USDA
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RESOURCE UPDATE FS-63

Forests of Delaware, 2014

This publication provides an overview of forest resources in Delaware based on inventories conducted by the U.S. Forest Service, Forest Inventory and Analysis (FIA) program of the Northern Research Station. From 2004-2013, FIA employed an annual inventory with a cycle length of 5 years, measuring data on 20 percent of all sample plots each year in Delaware. Beginning in 2014, FIA is on a 7-year cycle, inventorying 14.3 percent of all plots annually. For the 2014 inventory, estimates for current variables such as area, volume, and biomass are based on 393 plots collected from 2009-2014. Change variables such as net growth, removals, and mortality are based on 374 samples collected in 2004-2009 and resampled in 2009-2014. 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

Delaware is home to an estimated 359,000 acres of forest land (Table 1). Since 2008, there has been little change in forest land area, however long-term data show decreases in the amount of forest land since the 1986 FIA inventory (Fig. 1). According to the 2014 results, there are approximately 228 million trees on Delaware's forest land with a live tree aboveground biomass of 26 million tons and a net volume of 955 million cubic feet. Estimates of aboveground biomass and net volume on forest land have increased since 2008. Average annual net growth has decreased and there has been an increase in mortality. Harvest removal levels appear stable, but these numbers must be interpreted cautiously due to the large sampling errors associated with the estimates.

Table 1.—Delaware forest statistics, 2014 and 2008. Volumes are for trees 5 inch diameter and larger. Number of trees and biomass are for trees 1 inch diameter and larger.

	2014 Estimate	Sampling error (percent)	2008 Estimate	Sampling error (percent)	Change since 2008 (percent)
Forest Land					
Area (thousand acres)	359	3.9	352	4.2	1.9
Number of live trees (million trees)	228	10.0	242	8.7	-6.1
Aboveground biomass of live trees (thousand oven-dry tons)	26,156	5.1	23,613	5.1	10.8
Net volume of live trees (million ft^3)	955	5.6	863	5.5	10.7
Annual net growth of live trees (thousand ft^3/yr)	19,009	12.1	35,663	12.9	-46.7
Annual mortality of trees (thousand ft^3/yr)	10,102	17.7	5,985	23.1	68.8
Annual harvest removals of live trees (thousand ft^3/yr)	7,495	40.7	7,555	54.2	-0.8
Timberland					
Area (thousand acres)	344	4.2	338	4.6	1.8
Number of live trees (million trees)	222	10.2	230	9.0	-3.5
Aboveground biomass of live trees (thousand oven-dry tons)	24,789	5.5	22,425	5.5	10.5
Net volume of live trees (million ft^3)	896	6.0	815	5.8	9.9
Net volume of growing stock trees (million ft^3)	823	6.3	787	5.9	4.6
Annual net growth of growing stock trees (thousand ft^3/yr)	15,528	12.3	30,587	12.5	-49.2
Annual mortality of growing stock trees (thousand ft^3/yr)	7,593	19.3	4,523	25.3	67.9
Annual harvest removals of growing stock trees (thousand ft^3/yr)	6,411	40.9	6,899	55.0	-7.1

Forest Area

Successive inventories since the mid 1980s in Delaware have shown forest land area decreasing. However, since 2008, forest land estimates have been relatively stable. The 2014 estimate of 359,000 acres of forest land was 1.9 percent larger than the 2008 estimate and although this change isn't statistically significant, it may be an indication of a stabilizing forest land base. (Fig. 1). Timberland accounts for 96 percent of this forest land or 344,000 acres. Slightly more than 3 percent of forest land is reserved from timber production and less than 1 percent is other forest land identified as not meeting minimum productivity standards.

Seventy-seven percent of Delaware's forests (276,000 acres) are privately owned (Fig. 2). Private owners include individuals, families, corporations, and other private entities. The remaining 23 percent (83,000 acres) is in public ownership. The largest public owner is the State of Delaware, which holds 58,000 acres of timberland and 9,000 acres of reserved forest.

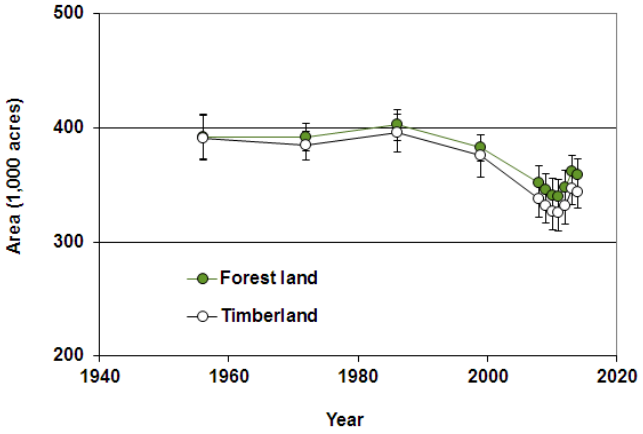

Figure 1.—Forest land and timberland area by year, Delaware, 1957-2014. Error bars shown in figures in this report represent a 68 percent confidence interval around the mean.

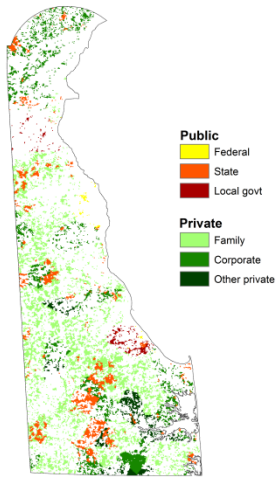

Figure 2.—Distribution of forest land by major owner group, Delaware, 2014.

Delaware's forests have been maturing as illustrated by the distribution of timberland by stand-size class (Fig. 3). Since the 1973 inventory, there has been a general trend of increasing acreage in large-diameter stands and decreasing acreage in medium- and small-diameter stands. Acreage in large-diameter stands now accounts for 76 percent of timberland whereas the area in small-diameter stands is 12 percent. Even within each major forest-type group, most forest land is classified in the large-diameter stand size class.

Oak/hickory is the dominant forest-type group in Delaware, covering 54 percent of forest land (Fig. 4). The oak/hickory group is most prevalent in all but the southern most part of the State where the loblolly pine/shortleaf pine forest-type group dominates. Loblolly pine/short leaf pine is the most abundant softwood forest-type group within the State, accounting for 16 percent of the forest land.

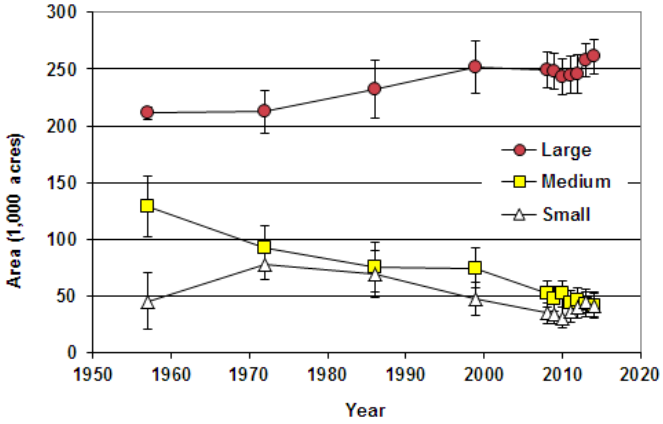

Figure 3.—Timberland area by stand-size class and year, Delaware, 1957-2014.

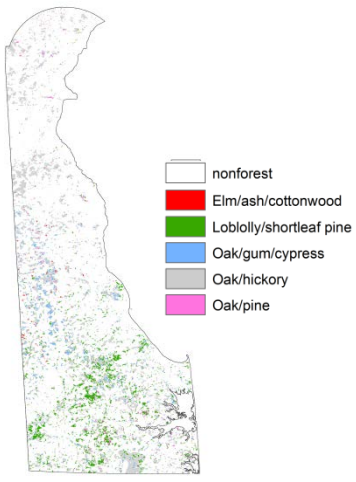

Figure 4.—Distribution of major forest-type groups, Delaware, 2014.

Volume, Biomass, and Trends

The net volume of trees on forest land increased by 10.7 percent to 955 million cubic feet. Red maple continues to be the most voluminous species followed by yellow-poplar, sweetgum, and loblolly pine (Table 2). Changes in live volume since 2008 varied across species and interpretation is difficult given the high sampling errors for most species. Yellow-poplar was the only species to post marked increases.

The sawtimber volume on timberland increased by 15.8 percent to a total of 3 billion board feet. Red maple was the leading sawtimber species by volume, followed by yellow-poplar and loblolly pine. Again, yellow-poplar was the only species to post significant increases since 2008.

Aboveground biomass on forest land totaled 26 million dry tons. This was a 5.1 percent increase since 2008. Ninety-five percent of biomass is contained in trees on timberland. Aboveground biomass on timberland averaged 76 dry tons per acre.

Loblolly pine had the highest growth rate and the highest removals of all tree species (Fig. 5). Loblolly pine and red maple combined for 41 percent of the total growth and 40 percent of all removals.

Total annual growth outpaced total removals. The growth-to-removals ratio (G:R) is 2.5:1 from 2008 to 2014, although ratios varied considerably among species (Fig. 5). Among the five most voluminous species, yellow-poplar had the largest growth to removals ratio (7.1:1) and southern red oak had the smallest (1.4:1). As a percentage of current volume, annual mortality averaged 0.9 percent on timberland. Of the prominent species, sweetgum had the highest mortality rate (1.3 percent per year).

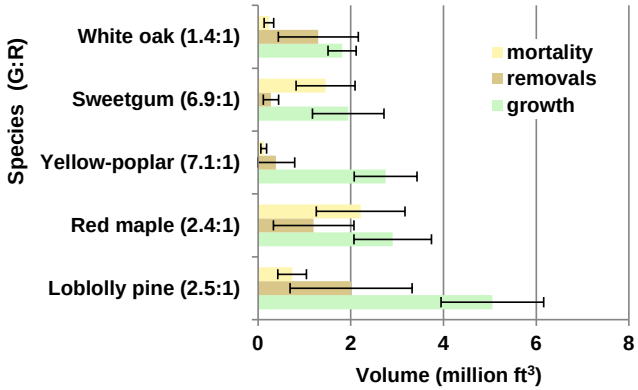

Figure 5.—Average annual net growth, removals, and mortality of net volume on timberland, and growth-to-removals ratio (G:R) for select species, Delaware, 2014

Table 2.—Top 10 species by net volume and percent change on forest land; sawtimber volume and percent change on timberland; and biomass on forest land, Delaware, 2014.

	Volume of live trees on forest land (million ft^3)	Sampling error (percent)	Percent change since 2008	Volume of sawtimber trees on timberland (million board feet)	Sampling error (percent)	Percent change since 2008	Aboveground biomass on forest land (thousand tons)	Sampling error (percent)
Red maple	207	11.7	9.6	601	15.4	7.5	5,699	11.1
Yellow-poplar	134	24.4	41.5	438	25.5	48.3	2,741	23.8
Sweetgum	118	13.9	2.8	395	18.1	9.9	2,970	13.3
Loblolly pine	108	18.6	9.9	401	20.2	22.9	2,442	17.9
White oak	75	17.8	15.5	312	20.8	16.8	2,451	17.5
Willow oak	51	32.6	27.5	266	33.9	33.2	1,529	32.4
Blackgum	38	18.3	12.7	110	25.3	21.9	1,054	16.7
Southern red oak	34	25.0	14.5	122	28.6	16.9	1,049	24.5
Scarlet oak	23	32.5	1.3	86	35.9	-2.3	798	31.6
Black cherry	22	28.8	-9.2	40	60.5	12.5	616	26.0
Total of all species	955	5.6	10.7	3,202	7.8	15.8	26,156	5.1

Flowering Dogwood Trees are Declining

Flowering dogwood (*Cornus florida*) is a shade tolerant native tree that grows in the understory from Maine to the Gulf of Mexico. It is used commonly for landscaping and is valued for its spectacular flowering in the spring, the high quality of its fruit as food for wildlife, and its red and purple fall foliage. Dogwood also plays an important role in the calcium cycle in eastern forests.

Since the 1970s, a fungal disease of unknown origin with no known cure has been eliminating dogwood from the landscape. This disease, known as dogwood anthracnose, is caused by the fungus *Discula destructive.* It was first identified in New York and has since caused extensive mortality of dogwoods throughout the eastern hardwood forest. Previous to this disease, dogwood was one of the most numerous trees in the understory of eastern hardwood forests.

In the last 5 years many states have seen a decrease in the number of dogwood trees at least 1 inch diameter and larger (Fig. 6). Although sampling errors for individual inventory years are high, the trend of decreasing numbers over 4 inventory cycles is apparent (Fig. 7). In Delaware the average density of dogwood on timberland has fallen from 28 trees/acre in 1986 to less than 4 trees/acre in 2014 (Fig.7).

Although the recent decline indicates that few trees are resistant to the disease, there are still an estimated 1.3 million dogwood trees in Delaware forests. A cultivar was cloned from a tree discovered on Catoctin Mountain in Maryland that showed resistance to the disease.

This cultivar and other disease resistant varieties are now sold by tree nurseries. Hopefully trees resistant to dogwood anthracnose will appear within wild populations; otherwise forests will likely be altered aesthetically and ecologically.

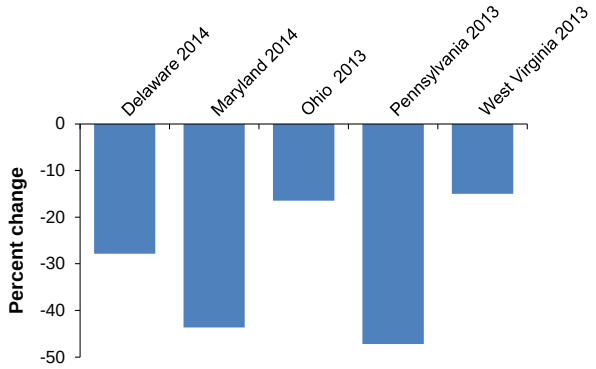

Figure--6. Percent change in numbers of dogwood trees over most recent 5-year period, by state and inventory year for trees 1 inch diameter and larger.

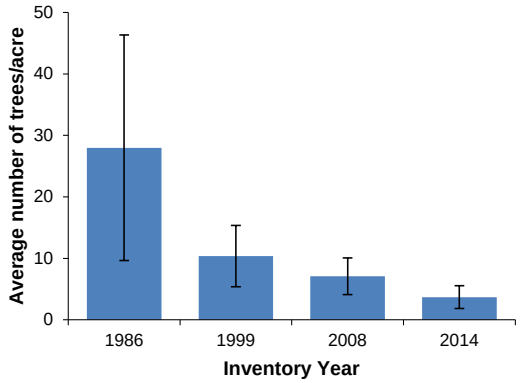

Figure--7. Average number of live dogwood trees per acre of timberland, trees 1 inch diameter and larger, by inventory year, Delaware.

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More information on Delaware Forests

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