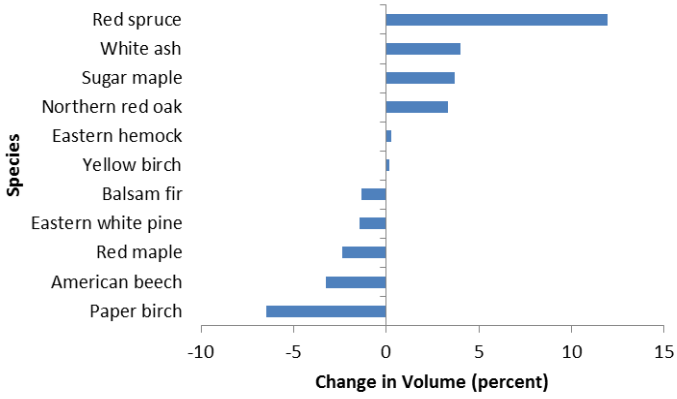

Figure 5.—Percent change in inventory net volume by species, New Hampshire, 2012 to 2015.

Trends in volume, number of trees, and growth, removals, and mortality are all important for understanding the current status of New Hampshire's forests (Tables 1, 2), but the seedling- and sapling-size trees which form the understory represent the advanced regeneration which is available to grow into the overstory.

A comparison of numbers of trees (5 inches and greater d.b.h.) (Table 2), saplings (1-4.9 inches d.b.h.) (Fig. 6), and seedlings (<1 inch d.b.h. and at least 1 foot tall) (Fig. 7) by species highlights a number of differences that have important implications for future species composition. Many factors drive understory composition including management, disturbance, herbivory, climate, and presence of invasive plants.

Balsam fir (*Abies balsamea*) is the most numerous sapling followed by American beech (*Fagus grandifolia*), red maple, and red spruce. Northern red oak (*Quercus rubra*) and eastern white pine (*Pinus strobus*) occur at low densities in the sapling-size class. Since 2007, species with large increases in saplings include sweet birch (*Betula lenta*), striped maple (*Acer pensylvanicum*), eastern hophornbeam (*Ostrya virginiana*), balsam fir, American beech, and red spruce. Species with large decreases in saplings include sugar maple (*Acer saccharum*), eastern white pine, yellow birch (*Betula allegheniensis*), and northern red oak (Fig. 6).

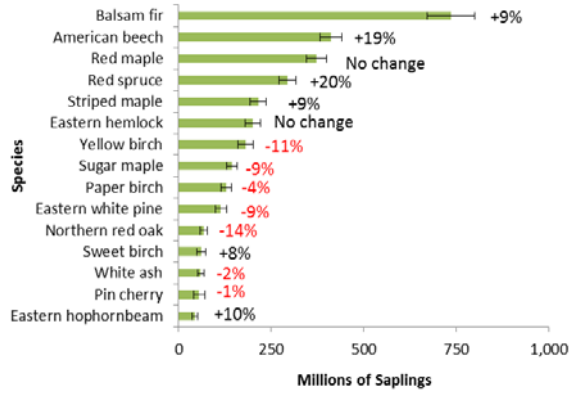

Figure 6.—Species ranked by number of saplings (1 to 4.9 inches d.b.h.) and percent change since 2007, New Hampshire, 2015.

Cow moose and calf. **Photo by Randall Morin, U.S. Forest Service.**

Table 2.—Number, net volume, oven-dry biomass, net growth, mortality, and harvest removals of live trees on forest land, New Hampshire, 2015 (selected prominent species)

Species	Trees[a] (million trees)	Net volume[a] (million ft^3)	Aboveground biomass[b] (thousand tons)	Net growth[a] (thousand ft^3/yr)	Mortality[a] (thousand ft^3/yr)	Harvest removals[a] (thousand ft^3/yr)
Red maple	170	1,648	42,636	24,447	16,106	18,628
Eastern hemock	99	1,167	21,627	30,361	2,255	8,100
Balsam fir	99	518	7,788	16,219	12,465	5,745
Eastern white pine	79	2,156	36,938	43,484	13,786	33,328
Red spruce	72	627	10,170	13,549	2,540	5,338
Sugar maple	65	874	26,489	14,215	6,416	15,225
Northern red oak	63	1,211	38,518	34,404	5,461	8,643
Yellow birch	60	647	18,987	6,435	8,820	4,561
American beech	59	507	14,980	5,174	9,556	6,036
Paper birch	57	477	12,407	-8,610	16,876	3,286
White ash	24	338	9,753	5,953	2,225	4,524

[a]Trees at least 5-inch diameter. [b] Trees at least 1 inch diameter.

Regeneration and Future Species Composition

Balsam fir and American beech are the most numerous seedlings in New Hampshire, followed by eastern white pine, red spruce and red maple (Fig. 7). Despite the lack of eastern white pine saplings, the species has the third highest number of seedlings. Northern red oak occurs at very low densities in the seedling and sapling size-classes (Figs. 6, 7).

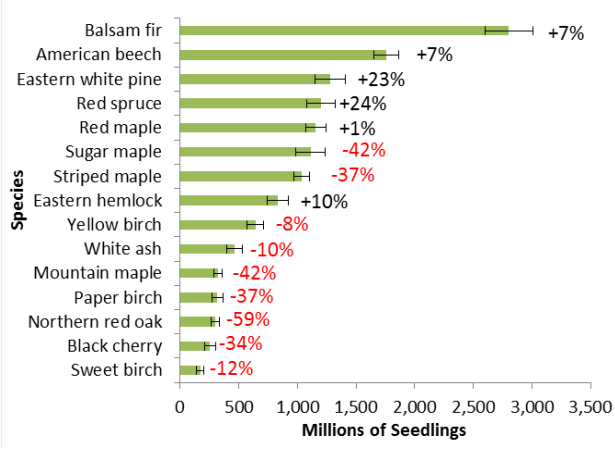

Figure 7.—Species ranked by number of seedlings (at least 1 foot tall and less than 1 inch d.b.h.) and percentage change since 2007, New Hampshire, 2015.

Since 2007, species with large increases in seedling numbers include eastern hemlock, eastern white pine, and red spruce. Species with large decreases in seedlings include northern red oak, sugar maple, paper birch (*Betula papyrifera*), mountain maple (*Acer spicatum*), striped maple, and black cherry (*Prunus serotina*) (Fig. 7).

Although overstory tree species composition has been relatively stable over the last decade, the species composition of the understory suggests that changes are likely to occur. A lack of oaks and pines in the sapling diameter classes (Fig. 6) means that as large oaks and pines are harvested or die they will likely be replaced by species such as American beech, red maple, balsam fir, and red spruce that dominate the sapling size-class. This is reinforced further by a dearth of oak seedlings (Fig. 7). By contrast, balsam fir and red spruce regeneration appears to be adequate and increasing.

Based on the current status of regeneration in the State, both the maple/beech/birch and spruce/fir forest types appear poised to increase or remain stable. However, future projections of suitable habitat predict that much of New Hampshire may be more suitable for the oak/hickory forest type than the maple/beech/birch or spruce/fir forest types (Rustad et al. 2013).

Spruce/fir forest in New Hampshire. Photo by Randall Morin, U.S. Forest Service.

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. Department of Agriculture, Forest Service, Southern Research Station. 85 p.

Morin, R.S.; Barnett, C.J.; Butler, B.J.; Crocker, S. J. [et al.]. 2015. **Forests of Vermont and New Hampshire 2012**. Resour. Bull. NRS-95. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 80 p. [DVD included].

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.** Washington, DC: U.S. Department of Agriculture, Forest Service. 748 p. http://www.fia.fs.fed.us/library/database-documentation/.

Rustad, L.; Campbell, J.; Dukes, J.S.; Huntington, T.; Fallon Lambert, K. [et al.]. 2012. **Changing climate, changing forests: The impacts of climate change on forests of the northeastern United States and eastern Canada**. Gen. Tech. Rep. NRS-99. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 48 p.

How to Cite This Publication
Morin, Randall S.; Widmann, Richard H. 2016. **Forests of New Hampshire, 2015.** Resource Update FS-71. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 4 p.
.

Contact Information
Randall S. Morin, Research Forester
USDA Forest Service, Northern Research Station
11 Campus Blvd., Ste. 200
Newtown Square, PA 19073
Ph: 610-557-4054 / Fax: 610-557-4250
rsmorin@fs.fed.us
Northern FIA: http://nrs.fs.fed.us/fia/
National FIA: http://fia.fs.fed.us