North Carolina's

Forests, 2013

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Front cover: top left, Carolina Hickory (*Carya carolinae-septentrionalis*) located in the Uwharrie National Forest, NC. (photo courtesy of Wikimedia.org); top right, vista within the Great Smoky Mountains National Park. (photo courtesy of Wikimedia.org); bottom right, Wilson Creek in the western part of Caldwell County, NC. (photo courtesy of Wikimedia.org). Back cover: top left, tidal creek in the Northern Coastal Plain of North Carolina. (photo courtesy of Albemarle-Pamlico National Estuary Partnership); top right, Carolina Hickory (*Carya carolinae-septentrionalis*) located in the Uwharrie National Forest, NC. (photo courtesy of Wikimedia.org); bottom, view from part of the Jonas Ridge, which forms the eastern rim of the Linville Gorge, NC. (photo courtesy of Wikimedia.org)

Little Santeetlah Creek in the Joyce Kilmer Memorial Forest. The 3,840-acre memorial area in Graham County, NC is one of the few remaining examples of old growth hardwood forest in the Eastern United States. (photo courtesy of Wikimedia.org)

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Riverine cypress (*Taxodium distichum*) in the Northern Coastal Plain of North Carolina. (photo courtesy of Albemarle-Pamlico National Estuary Partnership)

Foreword

The U.S. Department of Agriculture Forest Service, Southern Research Station's (SRS) Forest Inventory and Analysis (FIA) research work unit and cooperating State forestry agencies conduct annual forest inventories of resources in the 13 Southern States (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia), the Commonwealth of Puerto Rico, and the U.S. Virgin Islands. In order to provide more frequent and nationally consistent information on America's forest resources, all research stations and their respective FIA work units conduct annual surveys with a common sample design. These surveys are mandated by law through the Agricultural Research Extension and Education Reform Act of 1998 (Farm Bill).

The primary objective in conducting these inventories is to gather the multi-resource information needed to formulate sound forest policies, provide information for

economic development, develop forest programs, and provide a scientific basis to monitor forest ecosystems. The inventory data are used to provide an overview of forest resources that may include, but is not limited to, forest area, forest ownership, forest type, stand structure, timber volume, growth, removals, mortality, management activity, down woody material, and invasive species. The information presented is applicable at the State and survey unit level; although it provides the background for more intensive studies of critical situations, it is not designed to reflect resource conditions at small scales.

More information about Forest Service resource inventories is available in "Forest Resource Inventories: An Overview" (U.S. Department of Agriculture Forest Service 1992). More detailed information about sampling methodologies used in the annual FIA inventories can be found in "The Enhanced Forest Inventory and Analysis Program—National Sampling Design and Estimation Procedures" (Bechtold and Patterson 2005).

Data tables included in FIA reports are designed to provide an array of forest resource estimates, but additional tables can be obtained at http://fia.fs.fed.us/tools-data/default.asp. Additional information about the FIA program can be obtained at http://fia.fs.fed.us/.

Additional information about any aspect of this survey may be obtained from:

Forest Inventory and Analysis
Research Work Unit
U.S. Department of Agriculture
Forest Service
Southern Research Station
4700 Old Kingston Pike
Knoxville, TN 37919
Telephone: 865-862-2000
William G. Burkman
Program Manager

Waterfall on Little Fall Creek, in the Harmon Den area of the Pisgah National Forest, NC. (photo courtesy of Wikimedia.org)

Piney Mountain Road located on the Duke Forest, Durham NC. (photo courtesy of Wikimedia.org)

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Shagbark hickory
(*Carya ovata*),
located on the
Duke Forest,
Durham NC.
(photo courtesy
of Wikimedia.org)

Area

- Total forest area increased slightly since 2007 to >18.6 million acres in 2013. Forests continue to occupy about 60 percent of the land area of North Carolina.

- Timberland area totaled 17.9 million acres, down from 18.1 million acres in 2007, but this change involved reclassification of some timberland to reserved status. Hardwood forest types accounted for 11.8 million acres (66 percent) of timberland, and softwood forest types accounted for 5.9 million acres (33 percent). The remaining 1 percent consisted of timberland classified as nonstocked.

- Oak-hickory was the predominant forest-type group and occupied 7.0 million acres. Loblolly-shortleaf forest-type group was second in prevalence with almost 5.5 million acres. The oak-pine forest-type group was a distant third with 2.3 million acres, followed by oak-gum-cypress with almost 1.7 million acres.

Ownership

- Nonindustrial private forest (NIPF) ownerships controlled 14.4 million acres (80 percent) of the State's timberland, up from 14.1 million in 2007. Forest industry owned 1.0 million acres (6 percent), down from 1.4 million in 2007. Public ownerships held <2.5 million acres of timberland (14 percent), down slightly from the amount in 2007, but the change involved reclassification to reserved.

- Within the NIPF group, the private individual category (all NIPF owner classes other than corporate) owned 11.0 million acres of the State's timberland, down from 11.5 million acres in 2007.

Volume

- In 2013, total all-live merchantable volume on timberland in North Carolina amounted to 38.4 billion cubic feet, up from 35.8 billion cubic feet in 2007 and 34.5 billion cubic feet in 2002.

- With 24.9 billion cubic feet, hardwoods made up 65 percent of all-live volume in the State. Softwood volume totaled almost 13.5 billion cubic feet.

- White oaks, red oaks, red maple, and sweetgum accounted for 3.97, 3.63, 2.83, and 2.34 billion cubic feet of the hardwood volume, respectively. Loblolly and shortleaf pines accounted for 9.56 billion cubic feet of the softwood volume.

Net Growth and Removals

- Total net annual growth of all-live trees on timberland averaged almost 1.6 billion cubic feet per year between 2007 and 2013, and removals averaged >0.9 billion cubic feet during the same period. Planted stands provided 390 million cubic feet of the net growth and 289 million cubic feet of the removals.

- Net growth for all-live softwood trees on timberland averaged 796 million cubic feet per year, and removals averaged 550 million cubic feet per year between 2007 and 2013. Softwood growth was up from the 2002–07 average of 702 million cubic feet per year. However, softwood removals were down from the previous survey period average of 613 million cubic feet per year.

- Hardwood net growth averaged 788 million cubic feet per year, and removals averaged 372 million cubic feet per year between 2007 and 2013. Hardwood growth was up from the annual average of 748 million cubic feet observed between 2002 and 2007. Hardwood removals decreased from the annual average of 533 million cubic feet in the previous survey period.

Forest Health

• Total mortality of live trees on North Carolina's timberland averaged 322 million cubic feet per year between 2007 and 2013. Hardwood species represented 183 million cubic feet (57 percent) and softwoods represented 139 million cubic feet (43 percent) of total mortality compared to 228 and 175 million cubic feet, respectively, averaged between 2002 and 2007.

• Standing dead trees totaled 171 million on North Carolina's timberland. The leading identifiable causes of death to these snags, in descending order of prevalence, were competing vegetation, disease, insects, and weather.

• In descending order of prevalence, tree-of-heaven, mimosa, and royal paulownia were the most commonly detected invasive trees. The privets were the most common shrub, Japanese honeysuckle was the most frequent vine, and Nepalese browntop was the most frequently detected invasive grass.

Hardwood forest along the Baxter Creek Trail located in the Great Smoky Mountains National Park. (photo courtesy of Brian Stansberry, Wikimedia.org)

Introduction

The 1998 Farm Bill mandates forest inventory reporting every 5 years. Field measurements for the ninth inventory cycle of North Carolina's forests began in December of 2008 and the 5 years' worth that are used in this report were completed in December of 2013. In North Carolina, the strategy involves rotating measurements of seven systematic samples (or panels), each of which represents about 15 percent of all plots in the State. A panel may take more or less than 1 year to complete. This bulletin provides inventory statistics and discusses the principal findings from the measurement of five panels from cycle 9 of annual inventory data merged with plot data from cycle 8 not yet remeasured in cycle 9. This method produces a dataset representing 100 percent of the sample plot population. Forest and timberland estimates, inventory volume, growth, removals, and mortality statistics are summarized from the data collected.

The eight previous inventories and State analytical reports were completed in 1938 (Cruikshank 1944), 1955 (Larson 1957), 1964 (Knight and McClure 1966), 1974 (Knight and McClure 1975), 1984 (Sheffield and Knight 1986), 1990 (Brown 1993), 2002 (Brown and others 2006), and 2007 (Brown and others 2014). Tabular summaries of the 2013 resource statistics for North Carolina used in this report are available at http://srsfia2.fs.fed.us/states/north_carolina.shtml. Click on the 2013 survey year and select "Tables." Tabular data for many of the previous surveys are also available at that Web site. However, caution

is advised when making comparisons to previous surveys, as changes have occurred in plot design, collection procedures, and data processing algorithms. Methods have continued to evolve as changing technologies are adapted and implemented over time to improve Forest Inventory and Analysis (FIA) surveys. It is recommended to review the inventory methods section (appendix A) prior to any trend analysis.

With elevations ranging from sea level to 6,684 feet, North Carolina is one of the most physiographically diverse States in the Southern United States. Not only does North Carolina have more peaks over 6,000 feet than any State east of the Mississippi River, it also has the most extensive system of coastal barrier islands in the United States. In between its sea-level eastern end and the peaks at its western end, North Carolina has three distinct physiographic regions, recognized as the Coastal Plain, Piedmont, and Mountains (Fenneman 1938). The Coastal Plain harbors pocosins, Carolina bays, and deep swamps. The Piedmont is hilly and dissected by streams and drains. The Mountains have numerous ridges, valleys, and peaks. In addition to the topographic differences among these regions are varying ownerships, demographics, and tree species occurrence. For example, demographically, most of the State's large metropolitan centers are located in the Piedmont. Primary forest management issues differ among the regions as well. In the Coastal Plain, reestablishment of longleaf pine is a concern. In the Piedmont, the decline in area of shortleaf pine is a concern. In the Mountains, oak regeneration and loss of hemlock (a keystone species) are concerns.

Land Use

Area and condition of North Carolina's forest land are determined in many respects by trends in ownership and by land use changes. Change in forest land ownership often results in a change in the reasons for owning the land. Traditional timber harvesting or other forest-product-based uses may be replaced by desires to develop and manage habitat for wildlife or provide another recreational opportunity. Ownership change can also lead to land use change, particularly if plans are to convert forest land to new cropland, pasture, or urban use. Loss of forest land to urbanization continues to be a concern. These losses are considered diversions from forest land to nonforest uses. Owner decisions can also increase forest land, either through planting efforts or by allowing idle cropland or pasture to revert naturally to forest. These increases are considered additions to forest land from nonforest sources.

The 2010 Census (U.S. Department of Commerce, Bureau of the Census 2012) reported that nearly 9.6 million people lived in North Carolina. At the time of the 2000 Census, the population was approaching 8.1 million people (U.S. Department of Commerce, Bureau of the Census 2002). The additional 1.5 million people living in the State, mostly from net migration, made North Carolina one of the fastest growing States in the country. Increased population can bring increased pressure on finite natural resources, including the State's forest land.

Table 1 summarizes the broad category distribution of land in North Carolina by land use since 2002. Some general trends are apparent. Total land area of North Carolina is about 31.1 million acres, including 171,000 acres of noncensus water defined by the U.S. Bureau of the Census as land. Forests occupy almost 60 percent of the State's land area, or about 18.6 million acres. The remaining 12.5 million acres of land reflect a variety of nonforest uses such as agriculture and urban development. Total nonforest land increased by about 200,000 acres between 2002 and 2007 but has remained relatively stable since 2007. Land used for cropland has declined by more than 3 percent since 2007. Pasture has decreased by nearly 11 percent since 2007. Another trend in land use is the increase in other nonforest land (which includes urban, industrial, and other developed areas), which has risen by 6 percent since 2007 to more than 5.9 million acres in 2013. Tracking these trends is important because shifts in agriculture and urban land uses often directly impact the extent and condition of North Carolina's forest land.

Clearing land for agriculture was once the primary reason for loss of forest. Although conversions to agriculture still occur, the principal threat to forest land since 2002 has been urbanization, as evidenced by the steady increase in area of other nonforest land (table 1). The loss of forest land due to urbanization is permanent, whereas clearing of forest land for crops or pasture can be reversed in many instances. In fact, idle cropland and pasture continue to be the primary source for new acres of forest land, either from planting or from natural reversion.

Table 1—Land area by land use and survey year, North Carolina

Land use	Survey year 2002[a]	Survey year 2007[a]	Survey year 2013
	acres		
Forest land			
Timberland	18,374,501	18,055,447	17,887,864
Reserved	378,931	380,131	646,073
Other forest[b]	68,912	146,579	76,754
Total	18,822,344	18,582,157	18,610,691
Nonforest land			
Cropland	5,709,808	5,042,947	4,871,385
Pasture	1,454,805	1,742,200	1,558,749
Other nonforest[c]	5,032,221	5,592,876	5,931,080
Noncensus water[d]	149,220	173,372	171,322
Total	12,346,054	12,551,395	12,532,536
All land	31,168,398	31,133,552	31,143,227[e]
Census water	3,275,315	3,310,157	3,300,850
Total area	34,443,713	34,443,709	34,444,077
Percent land area forested	60.39	59.69	59.76

Numbers in rows and columns may not sum to totals due to rounding.

[a] From Brown and others (2014).

[b] Unproductive lands incapable of producing 20 cubic feet of wood per acre, per year due to adverse site conditions.

[c] Includes areas classified as urban, industrial, swampland, and other nonforest, etc.

[d] Areas classed as water by Forest Inventory and Analysis standards, but defined by Bureau of Census as land.

[e] From U.S. Bureau of the Census (2012).

Timberland Classification

As shown in table 1, 17.9 million acres (96 percent) of North Carolina's 18.6 million acres in forest were classified as timberland. These 17.9 million acres were defined as capable of producing at least 20 cubic feet of industrial wood per acre per year and not classified as reserved and withdrawn from timber production. The area of timberland in 2013 was down 1 percent from 18.1 million acres in 2007. However, this change largely resulted from national-level decisions to standardize classification of certain timberlands as reserved based on ownership criteria established in FIA field manual version 6.0 (U.S. Department of Agriculture Forest Service 2012). In North Carolina, this change increased reserved timberland from 380,000 acres in 2007 to nearly 650,000 acres in 2013. These acres classified as reserved timberland are generally under public ownership and primarily located in the national forest wilderness areas, national wildlife refuges and preserves, and the national parks. The remaining other forest land consisted largely of unproductive or adverse sites. The area of other forest land has decreased to 2002 levels. Reasons for this change are unclear and could be related to the reclassification decision involving reserved acres. Since the acres classified as timberland are the ones subject to viable forest management activities and thus are most apt to influence forest economics of the State, the remainder of this report will concentrate on timberland.

Timberland Distribution

FIA surveys divide North Carolina into four units or regions (fig. 1). The Southern Coastal Plain unit is the lower portion of the eastern half of the State, bordering South Carolina. The Northern Coastal Plain unit is the upper portion of the eastern half of the State, bordering Virginia. The Piedmont unit is roughly the center one-third of the State and borders Virginia to the north and South Carolina to the south. The Mountains unit is the entire western one-fourth of the State, largely bordering Tennessee to the west.
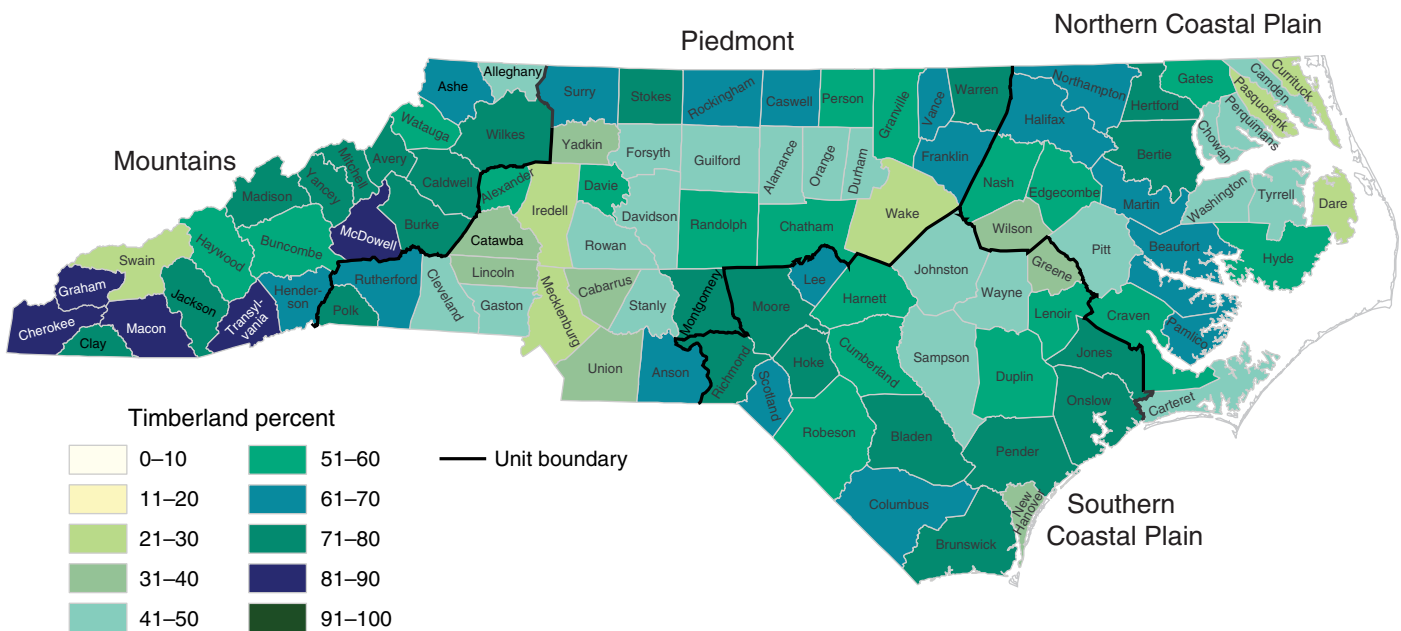
Figure 1—Timberland as a percentage of all land by county, North Carolina, 2013.

Loblolly pine (*Pinus taeda*) located in the Duke Forest, Durham, NC. Picture shows the red twigs and 3-needle clusters.
(photo courtesy of Wikimedia.org)

Since 2007, area of cropland decreased in all four survey units (tables 1A, 1B, 1C, and 1D). Area in pasture decreased in all units as well. The area of other nonforest land (primarily urban) increased in all the units, although the increase was <1 percent in the Northern Coastal Plain unit. Eighty percent of the State's total increase in area of other nonforest land occurred almost equally in the Piedmont and Southern Coastal Plain units.

Timberland as a percentage of land area by county (fig. 1) shows the most heavily forested part of the State to be the

Table 1A—Land area by land use and survey year, Southern Coastal Plain unit, North Carolina

Land use	Survey year		
	2002[a]	2007[a]	2013
		acres	
Forest land			
Timberland	5,237,274	5,083,747	5,096,068
Reserved	0	0	5,828
Other forest[b]	6,276	41,824	33,847
Total	5,243,550	5,125,571	5,135,743
Nonforest land			
Cropland	1,857,813	1,655,909	1,589,820
Pasture	159,058	296,817	224,203
Other nonforest[c]	1,079,086	1,225,290	1,365,988
Noncensus water[d]	28,079	46,891	52,773
Total	3,124,036	3,224,906	3,232,784
All land	8,367,586	8,350,477	8,368,527[e]
Census water	393,052	410,161	392,189
Total area	8,760,637	8,760,638	8,760,716
Percent land area forested	62.67	61.38	61.37

0 = no sample for the cell.
Numbers in rows and columns may not sum to totals due to rounding.
[a] From Brown and others (2014).
[b] Unproductive lands incapable of producing 20 cubic feet of wood per acre, per year due to adverse site conditions.
[c] Includes areas classified as urban, industrial, swampland, and other nonforest, etc.
[d] Areas classed as water by Forest Inventory and Analysis standards, but defined by Bureau of Census as land.
[e] From U.S. Bureau of the Census (2012).

Table 1B—Land area by land use and survey year, Northern Coastal Plain unit, North Carolina

Land use	Survey year		
	2002[a]	2007[a]	2013
		acres	
Forest land			
Timberland	3,783,403	3,689,755	3,544,770
Reserved	18,029	18,372	266,428
Other forest[b]	56,607	96,613	34,716
Total	3,858,039	3,804,740	3,845,914
Nonforest land			
Cropland	2,020,145	1,885,259	1,873,495
Pasture	45,941	59,740	34,709
Other nonforest[c]	748,092	883,703	887,150
Noncensus water[d]	28,433	36,908	36,027
Total	2,842,611	2,865,610	2,831,381
All land	6,700,650	6,670,350	6,677,295[e]
Census water	2,644,467	2,674,769	2,667,584
Total area	9,345,118	9,345,118	9,344,879
Percent land area forested	57.58	57.04	57.60

Numbers in rows and columns may not sum to totals due to rounding.
[a] From Brown and others (2014).
[b] Unproductive lands incapable of producing 20 cubic feet of wood per acre, per year due to adverse site conditions.
[c] Includes areas classified as urban, industrial, swampland, and other nonforest, etc.
[d] Areas classed as water by Forest Inventory and Analysis standards, but defined by Bureau of Census as land.
[e] From U.S. Bureau of the Census (2012).

Mountains unit followed by the Southern Coastal Plain unit. Five counties in the Mountains unit were >80 percent timberland. One county (Swain) in the Mountains unit contains a large portion of the Great Smoky Mountains National Park, which is reserved; otherwise, it would have been in a higher timberland percentage category. Eight counties in the Southern Coastal Plain unit were >70 percent timberland. In the Piedmont unit, 18 counties were ≤50 percent timberland. Counties with the least timberland contained large metropolitan areas or extensive areas in farmland.

Table 1C—Land area by land use and survey year, Piedmont unit, North Carolina

Land use	Survey year		
	2002[a]	2007[a]	2013
	acres		
Forest land			
Timberland	5,484,877	5,349,603	5,305,360
Reserved	6,008	5,927	17,638
Other forest[b]	0	2,111	2,139
Total	5,490,885	5,357,641	5,325,137
Nonforest land			
Cropland	1,554,197	1,273,273	1,216,676
Pasture	838,526	1,000,749	944,135
Other nonforest[c]	2,485,478	2,754,931	2,886,736
Noncensus water[d]	67,707	61,128	59,817
Total	4,945,907	5,090,081	5,107,364
All land	10,436,792	10,447,722	10,432,501[e]
Census water	193,600	182,670	197,291
Total area	10,630,392	10,630,392	10,629,792
Percent land area forested	52.61	51.28	51.04

0 = no sample for the cell.
Numbers in rows and columns may not sum to totals due to rounding.
[a] From Brown and others (2014).
[b] Unproductive lands incapable of producing 20 cubic feet of wood per acre, per year due to adverse site conditions.
[c] Includes areas classified as urban, industrial, swampland, and other nonforest, etc.
[d] Areas classed as water by Forest Inventory and Analysis standards, but defined by Bureau of Census as land.
[e] From U.S. Bureau of the Census (2012).

Table 1D—Land area by land use and survey year, Mountains unit, North Carolina

Land use	Survey year		
	2002[a]	2007[a]	2013
	acres		
Forest land			
Timberland	3,868,947	3,932,342	3,941,666
Reserved	354,894	355,832	356,178
Other forest[b]	6,029	6,031	6,052
Total	4,229,870	4,294,205	4,303,896
Nonforest land			
Cropland	277,653	228,506	191,394
Pasture	411,280	384,894	355,702
Other nonforest[c]	719,565	728,952	791,206
Noncensus water[d]	25,000	28,446	22,705
Total	1,433,497	1,370,798	1,361,007
All land	5,663,367	5,665,003	5,664,903[e]
Census water	44,196	42,558	43,785
Total area	5,707,562	5,707,562	5,708,688
Percent land area forested	74.69	75.80	75.97

Numbers in rows and columns may not sum to totals due to rounding.
[a] From Brown and others (2014).
[b] Unproductive lands incapable of producing 20 cubic feet of wood per acre, per year due to adverse site conditions.
[c] Includes areas classified as urban, industrial, swampland, and other nonforest, etc.
[d] Areas classed as water by Forest Inventory and Analysis standards, but defined by Bureau of Census as land.
[e] From U.S. Bureau of the Census (2012).

Timberland Statistics: Area

Trends

The 17.9 million acres of timberland recorded for North Carolina in 2013 appeared to continue a downward trend in area of timberland for the State (fig. 2A). However, a nationally instituted change by FIA in the definition of reserved timberland was responsible for many of the timberland acres moving to the reserved category. The 168,000-acre decrease represented a 1-percent drop from the 18.1 million acres reported for the 2007 survey. Appendix D contains 36 tables with information describing this resource. In addition to the definition-induced change in timberland, the expansion of the major metropolitan areas found across the State increased the area of the "other nonforest land" category (table 1), often at the expense of

previously forested areas. This urbanization was the leading cause of any real loss of timberland in the State.

Occurrence

The State's overall decrease in timberland did not occur across all four survey units of the State. The Northern Coastal Plain unit (fig. 2C) and the Piedmont unit (fig.2D) both declined. The Southern Coastal Plain (fig. 2B) and Mountains units (fig. 2E) actually increased in timberland area by slight margins since 2007. The Piedmont unit (fig. 2D) continued an established downward trend in area of timberland. However, caution is advised regarding detailed analysis of the timberland loss because of the aforementioned reclassification of certain timberland areas into a reserved status under FIA field manual 6.0 guidelines. These changes potentially complicate accurate assessment of true

Loblolly pine (*Pinus taeda*) located in the Duke Forest, Durham, NC. Picture shows widely spaced "seed" trees for natural regeneration after harvest. (photo courtesy of Wikimedia.org)
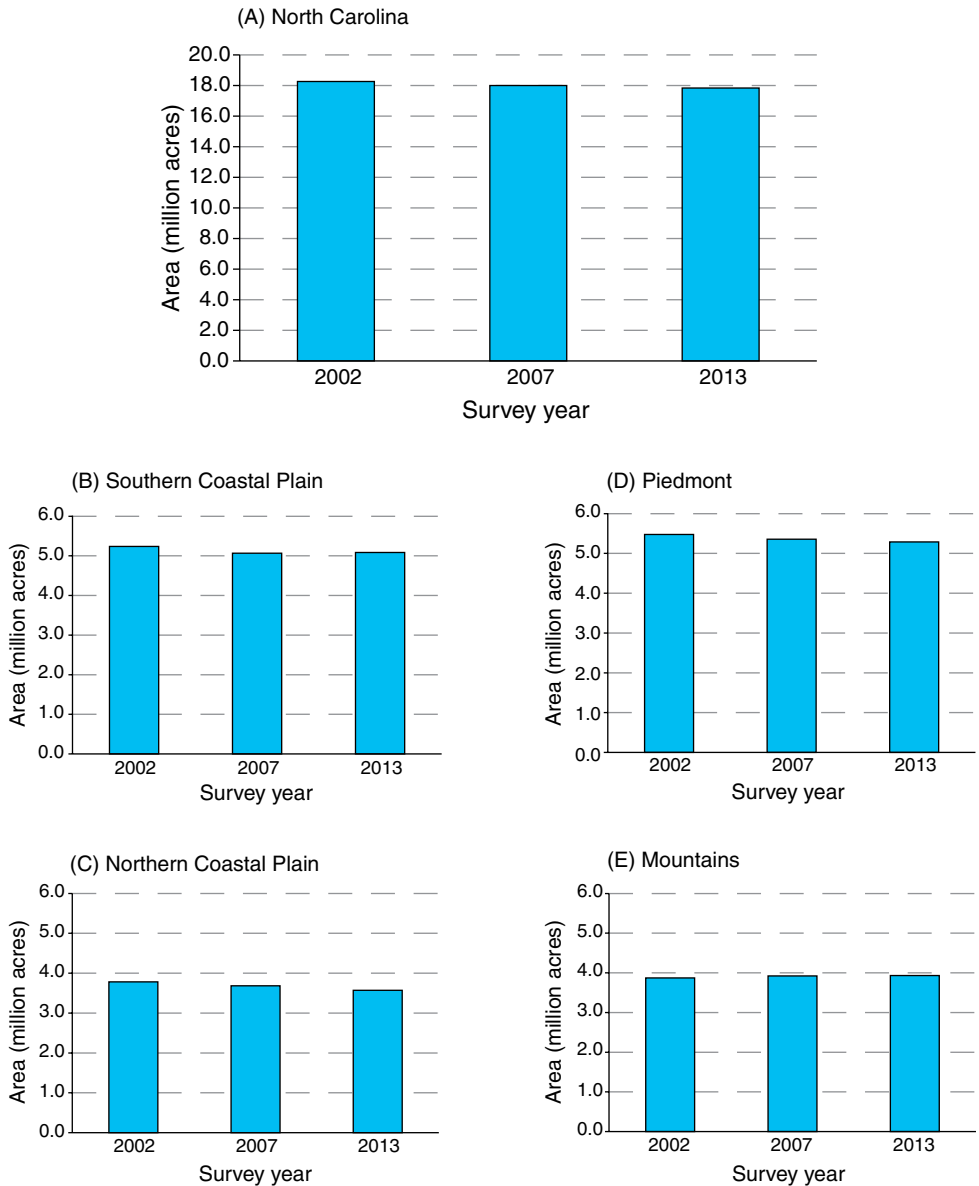
Figure 2—Area of timberland in (A) North Carolina by survey year and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2002 and 2007 from Brown and others (2014).

timberland change at scales smaller than State level, particularly when the changes are nominal. With that in mind, the Northern Coastal Plain lost about 4.0 percent, or 145,000 acres, of its timberland since 2007. However, this could be due to reclassification of Great Dismal Swamp National Wildlife Refuge timberlands to a reserved status. The Southern Coastal Plain gained 12,000 acres, or a fraction of a percent; the actual gain could be greater if some of the reclassification occurred here.

Similarly, the Mountains unit gained 9,000 acres of timberland. The Piedmont unit lost 0.8 percent, or 44,000 acres, since 2007, following a 2.5-percent loss, or 135,000 acres, from the 2002 survey.

Ownership

Although in a downward trend, the private individual category (all NIPF owner classes other than corporate) with 11.0 million acres, continued to control most

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(61 percent) of North Carolina's timberland in 2013. The "other corporate" category (all corporate-owned timberland other than forest industry) with 3.4 million acres was second (19 percent), followed by national forest with <1.2 million acres (7 percent), and forest industry with 1.0 million acres

(6 percent) (fig. 3A). Area of timberland owned by private individuals dominated each of the four survey units, and the "other corporate" category was second in three of the four survey units. However, some differences existed by survey unit. In the Southern Coastal Plain unit (fig. 3B),
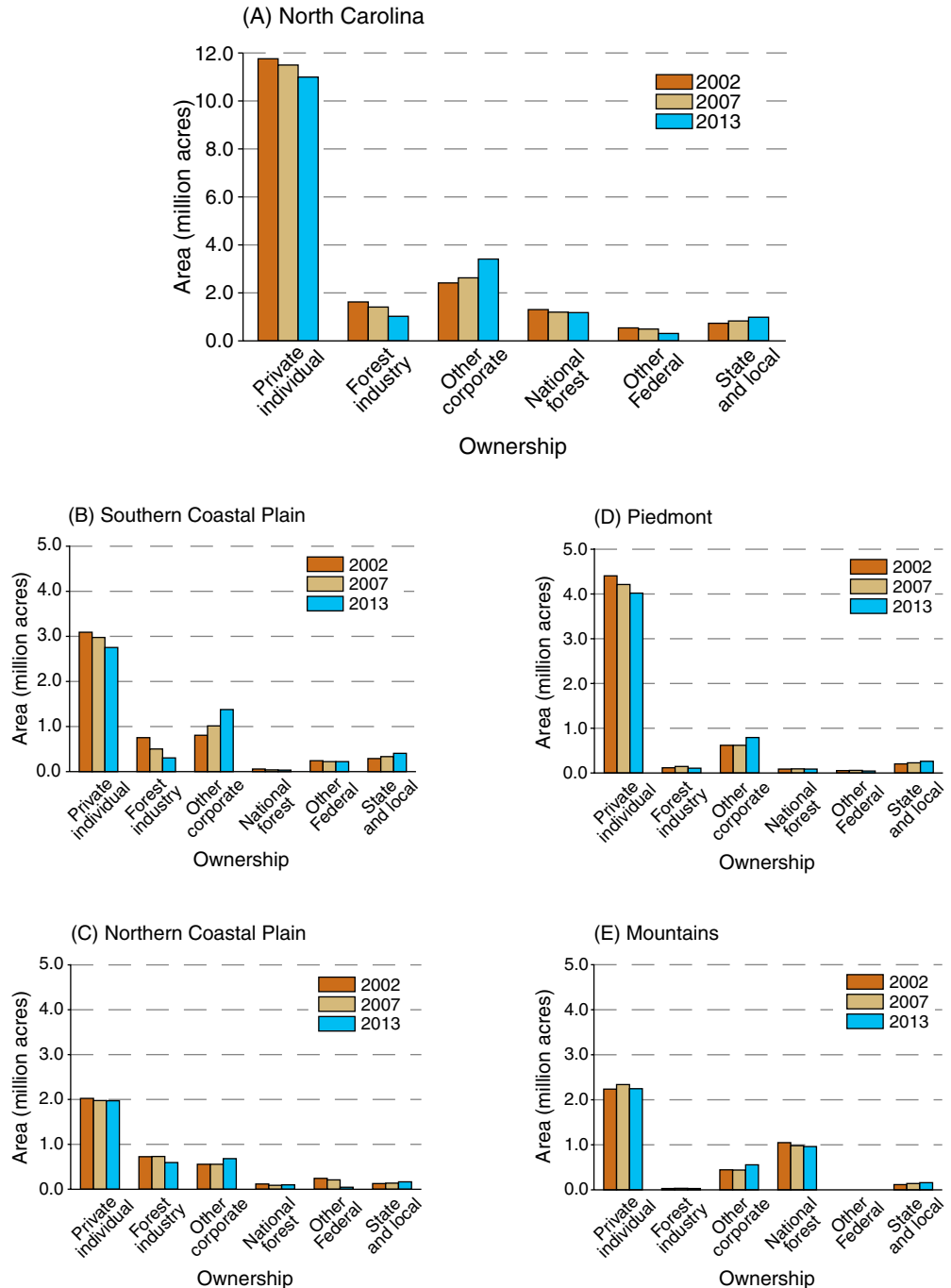
Figure 3—Area of timberland in (A) North Carolina by ownership, survey year, and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2002 and 2007 from Brown and others (2014).

State and local government timberland was third, followed by forest industry and then other Federal ownerships. In the Northern Coastal Plain (fig. 3C), forest industry was third, followed by State and local government timberlands. In the Piedmont (fig. 3D), State and local was third, followed by forest industry. In the Mountains (fig. 3E), national forest ownership was clearly second, and other corporate was third.

The decrease in area of North Carolina's timberland was also distributed differently by ownership category. At the State level, most of the decrease in timberland was recorded in the private individual and forest industry lands categories. Some of the State's timberland decrease occurred in the other Federal category through reclassification of areas to a reserved status. Area of privately owned timberland decreased 4.4 percent since 2007, from 11.5 million to 11.0 million acres in 2013. Forest industry timberland decreased 27 percent from 1.4 million to 1.0 million acres in 2013. Much of the lost private individual and forest industry category timberland was absorbed by increased area of timberland in the "State and local" and "other corporate" ownership categories.

By survey unit, for instance, the decreased timberland in the private individual owner category occurred in each of the State's four survey units. However, the change in the Northern Coastal Plain was negligible. The decreased timberland in the forest industry category occurred in all survey units. Forest industry timberland decreased most in the Southern Coastal Plain unit.

The increased area of "other corporate" timberland often corresponds with the decreased area of forest industry timberland as seen in the figure 3 graphs. The other corporate timberland acres are largely held in Timber Investment and Management Organizations, Real Estate Investment Trusts, Limited Liability Corporations, and similar organizations. Whether these timberlands remain in the timber base and contribute to the State's wood supply is

unclear and depends on the new landowners' management goals and priorities.

Most of the State's 11.0 million acres of private individual timberland, 37 percent, was located in the Piedmont unit, and 25 percent was located in the Southern Coastal Plain unit. The Mountains unit accounted for 20 percent, and the Northern Coastal Plain unit accounted for the remaining 18 percent.

Most of the State's 1.0 million acres of forest industry timberland, 58 percent, was located in the Northern Coastal Plain unit, and 30 percent was located in the Southern Coastal Plain unit. The Piedmont unit accounted for 10 percent, and the Mountains unit accounted for the remaining >2 percent.

Most of the State's 3.4 million acres of other corporate timberland, <41 percent, was located in the Southern Coastal Plain unit, and 23 percent was located in the Piedmont unit. The Northern Coastal Plain unit accounted for 20 percent, and the Mountains unit accounted for the remaining 16 percent.

Most of the State's 1.2 million acres of national forest timberland, 82 percent, was located in the Mountains unit, and 8 percent was located in the Northern Coastal Plain unit. The Piedmont unit accounted for 7 percent, and the Southern Coastal Plain unit accounted for the remaining 3 percent.

Most of the State's 0.3 million acres of other Federal timberland, 72 percent, was located in the Southern Coastal Plain unit, and 14 percent was located in the Piedmont unit. The Northern Coastal Plain unit accounted for the remaining 14 percent, as none was recorded for the Mountains unit.

Most of the State's 1.0 million acres of State and local government timberland, 41 percent, was located in the Southern Coastal Plain unit, and 27 percent was located in the Piedmont unit. The Northern Coastal Plain unit accounted for 16 percent, and the Mountains unit accounted for another 16 percent.

Forest Types

From its coastline to its mountain tops, North Carolina's boundaries contain many physiographic classes, including cypress ponds, pocosins, drains, swamps, flood-plains, coves, uplands, flatwoods, deep sands, and dry tops. Within these physio-graphic classes, many forest types and even transitional types are encountered. Among these types, numerous tree species exist, some less common than others and some even rare. For this reason, the accompany-ing species list is limited to some 106 tree species historically identified on sample plots (appendix C). Furthermore, the most common species associations can be com-bined into forest types. The individual forest types are named for the species forming a plurality of the stocking. Forest types are collapsed into forest-type groups for better graphical representation in the figures. The forest-type groups of spruce-fir, white-red-jack pine, longleaf-slash pine, loblolly-shortleaf pine, oak-pine, other hardwoods, oak-hickory, maple-beech-birch, elm-ash-cottonwood, oak-gum-cypress, and nonstocked are typically used in the Southern United States.

Collectively, the hardwood forest types accounted for 11.8 million acres, or 66 percent of North Carolina's timberland, and softwood forest types accounted for 5.9 million acres, or 33 percent. Nonstocked areas of <0.2 million acres made up the remaining 1 percent.

The most common forest-type group that occurred in North Carolina was oak-hick-ory (fig. 4A). The oak-hickory forest-type group accounted for 7.0 million acres, or 39 percent, of North Carolina's timberland. Loblolly-shortleaf pine types were next with 5.5 million acres, or 31 percent of the State's timberland. Oak-pine types were third with 2.3 million acres, or 13 percent of the State's timberland. The area of tim-berland classified as an oak-gum-cypress forest type was fourth and accounted for almost 1.7 million acres, or <10 percent of the State total. Areas having insufficient

stocking of trees to determine a forest type were classified as nonstocked. Nonstocked timberland accounted for 177,000 acres.

Most of the State's 7.0 million acres of oak-hickory forest-type timberland, 44 percent, was located in the Mountains unit, and 38 percent was located in the Piedmont unit. The Southern Coastal Plain unit accounted for 11 percent, and the Northern Coastal Plain unit accounted for the remaining 7 percent.

Most of the State's 5.5 million acres of loblolly-shortleaf forest-type timberland, 41 percent, was located in the Southern Coastal Plain unit, and 31 percent was located in the Northern Coastal Plain unit. The Piedmont unit accounted for 26 percent, and the Mountains unit accounted for the remaining 2 percent.

Most of the State's 2.3 million acres of oak-pine forest-type timberland, 36 percent, was located in the Piedmont unit, and 29 percent was located in the Southern Coastal Plain unit. The Northern Coastal Plain unit accounted for 19 percent, and the Mountains unit accounted for the remain-ing 16 percent.

Most of the State's nearly 1.7 million acres of oak-gum-cypress forest type timberland, 51 percent, was located in the Southern Coastal Plain unit, and 43 percent was located in the Northern Coastal Plain unit. The Piedmont unit accounted for the remaining 6 percent, as only a trace was recorded in the Mountains unit.

As might be expected, the forest-type group order of prevalence at the State level was different by survey unit. In the Southern Coastal Plain unit (fig. 4B), the most common forest-type group present was loblolly-shortleaf pine, which accounted for 44 percent of the unit's timberland. Oak-gum-cypress type was second with 17 percent of the timberland, and third was oak-hickory with 16 percent. Oak-pine came in fourth with 13 percent. Although the Northern Coastal Plain unit's (fig. 4C) order of forest-type prevalence

(A) North Carolina

a Includes other softwoods.
b Includes exotic hardwoods and aspen-birch.

(B) Southern Coastal Plain

a Includes other softwoods.
b Includes exotic hardwoods and aspen-birch.

(D) Piedmont

a Includes other softwoods.
b Includes exotic hardwoods and aspen-birch.

(C) Northern Coastal Plain

a Includes other softwoods.
b Includes exotic hardwoods and aspen-birch.

(E) Mountains

a Includes other softwoods.
b Includes exotic hardwoods and aspen-birch.

Figure 4—Area of timberland in (A) North Carolina by forest-type group, survey year, and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2002 and 2007 from Brown and others (2014).

matched that of the Southern Coastal Plain, the percentages varied by forest type. Loblolly-shortleaf pine type accounted for 47 percent, oak-gum-cypress 21 percent, oak-hickory 13 percent, and oak-pine 12 percent of the timberland in the Northern Coastal Plain unit. The Piedmont unit (fig. 4D) came closest to following the statewide order of prevalence. It matched the first three but differed on the fourth. In the Piedmont, oak-hickory forest type accounted for 50 percent of the timberland, followed by loblolly-shortleaf with 27 percent, oak-pine with 16 percent, and then elm-ash-cottonwood with 5 percent. The Mountains unit (fig. 4E) was the most dominated by one forest-type group. In the Mountains, oak-hickory accounted for 79 percent of the timberland. Oak-pine was second with 10 percent, loblolly-shortleaf was third with >3 percent, other hardwoods was fourth with 3 percent, and white-red-jack pine was fifth with <3 percent of the timberland in the Mountains unit.

Ancient Tulip Poplar (*Liriodendron tulipifera*) located in Joyce Kilmer Memorial Forest of Graham County, NC. (photo courtesy of Wikimedia.org)

Stand-Size Class

For a broad-scale portrayal of the State's timberland, FIA classified forest stands into three major stand-size classes. Those few acres with insufficient stocking to determine forest type or stand size were allocated to the nonstocked category. The classes were large, medium, and small. The large stand-size class correlates to the sawtimber-size class, the medium stand-size class correlates to the poletimber-size class, and the small stand-size class correlates to the sapling-seedling-size class. For all forest-type groups, the small stand size included stands at least 10 percent stocked with trees more than half of which were from 1.0 to 4.9 inches in diameter at breast height (d.b.h.). For softwood forest types, the medium stand size included stands at least 10 percent stocked with trees more than half of which were from 5.0 to 8.9 inches d.b.h., and the large stand size included stands at least 10 percent stocked with trees more than half of which were 9.0 inches d.b.h. and larger. The definition for hardwood forest types only differs in the diameter threshold, where medium size ranges from 5.0 to 10.9 inches d.b.h., and large size requires 11.0 inches d.b.h. and larger.

The sawtimber-size class covered 10.1 million acres, or 56 percent, of North Carolina's timberland in 2013. Based on broad forest-type groupings, most of the sawtimber-size stands, 46 percent, were composed of upland hardwood forest types (fig. 5A). Softwood forest types made up 30 percent and lowland hardwood forest types made up 12 percent of the State's sawtimber-size timberland. The oak-pine forest types were fourth and accounted for nearly 12 percent.

The poletimber-size class covered >3.9 million acres, or 22 percent, of North Carolina's timberland in 2013. Based on broad forest-type groupings, most of the poletimber-size stands, 46 percent, were composed of softwood forest types (fig. 5A). Upland hardwood forest types were second

with 33 percent of the State's poletimber-size timberland, and oak-pine forest types made up 11 percent. The lowland hardwood forest types were fourth and accounted for 10 percent.

The sapling-seedling-size class covered <3.7 million acres, or 21 percent, of North Carolina's timberland in 2013. Based on broad forest-type groupings, most of the sapling-seedling-size stands, 34 percent, were composed of upland hardwood forest types (fig. 5A). Softwood forest types made up 30 percent and oak-pine types made up 19 percent of the State's sapling-seedling-size timberland. The lowland hardwood forest types were fourth and accounted for 17 percent.

Just as forest-type distribution by survey unit differed from those at the State level, so the stand-size class distribution across the broad forest-type categories differed by survey unit from the statewide distribution. For instance, whereas upland hardwood forest types dominated the statewide distribution of sawtimber-size stands, the softwood forest types dominated sawtimber-size stands in the Southern Coastal Plain.

In fact, the sawtimber-size class covered almost 2.4 million acres, or 47 percent, of the Southern Coastal Plain's timberland in 2013. Based on broad forest-type groupings, most of the sawtimber-size stands, 56 percent, consisted of softwood forest types (fig. 5B). Lowland hardwood forest types made up 21 percent and upland hardwood types made up 12 percent of the Southern Coastal Plain's sawtimber-size timberland. The oak-pine forest types were fourth and accounted for 11 percent.

The poletimber-size class covered >1.2 million acres, or 24 percent, of the Southern Coastal Plain's timberland in 2013. Based on broad forest-type groupings, most of the poletimber-size stands, 59 percent, were made up of softwood forest types (fig. 5B). Next were upland hardwood, lowland hardwood, and

oak-pine forest types, which accounted for 15, 14, and 12 percent of the Southern Coastal Plain's poletimber-size timberland, respectively.

The sapling-seedling size class covered 1.4 million acres, or 28 percent, of the Southern Coastal Plain's timberland in 2013. Based on broad forest-type groupings, most of the sapling-seedling-size stands, almost 37 percent, were composed of soft-wood forest types (fig. 5B). Upland hard-wood forest types made up 25 percent and lowland hardwood forest types made up 21 percent of the Southern Coastal Plain's sapling-seedling-size timberland. The oak-pine forest types were fourth and accounted for 17 percent.

The sawtimber-size class covered 1.6 million acres, or 45 percent, of the Northern Coastal Plain's timberland in 2013. Based on broad forest-type group-ings, most of the sawtimber-size stands, 50 percent, were composed of softwood forest types (fig. 5C). Lowland hardwood forest types made up 29 percent and upland hardwood forest types made up 12 percent of the Northern Coastal Plain's sawtimber-size timberland. The oak-pine forest types were fourth and accounted for 9 percent.

The poletimber-size class covered almost 0.9 million acres, or 24 percent, of the Northern Coastal Plain's timberland in 2013. Based on broad forest-type group-ings, most of the poletimber-size stands, 62 percent, were composed of softwood forest types (fig. 5C). Lowland hardwood forest types accounted for 18 percent, upland hardwood forest types 13 percent, and oak-pine forest types 7 percent of the Northern Coastal Plain's poletimber-size timberland.

The sapling-seedling size class covered 1.0 million acres, or 29 percent, of the Northern Coastal Plain's timberland in 2013. Based on broad forest-type groupings, most of the sapling-seedling-size stands, 35 percent, were composed of softwood forest types (fig. 5C). Lowland hardwood forest types made up 25 percent and oak-pine

types made up 23 percent of the Northern Coastal Plain's sapling-seedling-size timber-land. The upland hardwood forest types were fourth and accounted for 17 percent.

The sawtimber-size class covered 3.0 million acres, or 57 percent, of the Piedmont's timberland in 2013. Based on broad forest-type groupings, most of the sawtimber-size stands, 53 percent, were composed of upland hardwood forest types (fig. 5D). Softwood forest types made up 23 percent and oak-pine forest types made up 15 percent of the Piedmont's sawtimber-size timberland. The lowland hardwood forest types were fourth and accounted for 9 percent.

The poletimber-size class covered >1.2 million acres, or 23 percent, of the Piedmont's timberland in 2013. Based on broad forest-type groupings, most of the poletimber-size stands, 41 percent, were composed of softwood forest types (fig. 5D). Upland hardwood forest types made up 40 percent and oak-pine forest types made up 15 percent of the Piedmont's poletimber-size timberland. The lowland hardwood forest types accounted for the remaining 4 percent.

The sapling-seedling size class covered >1.0 million acres, or 19 percent, of the Piedmont's timberland in 2013. Based on broad forest-type groupings, most of the sapling-seedling-size stands, 54 percent, were composed of upland hardwood forest types (fig. 5D). Softwood forest types made up 22 percent and oak-pine forest types made up 20 percent of the Piedmont's sapling-seedling-size timberland. The lowland hardwood forest types were fourth and accounted for 4 percent.

The sawtimber-size class covered 3.1 million acres, or 79 percent, of the Mountains' timberland in 2013. Based on broad forest-type groupings, a great major-ity of the sawtimber-size stands, 84 percent, were composed of upland hardwood forest types (fig. 5E). Oak-pine forest types made up 9 percent and the softwood forest types made up 7 percent of the Mountains'
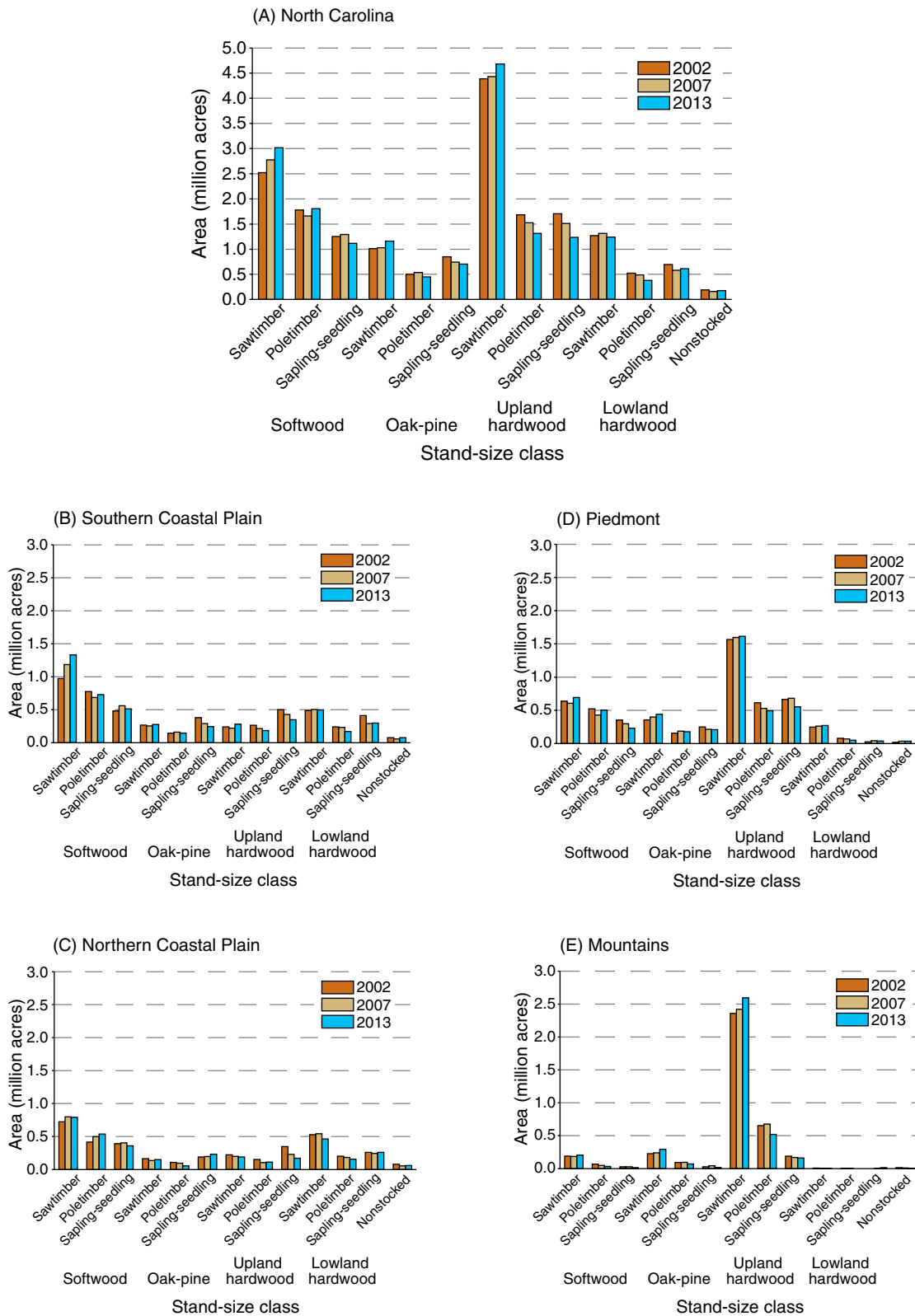
Figure 5—Area of timberland in (A) North Carolina by stand-size class, broad forest-type group, survey year, and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2002 and 2007 from Brown and others (2014).

sawtimber-size timberland. The lowland hardwood forest types accounted for only a fraction of a percent.

The poletimber-size class covered >0.6 million acres, or 16 percent, of the Mountains' timberland in 2013. Based on broad forest-type groupings, most of the poletimber-size stands, 83 percent, were composed of upland hardwood forest types (fig. 5E). Oak-pine forest types made up 11 percent and softwood forest types made up 6 percent of the Mountains' poletimber-size timberland. The lowland hardwood forest types were not recorded in this size class.

The sapling-seedling size class covered >0.2 million acres, or 5 percent, of the Mountains' timberland in 2013. Based on broad forest-type groupings, most of the sapling-seedling-size stands, 76 percent, were composed of upland hardwood forest types (fig. 5E). Oak-pine forest types made up 9 percent and lowland hardwood forest types made up 8 percent of the Mountains' sapling-seedling-size timberland. The softwood forest types were fourth and accounted for 7 percent.

Stand Origin

Determining whether a forest stand was established naturally or through planting, helps characterize the State's timberland resource and provides important information to the State's wood-using industry. In 2013, >3.2 million acres, or 18 percent, of North Carolina's timberland exhibited clear evidence of artificial regeneration (fig. 6A). For the purposes of this report, those acres are considered to be planted and the terms herein used synonymously.

More than 2.7 million acres, or 85 percent of the area with evidence of artificial regeneration, was classified in the soft-wood forest-type group. Hardwoods accounted for 14 percent, and the remaining 1 percent was classified in the non-stocked category. It is important to note that the oak-pine forest types are classified under the hardwood forest-type group. In fact, oak-pine forest types accounted for 59 percent of the planted hardwood forest-type group timberland. These planted oak-pine stands typically result from varying degrees of planting spacing, survival, and hardwood competition. Under these circumstances, forest-type classifications compute to mixed-species stands from the species stocking ratios present. However, some acres are intentionally planted to specific hardwood species. Of the <0.5 million planted hardwood acres, 274,000 acres were oak-pine forest types and 176,000 were oak-hickory forest types. Almost 9,000 acres were classified as oak-gum-cypress and 6,000 acres were classified as elm-ash-cottonwood forest types. Within the softwood forest-type group, loblolly-shortleaf pine forest type accounted for <2.6 million acres, or 79 percent, of the State's total planted timberland. Longleaf-slash pine forest type accounted for 142,000 acres, and white-red-jack pine forest type accounted for 29,000 acres.

In 2002, the area of natural softwood was 40 percent higher than the area of planted softwood in North Carolina (fig. 6A). In the 2007 survey, however, the areas of planted softwood and natural softwood had drawn closer to the same amounts because the area of planted softwood acres increased while the area of natural softwood acres decreased. By 2013, the area of natural softwood increased slightly more than did the area of planted softwood, slowing the former trend.

Distribution of the State's >3.2 million acres of planted timberland was not even across the four survey units. The two easternmost units together accounted for more than three-fourths of the planted timberland in North Carolina. Most of the planted acres, or 41 percent, were located in the Southern Coastal Plain unit (fig. 6B) and another 34 percent were located in the Northern Coastal Plain unit (fig. 6C). The Piedmont unit (fig. 6D) accounted for 23 percent of the planted timberland. Planted timberland in the Mountains unit (fig. 6E) accounted for only 2 percent of the State total.
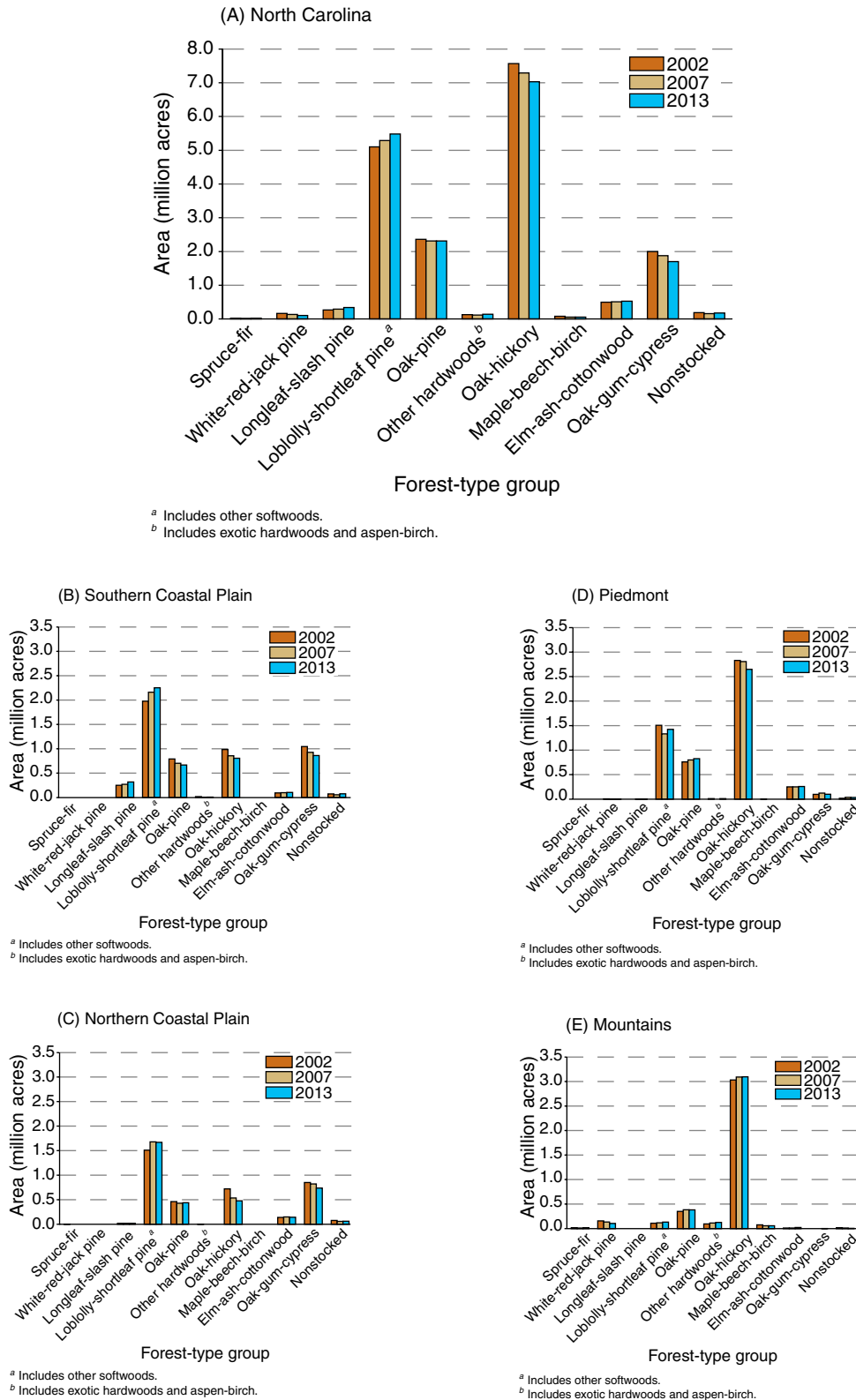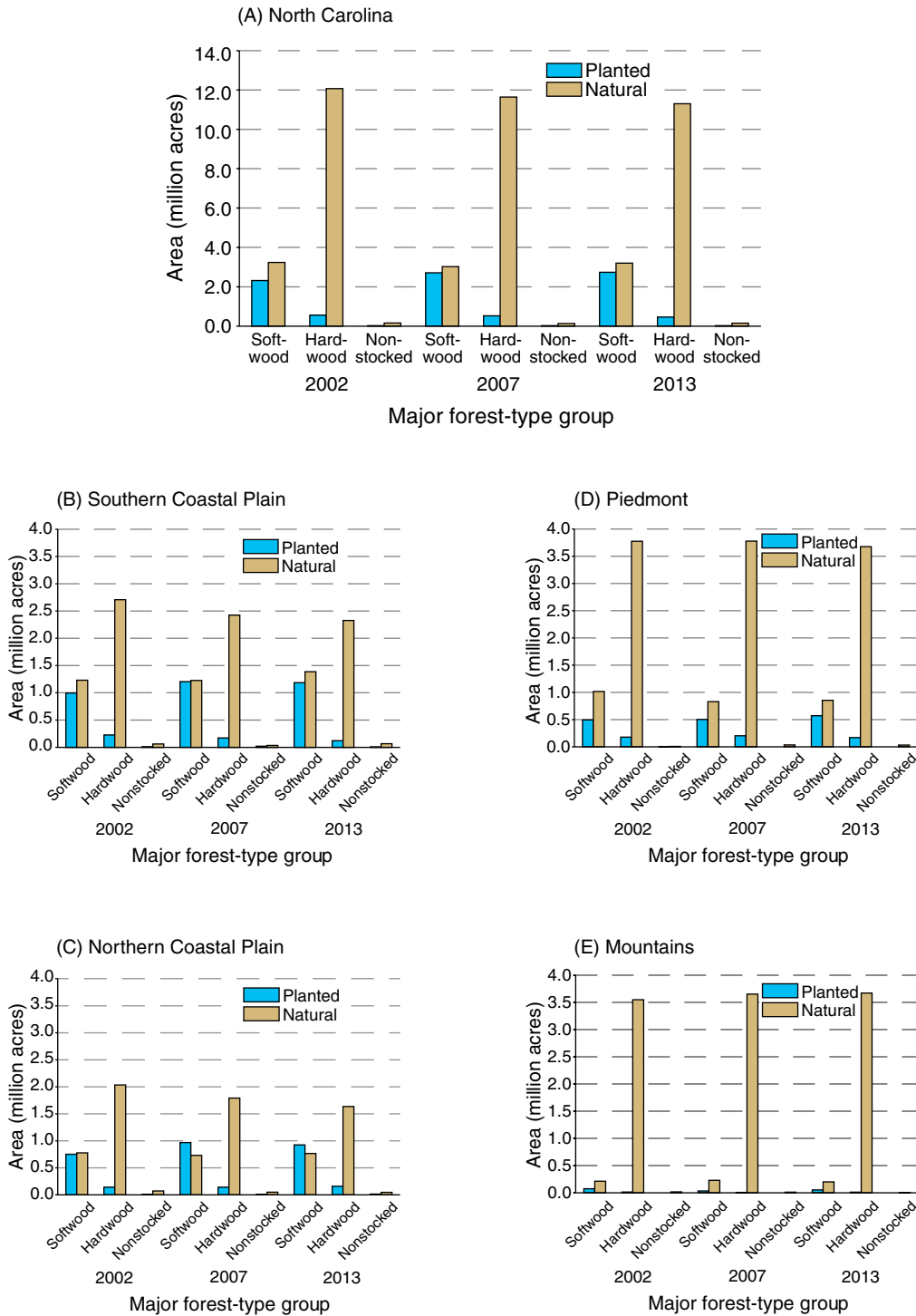
(A) North Carolina

Figure 6—Area of timberland in (A) North Carolina by major forest-type group, stand origin, survey year, and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2002 and 2007 from Brown and others (2014).

Area of planted timberland accounted for 1.3 million acres, or 26 percent, of the Southern Coastal Plain's timberland in 2013. Based on major forest-type groupings, most of the planted stands, 90 percent, were composed of softwood forest types (fig. 6B). Since 2007, the area of planted softwood stands has slightly decreased in the Southern Coastal Plain unit, whereas the area of natural softwood stands increased slightly.

Area of planted timberland accounted for 1.1 million acres, or 31 percent, of the Northern Coastal Plain's timberland in 2013. Based on major forest-type groupings, most of the planted stands, 84 percent, were composed of softwood forest types (fig. 6C). Since 2007, the area of planted softwood stands has decreased slightly in the Northern Coastal Plain unit, and the area of natural softwood stands has increased slightly. However, planted softwood stands still exceeded natural softwood stands in 2013. To date, the Northern Coastal Plain unit remains the only part of the State where this occurred.

Area of planted timberland accounted for >0.7 million acres, or 14 percent, of the Piedmont's timberland in 2013. Based on major forest-type groupings, most of the planted stands, 77 percent, were composed of softwood forest types (fig. 6D). Since 2007, the area of planted softwood stands increased slightly in the Piedmont unit as did the area of natural softwood stands.

Area of planted timberland accounted for 65,000 acres, or <2 percent, of the Mountains' timberland in 2013. Based on major forest-type groupings, most of the planted stands, 82 percent, were composed of softwood forest types (fig. 6E). Although nominal, the area of planted softwood stands increased. The area of natural softwood stands has decreased slightly in the Mountains unit since 2007.

Stand-Age Class

The planted and natural stands by stand-age class provide another method to describe North Carolina's timberland. In 2013, for all species combined, the >3.2-million-acre statewide area of planted timberland peaked in the 0- to 10-year age class with >1.0 million acres (fig. 7A). The 380,000-acre 31- to 40-year age class was less than one-half of the 900,000-acre 21- to 30-year age class. This drop occurred at the typical point where many planted yellow pine stands begin to be harvested. The slight dip to 744,000 acres in the 11- to 20-year age class may indicate pulpwood removal prior to stand liquidation evident in >30-year age classes. The statewide area of natural timberland peaked sharply in the 41- to 80-year age classes. This situation could be indicative of either higher levels of harvest and natural regeneration in the past, or higher levels of reversion of abandoned farmland by natural regeneration.

In the Southern Coastal Plain unit (fig. 7B), the age distribution of the 1.3-million-acre area of planted timberland was similar to that at the State level, peaking in both the 0- to 10- and 21- to 30-year age classes, after which the rate of liquidation accelerated. The Southern Coastal Plain unit contained nearly one-half of the State's remaining acres of planted timberland in the 41- to 60-year age class. Natural timberland in this unit peaked in the 41- to 60-year age class.

In the Northern Coastal Plain unit (fig. 7C), the 1.1-million-acre area of planted timberland peaked in the 0- to 10-year age class and was nearly gone after the 31- to 40-year age class. The largest reduction between the 0- to 10- and the 11- to 20-year age classes of planted timberland occurred in the Northern Coastal Plain unit. The natural timberland in this unit peaked in the 0- to 10- and 41- to 60-year age classes.

In the Piedmont unit (fig. 7D), the >0.7-million-acre area of planted timberland peaked in the 0- to 10- and 21- to

30-year age classes. The smallest reduction between the 0- to 10- and 11- to 20-year age classes of planted timberland occurred in the Piedmont unit. The natural timberland in this unit peaked in the 41- to 60-year age class.

In the Mountains unit (fig. 7E), the nominal 65,000-acre area of planted timberland peaked in the 21- to 30-year age class, with none recorded after the 41-60 year age class. The Mountains unit had the oldest peak of natural timberland in the State at the 61- to 80-year old age class.
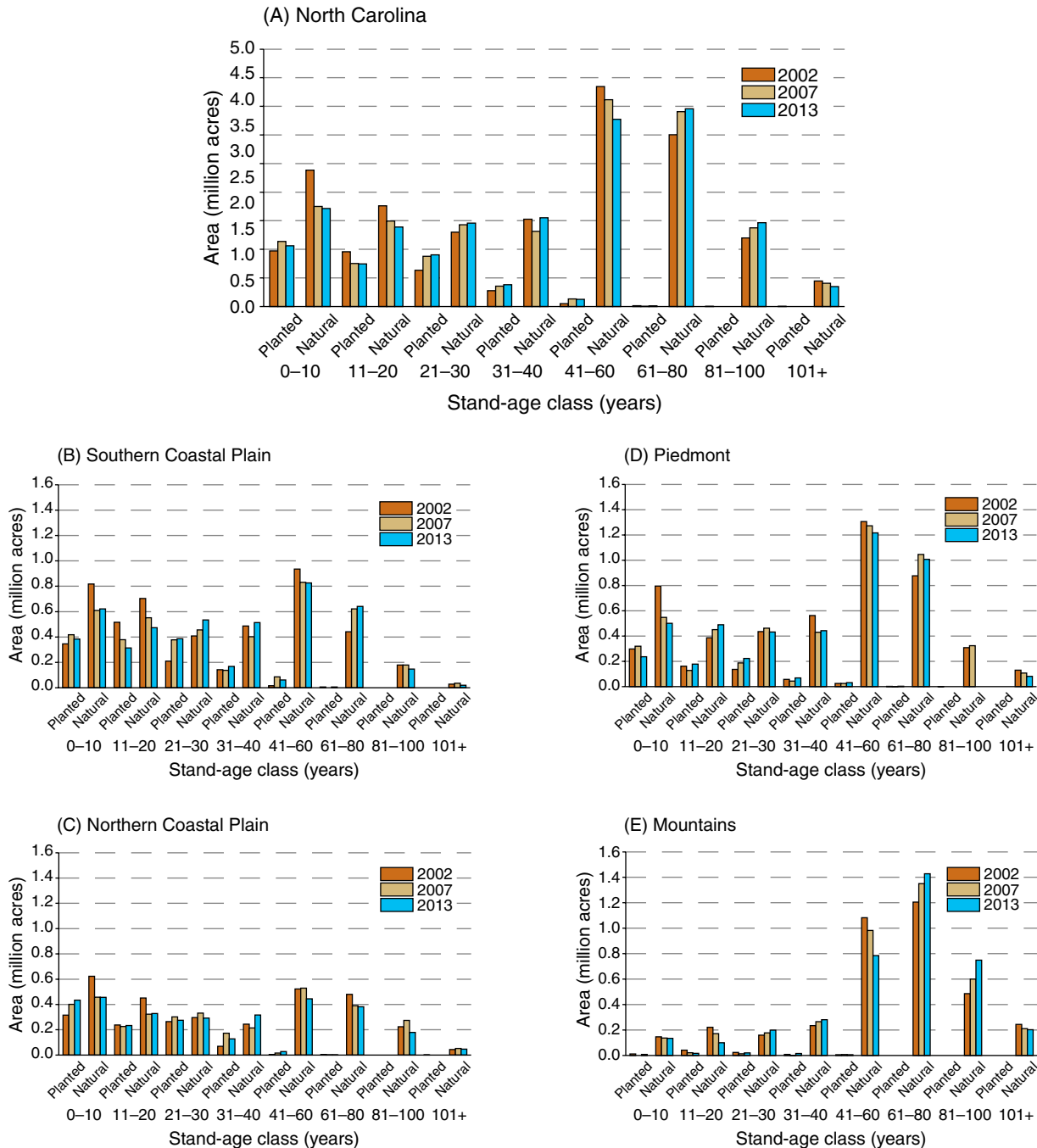
Figure 7—Area of timberland in (A) North Carolina by stand-age class, stand origin, survey year, and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2002 and 2007 from Brown and others (2014).

Timberland Statistics: Tree Volume

Volume as a descriptor of the timber resource is in many ways a better approach to analyzing the potential of a State's forests. Unlike area by forest type, volume can be analyzed related to tree species population estimates regardless of occurrence. For example, all yellow-poplar volume can be summed for an individual survey unit regardless of its distribution on the ground, or trends in volume of yellow-poplar can be tracked. Furthermore, volume can be summed for a species or species group by diameter class or for a particular ownership group alone. In essence, wood volume is the medium of exchange that propels the State's forest industry economy. Suffice it to say, volume is ultimately the basis for determining net change using components of growth to be discussed in the next section of this report.

The calculation of volume begins with a tally of trees. The numbers of trees by species along with their heights and diameters form the foundation for all the algorithmic processes to follow.

Figure 8A shows the top 10 timberland tree species by number that are at least 1 inch in diameter at breast height (d.b.h.). Loblolly, red maple, and sweetgum accounted for the highest numbers of trees. There were similarities and differences in the order of prevalence and species present by survey unit. For instance, the top three in the two Coastal Plain units matched the order of the top three statewide. In the Piedmont, the order of these three species switched to sweetgum, loblolly pine, and red maple. Longleaf pine made the top 10 list only in the Southern Coastal Plain unit (fig. 8B). Sweetbay, redbay, and swamp

American beech (*Fagus grandifolia*) located on the Duke Forest, Durham, NC. (photo courtesy of Wikimedia.org)
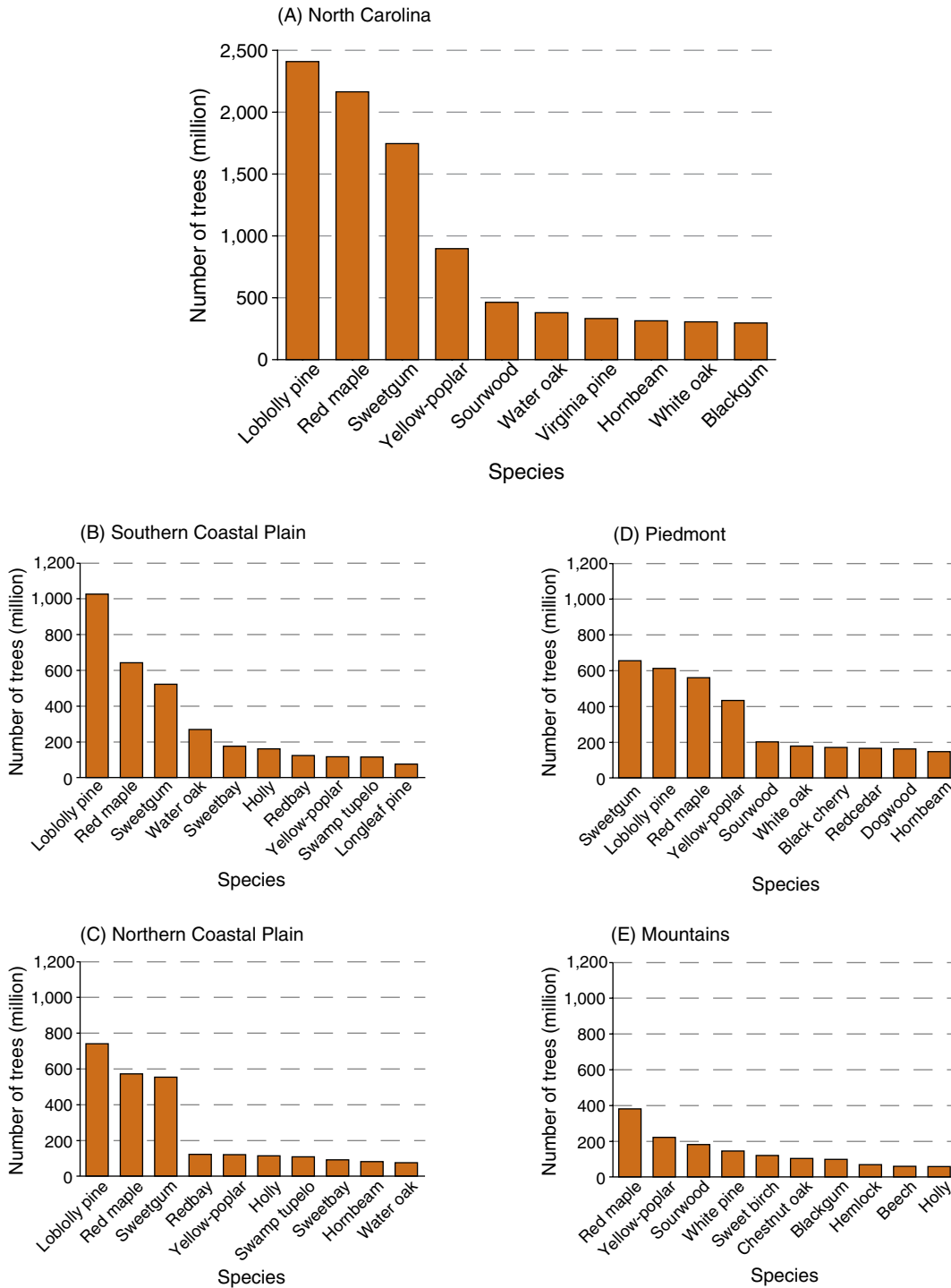
Figure 8—Top 10 species based on number of trees in (A) North Carolina and by survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2013.

tupelo were included in the top 10 only in the two Coastal Plain unit (fig. 8C) lists. Black cherry, redcedar, and dogwood were unique to the Piedmont top 10 (fig. 8D). The top 10 for the Mountains unit (fig. 8E) differed from the other units most of all. Here, white pine, sweet birch, chestnut oak, hemlock, and beech made the top 10. However, with the demise of hemlock trees (see Hemlock Attrition section below), it is virtually certain to be missing from future lists.

The top 10 trees on North Carolina timberland based on tree species volume (fig. 9A) altered the list of species order and presence from that by number of trees. These differences occurred for two primary reasons. First, it would take the volume from numerous small trees of a particular species to match the volume in one large tree of another species. Second, volume is calculated based on merchantability standards of a 1-foot stump to a 4-inch top; thus only trees ≥5.0 inches d.b.h. are included in volume calculations. Statewide, yellow-poplar, which ranked fourth in tree numbers (fig. 8A), rose to second in prominence when considered by volume (fig. 9A). In fact, by volume, the list changed for spots 5 through 10, retaining only Virginia pine and white oak.

Similar changes occurred by survey unit. In the Southern Coastal Plain unit (fig. 9B), loblolly pine, sweetgum, and swamp tupelo formed the top three by volume, with pond pine and slash pine having enough volume to make the list. In the Northern Coastal Plain (fig. 9C), loblolly pine, sweetgum, and red maple formed the top three. Here, baldcypress and green ash accounted for enough volume to make the list. In the Piedmont unit (fig. 9D), loblolly pine, yellow-poplar, and white oak accounted for the top three volume totals. Only in the Piedmont did shortleaf pine have enough volume to make the list. In the Mountains unit (fig. 9E), yellow-poplar, chestnut oak, and red maple occupied the top three spots for volume. Sweet birch, pignut hickory, and sourwood made the top 10 list as well,

but mortality of hemlock caused it to fall out of the top 10 since the 2007 survey.

The Southern Coastal Plain held 42 percent of the State's total loblolly pine volume. Together, the two Coastal Plain units had 74 percent of the loblolly pine volume in the State. The Mountains unit had almost one-half, 46 percent, of the State's yellow-poplar volume, and the Piedmont unit contained another 38 percent. Together, these two units had 84 percent of North Carolina's yellow-poplar volume. The greatest volume of red maple, 40 percent, was located in the Mountains unit, followed by 27 percent in the Piedmont unit. Forty-four percent of the sweetgum volume occurred in the Piedmont unit, 29 percent in the Southern Coastal Plain, 27 percent in the Northern Coastal Plain, and <1 percent in the Mountains unit. Other survey findings showed 59 percent of the white oak volume to be located in the Piedmont unit, 95 percent of the white pine volume in the Mountains unit, and 65 percent of the State's baldcypress volume in the Northern Coastal Plain unit.

Overall, all-live tree merchantable volume on timberland in North Carolina increased to 38.4 billion cubic feet in 2013 from 35.8 billion cubic feet in 2007. Merchantable volume is based on trees 5.0 inches d.b.h. and larger. The softwood species together accounted for 35 percent, or 13.5 billion cubic feet, of the total (fig. 10A). In combination, all the hardwood species made up 65 percent, or 24.9 billion cubic feet.

Eighty-eight percent, or 33.6 billion cubic feet, of North Carolina's total all-live merchantable volume is in species from stands of natural origin. Twelve percent, or almost 4.7 billion cubic feet, is in species from stands with evidence of artificial regeneration (planted). Softwood species accounted for 92 percent, or <4.4 billion cubic feet, of the State's planted volume (fig. 10A). The distribution of this planted volume differed by survey unit within the State. Together, the two Coastal Plain units accounted for 70 percent, or 3.3 billion cubic feet, of the State's planted volume.
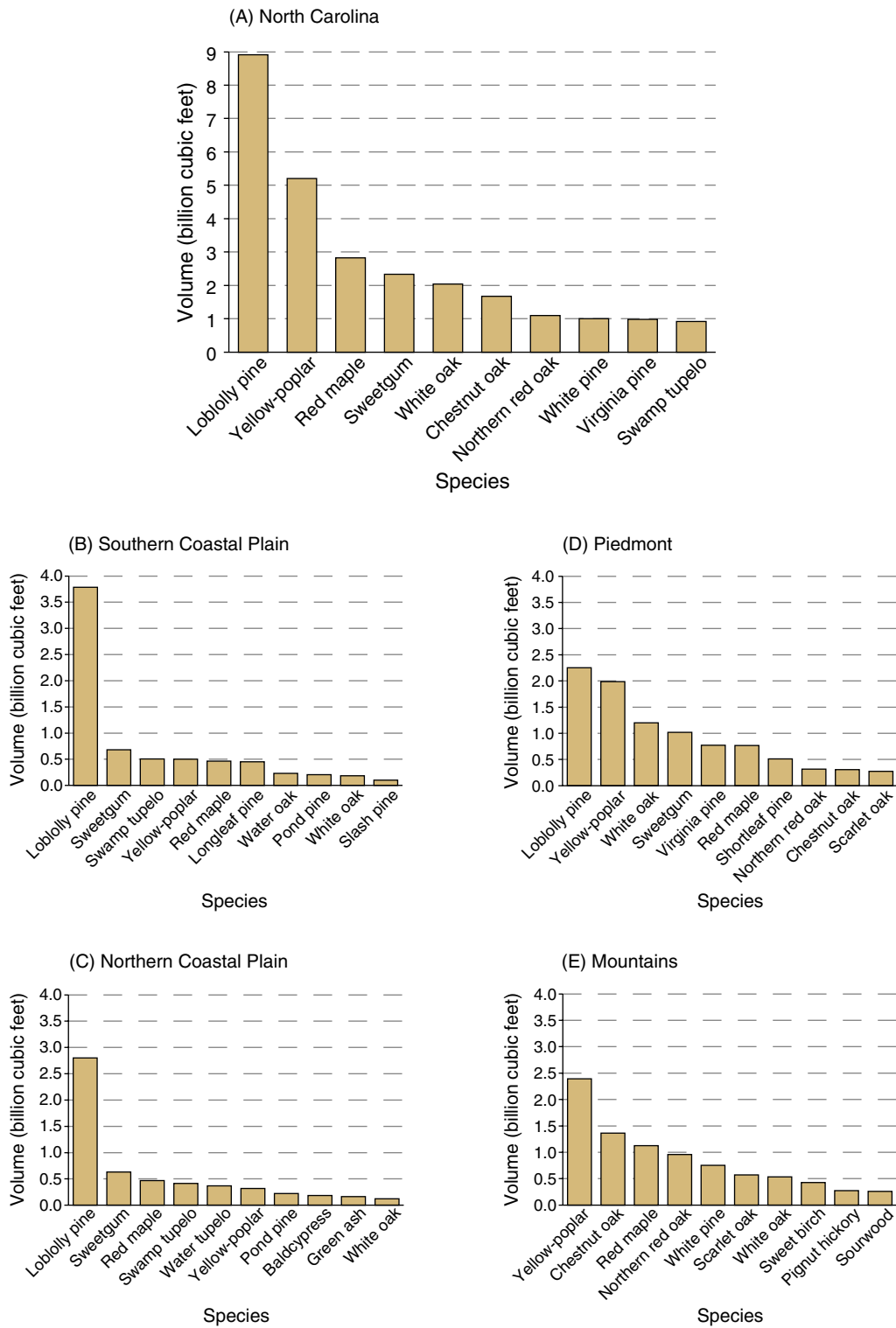
Figure 9—Top 10 species based on volume of trees in (A) North Carolina and by survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2013.
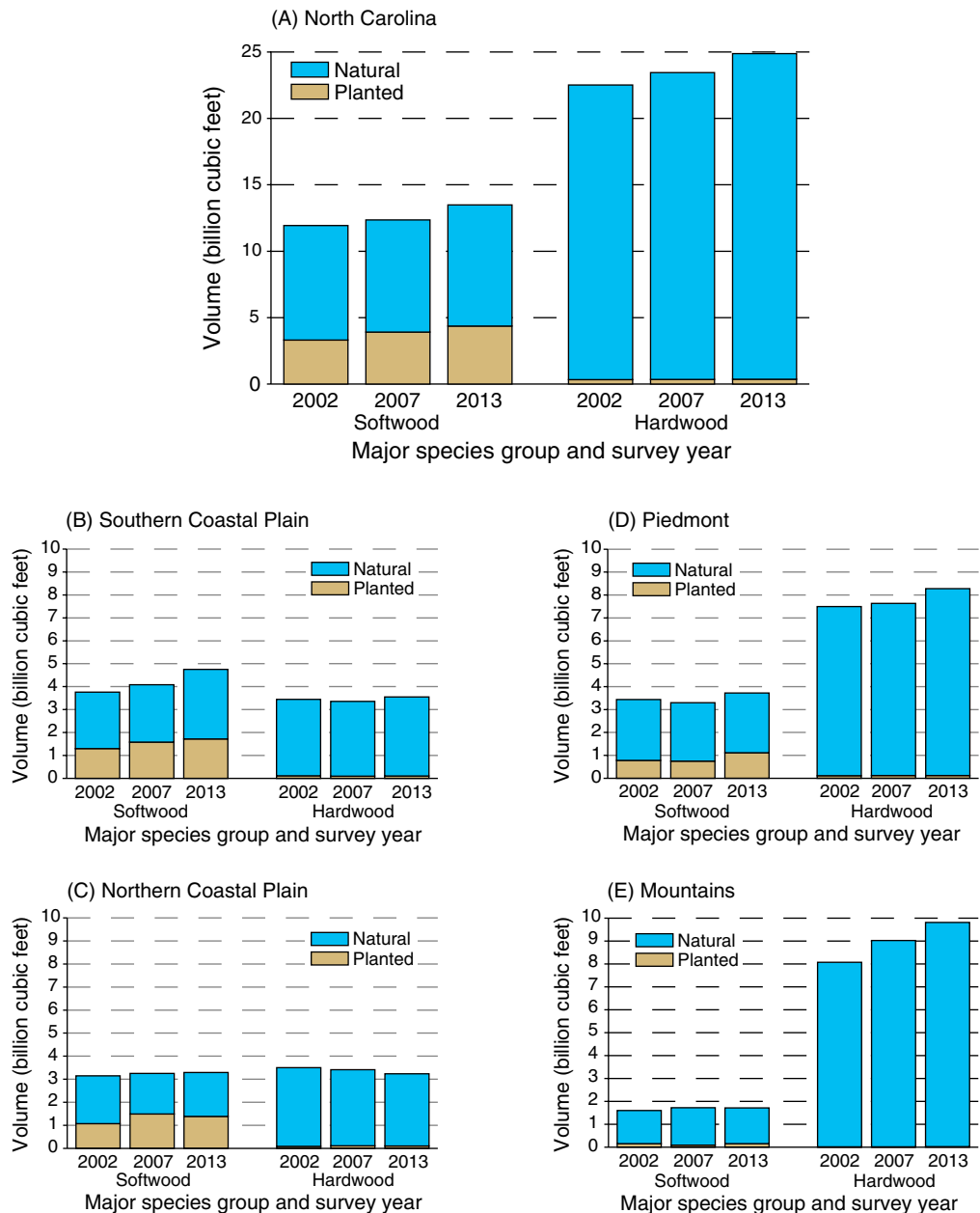
Figure 10—All-live merchantable volume in (A) North Carolina by major species group, survey year, stand origin, and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2002 and 2007 from Brown and others (2014).

The Southern Coastal Plain accounted for 1.8 billion cubic feet of the planted volume (fig. 10B) and the Northern Coastal Plain accounted for 1.5 billion cubic feet (fig. 10C). The Piedmont unit accounted for 26 percent, or >1.2 billion cubic feet, of the State's planted volume (fig. 10D). The Mountains unit accounted for <4 percent,

or <0.2 billion cubic feet, of the State's planted volume (fig. 10E). Softwood species made up a slightly higher percentage of the planted volume in the Southern and Northern Coastal Plain units, 94 and 93 percent, respectively, versus 90 percent in the Piedmont unit and 85 percent in the Mountains unit.

The distribution of the State's all-live merchantable volume differed by diameter class between the species groups. At the State level, most of the softwood species volume was found in the 8- to 14-inch diameter classes (fig. 11A). The softwood volume peaked in the 10- to 12-inch d.b.h. classes. In 2013, the volume of softwood in the 6- through 18-inch diameter classes was up from that reported in 2007. In the Southern Coastal Plain unit (fig. 11B), softwood volume distribution by diameter

class reflected that at the State level, primarily because it contained more of the softwood volume than did any of the other units. In the Northern Coastal Plain unit (fig. 11C), softwood volume peaked in the 10- to 12-inch diameters as well. Softwood increased in the 6- through 10-inch diameter classes, but to a lesser amount than it did in the Southern Coastal Plain. However, the 12- and ≥18-inch diameter classes decreased from the volumes reported in 2007. In the Piedmont unit (fig. 11D),
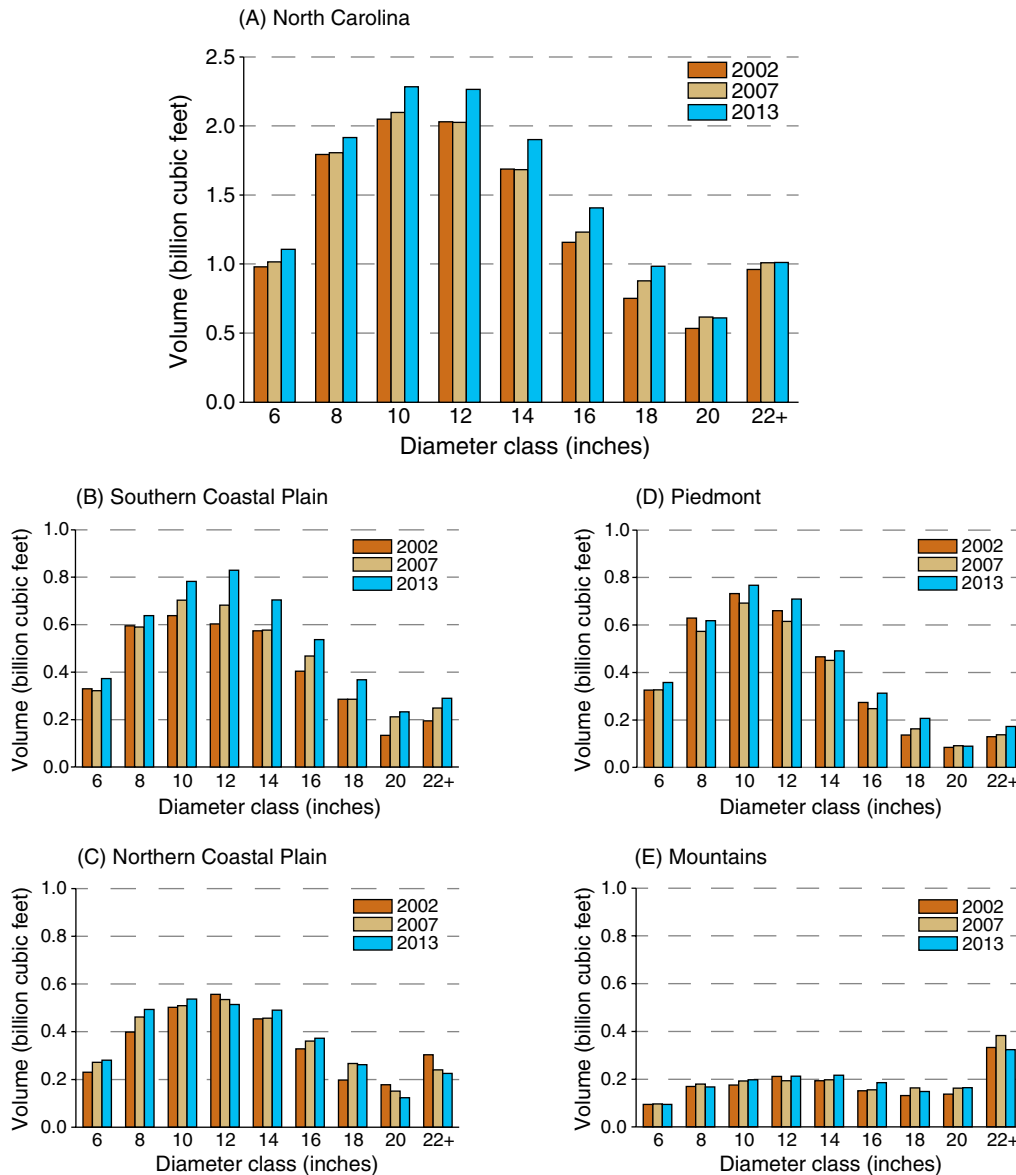
Figure 11—All-live merchantable softwood volume on timberland in (A) North Carolina by diameter class, survey year, and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2002 and 2007 from Brown and others (2014).

softwood volume also peaked in the 10- to 12-inch diameters. Softwood volume was up in the 6- through 18-inch diameter classes from that reported in 2007. In the Mountains unit (fig. 11E), in contrast to the other survey units, softwood volume was more evenly distributed among all the diameter classes. Although the greatest volume occurred in the 22+ inches class, this is misleading due to its combination of multiple diameter classes. A slight increase extended from the 10- through 16-inch diameter classes with a shallow peak in the 12- to 14-inch classes.

Volume of hardwood species at the State level was distributed more widely across the range of diameter classes (fig. 12A)

than softwoods. While the highest volume occurred in the summation of all diameter classes 22+ inches, hardwood volume overall peaked across the 12- to 16-inch diameter classes, with most of the volume spread across the 8- to 18-inch diameter classes. In 2013, hardwood volume had increased somewhat in all diameter classes from that reported in 2007. However, more of the increase occurred in the 16-inch and larger diameter classes. The changes in hardwood volume by diameter class differed by survey unit. In the Southern Coastal Plain unit (fig. 12B), volume of hardwood changed little, with the exception of some increases in the larger diameters. Although hardly noticeable, it peaked in the 10-inch diameter class. In the

Vista within the Great Smoky Mountains National Park.
(photo courtesy of Wikimedia.org)
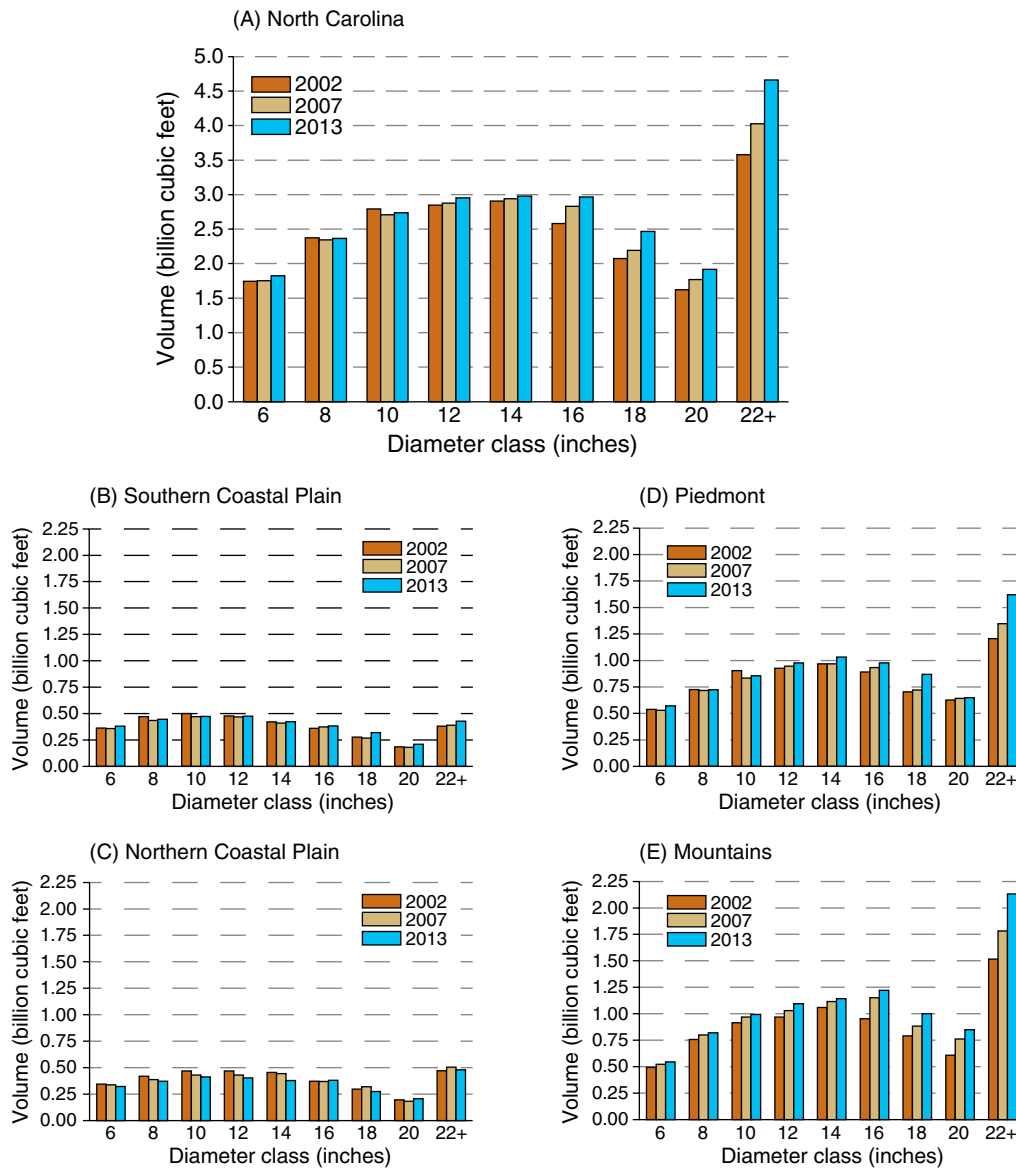
Figure 12—All-live merchantable hardwood volume on timberland in (A) North Carolina by diameter class, survey year, and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2002 and 2007 from Brown and others (2014).

remainder of the units, volume was highest in the summation of all diameter classes 22+ inches. In the Northern Coastal Plain unit (fig. 12C), hardwood volume declined in all but the 16- and 20-inch diameter classes since 2007, with a slight peak noted in the 10-inch diameter class. The Piedmont unit (fig. 12D) most resembled State-level hardwood volume changes by

diameter class. In the Piedmont, hardwood volume was up somewhat in all diameter classes and increased most in those classes 14 inches and larger. Hardwood volume in the Piedmont peaked in the 14-inch diameter class. In the Mountains unit (fig. 12E), hardwood volume increased across all diameter classes and peaked in the 16-inch diameter class.

Timberland Statistics: Net Change Components

A main purpose of the forest inventory is to determine resource change and direction, if any. The components of change revolve around measurements of gross growth, mortality, and removal volumes calculated in terms of average annual rates based on the remeasurement period involved. The relationship is such that gross growth is diminished by mortality, creating net growth. Measured removals then detract from net growth, resulting in net change in the inventory.

As noted and cautioned in the 2007 report, growth figures identified for the Mountains unit were high. A convincing explanation has yet to be determined. Possible explanations range from changes in harvest rates to impacts from insects to the unit's softwood resource. However, unusually high growth figures reported for the Mountains unit in 2007 have subsided somewhat in 2013. The results showed softwood growth more comparable to previous surveys, although hardwood growth remained high.

Statewide, for all species combined, net growth averaged 1,584 million cubic feet annually, and removals averaged 922 million cubic feet annually. Planted stands provided 25 percent, or 390 million cubic feet, of the State's total net growth. Planted stands also supplied 31 percent, or 289 million cubic feet, of total removals in the State.

The average annual components of change for softwood volume in North Carolina are shown in figure 13A. Statewide in 2013, softwood average annual net growth of 796 million cubic feet exceeded softwood average annual removals of 550 million cubic feet. The difference between these two components yielded a positive average annual net change of 246 million cubic feet for the State's softwood resource.

To put the State-level net change impact in perspective, figure 14A shows the growth and removals dynamics for softwoods compared to total inventory volume of softwoods. For the period ending in 2013, softwood net growth averaged 5.9 percent of total inventory volume and removals averaged 4.1 percent. The positive net change of 246 million cubic feet of softwood averaged 1.8 percent of total softwood inventory.

Seventy percent of the State's softwood removals came from the two Coastal Plain units. However, in the Southern Coastal Plain (fig. 13B), average annual softwood net growth of 318 million cubic feet exceeded average annual softwood removals of 189 million cubic feet by a wide margin and resulted in a positive average annual softwood net change of 129 million cubic feet. For the period ending in 2013, the Southern Coastal Plain's softwood net growth averaged 6.7 percent of its total softwood inventory volume and removals averaged 4.0 percent (fig. 14B). The net change of 129 million cubic feet averaged 2.7 percent of total softwood inventory.

In the Northern Coastal Plain (fig. 13C), average annual softwood net growth of 237 million cubic feet exceeded average annual softwood removals of 198 million cubic feet and resulted in a positive average annual softwood net change of 39 million cubic feet. For the period ending in 2013, the Northern Coastal Plain's softwood net growth averaged 7.2 percent of its total softwood inventory volume and removals averaged 6.0 percent (fig. 14C). The net change of 39 million cubic feet averaged 1.2 percent of total softwood inventory.

In the Piedmont (fig. 13D), the softwood situation reversed from previous findings. In the Piedmont, average annual softwood net growth of 197 million cubic feet exceeded average annual softwood removals of 127 million cubic feet and
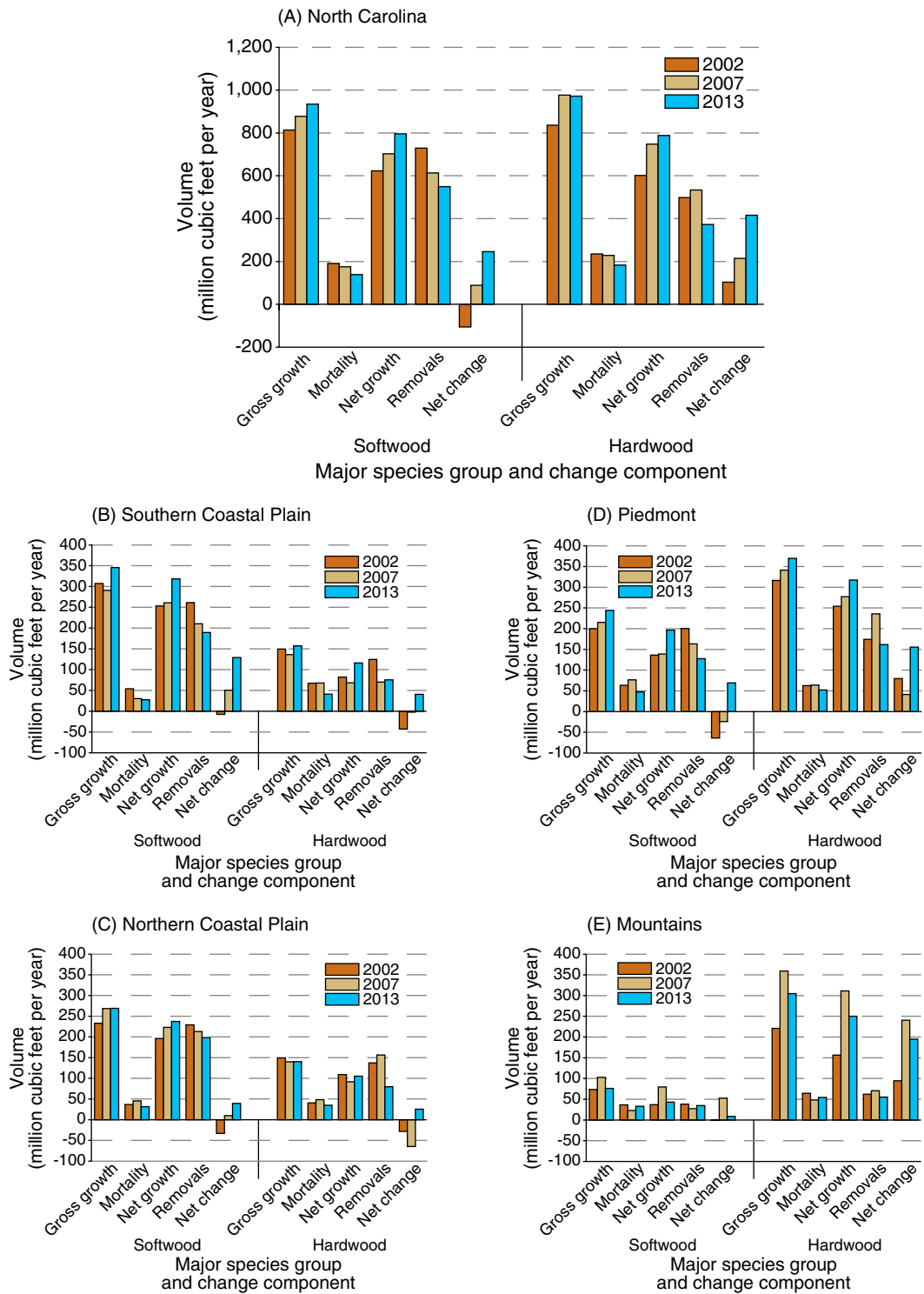
Figure 13—Net change components for all-live volume in (A) North Carolina by major species group, change component, survey year, and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2002 and 2007 from Brown and others (2014).

resulted in a positive average annual softwood net change of 70 million cubic feet. For the period ending in 2013, the Piedmont's softwood net growth averaged 5.3 percent of total softwood inventory volume and removals averaged 3.4 percent

(fig. 14D). The net change of 70 million cubic feet averaged 1.9 percent of total softwood inventory.

In the Mountains (fig. 13E), where the softwood component is the lowest of all units in the State, average annual softwood net
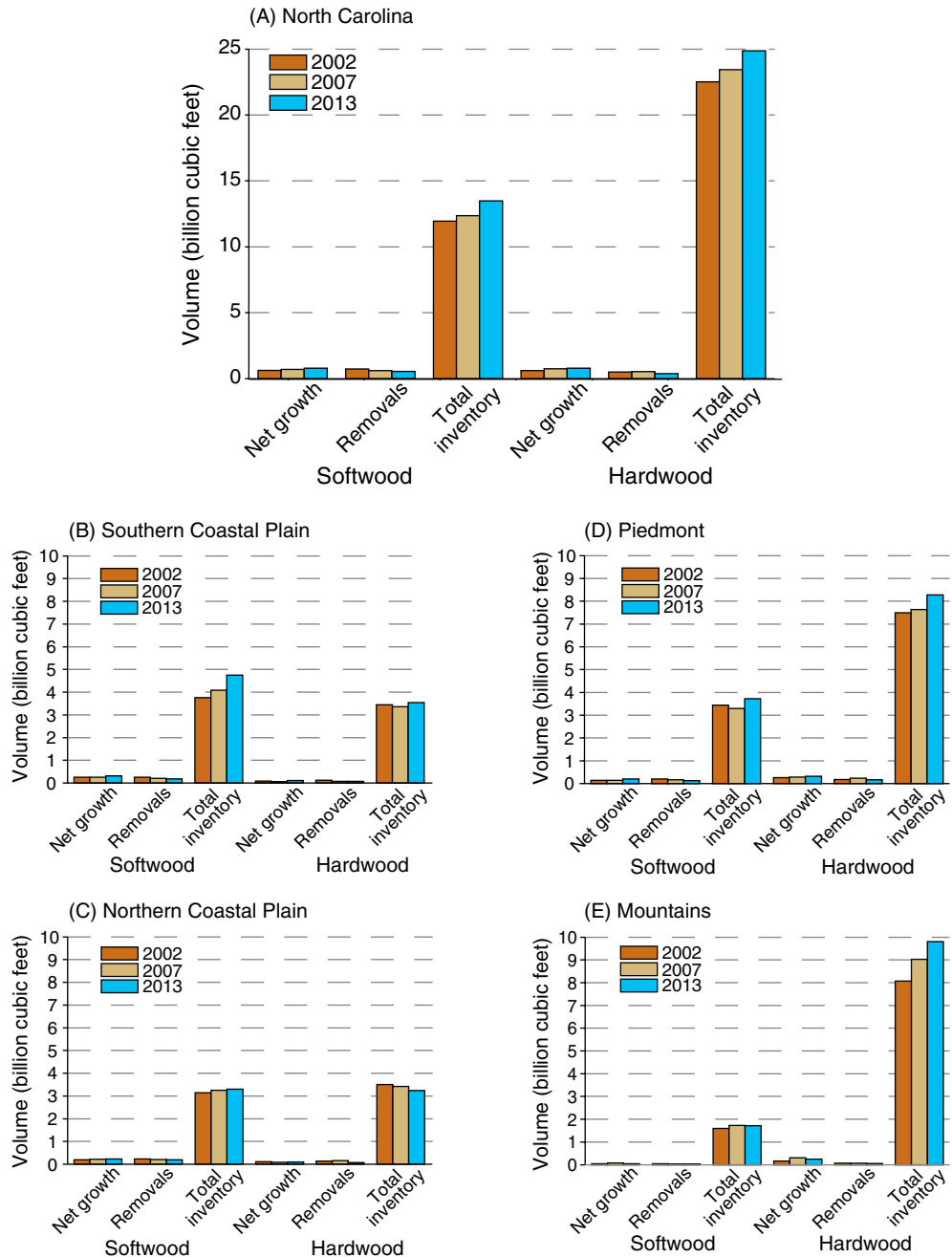
Figure 14—Comparison of net growth and removals to total inventory volume for softwood and hardwood in (A) North Carolina by survey year and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2002 and 2007 from Brown and others (2014).

growth of 43 million cubic feet exceeded average annual softwood removals of 35 million cubic feet. This resulted in a positive average annual softwood net change of 8 million cubic feet. For the period ending in 2013, the Mountains unit's softwood net growth averaged 2.5 percent of total softwood inventory volume and removals averaged 2.0 percent (fig. 14E). The net change of positive 8 million cubic feet averaged 0.5 percent of total softwood inventory.

The average annual components of change for hardwood volume in North Carolina are shown in figure 13A. Statewide in 2013, hardwood average annual net growth of 788 million cubic feet exceeded hardwood average annual removals of 372 million cubic feet. The difference between these two components yielded a large positive average annual net change of 416 million cubic feet for the State's hardwood resource.

To put the State-level net change impact in perspective, figure 14A shows the growth and removals dynamics for hardwoods compared to total inventory volume of hardwoods. For the period ending in 2013, hardwood net growth averaged 3.2 percent of total inventory volume and removals averaged 1.5 percent. The positive 416 million cubic feet of hardwood net change averaged 1.7 percent of total hardwood inventory.

In the Southern Coastal Plain (fig. 13B), average annual hardwood net growth of 116 million cubic feet exceeded average annual hardwood removals of 75 million cubic feet and resulted in a positive average annual hardwood net change of 41 million cubic feet. For the period ending in 2013, the Southern Coastal Plain's hardwood net growth averaged 3.3 percent of total hardwood inventory volume and removals averaged 2.1 percent (fig. 14B). The net change of 41 million cubic feet averaged 1.2 percent of total hardwood inventory.

In the Northern Coastal Plain (fig. 13C), average annual hardwood net growth of 105 million cubic feet exceeded average annual hardwood removals of 80 million cubic feet, resulting in a positive average annual hardwood net change of 25 million cubic feet. For the period ending in 2013, the Northern Coastal Plain's hardwood net growth averaged 3.2 percent of total hardwood inventory volume and removals averaged 2.5 percent (fig. 14C). The net change of 25 million cubic feet averaged >0.7 percent of total hardwood inventory.

The Piedmont unit accounted for 43 percent of the State's hardwood removals, more than any other unit. In the Piedmont (fig. 13D), average annual hardwood net growth of 317 million cubic feet exceeded average annual hardwood removals of 162 million cubic feet and resulted in a positive average annual hardwood net change of 155 million cubic feet. For the period ending in 2013, the Piedmont's hardwood net growth averaged 3.8 percent of total hardwood inventory volume and removals averaged 2.0 percent (fig. 14D). The net change of 155 million cubic feet averaged >1.8 percent of total hardwood inventory.

In the Mountains (fig. 13E), where the hardwood component is the highest of all units in the State, average annual hardwood net growth of 250 million cubic feet exceeded average annual hardwood removals of 55 million cubic feet. This resulted in a positive average annual hardwood net change of 195 million cubic feet. For the period ending in 2013, the Mountains unit's hardwood net growth averaged 2.6 percent of total hardwood inventory volume and removals averaged 0.6 percent (fig. 14E). The net change of positive 195 million cubic feet averaged 2.0 percent of total hardwood inventory.

Timberland Statistics: Forest Health

FIA collected several variables during sample plot measurement that can be used or interpreted to assess forest health in North Carolina. Some of these variables are degree of tree mortality, number of standing dead trees and identifiable causes of death, amount of down woody material (DWM) present, and the invasion of nonnative plants. The DWM data were collected for the 2010 survey year, but were reprocessed after algorithm corrections that produced minor adjustments for 2013. The nonnative plants data were collected under guidance from two versions of the FIA field manual, with some additional species of interest added to the latest version of the manual.

Tree Mortality

In 2013, average annual mortality volume of all-live trees ≥5 inches d.b.h. on North Carolina's timberland totaled 322 million cubic feet, down from 404 million cubic feet in 2007. Softwood species accounted for 139 million cubic feet, or 43 percent, compared to 175 million cubic feet in 2007. Hardwood species accounted for 183 million cubic feet, or 57 percent, compared to 228 million cubic feet in 2007. A nominal amount was attributed to trees not measured. Statewide, for all species combined, mortality peaked in the 61- to 80-year age class (fig. 15A), where 31 percent of total mortality occurred. For softwood species, mortality peaked in the 41- to 60-year age class, where 29 percent of the total softwood mortality occurred. For hardwood species, mortality peaked in the 61- to 80-year age class, where 36 percent of the total hardwood mortality occurred.

The Southern Coastal Plain contained 21 percent of the State's total mortality of all species, 20 percent of the State's

softwood mortality, and 22 percent of the State's hardwood mortality. In the Southern Coastal Plain (fig. 15B), softwood mortality peaked in the 21- to 40-year age class and was relatively low beyond the 41- to 60-year age class. The Southern Coastal Plain's hardwood mortality peaked in the 61- to 80-year age class.

The Northern Coastal Plain contained 21 percent of the State's total mortality of all species, 23 percent of the State's softwood mortality, and 19 percent of the State's hardwood mortality (lowest of all the units). Softwood mortality in the Northern Coastal Plain (fig. 15C) peaked in the 21- to 40-year age class as well, but continued to be relatively high through the 61- to 80-year age class. The Northern Coastal Plain's hardwood mortality also peaked in the 61- to 80-year age class.

The Piedmont unit contained the highest percentage of the State's total mortality of all species with 31 percent. The Piedmont also had the highest percentage of the State's total softwood mortality with 34 percent. Softwood mortality in the Piedmont (fig. 15D) peaked in the 41- to 60-year age class. The second highest percentage of the State's hardwood mortality, 29 percent, occurred in the Piedmont unit as well. Hardwood mortality in the Piedmont peaked in the 61- to 80-year age class.

The Mountains unit (fig. 15E) contained 27 percent of the State's total mortality of all species, 24 percent of the State's softwood mortality, and 30 percent of the State's hardwood mortality. In the Mountains unit, softwood mortality peaked in the 61- to 80-year age class and in the sum of all those classes 100+ years old, the oldest peak of softwood mortality of the four survey units. Hardwood mortality in the Mountains unit peaked in the 61- to 80-year age class as well.
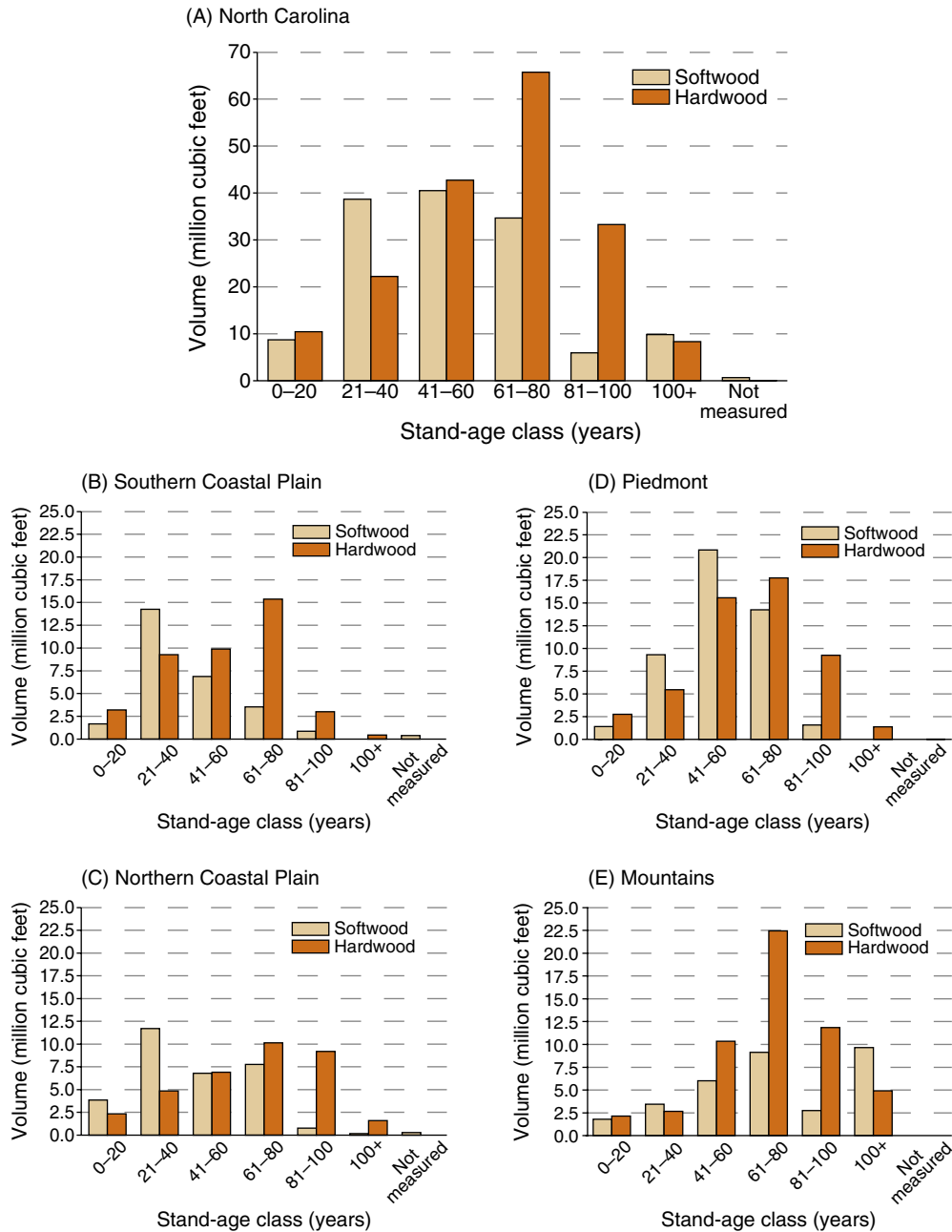
Figure 15—Average annual mortality of trees in (A) North Carolina by stand-age class, major species group, and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2013.

Standing Dead Trees

The number of standing dead trees by cause of death across the State provides a gauge to the health of North Carolina's timberland. Figure 16A shows the number of standing dead trees, 171 million trees ≥5 inches d.b.h., present on timberland in 2013 and lists major agents involved. Almost 41 percent of the standing dead trees were snags measured in prior surveys for which cause of death was attributed at that time. To ascertain current impacts, only data for new snags are broken out by cause of death. Statewide in 2013, for all species combined, the leading identifiable causes of death in descending order of prevalence were vegetation, disease, insects, weather, and fire. However, the order differed between softwoods and hardwoods.

For softwood species, insects were the leading identifiable cause of death state-wide (fig. 16A), with the order changing to insects, vegetation, disease, weather, and fire. For hardwood species, disease was the leading identifiable cause of death

Statewide, with the order changing to disease, vegetation, weather, fire, and animals. The order of the impact for these leading identifiable causes of death further differed among the four survey units of the State.

In the Southern Coastal Plain (fig. 16B), vegetation was the leading identifiable cause of death for softwoods, and insects were second. For hardwoods in the Southern Coastal Plain, disease was the leading identifiable cause of death, and vegetation was second.

In the Northern Coastal Plain (fig. 16C), vegetation was the leading identifiable cause of death for softwoods, and insects were second. For hardwoods in the Northern Coastal Plain, vegetation was the leading identifiable cause of death, and weather was second.

In the Piedmont unit (fig. 16D), vegetation was the leading identifiable cause of death for softwoods, and insects were second. The Piedmont accounted for nearly 42 percent of the State's total softwood trees lost to vegetation. Disease was third, and about 44 percent of the State's total softwood trees identified as having died from disease came from the Piedmont unit. For hardwoods in the Piedmont, disease was the leading identifiable cause of death, and vegetation was second. Vegetation in the Piedmont accounted for 37 percent of the State's total hardwood trees lost to disease.

In the Mountains unit (fig. 16E), insects were the leading identifiable cause of death for softwoods, and vegetation was second. The Mountains unit accounted for 35 percent of the State's total softwood trees lost to insects. The Mountains portion of State-total softwood trees lost to insects was notable for a unit dominated by hardwoods. For hardwoods in the Mountains unit, disease was the leading identifiable cause of death, and vegetation was second. The Mountains unit accounted for 38 percent of the State's total hardwood trees lost to disease.

Weather damage to trees located in a coastal plain swamp. (photo courtesy of Wikimedia.org)
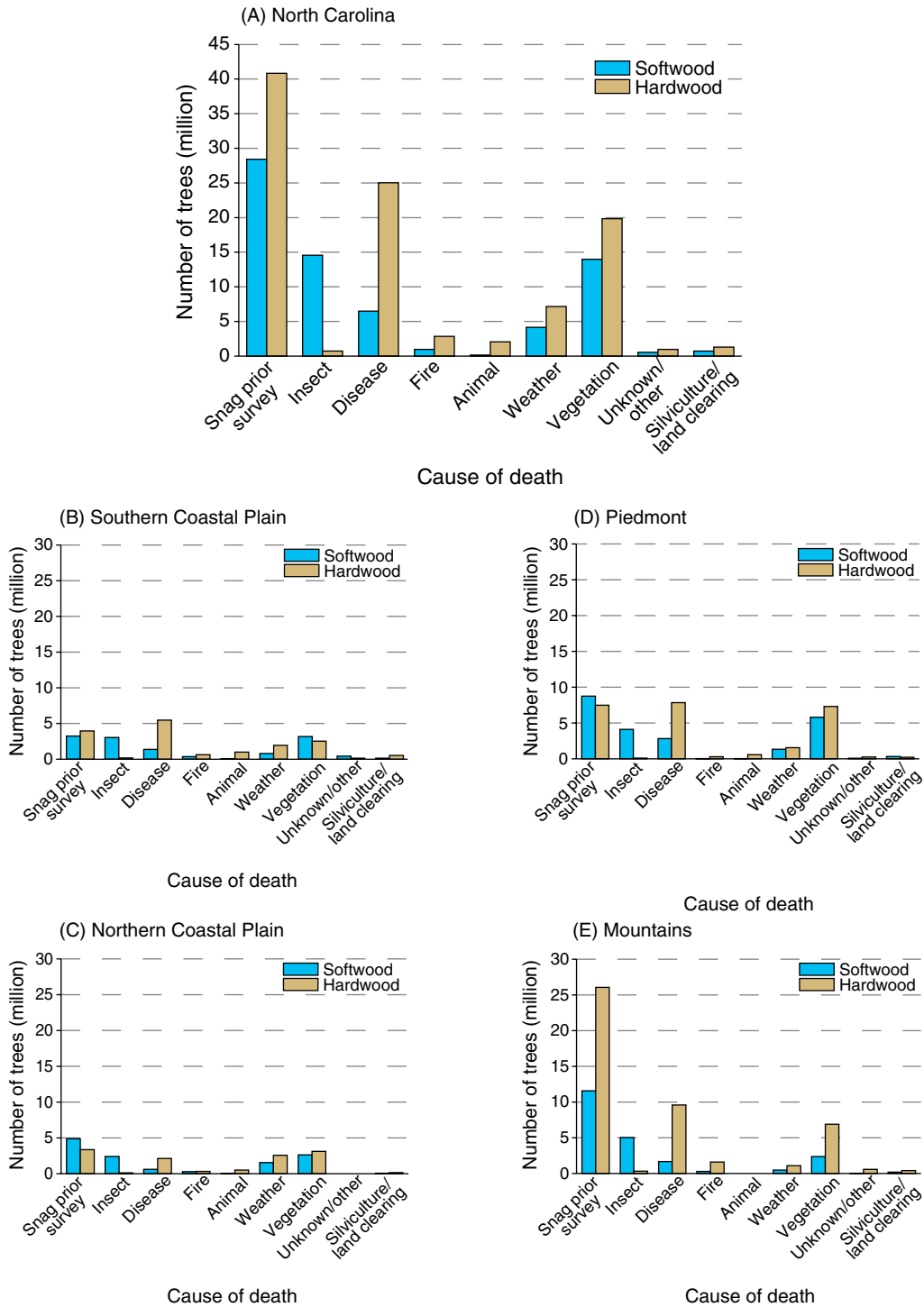
Figure 16—Number of standing dead trees ≥5 inches d.b.h. on timberland in (A) North Carolina by cause of death, broad species group, and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2013.

Hemlock Attrition

The hemlock woolly adelgid (*Adelges tsugae*; HWA), an invasive insect pest, threatens Carolina hemlock (*Tsuga caroliniana*) and eastern hemlock (*Tsuga canadensis*) throughout their range in the United States. A native of eastern Asia, HWA was first detected in Virginia in the early 1950s and currently infests an area from north Georgia to southeastern Maine. The entire range of *Tsuga* spp. in North Carolina was infested by summer 2010 (North Carolina Forest Service 2010). The adelgid is a phloem feeder, desiccating young shoots, causing needle drop, and preventing new growth. Feeding activity and subsequent damage weakens and kills trees within 3 to 6 years in the southern range of hemlock, either alone or in combination with other biotic and abiotic stressors. For a review of HWA establishment, biology and control, see Havill and others (2014) and references therein.

Hemlocks are a major component of western North Carolina forests. They are shade tolerant, common in cool coves as well as north-facing slopes and rock out-crops. They provide shaded habitat that is favorable to many native amphibians, fish, and invertebrates. They provide critical nesting sites for many bird species. Their aesthetic value is significant, yet impossible to quantify. The potential loss of hemlocks throughout their range has been likened to the loss of the American chestnut in the last century. Unfortunately, there is no other tree species that can adequately fill the functional niche of hemlock.

The HWA is a relatively recent newcomer to North Carolina, first collected in the mid-1990s and only recently (2007) detected in all of the mountainous counties. Also in 2007, widespread mortality became apparent in some of the previously infested counties. Based on all forest land (including reserved forest such as in the Great Smoky Mountains National Park), hemlock

Eastern hemlock (*Tsuga canadensis*) mortality caused by hemlock woolly adelgid in the Great Smoky Mountains National Park. (photo by Ignazio Graziosi, University of Kentucky, Bugwood.org)

data for North Carolina reveal an overall downward trend between 2007 and 2013 in western North Carolina (FIA Mountains unit). The net volume of hemlock decreased 27 percent from 362 million cubic feet in 2007 to approximately 264 million cubic feet in 2013. Individual FIA plot data through 2013 indicate continued growth in some stands but dramatic losses in others, likely due to more localized effects in areas where HWA has been present longer. The FIA data are inherently "backward looking;" thus, while the expected dramatic decline in hemlock volume will be captured and described by the FIA program, those changes will not be reflected in real time.

FIA conducted a simple analysis using standing volume for live and dead trees (cubic feet per acre) estimated using individual remeasured plots in the Mountains unit of North Carolina. The analysis took into account volume changes (live and standing dead) between the FIA annual inventory panel of interest (2007–13) and most recent prior visit (range 2–13 years; average 6–7 years). Data were annualized by dividing by the number of years since the prior visit. Decreases in standing dead volume were uncommon and were ignored,

as FIA was interested in recent mortality. These data indicate negative trends in live volume beginning around 2010, which followed increases in standing dead volume beginning around 2009 (fig. 17). FIA estimates these negative trends will continue for some time until the annual inventory panels capture the full change from the impact of the HWA.

Down Woody Material

The total amount of down woody material (DWM), both coarse and fine, accumulating on the forest floor can have implications for forest health. This debris, whether caused by damage agents such as weather, disease, or human activity, or even by stand senescence, can provide fuels for future fire events. Some determination of the amounts and locations of its occurrence can be a desirable byproduct of forest survey measurements. FIA collected DWM information in cubic feet on forest land for 2010. These data have been reprocessed due to algorithm corrections, resulting in minor adjustments for 2013 that are included in this report for additional perspective on the condition and health of North Carolina's forests.
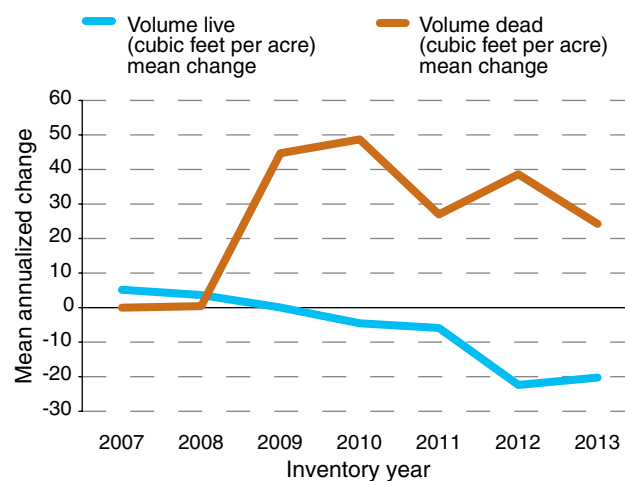
Figure 17—Mean annualized change in live and standing dead hemlock volume (cubic feet per acre) on forest land in the Mountains unit of North Carolina, 2007 to 2013.

In 2013, FIA forest survey measurements estimated nearly 10.5 billion cubic feet of DWM existed on North Carolina's 18.6 million acres of forest land. Statewide, DWM averaged 565 cubic feet per acre of forest land. This average varied by survey unit from a low of 375 cubic feet per acre in the Southern Coastal Plain, 586 cubic feet per acre in the Northern Coastal Plain, and 454 cubic feet per acre in the Piedmont, to a high of 907 cubic feet per acre in the Mountains unit.

The Southern Coastal Plain accounted for nearly 18 percent, or >1.9 billion cubic feet, of the State's total DWM. The Northern Coastal Plain accounted for 22 percent, or <2.3 billion cubic feet, and the Piedmont accounted for 23 percent, or >2.4 billion cubic feet. The Mountains unit accounted for the most, with 3.9 billion cubic feet, or 37 percent of the State's total DWM.

The physical geography of timberland plays a role in DWM occurrence. FIA classifies the terrain of all plot areas by physiographic class (U.S. Department of Agriculture Forest Service 2007a). Land form, topographic position, and soil generally determine physiographic class. Based on these classes, more of the State's DWM was located on rolling uplands than on any other physiographic class (fig. 18A). Statewide, rolling uplands accounted for 32 percent of the total DWM. Moist slopes and coves were second, accounting for 18 percent. Flatwoods were third with 16 percent of the State's total DWM.

The survey units generally subdivided the State based on approximate physiographic regions, so differences in DWM location by survey unit were evident. In the Southern Coastal Plain (fig. 18B), most of the unit's DWM was located in the flatwoods physiographic class. Flatwoods accounted for 46 percent of the unit's DWM. The second highest portion, 23 percent, of the unit's DWM was located in the narrow floodplains/bottomlands physiographic class.

In the Northern Coastal Plain (fig. 18C), more of the unit's DWM was also located in the flatwoods physiographic class than any other. Flatwoods accounted for 33 percent of the unit's DWM. The rolling uplands physiographic class was second with 18 percent of the unit's DWM. The bays and wet pocosins physiographic class was third, accounting for 17 percent.

In the Piedmont unit (fig. 18D), nearly all of the unit's DWM was located in one physiographic class. Here, the rolling uplands class accounted for 83 percent of the unit's DWM.

In the Mountains unit (fig. 18E), most of the unit's DWM was located in the moist slopes and coves physiographic class. Moist slopes and coves accounted for 45 percent of the unit's DWM. The dry slopes physiographic class was second with 26 percent of the unit's DWM.
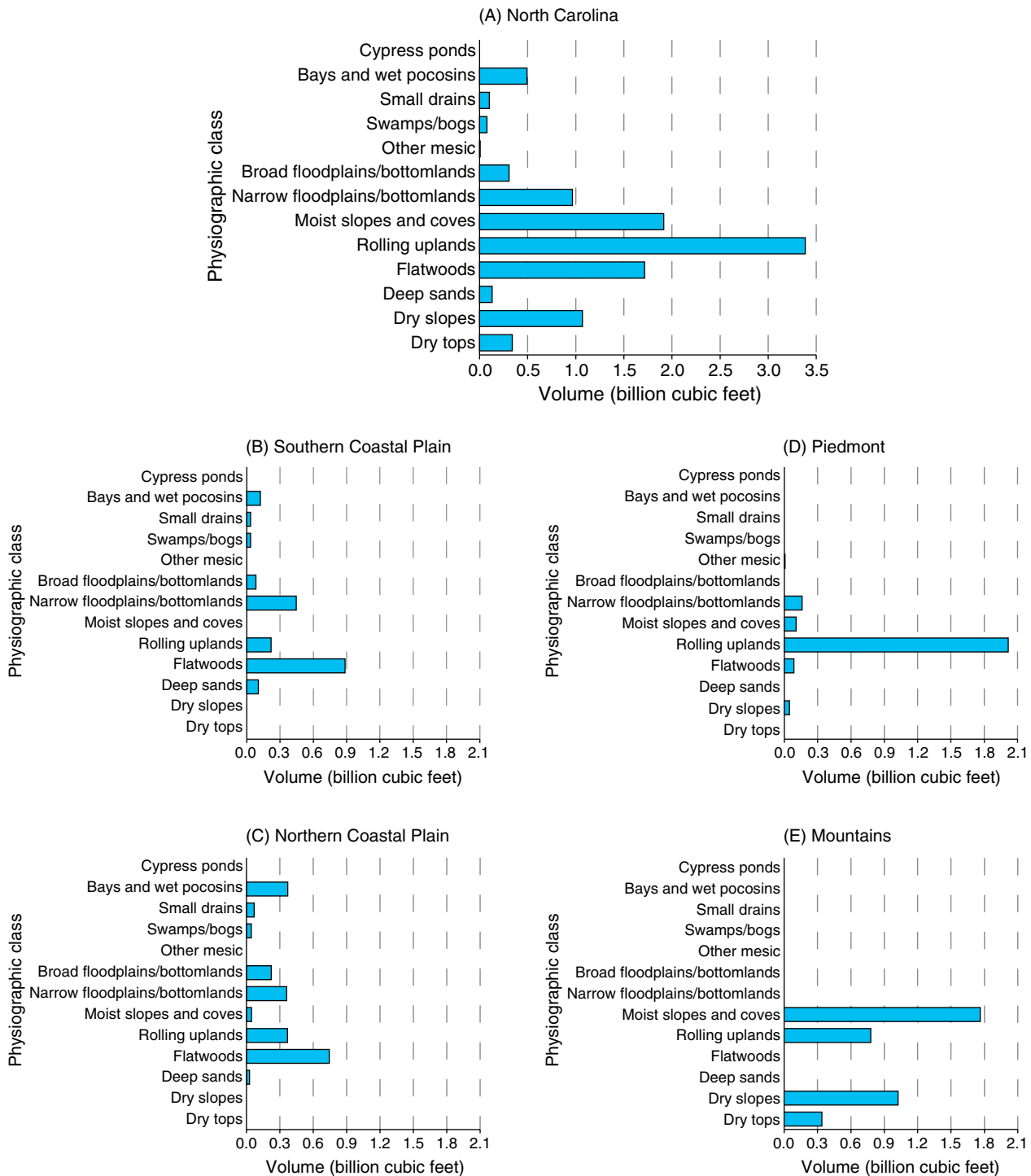
Figure 18—Volume of down woody material on forest land in (A) North Carolina by physiographic class and survey unit (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2010 (revised).

Nonnative Invasive Plants

Many nonnative invasive plants have been recognized as problematic because they compete with or even threaten to displace native species. Thus, it is important to assess their occurrence to gauge their potential impact. Table 2 lists by frequency those invasive species of trees, shrubs, vines, grasses, and herbs encountered on FIA survey plots in North Carolina in 2013. The list includes two samples due to a switch from FIA field manual version 4.0

guidelines (U.S. Department of Agriculture Forest Service 2007a) to field manual version 6.0 guidelines (U.S. Department of Agriculture Forest Service 2012) between the 2007 and 2013 survey cycles. Basically, field manual 6.0 identifies additional species as nonnative invasives.

The most frequently encountered invasive tree was tree-of-heaven, which was encountered on 142 plots. The mimosa tree was second in occurrence, encountered on 44 plots. Third was royal paulownia, which was encountered on 29 plots. The Piedmont unit individually accounted for 64 percent of the invasive tree encounters in the State. Overall, invasive trees were found on 7 percent of all forested plots in North Carolina in 2013.

The most frequently encountered invasive shrubs were the Chinese/European privets, which were encountered on 909 plots. As a group, the nonnative roses were second in occurrence for the shrubs, encountered on 424 plots. Autumn olive was the third most frequent of the shrubs, encountered on 64 plots across the State. Overall, invasive shrubs were found on 40 percent of all forested plots in North Carolina in 2013.

The most frequently encountered invasive vine was Japanese honeysuckle, which was also the most frequently encountered invasive life form altogether. Japanese honeysuckle was encountered on 1,593 plots. Overall, invasive vines were found on 47 percent of all forested plots in North Carolina in 2013.

The most frequently encountered invasive grass was Nepalese browntop, which was encountered on 476 plots. Tall fescue was second, encountered on 162 plots across the State. Overall, invasive grasses were found on 18 percent of all forested plots in North Carolina in 2013.

The most frequently encountered herb/forb was Chinese lespedeza, which was encountered on 210 plots. Overall, invasive herbs/forbs were found on 8 percent of all forested plots in the State in 2013.

Chinese privet (*Ligustrum sinense*) is one of the invasive shrubs in North Carolina. (photo courtesy of James H. Miller and Ted Bodner, Southern Weed Science Society, Bugwood.org)

Table 2—Regionally recognized nonnative invasive plants identified on forest survey plots by common name, scientific name, and number of plots, North Carolina, 2013

		Plots	
Common name	Scientific name	4.0[a]	6.0[b]
		number	
Trees			
Tree-of-heaven	*Ailanthus altissima*	121	21
Mimosa, silktree	*Albizia julibrissin*	37	7
Royal paulownia, princesstree	*Paulownia tomentosa*	21	8
Chinaberry	*Melia azederach*	12	2
Russian olive	*Elaeagnus angustifolia*	8	8
Tallowtree	*Triadica sebifera, Sapium sebiferum*	1	0
Callery pear	*Pyrus calleryana*	N/A	6
Hardy orange	*Poncirus trifoliata*	N/A	3
Shrubs			
Chinese/European privet	*Ligustrum sinense/L. vulgare*	777	132
Nonnative roses	*Rosa* spp.	361	63
Japanese/glossy privet	*Ligustrum japonicum/L. lucidum*	24	7
Autumn olive	*Elaeagnus umbellate*	64	0
Bush honeysuckle	*Lonicera* spp.	27	0
Nandina, sacred bamboo	*Nandina domestica*	13	3
Silverthorn	*Elaeagnus pungens*	10	0
Winged burning bush	*Euonymus alata*	2	0
Vines			
Japanese honeysuckle	*Lonicera japonica*	1,365	228
Nonnative vincas, periwinkles	*Vinca minor/V. major*	25	4
Oriental bittersweet	*Celastrus orbiculatus*	37	3
Kudzu	*Pueraria montana* var. *lobata*	18	0
English ivy	*Hedera helix*	26	2
Nonnative climbing yams	*Dioscorea bulbifera/D. oppositifolia*	12	0
Chinese/japanese wisteria	*Wisteria sinensis/W. floribunda*	7	2
Winter creeper	*Euonymus fortunei*	1	0
Grasses			
Nepalese browntop	*Microstegium vimineum*	376	100
Tall fescue	*Lolium arundinaceum*	151	11
Nonnative bamboos	*Phyllostachys* spp./*Bambusa* spp.	1	0
Chinese silvergrass	*Miscanthus sinensis*	5	0
Herbs			
Chinese lespedeza	*Lespedeza cuneata*	189	21
Shrubby lespedeza	*Lespedeza bicolor*	53	8
Garlic mustard	*Alliaria petiolata*	4	0
Lilyturf	*Liriope spicata*	N/A	1

N/A = not applicable.

[a] Count of survey plots with at least one invasive plant present collected under Forest Inventory and Analysis Program field manual version 4.0 guidelines during inventory cycle.

[b] Count of survey plots with at least one invasive plant present collected under Forest Inventory and Analysis Program field manual version 6.0 guidelines during inventory cycle.

Summary

The 2013 FIA survey recorded >18.6 million acres of forest land in North Carolina, of which 17.9 million acres were classified as timberland. Hardwood forest types covered 11.8 million acres (66 percent) of timberland, and softwood forest types covered 5.9 million acres (33 percent). Nonstocked timberland accounted for the remaining 1 percent. Oak-hickory was the predominant forest-type group and occupied 7.0 million acres. Nonindustrial private forest landowners controlled 14.4 million acres (80 percent) of the State's timberland. Forest industry held 1.0 million acres (6 percent) and public ownerships held <2.5 million acres (14 percent).

The volume of all-live trees on timberland totaled 38.4 billion cubic feet. Hardwoods accounted for 24.9 billion cubic feet (65 percent) of the State's total volume, and softwoods accounted for 13.5 billion cubic feet. Net annual growth of all-live trees averaged nearly 1.6 billion cubic feet, and annual removals averaged 0.9 billion cubic feet. Softwood net growth averaged 796 million cubic feet per year and exceeded softwood removals, which averaged 550 million cubic feet per year. In comparison, hardwood net growth averaged 788 million cubic feet per year and greatly exceeded hardwood removals, which averaged 372 million cubic feet per year.

With the exception of hemlock trees lost to insects, all indications are that these forested acres are relatively healthy (low mortality) and as productive as in any previous survey. Growth rates are high (with the note of caution about high hardwood growth in the Mountains unit) and net growth exceeded latest reported removals estimates at the State level. On these bases, the 2013 North Carolina survey data suggest a surplus of hardwood volume in the Mountains and Piedmont units as well as early signs of a building surplus of softwood volume in the Southern Coastal Plain (albeit partially related to reduced removal rates) available to meet future increases in demand for wood products.

Moon at twilight, viewed up through the tree tops. Duke Forest, Durham NC. (photo courtesy of Wikimedia.org)

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Bog turtle, a species protected under the Endangered Species Act. (photo by Gary Peeples, U.S. Fish and Wildlife Service Southeast Region, Wikimedia.org)

Glossary

Terms used in this report are defined in the Forest Inventory and Analysis (FIA) glossary available on the FIA Web site at http://www.fia.fs.fed.us/tools-data/docs/. For a hardcopy of the glossary please call 865-862-2000 or write to the following address:

Southern Research Station
Forest Inventory & Analysis
4700 Old Kingston Pike
Knoxville, TN 37919

Floodplain cypress knees in the Northern Coastal Plain of North Carolina.
(photo courtesy of Albemarle-Pamlico National Estuary Partnership)

Inventory Methods

The North Carolina 2013 inventory was a three-phase, fixed-plot design conducted on an annualized basis. Annualized means that a portion (a panel) of the entire sample population (a cycle) is collected each year until all plots have been remeasured. For the 2013 survey, the inventory involved 5 years of new data collection from a 7-year cycle period plus reuse of the previous cycle's data for those plots not yet remeasured. Phase 1 (P1) provides the area estimates for the inventory. Phase 2 (P2) involves on-the-ground measurements of sample plots by field personnel. Phase 3 (P3) is a subset of the P2 plot system where additional measurements are made by personnel to assess unique forest health indicators, many of which are not measured on the P2 plots. It should be noted here that, due to budgetary restraints, only a portion of the P3 data were collected for the 2013 survey.

The data that were used to derive the estimates in this report came from panels 1, 2, 3, 4, and 5 of cycle 9. Collectively, these five panels represent approximately five-sevenths of sample plots in the cycle. Cycle 8 data, equivalent to panels 6 and 7 of cycle 9, are then reused to represent the remaining two-sevenths. This process produces a dataset that represents 100 percent of the plot sample in the State. The data were processed with National Information Management System (NIMS) version 6.0 software.

Sample Design Overview

Under North Carolina's annual inventory system, approximately 15 percent (one panel) of the total number of plots in a State are measured every year over a 7-year period (one cycle). Each panel of plots is selected on a subgrid that is slightly offset from the previous panel, so that each panel covers essentially the same sample area (both spatially and in intensity) as the prior panel. In the eighth year, the plots that were measured in the first panel are remeasured. This marks the beginning of the next cycle of data collection. The 1998 Farm Bill requires a report every 5 years using the available field measurements completed at that time for the 5-year report. The dataset consists of data that are <1 year old (the most recently collected data), data up to 7 years old (the data collected at the beginning of the cycle), and data not yet remeasured that are reused to yield a full cycle's worth of data.

Sample Design Phases

The three phases (P1, P2, and P3) of the current sampling method are based upon a hexagonal-grid design for sample placement on the ground; successive phases are sampled with less intensity. In general, the P1 phase involves area estimation. The P2 and P3 phases involve placement of sample plots on the ground where measurement of variable attributes are made. The grid ensures a systematic placement of P2 and P3 plots on the ground. There are 16 P2 hexagons for every P3 hexagon. The P2 and P3 hexagons represent about 6,000 and 96,000 acres, respectively. To ensure systematic coverage of the sample domain (State), the goal is to place one P2 plot in every hexagonal grid cell. The grid covering North Carolina contains 5,800 hex cells with plots essentially centrally located.

Area

The determination of forest area applies a stratification technique to improve the precision of the estimate; that is, it reduces the variance of the estimate. With this method, the placement (on the ground) and subsequent classification (by land use) of the P2 plot carry much of the weight in determining forest area. The area of control was the survey unit. Forest Inventory and Analysis (FIA) used National Land Cover Database (NLCD) data for the stratification platform. The NLCD data are derived from Landsat Thematic Mapper data and incorporate the U.S. Geological Survey's land cover classification scheme. Using these data, FIA identified four strata to improve the variance of the area estimate. These strata are identified by a pixel classification according to four types of placement: (1) pixels in forest, (2) pixels in nonforest, (3) pixels in nonforest but within a 2-pixel width of a forest edge, and (4) pixels in a forest area but within a 2-pixel width of a forest edge. The estimation of forest area is then the sum across all strata from respective pixel counts (based on placement within the above strata) and the mean area from the P2 plots. This type of approach places more weight on the P2 plot in area determination than with previous aerial-photo dot-count methods.

Ownership

Under the annual inventory system, area estimation of all lands and ownerships was based on the probability of selection of P2 plot locations. There was no enumeration of any ownership (no use of known areas of ownership to determine area and plot expansion factors). As a result, the known forest land area (for specific ownerships)

does not always agree with area estimates based on probability of selection. For example, the acreage of national forests, published by the National Forest System, will not agree exactly with the statistical estimate of national forest land derived by FIA. These numbers may differ substantially for very small areas.

Plot Design

Bechtold and Patterson (2005) describe the current P2 and P3 ground plots and explain their use. These plots are clusters of four points arranged so that one point is central and the other three lie 120 feet from it at azimuths of 0, 120, and 240 degrees (fig. A.1). Each point is the center of a circular subplot with a fixed 24-foot

Four subplots, 120 feet apart

Subplot radius is 24.0 feet
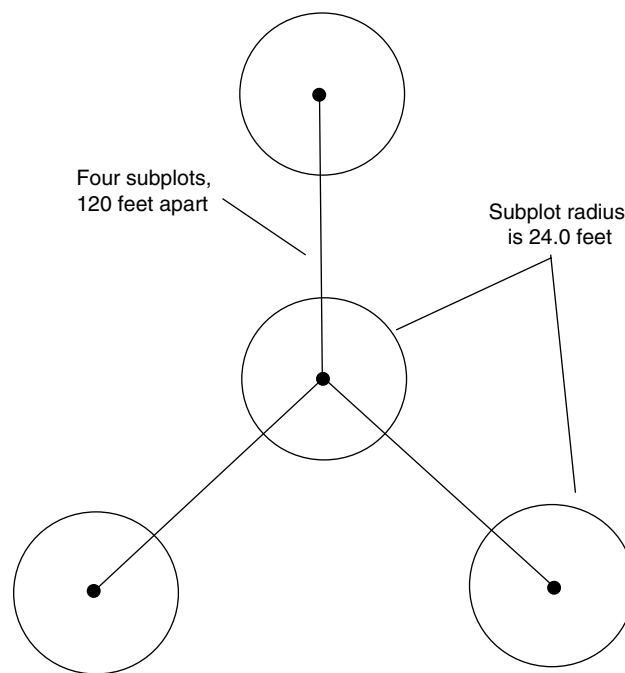
Figure A.1—Annual inventory fixed-plot design (the phase 2 plot).

radius. Trees >5.0 inches in diameter at breast height (d.b.h.) are measured in these subplots. Each subplot in turn contains a circular 1/300th-acre microplot with a fixed 6.8-foot radius (fig. A.2). Trees 1.0 to 4.9 inches d.b.h. and seedlings (<1.0 inch d.b.h.) are measured on these microplots.

Sometimes a plot cluster straddles two or more land use or forest condition classes (Bechtold and Patterson 2005). There are seven condition-class variables that require mapping of a unique condition on a plot: land use, forest type, stand size, owner-ship, stand density, regeneration status, and reserved status. A new condition is defined and mapped each time the aerial extent of one of these variables is encountered during plot measurement. The process of mapping any of these conditions on a plot changes the plot size for a respective condition. In other words, the condition size will be smaller than a full plot complement, so the variance of the estimate may increase.

Data on forest health variables (P3) are collected on about 1/16th of the P2 sample plots (U.S. Department of Agriculture Forest Service 2007b) (U.S. Department of Agriculture Forest Service 2010). P3 data are coarse descriptions, and are meant to be used as general indicators of overall forest health over large geographic areas. P3 data collection includes variables pertaining to tree crown health, down woody mate-rial (DWM), and foliar ozone injury. Tree crown health and DWM measurements are collected using the same plot design used during P2 data collection (fig. A.3).

Biomonitoring sites for ozone data collec-tion are located independently of the FIA grid. Sites must be 1-acre fields or similar open areas adjacent to or surrounded by forest land, and must contain a minimum number of plants of at least two identified bioindicator species (U.S. Department of Agriculture Forest Service 2007b) (U.S. Department of Agriculture Forest Service
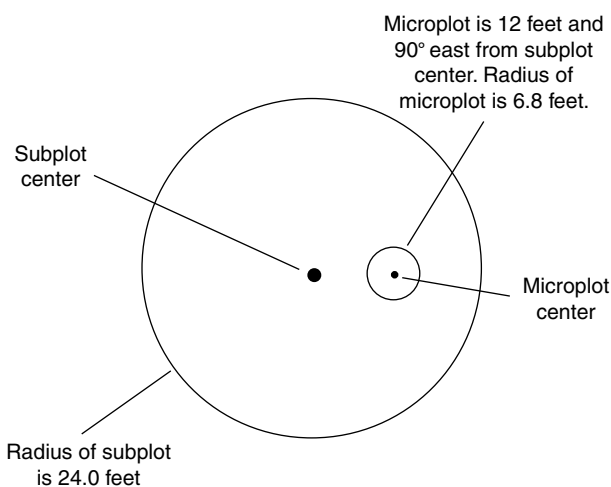
Figure A.2—Subplot and microplot layout.
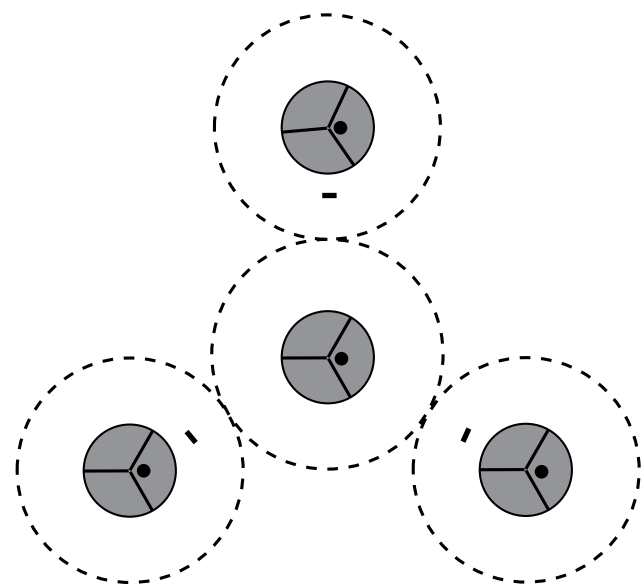
- ⬤ Subplot—24.0 ft radius
- ● Microplot—6.8 ft radius
- ⬚ Annular plot—58.9 ft radius
- ▬ Soil sampling—(point sample)
- ━ Down woody material—24 ft subplot transects

Figure A.3—Layout of the fixed-radius plot design illustrating where the phase 3 variables (soil and down woody material) are collected.

2010). Plants are evaluated for ozone injury, and voucher specimens are submitted to a regional expert for verification of ozone-induced foliar injury.

Volume

Tree volumes for each individual tally tree were derived by a linear regression model. The general form of the model involves two measurements from sample trees: d.b.h. and total height. This equation estimated gross cubic foot volume from a 1-foot stump to a 4-inch top for each sample tree. Separate equation coefficients for 77 species or species groupings were used. The volume in forks in the central bole and the volume in limbs outside of the main bole were excluded. Net cubic foot volume was derived by subtracting the estimate of rotten or missing wood for each sample tree. Volume of the saw-log portion (expressed in International ¼-inch board feet) of sample trees was derived by using board foot-to-cubic foot ratio equations. All equations and coefficients were developed from standing and felled tree volume studies conducted by FIA across several Southern States. For more detailed and specific information regarding volume models and coefficients, contact the Southern Research Station (SRS), FIA work unit.

Biomass

Tree biomass for each individual tally tree was derived by applying models and coefficients derived by McClure and Biesterfeldt (1981) and McClure and Knight (1984). The general form of the model used two measurements from sample trees: d.b.h. and total height. The coefficients derived green weight by means of a volume conversion method. The dry weight was then derived by multiplying the green weight by 0.5. The tree biomass model gives the weight of the total tree, including wood and bark, from ground level; foliage is not included. The model for the merchantable stem, including wood and bark, gives the weight of the stem from a 1-foot stump to a 4-inch top. For more detailed and specific information regarding biomass models and coefficients, contact the SRS FIA work unit.

Growth, Removals, and Mortality

Growth, removals, and mortality estimates were determined from the remeasurement of the 5,800 hexes with sample plots measured in the 2007 inventory. North Carolina's 2013 survey remeasured 5,478 of these plots. The 322-plot difference predominantly consisted of new plots (sample kind 1) as well as a nominal number of plots not sampled due to adverse conditions or denied access. Sixty-three percent, or 3,478, of the remeasured plots were forested and 2,000 were nonforested. The remeasurement information was then used in the calculation of seven components of change: survivor growth, ingrowth, growth on ingrowth, growth on mortality, mortality, growth on removals, and removals. The mathematical exchanges between these components of change were used to determine average annual rates of net growth and removals. The interaction of net growth to removals ultimately provided estimates of net change for the resource.

Summary

Users wishing to make rigorous comparisons of data between surveys should be aware of the significant differences in plot designs and variable assessments as well as continued adjustments and improvements to the processing methods and algorithms used to enhance accuracy of the data. Assuming there is no bias in plot selection or maintenance of plot integrity, the most valuable and powerful trend information comes from the same plots being revisited from one survey to the next and measured in the same way. This is also the only method that yields reliable components of change estimation for growth, removals, and mortality.

Data Reliability

Sampling Error

A measure of reliability of inventory statistics is provided by sampling errors. Sampling error is associated with the natural and expected deviation of the sample from the true population mean. This deviation is susceptible to a mathematical evaluation of the probability of error. Sampling errors for State totals are based on one standard deviation, meaning that the chances are two out of three that the true population value is within the limits indicated by a confidence interval.

FIA inventories supported by the full complement of sample plots are designed to achieve reliable statistics at the survey unit and State levels. However, users should note that sampling error increases as the area considered decreases in size. Sampling errors and associated confidence intervals are often unacceptably high for small components of the total resource.

Sampling errors (in percent) and associated confidence intervals around the sample estimates for timberland area, inventory volumes, and components of change are presented in the following tabulation:

Item	Sample estimate and confidence interval		Sampling error
			percent
Timberland (*1,000 acres*)	17,887.9 ±	121.6	0.68
All-live (*million cubic feet*)			
Inventory	38,353.2 ±	521.6	1.36
Net annual growth	1,583.9 ±	33.9	2.14
Annual removals	921.8 ±	50.8	5.52
Annual mortality	321.9 ±	15.8	4.92
Growing stock (*million cubic feet*)			
Inventory	34,967.0 ±	500.0	1.43
Net annual growth	1,491.6 ±	32.1	2.15
Annual removals	879.3 ±	49.3	5.61
Annual mortality	270.7 ±	15.1	5.58
Sawtimber (*million board feet*)			
Inventory	128,067.8 ±	2,382.1	1.86
Net annual growth	6,138.2 ±	153.5	2.50
Annual removals	3,308.9 ±	216.7	6.55
Annual mortality	867.0 ±	73.0	8.42

Statistical confidence may be computed for any subdivision of the State totals using the following formula. Sampling errors obtained from this method are only approximations of reliability because this process assumes constant variance across all subdivisions of totals. This method of sampling error calculation differs from the process and formulas used in the Evalidator output.

$$SE_s = SE_t \frac{\sqrt{X_t}}{\sqrt{X_s}}$$

where

SE$_s$ = sampling error for subdivision of State total

SE$_t$ = sampling error for State total

X$_s$ = sum of values for the variable of interest (area or volume) for subdivision of State

X$_t$ = total area or volume for State

For example, the estimate of sampling error for softwood live-tree volume on public timberland is computed as:

$$SE_s = 1.36 \frac{\sqrt{38,353.2}}{\sqrt{1,899.7}} = 6.11$$

Thus, the sampling error is 6.11 percent, and the resulting confidence interval (two times out of three) for softwood live-tree inventory on public timberland is 1,899.7 ± 116.1 million cubic feet.

Spruce trees (*Picea rubens*) on the Art Loeb Trail, in the Pisgah National Forest, NC. (photo courtesy of Wikimedia.org)

Table C.1—Species[a] list by common and scientific name, North Carolina, 2013

Common name	Scientific name[b]	Common name	Scientific name[b]
Softwoods		Hardwoods (continued)	
Fraser fir	*Abies fraseri* (Pursh) Poir.	Catalpa	*Catalpa* spp. Scop.
Atlantic white-cedar	*Chamaecyparis thyoides* (L.) B.S.P.	Sugarberry	*Celtis laevigata* Willd.
Southern redcedar	*Juniperus silicicola* (Small) Bailey	Hackberry	*C. occidentalis* L.
Eastern redcedar	*J. virginiana* L.	Eastern redbud	*Cercis canadensis* L.
Red spruce	*Picea rubens* Sarg.	Flowering dogwood	*Cornus florida* L.
Shortleaf pine	*Pinus echinata* Mill.	Hawthorn	*Crataegus* spp. L.
Longleaf pine	*P. palustris* Mill.	Common persimmon	*Diospyros virginiana* L.
Table Mountain pine	*P. pungens* Lamb.	American beech	*Fagus grandifolia* Ehrh.
Pitch pine	*P. rigida* Mill.	White ash	*Fraxinus americana* L.
Pond pine	*P. serotina* Michx.	Carolina ash	*F. caroliniana* Mill.
Eastern white pine	*P. strobus* L.	Green ash	*F. pennsylvanica* Marsh.
Loblolly pine	*P. taeda* L.	Pumpkin ash	*F. profunda* (Bush) Bush
Virginia pine	*P. virginiana* Mill.	Waterlocust	*Gleditsia aquatica* Marsh.
Baldcypress	*Taxodium distichum* (L.) Rich.	Honeylocust	*G. triacanthos* L.
Eastern hemlock	*Tsuga canadensis* (L.) Carr.	Kentucky coffeetree	*Gymnocladus dioicus* (L.) K. Koch
Hardwoods		Carolina silverbell	*Halesia carolina* L.
Florida maple	*Acer barbatum* Michx.	American holly	*Ilex opaca* Ait.
Boxelder	*A. negundo* L.	Black walnut	*Juglans nigra* L.
Red maple	*A. rubrum* L.	Sweetgum	*Liquidambar styraciflua* L.
Silver maple	*A. saccharinum* L.	Yellow-poplar	*Liriodendron tulipifera* L.
Sugar maple	*A. saccharum* Marsh.	Cucumbertree	*Magnolia acuminata* L.
Buckeye	*Aesculus* spp. L.	Fraser magnolia	*M. fraseri* Walt.
Yellow buckeye	*A. octandra* Marsh.	Southern magnolia	*M. grandiflora* L.
Ailanthus	*Ailanthus altissima* (Mill.) Swingle	Bigleaf magnolia	*M. macrophylla* Michx.
Serviceberry	*Amelanchier* spp. Medic.	Sweetbay	*M. virginiana* L.
Yellow birch	*Betula alleghaniensis* Britt.	Apple	*Malus* spp. Mill.
River birch	*B. nigra* L.	Chinaberry	*Melia azedarach* L.
American hornbeam	*Carpinus caroliniana* Walt.	White mulberry	*Morus alba* L.
Hickory	*Carya* spp. Nutt.	Red mulberry	*M. rubra* L.
Water hickory	*C. aquatica* (Michx. f.) Nutt.	Water tupelo	*Nyssa aquatica* L.
Bitternut hickory	*C. cordiformis* (Wangenh.) K. Koch	Blackgum	*N. sylvatica* Marsh.
Pignut hickory	*C. glabra* (Mill.) Sweet	Swamp tupelo	*N. sylvatica* var. *biflora* (Walt.) Sarg.
Pecan	*C. illinoensis* (Wangenh.) K. Koch	Eastern hophornbeam	*Ostrya virginiana* (Mill.) K. Koch
Shellbark hickory	*C. laciniosa* (Michx. f.) Loud.	Sourwood	*Oxydendrum arboreum* (L.) DC.
Shagbark hickory	*C. ovata* (Mill.) K. Koch	Redbay	*Persea borbonia* (L.) Spreng.
Mockernut hickory	*C. tomentosa* (Poir.) Nutt.	American sycamore	*Platanus occidentalis* L.
American chestnut	*Castanea dentata* (Marsh.) Borkh.	Bigtooth aspen	*Populus grandidentata* Michx.
Allegheny chinkapin	*C. pumila* Mill.	Cottonwood	*P.* spp. L.
Chinkapin	*Castanopsis* (D. Don) Spach	Pin cherry	*Prunus pensylvanica* L.f.

continued

Table C.1—Species[a] list by common and scientific name, North Carolina, 2013 (continued)

Common name	Scientific name[b]	Common name	Scientific name[b]
Hardwoods (continued)		Hardwoods (continued)	
Black cherry	*Prunus serotina* Ehrh.	Northern red oak	*Quercus rubra* L.
White oak	*Quercus alba* L.	Shumard oak	*Q. shumardii* Buckl.
Scarlet oak	*Q. coccinea* Muenchh.	Post oak	*Q. stellata* Wangenh.
Southern red oak	*Q. falcata* Michx.	Black oak	*Q. velutina* Lam.
Cherrybark oak	*Q. falcata* var. *pagodifolia* Ell.	Live oak	*Q. virginiana* Mill.
Bluejack oak	*Q. incana* Bartr.	Black locust	*Robinia pseudoacacia* L.
Turkey oak	*Q. laevis* Walt.	Willow	*Salix* spp. L.
Laurel oak	*Q. laurifolia* Michx.	Sassafras	*Sassafras albidum* (Nutt.) Nees
Overcup oak	*Q. lyrata* Walt.	American basswood	*Tilia americana* L.
Swamp chestnut oak	*Q. michauxii* Nutt.	White basswood	*T. heterophylla* Vent.
Chinkapin oak	*Q. muehlenbergii* Engelm.	Winged elm	*Ulmus alata* Michx.
Water oak	*Q. nigra* L.	American elm	*U. americana* L.
Pin oak	*Q. palustris* Muenchh.	Slippery elm	*U. rubra* Muhl.
Willow oak	*Q. phellos* L.	Rock elm	*U. thomasii* Sarg.
Chestnut oak	*Q. prinus* L.		

[a] Common and scientific names of tree species ≥1.0 inch diameter at breast height occurring in the Forest Inventory and Analysis sample.
[b] Little (1979).

Table D.1—Area by survey unit and land status, North Carolina, 2013

| | | Land status | | | | | | | | |
| | | Unreserved | | | | Reserved | | | | |
Survey unit	Total area	All forest	Total	Timber-land	Un-productive	Total	Productive	Un-productive	Nonforest land	Census water
					thousand acres					
Southern Coastal Plain	8,760.7	5,135.7	5,129.9	5,096.1	33.8	5.8	5.8	0.0	3,232.8	392.2
Northern Coastal Plain	9,344.9	3,845.9	3,579.5	3,544.8	34.7	266.4	227.2	39.2	2,831.4	2,667.6
Piedmont	10,629.8	5,325.1	5,307.5	5,305.4	2.1	17.6	17.6	0.0	5,107.4	197.3
Mountains	5,708.7	4,303.9	3,947.7	3,941.7	6.1	356.2	356.2	0.0	1,361.0	43.8
All units	34,444.1	18,610.7	17,964.6	17,887.9	76.8	646.1	606.8	39.2	12,532.5	3,300.9

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.

Bluets (*Houstonia caerulea*) growing on the forest floor in the Duke Forest, Durham, NC.
(photo courtesy of Wikimedia.org)

Table D.2—Area of forest land by ownership class and land status, North Carolina, 2013

| | | Land status | | | | | |
| | | Unreserved | | | Reserved | | |
Ownership class	All forest	Total	Timberland	Un-productive	Total	Productive	Un-productive
				thousand acres			
U.S. Forest Service							
National forest	1,280.3	1,193.9	1,176.0	18.0	86.4	80.2	6.1
Total	1,280.3	1,193.9	1,176.0	18.0	86.4	80.2	6.1
Other Federal							
National Park Service	290.5	0.0	0.0	0.0	290.5	287.6	2.9
U.S. Fish and Wildlife Service	262.8	0.0	0.0	0.0	262.8	232.6	30.2
Dept. of Defense/Dept. of Energy	308.3	308.3	302.2	6.1	0.0	0.0	0.0
Other Federal	5.7	5.7	5.7	0.0	0.0	0.0	0.0
Total	867.3	314.0	307.9	6.1	553.3	520.2	33.1
State and local government							
State	744.1	737.7	715.2	22.5	6.4	6.4	0.0
Local	269.7	269.7	269.7	0.0	0.0	0.0	0.0
Total	1,013.8	1,007.4	984.8	22.5	6.4	6.4	0.0
Forest industry							
Corporate	1,019.1	1,019.1	1,019.1	0.0	0.0	0.0	0.0
Individual	7.4	7.4	7.4	0.0	0.0	0.0	0.0
Total	1,026.5	1,026.5	1,026.5	0.0	0.0	0.0	0.0
Nonindustrial private							
Corporate	3,411.2	3,411.2	3,404.4	6.8	0.0	0.0	0.0
Conservation/natural resources organization	110.7	110.7	110.7	0.0	0.0	0.0	0.0
Unincorporated local partner-ship/association/club	243.3	243.3	237.4	5.8	0.0	0.0	0.0
Native American	24.2	24.2	24.2	0.0	0.0	0.0	0.0
Individual	10,633.4	10,633.4	10,615.9	17.5	0.0	0.0	0.0
Total	14,422.9	14,422.9	14,392.7	30.2	0.0	0.0	0.0
All classes	18,610.7	17,964.6	17,887.9	76.8	646.1	606.8	39.2

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.

Table D.3—Area of timberland by forest-type group and site productivity class, North Carolina, 2013

Forest-type group	All classes	Site productivity class (*cubic feet/acre/year*)						
		0–19	20–49	50–84	85–119	120–164	165–224	225+
		thousand acres						
Softwood types								
White-red-jack pine	104.3	0.0	0.0	10.3	21.3	72.5	0.3	0.0
Spruce-fir	18.2	0.0	12.1	6.1	0.0	0.0	0.0	0.0
Longleaf-slash pine	339.2	0.0	100.8	161.0	71.7	5.8	0.0	0.0
Loblolly-shortleaf pine	5,459.0	0.0	410.1	2,182.5	1,641.7	877.1	332.5	15.2
Other eastern softwoods	20.3	0.0	1.5	15.7	0.0	3.1	0.0	0.0
Total softwoods	5,941.0	0.0	524.5	2,375.5	1,734.6	958.5	332.8	15.2
Hardwood types								
Oak-pine	2,312.3	0.0	259.6	1,168.7	545.7	256.0	66.8	15.4
Oak-hickory	7,027.8	0.0	1,294.7	3,515.1	1,581.5	536.8	82.3	17.5
Oak-gum-cypress	1,699.9	0.0	324.9	992.2	293.2	66.8	22.8	0.0
Elm-ash-cottonwood	529.0	0.0	65.0	300.7	112.1	45.7	5.5	0.0
Maple-beech-birch	56.9	0.0	30.3	16.0	10.6	0.0	0.0	0.0
Aspen-birch	6.1	0.0	0.0	4.5	1.5	0.0	0.0	0.0
Other hardwoods	117.8	0.0	25.4	63.8	22.5	6.1	0.0	0.0
Exotic hardwoods	20.4	0.0	12.2	2.5	5.7	0.0	0.0	0.0
Total hardwoods	11,770.2	0.0	2,012.3	6,063.5	2,572.7	911.4	177.4	32.9
Nonstocked	176.7	0.0	26.9	109.1	33.3	7.4	0.0	0.0
All groups	17,887.9	0.0	2,563.7	8,548.1	4,340.6	1,877.2	510.2	48.1

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.

Table D.4—Area of timberland by forest-type group and ownership group, North Carolina, 2013

Forest-type group	All ownerships	Ownership group				
		U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
		thousand acres				
Softwood types						
White-red-jack pine	104.3	12.7	0.0	7.6	0.0	84.0
Spruce-fir	18.2	6.1	0.0	6.1	0.0	6.1
Longleaf-slash pine	339.2	6.6	84.4	51.2	11.9	185.1
Loblolly-shortleaf pine	5,459.0	105.3	91.7	314.2	679.7	4,268.2
Other eastern softwoods	20.3	0.0	0.0	1.5	0.0	18.8
Total softwoods	5,941.0	130.7	176.1	380.5	691.6	4,562.1
Hardwood types						
Oak-pine	2,312.3	112.6	34.7	112.7	88.0	1,964.2
Oak-hickory	7,027.8	859.5	37.7	276.8	81.1	5,772.8
Oak-gum-cypress	1,699.9	25.9	37.8	134.7	126.2	1,375.3
Elm-ash-cottonwood	529.0	0.0	18.7	57.8	12.6	439.8
Maple-beech-birch	56.9	23.1	0.0	0.0	0.0	33.8
Aspen-birch	6.1	0.0	0.0	0.0	0.0	6.1
Other hardwoods	117.8	24.2	0.0	6.1	0.0	87.5
Exotic hardwoods	20.4	0.0	0.0	0.0	2.9	17.5
Total hardwoods	11,770.2	1,045.3	128.9	588.1	310.7	9,697.1
Nonstocked	176.7	0.0	2.9	16.2	24.2	133.4
All groups	17,887.9	1,176.0	307.9	984.8	1,026.5	14,392.7

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.

Table D.5—Area of timberland by forest-type group and stand-age class, North Carolina, 2013

Forest-type group	All classes	Stand-age class (years)											Non-stocked
		1–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	101+	
		thousand acres											
Softwood types													
White-red-jack pine	104.3	0.3	9.2	14.1	21.1	19.7	16.8	2.7	13.6	0.0	0.6	6.1	0.0
Spruce-fir	18.2	0.0	6.1	0.0	0.0	0.0	0.0	6.1	6.1	0.0	0.0	0.0	0.0
Longleaf-slash pine	339.2	47.4	31.3	44.7	35.1	39.4	41.4	24.9	42.0	21.8	7.3	4.0	0.0
Loblolly-shortleaf pine	5,459.0	932.0	1,138.5	1,388.5	845.9	450.5	304.4	183.9	132.7	57.0	5.7	6.1	13.8
Other eastern softwoods	20.3	6.0	4.7	5.8	0.0	1.5	0.0	0.0	2.3	0.0	0.0	0.0	0.0
Total softwoods	5,941.0	985.7	1,189.7	1,453.0	902.2	511.1	362.6	217.6	196.8	78.8	13.6	16.2	13.8
Hardwood types													
Oak-pine	2,312.3	469.8	271.9	250.9	287.2	230.2	275.2	290.7	141.2	63.2	26.8	5.3	0.0
Oak-hickory	7,027.8	816.0	451.7	489.0	506.7	540.7	935.2	1,027.4	971.4	750.7	279.1	252.5	7.4
Oak-gum-cypress	1,699.9	201.3	127.5	125.4	189.0	174.6	229.6	235.6	207.2	138.8	23.1	47.7	0.0
Elm-ash-cottonwood	529.0	99.6	73.3	33.2	29.8	65.8	50.9	47.3	65.9	41.3	4.3	16.1	1.5
Maple-beech-birch	56.9	0.0	0.0	0.0	0.0	0.0	6.1	2.4	12.1	24.3	0.0	12.1	0.0
Aspen-birch	6.1	0.0	4.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other hardwoods	117.8	3.0	0.0	9.1	18.2	4.5	11.2	23.9	28.7	19.1	0.0	0.0	0.0
Exotic hardwoods	20.4	0.0	16.3	0.0	0.0	1.2	0.0	0.0	0.0	2.9	0.0	0.0	0.0
Total hardwoods	11,770.2	1,589.7	945.4	909.1	1,031.0	1,017.0	1,508.2	1,627.4	1,426.5	1,040.1	333.3	333.7	8.8
Nonstocked	176.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	176.7
All groups	17,887.9	2,575.4	2,135.0	2,362.2	1,933.2	1,528.1	1,870.8	1,845.0	1,623.3	1,118.9	346.8	349.9	199.4

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.

Table D.6—Area of timberland by forest-type group and stand origin, North Carolina, 2013

		Stand origin	
		Natural	Artificial
Forest-type group	Total	stands	regeneration
		thousand acres	
Softwood types			
White-red-jack pine	104.3	75.2	29.1
Spruce-fir	18.2	12.1	6.1
Longleaf-slash pine	339.2	196.9	142.4
Loblolly-shortleaf pine	5,459.0	2,900.8	2,558.2
Other eastern softwoods	20.3	20.3	0.0
Total softwoods	5,941.0	3,205.2	2,735.8
Hardwood types			
Oak-pine	2,312.3	2,038.7	273.6
Oak-hickory	7,027.8	6,851.8	176.0
Oak-gum-cypress	1,699.9	1,691.2	8.7
Elm-ash-cottonwood	529.0	522.8	6.2
Maple-beech-birch	56.9	56.9	0.0
Aspen-birch	6.1	6.1	0.0
Other hardwoods	117.8	117.8	0.0
Exotic hardwoods	20.4	20.4	0.0
Total hardwoods	11,770.2	11,305.8	464.4
Nonstocked	176.7	150.8	25.9
All groups	17,887.9	14,661.8	3,226.0

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.

Table D.7—Area of timberland disturbed annually by forest-type group and disturbance class, North Carolina, 2013

Forest-type group[a]	Disturbance class							
	Insects	Disease	Weather	Fire	Domestic animals	Wild animals	Human	Other natural
	thousand acres							
Softwood types								
White-red-jack pine	2.7	2.5	1.2	0.0	0.0	0.0	0.3	0.0
Spruce-fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Longleaf-slash pine	0.0	0.0	0.0	12.7	0.0	0.0	1.5	0.0
Loblolly-shortleaf pine	10.8	2.3	6.3	44.5	1.7	0.1	4.6	0.8
Other eastern softwoods	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	13.5	5.1	7.5	57.1	1.7	0.1	6.4	0.8
Hardwood types								
Oak-pine	10.6	1.4	1.9	6.2	0.0	0.8	3.4	0.0
Oak-hickory	55.6	8.7	11.5	23.4	2.0	1.7	4.1	0.6
Oak-gum-cypress	0.0	0.0	16.1	0.0	0.0	16.4	2.0	0.0
Elm-ash-cottonwood	0.0	0.0	1.5	1.0	0.0	4.0	0.0	0.0
Maple-beech-birch	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Aspen-birch	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other hardwoods	2.5	0.9	0.0	0.0	0.0	0.0	0.5	0.0
Exotic hardwoods	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total hardwoods	68.8	11.0	31.0	30.7	2.0	23.1	10.0	0.6
Nonstocked	0.0	0.0	0.0	2.7	0.2	0.6	0.0	0.0
All groups	82.3	16.1	38.5	90.5	3.9	23.7	16.3	1.4

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Based on past conditions.

Table D.8—Area of timberland treated annually by forest-type group and treatment class (cutting related), North Carolina, 2013

Forest-type group[a]	Total treated	Final harvest	Partial harvest	Seed-tree/ shelter wood harvest	Commercial thinning	Timber stand improvement	Salvage cutting
				thousand acres			
Softwood types							
White-red-jack pine	3.1	1.9	0.5	0.0	0.0	0.7	0.0
Spruce-fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Longleaf-slash pine	7.6	4.0	0.0	0.0	3.6	0.0	0.0
Loblolly-shortleaf pine	219.4	97.8	25.2	0.0	93.5	1.6	1.3
Other eastern softwoods	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	230.0	103.7	25.7	0.0	97.0	2.3	1.3
Hardwood types							
Oak-pine	34.8	19.3	7.1	0.0	7.2	1.2	0.0
Oak-hickory	80.1	46.0	25.5	0.0	3.4	5.1	0.0
Oak-gum-cypress	24.0	22.9	1.1	0.0	0.0	0.0	0.0
Elm-ash-cottonwood	10.2	8.2	1.9	0.0	0.1	0.0	0.0
Maple-beech-birch	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aspen-birch	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other hardwoods	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exotic hardwoods	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total hardwoods	149.1	96.4	35.6	0.0	10.7	6.4	0.0
Nonstocked	1.6	1.6	0.0	0.0	0.0	0.0	0.0
All groups	380.7	201.7	61.4	0.0	107.7	8.6	1.3

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Based on past conditions.

Table D.9—Area of timberland treated annually by forest-type group and treatment class (regeneration related), North Carolina, 2013

Forest-type group[a]	Treatment class (regeneration related)			
	Site preparation	Artificial regeneration	Natural regeneration	Other silvicultural
	thousand acres			
Softwood types				
White-red-jack pine	0.0	0.1	0.0	0.0
Spruce-fir	0.0	0.0	0.0	0.0
Longleaf-slash pine	4.3	4.3	0.3	3.7
Loblolly-shortleaf pine	47.0	56.2	16.5	33.1
Other eastern softwoods	0.0	0.0	0.0	0.0
Total softwoods	51.3	60.6	16.8	36.7
Hardwood types				
Oak-pine	11.9	20.0	15.5	4.3
Oak-hickory	11.5	22.1	38.1	3.9
Oak-gum-cypress	0.6	0.2	12.3	0.7
Elm-ash-cottonwood	0.0	0.0	4.2	0.3
Maple-beech-birch	0.0	0.0	0.0	0.0
Aspen-birch	0.0	0.0	0.0	0.0
Other hardwoods	0.0	0.0	0.0	0.0
Exotic hardwoods	0.0	0.0	0.0	0.0
Total hardwoods	24.0	42.4	70.1	9.2
Nonstocked	4.8	0.0	3.1	1.8
All groups	80.1	102.9	89.9	47.6

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Based on current conditions.

Table D.10—Area of timberland by forest-type group and stand-size class, North Carolina, 2013

		Stand-size class			
Forest-type group	All size classes	Large diameter	Medium diameter	Small diameter	Non-stocked
			thousand acres		
Softwood types					
White-red-jack pine	104.3	95.8	8.2	0.3	0.0
Spruce-fir	18.2	12.1	3.0	3.0	0.0
Longleaf-slash pine	339.2	196.9	79.1	63.2	0.0
Loblolly-shortleaf pine	5,459.0	2,707.4	1,712.2	1,039.4	0.0
Other eastern softwoods	20.3	6.6	3.1	10.6	0.0
Total softwoods	5,941.0	3,018.8	1,805.7	1,116.4	0.0
Hardwood types					
Oak-pine	2,312.3	1,161.2	448.3	702.7	0.0
Oak-hickory	7,027.8	4,535.0	1,278.9	1,213.9	0.0
Oak-gum-cypress	1,699.9	950.7	328.4	420.7	0.0
Elm-ash-cottonwood	529.0	287.9	48.7	192.4	0.0
Maple-beech-birch	56.9	50.9	6.1	0.0	0.0
Aspen-birch	6.1	4.5	1.5	0.0	0.0
Other hardwoods	117.8	89.6	13.2	14.9	0.0
Exotic hardwoods	20.4	0.0	13.0	7.4	0.0
Total hardwoods	11,770.2	7,080.0	2,138.2	2,552.0	0.0
Nonstocked	176.7	0.0	0.0	0.0	176.7
All groups	17,887.9	10,098.8	3,943.9	3,668.5	176.7

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.

Table D.11—Number of live trees on timberland by species group and diameter class, North Carolina, 2013

Species group	All classes	Diameter class (inches at breast height)														
		1.0–2.9	3.0–4.9	5.0–6.9	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–24.9	25.0–28.9	29.0–32.9	33.0–36.9	37.0+
		million trees														
Softwood																
Cypress	32.2	15.4	3.6	2.4	1.9	2.1	1.5	1.3	1.7	0.8	0.5	0.9	0.1	0.0	0.1	0.0
Eastern hemlock	71.1	34.5	15.8	8.6	5.0	2.2	1.9	1.4	0.7	0.4	0.4	0.1	0.1	0.0	0.0	0.0
Eastern white and red pines	157.2	84.6	21.7	14.7	11.0	7.9	5.3	3.3	2.6	2.1	1.7	1.2	0.7	0.3	0.0	0.0
Loblolly and shortleaf pines	2,474.8	1,033.2	546.6	350.6	234.9	140.8	81.5	43.8	21.9	12.3	4.5	3.8	0.8	0.1	0.0	0.0
Longleaf and slash pines	101.8	38.8	19.2	12.7	10.0	7.0	6.1	3.7	2.7	0.9	0.5	0.2	0.0	0.0	0.0	0.0
Other eastern softwoods	215.9	154.4	36.5	13.6	5.6	3.2	1.7	0.6	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Other yellow pines	426.8	206.4	84.1	46.1	36.2	24.8	14.7	8.9	3.7	1.0	0.6	0.2	0.1	0.0	0.0	0.0
Spruce and balsam fir	5.5	1.8	0.0	1.2	0.8	0.7	0.5	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	3,485.4	1,569.1	727.5	449.9	305.6	188.7	112.9	63.2	33.7	17.6	8.3	6.4	1.8	0.5	0.1	0.1
Hardwood																
Ash	263.4	163.2	54.9	17.4	9.7	5.8	4.1	2.6	2.3	1.2	0.7	1.2	0.1	0.0	0.0	0.0
Basswood	16.4	8.1	1.8	2.2	1.3	0.5	0.5	0.8	0.5	0.3	0.1	0.3	0.0	0.0	0.0	0.0
Beech	152.4	104.8	23.8	9.1	4.2	3.5	2.1	1.6	1.0	1.0	0.4	0.5	0.2	0.1	0.0	0.0
Black walnut	15.9	6.2	2.2	1.8	1.8	1.3	0.9	0.7	0.5	0.1	0.2	0.1	0.0	0.0	0.0	0.0
Cottonwood and aspen	5.9	3.3	0.9	0.7	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Eastern noncommercial hardwoods	1,349.5	1,000.2	217.2	79.2	34.3	11.1	4.8	1.8	0.3	0.3	0.1	0.1	0.1	0.0	0.0	0.0
Hard maple	77.6	54.0	12.1	3.9	2.7	1.7	1.2	0.5	0.6	0.2	0.1	0.4	0.0	0.0	0.0	0.0
Hickory	300.2	190.3	41.3	21.6	14.6	10.5	8.3	5.3	4.5	2.1	0.9	0.8	0.1	0.0	0.0	0.0
Other eastern hard hardwoods	899.1	685.5	130.2	40.6	18.5	10.6	6.6	3.5	1.7	1.0	0.4	0.4	0.1	0.0	0.0	0.0
Other eastern soft hardwoods	1,080.6	748.8	198.6	67.3	28.8	14.8	9.0	5.2	3.2	1.8	1.1	1.5	0.2	0.1	0.0	0.0
Other red oaks	774.3	485.4	133.6	50.2	32.5	22.9	16.7	12.0	8.8	4.5	3.0	3.0	0.9	0.4	0.1	0.2
Other white oaks	220.0	84.9	38.1	22.7	18.2	16.4	11.9	8.6	6.4	4.7	3.0	3.3	1.1	0.3	0.3	0.1
Select red oaks	128.2	65.6	18.2	10.5	7.6	5.8	4.5	4.2	3.3	2.5	1.8	2.6	1.1	0.3	0.1	0.1
Select white oaks	320.5	166.6	55.5	27.2	17.5	14.2	11.9	8.0	6.2	5.6	3.2	3.1	1.0	0.3	0.1	0.1
Soft maple	2,161.6	1,567.4	313.5	119.4	67.6	38.2	22.9	13.3	8.6	5.0	2.6	1.8	1.1	0.1	0.1	0.0
Sweetgum	1,743.6	1,245.0	293.3	93.5	44.7	27.0	15.4	10.1	7.0	3.6	2.1	1.4	0.4	0.1	0.0	0.0
Tupelo and blackgum	541.7	336.7	85.9	39.0	26.8	17.5	12.9	9.3	6.7	3.2	1.9	1.3	0.4	0.2	0.0	0.0
Yellow birch	22.3	9.6	5.5	2.7	2.1	1.0	0.8	0.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Yellow-poplar	884.5	530.3	135.1	60.8	42.0	30.2	23.5	18.9	14.9	10.5	7.4	7.1	2.7	0.7	0.3	0.1
Total hardwoods	10,957.7	7,455.8	1,761.9	669.8	375.4	233.2	158.0	106.9	76.8	47.8	29.2	28.9	9.6	2.8	1.2	0.7
All species	14,443.1	9,024.9	2,489.4	1,119.6	681.0	421.9	270.9	170.1	110.5	65.4	37.5	35.3	11.3	3.3	1.3	0.8

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.

Table D.12—Number of growing-stock trees on timberland by species group and diameter class, North Carolina, 2013

Species group	All classes	5.0–6.9	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–24.9	25.0–28.9	29.0–32.9	33.0–36.9	37.0+
							million trees							
Softwood														
Cypress	12.4	1.9	1.8	2.1	1.4	1.3	1.7	0.8	0.5	0.9	0.1	0.0	0.1	0.0
Eastern hemlock	18.4	7.1	4.4	2.0	1.7	1.3	0.7	0.4	0.4	0.1	0.1	0.0	0.0	0.0
Eastern white and red pines	49.0	13.7	10.8	7.7	5.1	3.3	2.6	2.0	1.7	1.2	0.7	0.3	0.0	0.0
Loblolly and shortleaf pines	877.2	342.3	230.5	138.0	80.3	43.3	21.5	12.1	4.5	3.7	0.8	0.1	0.0	0.0
Longleaf and slash pines	43.0	12.3	9.9	6.9	6.0	3.7	2.7	0.9	0.5	0.2	0.0	0.0	0.0	0.0
Other eastern softwoods	15.9	7.6	4.3	2.2	1.1	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Other yellow pines	124.5	40.9	33.5	22.6	13.8	8.4	3.6	0.9	0.6	0.1	0.1	0.0	0.0	0.0
Spruce and balsam fir	3.4	1.0	0.8	0.7	0.5	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	1,143.8	426.9	296.1	182.0	110.0	61.8	33.1	17.3	8.0	6.2	1.7	0.4	0.1	0.0
Hardwood														
Ash	35.1	12.4	7.3	4.7	3.4	2.3	1.9	1.1	0.6	1.2	0.1	0.0	0.0	0.0
Basswood	6.2	2.0	1.3	0.4	0.5	0.8	0.5	0.3	0.1	0.3	0.0	0.0	0.0	0.0
Beech	16.6	5.8	2.7	2.6	1.6	1.3	0.8	0.9	0.2	0.4	0.2	0.0	0.0	0.0
Black walnut	5.5	1.2	1.3	1.0	0.7	0.6	0.4	0.1	0.2	0.1	0.0	0.0	0.0	0.0
Cottonwood and aspen	1.6	0.7	0.4	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Hard maple	9.4	3.3	2.2	1.4	0.9	0.5	0.4	0.2	0.1	0.3	0.0	0.0	0.0	0.0
Hickory	62.1	18.4	13.2	9.9	7.6	5.1	4.1	2.0	0.8	0.8	0.1	0.0	0.0	0.0
Other eastern hard hardwoods	52.8	20.9	13.3	8.3	4.8	2.7	1.4	0.8	0.3	0.4	0.0	0.0	0.0	0.0
Other eastern soft hardwoods	88.1	39.9	19.4	11.0	6.6	4.3	2.8	1.5	0.8	1.3	0.2	0.1	0.0	0.0
Other red oaks	129.4	38.0	26.6	20.3	14.6	11.2	8.3	4.0	2.8	2.6	0.6	0.3	0.1	0.1
Other white oaks	80.7	17.4	15.5	14.4	10.0	7.4	5.6	4.1	2.5	2.4	0.8	0.3	0.1	0.0
Select red oaks	40.8	9.1	6.9	5.4	4.2	4.0	3.3	2.3	1.8	2.4	1.0	0.3	0.1	0.1
Select white oaks	89.2	23.3	16.0	13.1	11.1	7.8	5.9	5.3	3.0	2.8	0.7	0.1	0.1	0.0
Soft maple	195.6	79.4	47.1	27.9	16.8	9.9	6.8	3.9	1.7	1.3	0.8	0.0	0.1	0.0
Sweetgum	184.5	81.0	40.8	25.4	13.9	9.6	6.6	3.5	2.1	1.3	0.4	0.1	0.0	0.0
Tupelo and blackgum	100.5	28.5	23.1	15.8	11.7	8.8	6.1	3.0	1.8	1.2	0.4	0.1	0.0	0.0
Yellow birch	5.3	2.0	1.6	0.7	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow-poplar	208.3	56.6	39.2	28.8	22.5	18.2	14.7	10.2	7.3	7.0	2.6	0.7	0.2	0.1
Total hardwoods	1,311.8	440.1	277.6	191.2	131.8	94.9	69.7	43.3	26.1	25.7	8.0	2.2	0.7	0.5
All species	2,455.6	867.0	573.7	373.2	241.8	156.8	102.8	60.6	34.2	31.9	9.7	2.6	0.8	0.5

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.

Table D.13—Net[a] volume of live trees on timberland by forest-type group and stand-size class, North Carolina, 2013

Forest-type group	All size classes	Stand-size class			Non-stocked
		Large diameter	Medium diameter	Small diameter	
		million cubic feet			
Softwood types					
White-red-jack pine	438.5	424.6	14.0	0.0	0.0
Spruce-fir	36.6	34.9	1.6	0.1	0.0
Longleaf-slash pine	544.7	463.3	69.7	11.7	0.0
Loblolly-shortleaf pine	10,398.8	7,823.4	2,418.7	156.7	0.0
Other eastern softwoods	19.5	7.2	3.1	9.1	0.0
Total softwoods	11,438.1	8,753.4	2,507.1	177.6	0.0
Hardwood types					
Oak-pine	4,214.2	3,414.4	644.4	155.4	0.0
Oak-hickory	17,316.9	15,111.1	1,915.4	290.4	0.0
Oak-gum-cypress	3,861.0	3,220.7	544.0	96.3	0.0
Elm-ash-cottonwood	1,068.9	971.2	68.7	29.0	0.0
Maple-beech-birch	137.0	126.3	10.7	0.0	0.0
Aspen-birch	3.1	2.5	0.6	0.0	0.0
Other hardwoods	291.1	267.8	17.3	6.0	0.0
Exotic hardwoods	17.6	0.0	16.8	0.8	0.0
Total hardwoods	26,909.8	23,114.1	3,218.0	577.8	0.0
Nonstocked	5.3	0.0	0.0	0.0	5.3
All groups	38,353.2	31,867.4	5,725.1	755.4	5.3

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Excludes rotten, missing, and form cull defects volume.

Table D.14—Net^a volume of live trees on timberland by species group and ownership group, North Carolina, 2013

Species group	All ownerships	U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
				million cubic feet		
Softwood						
Cypress	342.9	9.6	0.0	29.2	29.9	274.2
Eastern hemlock	240.6	72.8	0.0	12.6	0.0	155.2
Eastern white and red pines	1,002.7	155.3	0.0	40.3	2.6	804.5
Loblolly and shortleaf pines	9,562.3	212.2	199.6	522.2	974.0	7,654.3
Longleaf and slash pines	610.1	26.1	159.9	85.9	19.3	318.8
Other eastern softwoods	152.1	1.0	1.4	19.3	1.9	128.6
Other yellow pines	1,543.0	143.3	33.5	146.2	25.1	1,195.0
Spruce and balsam fir	32.2	18.5	0.0	11.0	0.0	2.8
Total softwoods	13,485.9	638.7	394.4	866.6	1,052.8	10,533.4
Hardwood						
Ash	679.9	31.8	13.5	58.3	31.5	544.9
Basswood	142.4	51.2	0.0	0.1	12.5	78.7
Beech	402.2	48.7	2.8	12.2	0.0	338.6
Black walnut	100.7	0.0	0.0	2.1	2.0	96.6
Cottonwood and aspen	32.7	1.5	0.0	6.5	1.1	23.6
Eastern noncommercial hardwoods	612.3	101.1	9.2	26.1	11.9	464.0
Hard maple	174.8	50.8	2.2	5.3	0.1	116.3
Hickory	1,041.6	111.6	13.4	45.9	11.3	859.3
Other eastern hard hardwoods	742.3	140.0	3.1	21.3	5.3	572.7
Other eastern soft hardwoods	1,234.7	133.2	25.9	69.8	35.6	970.3
Other red oaks	2,439.0	247.3	25.4	96.9	32.0	2,037.5
Other white oaks	1,874.4	507.8	5.2	101.6	6.0	1,253.7
Select red oaks	1,193.9	292.5	7.1	71.1	11.7	811.5
Select white oaks	2,097.6	190.2	5.7	88.9	7.7	1,805.1
Soft maple	2,829.5	336.5	22.4	180.3	83.6	2,206.7
Sweetgum	2,338.1	16.7	52.6	150.2	71.1	2,047.6
Tupelo and blackgum	1,654.5	72.9	31.4	123.1	225.8	1,201.3
Yellow birch	74.9	40.9	0.0	0.9	0.0	33.1
Yellow-poplar	5,201.7	473.0	28.0	184.4	51.9	4,464.4
Total hardwoods	24,867.3	2,847.5	247.7	1,245.0	601.0	19,926.1
All species	38,353.2	3,486.1	642.1	2,111.6	1,653.8	30,459.5

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
^{a} Excludes rotten, missing, and form cull defects volume.

Table D.15—Net^a volume of live trees on timberland by species group and diameter class, North Carolina, 2013

Species group	All classes	Diameter class (inches at breast height)												
		5.0–6.9	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–24.9	25.0–28.9	29.0–32.9	33.0–36.9	37.0+
		million cubic feet												
Softwood														
Cypress	342.9	8.1	14.0	26.8	27.3	36.6	64.3	41.1	34.3	70.5	8.0	0.0	11.9	0.0
Eastern hemlock	240.6	17.5	23.9	19.5	28.8	31.5	24.4	19.1	29.5	10.5	19.8	4.2	0.0	11.8
Eastern white and red pines	1,002.7	44.7	73.5	88.4	91.6	95.1	101.9	111.0	125.0	114.6	93.4	63.6	0.0	0.0
Loblolly and shortleaf pines	9,562.3	833.1	1,449.2	1,711.7	1,657.0	1,350.6	952.5	712.9	345.6	383.7	119.6	26.7	8.8	10.9
Longleaf and slash pines	610.1	31.7	63.8	81.5	121.2	105.8	105.7	46.3	34.5	19.6	0.0	0.0	0.0	0.0
Other eastern softwoods	152.1	31.6	30.2	30.0	27.7	13.6	5.9	6.7	1.7	0.0	4.8	0.0	0.0	0.0
Other yellow pines	1,543.0	136.4	257.5	321.0	303.9	263.4	145.2	47.5	40.1	18.8	9.3	0.0	0.0	0.0
Spruce and balsam fir	32.2	2.8	4.5	5.3	7.0	4.8	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	13,485.9	1,105.9	1,916.5	2,284.1	2,264.5	1,901.3	1,407.7	984.5	610.6	617.7	254.9	94.5	20.7	22.7
Hardwood														
Ash	679.9	50.9	63.3	71.7	80.7	72.6	87.7	66.6	48.5	116.1	5.8	6.3	0.0	9.6
Basswood	142.4	8.2	10.8	7.1	9.7	26.7	23.4	18.2	12.3	25.9	0.0	0.0	0.0	0.0
Beech	402.2	23.6	26.0	41.5	38.4	42.3	35.7	48.8	20.4	37.3	28.0	15.5	0.0	44.8
Black walnut	100.7	5.3	9.0	13.4	15.4	16.9	17.3	5.3	9.8	8.4	0.0	0.0	0.0	0.0
Cottonwood and aspen	32.7	1.8	2.4	1.5	1.4	2.6	6.4	3.0	3.3	10.5	0.0	0.0	0.0	0.0
Eastern noncommercial hardwoods	612.3	183.6	174.5	101.2	71.4	35.9	10.4	12.2	7.8	8.2	7.3	0.0	0.0	0.0
Hard maple	174.8	13.3	18.5	20.6	21.9	14.7	19.9	10.9	8.6	32.4	5.3	2.9	0.0	5.8
Hickory	1,041.6	56.2	91.9	126.1	158.9	158.3	180.3	116.0	57.2	69.3	20.8	6.6	0.0	0.0
Other eastern hard hardwoods	742.3	113.0	121.9	125.4	120.4	89.9	60.0	47.0	23.3	28.1	9.1	4.0	0.0	0.0
Other eastern soft hardwoods	1,234.7	175.2	168.9	164.2	156.3	130.8	116.4	86.4	64.9	109.1	30.9	20.3	8.7	2.6
Other red oaks	2,439.0	134.2	195.7	255.2	294.3	320.7	318.4	218.8	189.5	247.8	103.4	66.8	32.8	61.3
Other white oaks	1,874.4	59.4	112.1	184.7	209.2	223.2	225.6	221.4	170.8	242.5	115.4	46.5	44.4	19.2
Select red oaks	1,193.9	33.4	51.9	71.1	87.1	116.3	127.7	121.4	120.3	239.4	127.2	57.5	18.1	22.3
Select white oaks	2,097.6	78.8	113.8	170.3	232.9	235.2	252.5	299.7	218.8	287.3	121.1	42.8	18.6	26.1
Soft maple	2,829.5	355.6	425.4	419.6	389.1	327.5	285.7	219.5	135.5	131.4	105.5	9.1	25.6	0.0
Sweetgum	2,338.1	224.8	284.6	336.5	313.6	307.6	296.1	198.4	153.0	136.2	55.9	22.4	9.1	0.0
Tupelo and blackgum	1,654.5	107.7	174.4	212.6	240.4	248.2	239.5	155.8	109.3	98.6	44.0	23.8	0.0	0.0
Yellow birch	74.9	10.4	14.7	11.2	14.3	12.0	0.0	1.8	3.6	3.1	3.9	0.0	0.0	0.0
Yellow-poplar	5,201.7	187.2	304.1	402.2	498.0	598.0	662.9	613.9	561.6	725.5	393.2	144.5	63.3	46.4
Total hardwoods	24,867.3	1,822.5	2,363.8	2,736.0	2,954.3	2,979.3	2,965.8	2,465.0	1,918.7	2,557.1	1,176.9	469.1	220.6	238.0
All species	38,353.2	2,928.4	4,280.3	5,020.1	5,218.8	4,880.7	4,373.6	3,449.6	2,529.4	3,174.9	1,431.9	563.6	241.3	260.7

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
^{a} Excludes rotten, missing, and form cull defects volume.

Table D.16—Net[a] volume of live trees on timberland by forest-type group and stand origin, North Carolina, 2013

Forest-type group	Total	Natural stands	Artificial regeneration
		million cubic feet	
Softwood types			
White-red-jack pine	438.5	351.8	86.8
Spruce-fir	36.6	34.9	1.7
Longleaf-slash pine	544.7	383.1	161.6
Loblolly-shortleaf pine	10,398.8	6,068.1	4,330.7
Other eastern softwoods	19.5	19.5	0.0
Total softwoods	11,438.1	6,857.3	4,580.8
Hardwood types			
Oak-pine	4,214.2	4,099.6	114.6
Oak-hickory	17,316.9	17,276.0	40.9
Oak-gum-cypress	3,861.0	3,859.5	1.5
Elm-ash-cottonwood	1,068.9	1,068.4	0.5
Maple-beech-birch	137.0	137.0	0.0
Aspen-birch	3.1	3.1	0.0
Other hardwoods	291.1	291.1	0.0
Exotic hardwoods	17.6	17.6	0.0
Total hardwoods	26,909.8	26,752.4	157.5
Nonstocked	5.3	5.3	0.0
All groups	38,353.2	33,615.0	4,738.3

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
[a] Excludes rotten, missing, and form cull defects volume.

Table D.17—Net[a] volume of growing-stock trees on timberland by species group and diameter class, North Carolina, 2013

Species group	All classes	Diameter class (inches at breast height)												
		5.0–6.9	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–24.9	25.0–28.9	29.0–32.9	33.0–36.9	37.0+
		million cubic feet												
Softwood														
Cypress	337.0	6.7	13.5	26.2	26.9	36.6	64.3	41.1	32.3	69.6	8.0	0.0	11.9	0.0
Eastern hemlock	209.8	14.8	21.4	17.7	27.7	29.9	24.4	19.1	24.3	10.5	19.8	0.0	0.0	0.0
Eastern white and red pines	991.2	42.4	72.3	86.3	89.7	94.4	101.9	109.4	125.0	112.7	93.4	63.6	0.0	0.0
Loblolly and shortleaf pines	9,441.5	818.9	1,428.3	1,684.0	1,641.1	1,338.4	941.1	707.6	343.3	377.2	119.6	22.2	8.8	10.9
Longleaf and slash pines	598.8	31.0	63.1	80.5	120.3	105.8	105.7	46.3	29.8	16.3	0.0	0.0	0.0	0.0
Other eastern softwoods	103.1	19.7	24.5	22.4	19.2	9.5	3.1	4.8	0.0	0.0	0.0	0.0	0.0	0.0
Other yellow pines	1,450.4	125.2	242.5	295.8	290.1	250.9	142.0	43.2	38.5	13.0	9.3	0.0	0.0	0.0
Spruce and balsam fir	31.2	2.4	4.4	5.3	6.6	4.8	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	13,163.1	1,061.0	1,869.8	2,218.4	2,221.5	1,870.3	1,390.4	971.5	593.3	599.4	250.1	85.8	20.7	10.9
Hardwood														
Ash	612.8	38.9	50.0	61.6	71.2	67.1	79.9	62.3	44.7	115.3	5.8	6.3	0.0	9.6
Basswood	141.2	7.7	10.5	6.7	9.7	26.7	23.4	18.2	12.3	25.9	0.0	0.0	0.0	0.0
Beech	317.0	15.9	18.5	32.8	30.2	33.5	29.5	42.6	12.0	34.3	22.8	0.0	0.0	44.8
Black walnut	80.6	3.8	7.2	10.0	13.1	14.0	14.5	2.7	9.8	5.5	0.0	0.0	0.0	0.0
Cottonwood and aspen	28.6	1.7	2.4	0.5	1.4	2.6	6.4	3.0	3.3	7.5	0.0	0.0	0.0	0.0
Hard maple	147.2	11.2	15.5	17.5	17.8	13.9	15.4	10.9	8.6	31.1	5.3	0.0	0.0	0.0
Hickory	989.3	49.9	84.8	120.8	150.2	154.7	170.7	110.6	54.6	65.6	20.8	6.6	0.0	0.0
Other eastern hard hardwoods	581.5	72.4	96.9	104.6	94.4	74.8	52.0	37.1	14.7	26.0	4.6	4.0	0.0	0.0
Other eastern soft hardwoods	996.7	113.8	121.8	130.1	122.8	113.7	102.6	75.9	55.2	103.0	30.9	18.0	8.7	0.0
Other red oaks	2,174.0	107.3	166.1	232.7	264.8	306.3	302.0	200.3	180.9	224.4	77.0	57.4	16.8	38.3
Other white oaks	1,617.9	47.8	98.2	166.7	183.8	197.2	203.9	199.4	149.4	195.2	98.6	40.5	30.0	7.1
Select red oaks	1,144.2	29.9	48.4	66.5	83.2	112.6	125.6	116.3	120.3	230.3	120.6	54.7	13.5	22.3
Select white oaks	1,926.2	69.4	105.9	160.2	219.6	229.3	240.9	290.4	207.2	262.7	93.5	18.4	14.2	14.5
Soft maple	2,162.9	250.7	313.2	322.4	304.1	259.1	240.6	178.9	97.3	95.7	80.6	5.6	14.6	0.0
Sweetgum	2,210.6	202.0	264.8	320.6	290.1	297.3	284.7	195.5	149.8	124.2	50.1	22.4	9.1	0.0
Tupelo and blackgum	1,532.1	82.9	154.6	197.8	223.5	238.8	224.2	151.4	104.5	91.4	40.7	22.3	0.0	0.0
Yellow birch	54.7	8.1	11.5	8.0	12.1	10.1	0.0	1.8	0.0	3.1	0.0	0.0	0.0	0.0
Yellow-poplar	5,086.5	177.6	290.0	388.5	485.4	583.5	654.2	604.8	557.9	721.3	387.2	132.8	57.1	46.4
Total hardwoods	21,803.9	1,290.8	1,860.2	2,348.1	2,577.4	2,735.3	2,770.6	2,302.0	1,782.6	2,362.5	1,038.5	388.9	164.0	183.0
All species	34,967.0	2,351.9	3,730.0	4,566.5	4,798.9	4,605.5	4,161.0	3,273.5	2,375.9	2,961.9	1,288.6	474.7	184.7	193.9

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
[a] Excludes rotten, missing, and form cull defects volume.

Table D.18—Net[a] volume of growing-stock trees on timberland by species group and ownership group, North Carolina, 2013

Species group	All ownerships	U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
				Ownership group		
				million cubic feet		
Softwood						
Cypress	337.0	9.6	0.0	28.4	29.6	269.5
Eastern hemlock	209.8	69.5	0.0	12.6	0.0	127.7
Eastern white and red pines	991.2	155.0	0.0	39.4	2.6	794.2
Loblolly and shortleaf pines	9,441.5	210.4	199.4	516.8	962.1	7,553.0
Longleaf and slash pines	598.8	26.0	159.9	85.5	19.3	308.0
Other eastern softwoods	103.1	0.1	1.4	18.6	1.9	81.2
Other yellow pines	1,450.4	141.5	31.3	141.4	24.0	1,112.2
Spruce and balsam fir	31.2	17.9	0.0	10.6	0.0	2.8
Total softwoods	13,163.1	630.0	391.9	853.2	1,039.5	10,248.5
Hardwood						
Ash	612.8	27.1	11.0	54.7	28.8	491.1
Basswood	141.2	50.6	0.0	0.1	12.1	78.3
Beech	317.0	37.5	1.3	9.9	0.0	268.2
Black walnut	80.6	0.0	0.0	1.9	2.0	76.7
Cottonwood and aspen	28.6	1.5	0.0	6.1	1.1	20.0
Hard maple	147.2	42.3	2.2	4.8	0.1	97.8
Hickory	989.3	108.6	12.9	41.6	11.0	815.3
Other eastern hard hardwoods	581.5	122.7	1.9	16.7	2.4	437.6
Other eastern soft hardwoods	996.7	118.8	19.6	58.6	27.3	772.4
Other red oaks	2,174.0	232.4	19.7	81.8	26.4	1,813.8
Other white oaks	1,617.9	435.1	5.1	79.5	5.4	1,092.8
Select red oaks	1,144.2	277.7	7.1	67.6	11.6	780.3
Select white oaks	1,926.2	166.8	5.7	81.1	7.0	1,665.5
Soft maple	2,162.9	293.9	15.3	147.1	66.2	1,640.3
Sweetgum	2,210.6	15.5	49.9	147.1	65.5	1,932.7
Tupelo and blackgum	1,532.1	65.1	26.5	106.1	217.9	1,116.5
Yellow birch	54.7	30.9	0.0	0.2	0.0	23.6
Yellow-poplar	5,086.5	471.0	27.0	179.6	51.3	4,357.5
Total hardwoods	21,803.9	2,497.6	205.4	1,084.6	536.0	17,480.5
All species	34,967.0	3,127.6	597.3	1,937.7	1,575.5	27,728.9

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
[a] Excludes rotten, missing, and form cull defects volume.

Table D.19—Net[a] volume of sawtimber trees on timberland by species group and diameter class, North Carolina, 2013

Species group	All classes	Diameter class (inches at breast height)										
		9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–24.9	25.0–28.9	29.0–32.9	33.0–36.9	37.0+
		million board feet[b]										
Softwood												
Cypress	1,556.6	80.2	102.2	160.4	310.7	211.4	173.4	394.1	48.1	0.0	75.9	0.0
Eastern hemlock	870.5	60.7	116.2	141.5	124.8	103.3	138.0	62.1	123.8	0.0	0.0	0.0
Eastern white and red pines	4,834.7	313.1	394.4	467.9	547.0	623.1	745.2	700.9	612.3	430.9	0.0	0.0
Loblolly and shortleaf pines	35,881.2	6,105.8	7,423.6	6,920.0	5,321.7	4,269.5	2,177.0	2,513.1	839.7	161.5	66.1	83.1
Longleaf and slash pines	2,637.0	315.3	571.2	563.7	609.1	281.7	188.6	107.5	0.0	0.0	0.0	0.0
Other eastern softwoods	273.9	88.7	90.2	49.7	17.6	27.7	0.0	0.0	0.0	0.0	0.0	0.0
Other yellow pines	4,958.4	1,087.4	1,264.3	1,220.5	754.0	249.8	234.7	85.4	62.3	0.0	0.0	0.0
Spruce and balsam fir	115.1	19.6	29.6	24.0	41.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	51,127.5	8,070.8	9,991.8	9,547.7	7,726.8	5,766.5	3,657.0	3,863.2	1,686.3	592.4	142.0	83.1
Hardwood												
Ash	2,099.1	0.0	231.6	259.3	346.7	294.5	223.3	613.6	32.8	37.4	0.0	60.1
Basswood	519.6	0.0	32.8	106.4	101.5	84.6	60.1	134.2	0.0	0.0	0.0	0.0
Beech	1,009.0	0.0	110.4	127.4	114.9	169.4	48.4	140.8	95.8	0.0	0.0	201.8
Black walnut	225.4	0.0	44.4	50.9	55.9	10.7	40.3	23.3	0.0	0.0	0.0	0.0
Cottonwood and aspen	119.9	0.0	4.5	10.7	30.1	14.7	17.4	42.4	0.0	0.0	0.0	0.0
Hard maple	457.8	0.0	65.2	56.4	66.7	49.6	40.4	152.4	27.1	0.0	0.0	0.0
Hickory	3,257.8	0.0	519.2	629.1	770.1	541.7	281.1	355.6	121.4	39.5	0.0	0.0
Other eastern hard hardwoods	1,203.9	0.0	327.7	288.0	212.4	164.0	64.4	111.9	18.6	16.7	0.0	0.0
Other eastern soft hardwoods	2,832.1	0.0	416.2	449.4	451.7	361.8	275.5	543.2	178.9	106.1	49.1	0.0
Other red oaks	7,896.3	0.0	947.4	1,268.3	1,370.2	983.4	934.4	1,226.1	451.7	352.2	107.8	254.7
Other white oaks	5,871.2	0.0	616.7	764.5	875.9	918.3	726.3	997.0	531.3	226.2	172.7	42.3
Select red oaks	4,675.7	0.0	279.5	433.8	536.5	524.1	581.4	1,159.5	642.1	299.3	74.9	144.6
Select white oaks	7,394.4	0.0	749.8	920.5	1,067.6	1,386.7	1,047.4	1,407.1	526.4	107.0	90.8	91.1
Soft maple	5,304.5	0.0	996.5	991.0	1,012.2	811.8	466.4	482.2	429.6	31.1	83.8	0.0
Sweetgum	6,797.4	0.0	1,035.4	1,277.5	1,374.9	1,019.0	832.7	731.8	315.9	148.6	61.7	0.0
Tupelo and blackgum	4,660.0	0.0	705.0	907.7	957.1	710.5	522.4	491.6	233.9	131.7	0.0	0.0
Yellow birch	105.7	0.0	41.6	40.3	0.0	8.2	0.0	15.6	0.0	0.0	0.0	0.0
Yellow-poplar	22,510.5	0.0	1,744.2	2,540.1	3,216.2	3,241.5	3,192.8	4,401.5	2,524.6	907.7	404.5	337.4
Total hardwoods	76,940.3	0.0	8,868.3	11,121.2	12,560.5	11,294.6	9,354.8	13,029.9	6,130.2	2,403.5	1,045.4	1,132.0
All species	128,067.8	8,070.8	18,860.0	20,668.8	20,287.4	17,061.0	13,011.8	16,893.1	7,816.4	2,995.9	1,187.4	1,215.0

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Excludes rotten, missing, and form cull defects volume.

[b] International ¼-inch rule.

Table D.20—Net[a] volume of sawtimber trees on timberland by species group and ownership group, North Carolina, 2013

Species group	All ownerships	Ownership group				
		U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
		million board feet[b]				
Softwood						
Cypress	1,556.6	52.1	0.0	140.1	136.5	1,227.9
Eastern hemlock	870.5	299.4	0.0	62.8	0.0	508.3
Eastern white and red pines	4,834.7	797.9	0.0	183.9	5.4	3,847.5
Loblolly and shortleaf pines	35,881.2	1,084.8	986.2	2,212.6	3,762.9	27,834.7
Longleaf and slash pines	2,637.0	138.2	788.2	307.6	53.3	1,349.6
Other eastern softwoods	273.9	0.0	4.2	54.8	7.9	207.1
Other yellow pines	4,958.4	548.0	121.2	539.7	90.2	3,659.3
Spruce and balsam fir	115.1	69.8	0.0	34.1	0.0	11.3
Total softwoods	51,127.5	2,990.2	1,899.8	3,535.7	4,056.1	38,645.7
Hardwood						
Ash	2,099.1	105.1	31.0	219.0	109.4	1,634.7
Basswood	519.6	202.4	0.0	0.0	49.2	268.0
Beech	1,009.0	94.7	3.6	31.3	0.0	879.4
Black walnut	225.4	0.0	0.0	2.4	6.7	216.4
Cottonwood and aspen	119.9	7.3	0.0	24.5	4.9	83.2
Hard maple	457.8	121.7	9.4	13.4	0.0	313.3
Hickory	3,257.8	359.5	43.4	175.8	30.9	2,648.1
Other eastern hard hardwoods	1,203.9	233.7	0.0	48.4	2.8	918.9
Other eastern soft hardwoods	2,832.1	349.2	14.5	193.8	93.6	2,181.0
Other red oaks	7,896.3	851.3	55.3	273.3	76.6	6,639.8
Other white oaks	5,871.2	1,743.7	25.9	286.2	14.3	3,801.1
Select red oaks	4,675.7	1,191.3	35.1	272.8	45.0	3,131.5
Select white oaks	7,394.4	716.8	18.7	288.6	12.1	6,358.3
Soft maple	5,304.5	735.4	20.9	413.5	202.0	3,932.7
Sweetgum	6,797.4	41.0	187.2	548.3	170.5	5,850.4
Tupelo and blackgum	4,660.0	191.6	82.2	296.6	759.0	3,330.6
Yellow birch	105.7	69.4	0.0	0.0	0.0	36.3
Yellow-poplar	22,510.5	2,243.0	119.3	835.4	246.1	19,066.7
Total hardwoods	76,940.3	9,257.4	646.3	3,923.2	1,823.2	61,290.3
All species	128,067.8	12,247.5	2,546.1	7,458.9	5,879.3	99,935.9

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
[a] Excludes rotten, missing, and form cull defects volume.
[b] International ¼-inch rule.

Table D.21—Aboveground dry weight[a] of live trees on timberland by species group and diameter class, North Carolina, 2013

Species group	All classes	Diameter class (inches at breast height)														
		1.0–2.9	3.0–4.9	5.0–6.9	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–24.9	25.0–28.9	29.0–32.9	33.0–36.9	37.0+
		thousand tons														
Softwood																
Cypress	8,090.5	52.6	64.6	138.3	258.1	531.1	602.9	824.4	1,497.8	978.3	840.6	1,749.0	202.2	0.0	350.7	0.0
Eastern hemlock	7,150.7	120.5	318.5	602.9	696.6	532.6	768.6	822.7	632.1	491.2	754.7	267.6	504.6	178.3	0.0	459.8
Eastern white and red pines	19,029.9	237.1	351.7	974.0	1,488.8	1,749.1	1,773.2	1,786.3	1,881.4	2,004.7	2,204.5	1,974.4	1,568.6	1,035.9	0.0	0.0
Loblolly and shortleaf pines	227,333.3	3,232.1	9,791.3	22,361.0	33,610.8	37,889.2	36,096.9	29,202.1	20,495.4	15,360.9	7,408.5	8,261.9	2,555.9	647.7	187.9	231.5
Longleaf and slash pines	15,013.2	165.9	470.7	839.0	1,529.2	1,902.8	2,815.6	2,466.7	2,471.9	1,084.5	807.1	459.9	0.0	0.0	0.0	0.0
Other eastern softwoods	4,801.6	487.5	657.5	891.7	725.1	682.7	622.1	306.1	130.4	157.8	37.3	0.0	103.4	0.0	0.0	0.0
Other yellow pines	37,264.0	1,041.8	2,182.4	3,467.8	5,755.8	7,001.4	6,576.3	5,659.8	3,111.2	1,012.5	856.7	403.7	194.6	0.0	0.0	0.0
Spruce and balsam fir	711.0	7.6	0.0	67.7	99.5	113.6	151.8	104.1	166.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	319,394.1	5,345.0	13,836.6	29,342.5	44,163.9	50,402.5	49,407.3	41,172.3	30,386.9	21,089.9	12,909.5	13,116.5	5,129.4	1,862.0	538.6	691.3
Hardwood																
Ash	14,575.1	664.5	1,214.7	1,265.4	1,360.7	1,428.1	1,548.7	1,327.5	1,574.4	1,116.5	830.4	1,908.3	104.2	93.9	0.0	137.9
Basswood	3,107.5	44.5	43.8	147.6	208.2	142.8	201.4	559.8	500.6	412.8	269.0	577.0	0.0	0.0	0.0	0.0
Beech	13,015.4	463.9	583.4	616.9	665.8	1,054.3	1,024.7	1,199.8	1,037.4	1,446.6	671.9	1,170.2	934.4	556.4	0.0	1,589.8
Black walnut	3,336.5	36.2	92.6	148.7	271.4	404.7	476.4	537.9	580.3	170.8	331.6	285.8	0.0	0.0	0.0	0.0
Cottonwood and aspen	763.2	11.7	26.6	37.8	49.1	29.5	28.1	56.4	139.2	64.5	74.4	245.8	0.0	0.0	0.0	0.0
Eastern noncommercial hardwoods	23,852.7	4,210.9	5,095.9	4,958.4	4,079.1	2,174.4	1,511.2	773.1	232.6	278.3	172.4	211.5	155.0	0.0	0.0	0.0
Hard maple	5,924.5	299.1	387.6	337.1	490.4	552.8	595.3	412.9	565.5	326.5	249.5	1,016.4	164.4	222.9	0.0	303.9
Hickory	30,136.5	835.5	1,093.4	1,541.6	2,361.7	3,231.8	4,160.5	4,216.9	4,957.2	3,217.7	1,657.6	1,999.3	666.1	197.2	0.0	0.0
Other eastern hard hardwoods	27,154.2	2,894.2	3,210.9	2,680.1	3,072.8	3,400.5	3,464.9	2,725.8	1,866.2	1,435.3	811.8	1,027.4	326.2	238.1	0.0	0.0
Other eastern soft hardwoods	35,671.1	3,116.7	4,529.3	3,842.6	3,560.6	3,459.1	3,453.9	2,914.0	2,654.6	2,007.4	1,619.8	2,805.7	765.9	605.3	205.2	130.8
Other red oaks	75,438.6	2,308.3	3,499.1	3,941.5	5,463.6	6,978.2	8,130.3	9,020.4	9,021.9	6,283.5	5,460.9	7,354.3	3,077.3	2,036.7	999.8	1,862.7
Other white oaks	52,292.9	380.3	1,002.8	1,574.2	2,839.4	4,698.0	5,429.6	5,825.2	6,051.2	6,028.6	4,691.6	6,913.5	3,319.3	1,354.9	1,542.7	641.4
Select red oaks	34,178.7	325.2	567.9	883.7	1,367.0	1,867.8	2,332.1	3,153.5	3,514.9	3,411.1	3,393.6	6,741.8	3,705.8	1,712.8	527.9	673.5
Select white oaks	61,093.3	740.3	1,416.5	2,122.7	2,993.0	4,486.9	6,278.9	6,456.7	7,018.2	8,487.3	6,277.2	8,482.3	3,588.7	1,294.9	650.5	799.2
Soft maple	85,447.2	6,924.9	8,891.7	9,105.6	10,498.3	10,174.4	9,467.3	7,951.7	7,035.3	5,321.5	3,403.3	3,182.9	2,616.7	222.0	651.6	0.0
Sweetgum	63,527.2	4,513.8	6,098.8	5,779.7	6,316.1	7,258.6	6,847.1	6,825.7	6,663.8	4,479.8	3,492.0	3,180.3	1,320.1	533.2	217.3	0.0
Tupelo and blackgum	40,314.7	1,440.7	2,033.2	2,202.1	3,492.2	4,326.4	5,124.7	5,485.4	5,502.6	3,677.1	2,631.5	2,523.9	1,213.8	660.9	0.0	0.0
Yellow birch	2,168.8	80.0	166.2	199.5	340.2	282.1	378.3	322.7	0.0	48.8	114.8	93.0	143.2	0.0	0.0	0.0
Yellow-poplar	115,811.0	2,172.4	3,660.2	4,061.6	6,177.1	8,049.9	10,147.9	12,386.4	13,829.9	12,991.9	12,012.5	15,686.9	8,722.7	3,261.5	1,609.5	1,040.7
Total hardwoods	687,809.1	31,463.2	43,614.6	45,446.8	55,606.8	64,000.5	70,601.2	72,151.7	72,745.9	61,206.2	48,166.9	65,406.2	30,823.8	12,990.7	6,404.5	7,180.1
All species	1,007,203.2	36,808.2	57,451.3	74,789.2	99,770.7	114,403.0	120,008.5	113,324.0	103,132.7	82,296.1	61,076.4	78,522.7	35,953.1	14,852.6	6,943.1	7,871.4

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Calculations based on TREE_REGIONAL_BIOMASS.REGIONAL_DRYBIOT table in Forest Inventory and Analysis Database users guide.

Table D.22—Aboveground green weight[a] of live trees on timberland by species group and diameter class, North Carolina, 2013

Species group	All classes	Diameter class (inches at breast height)													
		1.0–2.9	3.0–4.9	5.0–6.9	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–24.9	25.0–28.9	29.0–32.9	33.0–36.9	37.0+
		thousand tons													
Softwood																
Cypress	16,181.0	105.2	129.1	276.5	516.2	1,062.2	1,205.7	1,648.7	2,995.6	1,956.6	1,681.3	3,497.9	404.4	0.0	701.5	0.0
Eastern hemlock	14,301.4	241.1	637.0	1,205.7	1,393.2	1,065.2	1,537.1	1,645.5	1,264.1	982.4	1,509.3	535.3	1,009.3	356.6	0.0	919.5
Eastern white and red pines	38,059.7	474.2	703.4	1,948.1	2,977.6	3,498.1	3,546.4	3,572.6	3,762.7	4,009.4	4,409.0	3,948.9	3,137.3	2,071.9	0.0	0.0
Loblolly and shortleaf pines	454,666.6	6,464.1	19,582.6	44,722.1	67,221.7	75,778.4	72,193.8	58,404.2	40,990.8	30,721.9	14,817.1	16,523.9	5,111.9	1,295.4	375.7	463.1
Longleaf and slash pines	30,026.4	331.8	941.3	1,678.0	3,058.4	3,805.6	5,631.2	4,933.4	4,943.8	2,168.9	1,614.2	919.7	0.0	0.0	0.0	0.0
Other eastern softwoods	9,603.2	974.9	1,315.0	1,783.5	1,450.2	1,365.5	1,244.1	612.2	260.8	315.7	74.7	0.0	206.8	0.0	0.0	0.0
Other yellow pines	74,528.0	2,083.6	4,364.8	6,935.5	11,511.7	14,002.8	13,152.7	11,319.6	6,222.4	2,024.9	1,713.3	807.5	389.2	0.0	0.0	0.0
Spruce and balsam fir	1,422.0	15.1	0.0	135.5	198.9	227.3	303.5	208.3	333.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	638,788.3	10,690.0	27,673.3	58,684.9	88,327.9	100,805.0	98,814.5	82,344.6	60,773.7	42,179.9	25,819.0	26,233.1	10,258.8	3,723.9	1,077.2	1,382.6
Hardwood																
Ash	29,150.1	1,328.9	2,429.4	2,530.8	2,721.3	2,856.3	3,097.5	2,654.9	3,148.9	2,233.1	1,660.7	3,816.5	208.3	187.8	0.0	275.7
Basswood	6,214.9	89.0	87.5	295.3	416.4	285.6	402.8	1,119.6	1,001.3	825.6	538.0	1,153.9	0.0	0.0	0.0	0.0
Beech	26,030.8	927.7	1,166.9	1,233.8	1,331.5	2,108.6	2,049.4	2,399.5	2,074.9	2,893.2	1,343.9	2,340.4	1,868.8	1,112.7	0.0	3,179.7
Black walnut	6,673.1	72.5	185.2	297.4	542.7	809.5	952.8	1,075.9	1,160.6	341.6	663.2	571.6	0.0	0.0	0.0	0.0
Cottonwood and aspen	1,526.3	23.5	53.3	75.7	98.3	59.0	56.2	112.7	278.4	129.0	148.8	491.5	0.0	0.0	0.0	0.0
Eastern noncommercial hardwoods	47,705.4	8,421.8	10,191.9	9,916.7	8,158.3	4,348.8	3,022.4	1,546.1	465.3	556.5	344.7	422.9	310.0	0.0	0.0	0.0
Hard maple	11,849.0	598.2	775.1	674.2	980.9	1,105.7	1,190.6	825.9	1,131.0	653.1	499.1	2,032.8	328.8	445.9	0.0	607.8
Hickory	60,273.0	1,671.1	2,186.8	3,083.2	4,723.4	6,463.7	8,320.9	8,433.7	9,914.3	6,435.4	3,315.3	3,998.7	1,332.2	394.3	0.0	0.0
Other eastern hard hardwoods	54,308.4	5,788.4	6,421.8	5,360.2	6,145.5	6,801.1	6,929.9	5,451.6	3,732.4	2,870.5	1,623.6	2,054.8	652.5	476.2	0.0	0.0
Other eastern soft hardwoods	71,342.1	6,233.4	9,058.6	7,685.1	7,121.6	6,918.2	6,907.8	5,828.0	5,309.1	4,014.9	3,239.6	5,611.5	1,531.8	1,210.6	410.3	261.6
Other red oaks	150,877.3	4,616.6	6,998.2	7,883.0	10,927.2	13,956.4	16,260.7	18,040.8	18,043.9	12,567.1	10,921.8	14,708.7	6,154.6	4,073.3	1,999.5	3,725.5
Other white oaks	104,585.8	760.7	2,005.6	3,148.5	5,678.8	9,395.9	10,859.2	11,650.4	12,102.5	12,057.3	9,383.3	13,827.1	6,638.7	2,709.7	3,085.3	1,282.8
Select red oaks	68,357.3	650.4	1,135.7	1,767.3	2,734.0	3,735.6	4,664.1	6,307.0	7,029.8	6,822.2	6,787.2	13,483.6	7,411.5	3,425.7	1,055.9	1,347.1
Select white oaks	122,186.6	1,480.7	2,833.0	4,245.5	5,985.9	8,973.9	12,557.8	12,913.3	14,036.3	16,974.7	12,554.4	16,964.6	7,177.3	2,589.8	1,301.1	1,598.4
Soft maple	170,894.4	13,849.8	17,783.5	18,211.2	20,996.5	20,348.8	18,934.5	15,903.4	14,070.5	10,643.0	6,806.7	6,365.8	5,233.4	444.0	1,303.3	0.0
Sweetgum	127,054.5	9,027.6	12,197.7	11,559.4	12,632.2	14,517.2	13,694.2	13,651.4	13,327.5	8,959.7	6,985.8	6,360.5	2,640.1	1,066.5	434.6	0.0
Tupelo and blackgum	80,629.4	2,881.4	4,066.4	4,404.2	6,984.5	8,652.9	10,249.3	10,970.8	11,005.2	7,354.3	5,263.1	5,047.8	2,427.7	1,321.9	0.0	0.0
Yellow birch	4,337.6	160.1	332.3	399.0	680.4	564.1	756.6	645.4	0.0	97.6	229.6	186.0	286.4	0.0	0.0	0.0
Yellow-poplar	231,622.0	4,344.8	7,320.3	8,123.2	12,354.1	16,099.7	20,295.7	24,772.8	27,659.8	25,983.8	24,025.1	31,373.8	17,445.4	6,523.0	3,218.9	2,081.5
Total hardwoods	1,375,618.1	62,926.5	87,229.3	90,893.6	111,213.6	128,000.9	141,202.5	144,303.5	145,491.7	122,412.4	96,333.8	130,812.4	61,647.5	25,981.4	12,809.0	14,360.1
All species	2,014,406.4	73,616.5	114,902.5	149,578.5	199,541.5	228,806.0	240,017.0	226,648.0	206,265.4	164,592.2	122,152.8	157,045.5	71,906.3	29,705.3	13,886.2	15,742.7

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Calculations based on TREE_REGIONAL_BIOMASS.REGIONAL_DRYBIOT table in Forest Inventory and Analysis Database users guide.

Table D.23—Merchantable dry weight^a of live trees on timberland by species group and diameter class, North Carolina, 2013

Species group	All classes	Diameter class (inches at breast height)												
		5.0–6.9	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–24.9	25.0–28.9	29.0–32.9	33.0–36.9	37.0+
		thousand tons												
Softwood														
Cypress	6,539.2	94.4	198.6	427.5	477.9	682.1	1,245.3	815.8	702.2	1,460.8	169.5	0.0	0.0	0.0
Eastern hemlock	5,438.6	426.4	563.6	445.7	650.1	705.8	544.0	424.4	654.0	232.3	438.7	93.1	0.0	260.4
Eastern white and red pines	15,719.3	729.9	1,229.1	1,478.4	1,519.5	1,538.9	1,619.3	1,730.1	1,906.2	1,717.0	1,352.0	898.7	0.0	0.0
Loblolly and shortleaf pines	182,228.5	16,013.2	27,641.6	32,516.0	31,529.2	25,724.5	18,149.6	13,587.0	6,587.5	7,311.5	2,282.5	509.6	168.6	207.9
Longleaf and slash pines	12,472.2	609.3	1,267.9	1,637.8	2,471.4	2,183.1	2,198.6	967.9	723.3	412.9	0.0	0.0	0.0	0.0
Other eastern softwoods	3,011.9	673.3	597.8	577.2	532.3	263.0	111.9	135.0	32.0	0.0	89.6	0.0	0.0	0.0
Other yellow pines	28,969.2	2,607.5	4,791.5	5,999.9	5,704.5	4,948.3	2,732.1	896.4	756.6	359.2	173.2	0.0	0.0	0.0
Spruce and balsam fir	586.9	48.7	80.7	95.1	129.3	89.4	143.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	254,965.9	21,202.7	36,370.9	43,177.5	43,014.1	36,135.1	26,744.6	18,556.7	11,361.7	11,493.8	4,505.5	1,501.3	433.6	468.2
Hardwood														
Ash	10,484.0	884.7	1,094.3	1,180.4	1,286.2	1,129.7	1,327.8	978.5	698.6	1,617.1	81.8	83.0	0.0	122.0
Basswood	2,538.0	104.2	167.2	119.7	168.9	480.1	429.3	338.5	233.3	496.8	0.0	0.0	0.0	0.0
Beech	9,262.4	402.1	491.5	820.3	804.0	935.4	819.3	1,154.7	492.5	923.3	713.4	402.6	0.0	1,303.4
Black walnut	2,513.8	99.8	194.7	314.4	379.9	429.6	456.0	138.8	267.5	233.2	0.0	0.0	0.0	0.0
Cottonwood and aspen	613.2	25.9	39.5	24.7	23.8	48.4	120.3	55.8	64.5	210.3	0.0	0.0	0.0	0.0
Eastern noncommercial hardwoods	10,637.3	3,281.9	3,044.3	1,686.7	1,186.7	607.2	177.6	219.8	143.4	162.0	127.7	0.0	0.0	0.0
Hard maple	3,869.9	225.1	363.0	425.7	476.0	327.5	453.8	257.3	203.2	784.5	131.7	72.9	0.0	149.3
Hickory	22,410.0	996.4	1,776.9	2,565.8	3,347.7	3,437.2	4,010.7	2,641.2	1,320.5	1,636.6	511.8	165.2	0.0	0.0
Other eastern hard hardwoods	15,876.8	1,749.7	2,297.4	2,638.9	2,700.0	2,131.0	1,478.3	1,121.9	598.1	789.3	245.7	126.6	0.0	0.0
Other eastern soft hardwoods	22,530.5	2,689.0	2,819.7	2,842.3	2,845.3	2,431.5	2,244.9	1,705.4	1,347.8	2,260.9	656.3	451.6	178.8	57.0
Other red oaks	54,523.9	2,607.7	4,108.1	5,465.0	6,471.8	7,214.9	7,244.7	5,018.2	4,370.4	5,800.9	2,416.8	1,609.1	767.5	1,428.9
Other white oaks	40,262.4	1,095.9	2,195.3	3,728.3	4,342.7	4,726.1	4,879.7	4,867.5	3,780.5	5,451.5	2,627.0	1,071.8	1,036.8	459.1
Select red oaks	26,535.9	634.7	1,064.1	1,488.8	1,868.6	2,547.9	2,845.2	2,717.2	2,734.1	5,439.7	2,914.7	1,316.6	413.0	551.0
Select white oaks	46,760.0	1,446.6	2,274.2	3,526.9	4,985.7	5,175.9	5,665.1	6,835.9	5,061.3	6,753.0	2,887.5	1,035.5	459.9	652.4
Soft maple	54,657.5	6,371.8	8,188.2	8,134.2	7,618.0	6,454.5	5,633.4	4,322.2	2,659.8	2,565.3	2,045.0	175.9	489.1	0.0
Sweetgum	44,031.3	3,930.0	5,069.2	6,104.8	5,822.3	5,843.7	5,728.8	3,896.8	3,050.1	2,759.0	1,159.8	473.7	193.1	0.0
Tupelo and blackgum	30,029.2	1,566.0	2,785.8	3,544.1	4,214.2	4,574.7	4,584.6	3,081.2	2,204.2	2,020.1	940.5	513.9	0.0	0.0
Yellow birch	1,461.6	133.2	257.0	221.0	301.5	260.3	0.0	39.7	83.2	72.1	93.7	0.0	0.0	0.0
Yellow-poplar	95,614.7	3,038.1	5,154.3	6,920.1	8,805.3	10,835.3	12,228.8	11,480.6	10,619.9	13,888.6	7,632.8	2,833.2	1,253.8	923.8
Total hardwoods	494,612.5	31,282.8	43,384.8	51,752.1	57,648.5	59,590.9	60,328.2	50,871.1	39,932.8	53,864.2	25,186.1	10,331.7	4,792.0	5,647.0
All species	749,578.3	52,485.5	79,755.7	94,929.7	100,662.6	95,726.0	87,072.8	69,427.8	51,294.5	65,358.0	29,691.7	11,833.0	5,225.6	6,115.3

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

^{a} Calculations based on TREE_REGIONAL_BIOMASS.REGIONAL_DRYBIOT table in Forest Inventory and Analysis Database users guide.

Table D.24—Total carbon[a] of live trees on forest land by ownership class and land status, North Carolina, 2013

Ownership class	All forest land	Unreserved			Reserved		
		Total	Timberland	Un-productive	Total	Productive	Un-productive
				thousand tons			
U.S. Forest Service							
National forest	49,500.4	45,893.3	45,837.9	55.4	3,607.1	3,606.3	0.8
Total	49,500.4	45,893.3	45,837.9	55.4	3,607.1	3,606.3	0.8
Other Federal							
National Park Service	13,307.9	0.0	0.0	0.0	13,307.9	13,294.3	13.6
U.S. Fish and Wildlife Service	5,601.6	0.0	0.0	0.0	5,601.6	5,431.7	169.9
Dept. of Defense/Dept. of Energy	7,764.0	7,764.0	7,756.7	7.3	0.0	0.0	0.0
Other Federal	187.3	187.3	187.3	0.0	0.0	0.0	0.0
Total	26,860.8	7,951.3	7,944.0	7.3	18,909.5	18,726.0	183.5
State and local government							
State	17,404.7	17,126.9	17,095.6	31.2	277.8	277.8	0.0
Local	9,829.1	9,829.1	9,829.1	0.0	0.0	0.0	0.0
Total	27,233.8	26,956.0	26,924.8	31.2	277.8	277.8	0.0
Forest industry							
Corporate	20,646.1	20,646.1	20,646.1	0.0	0.0	0.0	0.0
Individual	196.1	196.1	196.1	0.0	0.0	0.0	0.0
Total	20,842.2	20,842.2	20,842.2	0.0	0.0	0.0	0.0
Nonindustrial private							
Corporate	88,214.3	88,214.3	88,178.2	36.1	0.0	0.0	0.0
Conservation/natural resources organization	3,625.9	3,625.9	3,625.9	0.0	0.0	0.0	0.0
Unincorporated local partnership/ association/club	7,041.5	7,041.5	7,009.0	32.5	0.0	0.0	0.0
Native American	719.5	719.5	719.5	0.0	0.0	0.0	0.0
Individual	302,561.7	302,561.7	302,520.1	41.6	0.0	0.0	0.0
Total	402,163.0	402,163.0	402,052.7	110.2	0.0	0.0	0.0
All classes	526,600.1	503,805.7	503,601.6	204.1	22,794.4	22,610.0	184.4

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Estimates of carbon calculated by multiplying aboveground dry tree biomass by 0.5. Calculations based on TREE_REGIONAL_ BIOMASS.REGIONAL_DRYBIOT table in Forest Inventory and Analysis Database users guide.

Table D.25—Average annual net growth of live trees on timberland by forest-type group and stand-size class, North Carolina, 2007–13

| Forest-type group[a] | All size classes | Stand-size class | | | |
		Large diameter	Medium diameter	Small diameter	Non-stocked
		million cubic feet			
Softwood types					
White-red-jack pine	10.2	5.7	1.5	3.0	0.0
Spruce-fir	1.8	0.0	1.8	0.0	0.0
Longleaf-slash pine	19.4	10.3	5.9	3.2	0.0
Loblolly-shortleaf pine	656.4	267.5	252.4	136.5	0.0
Other eastern softwoods	1.5	-0.2	0.2	1.5	0.0
Total softwoods	689.4	283.5	261.7	144.3	0.0
Hardwood types					
Oak-pine	208.4	93.9	55.3	59.3	0.0
Oak-hickory	551.8	358.2	121.1	72.5	0.0
Oak-gum-cypress	90.2	61.3	19.4	9.6	0.0
Elm-ash-cottonwood	33.5	22.5	5.8	5.1	0.0
Maple-beech-birch	2.0	1.6	0.3	0.0	0.0
Aspen-birch	0.1	0.0	0.0	0.1	0.0
Other hardwoods	6.0	3.6	1.9	0.4	0.0
Exotic hardwoods	0.0	0.0	0.0	0.0	0.0
Total hardwoods	892.0	541.2	203.8	147.0	0.0
Nonstocked	2.4	0.0	0.0	0.0	2.4
All groups	1,583.9	824.6	465.5	291.4	2.4

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
[a] Based on past conditions.

Table D.26—Average annual net growth of live trees on timberland by species group and ownership group, North Carolina, 2007–13

Species group[a]	All ownerships	Ownership group				
		U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
		million cubic feet				
Softwood						
Cypress	6.6	0.4	0.0	0.8	0.0	5.5
Eastern hemlock	-10.1	-10.1	0.0	0.2	0.0	-0.2
Eastern white and red pines	40.6	4.4	0.0	1.3	0.3	34.6
Loblolly and shortleaf pines	694.3	1.1	6.0	29.3	95.7	562.2
Longleaf and slash pines	23.9	0.8	4.4	3.4	1.4	13.9
Other eastern softwoods	5.9	0.0	0.2	0.7	0.0	5.1
Other yellow pines	32.9	-1.0	-0.9	1.2	1.6	32.1
Spruce and balsam fir	1.4	0.8	0.0	0.5	0.0	0.1
Total softwoods	795.5	-3.5	9.6	37.2	99.1	653.1
Hardwood						
Ash	14.6	0.2	-0.1	1.2	0.4	12.9
Basswood	1.7	1.0	0.0	0.0	0.3	0.4
Beech	13.6	0.6	0.0	0.2	0.0	12.7
Black walnut	5.8	0.0	0.0	0.3	0.1	5.4
Cottonwood and aspen	1.1	0.0	0.0	0.2	-0.2	1.2
Eastern noncommercial hardwoods	18.7	2.3	0.6	0.6	0.7	14.6
Hard maple	3.9	-0.1	0.0	0.2	0.0	3.8
Hickory	25.4	1.8	0.4	0.7	0.5	21.9
Other eastern hard hardwoods	10.2	1.4	0.1	0.2	0.2	8.3
Other eastern soft hardwoods	38.7	3.1	0.1	1.3	1.1	33.2
Other red oaks	75.4	3.5	0.0	2.1	1.2	68.6
Other white oaks	40.9	9.0	0.1	1.6	0.3	30.0
Select red oaks	38.6	6.4	0.1	1.2	0.4	30.5
Select white oaks	78.7	3.9	0.2	2.4	0.4	71.7
Soft maple	94.8	8.8	0.9	4.0	3.6	77.6
Sweetgum	94.1	0.3	0.3	3.3	4.7	85.5
Tupelo and blackgum	30.3	1.6	1.9	1.9	4.0	21.0
Yellow birch	1.3	0.7	0.0	0.0	0.0	0.6
Yellow-poplar	200.6	11.0	1.0	4.5	0.4	183.6
Total hardwoods	788.4	55.4	5.6	25.9	18.0	683.6
All species	1,583.9	51.8	15.2	63.1	117.1	1,336.7

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
[a] Based on current conditions.

Table D.27—Average annual net growth of growing-stock trees on timberland by species group and ownership group, North Carolina, 2007–13

| Species group[a] | All ownerships | Ownership group | | | | |
		U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
				million cubic feet		
Softwood						
Cypress	6.5	0.4	0.0	0.7	-0.1	5.4
Eastern hemlock	-9.1	-10.1	0.0	0.1	0.0	0.8
Eastern white and red pines	41.1	4.4	0.0	1.2	0.3	35.3
Loblolly and shortleaf pines	684.9	1.0	6.0	29.1	94.3	554.5
Longleaf and slash pines	23.5	0.8	4.4	3.4	1.4	13.5
Other eastern softwoods	2.9	0.0	0.2	0.7	0.0	2.0
Other yellow pines	29.2	-1.0	-0.9	1.0	1.6	28.6
Spruce and balsam fir	1.3	0.8	0.0	0.4	0.0	0.1
Total softwoods	780.4	-3.7	9.6	36.7	97.6	640.2
Hardwood						
Ash	13.5	0.2	0.0	1.2	0.5	11.7
Basswood	1.7	1.0	0.0	0.0	0.3	0.4
Beech	10.0	0.5	0.0	0.2	0.0	9.3
Black walnut	5.0	0.0	0.0	0.4	0.1	4.5
Cottonwood and aspen	0.9	0.0	0.0	0.1	-0.2	1.0
Eastern noncommercial hardwoods	0.0	0.0	0.0	0.0	0.0	0.0
Hard maple	4.2	0.7	0.0	0.2	0.0	3.3
Hickory	24.2	1.9	0.4	0.7	0.5	20.8
Other eastern hard hardwoods	9.0	1.8	0.1	0.2	0.2	6.8
Other eastern soft hardwoods	32.2	3.0	0.2	1.0	1.0	27.0
Other red oaks	67.1	3.6	0.0	1.9	1.0	60.6
Other white oaks	36.9	9.0	0.1	1.2	0.2	26.4
Select red oaks	38.4	6.2	0.1	1.3	0.4	30.2
Select white oaks	74.9	3.5	0.2	2.3	0.4	68.6
Soft maple	77.1	7.6	0.6	3.6	3.0	62.3
Sweetgum	86.9	0.3	0.3	3.5	4.1	78.7
Tupelo and blackgum	29.4	1.4	1.5	1.8	3.8	20.8
Yellow birch	1.1	0.7	0.0	0.0	0.0	0.4
Yellow-poplar	198.7	11.0	1.0	4.6	0.4	181.7
Total hardwoods	711.3	52.4	4.3	24.2	15.7	614.6
All species	1,491.6	48.7	13.9	60.9	113.3	1,254.8

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
[a] Based on current conditions.

Table D.28—Average annual net growth of sawtimber on timberland by species group and ownership group, North Carolina, 2007–13

Species group[a]	All ownerships	U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
				million board feet[b]		
Softwood						
Cypress	37.5	3.0	0.0	4.6	-1.3	31.1
Eastern hemlock	-42.5	-50.7	0.0	0.8	0.0	7.4
Eastern white and red pines	216.1	24.8	0.0	8.0	0.5	182.9
Loblolly and shortleaf pines	2,727.1	19.1	25.8	137.1	433.3	2,111.9
Longleaf and slash pines	101.6	3.8	23.3	12.3	4.4	57.8
Other eastern softwoods	8.2	0.0	0.5	2.2	0.0	5.5
Other yellow pines	121.1	-3.6	-2.6	6.8	4.8	115.8
Spruce and balsam fir	6.1	4.1	0.0	1.8	0.0	0.3
Total softwoods	3,175.1	0.4	47.0	173.5	441.7	2,512.5
Hardwood						
Ash	59.5	1.2	-0.2	4.7	1.6	52.2
Basswood	8.5	3.0	0.0	0.0	1.5	4.1
Beech	30.6	-0.1	0.2	0.4	0.0	30.1
Black walnut	14.7	0.0	0.0	0.0	0.3	14.4
Cottonwood and aspen	7.2	0.0	0.0	1.6	-0.2	5.8
Eastern noncommercial hardwoods	0.0	0.0	0.0	0.0	0.0	0.0
Hard maple	15.2	2.1	-0.1	0.6	0.0	12.7
Hickory	99.0	9.0	1.4	4.0	1.4	83.2
Other eastern hard hardwoods	26.4	4.6	0.0	-0.5	0.1	22.2
Other eastern soft hardwoods	97.1	9.3	0.1	3.6	3.5	80.6
Other red oaks	300.9	16.9	0.2	9.1	2.7	272.0
Other white oaks	164.5	41.8	0.4	4.4	0.8	117.0
Select red oaks	186.8	32.1	0.6	6.5	2.1	145.5
Select white oaks	361.7	18.2	1.1	9.5	0.9	332.1
Soft maple	227.7	26.3	0.8	11.5	8.3	180.8
Sweetgum	264.1	1.0	1.4	11.0	12.3	238.5
Tupelo and blackgum	128.3	4.3	5.5	8.0	15.8	94.7
Yellow birch	4.7	3.4	0.0	0.0	0.0	1.3
Yellow-poplar	965.9	64.3	5.9	26.4	-1.0	870.3
Total hardwoods	2,963.0	237.3	17.4	100.8	50.0	2,557.6
All species	6,138.2	237.7	64.4	274.3	491.7	5,070.1

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
[a] Based on current conditions.
[b] International ¼-inch rule.

Table D.29—Average annual mortality of live trees on timberland by forest-type group and stand-size class, North Carolina, 2007–13

| Forest-type group[a] | All size classes | Stand-size class | | | |
		Large diameter	Medium diameter	Small diameter	Non-stocked
		million cubic feet			
Softwood types					
White-red-jack pine	11.9	11.6	0.3	0.0	0.0
Spruce-fir	0.3	0.0	0.3	0.0	0.0
Longleaf-slash pine	1.6	1.5	0.1	0.0	0.0
Loblolly-shortleaf pine	86.5	64.1	20.6	1.9	0.0
Other eastern softwoods	0.3	0.3	0.0	0.0	0.0
Total softwoods	100.6	77.5	21.3	1.9	0.0
Hardwood types					
Oak-pine	36.0	26.9	7.0	2.1	0.0
Oak-hickory	120.0	96.0	21.1	2.8	0.0
Oak-gum-cypress	48.6	37.6	9.3	1.7	0.0
Elm-ash-cottonwood	12.5	9.5	2.7	0.3	0.0
Maple-beech-birch	2.4	2.2	0.2	0.0	0.0
Aspen-birch	0.0	0.0	0.0	0.0	0.0
Other hardwoods	1.7	1.0	0.6	0.0	0.0
Exotic hardwoods	0.0	0.0	0.0	0.0	0.0
Total hardwoods	221.1	173.2	40.9	7.0	0.0
Nonstocked	0.1	0.0	0.0	0.0	0.1
All groups	321.9	250.7	62.2	8.9	0.1

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
[a] Based on past conditions.

Table D.30—Average annual mortality of live trees on timberland by species group and ownership group, North Carolina, 2007–13

Species group[a]	All ownerships	Ownership group				
		U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
		million cubic feet				
Softwood						
Cypress	2.9	0.1	0.0	0.1	0.9	1.7
Eastern hemlock	16.1	11.9	0.0	0.0	0.0	4.2
Eastern white and red pines	8.6	1.2	0.0	0.4	0.1	6.9
Loblolly and shortleaf pines	66.7	5.0	1.6	4.3	5.1	50.7
Longleaf and slash pines	1.9	0.0	0.3	0.3	0.0	1.2
Other eastern softwoods	3.0	0.0	0.0	0.1	0.0	2.9
Other yellow pines	39.8	5.0	1.9	3.8	0.0	29.1
Spruce and balsam fir	0.2	0.2	0.0	0.0	0.0	0.0
Total softwoods	139.1	23.4	3.8	8.9	6.2	96.7
Hardwood						
Ash	7.2	0.4	0.3	0.0	0.4	6.0
Basswood	0.2	0.1	0.0	0.0	0.0	0.1
Beech	0.8	0.4	0.1	0.1	0.0	0.3
Black walnut	0.2	0.0	0.0	0.1	0.0	0.2
Cottonwood and aspen	0.8	0.0	0.0	0.1	0.3	0.4
Eastern noncommercial hardwoods	7.1	0.6	0.3	0.6	0.2	5.5
Hard maple	1.2	1.2	0.0	0.0	0.0	0.0
Hickory	4.4	0.0	0.0	0.1	0.0	4.3
Other eastern hard hardwoods	12.3	1.2	0.0	0.3	0.0	10.8
Other eastern soft hardwoods	17.3	1.6	1.2	2.2	0.3	12.0
Other red oaks	30.7	2.7	1.0	2.2	0.1	24.7
Other white oaks	10.9	4.8	0.0	0.1	0.1	5.9
Select red oaks	6.7	1.1	0.0	1.2	0.0	4.3
Select white oaks	9.1	0.7	0.0	0.1	0.1	8.2
Soft maple	22.4	1.4	0.2	1.5	0.5	18.7
Sweetgum	19.0	0.1	0.5	0.7	0.4	17.3
Tupelo and blackgum	10.6	0.5	0.0	0.1	1.6	8.4
Yellow birch	0.7	0.4	0.0	0.0	0.0	0.3
Yellow-poplar	20.9	0.9	0.0	1.8	1.7	16.4
Total hardwoods	182.8	18.4	3.7	11.0	5.7	144.0
All species	321.9	41.8	7.5	20.0	11.9	240.7

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Based on current conditions.

Table D.31—Average annual mortality of growing-stock trees on timberland by species group and ownership group, North Carolina, 2007–13

Species group[a]	All ownerships	Ownership group				
		U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
		million cubic feet				
Softwood						
Cypress	2.8	0.1	0.0	0.1	0.9	1.7
Eastern hemlock	15.5	11.8	0.0	0.0	0.0	3.8
Eastern white and red pines	6.9	1.2	0.0	0.4	0.1	5.3
Loblolly and shortleaf pines	64.4	5.0	1.6	4.2	4.7	48.9
Longleaf and slash pines	1.8	0.0	0.3	0.3	0.0	1.2
Other eastern softwoods	2.4	0.0	0.0	0.1	0.0	2.4
Other yellow pines	37.9	5.0	1.8	3.7	0.0	27.4
Spruce and balsam fir	0.2	0.2	0.0	0.0	0.0	0.0
Total softwoods	132.1	23.2	3.7	8.8	5.8	90.6
Hardwood						
Ash	5.8	0.4	0.2	0.0	0.2	4.9
Basswood	0.2	0.1	0.0	0.0	0.0	0.1
Beech	0.7	0.3	0.1	0.1	0.0	0.2
Black walnut	0.1	0.0	0.0	0.0	0.0	0.1
Cottonwood and aspen	0.8	0.0	0.0	0.1	0.3	0.4
Eastern noncommercial hardwoods	0.0	0.0	0.0	0.0	0.0	0.0
Hard maple	0.3	0.3	0.0	0.0	0.0	0.0
Hickory	3.8	0.0	0.0	0.1	0.0	3.7
Other eastern hard hardwoods	7.6	0.9	0.0	0.2	0.0	6.5
Other eastern soft hardwoods	11.2	1.1	0.8	1.7	0.2	7.4
Other red oaks	26.7	2.3	0.8	1.6	0.1	21.9
Other white oaks	8.3	3.2	0.0	0.1	0.1	5.0
Select red oaks	5.6	0.9	0.0	0.9	0.0	3.8
Select white oaks	8.0	0.5	0.0	0.1	0.1	7.4
Soft maple	14.6	1.1	0.1	0.8	0.1	12.5
Sweetgum	16.8	0.1	0.5	0.7	0.4	15.2
Tupelo and blackgum	8.5	0.5	0.0	0.1	1.5	6.4
Yellow birch	0.4	0.2	0.0	0.0	0.0	0.3
Yellow-poplar	19.1	0.8	0.0	1.7	1.7	14.8
Total hardwoods	138.6	12.6	2.5	8.0	4.7	110.8
All species	270.7	35.8	6.2	16.8	10.5	201.4

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Based on current conditions.

Table D.32—Average annual mortality of sawtimber on timberland by species group and ownership group, North Carolina, 2007–13

		Ownership group				
Species group[a]	All ownerships	U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
				million board feet[b]		
Softwood						
Cypress	14.9	0.6	0.0	0.0	5.3	9.0
Eastern hemlock	71.3	57.8	0.0	0.0	0.0	13.5
Eastern white and red pines	30.4	4.2	0.0	1.6	0.4	24.2
Loblolly and shortleaf pines	204.1	21.2	8.9	15.3	12.0	146.6
Longleaf and slash pines	6.5	0.0	0.7	1.1	0.0	4.7
Other eastern softwoods	6.9	0.0	0.0	0.0	0.0	6.9
Other yellow pines	124.8	21.5	6.7	14.7	0.0	81.9
Spruce and balsam fir	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	459.0	105.3	16.4	32.7	17.8	286.8
Hardwood						
Ash	16.8	1.2	0.6	0.0	0.8	14.2
Basswood	0.5	0.3	0.0	0.0	0.0	0.2
Beech	2.5	1.2	0.2	0.2	0.0	0.8
Black walnut	0.0	0.0	0.0	0.0	0.0	0.0
Cottonwood and aspen	1.5	0.0	0.0	0.0	0.7	0.8
Eastern noncommercial hardwoods	0.0	0.0	0.0	0.0	0.0	0.0
Hard maple	1.0	1.0	0.0	0.0	0.0	0.0
Hickory	11.1	0.0	0.0	0.2	0.0	10.9
Other eastern hard hardwoods	10.6	0.7	0.0	0.6	0.0	9.3
Other eastern soft hardwoods	20.7	2.0	0.0	6.2	0.4	12.0
Other red oaks	94.2	7.9	3.5	5.3	0.0	77.5
Other white oaks	32.5	14.7	0.0	0.0	0.0	17.8
Select red oaks	15.4	2.5	0.0	3.7	0.0	9.2
Select white oaks	29.9	1.9	0.0	0.0	0.0	28.0
Soft maple	34.4	2.3	0.0	1.7	0.0	30.3
Sweetgum	49.8	0.4	1.8	1.7	0.4	45.5
Tupelo and blackgum	23.3	1.4	0.0	0.2	6.1	15.6
Yellow birch	0.6	0.0	0.0	0.0	0.0	0.6
Yellow-poplar	63.1	0.7	0.0	6.8	9.6	46.0
Total hardwoods	408.0	38.2	6.2	26.6	18.1	318.9
All species	867.0	143.4	22.6	59.3	35.9	605.7

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Based on current conditions.

[b] International ¼-inch rule.

Table D.33—Average annual removals of live trees on timberland by forest-type group and stand-size class, North Carolina, 2007–13

| Forest-type group[a] | All size classes | Stand-size class | | | |
		Large diameter	Medium diameter	Small diameter	Non-stocked
		million cubic feet			
Softwood types					
White-red-jack pine	23.5	21.9	0.7	0.9	0.0
Spruce-fir	0.0	0.0	0.0	0.0	0.0
Longleaf-slash pine	11.2	7.5	3.7	0.0	0.0
Loblolly-shortleaf pine	491.8	373.2	114.1	4.5	0.0
Other eastern softwoods	0.2	0.1	0.0	0.1	0.0
Total softwoods	526.7	402.7	118.5	5.5	0.0
Hardwood types					
Oak-pine	91.0	69.2	20.0	1.8	0.0
Oak-hickory	219.3	173.9	39.1	6.2	0.0
Oak-gum-cypress	61.7	47.2	12.2	2.3	0.0
Elm-ash-cottonwood	22.3	15.9	6.4	0.0	0.0
Maple-beech-birch	0.0	0.0	0.0	0.0	0.0
Aspen-birch	0.0	0.0	0.0	0.0	0.0
Other hardwoods	0.1	0.0	0.1	0.0	0.0
Exotic hardwoods	0.0	0.0	0.0	0.0	0.0
Total hardwoods	394.3	306.2	77.8	10.3	0.0
Nonstocked	0.8	0.0	0.0	0.0	0.8
All groups	921.8	708.8	196.3	15.9	0.8

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Based on past conditions.

Table D.34—Average annual removals of live trees on timberland by species group and ownership group, North Carolina, 2007–13

Species group[a]	All ownerships	U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
				million cubic feet		
Softwood						
Cypress	6.6	0.0	0.0	2.4	0.7	3.5
Eastern hemlock	2.2	0.0	0.0	0.0	0.1	2.1
Eastern white and red pines	23.6	0.0	0.0	0.0	0.6	23.1
Loblolly and shortleaf pines	458.1	0.0	1.5	13.0	127.7	315.9
Longleaf and slash pines	12.0	0.0	1.3	1.1	0.7	9.0
Other eastern softwoods	2.0	0.0	0.0	0.0	0.0	2.0
Other yellow pines	45.1	0.0	0.1	4.0	2.1	39.0
Spruce and balsam fir	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	549.6	0.0	2.8	20.5	131.7	394.5
Hardwood						
Ash	6.5	0.0	0.0	0.0	1.3	5.1
Basswood	0.5	0.0	0.0	0.0	0.0	0.5
Beech	3.8	0.0	0.0	0.0	0.0	3.8
Black walnut	2.7	0.0	0.0	0.1	0.0	2.6
Cottonwood and aspen	0.5	0.0	0.0	0.0	0.0	0.5
Eastern noncommercial hardwoods	5.6	0.0	0.1	0.2	0.3	5.0
Hard maple	0.9	0.0	0.0	0.0	0.0	0.8
Hickory	12.5	0.0	0.0	0.0	0.6	11.8
Other eastern hard hardwoods	6.1	0.0	0.1	0.2	0.5	5.4
Other eastern soft hardwoods	11.6	0.0	0.0	0.2	0.2	11.2
Other red oaks	51.2	0.3	0.1	0.8	1.8	48.2
Other white oaks	11.0	0.0	0.0	0.6	0.0	10.4
Select red oaks	18.2	0.0	0.0	0.9	0.0	17.3
Select white oaks	44.6	0.0	0.0	0.3	0.4	43.8
Soft maple	42.8	0.0	0.1	2.1	4.2	36.4
Sweetgum	59.8	0.0	0.6	1.1	5.0	53.1
Tupelo and blackgum	17.8	0.1	0.0	0.1	1.2	16.4
Yellow birch	0.0	0.0	0.0	0.0	0.0	0.0
Yellow-poplar	76.5	0.0	0.0	0.3	1.9	74.2
Total hardwoods	372.2	0.4	0.9	7.0	17.5	346.5
All species	921.8	0.4	3.7	27.5	149.2	741.0

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Based on current conditions.

Table D.35—Average annual removals of growing-stock trees on timberland by species group and ownership group, North Carolina, 2007–13

Species group[a]	All ownerships	Ownership group				
		U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
		million cubic feet				
Softwood						
Cypress	6.6	0.0	0.0	2.4	0.7	3.5
Eastern hemlock	2.2	0.0	0.0	0.0	0.1	2.1
Eastern white and red pines	23.5	0.0	0.0	0.0	0.6	22.9
Loblolly and shortleaf pines	450.0	0.0	1.5	12.9	125.8	309.8
Longleaf and slash pines	11.9	0.0	1.3	1.1	0.7	8.8
Other eastern softwoods	1.8	0.0	0.0	0.0	0.0	1.8
Other yellow pines	43.8	0.0	0.1	4.0	2.1	37.7
Spruce and balsam fir	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	539.8	0.0	2.8	20.4	129.8	386.6
Hardwood						
Ash	6.2	0.0	0.0	0.0	1.3	4.9
Basswood	0.5	0.0	0.0	0.0	0.0	0.5
Beech	3.5	0.0	0.0	0.0	0.0	3.5
Black walnut	2.7	0.0	0.0	0.1	0.0	2.6
Cottonwood and aspen	0.5	0.0	0.0	0.0	0.0	0.5
Eastern noncommercial hardwoods	0.0	0.0	0.0	0.0	0.0	0.0
Hard maple	0.9	0.0	0.0	0.0	0.0	0.8
Hickory	12.0	0.0	0.0	0.0	0.6	11.4
Other eastern hard hardwoods	4.0	0.0	0.0	0.1	0.4	3.5
Other eastern soft hardwoods	9.1	0.0	0.0	0.1	0.2	8.8
Other red oaks	48.9	0.2	0.1	0.8	1.6	46.3
Other white oaks	10.3	0.0	0.0	0.6	0.0	9.7
Select red oaks	18.2	0.0	0.0	0.9	0.0	17.2
Select white oaks	42.2	0.0	0.0	0.3	0.4	41.5
Soft maple	33.3	0.0	0.1	1.8	3.1	28.3
Sweetgum	56.7	0.0	0.5	1.1	4.6	50.5
Tupelo and blackgum	16.2	0.1	0.0	0.1	0.8	15.2
Yellow birch	0.0	0.0	0.0	0.0	0.0	0.0
Yellow-poplar	74.5	0.0	0.0	0.1	1.9	72.5
Total hardwoods	339.5	0.3	0.7	5.9	14.8	317.7
All species	879.3	0.3	3.6	26.4	144.6	704.4

Numbers in rows and columns may not sum to totals due to rounding.
0.0 = no sample for the cell or a value of >0.0 but <0.05.
[a] Based on current conditions.

Table D.36—Average annual removals of sawtimber on timberland by species group and ownership group, North Carolina, 2007–13

Species group[a]	All ownerships	U.S. Forest Service	Other Federal	State and local government	Forest industry	Nonindustrial private
				million board feet[b]		
Softwood						
Cypress	32.7	0.0	0.0	14.7	2.9	15.1
Eastern hemlock	11.6	0.0	0.0	0.0	0.2	11.4
Eastern white and red pines	126.6	0.0	0.0	0.0	3.6	123.0
Loblolly and shortleaf pines	1,817.1	0.0	9.3	55.3	582.6	1,169.9
Longleaf and slash pines	41.6	0.0	6.1	2.4	1.3	31.7
Other eastern softwoods	3.8	0.0	0.0	0.0	0.0	3.8
Other yellow pines	141.2	0.0	0.1	17.1	7.9	116.0
Spruce and balsam fir	0.0	0.0	0.0	0.0	0.0	0.0
Total softwoods	2,174.5	0.0	15.6	89.5	598.5	1,471.0
Hardwood						
Ash	13.1	0.0	0.0	0.0	7.3	5.9
Basswood	2.0	0.0	0.0	0.0	0.0	2.0
Beech	11.7	0.0	0.0	0.0	0.0	11.7
Black walnut	9.7	0.0	0.0	0.0	0.0	9.7
Cottonwood and aspen	2.0	0.0	0.0	0.0	0.0	2.0
Eastern noncommercial hardwoods	0.0	0.0	0.0	0.0	0.0	0.0
Hard maple	3.4	0.0	0.0	0.0	0.0	3.4
Hickory	37.9	0.0	0.0	0.0	1.4	36.5
Other eastern hard hardwoods	6.9	0.0	0.0	0.0	0.4	6.5
Other eastern soft hardwoods	16.3	0.0	0.0	0.0	0.0	16.3
Other red oaks	165.4	0.0	0.0	2.3	3.3	159.9
Other white oaks	27.9	0.0	0.0	0.8	0.0	27.1
Select red oaks	75.1	0.0	0.0	4.2	0.0	70.9
Select white oaks	157.8	0.0	0.0	1.1	1.2	155.5
Soft maple	65.4	0.0	0.3	3.7	3.1	58.3
Sweetgum	169.4	0.0	2.0	0.6	6.4	160.4
Tupelo and blackgum	49.4	0.0	0.0	0.0	1.1	48.3
Yellow birch	0.0	0.0	0.0	0.0	0.0	0.0
Yellow-poplar	320.9	0.0	0.0	0.0	7.5	313.4
Total hardwoods	1,134.3	0.0	2.2	12.8	31.7	1,087.7
All species	3,308.9	0.0	17.8	102.3	630.1	2,558.6

Numbers in rows and columns may not sum to totals due to rounding.

0.0 = no sample for the cell or a value of >0.0 but <0.05.

[a] Based on current conditions.

[b] International ¼-inch rule.

The principal findings from five panels of the ninth forest survey of North Carolina are presented. In 2013, forests covered 18.6 million acres of the State, of which 17.9 million were classified as timberland. Oak-hickory was the most common forest-type group and covered 7.0 million acres of the timberland. The second most common forest-type group was loblolly-shortleaf pine, which covered 5.5 million acres of timberland. Nonindustrial private forest ownerships controlled 80 percent of the State's timberland. Hardwood tree species accounted for 65 percent of the 38.4 billion cubic feet of all-live wood volume that occurred on the State's timberland. Total net growth of all-live trees on timberland averaged almost 1.6 billion cubic feet and removals averaged >0.9 billion cubic feet.

Keywords: FIA, forest health, forest ownership, timber growth, timber removals, timber volume, timberland.

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White water recreational rafting. (photo courtesy of Wikimedia.org)

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