



FORESTS OF North Carolina, 2013

This periodic resource update provides an overview of forest resources in North Carolina based on an inventory conducted by the U.S. Forest Service, Forest Inventory and Analysis (FIA) program at the Southern Research Station in cooperation with the North Carolina Forest Service. Data estimates are based on field data collected using the FIA annualized sample design and are updated yearly. The estimates presented in this update are for the measurement year 2013 with comparisons made to data reported in 2007. The sample plot population in North Carolina consists of 5,800 plots distributed across the State, of which up to 15 percent are collected annually from a 7-year cycle. The 2013 estimates included 5 years of data collection that measured 4,204 plots, resulting in about 72 percent new data merged with the remaining 28 percent from 2007 to produce the updated estimates. Growth, removals, and mortality (GRM) estimates were derived from remeasurement data on 4,096 of the plots. The slightly

smaller sample used for GRM estimates is due to a combination of new and/or lost plots. The data used in this publication were accessed from the FIA database on January 26, 2015.

Overview

North Carolina is home to 18.6 million acres of forest land (table 1). Forest land includes areas designated as reserved, whereas timberland is that portion, 17.9 million acres, not restricted from commercial timber production. The majority of this report is focused on timberland. The number of live trees on North Carolina’s timberland in 2013 was estimated at >14.4 billion trees, an increase of 3.0 percent from 2007. Net volume increased about 7.0 percent to <38.4 billion cubic feet. Average annual net growth increased 9.2 percent to nearly 1.6 billion cubic feet, whereas average annual removals decreased by 19.6 percent since 2007 to >0.9 billion cubic feet (table 1).

Table 1—North Carolina forest statistics, change between 2007 and 2013^a

Forest statistics	2007 estimate	Sampling error (percent)	2013 estimate	Sampling error (percent)	Change since 2007
Forest land					
Area (thousand acres)	18,582.2	0.64	18,610.7	0.61	28.5
Number of live trees ≥1.0 inch d.b.h. (million trees)	14,267.7	1.54	14,828.1	1.53	560.4
Net volume of live trees ≥5.0 inches d.b.h. (million cubic feet)	37,273.6	1.35	40,142.7	1.31	2,869.1
Live tree aboveground biomass (thousand oven-dry tons)	924,282.0	1.20	990,476.7	1.16	66,194.7
Net annual growth of live trees ≥5.0 inches d.b.h. (million cubic feet per year)	1,472.3	2.95	1,602.7	2.13	130.4
Annual removals of live trees ≥5.0 inches d.b.h. (million cubic feet per year)	1,146.8	6.17	917.3	5.53	-229.5
Annual mortality of live trees ≥5.0 inches d.b.h. (million cubic feet per year)	411.0	4.51	347.0	4.66	-64.0
Timberland					
Area (thousand acres)	18,055.4	0.69	17,887.9	0.68	-167.5
Number of live trees ≥1.0 inch d.b.h. (million trees)	14,017.3	1.57	14,443.1	1.57	425.8
Net volume of live trees ≥5.0 inches d.b.h. (million cubic feet)	35,801.3	1.40	38,353.2	1.36	2,551.9
Live tree aboveground biomass (thousand oven-dry tons)	946,817.0	1.25	947,796.0	1.22	979.0
Net annual growth of live trees ≥5.0 inches d.b.h. (million cubic feet per year)	1,450.0	2.99	1,583.9	2.14	133.9
Annual removals of live trees ≥5.0 inches d.b.h. (million cubic feet per year)	1,146.6	6.17	921.8	5.52	-224.8
Annual mortality of live trees ≥5.0 inches d.b.h. (million cubic feet per year)	403.7	4.59	321.9	4.92	-81.8

^a Estimates for 2013 represent a full sample comprised of 28 percent 2007 data and five panels (2009, 2010, 2011, 2012, and 2013), or 72 percent new data. Growth, removals, and mortality estimates for 2013 are comprised of just the five panels of new data, or 72 percent of a full sample.



Forest Area

North Carolina is divided into four survey units (fig. 1). The total timberland in all survey units is 17.89 million acres. The Piedmont unit contains the largest portion with 5.31 million acres, or almost 30 percent (table 2). The Southern Coastal Plain has >28 percent, the Mountains 22 percent, and the Northern Coastal Plain 20 percent of the timberland.

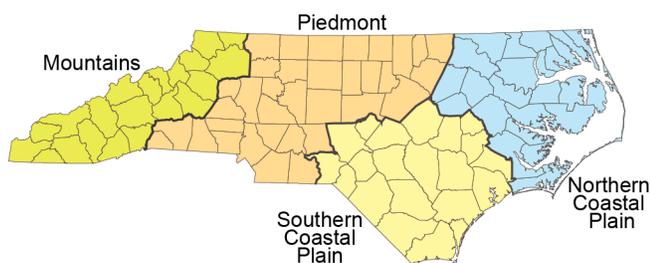


Figure 1—Forest survey regions in North Carolina.

Private individual ownerships account for most timberland with 10.99 million acres, or 61 percent (table 2). Other corporate ownerships combine for 19 percent, national forests for 7 percent, forest industry for 6 percent, and State/local governments for 5 percent of the timberland.

The largest portion of private individual ownerships, 37 percent, is located in the Piedmont. The Northern Coastal Plain contains the largest portion, 57 percent, of the forest industry timberland. The Mountains contain most, 81 percent, of the national forest timberland.

The oak-hickory forest-type group dominates with 7.03 million acres, or 39 percent, of all timberland (table 3). The loblolly-shortleaf pine forest-type group covers 31 percent, the oak-pine forest-type group 13 percent, and the oak-gum-cypress type group 10 percent of the timberland. The largest portion of the oak-hickory forest types, 44 percent, is located in the Mountains, and the Piedmont contains another 38 percent (table 3).

Table 2—Area of timberland by ownership and survey unit, North Carolina, 2013

Category	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Mountains	State
	<i>million acres</i>				
National forest	0.04	0.10	0.09	0.96	1.18
Other Federal	0.22	0.04	0.04	0.00	0.31
State and local government	0.40	0.16	0.26	0.16	0.98
Forest industry	0.30	0.59	0.11	0.03	1.03
Individual	2.76	1.97	4.02	2.24	10.99
Other corporate	1.38	0.68	0.79	0.55	3.40
Total	5.10	3.54	5.31	3.94	17.89

Table 3—Area of timberland by forest-type group and survey unit, North Carolina, 2013

Forest-type group	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Mountains	State
	<i>million acres</i>				
White-red-jack pine	0.00	0.00	0.00	0.10	0.10
Spruce-fir	0.00	0.00	0.00	0.02	0.02
Longleaf-slash pine	0.32	0.02	0.00	0.00	0.34
Loblolly-shortleaf pine ^a	2.25	1.67	1.42	0.13	5.48
Oak-pine	0.67	0.44	0.83	0.38	2.31
Oak-hickory	0.81	0.48	2.65	3.10	7.03
Oak-gum-cypress	0.86	0.74	0.10	0.00	1.70
Elm-ash-cottonwood	0.11	0.14	0.26	0.02	0.53
Maple-beech-birch	0.00	0.00	0.00	0.06	0.06
Other hardwoods ^b	0.01	0.00	0.01	0.13	0.14
Nonstocked	0.08	0.06	0.03	0.00	0.18
Total	5.10	3.54	5.31	3.94	17.89

^a Includes other eastern softwoods.

The Southern Coastal Plain contains the largest portion, 41 percent, of the loblolly-shortleaf pine forest types, and the Northern Coastal Plain contains another 30 percent. More of the oak-pine forest types, 36 percent, occur in the Piedmont, and another 29 percent in the Southern Coastal Plain unit. The majority (51 percent) of the oak-gum-cypress forest types are in the Southern Coastal Plain unit, and 44 percent are in the Northern Coastal Plain unit.

Planted stands account for 18 percent, or >3.2 million acres, of the timberland (table 4). The Southern Coastal Plain contains 41 percent of the planted acres, the Northern Coastal Plain 34 percent, the Piedmont 23 percent, and 2 percent are in the Mountains.

Table 4—Area^a of timberland by stand origin and survey unit, North Carolina, 2013

Stand origin	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Mountains	State
	<i>million acres</i>				
Planted	1.32	1.10	0.74	0.07	3.23
Natural	3.78	2.45	4.56	3.88	14.66
Total	5.10	3.54	5.31	3.94	17.89

^a Sum of components and totals may differ due to rounding.

Volume, Biomass, and Trends

North Carolina timberland contains 38.4 billion cubic feet of total wood volume. Hardwood species comprise 24.9 billion cubic feet, or 65 percent, of the total inventory (table 5). Softwood species comprise 13.5 billion cubic feet, or 35 percent, of the total volume in the State. Total softwood inventory was highest (35 percent) in the Southern Coastal Plain, and least (13 percent) in the Mountains unit. Total hardwood inventory was highest (39 percent) in the Mountains, and least (13 percent) in the Northern Coastal Plain.

Statewide, net growth of softwoods averaged 795 million cubic feet annually (table 5). Most of the softwood net growth, 40 percent, came from the Southern Coastal Plain. Another 30 percent came from the Northern Coastal Plain. The State averaged 550 million cubic feet of softwood removals annually, with 36 and 34 percent from the Northern and Southern Coastal Plain units, respectively. The softwood growth to removals ratio was highest (1.7) in the Southern Coastal Plain and least (1.2) in the Northern Coastal Plain and Mountains units.

Table 5—All-live volume of net growth, removals, and total inventory for softwoods and hardwoods by survey unit, North Carolina, 2013

Category	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Mountains	State
	<i>million cubic feet</i>				
Softwood					
Net growth	318.4	237.4	196.6	43.1	795.5
Removals	189.3	198.1	127.5	34.7	549.6
G/R ratio ^a	1.7	1.2	1.5	1.2	1.4
Total inventory	4,753.9	3,297.6	3,723.7	1,710.7	13,485.9
Hardwood					
Net growth	115.9	105.1	317.4	250.1	788.4
Removals	75.5	79.7	161.6	55.4	372.2
G/R ratio ^a	1.5	1.3	2.0	4.5	2.1
Total inventory	3,548.2	3,236.7	8,275.4	9,806.4	24,867.3
All species					
Net growth	434.2	342.5	514.0	293.2	1,583.9
Removals	264.8	277.8	289.1	90.1	921.8
G/R ratio ^a	1.6	1.2	1.8	3.3	1.7
Total inventory	8,302.4	6,534.3	11,999.4	11,517.1	38,353.2

^a Net growth/removals ratio.

The State’s net growth of hardwoods averaged 788 million cubic feet annually. Most of the hardwood net growth, 40 percent, came from the Piedmont unit. Another 32 percent came from the Mountains unit. The State’s hardwood removals averaged 372 million cubic feet annually. Most of the hardwood removals, 43 percent, came from the Piedmont unit. The hardwood growth to removals ratio was highest (4.5) in the Mountains unit and least (1.3) in the Northern Coastal Plain unit.

Biomass totaled 948 million tons in North Carolina. Hardwood species comprised 662 million tons, or 70 percent, of total biomass (table 6). Softwood species comprised 285 million tons, or 30 percent, of total biomass.

The Southern Coastal Plain contained the largest portion (36 percent) of the softwood biomass. The Mountains contained the largest portion (38 percent) of the hardwood biomass.

Table 6—Aboveground biomass and carbon estimates on timberland for softwoods and hardwoods by survey unit, North Carolina, 2013

Category	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Mountains	State
	<i>million tons</i>				
Softwood					
Biomass	103.49	70.49	80.77	30.57	285.31
Carbon	51.75	35.24	40.38	15.28	142.66
Hardwood					
Biomass	101.55	88.69	220.30	251.95	662.49
Carbon	50.77	44.35	110.15	125.98	331.24
Total					
Biomass	205.04	159.18	301.06	282.52	947.80
Carbon	102.52	79.03	150.53	141.26	473.90



Loblolly pine straw (photo from Bugwood.org)

Hemlock Population Changes in North Carolina

Hemlock (*Tsuga sp.*) trees in North Carolina have experienced widespread mortality from the hemlock woolly adelgid (*Adelges tsugae*) (HWA) infestation. One measure of the impact is the trend in live tree numbers over time. Based on FIA data from the survey years of 2007 and 2013, figure 2 shows the downward trend in number of live hemlock trees by diameter class. All diameter classes declined in tree numbers, but not to the same degree. Overall, according to FIA data, the total number of hemlock trees in North Carolina decreased from 99 million in 2007 to 83 million in 2013.

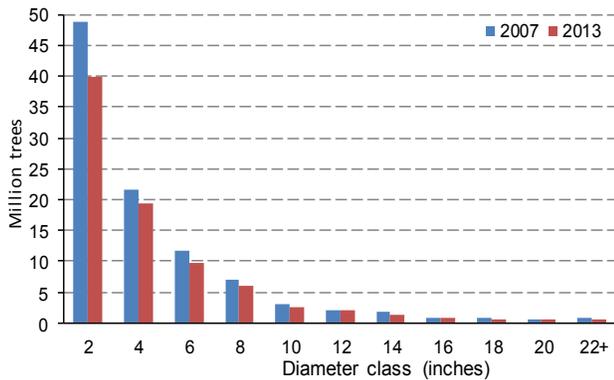


Figure 2—Trend in number of live hemlock trees on forest land by 2-inch diameter classes for the years 2007 and 2013, North Carolina.



Infested hemlock (photo by Bob Anderson, Bugwood.org)

Figure 3 shows the percentage change in number of hemlock trees by diameter class. With exceptions only for the 12- and 16-inch classes, the percentage decline generally increases as diameter increases. The greatest percentage decrease in tree numbers occurred in the largest trees, those above 20-inches in diameter.

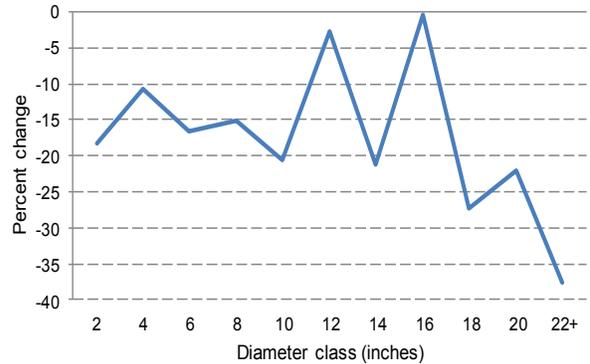


Figure 3—Percent change in the number of live hemlock trees by diameter class between the years 2007 and 2013, North Carolina.

Although FIA data rightfully portrays the downward trend in the hemlock tree population, users are cautioned that it does not accurately reflect real change in the population in a timely manner for the year 2013. Because FIA data is collected on an annualized basis, the mortality of hemlock since 2007 is based on measurements recorded in 2009, 2010, 2011, 2012, and 2013. Since the North Carolina survey operates on a 7-year cycle, each year collects up to 15 percent new data. Therefore, 2013 data includes about 72 percent new data since 2007 merged with 28 percent re-used from 2007 to represent a full measurement cycle. Considering that part of the recent data is up to several years older than 2013, real change for the resource is lagging for the year of the reported data. Thus, the actual hemlock decline may be more severe than the year of the data reveal, and will ultimately be captured over time.

The North Carolina Forest Service maintains a forest health page with information about HWA accessed at: http://www.ncforestservice.gov/forest_health/forest_health.htm.

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