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# North Carolina's Forests, 2018



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Cover photo: White oak in the Piedmont of North Carolina. (USDA Forest Service photo by Samuel G. Lambert)

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Mark J. Brown and Samuel G. Lambert



Longleaf pine forest traversed by field crew. (Courtesy photo by North Carolina Forest Service)

## 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) (AREERA 1998).

The primary objective in conducting these inventories is to gather the multiresource 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 are 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* (USDA 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 [https://www.fs.usda.gov/srsfia/states/north\\_carolina.shtml](https://www.fs.usda.gov/srsfia/states/north_carolina.shtml) (USDA Forest Service 2024). Additional information about the FIA program can be obtained at <https://www.fs.usda.gov/research/programs/fia> (USDA Forest Service 2024).

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

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## CONTENTS

|                                                                       |      |
|-----------------------------------------------------------------------|------|
| FOREWORD . . . . .                                                    | ii   |
| ACKNOWLEDGMENTS . . . . .                                             | iii  |
| LIST OF FIGURES . . . . .                                             | vi   |
| LIST OF TABLES . . . . .                                              | viii |
| HIGHLIGHTS FROM THE 2018 FOREST INVENTORY OF NORTH CAROLINA . . . . . | 1    |
| Area . . . . .                                                        | 1    |
| Ownership . . . . .                                                   | 1    |
| Volume . . . . .                                                      | 1    |
| Net Growth and Removals . . . . .                                     | 1    |
| Forest Health. . . . .                                                | 2    |
| INTRODUCTION . . . . .                                                | 3    |
| PHYSIOGRAPHY . . . . .                                                | 3    |
| LAND USE . . . . .                                                    | 4    |
| Timberland Classification. . . . .                                    | 4    |
| Timberland Distribution . . . . .                                     | 5    |
| TIMBERLAND STATISTICS . . . . .                                       | 9    |
| Area . . . . .                                                        | 9    |
| Trends . . . . .                                                      | 9    |
| Occurrence . . . . .                                                  | 10   |
| Ownership . . . . .                                                   | 10   |
| Forest types . . . . .                                                | 12   |
| Stand-size class . . . . .                                            | 13   |
| Stand origin . . . . .                                                | 16   |
| Stand-age class . . . . .                                             | 18   |
| Tree Volume . . . . .                                                 | 20   |
| Net Change Components. . . . .                                        | 24   |

|                                           |     |
|-------------------------------------------|-----|
| Forest Health. . . . .                    | .27 |
| Tree mortality . . . . .                  | .27 |
| Standing dead trees . . . . .             | .28 |
| Hemlock decline . . . . .                 | .29 |
| Nonnative invasive plants . . . . .       | .32 |
| CONCLUSIONS . . . . .                     | .34 |
| REFERENCES . . . . .                      | .35 |
| GLOSSARY. . . . .                         | .36 |
| APPENDIX 1—INVENTORY METHODS . . . . .    | .48 |
| Inventory Methods Overview . . . . .      | .48 |
| Sample Design. . . . .                    | .48 |
| Sample Design Phases . . . . .            | .48 |
| Area . . . . .                            | .48 |
| Ownership . . . . .                       | .49 |
| Plot Design . . . . .                     | .49 |
| Volume . . . . .                          | .50 |
| Biomass. . . . .                          | .50 |
| Growth, Removals, and Mortality . . . . . | .50 |
| Summary . . . . .                         | .50 |
| References . . . . .                      | .51 |
| APPENDIX 2—DATA RELIABILITY . . . . .     | .52 |
| Measurement Error . . . . .               | .52 |
| Sampling Error. . . . .                   | .53 |
| References . . . . .                      | .54 |
| APPENDIX 3—SPECIES LIST . . . . .         | .55 |
| Literature Cited . . . . .                | .56 |
| APPENDIX 4—SUPPLEMENTAL TABLES . . . . .  | .57 |

## LIST OF FIGURES

|                                                                                                                                                                                                                                                                                      |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Figure 1</b> —Timberland as a percentage of all land area by county, North Carolina, 2018 . . . .                                                                                                                                                                                 | 6  |
| <b>Figure 2</b> —Area of timberland by survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015) . . . . .                                                       | 9  |
| <b>Figure 3</b> —Area of timberland by ownership and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015) . . . . .                                         | 10 |
| <b>Figure 4</b> —Area of timberland by forest-type group and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015) . . . . .                                 | 12 |
| <b>Figure 5</b> —Area of timberland by stand-size class, broad forest-type group, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015) . . . . .        | 14 |
| <b>Figure 6</b> —Area of timberland by major forest-type group, stand origin, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015) . . . . .            | 16 |
| <b>Figure 7</b> —Area of timberland by stand-age class, stand origin, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015) . . . . .                    | 18 |
| <b>Figure 8</b> —Top 10 timberland tree species based on number of trees in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2018 . . . . .                                                                              | 20 |
| <b>Figure 9</b> —Top 10 timberland tree species based on volume of trees in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2018 . . . . .                                                                              | 21 |
| <b>Figure 10</b> —All-live merchantable volume by major species group, survey year, and stand origin in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015) . . . . .     | 22 |
| <b>Figure 11</b> —All-live merchantable softwood volume on timberland by diameter class, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015) . . . . . | 23 |
| <b>Figure 12</b> —All-live merchantable hardwood volume on timberland by diameter class, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015) . . . . . | 24 |

|                                                                                                                                                                                                                                                                                                    |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Figure 13</b> —Net change components for all-live volume by major species group, change component, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015) .....      | 25 |
| <b>Figure 14</b> —Comparison of net growth and removals to total inventory volume for softwood and hardwood by survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015) ..... | 25 |
| <b>Figure 15</b> —Average annual mortality of trees by stand-age class and major species group in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2018 .....                                                                          | 27 |
| <b>Figure 16</b> —Number of standing-dead trees $\geq 5$ inches d.b.h. on timberland by cause of death and broad species group in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2018. ....                                          | 28 |
| <b>Figure 17</b> —Map of hemlock woolly adelgid (HWA) presence and hemlock basal area, 2018                                                                                                                                                                                                        | 30 |
| <b>Figure 18</b> —Hemlock volume (for trees $\geq 5$ inches d.b.h.) in the Piedmont and Mountain units, North Carolina, 2007–2018. ....                                                                                                                                                            | 31 |
| <b>Figure 19</b> —Hemlock tree population ( $\geq 5$ inches d.b.h.) in the Piedmont and Mountain units, North Carolina, 2007–2018. ....                                                                                                                                                            | 31 |
| <b>Figure 20</b> —Number of hemlock trees ( $\geq 5$ inches d.b.h.) in the (A) Piedmont and (B) Mountain units, North Carolina, 2007–2018. ....                                                                                                                                                    | 31 |
| <b>Figure A1.1</b> —Annual inventory fixed-plot design (the phase 2 plot) .....                                                                                                                                                                                                                    | 49 |
| <b>Figure A1.2</b> —Subplot and microplot layout. ....                                                                                                                                                                                                                                             | 49 |

## LIST OF TABLES

|                                                                                                                                                                                           |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Table 1</b> —Land area by land use and survey year, North Carolina . . . . .                                                                                                           | 5  |
| <b>Table 2</b> —Land area by land use and survey year, Southern Coastal Plain unit, North Carolina . . . . .                                                                              | 6  |
| <b>Table 3</b> —Land area by land use and survey year, Northern Coastal Plain unit, North Carolina . . . . .                                                                              | 7  |
| <b>Table 4</b> —Land area by land use and survey year, Piedmont unit, North Carolina . . . . .                                                                                            | 7  |
| <b>Table 5</b> —Land area by land use and survey year, Mountains unit, North Carolina . . . . .                                                                                           | 8  |
| <b>Table 6</b> —Regionally recognized nonnative invasive plants identified on forest survey plots<br>by common name, scientific name, and number of plots, North Carolina, 2018 . . . . . | 33 |
| <b>Table A3.1</b> —Softwood species list by common and scientific name, North Carolina, 2018. . . . .                                                                                     | 55 |
| <b>Table A3.2</b> —Hardwood species list by common and scientific name, North Carolina, 2018. . . . .                                                                                     | 55 |
| <b>Table A4.1</b> —Area by survey unit and land status, North Carolina, 2018 . . . . .                                                                                                    | 57 |
| <b>Table A4.2</b> —Area of forest land by ownership class and land status, North Carolina, 2018. . . . .                                                                                  | 58 |
| <b>Table A4.3</b> —Area of timberland by forest-type group and site productivity class, North<br>Carolina, 2018 . . . . .                                                                 | 59 |
| <b>Table A4.4</b> —Area of timberland by forest-type group and ownership group, North Carolina, 2018 . .                                                                                  | 60 |
| <b>Table A4.5</b> —Area of timberland by forest-type group and stand age class, North Carolina, 2018 . . .                                                                                | 61 |
| <b>Table A4.6</b> —Area of timberland by forest-type group and stand origin, North Carolina, 2018 . . . . .                                                                               | 62 |
| <b>Table A4.7</b> —Area of timberland disturbed annually by forest-type group and disturbance<br>class, North Carolina, 2018. . . . .                                                     | 63 |
| <b>Table A4.8</b> —Area of timberland treated annually by forest-type group and treatment class<br>(cutting), North Carolina, 2018 . . . . .                                              | 64 |
| <b>Table A4.9</b> —Area of timberland treated annually by forest-type group and treatment class<br>(regeneration), North Carolina, 2018 . . . . .                                         | 65 |
| <b>Table A4.10</b> —Area of timberland by forest-type group and stand-size class, North Carolina, 2018 . .                                                                                | 66 |
| <b>Table A4.11</b> —Number of live trees on timberland by species group and diameter class,<br>North Carolina, 2018 . . . . .                                                             | 67 |
| <b>Table A4.12</b> —Number of growing-stock trees on timberland by species group and<br>diameter class, North Carolina, 2018. . . . .                                                     | 68 |
| <b>Table A4.13</b> —Net volume of live trees on timberland by forest-type group and stand-size<br>class, North Carolina, 2018. . . . .                                                    | 69 |
| <b>Table A4.14</b> —Net volume of live trees on timberland by species group and ownership<br>group, North Carolina, 2018 . . . . .                                                        | 70 |
| <b>Table A4.15</b> —Net volume of live trees on timberland by species group and diameter class,<br>North Carolina, 2018 . . . . .                                                         | 71 |

|                                                                                                                                                                              |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Table A4.16</b> —Net volume of live trees on timberland by forest-type group and stand origin, North Carolina, 2018 .....                                                 | 72 |
| <b>Table A4.17</b> —Net volume of growing-stock trees on timberland by species group and diameter class, North Carolina, 2018 .....                                          | 73 |
| <b>Table A4.18</b> —Net volume of growing-stock trees on timberland by species group and ownership group, North Carolina, 2018 .....                                         | 74 |
| <b>Table A4.19</b> —Net volume of sawtimber trees on timberland by species group and diameter class, North Carolina, 2018 .....                                              | 75 |
| <b>Table A4.20</b> —Net volume of sawtimber trees on timberland by species group and ownership group, North Carolina, 2018 .....                                             | 76 |
| <b>Table A4.21</b> —Aboveground dry weight of live trees on timberland by species group and diameter class, North Carolina, 2018 .....                                       | 77 |
| <b>Table A4.22</b> —Aboveground green weight of live trees on timberland by species group and diameter class, North Carolina, 2018 .....                                     | 78 |
| <b>Table A4.23</b> —Merchantable dry weight of live trees on timberland by species group and diameter class, North Carolina, 2018 .....                                      | 79 |
| <b>Table A4.24</b> —Total carbon of live trees on forest land by ownership class and land status, North Carolina, 2018 .....                                                 | 80 |
| <b>Table A4.25</b> —Average annual net growth of live trees on timberland by forest-type group and stand-size class, North Carolina, 2018 (2003–2013 to 2009–2018) .....     | 81 |
| <b>Table A4.26</b> —Average annual net growth of live trees on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018) .....          | 82 |
| <b>Table A4.27</b> —Average annual net growth of growing-stock trees on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018) ..... | 83 |
| <b>Table A4.28</b> —Average annual net growth of sawtimber on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018) .....           | 84 |
| <b>Table A4.29</b> —Average annual mortality of live trees on timberland by forest-type group and stand-size class, North Carolina, 2018 (2003–2013 to 2009–2018) .....      | 85 |
| <b>Table A4.30</b> —Average annual mortality of live trees on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018) .....           | 86 |
| <b>Table A4.31</b> —Average annual mortality of growing-stock trees on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018) .....  | 87 |
| <b>Table A4.32</b> —Average annual mortality of sawtimber on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018) .....            | 88 |
| <b>Table A4.33</b> —Average annual removals of live trees on timberland by forest-type group and stand-size class, North Carolina, 2018 (2003–2013 to 2009–2018) .....       | 89 |
| <b>Table A4.34</b> —Average annual removals of live trees on forest land by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018) .....           | 90 |

**Table A4.35**—Average annual removals of growing-stock trees on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018) ..... 91

**Table A4.36**—Average annual removals of sawtimber on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018) ..... 92

## HIGHLIGHTS FROM THE 2018 FOREST INVENTORY OF NORTH CAROLINA

### Area

- Total forest area increased <1 percent since 2013 to nearly 18.8 million acres in 2018. Forests continue to occupy about 60 percent of the land area of North Carolina.
- Timberland area totaled 18.1 million acres, which was similar to the estimate in 2013. Hardwood forest types accounted for 11.6 million acres (64 percent) of timberland, and softwood forest types accounted for 6.4 million acres (35 percent). The remaining 1 percent consisted of timberland classified as nonstocked.
- Oak-hickory was the predominant forest-type group and occupied 6.9 million acres. The loblolly-shortleaf forest-type group was second in prevalence with almost 5.8 million acres. The oak-pine forest-type group was a distant third with 2.3 million acres, followed by oak-gum-cypress with 1.7 million acres.

### Ownership

- Nonindustrial private forest (NIPF) ownerships controlled 14.7 million acres (82 percent) of the State's timberland, up from 14.4 million in 2013. Forest industry owned 0.8 million acres (4 percent), down from 1.0 million in 2013. Public ownerships held 2.5 million acres of timberland (14 percent), up slightly from 2.5 in 2013.
- Within the NIPF group, private individuals owned 10.8 million acres of the State's timberland, down from 11.0 million acres in 2013.

### Volume

- In 2018, total all-live merchantable volume on timberland in North Carolina amounted to 42.3 billion cubic feet, up from 38.4 billion cubic feet in 2013 and 35.8 billion cubic feet in 2007.
- With 26.8 billion cubic feet, hardwoods made up 63 percent of all-live volume in the State. Softwood volume totaled 15.4 billion cubic feet.
- White oaks, red oaks, yellow-poplar, red maple, and sweetgum accounted for 4.2, 3.9, 5.8, 3.0, and 2.6 billion cubic feet of the hardwood volume, respectively. Loblolly, Virginia, shortleaf, longleaf, and pond pines accounted for 10.6, 1.0, 0.7, 0.6, and 0.5 billion cubic feet of the softwood volume, respectively.

### Net Growth and Removals

- Total net annual growth of all-live trees on timberland averaged 1.7 billion cubic feet per year between 2013 and 2018 and removals averaged 1.0 billion cubic feet during the same period. Planted stands provided 450 million cubic feet of the net growth and 332 million cubic feet of the removals.
- Between 2013 and 2018, net growth for all-live softwood trees on timberland averaged 930 million cubic feet per year, and removals averaged 611 million cubic feet per year. Softwood growth was up from the 2007 to 2013 average of 796 million cubic feet per year. Likewise, softwood removals were up from the previous survey period average of 550 million cubic feet per year.

- Between 2013 and 2018, hardwood net growth averaged 721 million cubic feet per year, and removals averaged 349 million cubic feet per year. Hardwood growth was down from the annual average of 788 million cubic feet observed between 2007 and 2013. Likewise, hardwood removals were down from the annual average of 372 million cubic feet in the previous survey period.
  - Standing-dead trees totaled 180 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, oleaster, callery pear, and princess tree were the most 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.
- Forest Health**
- Total mortality of live trees on North Carolina's timberland averaged 363 million cubic feet per year between 2013 and 2018. Hardwoods represented 221 million cubic feet (61 percent) and softwoods represented 142 million cubic feet (39 percent) of total mortality compared to 183 and 139 million cubic feet in 2013, respectively.

## INTRODUCTION

The Agricultural Research Extension and Education Reform Act of 1998 (Farm Bill) mandates forest inventory reporting every 5 years (AREERA 1998). Field measurements for the 10th inventory cycle of North Carolina's forests began in January 2014 and the 5 years of measurements used in this report were completed in December 2018. In North Carolina, the strategy involves rotating measurements of seven systematic samples (or panels), each of which represents more than 14 percent of total 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, more than 71 percent from cycle 10 of annual inventory data merged with plot data from cycle 9 not yet remeasured in cycle 10. 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 nine 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), 2007 (Brown and others 2014), and 2013 (Brown and Vogt 2015). Tabular summaries of the 2018 resource statistics for North Carolina used in this report are available on the web (USDA Forest Service 2024). Tabular data for many of the previous surveys are also available at that website. However, caution is advised when making comparisons to previous surveys because 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 FIA surveys. It is recommended to review the inventory methods section (app. 1) prior to any trend analysis.

## PHYSIOGRAPHY

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. North Carolina has more peaks higher than 6,000 feet than any State east of the Mississippi River and 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 between these regions are varying ownerships, demographics, and occurrence of tree species. For example, demographically, most of the State's large metropolitan centers are found in the Piedmont region. Primary forest management issues differ between the regions as well. In the Coastal Plain, the re-establishment 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.



Coastal Plain swamp scene in North Carolina. (Courtesy photo by North Carolina Forest Service)

## LAND USE

The area and condition of North Carolina's forest land are determined in many respects by trends in ownership and land-use changes. The 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 naturally revert to forest. These increases are considered additions to forest land from nonforest sources.

The 2010 census reported that nearly 9.6 million people lived in North Carolina (USDC Bureau of Census 2012). At the time of the 2000 census the population was approaching 8.1 million people (USDC Bureau of 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. An 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 2007. Some general trends are apparent. In 2018, total land area of North Carolina was about 31.1 million acres, including 168,000 acres of noncensus water defined by the U.S. Bureau of Census as land. Forests occupy 60 percent of the State's land area, or nearly 18.8 million acres. The remaining 12.4 million acres of land reflect a variety of nonforest uses such as agriculture and urban development. Total nonforest land changed little between 2007 and 2013, but has decreased by 1 percent since 2013. Within the

nonforest category, land used for cropland has increased by 5 percent since 2013 to 5.1 million acres, whereas pasture continues to decrease, by 9 percent since 2013 to 1.4 million acres. The category of other nonforest land (which includes urban, industrial, and other developed areas), has reversed a long upward trend and decreased by 4 percent since 2013 to 5.7 million acres in 2018. Tracking these trends is important because shifts in agriculture and urban land uses often have a direct impact on 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 loss of forest land has been urbanization. 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.

## Timberland Classification

Table 1 shows 18.1 million acres (96 percent) of North Carolina's nearly 18.8 million acres in forest were classified as timberland in 2018. These 18.1 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.



Bottomland hardwood forest in the State's Coastal Plain with field crew. (Courtesy photo by North Carolina Forest Service)

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

| Land use                                |                              | Survey year       |                   |                   |
|-----------------------------------------|------------------------------|-------------------|-------------------|-------------------|
|                                         |                              | 2007 <sup>a</sup> | 2013 <sup>a</sup> | 2018              |
| <i>acres</i>                            |                              |                   |                   |                   |
| Forest land                             | Timberland                   | 18,055,447        | 17,887,864        | 18,089,841        |
|                                         | Reserved                     | 380,131           | 646,073           | 630,538           |
|                                         | Other forest <sup>b</sup>    | 146,579           | 76,754            | 38,127            |
|                                         | <b>Total</b>                 | <b>18,582,157</b> | <b>18,610,691</b> | <b>18,758,506</b> |
| Nonforest land                          | Cropland                     | 5,042,947         | 4,871,385         | 5,099,229         |
|                                         | Pasture                      | 1,742,200         | 1,558,749         | 1,417,403         |
|                                         | Other nonforest <sup>c</sup> | 5,592,876         | 5,931,080         | 5,694,084         |
|                                         | Noncensus water <sup>d</sup> | 173,372           | 171,322           | 167,982           |
|                                         | <b>Total</b>                 | <b>12,551,395</b> | <b>12,532,536</b> | <b>12,378,698</b> |
| <b>All land<sup>e</sup></b>             |                              | <b>31,133,552</b> | <b>31,143,227</b> | <b>31,137,204</b> |
| <b>Census water</b>                     |                              | <b>3,310,157</b>  | <b>3,300,850</b>  | <b>3,306,888</b>  |
| <b>Total area</b>                       |                              | <b>34,443,709</b> | <b>34,444,077</b> | <b>34,444,092</b> |
| <b>Percentage of land area forested</b> |                              | <b>59.69</b>      | <b>59.76</b>      | <b>60.24</b>      |

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

<sup>a</sup> Brown and Vogt (2015).

<sup>b</sup> Unproductive lands incapable of producing 20 cubic feet of wood per acre per year due to adverse site conditions.

<sup>c</sup> Includes areas classified as urban, industrial, swampland, and other nonforest, etc.

<sup>d</sup> Areas classed as water by Forest Inventory and Analysis standards, but defined by Bureau of Census as land.

<sup>e</sup> U.S. Department of Commerce, Bureau of the Census (2012).

The area of timberland in 2018 was up 1 percent from 17.9 million acres in 2013. In North Carolina, the area classified as reserved timberland declined slightly from 646,000 acres in 2013 to 631,000 acres in 2018. 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 by half since 2013 to 38,000 acres in 2018, circa 1990 levels. Reasons for this change are unclear and could be related to previous reclassification decisions involving reserved acres. Because 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, also called regions (fig. 1). The Southern Coastal Plain unit is the southern portion of the eastern half of the State, bordering South Carolina. The Northern Coastal Plain unit is the northern portion of the eastern half of the State, bordering Virginia. The Piedmont unit is roughly the central one-third of the State and borders Virginia along the north and South Carolina along the south. The Mountain unit is the entire western one-fourth of the State, largely bordering Tennessee.

Since 2013, area of cropland increased in all four survey units (tables 2, 3, 4, and 5). Area in pasture decreased in three of the four units, only increasing in the Northern Coastal Plain unit. The area of other nonforest land (urban, industrial, swampland, and more) decreased in all the units, with the largest portion (37 percent) taking place in the Southern Coastal Plain unit. The Northern

# NORTH CAROLINA'S FORESTS, 2018

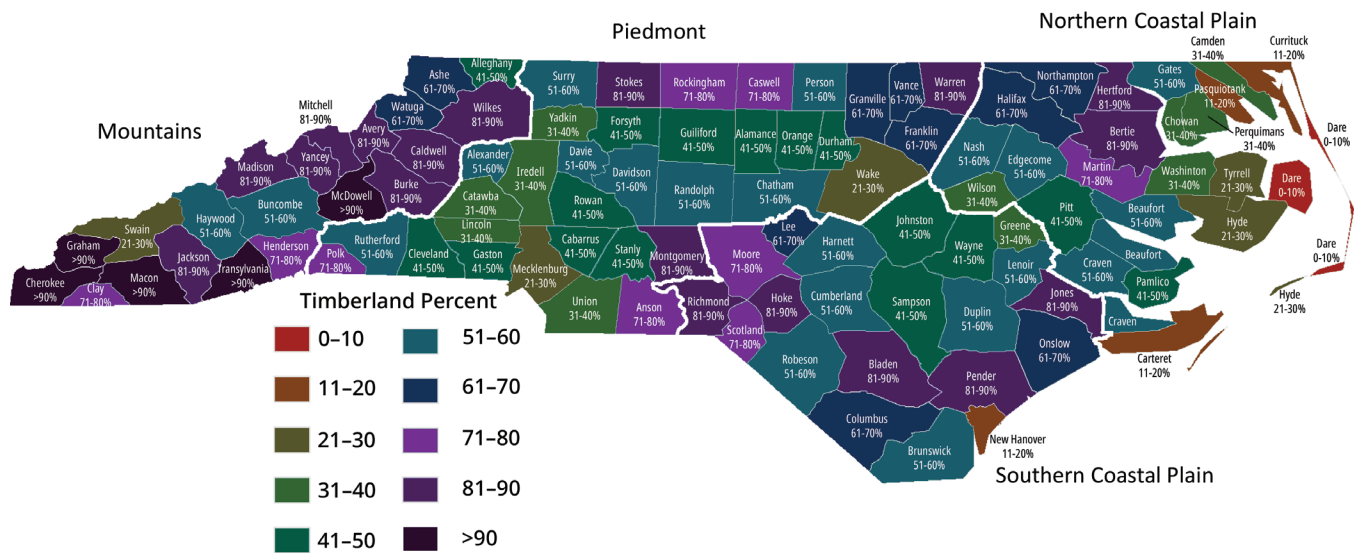


Figure 1—Timberland as a percentage of all land area by county, North Carolina, 2018.

**Table 2—Land area by land use and survey year, Southern Coastal Plain unit, North Carolina**

| Land use                                |                              | Survey year       |                   |                  |
|-----------------------------------------|------------------------------|-------------------|-------------------|------------------|
|                                         |                              | 2007 <sup>a</sup> | 2013 <sup>a</sup> | 2018             |
| <i>acres</i>                            |                              |                   |                   |                  |
| Forest land                             | Timberland                   | 5,083,747         | 5,096,068         | 5,116,053        |
|                                         | Reserved                     | 0                 | 5,828             | 6,168            |
|                                         | Other forest <sup>b</sup>    | 41,824            | 33,847            | 16,044           |
|                                         | <b>Total</b>                 | <b>5,125,571</b>  | <b>5,135,743</b>  | <b>5,138,265</b> |
| Nonforest land                          | Cropland                     | 1,655,909         | 1,589,820         | 1,707,299        |
|                                         | Pasture                      | 296,817           | 224,203           | 177,225          |
|                                         | Other nonforest <sup>c</sup> | 1,225,290         | 1,365,988         | 1,278,621        |
|                                         | Noncensus water <sup>d</sup> | 46,891            | 52,773            | 49,218           |
|                                         | <b>Total</b>                 | <b>3,224,907</b>  | <b>3,232,784</b>  | <b>3,212,363</b> |
| <b>All land<sup>e</sup></b>             |                              | <b>8,350,478</b>  | <b>8,368,527</b>  | <b>8,350,628</b> |
| Census water                            |                              | 410,161           | 392,189           | 400,606          |
| <b>Total area</b>                       |                              | <b>8,760,639</b>  | <b>8,760,716</b>  | <b>8,751,234</b> |
| <b>Percentage of land area forested</b> |                              | <b>61.30</b>      | <b>61.37</b>      | <b>61.53</b>     |

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

0 = no sample for the cell.

<sup>a</sup> Brown and Vogt (2015).

<sup>b</sup> Unproductive lands incapable of producing 20 cubic feet of wood per acre per year due to adverse site conditions.

<sup>c</sup> Includes areas classified as urban, industrial, swampland, and other nonforest, etc.

<sup>d</sup> Areas classed as water by Forest Inventory and Analysis standards, but defined by Bureau of Census as land.

<sup>e</sup> U.S. Department of Commerce, Bureau of the Census (2012).

**Table 3**—Land area by land use and survey year, Northern Coastal Plain unit, North Carolina

| Land use                         |                              | Survey year       |                   |                  |
|----------------------------------|------------------------------|-------------------|-------------------|------------------|
|                                  |                              | 2007 <sup>a</sup> | 2013 <sup>a</sup> | 2018             |
| <i>acres</i>                     |                              |                   |                   |                  |
| Forest land                      | Timberland                   | 3,689,755         | 3,544,770         | 3,611,753        |
|                                  | Reserved                     | 18,372            | 266,428           | 254,098          |
|                                  | Other forest <sup>b</sup>    | 96,613            | 34,716            | 22,083           |
|                                  | <b>Total</b>                 | <b>3,804,740</b>  | <b>3,845,914</b>  | <b>3,887,934</b> |
| Nonforest land                   | Cropland                     | 1,885,259         | 1,873,495         | 1,893,617        |
|                                  | Pasture                      | 59,740            | 34,709            | 46,955           |
|                                  | Other nonforest <sup>c</sup> | 883,703           | 887,150           | 822,255          |
|                                  | Noncensus water <sup>d</sup> | 36,908            | 36,027            | 35,617           |
|                                  | <b>Total</b>                 | <b>2,865,610</b>  | <b>2,831,381</b>  | <b>2,798,444</b> |
| All land <sup>e</sup>            |                              | 6,670,350         | 6,677,295         | 6,686,378        |
| Census water                     |                              | 2,674,769         | 2,667,584         | 2,668,841        |
| Total area                       |                              | 9,345,118         | 9,344,879         | 9,355,219        |
| Percentage of land area forested |                              | 57.04             | 57.60             | 58.15            |

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

<sup>a</sup> Brown and Vogt (2015).

<sup>b</sup> Unproductive lands incapable of producing 20 cubic feet of wood per acre per year due to adverse site conditions.

<sup>c</sup> Includes areas classified as urban, industrial, swampland, and other nonforest, etc.

<sup>d</sup> Areas classed as water by Forest Inventory and Analysis standards, but defined by Bureau of Census as land.

<sup>e</sup> U.S. Department of Commerce, Bureau of the Census (2012).

**Table 4**—Land area by land use and survey year, Piedmont unit, North Carolina

| Land use       |                              | Survey year       |                   |                  |
|----------------|------------------------------|-------------------|-------------------|------------------|
|                |                              | 2007 <sup>a</sup> | 2013 <sup>a</sup> | 2018             |
| <i>acres</i>   |                              |                   |                   |                  |
| Forest land    | Timberland                   | 5,349,603         | 5,305,360         | 5,426,085        |
|                | Reserved                     | 5,927             | 17,638            | 18,266           |
|                | Other forest <sup>b</sup>    | 2,111             | 2,139             | 0                |
|                | <b>Total</b>                 | <b>5,357,641</b>  | <b>5,325,137</b>  | <b>5,444,351</b> |
| Nonforest land | Cropland                     | 1,273,273         | 1,216,676         | 1,281,742        |
|                | Pasture                      | 1,000,749         | 944,135           | 863,142          |
|                | Other nonforest <sup>c</sup> | 2,754,931         | 2,886,736         | 2,826,352        |
|                | Noncensus water <sup>d</sup> | 61,128            | 59,817            | 63,268           |
|                | <b>Total</b>                 | <b>5,090,081</b>  | <b>5,107,364</b>  | <b>5,034,504</b> |

## NORTH CAROLINA'S FORESTS, 2018

**Table 4**—Land area by land use and survey year, Piedmont unit, North Carolina (continued)

| Land use                                | Survey year       |                   |            |
|-----------------------------------------|-------------------|-------------------|------------|
|                                         | 2007 <sup>a</sup> | 2013 <sup>a</sup> | 2018       |
| <i>acres</i>                            |                   |                   |            |
| <b>All land<sup>c</sup></b>             | 10,447,722        | 10,432,501        | 10,478,855 |
| <b>Census water</b>                     | 182,670           | 197,291           | 193,063    |
| <b>Total area</b>                       | 10,630,392        | 10,629,792        | 10,671,918 |
| <b>Percentage of land area forested</b> | 51.28             | 51.04             | 51.96      |

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

0 = no sample for the cell.

<sup>a</sup> Brown and Vogt (2015).

<sup>b</sup> Unproductive lands incapable of producing 20 cubic feet of wood per acre per year due to adverse site conditions.

<sup>c</sup> Includes areas classified as urban, industrial, swampland, and other nonforest, etc.

<sup>d</sup> Areas classed as water by Forest Inventory and Analysis standards, but defined by Bureau of Census as land.

<sup>e</sup> U.S. Department of Commerce, Bureau of the Census (2012).

**Table 5**—Land area by land use and survey year, Mountains unit, North Carolina

| Land use                                |                                    | Survey year       |                   |           |
|-----------------------------------------|------------------------------------|-------------------|-------------------|-----------|
|                                         |                                    | 2007 <sup>a</sup> | 2013 <sup>a</sup> | 2018      |
| <i>acres</i>                            |                                    |                   |                   |           |
| <b>Forest land</b>                      | <b>Timberland</b>                  | 3,932,342         | 3,941,666         | 3,935,950 |
|                                         | <b>Reserved</b>                    | 355,832           | 356,178           | 352,007   |
|                                         | <b>Other forest<sup>b</sup></b>    | 6,031             | 6,052             | 0         |
|                                         | <b>Total</b>                       | 4,294,205         | 4,303,896         | 4,287,957 |
| <b>Nonforest land</b>                   | <b>Cropland</b>                    | 228,506           | 191,394           | 216,571   |
|                                         | <b>Pasture</b>                     | 384,894           | 355,702           | 330,081   |
|                                         | <b>Other nonforest<sup>c</sup></b> | 728,952           | 791,206           | 766,856   |
|                                         | <b>Noncensus water<sup>d</sup></b> | 28,446            | 22,705            | 19,879    |
| <b>Total</b>                            |                                    | 1,370,798         | 1,361,007         | 1,333,387 |
| <b>All land<sup>c</sup></b>             |                                    | 5,665,003         | 5,664,903         | 5,621,344 |
| <b>Census water</b>                     |                                    | 42,558            | 43,785            | 44,377    |
| <b>Total area</b>                       |                                    | 5,707,562         | 5,708,688         | 5,665,721 |
| <b>Percentage of land area forested</b> |                                    | 75.80             | 75.97             | 76.28     |

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

0 = no sample for the cell.

<sup>a</sup> Brown and Vogt (2015).

<sup>b</sup> Unproductive lands incapable of producing 20 cubic feet of wood per acre per year due to adverse site conditions.

<sup>c</sup> Includes areas classified as urban, industrial, swampland, and other nonforest, etc.

<sup>d</sup> Areas classed as water by Forest Inventory and Analysis standards, but defined by Bureau of Census as land.

<sup>e</sup> U.S. Department of Commerce, Bureau of the Census (2012).

Coastal Plain unit accounted for 27 percent, the Piedmont unit 26 percent, and the Mountain unit the remaining 10 percent.

Timberland as a percentage of land area by county (fig. 1) shows the most heavily forested part of the State to be the Mountain unit, followed by the Southern Coastal Plain unit. Five counties in the Mountain unit were >80 percent timberland. Five counties in the Southern Coastal Plain unit were >70 percent timberland. In the Piedmont unit, 17 counties were ≤50 percent timberland. Counties with the least timberland contained large metropolitan areas or extensive areas in farmland. Ten counties were <30 percent timberland. Seven of those counties were along North Carolina's coastline and included considerable marsh, development, or large-scale farming operations. The two Piedmont counties included the State's larger cities of Charlotte and Raleigh. The one Mountain unit county (Swain) contains a large portion of the heavily forested Great Smoky Mountains National Park, which is reserved, otherwise the county would have been in a much higher percentage of timberland category.

## TIMBERLAND STATISTICS

### Area

#### Trends

The 18.1 million acres of timberland recorded for North Carolina in 2018 represents a 1-percent increase from the 17.9 reported in 2013, halting a decades long downward trend in area of timberland for the State (fig. 2A). Area of timberland in 2018 is now slightly above that reported in 2007. However, many factors were involved in this apparent turnaround. The previous 2007–2013 period's decrease resulted from two situations. First, 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. Second, the expansion of major metropolitan areas and industrialization across the State presumably increased the area

of the other nonforest land category by 338,000 acres (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. In contrast, during the 2013–2018 period, the other nonforest land category decreased by 237,000 acres and timberland increased by 202,000 acres. These changes appear to be behind the overall positive increase in the State's timberland. However, the fact that 60 percent of the State's gain in timberland occurred in the Piedmont unit and another 33 percent in the Northern Coastal Plain does not coincide completely with the degree of loss from the other nonforest category by unit, which makes the source of new timberland less clear.

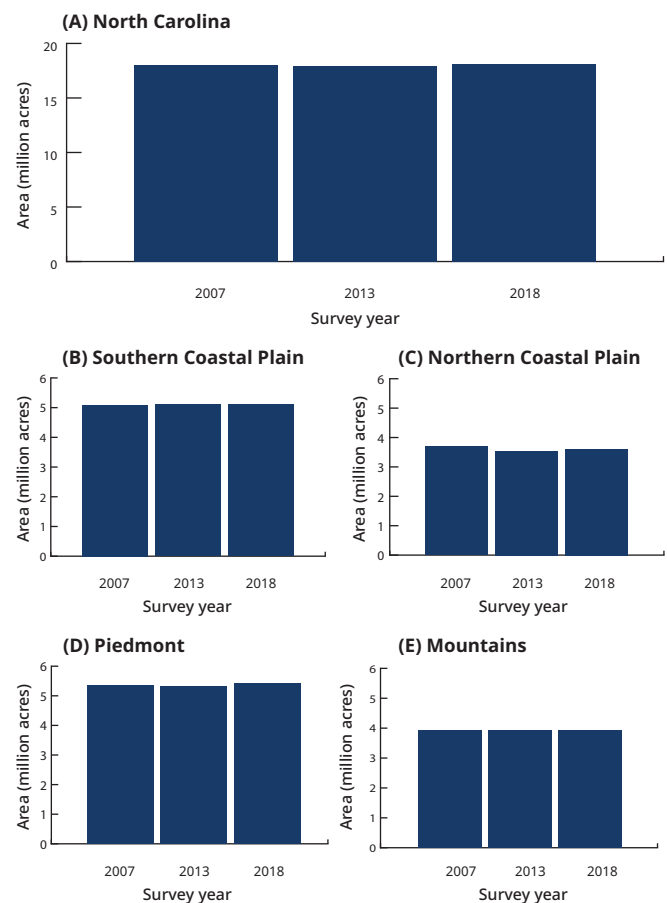


Figure 2—Area of timberland by survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015).

## Occurrence

North Carolina's 202,000-acre overall increase in timberland (fig. 2A) did not occur in each of the four survey units. The Mountain unit (fig. 2E) was the only part of the State to lose timberland, but the decrease was slight (6,000 acres) and by much less than 1 percent. The Southern Coastal Plain unit (fig. 2B) increased the least (20,000 acres), by <1 percent. The Piedmont unit (fig. 2D) increased the most (121,000 acres), by >2 percent. The Northern Coastal Plain (fig. 2C) increased by 67,000 acres, or by almost 2 percent. However, caution is advised regarding detailed analysis of the timberland gain or loss because of the aforementioned 2007–2013 period's reclassification of certain timberland areas into a reserved status under field manual 6.0 guidelines (USDA Forest Service 2012). These changes potentially complicate the accurate assessment of true timberland change at scales smaller than the State level, particularly when the changes are nominal.

## Ownership

Nonindustrial private forest (NIPF) owners held 86 percent, or more than 15.5 million acres of North Carolina's timberland. Private individuals (all NIPF-owner classes other than corporate) held 70 percent of the NIPF timberland. Despite a continued downward trend, the private individual category with 10.8 million acres continued to control most (60 percent) of North Carolina's total timberland in 2018 (fig. 3A). In contrast, NIPF's other corporate category (all corporate-owned timberland other than forest industry) continued its upward trend with 3.9 million acres to control 22 percent (the second highest amount) of the State's timberland in 2018. Third highest, national forest timberland decreased slightly to 1.1 million acres, or 6 percent of the State's timberland. Fourth highest, State and local government timberland increased slightly to 1.1 million acres for 6 percent of the State total. Fifth, area of forest industry timberland continued its downward trend to <0.8 million acres, 4 percent of the State total (fig. 3A).

Area of timberland owned by private individuals dominated each of the four survey units, and the

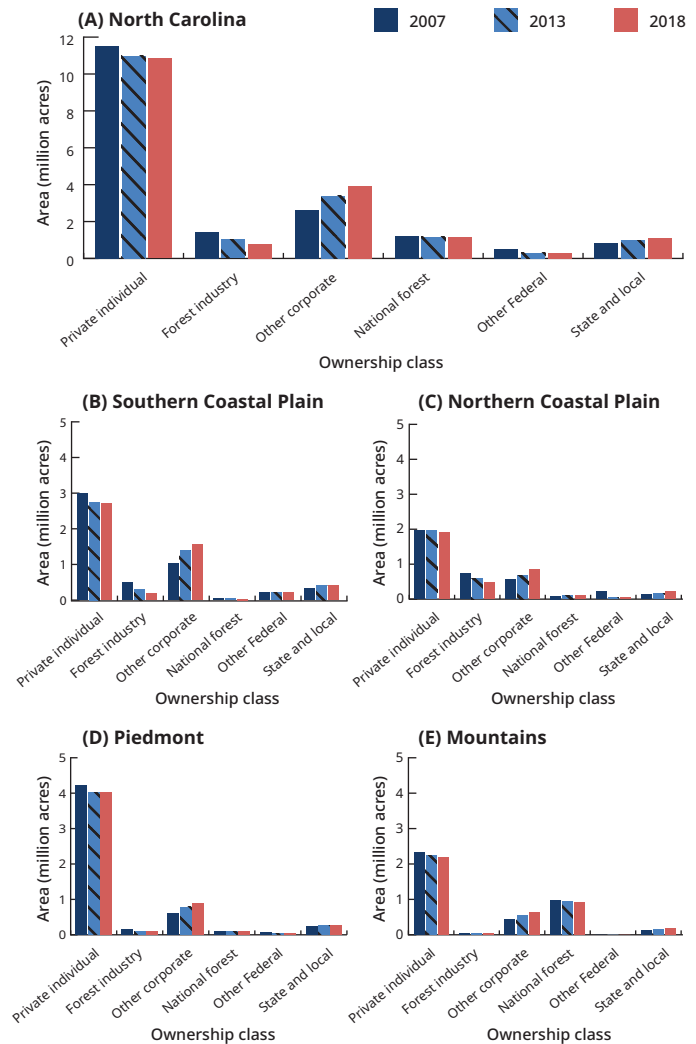


Figure 3—Area of timberland by ownership and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015).

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

The 202,000-acre net increase in area of North Carolina's timberland was also distributed differently by ownership category. At the State level, most of the increase in timberland was recorded in the other corporate and State and local government categories, which approximately increased by 520,000 and 110,00 acres, respectively. These cumulative gains totaled 630,000 acres that were offset by reductions in the forest industry, private individual, and national forest categories, which approximately decreased by 240,000, 150,000, and 40,000 acres, respectively. The other Federal category remained relatively stable since 2013 at about 310,000 acres in 2018. Area of privately owned timberland decreased by 14 percent since 2013, from 11.0 million acres to 10.8 million acres in 2018. Forest industry timberland decreased 23 percent since 2013, from >1.0 million acres to <0.8 million acres in 2018. Much of the lost private individual and forest industry category timberland was absorbed by increased area of timberland in State and local government, and other corporate ownership categories.

By survey unit, the decrease in timberland for the private individual owner category occurred in three of the State's four survey units. Only in the Piedmont unit did private individual timberland ownership increase, although the change was negligible. The decreased timberland in the forest industry category occurred in three of the four survey units. Forest industry timberland decreased most in the two Coastal Plain units and least in the Piedmont unit, where amounts were nominal in comparison. The Mountain unit contained the least forest industry ownership, with little recorded change.

The increased area of other corporate timberland often corresponds with the decreased area of forest industry timberland (fig. 3). 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 management goals and priorities of new landowners.

Most of the State's 10.8 million acres of private individual timberland, 37 percent, occurred in the Piedmont unit, and 25 percent was found in the Southern Coastal Plain unit. The Mountain unit accounted for 20 percent, and the Northern Coastal Plain unit accounted for the remaining 18 percent.

Most of the State's <0.8 million acres of forest industry timberland, 61 percent, occurred in the Northern Coastal Plain unit, and 24 percent was found in the Southern Coastal Plain unit. The Piedmont unit accounted for 11 percent, and the Mountain unit accounted for the remaining 4 percent.

Most of the State's 3.9 million acres of other corporate timberland, <40 percent, occurred in the Southern Coastal Plain unit, and 23 percent was found in the Piedmont unit. The Northern Coastal Plain unit accounted for 22 percent, and the Mountain unit accounted for the remaining nearly 16 percent.

Most of the State's 1.1 million acres of national forest timberland, 81 percent, occurred in the Mountain unit, and 9 percent occurred in the Northern Coastal Plain unit. The Piedmont unit accounted for 8 percent, and the Southern Coastal Plain unit accounted for the remaining 2 percent.

Most of the State's 0.3 million acres of other Federal timberland, 71 percent, was found in the Southern Coastal Plain unit, and 16 percent was found in the Piedmont unit. The Northern Coastal Plain unit accounted for the remaining 13 percent, and none was recorded for the Mountain unit.

Most of the State's 1.1 million acres of State and local government timberland, 39 percent, was found in the Southern Coastal Plain unit, and 26 percent was found in the Piedmont unit. The Northern Coastal Plain unit accounted for 19 percent, and the Mountain 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, floodplains, coves, uplands, flatwoods, deep sands, and dry tops. Within these physiographic 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 accompanying species list is limited to some 106 tree species historically identified on sample plots (app. 3). Furthermore, the most common species associations can be combined 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 in 2018, the hardwood forest types accounted for 11.6 million acres, 64 percent of North Carolina's timberland, and softwood forest types accounted for 6.4 million acres, 35 percent. Nonstocked areas of 0.1 million acres made up the remaining 1 percent.

The most common forest-type group that occurred in North Carolina was oak-hickory (fig. 4A). The oak-hickory forest-type group accounted for 6.9 million acres, or 38 percent, of North Carolina's timberland. Loblolly-shortleaf pine type (which included nominal other softwood amounts) was the second most common with <5.8 million acres, 32 percent of the State's timberland. Oak-pine type was third with 2.3 million acres, 12 percent of the State's timberland. The area of timberland classified as oak-gum-cypress forest type was fourth and accounted for almost 1.7 million acres, 9 percent of the State total. The 150,000 acres of other hardwoods category included traces of

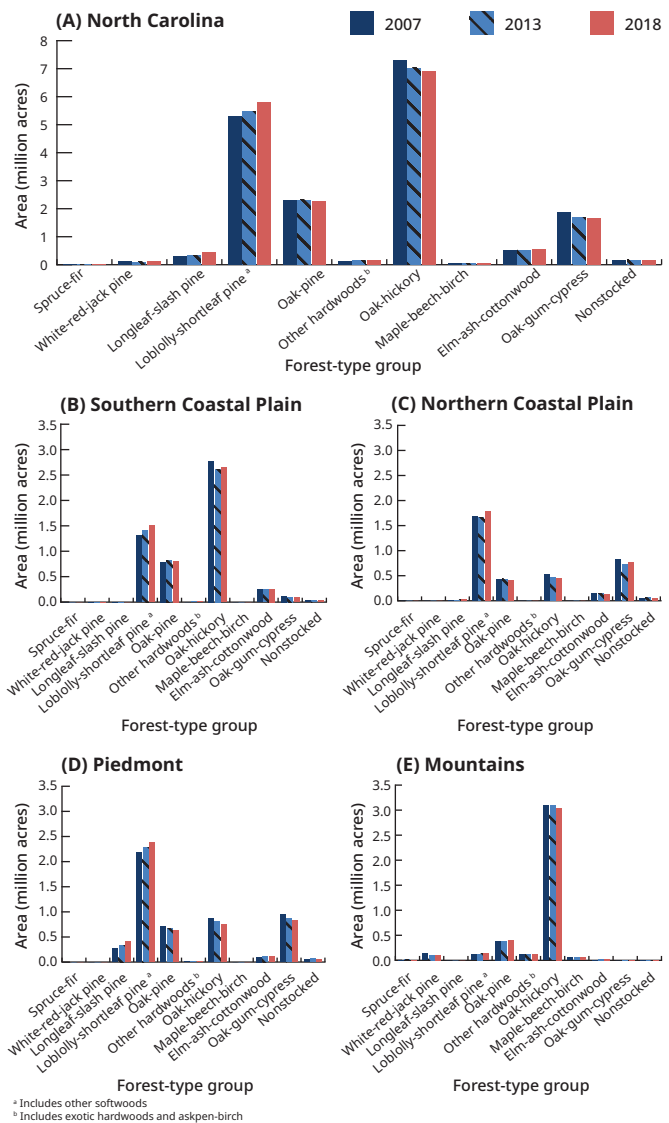


Figure 4—Area of timberland by forest-type group and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015).

exotic hardwoods and aspen-birch forest types. Timberland areas having insufficient stocking of trees to determine a forest type were classified as nonstocked and accounted for 148,000 acres.

Most of the State's 6.9 million acres of oak-hickory forest type timberland, 44 percent, was found in the Mountain unit, and 39 percent was found in the Piedmont unit. The Southern Coastal Plain unit accounted for 11 percent of oak-hickory forest type timberland, and the Northern Coastal Plain unit accounted for the remaining 6 percent.

Most of the State's 5.8 million acres of loblolly-shortleaf forest type timberland, 41 percent, was found in the Southern Coastal Plain unit, and 31 percent was found in the Northern Coastal Plain unit. The Piedmont unit accounted for 26 percent, and the Mountain unit accounted for the remaining 2 percent of loblolly-shortleaf forest type timberland.

Most of the State's 2.3 million acres of oak-pine forest type timberland, 36 percent, was found in the Piedmont unit, and 28 percent was found in the Southern Coastal Plain unit. The Mountain and Northern Coastal Plain units each accounted for 18 percent of oak-pine forest type timberland.

Most of the State's nearly 1.7 million acres of oak-gum-cypress forest type timberland, 49 percent, was found in the Southern Coastal Plain unit, and 45 percent was found in the Northern Coastal Plain unit. The Piedmont unit accounted for 6 percent of oak-gum-cypress forest type timberland, and only a trace was recorded in the Mountain unit.

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 46 percent of the unit's timberland. The oak-gum-cypress type was second, with 16 percent of the timberland, and third was oak-hickory with 15 percent. Oak-pine came in fourth with 12 percent of the

timberland. The Northern Coastal Plain unit (fig. 4C) had the same order of forest type prevalence as that of the Southern Coastal Plain, except the percentages differed by forest type. In the Northern Coastal Plain unit, loblolly-shortleaf pine type accounted for 49 percent of the timberland, oak-gum-cypress 21 percent, oak-hickory 12 percent, and oak-pine 11 percent. In the Piedmont unit (fig. 4D), oak-hickory forest type accounted for 49 percent of the timberland, followed by loblolly-shortleaf with 28 percent, oak-pine with 15 percent, and elm-ash-cottonwood with 5 percent. The Mountain unit (fig. 4E) was dominated by one forest-type group, oak-hickory, which accounted for 77 percent of the timberland. Oak-pine was second with 10 percent of the timberland in the Mountain unit, loblolly-shortleaf was third with 3 percent, and white-red-jack pine was fourth with <3 percent.

### Stand-size class

For another purview of the State's timberland, FIA classified forest stands into three major stand-size classes. The classes were sawtimber, poletimber, and sapling-seedling size. Those few acres with insufficient stocking to determine forest type or stand size were allocated to the nonstocked category. For all forest-type groups, the sapling-seedling size class 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 poletimber-size class 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 sawtimber-size class 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 types only differs in the diameter threshold, wherein poletimber size ranges from 5.0 to 10.9 inches d.b.h., and sawtimber size requires 11.0 inches d.b.h. and larger.

In 2018, the sawtimber-size class covered 10.7 million acres, 59 percent, of North Carolina's timberland. Based on broad forest type groupings, most of the sawtimber-size stands, 45 percent, were composed of upland hardwood forest types



North Carolina forester measuring tree diameter (Courtesy photo by North Carolina Forest Service).

(fig. 5A). Softwood forest types made up 33 percent and lowland hardwood forest types made up 11 percent of the State's sawtimber-size timberland. Oak-pine forest type accounted for <11 percent of sawtimber-size timberland in North Carolina.

The poletimber-size class covered 3.8 million acres, 21 percent, of North Carolina's timberland in 2018. Based on broad forest type groupings, most of the poletimber-size stands, 44 percent, were composed of softwood forest types (fig. 5A). Upland hardwood forest types were second with 31 percent of the State's poletimber-size timberland, and oak-pine forest type made up

13 percent. Lowland hardwood forest types accounted for the remaining 12 percent.

The sapling-seedling size class covered 3.5 million acres, 19 percent, of North Carolina's timberland in 2018. Based on broad forest type groupings, most of the sapling-seedling size stands, 33 percent, were composed of upland hardwood forest types (fig. 5A). Softwood forest types made up 33 percent and oak-pine type made up 19 percent of the State's sapling-seedling size timberland. The lowland hardwood forest types accounted for the remaining 15 percent of sapling-seedling size timberland in North Carolina.

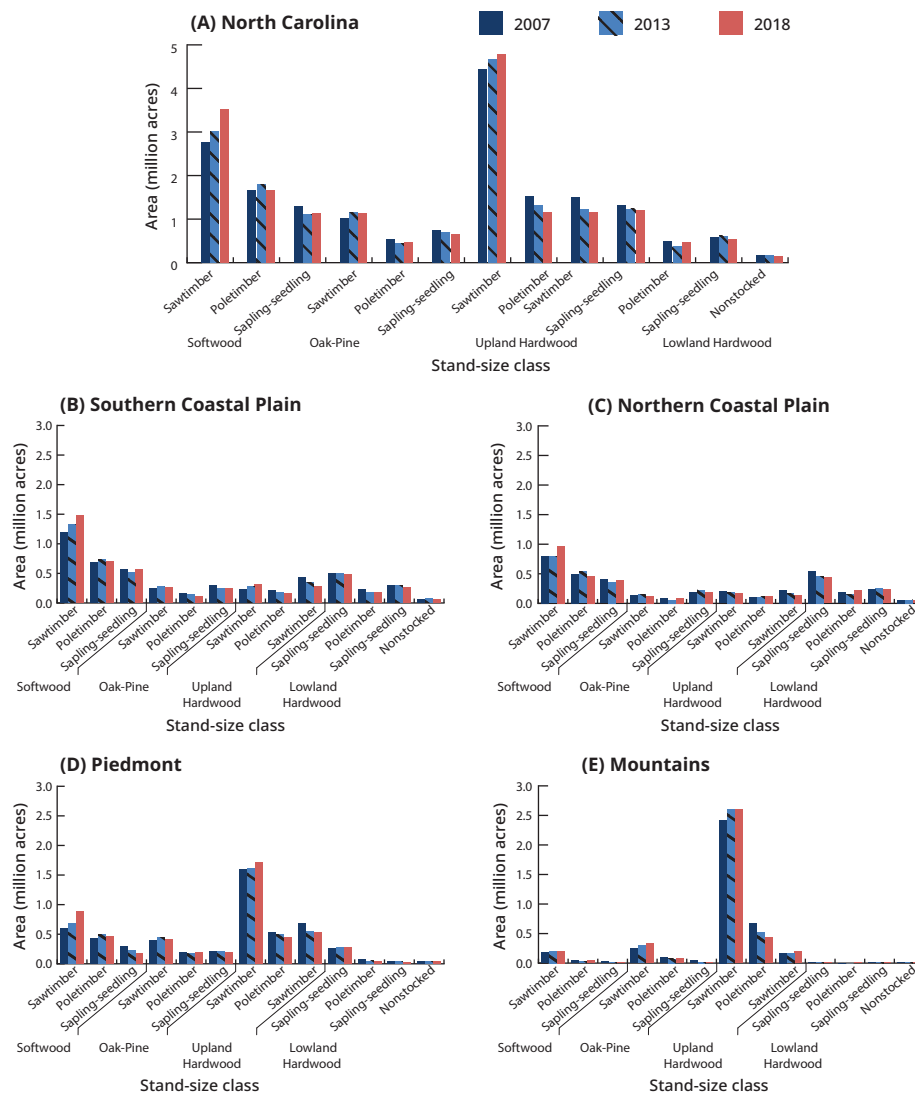


Figure 5—Area of timberland by stand-size class, broad forest-type group, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015).

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, it was the softwood forest types that dominated sawtimber-size stands in the Southern Coastal Plain unit.

The sawtimber-size class covered 2.5 million acres, 50 percent, of the Southern Coastal Plain's timberland in 2018. Based on broad forest type groupings, most of the sawtimber-size stands, 58 percent, consisted of softwood forest types (fig. 5B). Lowland hardwood forest types made up 19 percent and upland hardwood types made up 12 percent of the Southern Coastal Plain's sawtimber-size timberland. Oak-pine forest type accounted for the remaining 11 percent of sawtimber-size timberland in the Southern Coastal Plain unit.

The poletimber-size class covered 1.2 million acres, 23 percent, of the Southern Coastal Plain's timberland in 2018. Based on broad forest type groupings, most of the poletimber-size stands, 60 percent, were made up of softwood forest types (fig. 5B). Upland hardwood, lowland hardwood, and oak-pine forest types accounted for 14, 16, and 10 percent of the Southern Coastal Plain's poletimber-size timberland, respectively.

The sapling-seedling size class covered 1.4 million acres, >26 percent, of the Southern Coastal Plain's timberland in 2018. Based on broad forest type groupings, most of the sapling-seedling size stands, 42 percent, were composed of softwood forest types (fig. 5B). Upland hardwood forest types made up 21 percent and lowland hardwood forest types made up 19 percent of the Southern Coastal Plain's sapling-seedling size timberland. Oak-pine forest type accounted for the remaining 18 percent of sapling-seedling size timberland in the Southern Coastal Plain unit.

The sawtimber-size class covered 1.7 million acres, 47 percent, of the Northern Coastal Plain's timberland in 2018. Based on broad forest type groupings, most of the sawtimber-size stands,

57 percent, were composed of softwood forest types (fig. 5C). Lowland hardwood forest types made up 26 percent and upland hardwood forest types made up 10 percent of the Northern Coastal Plain's sawtimber-size timberland. Oak-pine forest type accounted for the remaining 7 percent of sawtimber-size timberland in the Northern Coastal Plain unit.

The poletimber-size class covered almost 0.9 million acres, 25 percent, of the Northern Coastal Plain's timberland in 2018. Based on broad forest type groupings, most of the poletimber-size stands, 51 percent, were composed of softwood forest types (fig. 5C). Lowland hardwood forest types accounted for 25 percent of the Northern Coastal Plain's poletimber-size timberland, upland hardwood forest types 14 percent, and oak-pine forest type 10 percent.

The sapling-seedling size class covered 1.0 million acres, 27 percent, of the Northern Coastal Plain unit's timberland in 2018. Based on broad forest type groupings, most of the sapling-seedling size stands, 40 percent, were composed of softwood forest types (fig. 5C). Lowland hardwood forest types made up 25 percent and oak-pine forest type made up 20 percent of the Northern Coastal Plain's sapling-seedling size timberland. Upland hardwood forest types accounted for 15 percent of sapling-seedling size timberland in the Northern Coastal Plain unit.

The sawtimber-size class covered 3.3 million acres, 61 percent, of the Piedmont unit's timberland in 2018. Based on broad forest type groupings, most of the sawtimber-size stands, 52 percent, were composed of upland hardwood forest types (fig. 5D). Softwood forest types made up 27 percent and oak-pine forest type made up 13 percent of the Piedmont unit's sawtimber-size timberland. Lowland hardwood forest types accounted for 8 percent of sawtimber-size timberland in the Piedmont unit.

The poletimber-size class covered 1.1 million acres, 21 percent, of the Piedmont unit's timberland in 2018. 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 39 percent and oak-pine forest type made up 17 percent of the Piedmont unit's poletimber-size timberland. Lowland hardwood forest types accounted for the remaining 3 percent.

The sapling-seedling size class covered 0.9 million acres, >17 percent, of the Piedmont unit's timberland in 2018. Based on broad forest type groupings, most of the sapling-seedling size stands, 57 percent, were composed of upland hardwood forest types (fig. 5D). Oak-pine forest type made up 21 percent and softwood forest types made up 19 percent of the Piedmont unit's sapling-seedling size timberland. Lowland hardwood forest types accounted for 3 percent of the sapling-seedling size timberland in the Piedmont unit.

The sawtimber-size class covered 3.1 million acres, 80 percent, of the Mountain unit's timberland in 2018. Based on broad forest type groupings, a great majority of the sawtimber-size stands, 83 percent, were composed of upland hardwood forest types (fig. 5E). Oak-pine forest type made up 10 percent of the Mountain unit's sawtimber-size timberland, softwood forest types made up 6 percent, and lowland hardwood forest types accounted for the remaining <1 percent.

The poletimber-size class covered 0.6 million acres, 14 percent, of the Mountain unit's timberland in 2018. Based on broad forest type groupings, most of the poletimber-size stands, 77 percent, were composed of upland hardwood forest types (fig. 5E). Oak-pine forest type made up 13 percent of the Mountain unit's poletimber-size timberland, softwood forest types made up 8 percent, and lowland hardwood forest types made up the remaining 2 percent.

The sapling-seedling size class covered 0.2 million acres, 6 percent, of the Mountain unit's timberland in 2018. Based on broad forest type groupings, most of the sapling-seedling size stands, 87 percent, were composed of upland hardwood forest types (fig. 5E). Lowland hardwood forest types made up 6 percent of the Mountain unit's sapling-seedling size timberland, softwood forest

types accounted for 4 percent, and oak-pine forest type made up 3 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 2018, nearly 3.1 million acres, 17 percent, of North Carolina's timberland exhibited clear evidence of artificial regeneration (fig. 6A). For the purposes of this bulletin, acres with clear evidence of artificial regeneration were considered planted and the terms herein used synonymously.

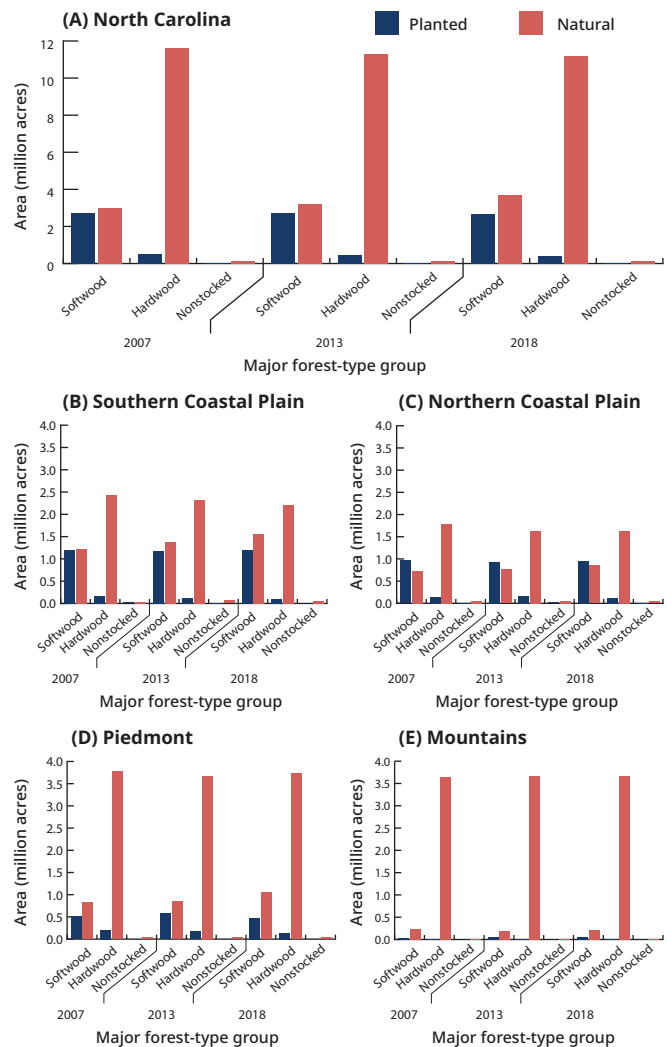


Figure 6—Area of timberland by major forest-type group, stand origin, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015).

More than 2.7 million acres, 88 percent of the area with evidence of artificial regeneration, was classified in the softwood forest-type group. These planted softwood forest type acres decreased about 2 percent in area since 2013. The hardwood forest-type group accounted for 12 percent of the State's total planted acres, and only a trace was classified in the nonstocked category. It is important to note that oak-pine forest type is classified as within the hardwood forest-type group. In fact, oak-pine forest type 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 0.4 million planted hardwood acres, 224,000 acres were oak-pine forest type and 116,000 were oak-hickory forest type. Almost 33,000 acres were classified as oak-gum-cypress forest type and 5,000 acres were classified as elm-ash-cottonwood forest type. Within the softwood forest-type group, loblolly-shortleaf pine forest type accounted for nearly 2.5 million acres, 81 percent, of the State's total planted timberland. Longleaf-slash pine forest type accounted for 176,000 acres, and white-red-jack pine forest type accounted for 30,000 acres.

In 2018, area of natural softwood reached almost 3.7 million acres, 15 percent higher than the 3.2 million acres in 2013, and 22 percent higher than the 3.0 million acres in 2007 (fig. 6A).



North Carolina forester inspects pine seedling before planting efforts begin. (Courtesy photo by North Carolina Forest Service)

Distribution of the State's nearly 3.1 million acres of planted timberland differed between the four survey units. Together, the two Coastal Plain units accounted for 78 percent of the planted timberland in North Carolina. Most of the planted acres, 43 percent, were found in the Southern Coastal Plain unit (fig. 6B), and another 35 percent were located in the Northern Coastal Plain unit (fig. 6C). The Piedmont unit (fig. 6D) accounted for 20 percent of the planted timberland. Planted timberland in the Mountain unit (fig. 6E) accounted for only 2 percent of the State total.

Area of planted timberland accounted for 1.3 million acres, 25 percent, of the Southern Coastal Plain's timberland in 2018. Based on major forest type groupings, most of the planted stands, 92 percent, were composed of softwood forest types (fig. 6B). In the Southern Coastal Plain unit, the area of planted softwood stands slightly decreased since 2007, whereas the area of natural softwood stands increased steadily in that time period.

In 2018, area of planted timberland accounted for nearly 1.1 million acres, 30 percent, of the Northern Coastal Plain's timberland. Based on major forest type groupings, most of the planted stands, 89 percent, were composed of softwood forest types (fig. 6C). In the Northern Coastal Plain unit, the area of planted softwood stands remained about the same since 2007, whereas the area of natural softwood stands increased slightly in that time period. In 2018, however, the Northern Coastal Plain unit was the only part of the State where planted softwood stands exceeded natural softwood stands.

Area of planted timberland accounted for 0.6 million acres, 11 percent, of the Piedmont unit's timberland in 2018. Based on major forest type groupings, most of the planted stands, 78 percent, were composed of softwood forest types (fig. 6D). In the Piedmont unit, the area of planted softwood stands decreased by 17 percent since 2013, whereas the area of natural softwood stands increased by 23 percent in that time period.

In the Mountain unit, area of planted timberland accounted for 58,000 acres, 1 percent, of the Mountain timberland in 2018. 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 decreased since 2013. The area of natural softwood stands has remained about the same since 2013.

### Stand-age class

The planted and natural stands by stand-age class provide another method to describe North Carolina's timberland. This section focuses on the planted stand-age structure. In 2018 for all species combined, the nearly 3.1-million-acre statewide area of planted timberland peaked in

the 0- to 10-year stand-age class with almost 1.0 million acres (fig. 7A). The area in the 0- to 10-year stand-age class decreased by 9 percent since 2013, and by 15 percent since 2007. The area of planted stands steadily decreased as the stand-age class increased. By the 31- to 40-year stand-age class, only 15 percent, 448,000 acres, of the planted stands remained. This drop was typical of the point where many planted yellow pine stands begin to be harvested. In fact, only 4 percent, 128,000 acres, of the planted stands remained in the 41- to 60-year stand-age class. Within that broader age class, 70 percent were gone by age 50. In 2018, the 15.0 million acres of North Carolina's

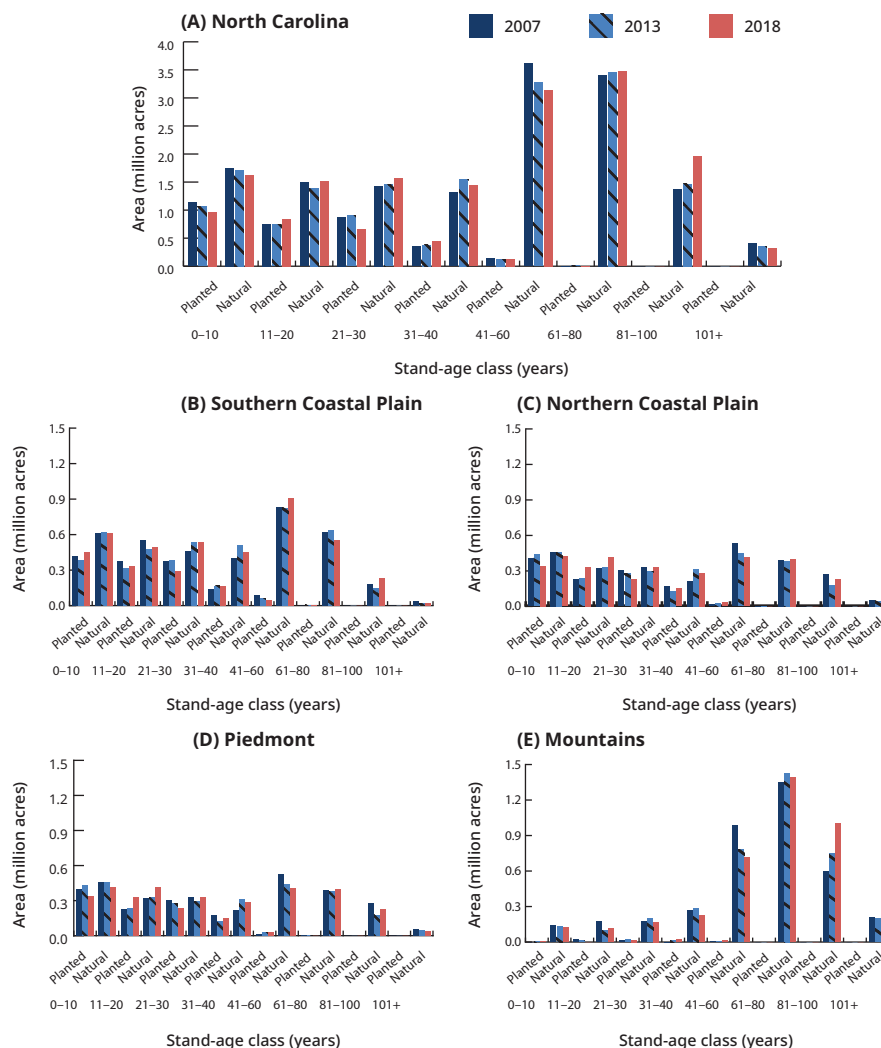


Figure 7—Area of timberland by stand-age class, stand origin, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015).

natural timberland stands were almost equally distributed across the stand-age classes (adjusted as noted below) until the 81-year and older stand-age brackets, where remaining acres declined.

Please note, particularly regarding the statewide area of natural timberland depicted in each of the five panels of figure 7, that the obvious peaks in the 41- to 60-year and older stand-age classes are largely a result of intentional doubling of the stand-age class brackets for older stands to enable graphical display of the oldest stands within chart boundaries. For any trend comparisons to the younger age brackets, it is recommended to either halve the older brackets or double the younger brackets for consistency.

In the Southern Coastal Plain unit (fig. 7B), the age distribution of the 1.3-million-acre area of planted timberland was like that at the State level; it peaked in the 0- to 10-year stand-age class, after the rate of liquidation accelerated. However, the Southern Coastal Plain was the only unit that increased in area of 0- to 10-year-old planted stands, by 17 percent since 2013 and by 7 percent since 2007. The Southern Coastal Plain unit also had the highest percentage of its planted timberland in the 0- to 10-year stand-age class with 35 percent, 448,000 acres. The Southern Coastal Plain unit contained the most, 40 percent, of the State's planted timberland in the 41-year and older stand-age classes. Adjusted for the previously noted stand-age class bracket change at 41 or more years, there were 3.8 million acres of natural timberland in this unit in 2018. Contrary to the upland units of the State, the stand-age class distribution peaked in the youngest 0- to 10-year stand-age class. After that peak, the unit's stand-age class distribution plateaued at similar levels until the 61 year and older stand-age classes, where it appeared to decrease with increasing stand-age classes more than it did in the other three units.

In the Northern Coastal Plain unit (fig. 7C), the age distribution of the nearly 1.1-million-acre area of planted timberland was highest in the 0- to 10-year stand-age class with 31 percent, 340,000

acres. The area of the 0- to 10-year stand-age class decreased by 22 percent since 2013, and by 15 percent since 2007. Planted timberland was nearly absent after the 31- to 40-year age class in the Northern Coastal Plain, with only 3 percent in the next age class. Again, adjusting for the noted age bracket differences, there were >2.5 million acres of natural timberland in this unit in 2018. Like that in the other lowland unit of the State, the stand-age class distribution peaked in the youngest 0- to 10-year stand-age class. After that peak held through the 11- to 20-year stand-age class, the distribution decreased continuously in most of the succeeding stand-age classes. There, that trend appeared to start earlier than in the other survey units.

In the Piedmont unit (fig. 7D), the 0.6-million-acre area of planted timberland peaked in the 0- to 10- and 21- to 30-year stand-age classes with 28 and 29 percent, respectively. In 2018, these two stand-age classes had 171,000 and 178,000 acres of the Piedmont unit's planted timberland, respectively. However, the area in the 0- to 10-year stand-age class decreased by 28 percent since 2013 and by 47 percent since 2007. The distribution of planted timberland in the Piedmont unit showed a drop to 120,000 acres in the 21- to 30-year stand-age class and 109,000 in the 31- to 40-year age class, after which <6 percent remained in older stands. The 4.8 million acres of natural timberland in this unit in 2018 peaked in the 51- to 60-year stand-age class. The distribution remained relatively equal across stand-age classes until the 81-year and older stand-age classes.

In the Mountain unit (fig. 7E), the nominal 58,000-acre area of planted timberland recorded in 2018 peaked in the 31- to 40-year stand-age class. Most of this unit's planted stand acres ranged among the 21- to 60-year stand-age classes. The Mountain unit had nearly 3.9 million acres of natural timberland stands in 2018. The Mountain unit had the fewest acres of natural timberland stands <20 years old in the State. It also increased in area in each older stand-age class until the highest stand-age class peak for natural timberland in the State at the 71- to 80-year stand-age class.

## 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 over time. Furthermore, volume can be summed for an individual 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 in the next section (Timberland Statistics: Net Change Components).

Volume calculation 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 d.b.h. Loblolly pine, 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.

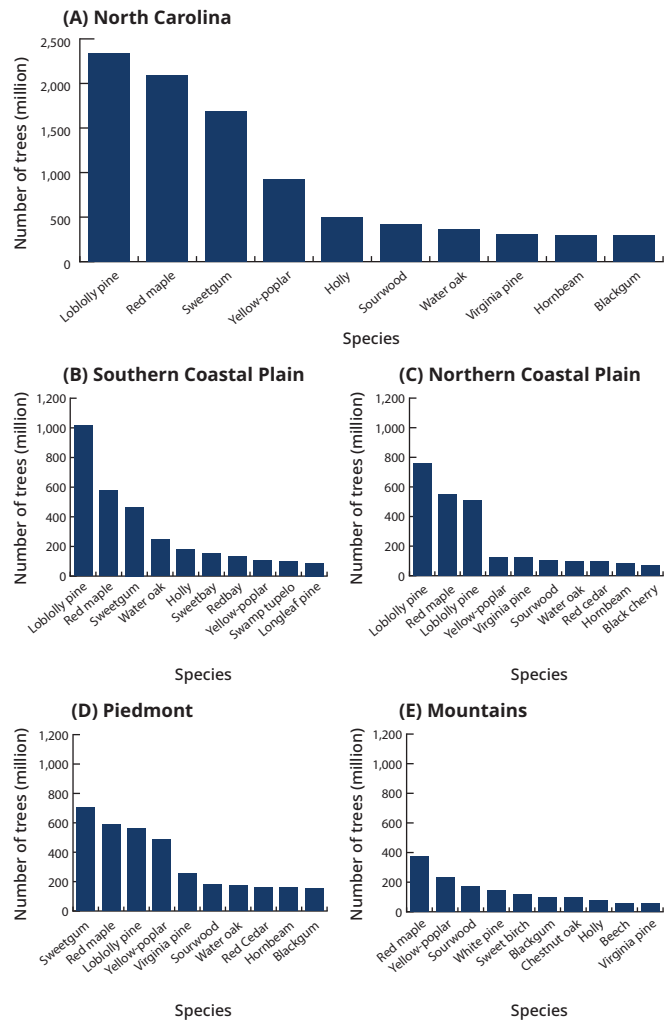
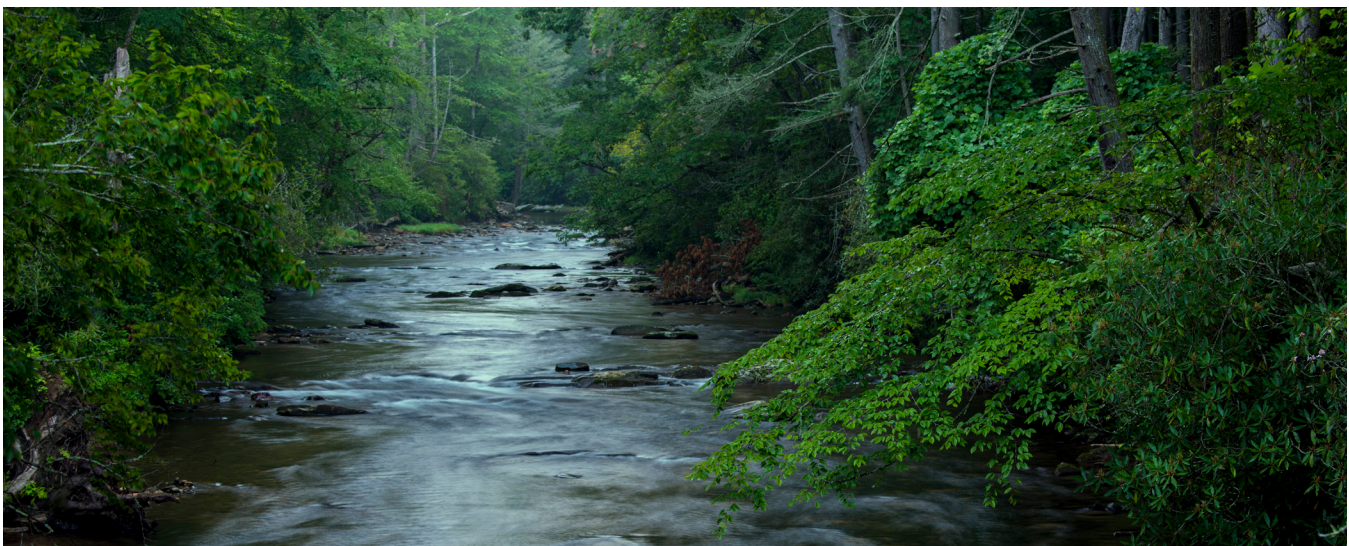


Figure 8—Top 10 timberland tree species based on number of trees in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2018.



A morning river scene in the Davidson River Campground, Pisgah National Forest, NC, July 29, 2017. (USDA Forest Service photo by Lance Cheung)

For instance, the statewide top three order was the same in the two Coastal Plain units. In the Piedmont unit, this order switched to sweetgum, red maple, and loblolly pine. Longleaf pine made the top 10 species list only in the Southern Coastal Plain unit (fig. 8B). Sweetbay, redbay, and swamp tupelo were included in the top 10 species only in the two Coastal Plain unit (fig. 8C) lists. Black cherry and red cedar were unique to the Piedmont unit's top 10 species list (fig. 8D). The top 10 tree species for the Mountain unit (fig. 8E) differed from the other units most of all. Here, eastern white pine, sweet birch, chestnut oak, and beech made the top 10 species list. As expected, the number of hemlock trees fell out of the Mountain unit's top 10 tree list for 2018. Also expected, but at a slower pace, the number of dogwood trees fell out of the Piedmont unit's top 10 tree list for 2018. As recently as 2007, dogwood was 8 of 10 in the State's top 10 tree list, 6 of 10 in the Piedmont unit, and 9 of 10 in the Mountain unit.

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. Similar changes occurred by survey unit. In the Southern Coastal Plain unit (fig. 9B), loblolly pine, sweetgum, and yellow-poplar formed the top three by volume. Pond pine and baldcypress having enough volume to make the list. In the Northern Coastal Plain (fig. 9C), loblolly pine, sweetgum, and red maple were the top three species by volume. Pond pine, baldcypress, and green ash accounted for enough volume to make the top 10 list in the Northern Coastal Plain unit. In the Piedmont unit (fig. 9D), loblolly pine,

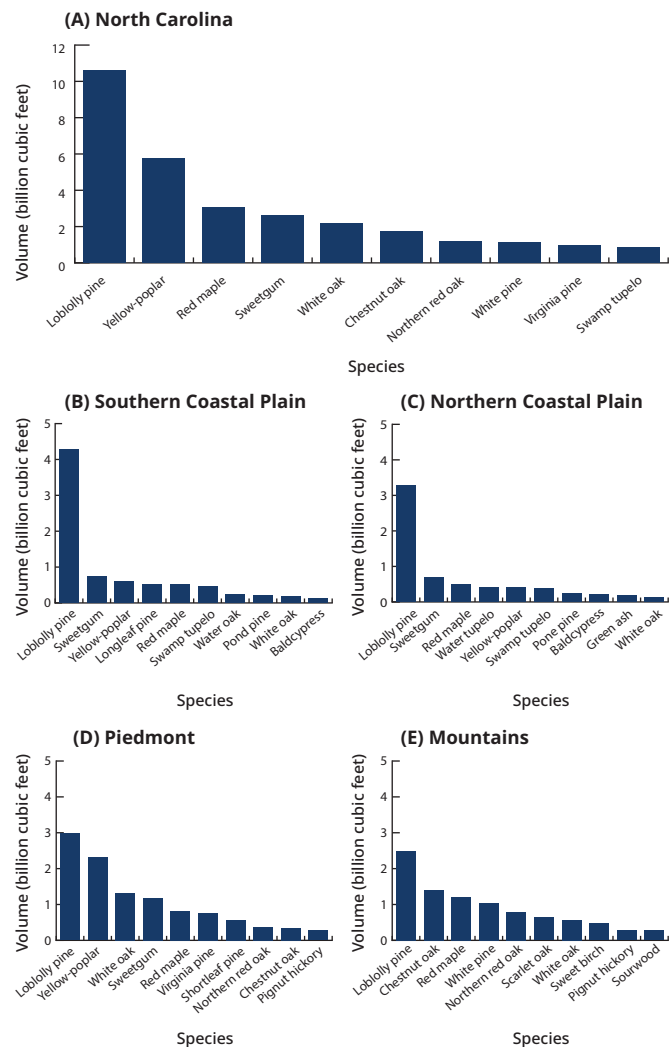


Figure 9—Top 10 timberland tree species based on volume of trees in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2018.

yellow-poplar, and white oak were the top three species by volume. Only in the Piedmont unit did shortleaf pine have enough volume to make the list. In the Mountain unit (fig. 9E), yellow-poplar, chestnut oak, and red maple occupied the top three spots for volume. Scarlet oak, sweet birch, pignut hickory, and sourwood had enough volume to make the top 10 list in that unit as well.

The Southern Coastal Plain held the most—more than 40 percent—of the State's total loblolly pine volume. The Northern Coastal Plain unit had 31 percent, and the Piedmont contained 28 percent of the loblolly pine volume in the State. The Mountain unit had 43 percent of the State's yellow-poplar volume and the Piedmont unit

contained another 40 percent. Together these two units had 83 percent of North Carolina's yellow-poplar volume. Most of the red maple volume, 40 percent, was found in the Mountain unit, followed by 27 percent in the Piedmont unit. The Southern and Northern Coastal Plain units had 17 and 16 percent of the red maple volume, respectively. Forty-five percent of the sweetgum volume occurred in the Piedmont unit, 28 percent of it occurred in the Southern Coastal Plain, 27 percent of it occurred in the Northern Coastal Plain, and a trace amount of it occurred in the Mountain unit. Volume and primary location of other notable species in North Carolina included white oak, with 60 percent of the State's white oak volume found in the Piedmont unit (fig. 9D). Ninety-five percent of the State's white pine volume was found in the Mountain unit (fig. 9E). Sixty-two percent of the State's baldcypress volume occurred in the Northern Coastal Plain unit (fig. 9C). Ninety-two percent of the State's longleaf pine volume was found in the Southern Coastal Plain unit (fig. 9B).

Overall, all-live tree merchantable volume on timberland in North Carolina increased to almost 42.3 billion cubic feet in 2018 from 38.4 billion cubic feet in 2013. Merchantable volume is based on trees >5.0 inches d.b.h. Softwoods together accounted for 37 percent, more than 15.4 billion cubic feet, of the total (fig. 10A). In combination, all hardwoods made up 63 percent, 26.8 billion cubic feet. At the State level, volume increased for softwoods and hardwoods as well as for planted and natural stands since 2007.

Eighty-eight percent, or 37.2 billion cubic feet, of North Carolina's total all-live merchantable volume was in species from stands of natural origin. Twelve percent, or almost 5.0 billion cubic feet, was in species from stands with evidence of artificial regeneration (planted). Softwoods accounted for 93 percent, nearly 4.7 billion cubic feet, of the State's planted volume (fig. 10A). The distribution of this planted volume differed by survey unit within the State. The two Coastal Plain units combined for 72 percent, 3.6 billion cubic feet, of the State's planted volume. Both the Southern (fig. 10B) and Northern (fig. 10C) Coastal Plain units each accounted for 1.8 billion

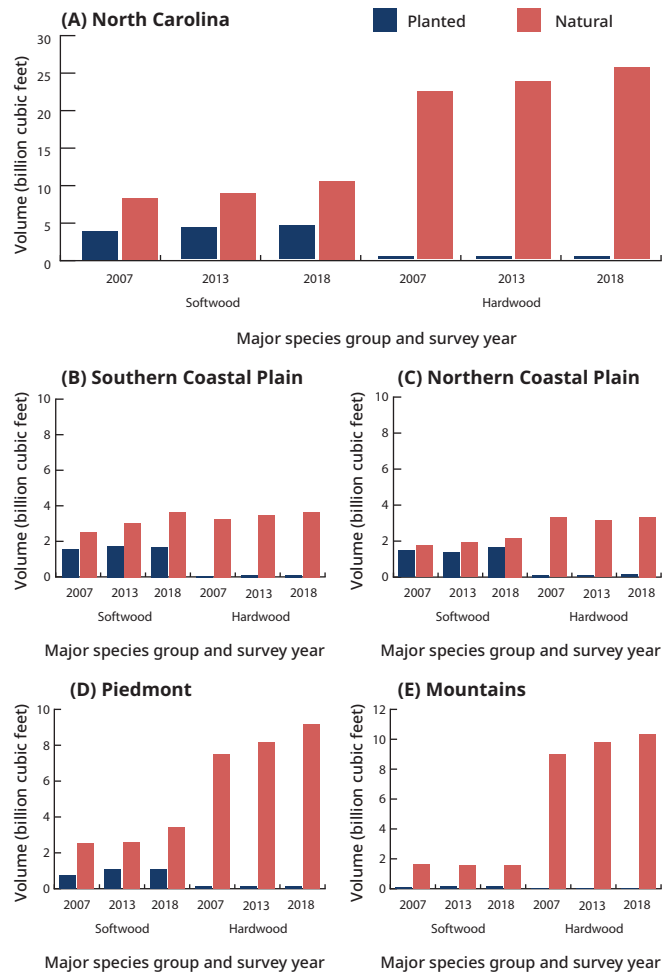


Figure 10—All-live merchantable volume by major species group, survey year, and stand origin in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015).

cubic feet, 36 percent, of the planted volume. The Piedmont unit accounted for 24 percent, 1.2 billion cubic feet, of the State's planted volume (fig. 10D). The Mountain unit accounted for 4 percent, 0.2 billion cubic feet, of the State's planted volume (fig. 10E). Softwoods made up a slightly higher percentage of the planted volume in the Southern and Northern Coastal Plain units, 94 and 93 percent, respectively. Softwoods made up 90 percent of planted volume in the Piedmont unit and 90 percent in the Mountain unit.

The distribution of the State's all-live merchantable volume differed by diameter class between the species groups. For 2018, at the State level, most of the more than 15.4 billion cubic feet of softwood volume was found in the 10- to 14-inch diameter

classes (fig. 11A). The softwood volume peaked in the 12-inch diameter class. Softwood volume increased in every diameter class since 2007. In the Southern Coastal Plain unit (fig. 11B), softwood volume totaled more than 5.3 billion cubic feet in 2018, the most of the State's four units. Its distribution and peak by diameter class reflected that at the State level. In the Northern Coastal Plain unit (fig. 11C), softwood volume totaled 3.8 billion cubic feet in 2018 and peaked in the 10-inch diameter class. However, in the Northern Coastal Plain unit, softwood volume decreased in the 6-inch diameter class, but increased in all other classes from that reported in 2007. In the Piedmont unit (fig. 11D), softwood volume totaled 4.5 billion cubic feet in 2018 and peaked in the 10-inch diameter class. Softwood volume increased in every diameter class since that reported in 2007. In the Mountain unit (fig. 11E), softwood volume



Patrick Scott, Forest Service Fire Management Officer, looks at cold wood at a timber sale on the North Mills Area, Pisgah Ranger District, Pisgah National Forest, NC. (USDA Forest Service photo by Cecilio Ricardo)

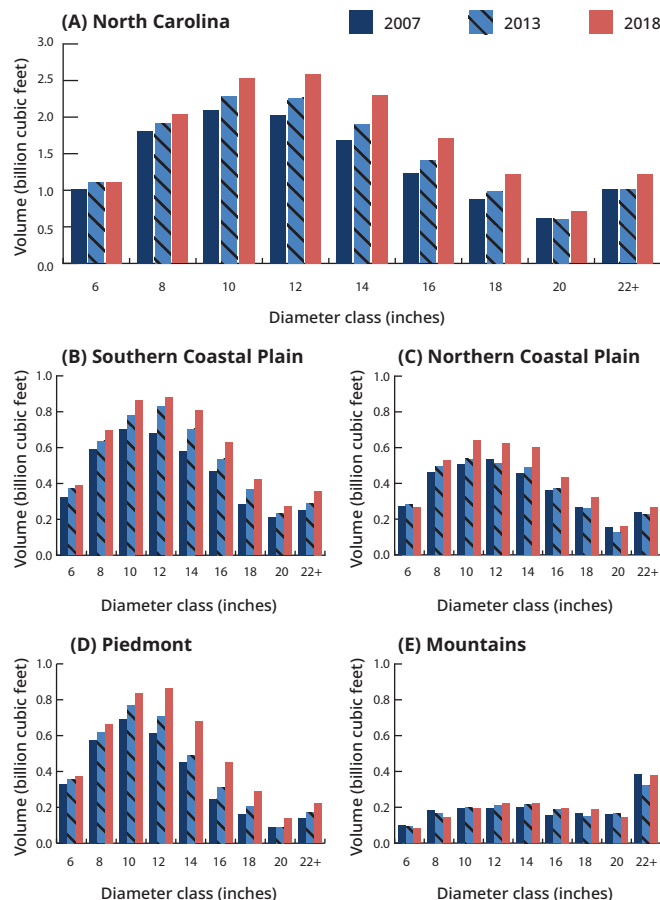


Figure 11—All-live merchantable softwood volume on timberland by diameter class, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015).

totaled 1.8 billion cubic feet in 2018. In contrast to the other survey units, softwood volume in the Mountain unit was more evenly distributed among all the diameter classes with a minimal peak in the 14-inch diameter class. Softwood volume decreased in the 6- and 8-inch diameter classes since that reported in 2007. Noteworthy, only in the Mountain unit did softwood volume for cumulative 22-inch and larger diameter classes exceed the volume of any other softwood diameter class, more typical of that for hardwood volume. This situation probably existed due to former populations of hemlocks and eastern white pines in the largest diameter classes. However, only time will tell if loss of hemlock will change this diameter distribution profile.

For 2018, at the State level, the 26.8 billion cubic feet of hardwood volume was distributed more widely across the range of diameter classes (fig. 12A) than it was for softwoods. The hardwood volume peak stretched across the 12- to 16-inch diameter classes and was highest in the 16-inch diameter class. However, the most volume was in the accumulated 22-inch and larger diameter classes, which accounted for 21 percent of the State's hardwood volume. In 2018, hardwood volume increased in all diameter classes from that reported in 2007. However, the increase was greater in the 16-inch and larger diameter classes. Changes in hardwood volume by diameter class differed by survey unit. In the Southern Coastal Plain unit (fig. 12B), hardwood volume totaled

3.7 billion cubic feet in 2018 and peaked almost imperceptibly in the 12-inch diameter class due to the widespread diameter class distribution. In the Southern Coastal Plain unit, hardwood volume in the accumulated 22-inch and larger diameter classes was the least of the four survey units. Hardwood volume increased slightly in the 6- and 8-inch diameter classes and decreased slightly in the 10- to 16-inch diameter classes, then increased in the 18-inch and larger diameter classes. In the Northern Coastal Plain unit (fig. 12C), hardwood volume totaled 3.5 billion cubic feet in 2018 and peaked only slightly in the 10-inch diameter class, the smallest diameter peak for hardwood volume of all four survey units. The diameter class distribution in the Northern Coastal Plain unit was the most plateaued of all the units. The hardwood volume accumulated in the combined 22-inch and larger diameter classes was second

lowest of the four units. Most hardwood volume diameter classes in the Northern Coastal Plain unit slightly decreased or changed little except in the 20-inch and larger classes, where it mostly increased. In the Piedmont unit (fig. 12D) hardwood volume totaled 9.3 billion cubic feet in 2018 and peaked in the 16-inch diameter class. Hardwood volume increased in all diameter classes from that reported in 2007. The Piedmont's hardwood volume increased more in the 16-inch and above diameter classes, but was greatest in the combined 22-inch and larger diameter classes. In the Mountain unit (fig. 12E), hardwood volume totaled 10.3 billion cubic feet in 2018 and peaked in the 16-inch diameter class. When compared to that reported in 2007, the 2018 hardwood volume in the Mountain unit increased across all diameter classes, but minimally for most classes from 6 to 14 inches diameter. However, hardwood volume in the combined 22-inch and larger classes was the most of all four survey units.

### 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 specific remeasurement period. The relationship is such that gross growth is diminished by mortality, creating net growth. Then measured removals detract from net growth, resulting in net change in the inventory.

As cautioned in the 2007 report (Brown and others 2014), growth figures identified for the Mountain unit were high. Although no viable explanation was identified, growth figures for the Mountain unit subsided in both 2013 (Brown and Vogt 2015) and 2018.

For all species combined, statewide net growth averaged 1,650 million cubic feet annually, and removals averaged 961 million cubic feet annually. Planted stands provided 27 percent, 450 million cubic feet, of the State's total net growth. Planted stands also supplied 34 percent, 329 million cubic feet, of total removals in the State.

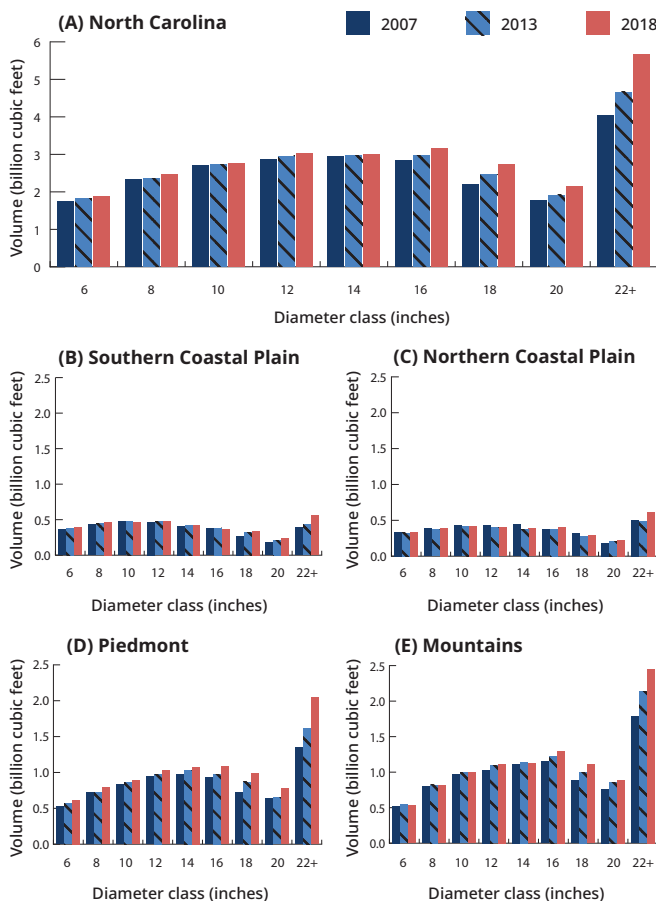


Figure 12—All-live merchantable hardwood volume on timberland by diameter class, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015).

The average annual components of change for softwood volume in North Carolina are shown in figure 13A. Statewide in 2018, softwood average annual net growth of 930 million cubic feet exceeded softwood average annual removals of 611 million cubic feet. The difference between these two components yielded a positive average annual net change of 319 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 2018, softwood net growth

averaged 6.0 percent of total inventory volume and removals averaged 4.0 percent. The positive net change of 319 million cubic feet of softwood averaged 2.1 percent of total softwood inventory.

More than 39 percent of the State's softwood removals came from the Southern Coastal Plain unit (fig. 13B). In the Southern Coastal Plain unit, average annual softwood net growth of 357 million cubic feet exceeded average annual softwood removals of 241 million cubic feet by a wide margin and resulted in a positive average annual softwood net change of 116 million cubic feet. For the period ending in 2018, the Southern Coastal Plain's softwood net growth averaged 6.7 percent of its total softwood inventory volume and removals averaged 4.5 percent (fig. 14B). The

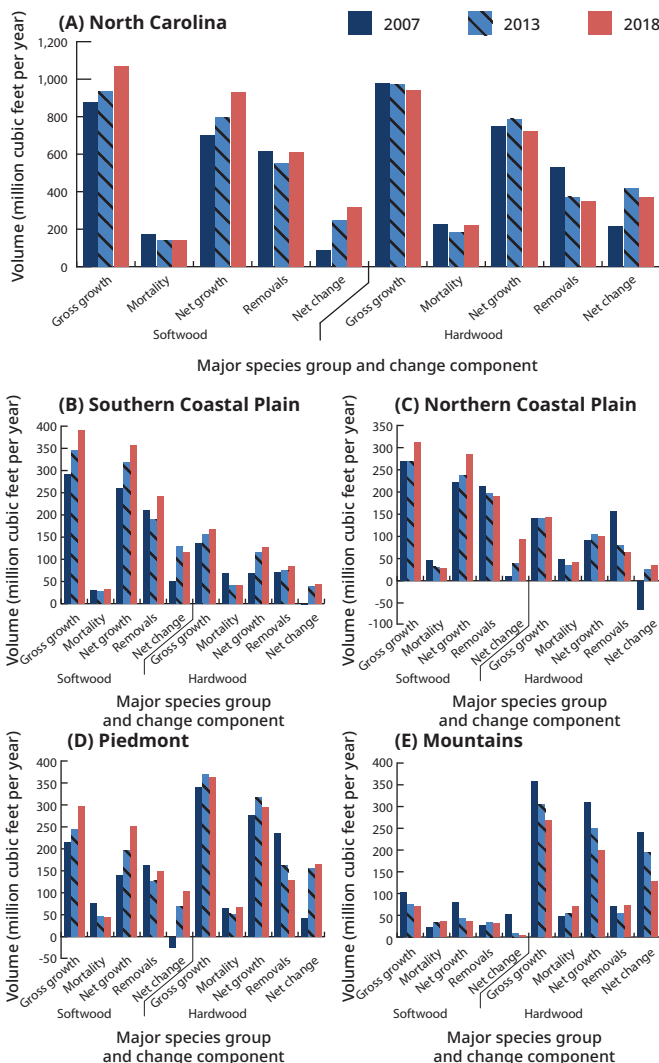


Figure 13—Net change components for all-live volume by major species group, change component, and survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015).

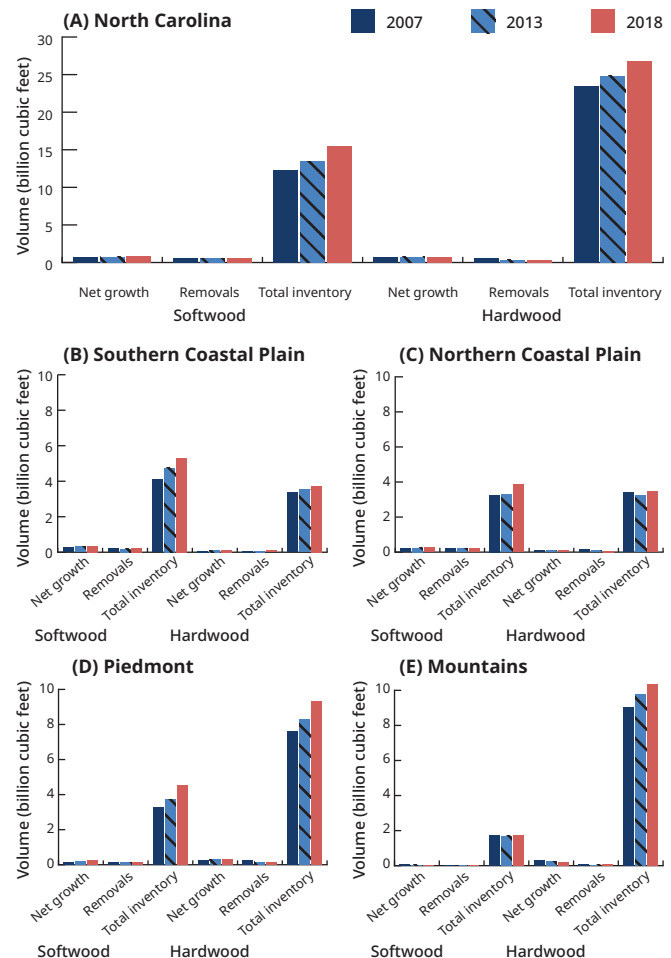


Figure 14—Comparison of net growth and removals to total inventory volume for softwood and hardwood by survey year in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains. Data for 2007 and 2013 from Brown and Vogt (2015).

net change of 116 million cubic feet averaged 2.2 percent of total softwood inventory.

In the Northern Coastal Plain (fig. 13C), average annual softwood net growth of 284 million cubic feet exceeded average annual softwood removals of 191 million cubic feet and resulted in a positive average annual softwood net change of nearly 94 million cubic feet. For the period ending in 2018, the Northern Coastal Plain's softwood net growth averaged 7.4 percent of its total softwood inventory volume and removals averaged 5.0 percent (fig. 14C). This net change of nearly 94 million cubic feet averaged 2.4 percent of total softwood inventory.

In the Piedmont (fig. 13D), average annual softwood net growth of less than 253 million cubic feet exceeded average annual softwood removals of more than 148 million cubic feet and resulted in a positive average annual softwood net change of 104 million cubic feet. For the period ending in 2018, the Piedmont's softwood net growth averaged 5.6 percent of total softwood inventory volume and removals averaged 3.3 percent (fig. 14D). The net change of 104 million cubic feet averaged 2.3 percent of total softwood inventory.

In the Mountain unit (fig. 13E), where the softwood component is the lowest of all units in the State, average annual softwood net growth of less than 36 million cubic feet minimally exceeded average annual softwood removals of 31 million cubic feet. This resulted in the State's smallest positive average annual softwood net change of more than 4 million cubic feet. For the period ending in 2018, the Mountain unit's softwood net growth averaged 2.0 percent of total softwood inventory volume and removals averaged 1.8 percent (fig. 14E). The net change of more than 4 million cubic feet averaged 0.3 percent of total softwood inventory.

The average annual components of change for hardwood volume in North Carolina are shown in figure 13A. Statewide in 2018, hardwood average annual net growth of 721 million cubic feet exceeded hardwood average annual removals of more than 349 million cubic feet. The difference between these two components yielded a large

positive average annual net change of more than 371 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 2018, hardwood net growth averaged 2.7 percent of total inventory volume and removals averaged 1.3 percent. The positive more than 371 million cubic feet hardwood net change averaged 1.4 percent of total hardwood inventory.

In the Southern Coastal Plain (fig. 13B), average annual hardwood net growth of 126 million cubic feet exceeded average annual hardwood removals of 83 million cubic feet and resulted in a positive average annual hardwood net change of 43 million cubic feet. For the period ending in 2018, the Southern Coastal Plain's hardwood net growth averaged 3.4 percent of total hardwood inventory volume and removals averaged 2.2 percent (fig. 14B). The net change of 43 million cubic feet averaged 1.2 percent of total hardwood inventory.

In the Northern Coastal Plain (fig. 13C), average annual hardwood net growth of 100 million cubic feet exceeded average annual hardwood removals of 65 million cubic feet, resulting in a positive average annual hardwood net change of 35 million cubic feet. For the period ending in 2018, the Northern Coastal Plain's hardwood net growth averaged 2.9 percent of total hardwood inventory volume and removals averaged 1.9 percent (fig. 14C). The net change of 35 million cubic feet averaged 1.0 percent of total hardwood inventory.

Although its hardwood removals decreased, the Piedmont unit accounted for 37 percent of the State's hardwood removals, more than any other unit. In the Piedmont (fig. 13D), average annual hardwood net growth of 295 million cubic feet exceeded average annual hardwood removals of 129 million cubic feet and resulted in a positive average annual hardwood net change of 166 million cubic feet. For the period ending in 2018, the Piedmont's hardwood net growth averaged 3.2 percent of total hardwood inventory volume and removals averaged 1.4 percent (fig. 14D). This

net change of 166 million cubic feet averaged 1.8 percent of total hardwood inventory.

In the Mountain unit (fig. 13E), where the hardwood component is the highest of all units in the State, average annual hardwood net growth of 200 million cubic feet exceeded average annual hardwood removals of 72 million cubic feet. This resulted in a positive average annual hardwood net change of 128 million cubic feet. For the period ending in 2018, the Mountain unit's hardwood net growth averaged 1.9 percent of total hardwood inventory volume and removals averaged 0.7 percent (fig. 14E). This net change of positive 128 million cubic feet averaged 1.2 percent of total hardwood inventory.

## 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.

## Tree mortality

In 2018, average annual mortality volume of all-live trees  $\geq 5$  inches d.b.h. on North Carolina's timberland totaled 363 million cubic feet, up from 322 million cubic feet in 2013. In 2018, softwoods accounted for 142 million cubic feet, 39 percent of the State total, compared to 139 million cubic feet, 43 percent in 2013. In 2018, hardwoods accounted for 221 million cubic feet, 61 percent of the State total, compared to 183 million cubic feet, 57 percent in 2013. 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 32 percent of total mortality occurred. For softwoods, mortality peaked in the 21- to 40-year age class, where 31 percent of the total softwood mortality occurred. For hardwoods, mortality peaked in the 61- to 80-year age class, where 36 percent of the total hardwood mortality occurred.

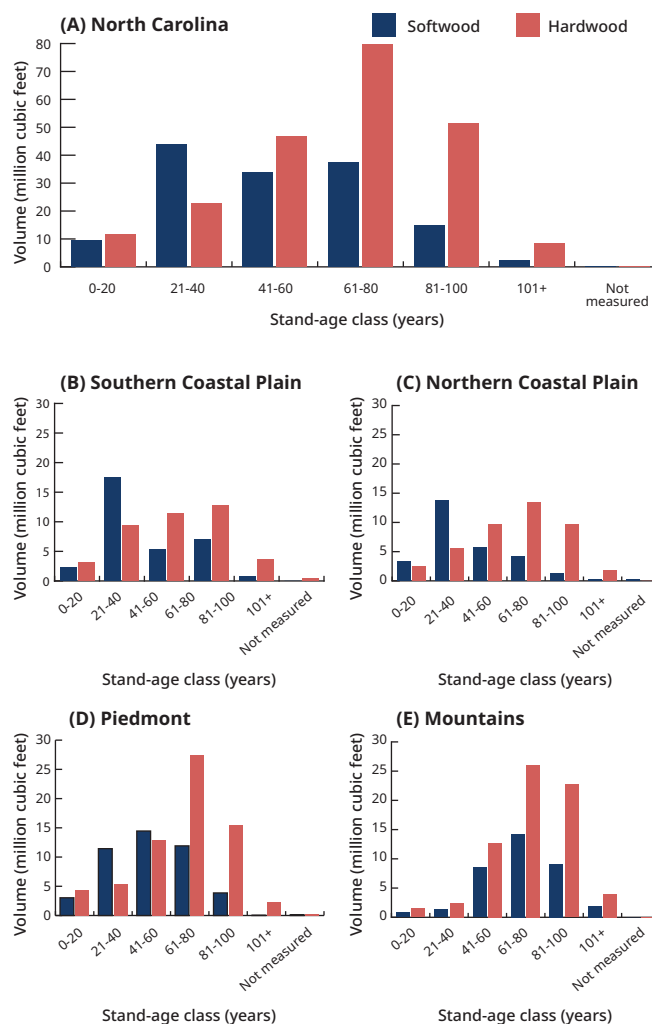


Figure 15—Average annual mortality of trees by stand-age class and major species group in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2018.

The Southern Coastal Plain unit contained 20 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 units). In the Southern Coastal Plain (fig. 15B), softwood mortality peaked in the 21- to 40-year age class and reached less than half that by the 61- to 80-year age class, after which it practically disappeared. The Southern Coastal Plain's hardwood mortality peaked in the 61- to 80-year age class, after which it dropped rapidly.

The Northern Coastal Plain unit contained 20 percent of the State's total mortality of all species, 20 percent of the State's softwood mortality, and

19 percent of the State's hardwood mortality. Softwood mortality in the Northern Coastal Plain (fig. 15C) peaked in the 21- to 40-year age class, similar to the Southern Coastal Plain unit, but dropped steadily afterwards in comparison. The Northern Coastal Plain's hardwood mortality also peaked in the 61- to 80-year age class, but remained high in the 81- to 100-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 32 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, 31 percent, occurred in the Piedmont unit as well. Hardwood mortality in the Piedmont unit peaked in the 61- to 80-year age class.

The Mountain unit (fig. 15E) contained 29 percent of the State's total mortality of all species, 25 percent of the State's softwood mortality, and 31 percent of the State's hardwood mortality. In the Mountain unit, softwood mortality peaked in the 61- to 80-year age class and remained half as high in the 81- to 100-year age class, the oldest peak of softwood mortality of the four survey units. Hardwood mortality in the Mountain unit also peaked in the 61- to 80-year age class and remained almost as high in the 81- to 100-year age class.

## Standing dead trees

The number of standing dead trees by cause of death across the State provided a gauge to the health of North Carolina's timberland. Figure 16A shows the number of standing dead trees, 180 million trees  $\geq 5$  inches d.b.h., present on timberland and lists major agents involved. Almost 31 percent of the standing dead trees were snags measured in prior surveys, in 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 2018, 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 softwoods, vegetation was the leading identifiable cause of death statewide, but insects were second (fig. 16A), which changed the order to vegetation, insects, disease, weather, and fire. For hardwoods, disease was the leading identifiable cause of death statewide, which changed the order to disease, vegetation, weather, fire, and animals. The order of the impact for these leading identifiable causes of death further differed between the different survey units of the State.

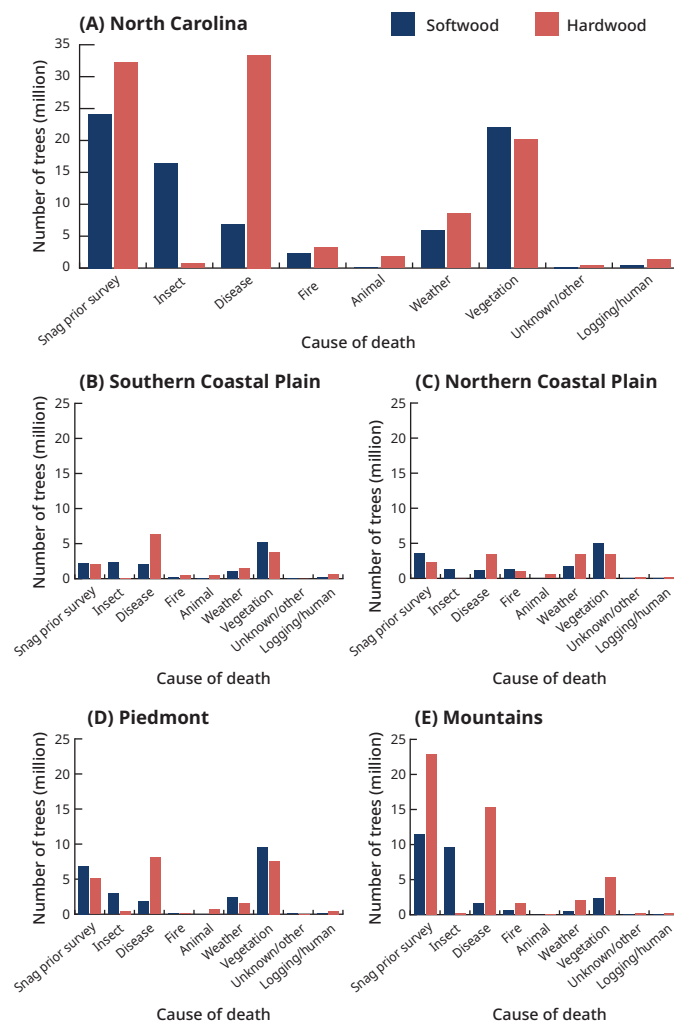


Figure 16—Number of standing dead trees  $\geq 5$  inches d.b.h. on timberland by cause of death and broad species group in (A) North Carolina, (B) Southern Coastal Plain, (C) Northern Coastal Plain, (D) Piedmont, and (E) Mountains, 2018.



Firefighter crew en route. (Courtesy photo by North Carolina Forest Service)

In the Southern Coastal Plain unit (fig. 16B), vegetation was the leading identifiable cause of death for softwoods and insects was second. However, the Southern Coastal Plain accounted for more, 31 percent, of the State's total softwood trees lost to disease than other units. For hardwoods in the Southern Coastal Plain, disease was the leading identifiable cause of death and vegetation was second.

In the Northern Coastal Plain unit (fig. 16C), vegetation was the leading identifiable cause of death for softwoods and weather was second. However, the Northern Coastal Plain accounted for most, 60 percent, of the State's total softwood trees lost to fire. For hardwoods in the Northern Coastal Plain, disease 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 was second. The Piedmont accounted

for most, 43 percent, of the State's total softwood trees lost to vegetation. Weather was third, and about 41 percent of the State's total softwood trees lost to weather were in 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 38 percent of the State's total hardwood trees lost to vegetation.

In the Mountain unit (fig. 16E), insects was the leading identifiable cause of death for softwoods and vegetation was second. The Mountain unit accounted for 59 percent of the State's total softwood trees lost to insects. The Mountain portion of State-total softwood trees lost to insects was notable for a unit dominated by hardwoods. For hardwoods in the Mountain unit, disease was the leading identifiable cause of death and vegetation was second. The Mountain unit accounted for 46 percent of the State's total hardwood trees lost to disease. The Mountain unit also accounted for most, 51 percent, of the State's total hardwood trees lost to fire.

## Hemlock decline

Hemlocks have been a major component in Southern Appalachian forests and play key roles in the forest ecosystems of western North Carolina (NCFS 2010). Many factors impact the health of hemlocks in the South. Hemlock woolly adelgid (*Adelges tsugae*) (HWA), an invasive insect pest, has been a threat to Carolina hemlock (*Tsuga caroliniana*) and eastern hemlock (*Tsuga canadensis*) in North Carolina and throughout much of their range in the United States (NCFS 2010). The pest gets its name from the white woolly coating that surrounds and protects the nymphs while they feast on hemlock trees in the winter (NPS 2015). In 2013, the pest was reported as a concern in North Carolina (Brown and Vogt 2015) and continued to be a concern in 2018.

HWA is native to Asia and was first described in western North America in 1924 and first reported in the Eastern United States in 1951 near Richmond, VA (Baker and others 2008). In 2018, it infested an area from north Georgia to southeastern Maine (USDA Forest Service 2019).

The entire range of hemlock species in North Carolina was reported as infected by the summer of 2010 (NCFS 2010). The adelgid is a phloem feeder, desiccating young shoots, causing needle drop, and preventing new growth (NPS 2015).

HWA was first reported in North Carolina in 1995 in three counties adjacent to Virginia (NCFS 2010). In 2002, the pest was discovered in the Great Smoky Mountains National Park, where over 800 acres of old-growth hemlock forests occurred, more than in any other national park (NPS 2015). Young hemlock forests of 75–100 years in age covered an additional 90,000 acres of land in the park (NPS 2015).

HWA has progressed more rapidly and been more destructive in the Southern Appalachians of North Carolina (fig. 17) than originally expected, likely due to a combination of factors that includes drought, abundant hemlock populations, exceptionally large trees, and milder temperatures. In other parts of eastern hemlock's range, colder winters and hotter summers have slowed the advancement of the pest (NCDACS and USDA 2018).

HWA kills trees slowly, affixing itself to the base of the hemlock needle where it feeds on the tree's starch reserves. (NCDACS and USDA 2018). HWA feeding interferes with the tree's ability to take up water and nutrients, producing a drought-like

response that some researchers have likened to an allergic reaction (NCDACS and USDA 2018). As a result, the hemlock's needles take on a grey and dusty appearance and begin to drop (NCDACS and USDA 2018). Increasingly unable to photosynthesize as it loses its needles, the tree slowly dies from the bottom up (NCDACS and USDA 2018). Trees can succumb to the pest in as little as 4 years, but in some cases, this takes much longer (NCDACS and USDA 2018). Sadly, the largest trees, which require the movement of more water and nutrients to their crowns, appear to be the most vulnerable (NCDACS and USDA 2018).

Hemlocks have been some of the largest and most common trees in the Great Smoky Mountains (NPS 2015). They play an ecologically vital role in cooling mountain streams and providing habitat for many other species (NPS 2015). They are shade tolerant, common in cool coves as well as north-facing slopes and rock outcrops (NCFS 2010). They provide shaded habitat that is favorable to many native amphibians, fish, and invertebrates and provide critical nesting sites for many bird species (NCFS 2010). Their aesthetic value is significant, yet impossible to quantify (NPS 2015). 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 (NPS 2018).

The net volume of hemlock in North Carolina (Piedmont and Mountain units combined) decreased 26 percent from 375 million cubic feet in 2007 to approximately 277 million cubic feet in 2013 and decreased 39 percent from 2013 to 2018 to approximately 169 million cubic feet. This was a total net loss of 55 percent for both units since 2007.

Also, most of the hemlock population in North Carolina occurred in the Mountain unit (fig. 18), where the net volume of hemlock decreased 27 percent from 362 million cubic feet in 2007 to approximately 264 million cubic feet in 2013. The net volume of hemlock further decreased 41 percent from 264 million cubic feet in 2013 to approximately 157 million cubic feet in 2018. This is a total net loss of 57 percent since 2007.

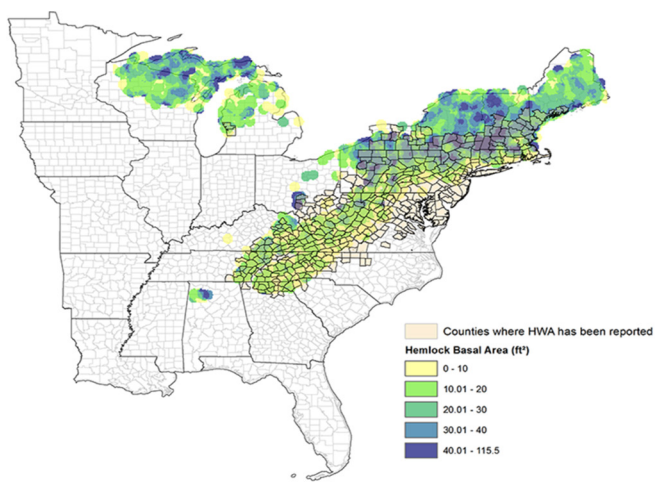


Figure 17—Map of hemlock woolly adelgid (HWA) presence and hemlock basal area, 2018.

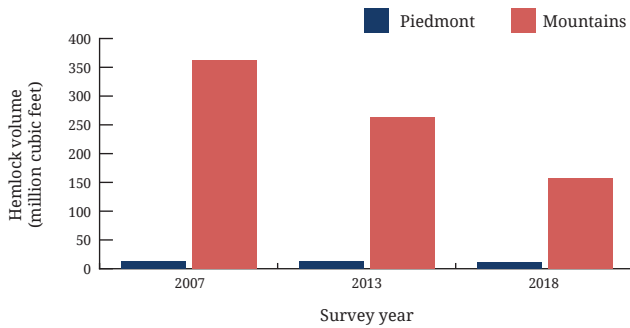


Figure 18—Hemlock volume (for trees  $\geq 5$  inches d.b.h.) in the Piedmont and Mountain units, North Carolina, 2007–2018.

FIA data are inherently backward looking; thus, although the expected dramatic decline in hemlock volume will ultimately be captured and described by the FIA program, those changes will not be reflected in real time (Brown and Vogt 2015). Aside from volume, and for another perspective on the hemlock decline, FIA conducted a simple analysis of the hemlock tree population (fig. 19) for the years 2007 through 2018. For the comparison, FIA used the number of hemlock trees  $\geq 5$  inches d.b.h. as estimated from plot data in both the Piedmont (fig. 20A) and Mountain (fig. 20B) units of North Carolina.

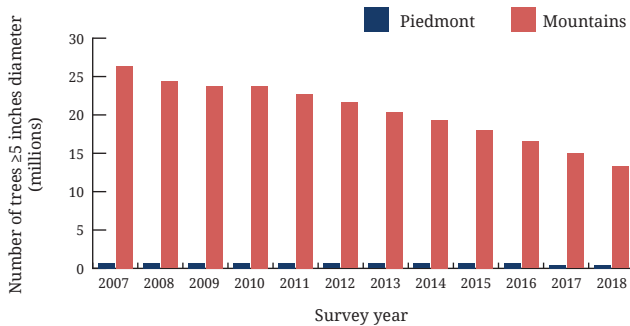


Figure 19—Hemlock tree population ( $\geq 5$  inches d.b.h.) in the Piedmont and Mountain units, North Carolina, 2007–2018.



Forester measures eastern hemlock trees. (USDA Forest Service photo by Preston Keres)

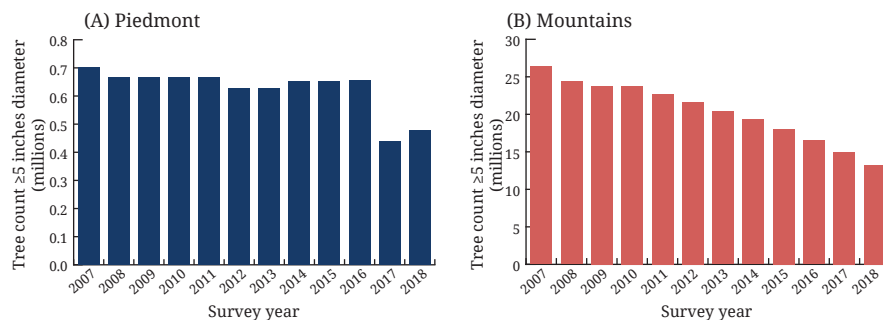


Figure 20—Number of hemlock trees ( $\geq 5$  inches d.b.h.) in the (A) Piedmont and (B) Mountain units, North Carolina, 2007–2018.

SRS-FIA estimates these negative trends may continue for some time until the annual inventory panels capture the full change from the impact of HWA in North Carolina. For a review of HWA establishment, biology, and control, see Havill and others (2014) and references therein. In 2018, more than half of the hemlocks ( $\geq 5$  inches d.b.h.) have been lost in both units, with a greater loss in the Mountain unit; there is no indication that this trend will slow down anytime soon (Brown and Vogt 2015).

### Nonnative invasive plants

Because many nonnative invasive plants have been recognized as problematic because they compete with or even threaten to displace native species, it is important to assess their occurrence to gauge their potential impact. Table 6 lists a count of survey plots with at least one invasive plant present by species of trees, shrubs, vines, grasses, and herbs encountered on FIA survey plots in North Carolina in 2018. The list includes samples collected under field manual 6.0 guidelines between the 2013 and 2018 survey cycles (USDA Forest Service 2012). Field manual 6.0 identified additional species as nonnative invasives from those in field manual 4.0 used in the 2013 survey cycle (USDA Forest Service 2007).

The most frequently encountered invasive tree was tree-of-heaven (*Ailanthus altissima*), which was encountered on 127 plots. The oleaster tree (*Eleagnus* spp.), also called Russian olive, was second in occurrence and encountered on 105 plots. Third was callery pear (*Pyrus calleryana*); a popular cultivar is Bradford pear, which was encountered on 57 plots. Fourth was princess tree (*Paulownia tomentosa*), found on 32 plots. Overall, invasive trees were found on 11 percent of all forested plots in North Carolina in 2018.

The most frequently encountered invasive shrubs were the privets (*Ligustrum* spp.), which were encountered on 1,045 plots. As a group, the nonnative roses (*Rosa* spp.) were second in occurrence of the shrubs and encountered on 418 plots. Japanese barberry (*Berberis thunbergii*) was the third most frequent of the shrubs, encountered on 34 plots across the State. Fourth was Japanese privet (*Ligustrum japonicum*), found on 25 plots. Overall, invasive shrubs were found on 43 percent of all forested plots in North Carolina in 2018.

The most frequently encountered invasive vine was Japanese honeysuckle (*Lonicera japonica*), found on 1,627 plots. Japanese honeysuckle continued as the most recorded invasive plant life form in



North Carolina Forestry crew surveying wetlands. (Courtesy photo by North Carolina Forest Service)

**Table 6**—Regionally recognized nonnative invasive plants identified on forest survey plots by common name, scientific name, and number of plots, North Carolina, 2018

|                | Common name          | Scientific name                            | Plots <sup>1</sup> |
|----------------|----------------------|--------------------------------------------|--------------------|
| <b>Trees</b>   | Tree-of-heaven       | <i>Ailanthus altissima</i>                 | 127                |
|                | Oleaster             | <i>Elaeagnus</i> spp.                      | 105                |
|                | Callery pear         | <i>Pyrus calleryana</i>                    | 57                 |
|                | Princess tree        | <i>Paulownia tomentosa</i>                 | 32                 |
|                | Silktree             | <i>Albizia julibrissin</i>                 | 30                 |
|                | Chinaberry tree      | <i>Melia azedarach</i>                     | 19                 |
|                | Hardy orange         | <i>Poncirus trifoliata</i>                 | 10                 |
|                | Chinese tallow       | <i>Triadica sebifera</i>                   | 1                  |
| <b>Shrubs</b>  | Privet               | <i>Ligustrum</i> spp.                      | 1,045              |
|                | Nonnative rose       | <i>Rosa</i> spp.                           | 418                |
|                | Japanese barberry    | <i>Berberis thunbergii</i>                 | 34                 |
|                | Japanese privet      | <i>Ligustrum japonicum</i>                 | 25                 |
|                | Sacred bamboo        | <i>Nandina domestica</i>                   | 20                 |
|                | Honeysuckle          | <i>Lonicera</i> spp.                       | 15                 |
|                | Thorny olive         | <i>Elaeagnus pungens</i>                   | 7                  |
|                | Japanese meadowsweet | <i>Spiraea japonica</i>                    | 4                  |
|                | Beale's barberry     | <i>Mahonia bealei</i>                      | 4                  |
| <b>Vines</b>   | Japanese honeysuckle | <i>Lonicera japonica</i>                   | 1,627              |
|                | Oriental bittersweet | <i>Celastrus orbiculatus</i>               | 73                 |
|                | Ivy                  | <i>Hedera</i> spp.                         | 42                 |
|                | Kudzu                | <i>Pueraria montana</i> var. <i>lobata</i> | 20                 |
|                | Periwinkle           | <i>Vinca</i> spp.                          | 17                 |
|                | Wisteria             | <i>Wisteria</i> spp.                       | 12                 |
|                | Yam                  | <i>Dioscorea</i> spp.                      | 5                  |
| <b>Grasses</b> | Nepalese browntop    | <i>Microstegium vimineum</i>               | 659                |
|                | Chinese silvergrass  | <i>Miscanthus sinensis</i>                 | 19                 |
|                | Bamboo               | <i>Bambusa</i> spp.                        | 3                  |
| <b>Herbs</b>   | Sericea lespedeza    | <i>Lespedeza cuneata</i>                   | 244                |
|                | Lespedeza            | <i>Lespedeza</i> spp.                      | 40                 |
|                | Crownvetch           | <i>Securigera varia</i>                    | 4                  |
|                | Garlic mustard       | <i>Alliaria petiolata</i>                  | 3                  |
|                | Lilyturf             | <i>Liriope</i> spp.                        | 2                  |

<sup>1</sup> Count of survey plots with at least one invasive plant present collected under the Forest Inventory and Analysis program field manual.

the State. The second most encountered vine was oriental bittersweet (*Celastrus orbiculatus*), found on 73 plots. Third was ivy (*Hedera* spp.), which occurred on 42 plots. Fourth was kudzu (*Pueraria montana* var. *lobata*), found on 20 plots. Overall, invasive vines were found on 49 percent of all forested plots in North Carolina in 2018.

The most frequently encountered invasive grass was Nepalese browntop (*Microstegium vimineum*), which occurred on 659 plots. Chinese silvergrass (*Miscanthus sinensis*) was second, found on 19 plots across the State. Overall, invasive grasses were found on 19 percent of all forested plots in North Carolina in 2018.

The most frequently encountered herb and forb was Sericea lespedeza (*Lespedeza cuneata*), which was found on 244 plots. Overall, invasive herbs and forbs were found on 8 percent of all forested plots in the State in 2018.

## CONCLUSIONS

The 2018 FIA survey recorded nearly 18.8 million acres of forest land in North Carolina, of which 18.1 million acres were classified as timberland. Hardwood forest types covered 11.6 million acres (64 percent) of timberland and softwood forest types covered 6.4 million acres (35 percent). Nonstocked timberland accounted for the remaining 1 percent. Oak-hickory was the predominant forest-type group and occupied 6.9 million acres. NIPF landowners controlled >14.7

million acres (almost 82 percent) of the State's timberland. Forest industry held 0.8 million acres (more than 4 percent) and public ownerships held >2.5 million acres (14 percent).

The volume of all-live trees on timberland totaled 42.3 billion cubic feet. Hardwoods accounted for 26.8 billion cubic feet (63 percent) of the State's total volume and softwoods accounted for >15.4 billion cubic feet. Net annual growth of all-live trees averaged <1.7 billion cubic feet and annual removals averaged <1.0 billion cubic feet. Softwood net growth averaged 930 million cubic feet per year and exceeded softwood removals, which averaged 611 million cubic feet per year. In comparison, hardwood net growth averaged 721 million cubic feet per year and exceeded hardwood removals, which averaged 349 million cubic feet per year.

Although total average annual mortality increased from 322 million cubic feet in 2013 to 363 in 2018, it is still down from the 404 million cubic feet recorded in 2007. All indications are that these forested acres are relatively healthy and as productive as in previous surveys. Growth rates are high and net growth exceeded 2018 removals estimates at the State level. Thus, the 2018 North Carolina survey data suggest increasing hardwood volume in the Mountain and Piedmont units and indications of softwood volume increases in both Coastal Plain units.

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## GLOSSARY

**All-live tree**—All living trees. All size classes, all tree classes, and both saw-log and nonsaw-log species are included. See: FIA tree species list in the field manual.

**Average annual mortality**—Average annual volume of trees  $\geq 5.0$  inches d.b.h. that died from human and natural causes during the intersurvey period, excluding those removed by harvesting, cultural operations, land clearing or changes in land use.

**Average annual removals**—Average annual volume of trees  $\geq 5.0$  inches d.b.h. removed from the inventory by harvesting, cultural operations (such as timber-stand improvement), land clearing, or changes in land use during the intersurvey period.

**Average net annual growth**—Average annual net change in volume of trees  $\geq 5.0$  inches d.b.h./d.r.c. without taking into account losses from cutting (gross growth minus mortality) during the intersurvey period.

**Basal area**—The cross-sectional area of a tree at breast height or of all the trees in a stand, usually expressed in square feet or square feet per acre.

**Bioindicator species**—A tree, woody shrub, or nonwoody herbaceous species that responds to ambient levels of ozone pollution with distinct visible foliar symptoms that are easy to diagnose.

**Biomass**—For the southern region, total aboveground biomass is estimated using allometric equations and is defined as the aboveground weight of wood and bark in live trees  $\geq 1.0$ -inch d.b.h./d.r.c. from the ground to the tip of the tree, excluding all foliage (leaves, needles, buds, fruit, and limbs  $< 0.5$  inch in diameter). Biomass is expressed as oven-dry weight and the units are tons.

Note: the weight of wood and bark in limbs  $< 0.5$  inch in diameter is included in the biomass of small-diameter trees.

Additionally, biomass in the merchantable stem is estimated regionally, where the main and merchantable stems are defined as follows.

*Main stem*—The central portion of the tree extending from the ground level to the tip for timber species. Woodland species includes from ground level to the tips of all branches of qualifying stems. For timber species trees that fork, the main stem refers to the fork that would yield the most merchantable volume.

*Merchantable stem*—That portion of the main stem of a timber species tree from a 1-foot stump to a minimum 4-inch top diameter inside or outside bark depending on species. That portion of a woodland species tree from the d.r.c. measurements to the 1.5-inch diameters of all the qualifying stems.

Nationally, aboveground and belowground biomass is estimated from each tree's sound volume using a Component Ratio Method that is consistently applied in all FIA regions.

*Gross aboveground biomass*—Total tree biomass excluding foliage and roots with no deductions made for rotten, missing, or broken-top cubic-foot cull.

*Net aboveground biomass*—Gross aboveground biomass minus deductions for missing cull, broken-top, and a reduction for a proportion of rotten cull for live or standing dead trees  $\geq 5.0$  inches d.b.h. (rotten cull will have a factor to reduce specific gravity separately from sound wood). Live and standing dead trees 1.0 to 4.9 inches only have deductions for broken-top cull. Additional deductions are made for dead trees  $\geq 1.0$  inch using decay class.

*Belowground biomass*—Coarse roots only.

Further, the total net aboveground biomass estimated using the Component Ratio Method is divided into the following components:

*Top*—That portion of the main stem of a timber species tree above the 4-inch top diameter.

For woodland species, this component of the biomass is included with branches.

*Branches*—All the branches of a timber species tree excluding the main stem. That portion of all the branches of qualifying stems of woodland species above the 1.5-inch diameter ends.

*Bole*—See: Merchantable stem.

*Stump*—That portion of timber species below 1-foot to ground level. That portion of woodland species from all the d.r.c. measurements to ground level.

**Blind check**—A reinstallation done by a qualified inspection crew without production crew data on hand; at least two full subplots are completely remeasured along with all the plot level information. The two datasets are maintained separately. Discrepancies between the two sets of data are not reconciled. See: Quality assurance and quality control.

**Bole**—Trunk or main stem of a tree. (See: Main stem.)

**Census water**—See: Land use.

**Coarse woody debris (CWD)**—Downed, dead tree and shrub boles, large limbs, and other woody pieces with a minimum small-end diameter of  $\geq 3$  inches and a length of  $\geq 3$  feet not attached to a living or standing dead source.

**Cold check**—An inspection done either as part of the training process, or as part of the ongoing quality control program. Normally the installation crew is not present at the time of inspection. The inspector has the completed data in-hand at the time of inspection. The inspection can include the whole plot or a subset of the plot. Data errors are corrected. See: Quality assurance and quality control.

**Components of change**—Volume increment and decrement values that explain the change in inventory between two points in time. Components of change are usually expressed in terms of growing-stock or all-live merchantable

volume. These components can be expressed as average annual values by dividing the component by the number of years in the measurement cycle. FIA inventories are designed to measure net change over time, as well as the individual components of change that constitute net change (e.g., growth, removals, mortality). Change estimates are computed for two sequential measurements of each inventory panel. Upon remeasurement, a new initial inventory is established for remeasurement at the next scheduled inventory. As such, computation of change components is not intended to span more than one inventory cycle. Rather, the change estimation process is repeated cycle by cycle. This simplifies field protocols and ensures that change estimation is based on short and relatively constant time intervals (e.g., 5 years). Change estimates for individual panels are combined across multiple panels in the same manner as panels are combined to obtain current inventory parameters such as total standing volume. FIA recognizes the following components of change as prescribed core variables; they usually are expressed in terms of growing-stock or all-live volume, where  $t$  is the initial inventory of a measurement cycle, and  $t + 1$  is the terminal inventory:

*Cut*—The volume of trees cut between time  $t$  and time  $t + 1$ . The estimate is based on tree size at the midpoint of the measurement interval (includes cut growth). Tree size at the midpoint is modeled from tree size at time  $t$ . Trees felled or killed in conjunction with a harvest or silvicultural operation (whether they are utilized or not) are included, but trees on land diverted from forest to nonforest (diversions) are excluded.

*Cut growth*—The growth of cut trees between time  $t$  and the midpoint of the measurement interval. Tree size at the midpoint is modeled from tree size at time  $t$ . This term also includes the subsequent growth on ingrowth trees that achieve the minimum diameter threshold prior to being cut.

*Diversion*—The volume of trees on land diverted from forest to nonforest (or, for some

analyses, this may also include land diverted to reserved forest land and other forest land), whether utilized or not, between time  $t$  and time  $t + 1$ . The estimate is based on tree size at the midpoint of the measurement interval (includes diversion growth). Tree size at the midpoint is modeled from tree size at time  $t$ .

*Diversion growth*—The growth of diversion trees from time  $t$  to the midpoint of the measurement interval. Tree size at the midpoint is modeled from tree size at time  $t$ . This term also includes the subsequent growth on ingrowth trees that achieve the minimum diameter threshold prior to diversion.

*Growth on ingrowth*—The growth on trees between the time they grow across the minimum d.b.h./d.r.c. threshold and time  $t + 1$ .

*Ingrowth*—The volume of trees at the time that they grow across the minimum d.b.h./d.r.c. threshold between time  $t$  and time  $t + 1$ . The estimate is based on the size of trees at the d.b.h./d.r.c. threshold which is 1.0 inch for all-live trees and 5.0 inches for growing-stock trees. This term also includes trees that subsequently die (i.e., ingrowth mortality), are cut (i.e., ingrowth, cut), or diverted to nonforest (i.e., ingrowth diversion); as well as trees that achieve the minimum threshold after an area reverts to a forest land use (i.e., reversion ingrowth).

*Mortality*—The volume of trees that die from human or natural causes between time  $t$  and time  $t + 1$ . The estimate is based on tree size at the midpoint of the measurement interval (includes mortality growth). Tree size at the midpoint is modeled from tree size at time  $t$ .

*Mortality growth*—The growth of trees that died from human or natural causes between time  $t$  and the midpoint of the measurement interval. Tree size at the midpoint is modeled from tree size at time  $t$ . This term also includes the subsequent growth on ingrowth trees that achieve the minimum diameter threshold prior to mortality.

*Reversion*—The volume of trees on land that reverts from a nonforest land use to a forest land use (or, for some analyses, land that reverts from any source to timberland) between time  $t$  and time  $t + 1$ . The estimate is based on tree size at the midpoint of the measurement interval. Tree size at the midpoint is modeled from tree size at time  $t + 1$ .

*Reversion growth*—The growth of reversion trees from the midpoint of the measurement interval to time  $t + 1$ . Tree size at the midpoint is modeled from tree size at time  $t + 1$ . This term also includes the subsequent growth on ingrowth trees that achieve the minimum diameter threshold after reversion.

*Survivor growth*—The growth on trees tallied at time  $t$  that survive until time  $t + 1$ .

The following components of change may be used to further quantify changes in growing-stock (but not all-live) volume:

*Cull decrement*—The net gain in growing-stock volume due to reclassification of cull trees to growing-stock trees between two surveys. Cull decrement is the volume of trees that were cull at time  $t$ , but growing stock at time  $t + 1$ . The estimate is based on tree size at the midpoint of the measurement interval. Tree size at the midpoint can be modeled from tree at time  $t$ , time  $t + 1$ , or both.

*Cull decrement growth*—The growth from the midpoint of the measurement interval to time  $t + 1$  on trees that were cull at time  $t$ , but growing stock at time  $t + 1$ . Tree size at the midpoint can be modeled from tree size at time  $t$ , time  $t + 1$ , or both.

*Cull increment*—The net reduction in growing-stock volume due to reclassification of growing stock trees to cull trees between two surveys. Cull increment is the volume of trees that were growing stock at time  $t$ , but cull at time  $t + 1$ . The estimate is based on tree size at the midpoint of the measurement interval (includes cull increment growth). Tree size at the midpoint can be modeled from tree size at time  $t$ , time  $t + 1$ , or both.

*Cull increment growth*—The growth to the midpoint of the measurement interval between time  $t$  and  $t + 1$  of trees that were growing stock at time  $t$ , but cull trees at time  $t + 1$ . Tree size at the midpoint can be modeled from tree size at time  $t$ , time  $t + 1$ , or both.

**Condition class**—The combination of discrete landscape and forest attributes that identify, define, and stratify the area associated with a plot. Examples of such attributes include condition status, forest type, stand origin, stand size, owner group, reserve status, and stand density.

**Crown**—The part of a tree or woody plant bearing live branches or foliage.

**Crown vigor class**—A visual assessment of the apparent crown vigor of saplings. The purpose is to separate excellent saplings with superior crowns from stressed individuals with poor crowns.

**Crown density**—The amount of crown stem, branches, twigs, shoots, buds, foliage, and reproductive structures that block light penetration through the projected crown outline. Measured as a percentage.

**Crown dieback**—Recent mortality of branches with fine twigs, which begins at the terminal portion of a branch and proceeds toward the trunk. Dieback is only considered when it occurs in the upper and outer portions of the tree. Dead branches in the lower live crown are not considered as part of crown dieback, unless there is continuous dieback from the upper and outer crown down to those branches.

**Cull**—Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect. Cull is further categorized as the following:

*Broken-top cubic-foot cull*—The broken-top proportion of a timber species tree's merchantable portion from the break to the actual or projected 4-inch top diameter outside bark, or to where the central stem forks, where all forks are <4.0 inches diameter. For trees 1.0

to 4.9 inches diameter, this is the proportion of the main stem missing due to a broken-top.

*Form board-foot cull*—The part of the tree's saw-log portion that is sound but not usable for sawn wood products due to sweep, crook, forking, or other physical culls.

*Missing cubic-foot cull*—The proportion of a tree's merchantable portion that is missing or absent. Does not include any cull deductions above actual length for broken-top timber trees. Does include cull deductions above actual length for broken-top woodland species. Trees with d.b.h./d.r.c. <5.0 inches have a null value in this field.

*Percent board-foot cull*—Percentage of sound and unsound board-foot volume, to the nearest 1 percent.

*Rotten cubic-foot cull*—The proportion of a tree's merchantable portion that is in a decayed state. Does not include any cull deductions above actual length for broken-top timber trees. Does include cull deductions above actual length for broken-top woodland species. Trees <5.0 inches d.b.h. have a null value in this field.

*Rotten/missing cull*—The part of the tree's merchantable portion that is decayed and/or absent due to other factors.

*Total board-foot cull*—The proportion of a timber species tree's saw log portion that is rotten, missing, or sound but not useable for sawn wood products due to sweep, crook, forking, or other physical defects (form board-foot cull). Nonsaw-log species and softwoods <9.0 inches d.b.h. and hardwoods <11.0 inches d.b.h. have a null value in this field.

**Cull tree**—Live trees that are unsuitable for the production of some roundwood products, now or prospectively. Cull trees can include those with decay (rotten cull) or poor form, limbiness, or splits (rough cull). Rough cull is suitable for pulpwood and other fiber products.

**Cycle**—One sequential and complete set of panels.

**Diameter at breast height (d.b.h.)**—The diameter for tree stem, located at 4.5 feet above the ground (breast height) on the uphill side of a tree. The point of diameter measurement may vary on abnormally formed trees.

**Diameter class**—A classification of trees based on diameter outside bark, measured at breast height (d.b.h.) above the ground or at root collar (d.r.c.). Note: Diameter classes are commonly in 2-inch increments, beginning with 2 inches. Each class provides a range of values with the class name being the approximate midpoint. For example, the 6-inch class includes trees 5.0–6.9 inches d.b.h.

**Disturbance**—Natural or human-caused disruption that is  $\geq 1.0$  acre in size and results in mortality and/or damage to 25 percent of all trees in a stand or 50 percent of an individual species' count or, in the case when the disturbance does not initially affect tree growth or health (e.g., grazing, browsing, flooding, etc.), affects 25 percent of the soil surface or understory vegetation. For initial forest plot establishment, the disturbance must be within the last 5 years. For remeasured plots only those disturbances that have occurred since the previous inventory are recognized.

**Diversion**—See: Components of change.

**Down woody material (DWM)**—DWM is dead material on the ground in various stages of decay. It includes coarse and fine woody material. Previously named down woody debris (DWD). The depth of duff layer, litter layer, and overall fuelbed; fuel loading on the microplot; and residue piles are also measured as part of the DWM indicator for FIA.

**Dry weight**—The oven-dry weight of biomass.

**Federal land**—An ownership class of public lands owned by the U.S. Government. See: Ownership.

**Fine woody debris (FWD)**—Downed, dead branches, twigs, and small tree or shrub boles

<3 inches in diameter not attached to a living or standing dead source.

**Fixed-radius plot**—A circular sampled area with a specified radius in which all trees of a given size, shrubs, or other items are tallied.

**Foliage transparency**—The amount of skylight visible through microholes in the live portion of the crown, i.e. where you see foliage, normal or damaged, or remnants of its recent presence. Recently defoliated branches are included in foliage transparency measurements. Macroholes are excluded unless they are the result of recent defoliation. Dieback and dead branches are always excluded from the estimate. Foliage transparency is different from crown density because it emphasizes foliage and ignores stems, branches, fruits, and holes in the crown.

**Forest floor**—The entire thickness of organic material overlying the mineral soil, consisting of the litter and the duff (humus).

**Forest industry land**—See: Ownership.

**Forest land**—Land that is at least 10 percent stocked by forest trees of any size, or land formerly having such tree cover, and is not currently developed for a nonforest use. The minimum area for classification as forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must be at least 120 feet wide to qualify as forest land. Unimproved roads and trails, streams and other bodies of water, or natural clearings in forested areas shall be classified as forest, if <120 feet in width or 1.0 acre in size. Forest land is divided into timberland, reserved forest land, and other forest land (such as woodland).

**Forest type**—A classification of forest land based upon and named for the tree species that forms the plurality of live-tree stocking. A forest-type classification for a field location indicates the predominant live-tree species cover for the field location; hardwoods and softwoods are first grouped to determine predominant group, and forest type is selected from the predominant group.

**Forest-type group**—A combination of forest types that share closely associated species or site requirements.

*Elm-ash-cottonwood*—Forests in which elm, ash, or cottonwood, singly or in combination, constitute a plurality of the stocking. (Common associates include willow, sycamore, beech, and maple.)

*Loblolly-shortleaf pine*—Forests in which loblolly pine, shortleaf pine, or other southern yellow pines, except longleaf or slash pine, singly or in combination, constitute a plurality of the stocking. (Common associates include oak, hickory, and gum.)

*Maple-beech-birch*—Forests in which maple, beech, or yellow birch, singly or in combination, constitute a plurality of the stocking. (Common associates include hemlock, elm, basswood, and white pine.)

*Oak-gum-cypress*—Bottomland forests in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, constitute a plurality of the stocking, except where pines account for 25–50 percent of stocking, in which case the stand is classified as oak-pine. (Common associates include cottonwood, willow, ash, elm, hackberry, and maple.)

*Oak-hickory*—Forests in which upland oaks or hickory, singly or in combination, constitute a plurality of the stocking, except where pines account for 25–50 percent, in which case the stand is classified oak-pine. (Common associates include yellow-poplar, elm, maple, and black walnut.)

*Oak-pine*—Forests in which hardwoods (usually upland oaks) constitute a plurality of the stocking but in which pines account for 25–50 percent of the stocking. (Common associates include gum, hickory, and yellow-poplar.)

**Fuel class**—Categories of forest fire fuels defined by the approximate amount of time it takes for moisture conditions to fluctuate. Large

coarse woody debris pieces take longer to dry out than smaller fine woody pieces.

*1,000-hour fuels*—Coarse woody debris with a transect diameter  $\geq 3.0$  inches in diameter and  $\geq 3.0$  feet long.

*100-hour fuels*—Fine woody debris with a transect diameter between 1.0 and 2.9 inches.

*10-hour fuels*—Fine woody debris with a transect diameter between 0.25 and 0.9 inches.

*1-hour fuels*—Fine woody debris with a transect diameter  $\leq 0.24$  inches.

**Growing-stock trees**—Live large-diameter timber species (excludes nonsaw-log species) trees with one-third or more of the gross board-foot volume in the entire saw log portion meeting grade, soundness, and size requirements or the potential to do so for medium-diameter and small-diameter trees. A growing-stock tree must have one 12-foot log or two noncontiguous 8-foot merchantable logs, now (large diameter) or prospectively (medium diameter and small diameter), to qualify as growing stock.

**Hardwoods**—Tree species belonging to the botanical divisions Magnoliophyta, Ginkgophyta, Cycadophyta, or Pteridophyta, usually angiospermic, dicotyledonous, broad-leaved and deciduous.

*Soft hardwoods*—Hardwood species with an average specific gravity of  $\leq 0.50$ , such as gums, yellow-poplar, cottonwoods, red maple, basswoods, and willows.

*Hard hardwoods*—Hardwood species with an average specific gravity  $> 0.50$ , such as oaks, hard maples, hickories, and beech.

**Hot check**—An inspection normally done as part of the training process. The inspector is present on the plot with the trainee and provides immediate feedback regarding data quality. Data errors are corrected. Hot checks can be done on training plots or production plots. See: Quality assurance and quality control.

**Land**—The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains.

**Land cover**—The dominant vegetation or other kind of material that covers the land surface. A given land cover may have many land uses.

**Land use**—The purpose of human activity on the land; it is usually, but not always, related to land cover.

Southern regional present land-use categories are as follows:

*Accessible timberland*—Land that is within the population of interest, is accessible, is on a subplot that can be occupied at subplot center, can safely be visited, and meets the criteria for forest land (See: Forest land).

*Accessible other forest land*—Land that meets the definition of accessible forest land, but is incapable of producing 20 cubic feet per acre per year of industrial wood under natural conditions because of adverse site conditions. Adverse conditions include sterile soils, dry climate, poor drainage, high elevation, steepness, and soil rockiness.

*Agricultural land*—Land managed for crops, pasture, or other agricultural use. The area must be at least 1.0 acre in size and 120 feet wide (with the exception of windbreak/shelterbelt, which has no minimum width). This land use includes cropland, pasture (improved through cultural practices), idle farmland, orchard, Christmas tree plantation, maintained wildlife opening, and windbreak/shelterbelt.

*Rangeland*—Land primarily composed of grasses, forbs, or shrubs. This includes lands vegetated naturally or artificially to provide a plant cover managed like native vegetation and does not meet the definition of pasture. The area must be at least  $\geq 1.0$  acre in size and  $\leq 120$  feet wide.

*Developed*—Land used primarily by humans for purposes other than forestry or

agriculture. This land use includes cultural (business, industrial/commercial, residential, and other places of intense human activity), rights-of-way (improved roads, railway, power lines, maintained canal), recreation (parks, skiing, golf courses), and mining.

*Other*—Land parcels  $\geq 1.0$  acre in size and  $\geq 120$  feet wide, which do not fall into one of the uses described above. Examples include undeveloped beaches, barren land (rock, sand), marshes, bogs, ice, and snow. This land use includes nonvegetated, wetland, beach, and nonforest-chaparral.

*Census water*—Rivers and streams that are  $>200$  feet wide and bodies of water  $>4.5$  acres in size.

*Noncensus water*—Rivers, streams, and other bodies of water that do not meet the requirements for census water.

*Nonsampled*—Not sampled due to denied access, hazardous conditions, being outside the United States or other reasons.

**Large-diameter trees**—Softwoods  $\geq 9.0$  inches d.b.h. and hardwoods  $\geq 11.0$  inches d.b.h. These trees were called sawtimber-sized trees in prior surveys. See: Stand-size class.

**Litter**—Undecomposed or only partially decomposed organic material that can be readily identified (e.g., plant leaves, twigs, etc.).

**Main stem**—The central portion of the tree extending from the ground level to the tip for timber species. For woodland species the main stem extends from the ground level to the tips of all branches of qualifying stems. For timber species trees that fork, the main stem follows the fork that would yield the most merchantable volume.

### Measurement quality objective

**(MQO)**—A data user's estimate of the precision, bias, and completeness of data necessary to satisfy a prescribed application (e.g., Resource Planning Act, assessments by State foresters, forest planning, forest health analyses). Describes the acceptable tolerance for each data element. MQOs

consist of two parts: a statement of the tolerance and a percentage of time when the collected data are required to be within tolerance. MQOs can only be assigned where standard methods of sampling or field measurements exist, or where experience has established upper or lower bounds on precision or bias. MQOs can be set for measured data elements, observed data elements, and derived data elements.

**Medium-diameter tree**—Softwood timber species 5.0 to 8.9 inches d.b.h. and hardwood timber species 5.0 to 10.9 inches d.b.h. These trees were called poletimber-sized trees in prior surveys. See: Stand-size class.

**Microplot**—A circular, fixed-radius plot with a radius of 6.8 feet (0.003 acre) that is used to sample trees <5.0 inches d.b.h./d.r.c., as well as other vegetation. Point center is 90 degrees and 12 feet offset from point center of each subplot.

**Mortality**—See: Components of change.

**National forest land**—See: Ownership.

**Noncensus water**—See: Land use.

**Nonforest land**—Land that does not support or has never supported, forests, and lands formerly forested where use for timber management is precluded by development for other uses. Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining rights-of-way, power line clearings of any width, and noncensus water. If intermingled in forest areas, unimproved roads and nonforest strips must be  $\geq 120$  feet wide, and clearings, etc.,  $\geq 1.0$  acre in size, to qualify as nonforest land.

**Nonindustrial private forest land**—See: Ownership.

**Operability**—The viability of operating logging equipment in the vicinity of the condition. Operability classes are as follows:

No problems.

Seasonal access due to water conditions in wet weather.

Mixed wet and dry areas typical of multichanneled streams punctuated with dry islands.

Broken terrain, cliffs, gullies, outcroppings, etc., which would severely limit equipment, access, or use.

Year-round water problems (includes islands).

Slopes 20–40 percent.

Slopes >40 percent.

**Other forest land**—Forest land other than timberland and reserved forest land. It includes available and reserved forest land that is incapable of producing 20 cubic feet per acre per year of wood under natural conditions because of adverse site conditions such as sterile soils, dry climate, poor drainage, high elevation, steepness, or rockiness.

**Other public land**—See: Ownership.

**Other removals**—The volume of trees removed from the inventory by cultural operations such as timber stand improvement, land clearing, and other changes in land use, resulting in the removal of the trees from timberland.

**Ownership**—A legal entity having control of a parcel or group of parcels of land. An ownership may be an individual; a combination of persons; a legal entity such as corporation, partnership, club, or trust; or a public agency.

*National forest land*—Federal land that has been legally designated as national forests or purchase units, and other land under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III land.

*Forest industry land*—An ownership class of private lands owned by a company or an individual(s) operating a primary wood-processing plant.

*Nonindustrial private forest (NIPF) land*—Privately owned land excluding forest industry land.

*Corporate*—Owned by corporations, including incorporated farm ownerships.

*Individual*—All lands owned by individuals, including farm operators.

*Other public*—An ownership class that includes all public lands except national forests.

*Miscellaneous Federal land*—Federal land other than national forests.

*State, county, and municipal land*—Land owned by States, counties, and local public agencies or municipalities, or land leased to these governmental units for 50 years or more.

**Ozone ( $O_3$ )**—A gaseous air pollutant produced primarily through sunlight-driven chemical reactions of  $NO_2$  and hydrocarbons in the atmosphere and causing foliar injury to deciduous trees, conifers, shrubs, and herbaceous species.

**Ozone bioindicator site**—An open area used for ozone injury evaluations on ozone-sensitive species. The area must meet certain site selection guidelines regarding size, condition, and plant counts to be used for ozone injury evaluations in FIA.

**Phase 1 (P1)**—FIA activities related to remote sensing, the primary purpose of which is to label plots and obtain stratum weights for population estimates.

**Phase 2 (P2)**—FIA activities conducted on the network of ground plots. The primary purpose is to obtain field data that enable classification and summarization of area, tree, and other attributes associated with forest land uses.

**Plantation**—Stands that currently show evidence of being planted or artificially seeded.

**Poletimber-sized tree**—Softwood timber species 5.0 to 8.9 inches d.b.h. and hardwood

timber species 5.0 to 10.9 inches d.b.h. Now referred to as medium-diameter trees.

**Private land**—See: Ownership.

**Productivity class**—A classification of forest land in terms of potential annual cubic-foot volume growth per acre at culmination of mean annual increment (MAI) in fully stocked natural stands.

**Quality assurance (QA)**—The total integrated program for ensuring that the uncertainties inherent in FIA data are known and do not exceed acceptable magnitudes, within a stated level of confidence. Quality assurance encompasses the plans, specifications, and policies affecting the collection, processing, and reporting of data. It is the system of activities designed to provide program managers and project leaders with independent assurance that total system quality control is being effectively implemented.

**Quality control (QC)**—The routine application of prescribed field and laboratory procedures (e.g., random check cruising, periodic calibration, instrument maintenance, use of certified standards, etc.) in order to reduce random and systematic errors and ensure that data are generated within known and acceptable performance limits. Quality control also ensures the use of qualified personnel; reliable equipment and supplies; training of personnel; good field and laboratory practices; and strict adherence to standard operating procedures.

**Reserved forest land**—Forest land where management for the production of wood products is prohibited through statute or administrative designation. Examples include national forest wilderness areas and national parks and monuments.

**Reversion**—Land that reverts from a nonforest land use to a forest land use. See: Components of change.

**Sapling**—Live trees 1.0–4.9 inches d.b.h./d.r.c.

**Seedling**—Live trees <1.0-inch d.b.h./d.r.c. that are ≥6.0 inches in height for softwoods, ≥12.0

inches in height for hardwoods, and >0.5-inch d.b.h./d.r.c. at ground level for longleaf pine.

**Site index**—The average total height that dominant and codominant trees in fully-stocked, even-aged stands will obtain at key ages (usually 25 or 50 years).

**Small-diameter trees**—Trees 1.0–4.9 inches in d.b.h./d.r.c. These were called sapling-seedling sized trees in prior surveys. See: Stand-size class.

**Softwoods**—Tree species belonging to the botanical division Coniferophyta, usually evergreen having needles or scale-like leaves.

**Species group**—A collection of species used for reporting purposes.

**Stand**—Vegetation or a group of plants occupying a specific area and sufficiently uniform in species composition, age arrangement, structure, and condition as to be distinguished from the vegetation on adjoining areas.

**Stand age**—A stand descriptor that indicates the average age of the live dominant and codominant trees in the predominant stand-size class of a condition.

**Standing dead tree**—A dead tree  $\geq 5.0$  inches d.b.h. that has a bole which has an unbroken actual length of at least 4.5 feet, and lean  $< 45$  degrees from vertical as measured from the base of the tree to 4.5 feet.

**Stand origin**—A classification of forest stands describing their means of origin.

*Planted*—Planted or artificially seeded.

*Natural*—No evidence of artificial regeneration.

**Stand-size class**—A classification of forest land based on the diameter-class distribution of live trees in the stand. See definitions of large-, medium-, and small-diameter trees.

*Large-diameter stands*—Stands at least 10 percent stocked with live trees, with one-half or more of total stocking in large- and medium-diameter trees, and with

large-diameter tree stocking at least equal to medium-diameter tree stocking.

*Medium-diameter stands*—Stands at least 10 percent stocked with live trees, with one-half or more of total stocking in medium- and large-diameter trees, and with medium-diameter tree stocking exceeding large-diameter tree stocking.

*Small-diameter stands*—Stands at least 10 percent stocked with live trees, in which small-diameter trees account for more than one-half of total stocking.

*Nonstocked stands*—Stands  $< 10$  percent stocked with live trees.

**Stand structure**—The predominant canopy structure for the condition, only considering the vertical position of the dominant and codominant trees in the stand and not considering trees that are intermediate or overtopped. As a general rule, a different story should comprise 25 percent of the stand.

*Nonstocked*—The condition is  $< 10$  percent stocked.

*Single-storied*—Most of the dominant/codominant tree crowns form a single canopy (i.e., most of the trees are approximately the same height).

*Multistoried*—Two or more recognizable levels characterize the crown canopy. Dominant/codominant trees of many sizes (diameters and heights) for a multilevel canopy.

**State, county, and municipal land**—See: Ownership.

**Stocking**—(1) At the tree level, stocking is the density value assigned to a sampled tree (usually in terms of numbers of trees or basal area per acre), expressed as a percent of the total tree density required to fully utilize the growth potential of the land. (2) At the stand level, stocking refers to the sum of the stocking values of all trees sampled.

**Subplot**—A circular area with a fixed horizontal radius of 24.0 feet (1/24 acre), primarily used to sample trees  $\geq 5.0$  inches at d.b.h./d.r.c.

**Survivor tree**—A sample tree alive at both the current and previous inventories.

**Timberland**—Forest land that is producing or capable of producing 20 cubic feet per acre or more per year of wood at culmination of MAI. Timberland excludes reserved forest lands.

**Treatment**—Forestry treatments are a form of human disturbance. The term treatment further implies that a silvicultural application has been prescribed. This does not include occasional stumps of unknown origin or sparse removals for firewood, Christmas trees, or other miscellaneous purposes. The area affected by any treatment must be at least 1.0 acre in size.

*None*—No observable treatment.

*Cutting*—The removal of one or more trees from a stand. SRS FIA categories are the following:

*Clearcut harvest*—The removal of the majority of the merchantable trees in a stand; residual stand stocking is under 50 percent.

*Partial harvest*—Removal primarily consisting of highest quality trees. Residual consists of lower quality trees because of high grading or selection harvest (e.g., uneven aged, group selection, high grading, species selection).

*Seed-tree/shelterwood harvest*—Crop trees are harvested leaving seed source trees either in a shelterwood or seed tree. Also includes the final harvest of the seed trees.

*Commercial thinning*—The removal of trees (usually of medium-diameter) from medium-diameter stands leaving sufficient stocking of growing-stock trees to feature in future stand development. Also included are thinning in large-diameter stands where medium-diameter trees have been

removed to improve the quality of those trees featured in a final harvest.

*Timber stand improvement (cut trees only)*—The cleaning, release, or other stand improvement involving noncommercial cutting applied to an immature stand that leaves sufficient stocking.

*Salvage cutting*—The harvesting of dead or damaged trees, or of trees in danger of being killed by insects, disease, flooding, or other factors in order to save their economic value.

*Site preparation*—Clearing, slash burning, chopping, disking, bedding, or other practices clearly intended to prepare a site for either natural or artificial regeneration.

*Artificial regeneration*—Following a disturbance or treatment (usually cutting), a new stand where at least 50 percent of the live trees present resulted from planting or direct seeding.

*Natural regeneration*—Following a disturbance or treatment (usually cutting), a new stand where at least 50 percent of the live trees present (of any size) were established through the growth of existing trees and/or natural seeding or sprouting.

*Other silvicultural treatment*—The use of fertilizers, herbicides, girdling, pruning, or other activities designed to improve the commercial value of the residual stand, or chaining, which is a practice used on woodlands to encourage wildlife forage.

**Tree**—A woody perennial plant, typically large, with a single well-defined stem carrying a more or less definite crown; sometimes defined as attaining a minimum diameter of 3 inches and a minimum height of 15 feet at maturity. For FIA, any plant on the tree list in the current field manual is measured as a tree.

**Tree class**—An assessment of the general quality of a tree.

*Cull species*—Species measured at d.r.c. and timber species (measured at d.b.h.) that would not produce saw logs. See national list of nonsaw-log species.

*Growing stock*—Live large-diameter timber species (excludes nonsaw-log species) trees with one-third or more of the gross board-foot volume in the entire saw log portion meeting grade, soundness, and size requirements or the potential to do so for medium-diameter trees. A growing-stock tree must have one 12-foot log or two noncontiguous 8-foot merchantable logs, now (large-diameter) or prospectively (medium-diameter), to qualify as growing stock.

*Rough cull*—Trees that do not contain at least one 12-foot saw log or two 8-foot logs now or prospectively, primarily because of roughness or poor form. Less than 1/3 of its gross board-foot volume meets size, soundness, and grade requirements and <1/2 of the cubic-foot cull is rotten or unsound.

*Rotten cull*—Trees that do not contain at least one 12-foot saw log or two 8-foot logs now or prospectively and/or do not meet grade specifications for percent sound primarily because of rot. All species not having 1/3 or more of its gross board-foot volume meeting size, soundness, and grade requirements, and over 1/2 of the cubic-foot cull is rotten or unsound.

**Tree grade**—A classification of the saw log portion of large-diameter trees based on: (1) the grade of the butt log, or (2) the ability to produce at least one 12-foot log or two 8-foot logs in the upper section of the saw log portion. Tree grade is an indicator of quality; grade 1 is the best quality.

**Volume**—A measure of the solid content of the tree stem used to measure wood quantity.

*Gross board-foot volume*—Total board-foot volume of wood inside bark without deductions for total board-foot cull.

*Gross cubic-foot volume*—Total cubic-foot volume of wood inside bark without deductions for rotten, missing, or broken-top cull.

*Net board-foot volume*—Gross board-foot volume minus deductions for total board-foot cull.

*Net cubic-foot volume*—Gross cubic-foot volume minus deductions for rotten, missing, and broken-top cull.

## APPENDIX 1—INVENTORY METHODS

### Inventory Methods Overview

The North Carolina 2018 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. Under the annual inventory system as originally designed, 20 percent (one panel) of the total number of plots in a State are measured every year over a 5-year period (one cycle). However, North Carolina's 2018 survey was conducted on a 7-year cycle with >14 percent of the plots measured every year. The State's previous 2013 survey was also collected on a 7-year cycle. Forest Inventory and Analysis (FIA) is required to report these data in 5-year increments based on the original inventory design. Therefore, data used in this report involves 5 years (71 percent) 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. However, due to changing methodology, only a portion of the P3 data were collected for the 2018 survey.

The data that were used to derive the estimates in this report came from panels 1, 2, 3, 4, and 5 (5/7, 71 percent) of cycle 10 plus reuse of cycle 9 data equivalent to panels 6 and 7 (29 percent) of cycle 10. This process produces a dataset that represents 100 percent of the plot sample in the State. Collectively, these five panels represent approximately 5/7 of sample plots in the cycle. The data were processed with the national inventory and monitoring system version 6.0 software.

### Sample Design

Under North Carolina's annual inventory system, approximately >14 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 which 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 (AREERA 1998). 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 is reused to yield a full cycle of data (potentially adding data older than 7 years).

### 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 Data (NLCD) for the stratification platform (USGS 2018). 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 summed across all strata from respective pixel counts (based on placement within the above strata) and the mean area from the P2 plots (Westfall and others 2022).

### 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, may 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. Further instructions are contained in field crew manuals (USDA Forest Service 2014). 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. 1.1). Each point is the center of a circular subplot with a fixed 24-foot 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 1/300-acre microplot with a fixed 6.8-foot radius (fig. 1.2). Trees 1.0 to 4.9 inches d.b.h. and seedlings (<1.0 inch d.b.h.) are measured on these microplots.

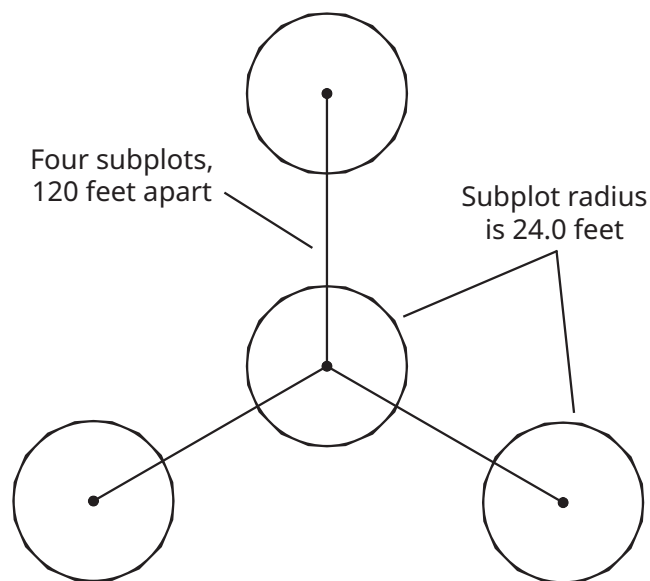


Figure A1.1—Annual inventory fixed-plot design (the phase 2 plot).

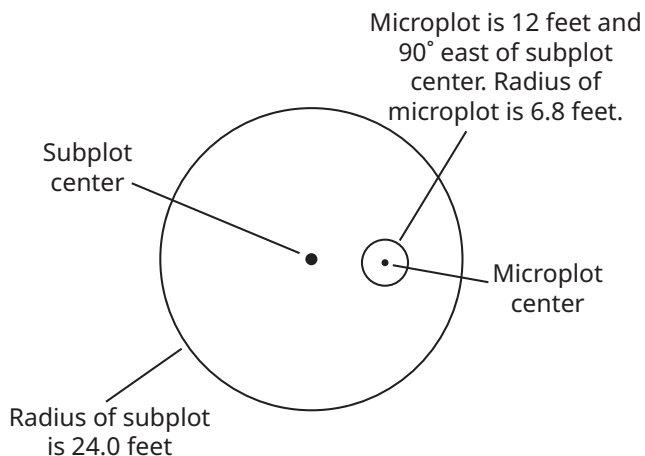


Figure A1.2—Subplot and microplot layout.

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, ownership, 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 1/16 of the P2 sample plots (USDA 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. However, the number of P3 data variables collected has been scaled back to a more simplified set so that field protocols can be implemented on more plots to improve the sample size.

## 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 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 sawlog 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. See the Southern Research Station volume calculations in the following document (USDA Forest Service 2024). For more detailed and specific information regarding volume models and coefficients, contact the Southern Research Station 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 Southern Research Station 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 2013 inventory. North Carolina's 2018 survey remeasured 5,666 of these plots. The 134-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 (3,598) of the remeasured plots were forested and 2,068 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 changes in methods and measurements evolving from nationalization of the FIA program, 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. Since the 2002 closeout periodic inventory of North Carolina (Brown and others 2006), the State

has followed the national annualized inventory protocols for three cycles, 2007 (Brown and others 2014), 2013 (Brown and Vogt 2015), and 2018, permitting trend analysis with more certainty.

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## APPENDIX 2—DATA RELIABILITY

A relative standard of accuracy has been incorporated into the forest survey. This standard satisfies user demands, minimizes human and instrumental sources of error, and keeps costs within prescribed limits. The two primary types of error are measurement error and sampling error.

### Measurement Error

Measurement error is also called nonsampling error or data acquisition error. These are errors that arise in the acquisition, recording, or editing of statistical data (Burt and Barber 1996). There are three elements of measurement error: (1) biased error, caused by instruments not properly calibrated; (2) compensating error, caused by instruments of moderate precision; and (3) accidental error, caused by human error in measuring, recording, and compiling. All of these are held to a minimum by a system, the Forest Inventory and Analysis (FIA) quality assurance (QA) program that incorporates training, check plots, and editing and checking for consistency. The goal of the QA program is to provide a framework to assure the production of complete, accurate, and unbiased forest assessments for given standards.

The QA program uses quality control (QC) procedures to minimize field measurement error. These QC methods include use of nationally standardized field manuals, use of portable data recorders (PDRs), intensive entry-level training, periodic review training, supervision, check plots, editing checks, and emphasis on careful work. Data quality is assessed and documented using performance measurements and post-survey assessments. These assessments are then used to identify areas of the data collection process that need improvement, or refinement, to meet quality standards of the program.

For all plots, editing checks are performed in the PDR and office to screen out logical and data entry inconsistencies and errors. The use of PDR's also helps to ensure that specified procedures are followed. The minimum national standards for

annual training of field crews are (1) a minimum of 40 hours for new employees, and (2) a minimum of 8 hours for returning employees. Field crew members are certified on a test plot. All crews are required to have at least one certified person on the plot.

Field audits consist of hot checks, cold checks, and blind checks. A hot check is an inspection normally done as part of the training process. The inspector is present with the crew to document crew performance as plots are measured. The recommended intensity for hot checks is 2 percent of the plots installed.

Cold checks are done at regular intervals throughout the field season. The crew that installed the plot is not present at the time of inspection and does not know when or which plots will be remeasured. The inspector visits the completed plot, evaluates the crew's data collection, and notes corrections where necessary. The recommended intensity for cold checks is 5 percent of the plots installed.

A blind check is a complete reinstallation remeasurement of a previously completed plot. However, the QA crew performs the remeasurement without the previously recorded data. This type of blind measurement provides a direct, unbiased observation of measurement precision from two independent crews. Plots selected for blind checks are chosen to be a representative subsample of all plots measured and are randomly selected. Blind checks are planned to take place within 2 weeks of the date of the field measurement. The recommended intensity for blind checks is 3 percent of the plots installed.

Each variable collected by FIA is assigned a measurement quality objective (MQO) and a measurement tolerance level. The MQOs are documented in the FIA national field manuals for P2 and P3 collection (USDA Forest Service 2014). In some instances, the MQOs are a best guess of what experienced field crews should be able to consistently achieve. Tolerances are somewhat

arbitrary and are based on the ability of crews to make repeatable measurements or observations within the assigned MQO. Based on review and analysis, these tolerances improved over time.

Evaluation of field crew performance is accomplished by calculating the differences between data collected by the field crew and that collected by the QA crew on blind check plots. Results of these calculations are compared to the established MQOs. In the analysis of blind check data, an observation is within tolerance when the difference between the field crew observation and the QA crew observation does not exceed the assigned tolerance for that variable. For many categorical variables, the tolerance is no error allowed, so only observations that are identical with the standard are within the tolerance level.

### Sampling Error

A measure of reliability of inventory statistics is provided by sampling errors (SEs). 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. That is, there is a 68.27-percent probability that the confidence interval given for each sample estimate will cover the true population mean.

The size of the sampling error generally increases as the size of the area examined decreases. In addition, as area or volume totals are stratified by forest type, species, diameter class, ownership, or other subunits, the sampling error may increase and be greatest for the smallest divisions. However, there may be instances where a smaller component does not have a proportionately larger sampling error. This can happen when the postdefined strata are more homogeneous than the larger strata, thereby having a smaller variance.

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 | Confidence interval | Sampling error |
|-------------------------------------------|--------------------------|-----------------|---------------------|----------------|
|                                           |                          |                 |                     | percent        |
| <b>Timberland (1,000 acres)</b>           |                          | 18,089.8        | ± 121.2             | 0.67           |
| <b>All live (million cubic feet)</b>      | <b>Inventory</b>         | 42,251.5        | ± 553.5             | 1.31           |
|                                           | <b>Net annual growth</b> | 1,650.4         | ± 28.8              | 1.75           |
|                                           | <b>Annual removals</b>   | 961.3           | ± 48.4              | 5.03           |
|                                           | <b>Annual mortality</b>  | 363.2           | ± 12.8              | 3.52           |
| <b>Growing stock (million cubic feet)</b> | <b>Inventory</b>         | 38,317.7        | ± 529.9             | 1.38           |
|                                           | <b>Net annual growth</b> | 1,573.4         | ± 27.4              | 1.74           |
|                                           | <b>Annual removals</b>   | 915.4           | ± 46.8              | 5.11           |
|                                           | <b>Annual mortality</b>  | 295.5           | ± 11.3              | 3.82           |
| <b>Sawtimber (million board feet)</b>     | <b>Inventory</b>         | 144,339.1       | ± 2,603.9           | 1.80           |
|                                           | <b>Net annual growth</b> | 6,619.1         | ± 133.2             | 2.01           |
|                                           | <b>Annual removals</b>   | 3,399.1         | ± 206.7             | 6.08           |
|                                           | <b>Annual mortality</b>  | 953.5           | ± 52.4              | 5.49           |

For specific postdefined strata or subdivision of State totals, sampling error can be calculated 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 Evaluator 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:

$$SE_s = 1.31 \frac{\sqrt{42,251.5}}{\sqrt{2,186.4}} = 5.76$$

Thus, the sampling error is 5.76 percent, and the resulting 68.27 percent confidence interval for softwood live-tree inventory on public timberland is  $2,186.4 \pm 125.9$  million cubic feet.

## References

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## APPENDIX 3—SPECIES LIST

**Table A3.1**—Softwood species<sup>1</sup> list by common and scientific name, North Carolina, 2018

| Common name          | Scientific name <sup>2</sup>               |
|----------------------|--------------------------------------------|
| Fraser fir           | <i>Abies fraseri</i> (Pursh) Poir.         |
| Atlantic white-cedar | <i>Chamaecyparis thyoides</i> (L.) B.S.P.  |
| Southern redcedar    | <i>Juniperus silicicola</i> (Small) Bailey |
| Eastern redcedar     | <i>J. virginiana</i> L.                    |
| Red spruce           | <i>Picea rubens</i> Sarg.                  |
| Shortleaf pine       | <i>Pinus echinata</i> Mill.                |
| Longleaf pine        | <i>P. palustris</i> Mill.                  |
| Table Mountain pine  | <i>P. pungens</i> Lamb.                    |
| Pitch pine           | <i>P. rigida</i> Mill.                     |
| Pond pine            | <i>P. serotina</i> Michx.                  |
| Eastern white pine   | <i>P. strobus</i> L.                       |
| Loblolly pine        | <i>P. taeda</i> L.                         |
| Virginia pine        | <i>P. virginiana</i> Mill.                 |
| Baldcypress          | <i>Taxodium distichum</i> (L.) Rich.       |
| Eastern hemlock      | <i>Tsuga canadensis</i> (L.) Carr.         |

<sup>1</sup> Common and scientific names of tree species ≥1.0 inch diameter at breast height occurring in the FIA sample.

<sup>2</sup> Little (1979).

**Table A3.2**—Hardwood species<sup>1</sup> list by common and scientific name, North Carolina, 2018

| Common name         | Scientific name <sup>2</sup>               |
|---------------------|--------------------------------------------|
| Florida maple       | <i>Acer barbatum</i> Michx.                |
| Boxelder            | <i>A. negundo</i> L.                       |
| Red maple           | <i>A. rubrum</i> L.                        |
| Silver maple        | <i>A. saccharinum</i> L.                   |
| Sugar maple         | <i>A. saccharum</i> Marsh.                 |
| Buckeye             | <i>Aesculus</i> spp. L.                    |
| Yellow buckeye      | <i>A. octandra</i> Marsh.                  |
| Ailanthus           | <i>Ailanthus altissima</i> (Mill.) Swingle |
| Serviceberry        | <i>Amelanchier</i> spp. Medic.             |
| Yellow birch        | <i>Betula alleghaniensis</i> Britt.        |
| River birch         | <i>B. nigra</i> L.                         |
| American hornbeam   | <i>Carpinus caroliniana</i> Walt.          |
| Hickory             | <i>Carya</i> spp. Nutt.                    |
| Water hickory       | <i>C. aquatica</i> (Michx. f.) Nutt.       |
| Bitternut hickory   | <i>C. cordiformis</i> (Wangenh.) K. Koch   |
| Pignut hickory      | <i>C. glabra</i> (Mill.) Sweet             |
| Pecan               | <i>C. illinoensis</i> (Wangenh.) K. Koch   |
| Shellbark hickory   | <i>C. laciniosa</i> (Michx. f.) Loud.      |
| Shagbark hickory    | <i>C. ovata</i> (Mill.) K. Koch            |
| Mockernut hickory   | <i>C. tomentosa</i> (Poir.) Nutt.          |
| American chestnut   | <i>Castanea dentata</i> (Marsh.) Borkh.    |
| Allegheny chinkapin | <i>C. pumila</i> Mill.                     |
| Chinkapin           | <i>Castanopsis</i> (D. Don) Spach          |
| Catalpa             | <i>Catalpa</i> spp. Scop.                  |
| Sugarberry          | <i>Celtis laevigata</i> Willd.             |
| Hackberry           | <i>C. occidentalis</i> L.                  |
| Eastern redbud      | <i>Cercis canadensis</i> L.                |
| Flowering dogwood   | <i>Cornus florida</i> L.                   |
| Hawthorn            | <i>Crataegus</i> spp. L.                   |
| Common persimmon    | <i>Diospyros virginiana</i> L.             |
| American beech      | <i>Fagus grandifolia</i> Ehrh.             |
| White ash           | <i>Fraxinus americana</i> L.               |

**Table A3.2**—Hardwood species<sup>1</sup> list by common and scientific name, North Carolina, 2018 (continued)

| Common name         | Scientific name <sup>2</sup>                          |
|---------------------|-------------------------------------------------------|
| Carolina ash        | <i>F. caroliniana</i> Mill.                           |
| Green ash           | <i>F. pennsylvanica</i> Marsh.                        |
| Pumpkin ash         | <i>F. profunda</i> (Bush) Bush                        |
| Waterlocust         | <i>Gleditsia aquatica</i> Marsh.                      |
| Honeylocust         | <i>G. triacanthos</i> L.                              |
| Kentucky coffeetree | <i>Gymnocladus dioicus</i> (L.) K. Koch               |
| Carolina silverbell | <i>Halesia carolina</i> L.                            |
| American holly      | <i>Ilex opaca</i> Ait.                                |
| Black walnut        | <i>Juglans nigra</i> L.                               |
| Sweetgum            | <i>Liquidambar styraciflua</i> L.                     |
| Yellow-poplar       | <i>Liriodendron tulipifera</i> L.                     |
| Cucumbertree        | <i>Magnolia acuminata</i> L.                          |
| Fraser magnolia     | <i>M. fraseri</i> Walt.                               |
| Southern magnolia   | <i>M. grandiflora</i> L.                              |
| Bigleaf magnolia    | <i>M. macrophylla</i> Michx.                          |
| Sweetbay            | <i>M. virginiana</i> L.                               |
| Apple               | <i>Malus</i> spp. Mill.                               |
| Chinaberry          | <i>Melia azedarach</i> L.                             |
| White mulberry      | <i>Morus alba</i> L.                                  |
| Red mulberry        | <i>M. rubra</i> L.                                    |
| Water tupelo        | <i>Nyssa aquatica</i> L.                              |
| Blackgum            | <i>N. sylvatica</i> Marsh.                            |
| Swamp tupelo        | <i>N. sylvatica</i> var. <i>biflora</i> (Walt.) Sarg. |
| Eastern hophornbeam | <i>Ostrya virginiana</i> (Mill.) K. Koch              |
| Sourwood            | <i>Oxydendrum arboreum</i> (L.) DC.                   |
| Redbay              | <i>Persea borbonia</i> (L.) Spreng.                   |
| American sycamore   | <i>Platanus occidentalis</i> L.                       |
| Bigtooth aspen      | <i>Populus grandidentata</i> Michx.                   |
| Cottonwood          | <i>Populus</i> spp. L.                                |
| Pin cherry          | <i>Prunus pensylvanica</i> L.f.                       |
| Black cherry        | <i>Prunus serotina</i> Ehrh.                          |
| White oak           | <i>Quercus alba</i> L.                                |

**Table A3.2**—Hardwood species<sup>1</sup> list by common and scientific name, North Carolina, 2018 (continued)

| Common name        | Scientific name <sup>2</sup>                   |
|--------------------|------------------------------------------------|
| Scarlet oak        | <i>Q. coccinea</i> Muenchh.                    |
| Southern red oak   | <i>Q. falcata</i> Michx.                       |
| Cherrybark oak     | <i>Q. falcata</i> var. <i>pagodifolia</i> Ell. |
| Bluejack oak       | <i>Q. incana</i> Bartr.                        |
| Turkey oak         | <i>Q. laevis</i> Walt.                         |
| Laurel oak         | <i>Q. laurifolia</i> Michx.                    |
| Overcup oak        | <i>Q. lyrata</i> Walt.                         |
| Swamp chestnut oak | <i>Q. michauxii</i> Nutt.                      |
| Chinkapin oak      | <i>Q. muehlenbergii</i> Engelm.                |
| Water oak          | <i>Q. nigra</i> L.                             |
| Pin oak            | <i>Q. palustris</i> Muenchh.                   |
| Willow oak         | <i>Q. phellos</i> L.                           |
| Chestnut oak       | <i>Q. prinus</i> L.                            |
| Northern red oak   | <i>Q. rubra</i> L.                             |
| Shumard oak        | <i>Q. shumardii</i> Buckl.                     |
| Post oak           | <i>Q. stellata</i> Wangenh.                    |
| Black oak          | <i>Q. velutina</i> Lam.                        |
| Live oak           | <i>Q. virginiana</i> Mill.                     |
| Black locust       | <i>Robinia pseudoacacia</i> L.                 |
| Willow             | <i>Salix</i> spp. L.                           |
| Sassafras          | <i>Sassafras albidum</i> (Nutt.) Nees          |
| American basswood  | <i>Tilia americana</i> L.                      |
| White basswood     | <i>T. heterophylla</i> Vent.                   |
| Winged elm         | <i>Ulmus alata</i> Michx.                      |
| American elm       | <i>U. americana</i> L.                         |
| Slippery elm       | <i>U. rubra</i> Muhl.                          |
| Rock elm           | <i>U. thomasi</i> Sarg.                        |

<sup>1</sup> Common and scientific names of tree species  $\geq 1.0$  inch diameter at breast height occurring in the FIA sample.

<sup>2</sup> Little (1979).

## Literature Cited

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## APPENDIX 4—SUPPLEMENTAL TABLES

**Table A4.1**—Area by survey unit and land status, North Carolina, 2018

| Unit                   | Land status |            |          |            |              |          |            |              | Nonforest land | Census water |
|------------------------|-------------|------------|----------|------------|--------------|----------|------------|--------------|----------------|--------------|
|                        | Unreserved  |            |          |            |              | Reserved |            |              |                |              |
|                        | Total area  | All forest | Total    | Timberland | Unproductive | Total    | Productive | Unproductive |                |              |
| thousand acres         |             |            |          |            |              |          |            |              |                |              |
| Southern Coastal Plain | 8,751.2     | 5,138.3    | 5,132.1  | 5,116.1    | 16.0         | 6.2      | 6.2        | 0.0          | 3,212.4        | 400.6        |
| Northern Coastal Plain | 9,355.2     | 3,887.9    | 3,633.8  | 3,611.8    | 22.1         | 254.1    | 227.1      | 27.0         | 2,798.4        | 2,668.8      |
| Piedmont               | 10,671.9    | 5,444.4    | 5,426.1  | 5,426.1    | 0.0          | 18.3     | 18.3       | 0.0          | 5,034.5        | 193.1        |
| Mountains              | 5,665.7     | 4,288.0    | 3,935.9  | 3,935.9    | 0.0          | 352.0    | 352.0      | 0.0          | 1,333.4        | 44.4         |
| All units              | 34,444.1    | 18,758.5   | 18,128.0 | 18,089.8   | 38.1         | 630.5    | 603.5      | 27.0         | 12,378.7       | 3,306.9      |

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.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.2**—Area of forest land by ownership class and land status, North Carolina, 2018

| Ownership class            |                                                   |          | Land status     |          |      |            |            |              |          |            |              |
|----------------------------|---------------------------------------------------|----------|-----------------|----------|------|------------|------------|--------------|----------|------------|--------------|
|                            |                                                   |          | All forest land |          |      | Unreserved |            |              | Reserved |            |              |
|                            |                                                   |          |                 |          |      | Total      | Timberland | Unproductive | Total    | Productive | Unproductive |
| thousand acres             |                                                   |          |                 |          |      |            |            |              |          |            |              |
| USDA Forest Service        | National forest                                   | 1,221.9  | 1,144.7         | 1,138.7  | 6.1  | 77.2       | 71.1       | 6.1          |          |            |              |
|                            | Total                                             | 1,221.9  | 1,144.7         | 1,138.7  | 6.1  | 77.2       | 71.1       | 6.1          |          |            |              |
| Other Federal              | National Park Service                             | 289.3    | 0.0             | 0.0      | 0.0  | 289.3      | 286.4      | 2.9          |          |            |              |
|                            | U.S. Fish and Wildlife Service                    | 257.4    | 0.0             | 0.0      | 0.0  | 257.4      | 239.4      | 18.1         |          |            |              |
|                            | Dept. of Defense/Dept. of Energy                  | 307.2    | 307.2           | 301.3    | 5.9  | 0.0        | 0.0        | 0.0          |          |            |              |
|                            | Other Federal                                     | 6.1      | 6.1             | 6.1      | 0.0  | 0.0        | 0.0        | 0.0          |          |            |              |
|                            | Total                                             | 860.1    | 313.3           | 307.4    | 5.9  | 546.8      | 525.8      | 21.0         |          |            |              |
| State and local government | State                                             | 842.4    | 835.8           | 819.8    | 16.0 | 6.6        | 6.6        | 0.0          |          |            |              |
|                            | Local                                             | 269.2    | 269.2           | 269.2    | 0.0  | 0.0        | 0.0        | 0.0          |          |            |              |
|                            | Total                                             | 1,111.6  | 1,105.0         | 1,089.0  | 16.0 | 6.6        | 6.6        | 0.0          |          |            |              |
| Forest industry            | Corporate                                         | 763.1    | 763.1           | 763.1    | 0.0  | 0.0        | 0.0        | 0.0          |          |            |              |
|                            | Individual                                        | 30.9     | 30.9            | 30.9     | 0.0  | 0.0        | 0.0        | 0.0          |          |            |              |
|                            | Total                                             | 794.0    | 794.0           | 794.0    | 0.0  | 0.0        | 0.0        | 0.0          |          |            |              |
| Nonindustrial private      | Corporate                                         | 3,922.5  | 3,922.5         | 3,916.7  | 5.9  | 0.0        | 0.0        | 0.0          |          |            |              |
|                            | Conservation/natural resources organization       | 136.7    | 136.7           | 136.7    | 0.0  | 0.0        | 0.0        | 0.0          |          |            |              |
|                            | Unincorporated local partnership/association/club | 169.8    | 169.8           | 169.8    | 0.0  | 0.0        | 0.0        | 0.0          |          |            |              |
|                            | Native American                                   | 24.7     | 24.7            | 24.7     | 0.0  | 0.0        | 0.0        | 0.0          |          |            |              |
|                            | Individual                                        | 10,517.2 | 10,517.2        | 10,512.9 | 4.3  | 0.0        | 0.0        | 0.0          |          |            |              |
|                            | Total                                             | 14,770.9 | 14,770.9        | 14,760.7 | 10.1 | 0.0        | 0.0        | 0.0          |          |            |              |
| All classes                |                                                   | 18,758.5 | 18,128.0        | 18,089.8 | 38.1 | 630.5      | 603.5      | 27.0         |          |            |              |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.3**—Area of timberland by forest-type group and site productivity class, North Carolina, 2018

| 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     | 113.0          | 0.0                                            | 4.6     | 10.3    | 32.2    | 65.8    | 0.0     | 0.0  |
|                   | Spruce-fir              | 12.3           | 0.0                                            | 12.3    | 0.0     | 0.0     | 0.0     | 0.0     | 0.0  |
|                   | Longleaf-slash pine     | 432.6          | 0.0                                            | 190.7   | 205.2   | 36.7    | 0.0     | 0.0     | 0.0  |
|                   | Loblolly-shortleaf pine | 5,771.5        | 0.0                                            | 500.1   | 2,289.6 | 1,899.6 | 940.3   | 138.1   | 3.7  |
|                   | Other eastern softwoods | 21.1           | 0.0                                            | 6.2     | 15.0    | 0.0     | 0.0     | 0.0     | 0.0  |
|                   | Total softwoods         | 6,350.5        | 0.0                                            | 713.8   | 2,520.1 | 1,968.6 | 1,006.1 | 138.1   | 3.7  |
| Hardwood types    | Oak-pine                | 2,255.2        | 0.0                                            | 288.8   | 1,150.2 | 541.2   | 224.3   | 49.1    | 1.6  |
|                   | Oak-hickory             | 6,916.6        | 0.0                                            | 1,448.6 | 3,424.1 | 1,455.4 | 527.0   | 41.8    | 19.8 |
|                   | Oak-gum-cypress         | 1,671.6        | 0.0                                            | 365.8   | 1,014.6 | 210.3   | 57.6    | 23.3    | 0.0  |
|                   | Elm-ash-cottonwood      | 542.7          | 0.0                                            | 55.9    | 284.2   | 145.2   | 51.3    | 6.1     | 0.0  |
|                   | Maple-beech-birch       | 55.7           | 0.0                                            | 26.3    | 21.7    | 0.0     | 1.5     | 0.0     | 6.2  |
|                   | Other hardwoods         | 132.0          | 0.0                                            | 42.6    | 62.4    | 20.8    | 6.2     | 0.0     | 0.0  |
|                   | Exotic hardwoods        | 17.5           | 0.0                                            | 3.1     | 12.8    | 1.6     | 0.0     | 0.0     | 0.0  |
| Total hardwoods   |                         | 11,591.3       | 0.0                                            | 2,231.1 | 5,970.0 | 2,374.6 | 867.9   | 120.3   | 27.5 |
| Nonstocked        |                         | 148.0          | 0.0                                            | 23.2    | 88.3    | 33.7    | 2.9     | 0.0     | 0.0  |
| All groups        |                         | 18,089.8       | 0.0                                            | 2,968.1 | 8,578.4 | 4,376.8 | 1,876.8 | 258.4   | 31.3 |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.4**—Area of timberland by forest-type group and ownership group, North Carolina, 2018

| Forest-type group |                         | Ownership group |                     |               |                            |                 |                       |
|-------------------|-------------------------|-----------------|---------------------|---------------|----------------------------|-----------------|-----------------------|
|                   |                         | All ownerships  | USDA Forest Service | Other Federal | State and local government | Forest industry | Nonindustrial private |
|                   |                         | thousand acres  |                     |               |                            |                 |                       |
| Softwood types    | White-red-jack pine     | 113.0           | 10.5                | 0.0           | 7.7                        | 0.0             | 94.8                  |
|                   | Spruce-fir              | 12.3            | 6.1                 | 0.0           | 6.2                        | 0.0             | 0.0                   |
|                   | Longleaf-slash pine     | 432.6           | 12.9                | 95.3          | 58.9                       | 12.3            | 253.2                 |
|                   | Loblolly-shortleaf pine | 5,771.5         | 95.4                | 100.5         | 348.9                      | 595.8           | 4,630.9               |
|                   | Other eastern softwoods | 21.1            | 0.0                 | 0.0           | 0.0                        | 0.0             | 21.1                  |
|                   | Total softwoods         | 6,350.5         | 124.8               | 195.8         | 421.7                      | 608.1           | 5,000.0               |
| Hardwood types    | Oak-pine                | 2,255.2         | 116.9               | 27.7          | 121.4                      | 47.5            | 1,941.7               |
|                   | Oak-hickory             | 6,916.6         | 811.2               | 35.1          | 306.1                      | 54.9            | 5,709.3               |
|                   | Oak-gum-cypress         | 1,671.6         | 33.4                | 31.1          | 175.2                      | 64.4            | 1,367.6               |
|                   | Elm-ash-cottonwood      | 542.7           | 0.0                 | 17.8          | 51.9                       | 6.3             | 466.7                 |
|                   | Maple-beech-birch       | 55.7            | 22.0                | 0.0           | 0.0                        | 0.0             | 33.7                  |
|                   | Other hardwoods         | 132.0           | 30.4                | 0.0           | 6.2                        | 0.0             | 95.5                  |
|                   | Exotic hardwoods        | 17.5            | 0.0                 | 0.0           | 0.0                        | 3.1             | 14.4                  |
|                   | Total hardwoods         | 11,591.3        | 1,013.8             | 111.6         | 660.8                      | 176.2           | 9,628.9               |
| Nonstocked        |                         | 148.0           | 0.0                 | 0.0           | 6.5                        | 9.7             | 131.8                 |
| All groups        |                         | 18,089.8        | 1,138.7             | 307.4         | 1,089.0                    | 794.0           | 14,760.7              |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.5**—Area of timberland by forest-type group and stand age class, North Carolina, 2018

| Forest-type group |                                | All<br>classes | Stand age (years) |         |         |         |         |         |         |         |         |        |       | Non-<br>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<br>types | White-red-<br>jack pine        | 113.0          | 0.0               | 3.1     | 17.2    | 21.6    | 22.9    | 25.6    | 2.7     | 13.2    | 0.0     | 0.0    | 6.7   | 0.0             |  |
|                   | Spruce-fir                     | 12.3           | 0.0               | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 6.1     | 6.2     | 0.0     | 0.0    | 0.0   | 0.0             |  |
|                   | Longleaf-<br>slash pine        | 432.6          | 61.6              | 64.7    | 38.4    | 54.7    | 54.9    | 26.5    | 20.5    | 54.3    | 31.8    | 19.2   | 6.2   | 0.0             |  |
|                   | Loblolly-<br>shortleaf<br>pine | 5,771.5        | 916.8             | 1,293.5 | 1,307.1 | 946.6   | 420.1   | 411.7   | 220.5   | 120.8   | 66.9    | 32.8   | 5.6   | 28.9            |  |
|                   | Other eastern<br>softwoods     | 21.1           | 0.0               | 7.9     | 6.2     | 4.6     | 0.0     | 0.0     | 0.0     | 2.5     | 0.0     | 0.0    | 0.0   | 0.0             |  |
|                   | Total<br>softwoods             | 6,350.5        | 978.4             | 1,369.2 | 1,368.8 | 1,027.5 | 497.9   | 463.8   | 249.8   | 197.0   | 98.7    | 52.0   | 18.6  | 28.9            |  |
| Hardwood<br>types | Oak-pine                       | 2,255.2        | 409.0             | 273.8   | 257.8   | 238.9   | 222.0   | 220.9   | 294.1   | 178.0   | 98.4    | 30.2   | 16.1  | 15.9            |  |
|                   | Oak-hickory                    | 6,916.6        | 698.3             | 483.3   | 419.3   | 427.2   | 511.9   | 829.3   | 915.0   | 1,023.1 | 934.1   | 420.8  | 208.3 | 46.0            |  |
|                   | Oak-gum-<br>cypress            | 1,671.6        | 178.1             | 132.9   | 134.4   | 143.4   | 198.7   | 203.8   | 221.0   | 187.3   | 166.9   | 55.7   | 44.9  | 4.4             |  |
|                   | Elm-ash-<br>cottonwood         | 542.7          | 59.8              | 78.4    | 49.8    | 37.5    | 38.4    | 55.9    | 55.1    | 75.0    | 43.9    | 23.8   | 17.1  | 7.9             |  |
|                   | Maple-beech-<br>birch          | 55.7           | 0.0               | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 9.8     | 16.6    | 23.2    | 0.0    | 6.1   | 0.0             |  |
|                   | Other<br>hardwoods             | 132.0          | 10.4              | 6.2     | 3.2     | 13.8    | 15.5    | 8.1     | 17.9    | 34.9    | 16.4    | 0.0    | 5.6   | 0.0             |  |
|                   | Exotic<br>hardwoods            | 17.5           | 5.7               | 4.2     | 1.6     | 1.6     | 1.2     | 0.0     | 0.0     | 0.0     | 0.0     | 3.1    | 0.0   | 0.0             |  |
|                   | Total<br>hardwoods             | 11,591.3       | 1,361.5           | 978.8   | 866.2   | 862.5   | 987.6   | 1,318.0 | 1,512.9 | 1,514.9 | 1,283.0 | 533.6  | 298.2 | 74.2            |  |
| Nonstocked        |                                | 148.0          | 0.0               | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0    | 0.0   | 148.0           |  |
| All groups        |                                | 18,089.8       | 2,339.9           | 2,348.0 | 2,235.0 | 1,890.0 | 1,485.5 | 1,781.8 | 1,762.6 | 1,711.9 | 1,381.7 | 585.6  | 316.7 | 251.2           |  |

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

0.0 = no sample for the cell or a value of &gt; 0.0 but &lt; 0.05.

**Table A4.6**—Area of timberland by forest-type group and stand origin, North Carolina, 2018

| Forest-type group |                         | Total    | Stand origin   |                         |
|-------------------|-------------------------|----------|----------------|-------------------------|
|                   |                         |          | Natural stands | Artificial regeneration |
| thousand acres    |                         |          |                |                         |
| Softwood types    | White-red-jack pine     | 113.0    | 82.6           | 30.4                    |
|                   | Spruce-fir              | 12.3     | 12.3           | 0.0                     |
|                   | Longleaf-slash pine     | 432.6    | 256.5          | 176.1                   |
|                   | Loblolly-shortleaf pine | 5,771.5  | 3,304.7        | 2,466.7                 |
|                   | Other eastern softwoods | 21.1     | 21.1           | 0.0                     |
|                   | Total softwoods         | 6,350.5  | 3,677.3        | 2,673.2                 |
| Hardwood types    | Oak-pine                | 2,255.2  | 2,030.7        | 224.5                   |
|                   | Oak-hickory             | 6,916.6  | 6,800.8        | 115.8                   |
|                   | Oak-gum-cypress         | 1,671.6  | 1,638.8        | 32.8                    |
|                   | Elm-ash-cottonwood      | 542.7    | 537.3          | 5.4                     |
|                   | Maple-beech-birch       | 55.7     | 55.7           | 0.0                     |
|                   | Other hardwoods         | 132.0    | 132.0          | 0.0                     |
|                   | Exotic hardwoods        | 17.5     | 17.5           | 0.0                     |
| Total hardwoods   |                         | 11,591.3 | 11,212.8       | 378.5                   |
| Nonstocked        |                         | 148.0    | 145.9          | 2.2                     |
| All groups        |                         | 18,089.8 | 15,036.0       | 3,053.9                 |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.7**—Area of timberland disturbed annually by forest-type group and disturbance class, North Carolina, 2018

| Forest-type group <sup>2</sup> |                         | Disturbance class <sup>1</sup> |         |         |       |                  |              |       |               |
|--------------------------------|-------------------------|--------------------------------|---------|---------|-------|------------------|--------------|-------|---------------|
|                                |                         | Insects                        | Disease | Weather | Fire  | Domestic animals | Wild animals | Human | Other natural |
| <i>thousand acres</i>          |                         |                                |         |         |       |                  |              |       |               |
| Softwood types                 | White-red-jack pine     | 0.9                            | 0.0     | 0.1     | 0.9   | 0.0              | 0.0          | 0.0   | 0.0           |
|                                | Spruce-fir              | 0.0                            | 0.0     | 0.0     | 0.0   | 0.0              | 0.0          | 1.2   | 0.0           |
|                                | Longleaf-slash pine     | 0.0                            | 0.0     | 0.0     | 19.2  | 0.0              | 0.0          | 2.2   | 0.0           |
|                                | Loblolly-shortleaf pine | 4.5                            | 2.3     | 10.9    | 42.3  | 1.3              | 1.2          | 5.2   | 2.1           |
|                                | Other eastern softwoods | 0.0                            | 0.3     | 0.2     | 0.0   | 0.6              | 0.0          | 0.0   | 0.0           |
|                                | <b>Total softwoods</b>  | 5.4                            | 2.6     | 11.2    | 62.4  | 1.9              | 1.2          | 8.5   | 2.1           |
| Hardwood types                 | Oak-pine                | 8.3                            | 1.0     | 3.3     | 9.3   | 2.8              | 0.1          | 3.5   | 0.7           |
|                                | Oak-hickory             | 41.7                           | 3.8     | 15.4    | 31.1  | 11.2             | 1.5          | 2.3   | 5.3           |
|                                | Oak-gum-cypress         | 0.7                            | 0.0     | 17.5    | 5.6   | 0.0              | 9.7          | 0.0   | 0.0           |
|                                | Elm-ash-cottonwood      | 0.0                            | 0.0     | 4.4     | 0.8   | 0.2              | 7.7          | 0.0   | 1.1           |
|                                | Maple-beech-birch       | 1.4                            | 1.3     | 0.8     | 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   | 0.0           |
|                                | Other hardwoods         | 1.7                            | 0.9     | 0.0     | 0.0   | 0.0              | 0.0          | 0.0   | 0.8           |
|                                | Exotic hardwoods        | 0.0                            | 0.0     | 0.0     | 0.0   | 0.0              | 0.0          | 0.0   | 0.0           |
|                                | <b>Total hardwoods</b>  | 53.9                           | 6.9     | 41.4    | 46.8  | 14.1             | 19.1         | 5.7   | 7.9           |
| Nonstocked                     |                         | 0.0                            | 0.0     | 0.0     | 0.7   | 0.0              | 0.0          | 0.0   | 0.8           |
| All groups                     |                         | 59.3                           | 9.6     | 52.6    | 109.9 | 16.0             | 20.3         | 14.3  | 10.8          |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.<sup>2</sup> Based on past conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.8**—Area of timberland treated annually by forest-type group and treatment class (cutting), North Carolina, 2018

| Forest-type group <sup>2</sup> |                         | Treatment class <sup>1</sup> |               |                 |                                      |                        |                             |                    |
|--------------------------------|-------------------------|------------------------------|---------------|-----------------|--------------------------------------|------------------------|-----------------------------|--------------------|
|                                |                         | Cutting                      |               |                 |                                      |                        |                             |                    |
|                                |                         | Total treated                | Final harvest | Partial harvest | Seed-tree/<br>shelterwood<br>harvest | Commercial<br>thinning | Timber stand<br>improvement | Salvage<br>cutting |
|                                |                         | thousand acres               |               |                 |                                      |                        |                             |                    |
| Softwood<br>types              | White-red-jack pine     | 2.7                          | 1.4           | 1.3             | 0.0                                  | 0.0                    | 0.0                         | 0.0                |
|                                | Spruce-fir              | 0.0                          | 0.0           | 0.0             | 0.0                                  | 0.0                    | 0.0                         | 0.0                |
|                                | Longleaf-slash pine     | 10.3                         | 2.3           | 1.3             | 0.0                                  | 5.4                    | 1.4                         | 0.0                |
|                                | Loblolly-shortleaf pine | 251.8                        | 111.9         | 7.2             | 5.1                                  | 124.1                  | 2.2                         | 1.2                |
|                                | Other eastern softwoods | 0.0                          | 0.0           | 0.0             | 0.0                                  | 0.0                    | 0.0                         | 0.0                |
|                                | Total softwoods         | 264.8                        | 115.6         | 9.8             | 5.1                                  | 129.5                  | 3.6                         | 1.2                |
| Hardwood<br>types              | Oak-pine                | 37.7                         | 24.5          | 4.2             | 1.5                                  | 6.5                    | 1.0                         | 0.0                |
|                                | Oak-hickory             | 74.0                         | 47.7          | 17.2            | 3.0                                  | 3.2                    | 2.9                         | 0.0                |
|                                | Oak-gum-cypress         | 18.8                         | 17.2          | 0.3             | 0.9                                  | 0.5                    | 0.0                         | 0.0                |
|                                | Elm-ash-cottonwood      | 2.1                          | 1.5           | 0.5             | 0.0                                  | 0.0                    | 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                |                         | 132.6                        | 90.9          | 22.2            | 5.4                                  | 10.2                   | 3.9                         | 0.0                |
| Nonstocked                     |                         | 2.3                          | 2.3           | 0.0             | 0.0                                  | 0.0                    | 0.0                         | 0.0                |
| All groups                     |                         | 399.7                        | 208.8         | 32.1            | 10.4                                 | 139.7                  | 7.5                         | 1.2                |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.<sup>2</sup> Based on past conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.9**—Area of timberland treated annually by forest-type group and treatment class (regeneration), North Carolina, 2018

| Forest-type group <sup>1</sup> |                         | Treatment class <sup>1</sup> |                         |                      |                     |
|--------------------------------|-------------------------|------------------------------|-------------------------|----------------------|---------------------|
|                                |                         | Site preparation             | Artificial regeneration | Natural regeneration | Other silvicultural |
| <i>thousand acres</i>          |                         |                              |                         |                      |                     |
| Softwood types                 | White-red-jack pine     | 0.0                          | 0.0                     | 0.0                  | 0.0                 |
|                                | Spruce-fir              | 0.0                          | 0.0                     | 0.0                  | 0.0                 |
|                                | Longleaf-slash pine     | 6.5                          | 9.4                     | 0.6                  | 4.7                 |
|                                | Loblolly-shortleaf pine | 51.1                         | 66.4                    | 26.9                 | 29.9                |
|                                | Other eastern softwoods | 0.0                          | 0.0                     | 0.0                  | 0.0                 |
|                                | <b>Total softwoods</b>  | 57.6                         | 75.9                    | 27.5                 | 34.6                |
| Hardwood types                 | Oak-pine                | 11.3                         | 16.3                    | 26.1                 | 3.9                 |
|                                | Oak-hickory             | 6.8                          | 16.4                    | 55.3                 | 1.8                 |
|                                | Oak-gum-cypress         | 2.6                          | 3.0                     | 11.1                 | 0.0                 |
|                                | Elm-ash-cottonwood      | 0.8                          | 0.0                     | 3.6                  | 0.5                 |
|                                | Maple-beech-birch       | 0.0                          | 0.0                     | 0.0                  | 0.0                 |
|                                | Other hardwoods         | 0.0                          | 0.0                     | 0.6                  | 0.0                 |
|                                | Exotic hardwoods        | 0.0                          | 0.0                     | 0.0                  | 0.0                 |
|                                | <b>Total hardwoods</b>  | 21.4                         | 35.7                    | 96.6                 | 6.2                 |
| <b>Nonstocked</b>              |                         | 2.5                          | 0.0                     | 3.0                  | 0.3                 |
| <b>All groups</b>              |                         | 81.6                         | 111.6                   | 127.1                | 41.2                |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.10**—Area of timberland by forest-type group and stand-size class, North Carolina, 2018

| Forest-type group |                         | All classes | Stand-size class |                 |                |            |
|-------------------|-------------------------|-------------|------------------|-----------------|----------------|------------|
|                   |                         |             | Large diameter   | Medium diameter | Small diameter | Nonstocked |
| thousand acres    |                         |             |                  |                 |                |            |
| Softwood types    | White-red-jack pine     | 113.0       | 106.0            | 7.0             | 0.0            | 0.0        |
|                   | Spruce-fir              | 12.3        | 12.3             | 0.0             | 0.0            | 0.0        |
|                   | Longleaf-slash pine     | 432.6       | 239.0            | 85.5            | 108.1          | 0.0        |
|                   | Loblolly-shortleaf pine | 5,771.5     | 3,171.0          | 1,581.8         | 1,018.7        | 0.0        |
|                   | Other eastern softwoods | 21.1        | 7.0              | 0.0             | 14.1           | 0.0        |
|                   | Total softwoods         | 6,350.5     | 3,535.3          | 1,674.3         | 1,140.9        | 0.0        |
| Hardwood types    | Oak-pine                | 2,255.2     | 1,136.6          | 474.7           | 643.8          | 0.0        |
|                   | Oak-hickory             | 6,916.6     | 4,653.8          | 1,137.2         | 1,125.6        | 0.0        |
|                   | Oak-gum-cypress         | 1,671.6     | 899.8            | 365.0           | 406.8          | 0.0        |
|                   | Elm-ash-cottonwood      | 542.7       | 313.0            | 100.4           | 129.2          | 0.0        |
|                   | Maple-beech-birch       | 55.7        | 49.5             | 6.2             | 0.0            | 0.0        |
|                   | Other hardwoods         | 132.0       | 88.3             | 14.8            | 28.9           | 0.0        |
|                   | Exotic hardwoods        | 17.5        | 3.1              | 10.2            | 4.3            | 0.0        |
|                   | Total hardwoods         | 11,591.3    | 7,144.2          | 2,108.5         | 2,338.6        | 0.0        |
| Nonstocked        |                         | 148.0       | 0.0              | 0.0             | 0.0            | 148.0      |
| All groups        |                         | 18,089.8    | 10,679.5         | 3,782.8         | 3,479.5        | 148.0      |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

**Table A4.11**—Number of live trees on timberland by species group and diameter class, North Carolina, 2018

| Species group | All classes                     | Diameter class (inches) |         |         |         |          |           |           |           |           |           |           |           |           |     |     |     | 33.0–36.9 | 37.0+ |
|---------------|---------------------------------|-------------------------|---------|---------|---------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----|-----|-----|-----------|-------|
|               |                                 | 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 |     |     |     |           |       |
|               |                                 | million trees           |         |         |         |          |           |           |           |           |           |           |           |           |     |     |     |           |       |
| Softwood      | Longleaf and slash pines        | 109.4                   | 38.7    | 23.9    | 14.1    | 10.2     | 6.7       | 6.5       | 4.3       | 2.8       | 1.1       | 0.6       | 0.3       | 0.0       | 0.0 | 0.0 | 0.0 |           |       |
|               | Loblolly and shortleaf pines    | 2,418.8                 | 930.9   | 539.6   | 332.2   | 251.4    | 160.5     | 95.7      | 54.4      | 28.0      | 14.5      | 6.0       | 4.4       | 1.0       | 0.1 | 0.1 | 0.0 |           |       |
|               | Other yellow pines              | 404.7                   | 194.6   | 79.3    | 45.7    | 31.0     | 23.3      | 15.2      | 9.3       | 3.7       | 1.8       | 0.5       | 0.3       | 0.0       | 0.0 | 0.0 | 0.0 |           |       |
|               | Eastern white and red pines     | 157.1                   | 82.1    | 24.9    | 13.3    | 9.3      | 8.5       | 5.7       | 3.8       | 2.8       | 2.5       | 1.5       | 1.8       | 0.5       | 0.4 | 0.0 | 0.0 |           |       |
|               | Spruce and balsam fir           | 5.7                     | 1.4     | 0.5     | 1.3     | 0.9      | 0.6       | 0.4       | 0.3       | 0.2       | 0.1       | 0.0       | 0.0       | 0.0       | 0.0 | 0.0 | 0.0 |           |       |
|               | Eastern hemlock                 | 52.5                    | 28.1    | 10.8    | 5.6     | 3.1      | 1.4       | 1.3       | 0.9       | 0.5       | 0.2       | 0.1       | 0.3       | 0.1       | 0.0 | 0.0 | 0.0 |           |       |
|               | Cypress                         | 43.4                    | 20.3    | 5.8     | 4.7     | 3.4      | 2.2       | 1.3       | 1.4       | 1.5       | 0.9       | 0.7       | 0.9       | 0.2       | 0.0 | 0.0 | 0.0 |           |       |
|               | Other eastern softwoods         | 209.9                   | 143.8   | 41.6    | 12.0    | 6.1      | 3.2       | 1.6       | 0.9       | 0.3       | 0.2       | 0.1       | 0.0       | 0.0       | 0.0 | 0.0 | 0.0 |           |       |
|               | Total softwoods                 | 3,401.5                 | 1,440.0 | 726.4   | 428.9   | 315.6    | 206.3     | 127.7     | 75.2      | 39.8      | 21.4      | 9.5       | 8.1       | 1.9       | 0.5 | 0.1 | 0.0 |           |       |
| Hardwood      | Select white oaks               | 304.1                   | 157.3   | 50.4    | 25.9    | 17.6     | 13.9      | 10.1      | 8.4       | 6.7       | 4.7       | 3.9       | 3.3       | 1.4       | 0.3 | 0.1 | 0.1 |           |       |
|               | Select red oaks                 | 115.7                   | 57.5    | 14.5    | 9.3     | 7.8      | 5.8       | 3.8       | 4.4       | 3.2       | 2.9       | 1.9       | 2.2       | 1.5       | 0.4 | 0.2 | 0.1 |           |       |
|               | Other white oaks                | 211.8                   | 84.3    | 33.8    | 20.9    | 16.8     | 14.5      | 12.0      | 8.6       | 6.9       | 5.5       | 3.0       | 3.9       | 1.1       | 0.4 | 0.3 | 0.0 |           |       |
|               | Other red oaks                  | 699.7                   | 437.8   | 109.0   | 48.4    | 31.8     | 22.0      | 16.5      | 10.9      | 9.1       | 5.6       | 2.9       | 3.6       | 1.3       | 0.5 | 0.2 | 0.2 |           |       |
|               | Hickory                         | 286.0                   | 175.0   | 44.1    | 19.9    | 14.3     | 10.2      | 8.3       | 5.3       | 4.3       | 2.6       | 1.0       | 0.7       | 0.2       | 0.0 | 0.0 | 0.0 |           |       |
|               | Yellow birch                    | 21.0                    | 8.2     | 5.3     | 2.5     | 2.1      | 1.3       | 0.6       | 0.7       | 0.1       | 0.0       | 0.0       | 0.1       | 0.0       | 0.0 | 0.0 | 0.0 |           |       |
|               | Hard maple                      | 71.3                    | 46.4    | 12.3    | 4.7     | 2.5      | 1.9       | 1.2       | 0.7       | 0.6       | 0.4       | 0.1       | 0.3       | 0.0       | 0.1 | 0.0 | 0.0 |           |       |
|               | Soft maple                      | 2,093.0                 | 1,507.1 | 298.6   | 120.4   | 69.5     | 38.2      | 23.3      | 14.2      | 9.6       | 5.4       | 2.8       | 2.4       | 1.2       | 0.1 | 0.1 | 0.0 |           |       |
|               | Beech                           | 169.9                   | 118.4   | 28.2    | 9.3     | 3.6      | 3.3       | 2.2       | 1.2       | 1.2       | 0.8       | 0.5       | 0.4       | 0.3       | 0.1 | 0.0 | 0.0 |           |       |
|               | Sweetgum                        | 1,686.7                 | 1,178.0 | 293.2   | 96.4    | 48.9     | 26.5      | 17.4      | 10.3      | 6.8       | 4.2       | 2.3       | 2.2       | 0.4       | 0.0 | 0.1 | 0.0 |           |       |
|               | Tupelo and blackgum             | 516.9                   | 317.4   | 87.0    | 37.0    | 25.6     | 15.7      | 12.4      | 8.3       | 6.4       | 3.0       | 2.0       | 1.4       | 0.4       | 0.3 | 0.0 | 0.0 |           |       |
|               | Ash                             | 253.0                   | 145.1   | 59.7    | 19.6    | 10.1     | 5.6       | 4.5       | 2.8       | 2.1       | 1.2       | 0.6       | 1.3       | 0.2       | 0.0 | 0.0 | 0.0 |           |       |
|               | Cottonwood and aspen            | 9.5                     | 5.9     | 1.8     | 0.7     | 0.4      | 0.1       | 0.1       | 0.1       | 0.1       | 0.1       | 0.0       | 0.0       | 0.0       | 0.0 | 0.0 | 0.0 |           |       |
|               | Basswood                        | 15.9                    | 7.4     | 2.8     | 1.1     | 1.4      | 0.6       | 0.5       | 0.6       | 0.6       | 0.4       | 0.1       | 0.2       | 0.0       | 0.0 | 0.0 | 0.0 |           |       |
|               | Yellow-poplar                   | 927.8                   | 557.8   | 137.9   | 64.3    | 44.5     | 32.3      | 24.5      | 18.2      | 15.5      | 11.5      | 7.9       | 8.5       | 3.2       | 1.1 | 0.3 | 0.2 |           |       |
|               | Black walnut                    | 19.7                    | 6.9     | 4.1     | 2.3     | 1.8      | 1.4       | 1.1       | 0.8       | 0.6       | 0.3       | 0.1       | 0.2       | 0.0       | 0.0 | 0.0 | 0.0 |           |       |
|               | Other eastern soft hardwoods    | 1,067.9                 | 716.3   | 206.2   | 69.3    | 33.7     | 17.1      | 9.5       | 6.2       | 3.6       | 2.3       | 1.5       | 1.8       | 0.2       | 0.2 | 0.1 | 0.0 |           |       |
|               | Other eastern hard hardwoods    | 883.2                   | 686.3   | 117.2   | 38.5    | 17.8     | 10.2      | 5.7       | 3.5       | 2.0       | 0.9       | 0.6       | 0.4       | 0.1       | 0.0 | 0.0 | 0.0 |           |       |
|               | Eastern noncommercial hardwoods | 1,272.2                 | 918.5   | 222.7   | 75.5    | 35.1     | 12.4      | 4.9       | 2.2       | 0.5       | 0.1       | 0.3       | 0.1       | 0.1       | 0.0 | 0.0 | 0.0 |           |       |
|               | Total hardwoods                 | 10,625.1                | 7,131.7 | 1,728.8 | 666.0   | 385.3    | 233.2     | 158.5     | 107.2     | 80.0      | 51.8      | 31.7      | 33.1      | 11.8      | 3.6 | 1.4 | 0.8 |           |       |
| All species   |                                 | 14,026.6                | 8,571.7 | 2,455.3 | 1,094.9 | 700.9    | 439.6     | 286.2     | 182.5     | 119.8     | 73.2      | 41.2      | 41.2      | 13.6      | 4.1 | 1.6 | 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 A4.12**—Number of growing-stock trees on timberland by species group and diameter class, North Carolina, 2018

| Species group                |                              | Diameter class (inches) |         |         |          |           |           |           |           |           |           |           |           |           |       |
|------------------------------|------------------------------|-------------------------|---------|---------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------|
|                              |                              | 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                     | Longleaf and slash pines     | 45.8                    | 13.8    | 9.8     | 6.7      | 6.4       | 4.3       | 2.8       | 1.1       | 0.6       | 0.3       | 0.0       | 0.0       | 0.0       | 0.0   |
|                              | Loblolly and shortleaf pines | 932.7                   | 327.0   | 247.3   | 157.2    | 94.0      | 53.8      | 27.5      | 14.3      | 5.9       | 4.4       | 1.0       | 0.1       | 0.1       | 0.0   |
|                              | Other yellow pines           | 121.6                   | 42.4    | 29.0    | 21.2     | 14.3      | 8.7       | 3.5       | 1.7       | 0.5       | 0.3       | 0.0       | 0.0       | 0.0       | 0.0   |
|                              | Eastern white and red pines  | 48.3                    | 12.4    | 9.0     | 8.3      | 5.6       | 3.7       | 2.7       | 2.5       | 1.5       | 1.7       | 0.5       | 0.4       | 0.0       | 0.0   |
|                              | Spruce and balsam fir        | 3.6                     | 1.1     | 0.9     | 0.6      | 0.4       | 0.3       | 0.2       | 0.1       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0   |
|                              | Eastern hemlock              | 12.7                    | 5.3     | 3.0     | 1.3      | 1.1       | 0.8       | 0.4       | 0.2       | 0.1       | 0.3       | 0.1       | 0.0       | 0.0       | 0.0   |
|                              | Cypress                      | 14.8                    | 3.4     | 2.6     | 2.1      | 1.1       | 1.4       | 1.4       | 0.9       | 0.7       | 0.9       | 0.1       | 0.0       | 0.0       | 0.0   |
|                              | Other eastern softwoods      | 18.6                    | 9.1     | 5.0     | 2.4      | 1.0       | 0.7       | 0.2       | 0.1       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0   |
|                              | Total softwoods              | 1,198.0                 | 414.4   | 306.7   | 199.8    | 124.0     | 73.7      | 38.8      | 21.0      | 9.3       | 7.9       | 1.8       | 0.5       | 0.1       | 0.0   |
| Hardwood                     | Select white oaks            | 88.2                    | 23.1    | 16.3    | 12.7     | 9.5       | 8.0       | 6.2       | 4.4       | 3.7       | 2.9       | 1.1       | 0.2       | 0.1       | 0.1   |
|                              | Select red oaks              | 39.5                    | 7.9     | 6.9     | 5.4      | 3.4       | 4.2       | 3.1       | 2.6       | 1.9       | 2.1       | 1.5       | 0.3       | 0.2       | 0.1   |
|                              | Other white oaks             | 74.2                    | 16.0    | 13.0    | 11.9     | 9.8       | 7.1       | 5.7       | 4.5       | 2.3       | 2.9       | 0.6       | 0.2       | 0.1       | 0.0   |
|                              | Other red oaks               | 130.7                   | 40.6    | 26.6    | 18.9     | 14.4      | 9.8       | 8.0       | 4.9       | 2.6       | 3.2       | 1.2       | 0.4       | 0.1       | 0.1   |
|                              | Hickory                      | 59.9                    | 17.3    | 13.2    | 9.3      | 7.2       | 4.8       | 3.9       | 2.3       | 1.0       | 0.7       | 0.1       | 0.0       | 0.0       | 0.0   |
|                              | Yellow birch                 | 5.2                     | 1.8     | 1.3     | 0.9      | 0.5       | 0.6       | 0.1       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0   |
|                              | Hard maple                   | 10.1                    | 3.8     | 2.1     | 1.7      | 0.9       | 0.5       | 0.4       | 0.3       | 0.1       | 0.3       | 0.0       | 0.0       | 0.0       | 0.0   |
|                              | Soft maple                   | 207.6                   | 87.6    | 49.9    | 28.1     | 16.8      | 10.2      | 7.1       | 3.8       | 1.7       | 1.5       | 0.7       | 0.1       | 0.1       | 0.0   |
|                              | Beech                        | 15.9                    | 6.2     | 2.5     | 2.3      | 1.5       | 0.7       | 0.9       | 0.7       | 0.3       | 0.4       | 0.3       | 0.1       | 0.0       | 0.0   |
|                              | Sweetgum                     | 200.7                   | 88.8    | 45.5    | 25.2     | 16.3      | 9.6       | 6.5       | 3.9       | 2.3       | 2.1       | 0.4       | 0.0       | 0.1       | 0.0   |
|                              | Tupelo and blackgum          | 99.2                    | 31.0    | 22.5    | 14.3     | 10.9      | 8.0       | 5.8       | 3.0       | 1.8       | 1.3       | 0.4       | 0.2       | 0.0       | 0.0   |
|                              | Ash                          | 38.9                    | 15.5    | 8.1     | 4.5      | 3.5       | 2.6       | 1.7       | 1.0       | 0.5       | 1.2       | 0.2       | 0.0       | 0.0       | 0.0   |
|                              | Cottonwood and aspen         | 1.8                     | 0.7     | 0.4     | 0.1      | 0.1       | 0.1       | 0.1       | 0.1       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0   |
|                              | Basswood                     | 5.2                     | 1.0     | 1.3     | 0.6      | 0.4       | 0.5       | 0.5       | 0.5       | 0.4       | 0.1       | 0.2       | 0.0       | 0.0       | 0.0   |
|                              | Yellow-poplar                | 221.5                   | 61.3    | 42.3    | 31.1     | 23.0      | 17.5      | 15.0      | 11.1      | 7.6       | 8.4       | 3.0       | 1.1       | 0.2       | 0.2   |
|                              | Black walnut                 | 6.4                     | 1.7     | 1.3     | 1.1      | 0.8       | 0.6       | 0.4       | 0.3       | 0.1       | 0.1       | 0.0       | 0.0       | 0.0       | 0.0   |
|                              | Other eastern soft hardwoods | 102.1                   | 47.7    | 23.1    | 12.1     | 6.8       | 4.8       | 2.6       | 1.8       | 1.2       | 1.4       | 0.2       | 0.2       | 0.1       | 0.0   |
| Other eastern hard hardwoods | 56.3                         | 24.5                    | 13.6    | 8.4     | 4.3      | 2.8       | 1.4       | 0.7       | 0.4       | 0.3       | 0.0       | 0.0       | 0.0       | 0.0       |       |
| Total hardwoods              | 1,363.5                      | 476.4                   | 289.9   | 188.9   | 130.0    | 92.3      | 69.3      | 45.9      | 27.8      | 29.1      | 9.6       | 2.9       | 1.0       | 0.4       |       |
| All species                  | 2,561.5                      | 890.9                   | 596.6   | 388.7   | 254.0    | 166.0     | 108.1     | 66.8      | 37.1      | 37.1      | 11.4      | 3.4       | 1.1       | 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.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.13**—Net<sup>1</sup> volume of live trees on timberland by forest-type group and stand-size class, North Carolina, 2018

| Forest-type group |                         | All classes        | Stand-size class |                 |                |            |
|-------------------|-------------------------|--------------------|------------------|-----------------|----------------|------------|
|                   |                         |                    | Large diameter   | Medium diameter | Small diameter | Nonstocked |
|                   |                         | million cubic feet |                  |                 |                |            |
| Softwood types    | White-red-jack pine     | 463.3              | 454.9            | 8.4             | 0.0            | 0.0        |
|                   | Spruce-fir              | 35.6               | 35.6             | 0.0             | 0.0            | 0.0        |
|                   | Longleaf-slash pine     | 685.6              | 581.2            | 91.7            | 12.7           | 0.0        |
|                   | Loblolly-shortleaf pine | 12,362.1           | 9,772.2          | 2,422.4         | 167.4          | 0.0        |
|                   | Other eastern softwoods | 17.9               | 9.3              | 0.0             | 8.6            | 0.0        |
|                   | Total softwoods         | 13,564.4           | 10,853.2         | 2,522.6         | 188.7          | 0.0        |
| Hardwood types    | Oak-pine                | 4,565.3            | 3,694.9          | 726.4           | 144.0          | 0.0        |
|                   | Oak-hickory             | 18,444.0           | 16,322.0         | 1,834.7         | 287.3          | 0.0        |
|                   | Oak-gum-cypress         | 3,960.1            | 3,281.5          | 586.9           | 91.7           | 0.0        |
|                   | Elm-ash-cottonwood      | 1,241.8            | 1,112.4          | 109.3           | 20.1           | 0.0        |
|                   | Maple-beech-birch       | 156.6              | 145.7            | 10.9            | 0.0            | 0.0        |
|                   | Other hardwoods         | 288.7              | 260.5            | 23.4            | 4.8            | 0.0        |
|                   | Exotic hardwoods        | 25.8               | 16.9             | 6.7             | 2.2            | 0.0        |
|                   | Total hardwoods         | 28,682.4           | 24,833.9         | 3,298.4         | 550.0          | 0.0        |
| Nonstocked        |                         | 4.7                | 0.0              | 0.0             | 0.0            | 4.7        |
| All groups        |                         | 42,251.5           | 35,687.1         | 5,821.0         | 738.7          | 4.7        |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Excludes rotten, missing, and form cull defects volume.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.14**—Net<sup>1</sup> volume of live trees on timberland by species group and ownership group, North Carolina, 2018

| Species group      |                                 | Ownership group |                     |               |                            |                 |                       |
|--------------------|---------------------------------|-----------------|---------------------|---------------|----------------------------|-----------------|-----------------------|
|                    |                                 | All ownerships  | USDA Forest Service | Other Federal | State and local government | Forest industry | Nonindustrial private |
| million cubic feet |                                 |                 |                     |               |                            |                 |                       |
| Softwood           | Longleaf and slash pines        | 683.9           | 30.7                | 176.8         | 102.5                      | 28.2            | 345.6                 |
|                    | Loblolly and shortleaf pines    | 11,319.9        | 223.9               | 242.0         | 708.0                      | 658.8           | 9,487.1               |
|                    | Other yellow pines              | 1,573.2         | 165.2               | 30.6          | 152.3                      | 3.2             | 1,221.8               |
|                    | Eastern white and red pines     | 1,103.6         | 158.6               | 0.0           | 47.5                       | 11.0            | 886.4                 |
|                    | Spruce and balsam fir           | 34.1            | 18.6                | 0.0           | 12.4                       | 0.0             | 3.1                   |
|                    | Eastern hemlock                 | 163.3           | 40.9                | 0.0           | 11.1                       | 1.7             | 109.5                 |
|                    | Cypress                         | 393.2           | 9.3                 | 0.0           | 33.4                       | 5.7             | 344.8                 |
|                    | Other eastern softwoods         | 165.0           | 1.3                 | 1.4           | 19.7                       | 0.5             | 142.1                 |
|                    | Total softwoods                 | 15,436.1        | 648.6               | 450.8         | 1,087.0                    | 709.2           | 12,540.5              |
| Hardwood           | Select white oaks               | 2,246.0         | 203.0               | 8.3           | 91.0                       | 14.0            | 1,929.7               |
|                    | Select red oaks                 | 1,287.2         | 307.6               | 9.1           | 78.1                       | 8.0             | 884.4                 |
|                    | Other white oaks                | 1,969.3         | 499.6               | 6.1           | 116.6                      | 11.7            | 1,335.3               |
|                    | Other red oaks                  | 2,591.7         | 250.4               | 29.1          | 133.7                      | 14.0            | 2,164.5               |
|                    | Hickory                         | 1,095.7         | 115.3               | 14.3          | 47.7                       | 13.2            | 905.3                 |
|                    | Yellow birch                    | 83.0            | 41.9                | 0.0           | 1.0                        | 3.1             | 37.0                  |
|                    | Hard maple                      | 198.4           | 54.1                | 2.4           | 6.8                        | 0.6             | 134.6                 |
|                    | Soft maple                      | 3,034.4         | 345.8               | 23.3          | 223.9                      | 43.4            | 2,398.0               |
|                    | Beech                           | 419.0           | 40.2                | 2.6           | 11.5                       | 6.0             | 358.9                 |
|                    | Sweetgum                        | 2,623.0         | 20.4                | 57.7          | 183.6                      | 43.7            | 2,317.5               |
|                    | Tupelo and blackgum             | 1,587.7         | 69.4                | 24.2          | 132.6                      | 65.9            | 1,295.4               |
|                    | Ash                             | 740.8           | 26.9                | 13.4          | 61.1                       | 11.2            | 628.2                 |
|                    | Cottonwood and aspen            | 43.8            | 1.8                 | 0.0           | 8.5                        | 0.0             | 33.5                  |
|                    | Basswood                        | 145.7           | 53.2                | 0.0           | 0.1                        | 4.8             | 87.5                  |
|                    | Yellow-poplar                   | 5,782.2         | 481.8               | 29.6          | 225.0                      | 57.4            | 4,988.5               |
|                    | Black walnut                    | 127.0           | 0.0                 | 0.0           | 3.5                        | 2.5             | 121.0                 |
|                    | Other eastern soft hardwoods    | 1,450.0         | 143.5               | 23.8          | 94.0                       | 14.1            | 1,174.6               |
|                    | Other eastern hard hardwoods    | 741.3           | 145.0               | 3.3           | 26.6                       | 6.4             | 559.9                 |
|                    | Eastern noncommercial hardwoods | 649.2           | 99.7                | 8.9           | 30.6                       | 12.4            | 497.6                 |
|                    | Total hardwoods                 | 26,815.4        | 2,899.7             | 256.2         | 1,475.8                    | 332.3           | 21,851.4              |
| All species        |                                 | 42,251.5        | 3,548.3             | 707.0         | 2,562.8                    | 1,041.5         | 34,391.9              |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Excludes rotten, missing, and form cull defects volume.

**Table A4.15**—Net<sup>1</sup> volume of live trees on timberland by species group and diameter class, North Carolina, 2018

| Species group   | Diameter class (inches)         |          |         |          |           |           |           |           |           |           |           |           |           |       |       |
|-----------------|---------------------------------|----------|---------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------|-------|
|                 | 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 cubic feet              |          |         |          |           |           |           |           |           |           |           |           |           |       |       |
| Softwood        | Longleaf and slash pines        | 683.9    | 35.3    | 66.0     | 82.0      | 130.5     | 129.0     | 114.6     | 58.2      | 40.8      | 27.4      | 0.0       | 0.0       | 0.0   | 0.0   |
|                 | Loblolly and shortleaf pines    | 11,319.9 | 834.4   | 1,606.3  | 1,976.1   | 1,962.1   | 1,700.7   | 1,248.3   | 855.1     | 460.3     | 469.3     | 163.6     | 11.4      | 20.8  | 11.4  |
|                 | Other yellow pines              | 1,573.2  | 139.0   | 221.8    | 302.7     | 316.1     | 283.0     | 151.5     | 95.7      | 33.2      | 26.9      | 3.2       | 0.0       | 0.0   | 0.0   |
|                 | Eastern white and red pines     | 1,103.6  | 40.3    | 64.5     | 96.6      | 104.9     | 106.9     | 112.8     | 143.1     | 109.0     | 171.7     | 72.8      | 80.8      | 0.0   | 0.0   |
|                 | Spruce and balsam fir           | 34.1     | 3.0     | 5.1      | 5.0       | 6.3       | 5.3       | 6.7       | 2.6       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0   | 0.0   |
|                 | Eastern hemlock                 | 163.3    | 11.6    | 15.4     | 12.4      | 20.8      | 19.1      | 15.8      | 11.5      | 10.0      | 27.7      | 19.0      | 0.0       | 0.0   | 0.0   |
|                 | Cypress                         | 393.2    | 14.8    | 22.4     | 28.7      | 25.2      | 40.8      | 54.2      | 45.1      | 52.6      | 82.1      | 18.8      | 0.0       | 8.5   | 0.0   |
|                 | Other eastern softwoods         | 165.0    | 30.7    | 34.1     | 30.6      | 26.6      | 21.5      | 7.8       | 6.8       | 3.4       | 0.0       | 0.0       | 3.5       | 0.0   | 0.0   |
| Total softwoods |                                 | 15,436.1 | 1,109.1 | 2,035.8  | 2,534.3   | 2,592.7   | 2,306.2   | 1,711.7   | 1,218.1   | 709.3     | 805.0     | 277.4     | 95.7      | 29.3  | 11.4  |
| Hardwood        | Select white oaks               | 2,246.0  | 76.2    | 119.0    | 170.1     | 198.8     | 249.3     | 284.6     | 262.6     | 278.0     | 310.8     | 186.3     | 53.9      | 18.2  | 38.1  |
|                 | Select red oaks                 | 1,287.2  | 30.5    | 54.6     | 73.3      | 71.7      | 127.2     | 126.3     | 143.4     | 125.1     | 197.4     | 196.8     | 59.7      | 49.8  | 31.3  |
|                 | Other white oaks                | 1,969.3  | 55.9    | 103.8    | 163.8     | 217.7     | 223.9     | 242.3     | 263.7     | 172.4     | 294.3     | 114.6     | 56.8      | 47.5  | 12.7  |
|                 | Other red oaks                  | 2,591.7  | 133.5   | 196.1    | 246.6     | 292.6     | 285.6     | 337.3     | 262.0     | 186.1     | 307.9     | 162.1     | 73.5      | 49.0  | 59.4  |
|                 | Hickory                         | 1,095.7  | 53.3    | 91.8     | 127.0     | 161.8     | 159.2     | 179.0     | 147.7     | 72.3      | 68.4      | 27.5      | 7.8       | 0.0   | 0.0   |
|                 | Yellow birch                    | 83.0     | 9.6     | 13.9     | 14.2      | 11.6      | 19.0      | 3.7       | 1.7       | 2.1       | 5.3       | 1.9       | 0.0       | 0.0   | 0.0   |
|                 | Hard maple                      | 198.4    | 15.4    | 17.2     | 24.1      | 23.1      | 17.4      | 22.2      | 19.6      | 9.3       | 31.4      | 4.5       | 9.5       | 0.0   | 4.7   |
|                 | Soft maple                      | 3,034.4  | 365.7   | 439.6    | 427.0     | 404.3     | 354.1     | 319.5     | 241.4     | 154.1     | 170.2     | 121.5     | 16.3      | 20.7  | 0.0   |
|                 | Beech                           | 419.0    | 25.1    | 23.0     | 40.5      | 38.5      | 29.7      | 44.8      | 43.0      | 30.9      | 38.4      | 38.0      | 16.6      | 4.7   | 45.8  |
|                 | Sweetgum                        | 2,623.0  | 245.6   | 323.7    | 341.0     | 361.4     | 318.6     | 303.4     | 243.0     | 176.0     | 212.4     | 67.4      | 0.9       | 29.5  | 0.0   |
|                 | Tupelo and blackgum             | 1,587.7  | 104.7   | 162.7    | 186.0     | 234.4     | 223.1     | 234.8     | 146.7     | 114.1     | 109.5     | 38.5      | 33.2      | 0.0   | 0.0   |
|                 | Ash                             | 740.8    | 59.0    | 67.6     | 69.5      | 86.7      | 86.6      | 85.6      | 70.0      | 45.9      | 127.0     | 26.6      | 6.7       | 0.0   | 9.6   |
|                 | Cottonwood and aspen            | 43.8     | 2.6     | 2.4      | 1.8       | 2.4       | 2.6       | 6.9       | 5.2       | 3.3       | 2.9       | 6.2       | 7.6       | 0.0   | 0.0   |
|                 | Basswood                        | 145.7    | 4.4     | 11.5     | 8.6       | 11.1      | 20.4      | 26.9      | 23.3      | 10.8      | 23.3      | 5.4       | 0.0       | 0.0   | 0.0   |
|                 | Yellow-poplar                   | 5,782.2  | 206.7   | 325.2    | 434.6     | 531.6     | 577.3     | 698.6     | 675.0     | 606.7     | 892.8     | 464.5     | 221.4     | 76.0  | 71.7  |
|                 | Black walnut                    | 127.0    | 6.7     | 10.2     | 15.0      | 19.7      | 19.8      | 19.6      | 14.8      | 7.2       | 13.9      | 0.0       | 0.0       | 0.0   | 0.0   |
|                 | Other eastern soft hardwoods    | 1,450.0  | 190.5   | 199.8    | 187.4     | 168.0     | 156.4     | 128.5     | 112.4     | 88.2      | 145.8     | 24.6      | 30.4      | 18.1  | 0.0   |
|                 | Other eastern hard hardwoods    | 741.3    | 112.9   | 118.2    | 123.3     | 107.3     | 93.4      | 70.7      | 43.8      | 35.0      | 27.2      | 3.9       | 5.7       | 0.0   | 0.0   |
|                 | Eastern noncommercial hardwoods | 649.2    | 180.6   | 183.3    | 116.5     | 72.8      | 44.6      | 13.6      | 3.7       | 16.8      | 6.0       | 11.3      | 0.0       | 0.0   | 0.0   |
| Total hardwoods |                                 | 26,815.4 | 1,879.0 | 2,463.7  | 2,770.5   | 3,015.7   | 3,008.3   | 3,148.1   | 2,722.8   | 2,134.2   | 2,984.9   | 1,501.7   | 599.7     | 313.6 | 273.3 |
| All species     |                                 | 42,251.5 | 2,988.1 | 4,499.5  | 5,304.7   | 5,608.4   | 5,314.4   | 4,859.7   | 3,940.9   | 2,843.5   | 3,790.0   | 1,779.1   | 695.5     | 342.9 | 284.8 |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Excludes rotten, missing, and form cull defects volume.

**Table A4.16**—Net<sup>1</sup> volume of live trees on timberland by forest-type group and stand origin, North Carolina, 2018

| Forest-type group  |                         | Total    | Stand origin   |                         |
|--------------------|-------------------------|----------|----------------|-------------------------|
|                    |                         |          | Natural stands | Artificial regeneration |
| million cubic feet |                         |          |                |                         |
| Softwood types     | White-red-jack pine     | 463.3    | 341.1          | 122.2                   |
|                    | Spruce-fir              | 35.6     | 35.6           | 0.0                     |
|                    | Longleaf-slash pine     | 685.6    | 531.1          | 154.5                   |
|                    | Loblolly-shortleaf pine | 12,362.1 | 7,736.6        | 4,625.5                 |
|                    | Other eastern softwoods | 17.9     | 17.9           | 0.0                     |
|                    | Total softwoods         | 13,564.4 | 8,662.2        | 4,902.2                 |
| Hardwood types     | Oak-pine                | 4,565.3  | 4,466.0        | 99.4                    |
|                    | Oak-hickory             | 18,444.0 | 18,419.1       | 24.9                    |
|                    | Oak-gum-cypress         | 3,960.1  | 3,944.6        | 15.5                    |
|                    | Elm-ash-cottonwood      | 1,241.8  | 1,238.7        | 3.1                     |
|                    | Maple-beech-birch       | 156.6    | 156.6          | 0.0                     |
|                    | Other hardwoods         | 288.7    | 288.7          | 0.0                     |
|                    | Exotic hardwoods        | 25.8     | 25.8           | 0.0                     |
| Total hardwoods    | 28,682.4                | 28,539.5 | 142.9          |                         |
| Nonstocked         |                         | 4.7      | 4.7            | 0.0                     |
| All groups         |                         | 42,251.5 | 37,206.4       | 5,045.1                 |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Excludes rotten, missing, and form cull defects volume.

## NORTH CAROLINA'S FORESTS, 2018

Table A4.17—Net<sup>1</sup> volume of growing-stock trees on timberland by species group and diameter class, North Carolina, 2018

| Species group | Diameter class (inches)      |          |         |          |           |           |           |           |           |           |           |           |           |       | <i>million cubic feet</i> |
|---------------|------------------------------|----------|---------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------|---------------------------|
|               | 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+ |                           |
|               |                              |          |         |          |           |           |           |           |           |           |           |           |           |       |                           |
| Softwood      | Longleaf and slash pines     | 676.0    | 34.6    | 64.2     | 81.8      | 128.9     | 128.0     | 114.6     | 58.2      | 38.3      | 27.4      | 0.0       | 0.0       | 0.0   | 0.0                       |
|               | Loblolly and shortleaf pines | 11,181.2 | 823.7   | 1,582.2  | 1,942.4   | 1,937.2   | 1,686.1   | 1,228.9   | 850.2     | 453.8     | 469.3     | 163.6     | 11.4      | 20.8  | 11.4                      |
|               | Other yellow pines           | 1,483.4  | 130.7   | 210.2    | 279.7     | 300.7     | 268.0     | 141.8     | 91.4      | 33.2      | 24.5      | 3.2       | 0.0       | 0.0   | 0.0                       |
|               | Eastern white and red pines  | 1,081.9  | 38.3    | 62.5     | 95.6      | 103.9     | 105.7     | 110.9     | 139.4     | 109.0     | 166.0     | 69.6      | 80.8      | 0.0   | 0.0                       |
|               | Spruce and balsam fir        | 33.1     | 2.7     | 5.0      | 5.0       | 5.9       | 5.3       | 6.7       | 2.6       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0   | 0.0                       |
|               | Eastern hemlock              | 153.3    | 11.1    | 14.9     | 11.6      | 18.6      | 18.6      | 14.8      | 9.8       | 10.0      | 24.7      | 19.0      | 0.0       | 0.0   | 0.0                       |
|               | Cypress                      | 377.2    | 11.2    | 18.1     | 27.9      | 22.7      | 39.8      | 53.8      | 45.1      | 50.6      | 82.1      | 17.4      | 0.0       | 8.5   | 0.0                       |
|               | Other eastern softwoods      | 126.2    | 24.2    | 29.1     | 24.5      | 17.7      | 17.2      | 5.9       | 6.0       | 1.6       | 0.0       | 0.0       | 0.0       | 0.0   | 0.0                       |
|               | Total softwoods              | 15,112.3 | 1,076.5 | 1,986.3  | 2,468.6   | 2,535.7   | 2,268.7   | 1,677.5   | 1,202.7   | 696.5     | 794.0     | 272.9     | 92.2      | 29.3  | 11.4                      |
| Hardwood      | Select white oaks            | 2,061.9  | 69.1    | 111.7    | 157.7     | 189.9     | 240.4     | 265.9     | 249.1     | 268.8     | 281.0     | 150.9     | 34.8      | 18.2  | 24.2                      |
|               | Select red oaks              | 1,220.7  | 26.8    | 49.6     | 69.3      | 65.0      | 121.5     | 121.8     | 134.6     | 124.4     | 190.8     | 192.1     | 56.8      | 45.1  | 22.9                      |
|               | Other white oaks             | 1,593.0  | 44.4    | 82.9     | 137.8     | 185.2     | 192.0     | 205.3     | 225.9     | 144.1     | 238.3     | 76.2      | 34.9      | 26.1  | 0.0                       |
|               | Other red oaks               | 2,296.4  | 115.2   | 169.7    | 219.0     | 262.5     | 264.0     | 305.3     | 233.7     | 169.5     | 284.6     | 148.2     | 68.4      | 34.9  | 21.3                      |
|               | Hickory                      | 1,006.2  | 47.7    | 85.6     | 116.9     | 144.7     | 145.6     | 165.8     | 135.9     | 72.3      | 62.5      | 21.3      | 7.8       | 0.0   | 0.0                       |
|               | Yellow birch                 | 58.5     | 7.3     | 9.2      | 10.8      | 9.8       | 15.9      | 2.4       | 0.0       | 0.0       | 3.1       | 0.0       | 0.0       | 0.0   | 0.0                       |
|               | Hard maple                   | 148.2    | 12.8    | 14.0     | 22.2      | 18.2      | 13.7      | 16.0      | 15.1      | 7.5       | 24.1      | 4.5       | 0.0       | 0.0   | 0.0                       |
|               | Soft maple                   | 2,264.0  | 277.9   | 328.9    | 328.6     | 307.6     | 264.1     | 250.6     | 182.4     | 94.8      | 122.8     | 78.3      | 11.6      | 16.5  | 0.0                       |
|               | Beech                        | 327.2    | 18.1    | 17.3     | 29.8      | 28.3      | 18.4      | 32.8      | 38.4      | 19.9      | 35.2      | 32.2      | 11.1      | 0.0   | 45.8                      |
|               | Sweetgum                     | 2,502.4  | 230.5   | 306.6    | 328.0     | 342.7     | 304.7     | 292.4     | 233.4     | 171.7     | 204.6     | 57.3      | 0.9       | 29.5  | 0.0                       |
|               | Tupelo and blackgum          | 1,484.6  | 90.1    | 145.9    | 173.2     | 211.9     | 215.8     | 217.8     | 144.7     | 109.4     | 105.6     | 38.5      | 31.6      | 0.0   | 0.0                       |
|               | Ash                          | 644.3    | 48.5    | 56.9     | 59.1      | 71.7      | 82.0      | 73.7      | 61.8      | 39.7      | 121.0     | 23.1      | 6.7       | 0.0   | 0.0                       |
|               | Cottonwood and aspen         | 43.7     | 2.6     | 2.4      | 1.8       | 2.4       | 2.6       | 6.9       | 5.2       | 3.3       | 2.9       | 6.2       | 7.6       | 0.0   | 0.0                       |
|               | Basswood                     | 136.0    | 3.8     | 10.8     | 8.6       | 10.5      | 18.3      | 24.2      | 22.1      | 10.8      | 21.6      | 5.4       | 0.0       | 0.0   | 0.0                       |
|               | Yellow-poplar                | 5,584.9  | 199.6   | 313.3    | 422.0     | 505.7     | 561.8     | 682.4     | 655.0     | 595.9     | 880.3     | 437.0     | 209.4     | 57.6  | 65.0                      |
|               | Black walnut                 | 98.4     | 5.1     | 7.7      | 11.8      | 13.6      | 15.9      | 12.9      | 13.6      | 7.2       | 10.5      | 0.0       | 0.0       | 0.0   | 0.0                       |
|               | Other eastern soft hardwoods | 1,150.1  | 138.7   | 146.2    | 138.7     | 126.1     | 127.5     | 98.3      | 95.2      | 79.0      | 131.2     | 24.6      | 26.3      | 18.1  | 0.0                       |
|               | Other eastern hard hardwoods | 585.1    | 84.3    | 97.5     | 106.0     | 86.2      | 78.7      | 53.3      | 34.8      | 24.5      | 20.0      | 0.0       | 0.0       | 0.0   | 0.0                       |
|               | Total hardwoods              | 23,205.4 | 1,422.4 | 1,956.1  | 2,341.5   | 2,582.1   | 2,682.8   | 2,827.8   | 2,481.0   | 1,942.7   | 2,740.0   | 1,295.9   | 507.8     | 246.0 | 179.3                     |
| All species   |                              | 38,317.7 | 2,499.0 | 3,942.4  | 4,810.1   | 5,117.7   | 4,951.5   | 4,505.4   | 3,683.7   | 2,639.2   | 3,534.1   | 1,568.7   | 600.0     | 275.3 | 190.7                     |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Excludes rotten, missing, and form cull defects volume.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.18**—Net<sup>1</sup> volume of growing-stock trees on timberland by species group and ownership group, North Carolina, 2018

| Species group |                              | Ownership group    |                     |               |                            |                 |                       |
|---------------|------------------------------|--------------------|---------------------|---------------|----------------------------|-----------------|-----------------------|
|               |                              | All ownerships     | USDA Forest Service | Other Federal | State and local government | Forest industry | Nonindustrial private |
|               |                              | million cubic feet |                     |               |                            |                 |                       |
| Softwood      | Longleaf and slash pines     | 676.0              | 30.7                | 176.8         | 102.1                      | 28.2            | 338.2                 |
|               | Loblolly and shortleaf pines | 11,181.2           | 222.2               | 238.6         | 701.3                      | 655.1           | 9,364.0               |
|               | Other yellow pines           | 1,483.4            | 163.9               | 29.2          | 140.9                      | 3.1             | 1,146.4               |
|               | Eastern white and red pines  | 1,081.9            | 155.0               | 0.0           | 46.4                       | 11.0            | 869.4                 |
|               | Spruce and balsam fir        | 33.1               | 18.0                | 0.0           | 12.1                       | 0.0             | 3.1                   |
|               | Eastern hemlock              | 153.3              | 40.4                | 0.0           | 10.6                       | 1.7             | 100.6                 |
|               | Cypress                      | 377.2              | 9.3                 | 0.0           | 32.0                       | 5.6             | 330.2                 |
|               | Other eastern softwoods      | 126.2              | 0.4                 | 1.4           | 17.0                       | 0.4             | 107.0                 |
|               | Total softwoods              | 15,112.3           | 639.9               | 446.0         | 1,062.5                    | 705.1           | 12,258.8              |
| Hardwood      | Select white oaks            | 2,061.9            | 168.0               | 8.3           | 82.5                       | 8.6             | 1,794.5               |
|               | Select red oaks              | 1,220.7            | 280.8               | 9.1           | 77.9                       | 7.9             | 845.0                 |
|               | Other white oaks             | 1,593.0            | 378.8               | 6.1           | 90.7                       | 11.1            | 1,106.4               |
|               | Other red oaks               | 2,296.4            | 223.5               | 25.3          | 118.2                      | 11.3            | 1,918.1               |
|               | Hickory                      | 1,006.2            | 108.1               | 13.6          | 40.1                       | 10.7            | 833.8                 |
|               | Yellow birch                 | 58.5               | 31.0                | 0.0           | 0.2                        | 1.0             | 26.2                  |
|               | Hard maple                   | 148.2              | 35.3                | 2.4           | 5.6                        | 0.1             | 104.8                 |
|               | Soft maple                   | 2,264.0            | 284.8               | 18.0          | 160.0                      | 37.0            | 1,764.1               |
|               | Beech                        | 327.2              | 29.0                | 1.0           | 11.0                       | 2.5             | 283.6                 |
|               | Sweetgum                     | 2,502.4            | 20.2                | 54.5          | 172.6                      | 42.1            | 2,213.1               |
|               | Tupelo and blackgum          | 1,484.6            | 58.8                | 22.6          | 123.2                      | 64.3            | 1,215.8               |
|               | Ash                          | 644.3              | 24.5                | 13.1          | 58.1                       | 8.8             | 539.8                 |
|               | Cottonwood and aspen         | 43.7               | 1.8                 | 0.0           | 8.5                        | 0.0             | 33.4                  |
|               | Basswood                     | 136.0              | 49.9                | 0.0           | 0.1                        | 4.8             | 81.2                  |
|               | Yellow-poplar                | 5,584.9            | 474.9               | 28.6          | 210.6                      | 56.5            | 4,814.3               |
|               | Black walnut                 | 98.4               | 0.0                 | 0.0           | 3.1                        | 2.1             | 93.3                  |
|               | Other eastern soft hardwoods | 1,150.1            | 118.5               | 20.8          | 75.3                       | 12.4            | 923.1                 |
|               | Other eastern hard hardwoods | 585.1              | 127.5               | 1.9           | 22.0                       | 4.7             | 428.9                 |
|               | Total hardwoods              | 23,205.4           | 2,415.2             | 225.4         | 1,259.7                    | 285.9           | 19,019.3              |
| All species   |                              | 38,317.7           | 3,055.0             | 671.4         | 2,322.2                    | 991.0           | 31,278.1              |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Excludes rotten, missing, and form cull defects volume.

Table A4.19—Net<sup>1</sup> volume of sawtimber trees on timberland by species group and diameter class, North Carolina, 2018

| Species group                | Diameter class (inches)      |          |           |           |           |           |           |           |           |           |           |                    |         |       | 37.0+ |
|------------------------------|------------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------------------|---------|-------|-------|
|                              | All classes                  | 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 | million board feet |         |       |       |
| Softwood                     | Longleaf and slash pines     | 3,060.5  | 325.0     | 612.4     | 681.3     | 664.0     | 353.7     | 242.4     | 181.7     | 0.0       | 0.0       | 0.0                | 0.0     | 0.0   |       |
|                              | Loblolly and shortleaf pines | 44,064.8 | 7,033.9   | 8,747.5   | 8,706.3   | 6,954.2   | 5,131.7   | 2,879.1   | 3,132.0   | 1,153.3   | 82.6      | 156.7              | 87.7    | 87.7  |       |
|                              | Other yellow pines           | 5,301.6  | 1,024.9   | 1,310.0   | 1,305.3   | 753.1     | 526.6     | 201.5     | 158.5     | 21.7      | 0.0       | 0.0                | 0.0     | 0.0   |       |
|                              | Eastern white and red pines  | 5,402.7  | 344.3     | 457.7     | 525.1     | 594.5     | 796.5     | 650.6     | 1,031.7   | 456.6     | 545.7     | 0.0                | 0.0     | 0.0   |       |
|                              | Spruce and balsam fir        | 121.7    | 18.9      | 26.6      | 26.1      | 35.8      | 14.2      | 0.0       | 0.0       | 0.0       | 0.0       | 0.0                | 0.0     | 0.0   |       |
|                              | Eastern hemlock              | 656.5    | 39.6      | 79.0      | 88.0      | 75.5      | 53.3      | 56.7      | 145.8     | 118.6     | 0.0       | 0.0                | 0.0     | 0.0   |       |
|                              | Cypress                      | 1,733.3  | 85.9      | 85.2      | 174.5     | 258.5     | 231.0     | 272.7     | 466.9     | 103.9     | 0.0       | 54.8               | 0.0     | 0.0   |       |
|                              | Other eastern softwoods      | 347.1    | 97.2      | 82.9      | 89.3      | 32.8      | 35.5      | 9.3       | 0.0       | 0.0       | 0.0       | 0.0                | 0.0     | 0.0   |       |
|                              | Total softwoods              | 60,688.3 | 8,969.8   | 11,401.4  | 11,595.9  | 9,368.4   | 7,142.5   | 4,312.1   | 5,116.6   | 1,854.1   | 628.3     | 211.5              | 87.7    | 87.7  |       |
| Hardwood                     | Select white oaks            | 8,165.2  | 0.0       | 647.9     | 958.4     | 1,185.0   | 1,191.7   | 1,358.3   | 1,497.8   | 852.0     | 204.4     | 110.9              | 158.7   | 158.7 |       |
|                              | Select red oaks              | 5,098.0  | 0.0       | 218.5     | 469.5     | 519.4     | 612.9     | 593.4     | 955.0     | 1,014.7   | 314.5     | 250.6              | 149.4   | 149.4 |       |
|                              | Other white oaks             | 5,955.8  | 0.0       | 623.2     | 746.2     | 875.7     | 1,040.4   | 696.3     | 1,218.9   | 411.3     | 194.0     | 149.9              | 0.0     | 0.0   |       |
|                              | Other red oaks               | 8,623.1  | 0.0       | 940.0     | 1,092.2   | 1,389.6   | 1,135.9   | 874.7     | 1,556.2   | 855.5     | 411.9     | 224.9              | 142.4   | 142.4 |       |
|                              | Hickory                      | 3,391.4  | 0.0       | 500.6     | 592.7     | 748.0     | 666.4     | 370.7     | 341.9     | 124.0     | 47.1      | 0.0                | 0.0     | 0.0   |       |
|                              | Yellow birch                 | 122.6    | 0.0       | 33.7      | 62.9      | 10.0      | 0.0       | 0.0       | 16.0      | 0.0       | 0.0       | 0.0                | 0.0     | 0.0   |       |
|                              | Hard maple                   | 437.4    | 0.0       | 66.9      | 55.6      | 69.4      | 68.9      | 35.6      | 118.1     | 22.8      | 0.0       | 0.0                | 0.0     | 0.0   |       |
|                              | Soft maple                   | 5,543.5  | 0.0       | 1,006.6   | 1,004.2   | 1,053.1   | 824.6     | 453.0     | 622.5     | 420.9     | 64.1      | 94.5               | 0.0     | 0.0   |       |
|                              | Beech                        | 1,066.7  | 0.0       | 103.4     | 69.5      | 127.6     | 152.8     | 80.3      | 144.7     | 135.1     | 47.0      | 0.0                | 206.3   | 206.3 |       |
|                              | Sweetgum                     | 7,892.8  | 0.0       | 1,222.7   | 1,302.6   | 1,412.6   | 1,221.7   | 954.9     | 1,208.1   | 363.5     | 6.0       | 200.6              | 0.0     | 0.0   |       |
|                              | Tupelo and blackgum          | 4,612.5  | 0.0       | 664.5     | 823.2     | 927.7     | 679.8     | 543.2     | 564.0     | 222.5     | 187.5     | 0.0                | 0.0     | 0.0   |       |
|                              | Ash                          | 2,178.6  | 0.0       | 231.9     | 318.2     | 321.7     | 293.7     | 199.2     | 644.6     | 129.4     | 39.9      | 0.0                | 0.0     | 0.0   |       |
|                              | Cottonwood and aspen         | 195.9    | 0.0       | 8.5       | 10.7      | 32.2      | 26.0      | 17.5      | 16.4      | 37.7      | 46.7      | 0.0                | 0.0     | 0.0   |       |
|                              | Basswood                     | 509.5    | 0.0       | 35.9      | 72.4      | 104.6     | 102.9     | 53.1      | 111.4     | 29.2      | 0.0       | 0.0                | 0.0     | 0.0   |       |
|                              | Yellow-poplar                | 25,082.3 | 0.0       | 1,821.9   | 2,443.6   | 3,358.2   | 3,508.0   | 3,411.3   | 5,379.2   | 2,848.1   | 1,429.6   | 408.1              | 474.3   | 474.3 |       |
|                              | Black walnut                 | 281.8    | 0.0       | 46.2      | 58.0      | 49.4      | 54.1      | 29.4      | 44.6      | 0.0       | 0.0       | 0.0                | 0.0     | 0.0   |       |
|                              | Other eastern soft hardwoods | 3,313.3  | 0.0       | 427.3     | 505.5     | 431.7     | 454.3     | 398.1     | 698.7     | 137.3     | 154.8     | 105.6              | 0.0     | 0.0   |       |
| Other eastern hard hardwoods | 1,180.4                      | 0.0      | 297.6     | 305.0     | 221.1     | 153.2     | 113.9     | 89.6      | 0.0       | 0.0       | 0.0       | 0.0                | 0.0     |       |       |
| Total hardwoods              | 83,650.9                     | 0.0      | 8,897.5   | 10,890.5  | 12,837.0  | 12,187.5  | 10,183.0  | 15,227.9  | 7,603.9   | 3,147.5   | 1,545.1   | 1,131.1            | 1,131.1 |       |       |
| All species                  | 144,339.1                    | 8,969.8  | 20,298.9  | 22,486.4  | 22,205.4  | 19,330.0  | 14,495.1  | 20,344.4  | 9,457.9   | 3,775.8   | 1,756.6   | 1,218.7            | 1,218.7 |       |       |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Excludes rotten, missing, and form cull defects volume.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.20**—Net<sup>1</sup> volume of sawtimber trees on timberland by species group and ownership group, North Carolina, 2018

| Species group      |                              | All ownerships | Ownership group     |               |                            |                 |                       |
|--------------------|------------------------------|----------------|---------------------|---------------|----------------------------|-----------------|-----------------------|
|                    |                              |                | USDA Forest Service | Other Federal | State and local government | Forest industry | Nonindustrial private |
| million board feet |                              |                |                     |               |                            |                 |                       |
| Softwood           | Longleaf and slash pines     | 3,060.5        | 156.3               | 876.9         | 394.7                      | 110.7           | 1,522.0               |
|                    | Loblolly and shortleaf pines | 44,064.8       | 1,226.4             | 1,165.0       | 2,998.9                    | 2,266.9         | 36,407.6              |
|                    | Other yellow pines           | 5,301.6        | 669.3               | 126.9         | 565.5                      | 4.9             | 3,934.9               |
|                    | Eastern white and red pines  | 5,402.7        | 821.5               | 0.0           | 218.9                      | 67.5            | 4,294.8               |
|                    | Spruce and balsam fir        | 121.7          | 70.0                | 0.0           | 40.0                       | 0.0             | 11.8                  |
|                    | Eastern hemlock              | 656.5          | 172.9               | 0.0           | 54.6                       | 7.1             | 421.9                 |
|                    | Cypress                      | 1,733.3        | 47.0                | 0.0           | 147.5                      | 19.6            | 1,519.1               |
|                    | Other eastern softwoods      | 347.1          | 0.0                 | 4.4           | 58.4                       | 0.0             | 284.4                 |
|                    | Total softwoods              | 60,688.3       | 3,163.4             | 2,173.2       | 4,478.4                    | 2,476.7         | 48,396.5              |
| Hardwood           | Select white oaks            | 8,165.2        | 740.6               | 29.7          | 314.6                      | 21.2            | 7,059.1               |
|                    | Select red oaks              | 5,098.0        | 1,218.6             | 46.5          | 329.9                      | 24.0            | 3,479.0               |
|                    | Other white oaks             | 5,955.8        | 1,520.6             | 30.8          | 350.5                      | 40.2            | 4,013.8               |
|                    | Other red oaks               | 8,623.1        | 843.3               | 90.7          | 439.8                      | 25.0            | 7,224.4               |
|                    | Hickory                      | 3,391.4        | 365.4               | 47.6          | 167.1                      | 37.7            | 2,773.6               |
|                    | Yellow birch                 | 122.6          | 76.2                | 0.0           | 0.0                        | 3.7             | 42.7                  |
|                    | Hard maple                   | 437.4          | 104.3               | 9.5           | 18.5                       | 0.0             | 305.1                 |
|                    | Soft maple                   | 5,543.5        | 698.2               | 22.7          | 401.3                      | 118.1           | 4,303.2               |
|                    | Beech                        | 1,066.7        | 62.5                | 3.8           | 37.7                       | 8.7             | 954.0                 |
|                    | Sweetgum                     | 7,892.8        | 57.0                | 201.4         | 638.4                      | 122.9           | 6,873.1               |
|                    | Tupelo and blackgum          | 4,612.5        | 173.5               | 71.2          | 370.9                      | 215.2           | 3,781.7               |
|                    | Ash                          | 2,178.6        | 92.2                | 45.4          | 219.9                      | 20.7            | 1,800.3               |
|                    | Cottonwood and aspen         | 195.9          | 9.1                 | 0.0           | 32.0                       | 0.0             | 154.9                 |
|                    | Basswood                     | 509.5          | 186.8               | 0.0           | 0.0                        | 15.8            | 306.8                 |
|                    | Yellow-poplar                | 25,082.3       | 2,282.0             | 131.5         | 1,009.8                    | 296.2           | 21,362.9              |
|                    | Black walnut                 | 281.8          | 0.0                 | 0.0           | 8.1                        | 4.7             | 268.9                 |
|                    | Other eastern soft hardwoods | 3,313.3        | 341.7               | 25.3          | 238.0                      | 49.4            | 2,658.9               |
|                    | Other eastern hard hardwoods | 1,180.4        | 269.8               | 0.0           | 65.6                       | 8.5             | 836.5                 |
|                    | Total hardwoods              | 83,650.9       | 9,041.9             | 755.9         | 4,642.1                    | 1,012.0         | 68,199.0              |
|                    | All species                  | 144,339.1      | 12,205.3            | 2,929.1       | 9,120.5                    | 3,488.7         | 116,595.5             |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Excludes rotten, missing, and form cull defects volume.

**Table A4.21**—Aboveground dry weight<sup>1</sup> of live trees on timberland by species group and diameter class, North Carolina, 2018

| Species group                   | Diameter class (inches) |          |          |          |           |           |           |           |           |           |           |           |           |           |           |         | thousand tons |  |
|---------------------------------|-------------------------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------|---------------|--|
|                                 | All classes             | 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+   |               |  |
| <b>Softwood</b>                 | 16,964.3                | 193.6    | 655.0    | 931.9    | 1,580.4   | 1,912.9   | 3,033.3   | 3,002.0   | 2,685.3   | 1,362.1   | 961.9     | 646.0     | 0.0       | 0.0       | 0.0       | 0.0     |               |  |
| Longleaf and slash pines        |                         |          |          |          |           |           |           |           |           |           |           |           |           |           |           |         |               |  |
| Loblolly and shortleaf pines    | 265,035.4               | 3,039.4  | 10,001.4 | 22,132.4 | 37,120.4  | 43,721.6  | 42,733.8  | 36,740.3  | 26,853.9  | 18,360.8  | 9,853.1   | 10,055.1  | 3,483.5   | 254.2     | 442.4     | 243.1   |               |  |
| Other yellow pines              | 37,724.9                | 986.1    | 2,122.9  | 3,517.0  | 4,952.6   | 6,592.4   | 6,830.6   | 6,081.7   | 3,252.3   | 2,031.5   | 704.8     | 583.8     | 69.2      | 0.0       | 0.0       | 0.0     |               |  |
| Eastern white and red pines     | 20,829.9                | 222.2    | 412.1    | 878.5    | 1,304.1   | 1,903.8   | 2,024.5   | 2,010.7   | 2,089.9   | 2,571.0   | 1,919.3   | 2,948.6   | 1,236.4   | 1,308.8   | 0.0       | 0.0     |               |  |
| Spruce and balsam fir           | 754.0                   | 6.5      | 4.4      | 72.5     | 112.9     | 108.7     | 137.5     | 113.6     | 143.4     | 54.4      | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0     |               |  |
| Eastern hemlock                 | 4,647.6                 | 87.7     | 171.4    | 398.5    | 447.7     | 339.1     | 549.4     | 500.6     | 408.9     | 298.2     | 256.3     | 706.3     | 483.6     | 0.0       | 0.0       | 0.0     |               |  |
| Cypress                         | 9,378.2                 | 83.6     | 134.4    | 248.4    | 403.2     | 571.4     | 547.5     | 919.8     | 1,274.2   | 1,072.3   | 1,298.7   | 2,050.2   | 547.7     | 0.0       | 226.8     | 0.0     |               |  |
| Other eastern softwoods         | 5,249.4                 | 508.5    | 800.4    | 847.0    | 818.4     | 700.4     | 603.7     | 481.5     | 176.8     | 159.7     | 76.8      | 0.0       | 0.0       | 76.2      | 0.0       | 0.0     |               |  |
| <b>Total softwoods</b>          | 360,583.8               | 5,127.6  | 14,302.1 | 29,026.3 | 46,739.8  | 55,850.2  | 56,460.3  | 49,850.2  | 36,884.7  | 25,909.8  | 15,070.7  | 16,990.1  | 5,820.4   | 1,639.2   | 669.2     | 243.1   |               |  |
| <b>Hardwood</b>                 |                         |          |          |          |           |           |           |           |           |           |           |           |           |           |           |         |               |  |
| Select white oaks               | 65,137.2                | 691.5    | 1,312.1  | 2,048.2  | 3,130.7   | 4,479.6   | 5,355.7   | 6,856.9   | 7,941.5   | 7,423.4   | 7,937.7   | 9,068.9   | 5,556.8   | 1,607.4   | 548.8     | 1,178.1 |               |  |
| Select red oaks                 | 36,677.6                | 272.0    | 405.1    | 809.1    | 1,433.9   | 1,928.0   | 1,923.0   | 3,475.0   | 3,480.4   | 4,033.0   | 3,528.4   | 5,575.8   | 5,596.1   | 1,838.2   | 1,424.2   | 955.7   |               |  |
| Other white oaks                | 54,685.9                | 390.3    | 901.6    | 1,471.7  | 2,627.0   | 4,161.8   | 5,617.6   | 5,868.0   | 6,448.4   | 7,094.9   | 4,708.7   | 8,363.7   | 3,402.1   | 1,721.1   | 1,519.6   | 389.3   |               |  |
| Other red oaks                  | 79,080.1                | 2,189.5  | 2,985.8  | 3,888.6  | 5,451.9   | 6,742.8   | 8,081.5   | 8,028.5   | 9,609.2   | 7,506.1   | 5,377.0   | 8,917.3   | 4,762.2   | 2,286.2   | 1,429.4   | 1,823.8 |               |  |
| Hickory                         | 31,623.0                | 773.3    | 1,129.9  | 1,455.9  | 2,348.6   | 3,261.0   | 4,221.4   | 4,245.0   | 4,922.0   | 4,114.7   | 2,024.2   | 2,017.2   | 874.9     | 235.0     | 0.0       | 0.0     |               |  |
| Yellow birch                    | 2,437.9                 | 59.4     | 164.9    | 184.9    | 325.0     | 361.5     | 307.9     | 512.1     | 101.5     | 46.2      | 66.8      | 168.9     | 139.0     | 0.0       | 0.0       | 0.0     |               |  |
| Hard maple                      | 6,655.0                 | 266.5    | 377.0    | 390.2    | 451.7     | 642.7     | 655.2     | 483.8     | 641.1     | 574.6     | 272.0     | 963.2     | 136.7     | 425.6     | 0.0       | 374.8   |               |  |
| Soft maple                      | 90,353.1                | 7,125.1  | 8,606.2  | 9,350.4  | 10,860.9  | 10,317.3  | 9,821.6   | 8,567.7   | 7,835.6   | 5,840.9   | 3,752.3   | 4,233.7   | 3,129.9   | 388.3     | 523.3     | 0.0     |               |  |
| Beech                           | 13,785.8                | 517.3    | 732.7    | 655.3    | 589.9     | 1,030.3   | 1,045.6   | 851.4     | 1,295.7   | 1,268.2   | 931.7     | 1,182.6   | 1,260.9   | 584.5     | 215.1     | 1,624.8 |               |  |
| Sweetgum                        | 69,961.3                | 4,416.8  | 6,431.5  | 6,227.7  | 7,160.8   | 7,332.2   | 7,827.9   | 7,003.6   | 6,753.8   | 5,454.9   | 4,022.4   | 4,999.3   | 1,582.4   | 23.4      | 724.3     | 0.0     |               |  |
| Tupelo and blackgum             | 38,961.7                | 1,378.2  | 2,054.9  | 2,130.3  | 3,266.2   | 3,807.0   | 5,007.4   | 4,945.1   | 5,402.0   | 3,466.0   | 2,761.4   | 2,763.8   | 992.9     | 986.5     | 0.0       | 0.0     |               |  |
| Ash                             | 15,729.0                | 589.3    | 1,372.6  | 1,454.2  | 1,455.9   | 1,379.8   | 1,666.3   | 1,550.6   | 1,512.2   | 1,201.9   | 761.1     | 2,107.2   | 439.4     | 100.3     | 0.0       | 138.3   |               |  |
| Cottonwood and aspen            | 1,085.1                 | 29.6     | 57.5     | 54.3     | 49.6      | 36.8      | 50.9      | 55.5      | 151.8     | 124.6     | 74.7      | 73.2      | 145.6     | 180.8     | 0.0       | 0.0     |               |  |
| Basswood                        | 3,188.1                 | 16.6     | 64.1     | 78.8     | 222.5     | 171.2     | 228.7     | 427.3     | 574.8     | 512.2     | 238.6     | 531.3     | 122.0     | 0.0       | 0.0       | 0.0     |               |  |
| Yellow-poplar                   | 128,647.5               | 2,308.6  | 3,709.5  | 4,453.5  | 6,599.4   | 8,676.2   | 10,791.4  | 11,923.2  | 14,611.5  | 14,272.5  | 12,994.8  | 19,320.2  | 10,196.2  | 5,003.8   | 1,956.4   | 1,830.3 |               |  |
| Black walnut                    | 4,208.2                 | 28.4     | 124.6    | 188.1    | 304.8     | 452.7     | 612.3     | 634.2     | 653.0     | 489.6     | 241.9     | 478.5     | 0.0       | 0.0       | 0.0       | 0.0     |               |  |
| Other eastern soft hardwoods    | 40,806.0                | 3,068.9  | 4,998.6  | 4,147.9  | 4,193.9   | 3,934.5   | 3,664.8   | 3,522.1   | 2,942.2   | 2,585.0   | 2,149.6   | 3,688.8   | 666.7     | 788.1     | 455.0     | 0.0     |               |  |
| Other eastern hard hardwoods    | 26,330.3                | 2,831.7  | 2,947.3  | 2,626.1  | 2,950.7   | 3,255.4   | 2,988.0   | 2,732.3   | 2,174.8   | 1,327.1   | 1,094.2   | 1,036.9   | 148.3     | 217.8     | 0.0       | 0.0     |               |  |
| Eastern noncommercial hardwoods | 24,533.2                | 4,023.1  | 5,278.5  | 4,838.4  | 4,271.3   | 2,493.6   | 1,533.8   | 962.5     | 280.9     | 74.7      | 365.6     | 148.8     | 262.1     | 0.0       | 0.0       | 0.0     |               |  |
| <b>Total hardwoods</b>          | 733,886.0               | 30,976.1 | 43,654.5 | 46,453.7 | 57,694.6  | 64,464.3  | 71,400.8  | 72,644.6  | 77,332.2  | 67,410.4  | 53,303.0  | 75,639.3  | 39,414.2  | 16,386.9  | 8,796.0   | 8,315.2 |               |  |
| <b>All species</b>              | 1,094,469.7             | 36,103.7 | 57,956.6 | 75,480.0 | 104,434.4 | 120,314.5 | 127,861.2 | 122,494.8 | 114,216.9 | 93,320.3  | 68,373.7  | 92,629.3  | 45,234.6  | 18,026.1  | 9,465.3   | 8,558.3 |               |  |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Calculations based on TREE\_REGIONAL\_BIOMASS\_REGIONAL\_DRYBIOT.

**Table A4.22**—Aboveground green weight<sup>1</sup> of live trees on timberland by species group and diameter class, North Carolina, 2018

| Species group                   | Diameter class (inches) |          |           |           |           |           |           |           |           |           |           |           |           |           |           |          | 37.0+ |
|---------------------------------|-------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|-------|
|                                 | All classes             | 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 |          |       |
|                                 | thousand tons           |          |           |           |           |           |           |           |           |           |           |           |           |           |           |          |       |
| Softwood                        | 33,928.7                | 387.2    | 1,310.0   | 1,863.8   | 3,160.9   | 3,825.8   | 6,066.6   | 6,003.9   | 5,370.6   | 2,724.1   | 1,923.7   | 1,292.0   | 0.0       | 0.0       | 0.0       | 0.0      |       |
| Loblolly and shortleaf pines    | 530,070.7               | 6,078.8  | 20,002.8  | 44,264.9  | 74,240.8  | 87,443.2  | 85,467.5  | 73,480.7  | 53,707.8  | 36,721.5  | 19,706.2  | 20,110.3  | 6,967.0   | 508.3     | 884.8     | 486.1    |       |
| Other yellow pines              | 75,449.8                | 1,972.2  | 4,245.8   | 7,034.1   | 9,905.3   | 13,184.9  | 13,661.2  | 12,163.4  | 6,504.5   | 4,062.9   | 1,409.6   | 1,167.6   | 138.4     | 0.0       | 0.0       | 0.0      |       |
| Eastern white and red pines     | 41,659.9                | 444.3    | 824.2     | 1,757.0   | 2,608.2   | 3,807.6   | 4,049.0   | 4,021.4   | 4,179.9   | 5,142.0   | 3,838.5   | 5,897.3   | 2,472.8   | 2,617.6   | 0.0       | 0.0      |       |
| Spruce and balsam fir           | 1,507.9                 | 13.1     | 8.9       | 145.1     | 225.9     | 217.3     | 275.0     | 227.1     | 286.9     | 108.7     | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       | 0.0      |       |
| Eastern hemlock                 | 9,295.2                 | 175.4    | 342.9     | 797.0     | 895.3     | 678.2     | 1,098.8   | 1,001.2   | 817.7     | 596.4     | 512.5     | 1,412.6   | 967.2     | 0.0       | 0.0       | 0.0      |       |
| Cypress                         | 18,756.4                | 167.2    | 268.8     | 496.7     | 806.5     | 1,142.7   | 1,095.1   | 1,839.7   | 2,548.4   | 2,144.6   | 2,597.3   | 4,100.3   | 1,095.4   | 0.0       | 453.7     | 0.0      |       |
| Other eastern softwoods         | 10,498.9                | 1,017.0  | 1,600.7   | 1,694.1   | 1,636.8   | 1,400.7   | 1,207.5   | 962.9     | 353.7     | 319.4     | 153.6     | 0.0       | 0.0       | 152.5     | 0.0       | 0.0      |       |
| Total softwoods                 | 721,167.6               | 10,255.2 | 28,604.2  | 58,052.6  | 93,479.6  | 111,700.4 | 112,920.7 | 99,700.4  | 73,769.4  | 51,819.7  | 30,141.5  | 33,980.1  | 11,640.9  | 3,278.5   | 1,338.5   | 486.1    |       |
| Hardwood                        | 130,274.4               | 1,382.9  | 2,624.1   | 4,096.4   | 6,261.3   | 8,959.2   | 10,711.3  | 13,713.8  | 15,883.0  | 14,846.9  | 15,875.5  | 18,137.9  | 11,113.5  | 3,214.8   | 1,097.6   | 2,356.2  |       |
| Select white oaks               | 73,355.2                | 543.9    | 810.2     | 1,618.1   | 2,867.7   | 3,856.0   | 3,845.9   | 6,949.9   | 6,960.7   | 8,066.0   | 7,056.8   | 11,151.6  | 11,192.2  | 3,676.3   | 2,848.3   | 1,911.4  |       |
| Other white oaks                | 109,371.8               | 780.6    | 1,803.2   | 2,943.4   | 5,254.1   | 8,323.6   | 11,235.1  | 11,736.0  | 12,896.8  | 14,189.9  | 9,417.3   | 16,727.5  | 6,804.2   | 3,442.3   | 3,039.1   | 778.6    |       |
| Other red oaks                  | 158,160.1               | 4,379.0  | 5,971.7   | 7,777.2   | 10,903.9  | 13,485.7  | 16,163.1  | 16,057.0  | 19,218.5  | 15,012.2  | 10,754.0  | 17,834.5  | 9,524.4   | 4,572.4   | 2,858.9   | 3,647.7  |       |
| Hickory                         | 63,246.1                | 1,546.5  | 2,259.8   | 2,911.9   | 4,697.2   | 6,522.0   | 8,442.8   | 8,489.9   | 9,844.0   | 8,229.3   | 4,048.5   | 4,034.3   | 1,749.8   | 470.0     | 0.0       | 0.0      |       |
| Yellow birch                    | 4,875.8                 | 118.9    | 329.8     | 369.8     | 650.0     | 722.9     | 615.7     | 1,024.1   | 202.9     | 92.4      | 133.6     | 337.8     | 277.9     | 0.0       | 0.0       | 0.0      |       |
| Hard maple                      | 13,310.0                | 533.1    | 753.9     | 780.4     | 903.4     | 1,285.4   | 1,310.4   | 967.5     | 1,282.3   | 1,149.1   | 544.0     | 1,926.3   | 273.5     | 851.1     | 0.0       | 749.7    |       |
| Soft maple                      | 180,706.2               | 14,250.3 | 17,212.5  | 18,700.9  | 21,721.8  | 20,634.5  | 19,643.3  | 17,135.3  | 15,671.1  | 11,681.7  | 7,504.5   | 8,467.3   | 6,259.8   | 776.6     | 1,046.6   | 0.0      |       |
| Beech                           | 27,571.5                | 1,034.6  | 1,465.4   | 1,310.5   | 1,179.8   | 2,060.6   | 2,091.1   | 1,702.8   | 2,591.3   | 2,536.3   | 1,863.4   | 2,365.1   | 2,521.8   | 1,169.0   | 430.2     | 3,249.7  |       |
| Sweetgum                        | 139,922.6               | 8,833.6  | 12,863.1  | 12,455.4  | 14,321.6  | 14,664.5  | 15,655.8  | 14,007.2  | 13,507.7  | 10,909.9  | 8,044.9   | 9,998.7   | 3,164.8   | 46.9      | 1,448.7   | 0.0      |       |
| Tupelo and blackgum             | 77,923.4                | 2,756.5  | 4,109.7   | 4,260.7   | 6,532.4   | 7,614.1   | 10,014.7  | 9,890.2   | 10,804.0  | 6,932.0   | 5,522.8   | 5,527.5   | 1,985.9   | 1,972.9   | 0.0       | 0.0      |       |
| Ash                             | 31,458.0                | 1,178.6  | 2,745.1   | 2,908.4   | 2,911.7   | 2,759.6   | 3,332.6   | 3,101.1   | 3,024.3   | 2,403.8   | 1,522.2   | 4,214.4   | 878.8     | 200.5     | 0.0       | 276.6    |       |
| Cottonwood and aspen            | 2,170.1                 | 59.3     | 115.0     | 108.7     | 99.3      | 73.7      | 101.9     | 111.0     | 303.7     | 249.1     | 149.5     | 146.4     | 291.1     | 361.5     | 0.0       | 0.0      |       |
| Basswood                        | 6,376.2                 | 33.2     | 128.3     | 157.6     | 445.0     | 342.3     | 457.3     | 854.7     | 1,149.6   | 1,024.4   | 477.2     | 1,062.6   | 244.0     | 0.0       | 0.0       | 0.0      |       |
| Yellow-poplar                   | 257,295.0               | 4,617.3  | 7,419.1   | 8,907.1   | 13,198.8  | 17,352.3  | 21,582.9  | 23,846.3  | 29,222.9  | 28,545.0  | 25,989.6  | 38,640.4  | 20,392.3  | 10,007.6  | 3,912.7   | 3,660.6  |       |
| Black walnut                    | 8,416.5                 | 56.8     | 249.3     | 376.3     | 609.6     | 905.3     | 1,224.7   | 1,268.4   | 1,306.0   | 979.3     | 483.8     | 957.1     | 0.0       | 0.0       | 0.0       | 0.0      |       |
| Other eastern soft hardwoods    | 81,612.0                | 6,137.7  | 9,997.2   | 8,295.8   | 8,387.7   | 7,869.0   | 7,329.5   | 7,044.1   | 5,884.4   | 5,170.0   | 4,299.1   | 7,377.6   | 1,333.4   | 1,576.2   | 910.1     | 0.0      |       |
| Other eastern hard hardwoods    | 52,660.6                | 5,663.3  | 5,894.6   | 5,252.1   | 5,901.4   | 6,510.8   | 5,976.0   | 5,464.5   | 4,349.6   | 2,654.2   | 2,188.3   | 2,073.7   | 296.5     | 435.5     | 0.0       | 0.0      |       |
| Eastern noncommercial hardwoods | 49,066.4                | 8,046.1  | 10,557.1  | 9,676.7   | 8,542.5   | 4,987.2   | 3,067.5   | 1,925.1   | 561.7     | 149.4     | 731.1     | 297.7     | 524.3     | 0.0       | 0.0       | 0.0      |       |
| Total hardwoods                 | 1,467,771.9             | 61,952.2 | 87,309.0  | 92,907.5  | 115,389.3 | 128,928.6 | 142,801.7 | 145,289.2 | 154,664.4 | 134,820.9 | 106,605.9 | 151,278.6 | 78,828.4  | 32,773.7  | 17,592.1  | 16,630.5 |       |
| All species                     | 2,188,939.5             | 72,207.3 | 115,913.1 | 150,960.1 | 208,868.9 | 240,629.0 | 255,722.3 | 244,989.6 | 228,433.8 | 186,640.5 | 136,747.4 | 185,258.7 | 90,469.2  | 36,052.2  | 18,930.6  | 17,116.6 |       |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Calculations based on TREE\_REGIONAL\_BIOMASS\_REGIONAL\_DRYBIOT.

**Table A4.23**—Merchantable dry weight<sup>1</sup> of live trees on timberland by species group and diameter class, North Carolina, 2018

| Species group | Diameter class (inches)         |           |          |          |           |           |           |           |           |           |           |           |           |         |         |
|---------------|---------------------------------|-----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------|---------|
|               | 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+   |         |
|               | thousand tons                   |           |          |          |           |           |           |           |           |           |           |           |           |         |         |
| Softwood      | Longleaf and slash pines        | 14,000.3  | 678.6    | 1,309.3  | 1,651.9   | 2,662.1   | 2,658.9   | 2,386.4   | 1,217.7   | 858.1     | 577.3     | 0.0       | 0.0       | 0.0     | 0.0     |
|               | Loblolly and shortleaf pines    | 215,530.6 | 15,905.6 | 30,567.3 | 37,537.7  | 37,333.6  | 32,392.6  | 23,803.8  | 16,308.9  | 8,780.5   | 8,947.4   | 3,120.7   | 217.3     | 397.0   | 218.2   |
|               | Other yellow pines              | 29,538.7  | 2,646.2  | 4,125.7  | 5,653.2   | 5,933.5   | 5,316.6   | 2,859.4   | 1,796.3   | 625.1     | 520.8     | 62.0      | 0.0       | 0.0     | 0.0     |
|               | Eastern white and red pines     | 17,245.4  | 657.6    | 1,075.3  | 1,613.5   | 1,736.1   | 1,733.3   | 1,791.1   | 2,223.7   | 1,659.9   | 2,561.9   | 1,052.6   | 1,140.3   | 0.0     | 0.0     |
|               | Spruce and balsam fir           | 620.1     | 51.8     | 92.0     | 91.0      | 117.1     | 97.5      | 123.7     | 47.0      | 0.0       | 0.0       | 0.0       | 0.0       | 0.0     | 0.0     |
|               | Eastern hemlock                 | 3,686.6   | 283.0    | 362.2    | 284.0     | 468.1     | 428.0     | 351.4     | 254.4     | 222.1     | 612.9     | 420.5     | 0.0       | 0.0     | 0.0     |
|               | Cypress                         | 7,479.6   | 169.4    | 313.3    | 459.4     | 441.3     | 761.0     | 1,045.8   | 894.0     | 1,084.9   | 1,715.9   | 404.2     | 0.0       | 190.5   | 0.0     |
|               | Other eastern softwoods         | 3,259.3   | 643.8    | 676.5    | 590.9     | 516.8     | 413.9     | 150.0     | 136.2     | 66.4      | 0.0       | 0.0       | 64.8      | 0.0     | 0.0     |
|               | Total softwoods                 | 291,360.6 | 21,036.0 | 38,521.5 | 47,881.8  | 49,208.6  | 43,801.8  | 32,511.6  | 22,878.1  | 13,296.9  | 14,936.2  | 5,059.9   | 1,422.3   | 587.5   | 218.2   |
| Hardwood      | Select white oaks               | 50,408.9  | 1,398.1  | 2,380.8  | 3,529.5   | 4,262.5   | 5,489.7   | 6,415.8   | 6,002.0   | 6,440.6   | 7,309.5   | 4,462.9   | 1,307.1   | 447.8   | 962.7   |
|               | Select red oaks                 | 28,717.1  | 582.3    | 1,117.9  | 1,533.4   | 1,541.4   | 2,791.2   | 2,816.0   | 3,221.9   | 2,831.5   | 4,495.5   | 4,508.4   | 1,376.7   | 1,140.8 | 759.9   |
|               | Other white oaks                | 42,677.5  | 1,032.2  | 2,037.5  | 3,315.9   | 4,538.4   | 4,763.6   | 5,240.9   | 5,805.3   | 3,832.7   | 6,729.2   | 2,619.0   | 1,312.7   | 1,127.5 | 322.7   |
|               | Other red oaks                  | 58,355.7  | 2,576.0  | 4,118.4  | 5,286.3   | 6,434.6   | 6,426.7   | 7,729.3   | 6,020.6   | 4,332.3   | 7,240.5   | 3,823.9   | 1,754.6   | 1,158.4 | 1,454.1 |
|               | Hickory                         | 23,763.4  | 938.1    | 1,778.2  | 2,589.5   | 3,411.9   | 3,471.4   | 4,007.2   | 3,378.3   | 1,682.8   | 1,630.6   | 678.6     | 196.9     | 0.0     | 0.0     |
|               | Yellow birch                    | 1,658.4   | 123.9    | 243.1    | 281.4     | 245.4     | 413.1     | 81.6      | 37.6      | 49.0      | 137.8     | 45.4      | 0.0       | 0.0     | 0.0     |
|               | Hard maple                      | 4,516.3   | 260.2    | 337.5    | 499.7     | 502.8     | 386.4     | 512.6     | 465.1     | 221.5     | 763.9     | 111.7     | 332.1     | 0.0     | 122.8   |
|               | Soft maple                      | 59,223.0  | 6,575.3  | 8,505.0  | 8,303.7   | 7,998.4   | 7,023.2   | 6,340.9   | 4,765.9   | 3,053.0   | 3,436.6   | 2,480.2   | 312.4     | 428.5   | 0.0     |
|               | Beech                           | 9,825.7   | 430.7    | 433.9    | 805.3     | 830.2     | 665.0     | 1,036.6   | 1,021.3   | 749.0     | 952.9     | 967.4     | 478.2     | 123.2   | 1,332.1 |
|               | Sweetgum                        | 49,576.9  | 4,250.4  | 5,767.0  | 6,187.1   | 6,724.5   | 6,056.2   | 5,898.1   | 4,788.6   | 3,517.5   | 4,322.0   | 1,404.0   | 17.7      | 643.8   | 0.0     |
|               | Tupelo and blackgum             | 29,130.9  | 1,524.4  | 2,604.1  | 3,111.5   | 4,144.3   | 4,118.6   | 4,522.7   | 2,894.2   | 2,304.5   | 2,327.6   | 831.8     | 747.3     | 0.0     | 0.0     |
|               | Ash                             | 11,419.1  | 1,021.1  | 1,170.6  | 1,146.8   | 1,393.6   | 1,338.0   | 1,291.6   | 1,025.6   | 664.0     | 1,795.8   | 361.1     | 88.6      | 0.0     | 122.3   |
|               | Cottonwood and aspen            | 836.8     | 39.8     | 38.8     | 30.8      | 42.7      | 47.7      | 131.1     | 99.6      | 64.8      | 57.2      | 126.7     | 157.4     | 0.0     | 0.0     |
|               | Basswood                        | 2,619.3   | 55.8     | 179.0    | 143.2     | 194.4     | 365.7     | 490.9     | 433.3     | 203.5     | 447.4     | 106.1     | 0.0       | 0.0     | 0.0     |
|               | Yellow-poplar                   | 106,824.7 | 3,354.8  | 5,510.1  | 7,485.3   | 9,398.2   | 10,476.2  | 12,905.7  | 12,627.9  | 11,499.8  | 17,114.0  | 9,016.2   | 4,360.4   | 1,642.1 | 1,433.9 |
|               | Black walnut                    | 3,196.4   | 127.3    | 224.2    | 354.0     | 487.7     | 506.9     | 515.2     | 396.3     | 194.2     | 390.6     | 0.0       | 0.0       | 0.0     | 0.0     |
|               | Other eastern soft hardwoods    | 26,619.5  | 2,917.7  | 3,336.2  | 3,241.5   | 3,044.3   | 2,936.0   | 2,478.6   | 2,177.7   | 1,802.5   | 3,067.2   | 568.3     | 653.1     | 396.5   | 0.0     |
|               | Other eastern hard hardwoods    | 15,665.6  | 1,716.3  | 2,208.2  | 2,537.2   | 2,358.2   | 2,171.7   | 1,703.6   | 1,058.0   | 865.3     | 755.6     | 113.3     | 178.1     | 0.0     | 0.0     |
|               | Eastern noncommercial hardwoods | 11,291.9  | 3,232.6  | 3,201.0  | 1,950.0   | 1,214.3   | 755.7     | 225.7     | 63.2      | 307.2     | 115.0     | 227.2     | 0.0       | 0.0     | 0.0     |
|               | Total hardwoods                 | 536,327.2 | 32,157.1 | 45,191.5 | 52,332.0  | 58,767.9  | 60,203.1  | 64,344.0  | 56,282.3  | 44,615.5  | 63,089.1  | 32,452.2  | 13,273.2  | 7,108.7 | 6,510.5 |
| All species   |                                 | 827,687.8 | 53,193.2 | 83,713.0 | 100,213.8 | 107,976.5 | 104,005.0 | 96,855.6  | 79,160.4  | 57,912.4  | 78,025.3  | 37,512.1  | 14,695.6  | 7,696.2 | 6,728.7 |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Calculations based on TREE\_REGIONAL\_BIOMASS\_REGIONAL\_DRYBIOM.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.24**—Total carbon<sup>1</sup> of live trees on forest land by ownership class and land status, North Carolina, 2018

| Ownership class            |                                                   | All forest land | Unreserved |            |              | Reserved |            |              |
|----------------------------|---------------------------------------------------|-----------------|------------|------------|--------------|----------|------------|--------------|
|                            |                                                   |                 | Total      | Timberland | Unproductive | Total    | Productive | Unproductive |
| thousand tons              |                                                   |                 |            |            |              |          |            |              |
| USDA Forest Service        | National forest                                   | 49,741.8        | 46,215.8   | 46,215.3   | 0.5          | 3,526.0  | 3,526.0    | 0.0          |
|                            | Total                                             | 49,741.8        | 46,215.8   | 46,215.3   | 0.5          | 3,526.0  | 3,526.0    | 0.0          |
| Other Federal              | National Park Service                             | 14,001.2        | 0.0        | 0.0        | 0.0          | 14,001.2 | 13,987.6   | 13.6         |
|                            | U.S. Fish and Wildlife Service                    | 6,054.1         | 0.0        | 0.0        | 0.0          | 6,054.1  | 5,892.3    | 161.8        |
|                            | Dept. of Defense/Dept. of Energy                  | 8,402.1         | 8,402.1    | 8,395.1    | 7.0          | 0.0      | 0.0        | 0.0          |
|                            | Other Federal                                     | 200.1           | 200.1      | 200.1      | 0.0          | 0.0      | 0.0        | 0.0          |
|                            | Total                                             | 28,657.6        | 8,602.2    | 8,595.2    | 7.0          | 20,055.4 | 19,879.9   | 175.4        |
| State and local government | State                                             | 22,206.1        | 21,883.0   | 21,853.1   | 29.9         | 323.1    | 323.1      | 0.0          |
|                            | Local                                             | 10,734.6        | 10,734.6   | 10,734.6   | 0.0          | 0.0      | 0.0        | 0.0          |
|                            | Total                                             | 32,940.7        | 32,617.6   | 32,587.7   | 29.9         | 323.1    | 323.1      | 0.0          |
| Forest industry            | Corporate                                         | 12,373.5        | 12,373.5   | 12,373.5   | 0.0          | 0.0      | 0.0        | 0.0          |
|                            | Individual                                        | 997.5           | 997.5      | 997.5      | 0.0          | 0.0      | 0.0        | 0.0          |
|                            | Total                                             | 13,371.0        | 13,371.0   | 13,371.0   | 0.0          | 0.0      | 0.0        | 0.0          |
| Nonindustrial private      | Corporate                                         | 108,212.5       | 108,212.5  | 108,179.3  | 33.2         | 0.0      | 0.0        | 0.0          |
|                            | Conservation/natural resources organization       | 4,892.0         | 4,892.0    | 4,892.0    | 0.0          | 0.0      | 0.0        | 0.0          |
|                            | Unincorporated local partnership/association/club | 5,451.1         | 5,451.1    | 5,451.1    | 0.0          | 0.0      | 0.0        | 0.0          |
|                            | Native American                                   | 769.6           | 769.6      | 769.6      | 0.0          | 0.0      | 0.0        | 0.0          |
|                            | Individual                                        | 327,175.6       | 327,175.6  | 327,173.6  | 2.0          | 0.0      | 0.0        | 0.0          |
|                            | Total                                             | 446,500.8       | 446,500.8  | 446,465.6  | 35.1         | 0.0      | 0.0        | 0.0          |
| All classes                |                                                   | 571,211.9       | 547,307.4  | 547,234.9  | 72.6         | 23,904.5 | 23,729.1   | 175.4        |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Estimates of carbon calculated by multiplying aboveground dry tree biomass by 0.5. Calculations based on TREE\_REGIONAL\_BIOMASS.REGIONAL\_DRYBIOT.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.25**—Average annual net growth of live trees on timberland by forest-type group and stand-size class, North Carolina, 2018 (2003–2013 to 2009–2018)

| Forest-type group <sup>1</sup> |                         | All size classes | Stand-size class <sup>1</sup> |                 |                |            |
|--------------------------------|-------------------------|------------------|-------------------------------|-----------------|----------------|------------|
|                                |                         |                  | Large diameter                | Medium diameter | Small diameter | Nonstocked |
| million cubic feet per year    |                         |                  |                               |                 |                |            |
| Softwood types                 | White-red-jack pine     | 14.8             | 12.8                          | 1.8             | 0.2            | 0.0        |
|                                | Spruce-fir              | 1.0              | 0.1                           | 0.9             | 0.0            | 0.0        |
|                                | Longleaf-slash pine     | 22.4             | 12.6                          | 6.4             | 3.3            | 0.0        |
|                                | Loblolly-shortleaf pine | 778.6            | 332.6                         | 319.2           | 126.8          | 0.0        |
|                                | Other eastern softwoods | 0.8              | 0.1                           | 0.6             | 0.2            | 0.0        |
|                                | Total softwoods         | 817.6            | 358.2                         | 328.8           | 130.6          | 0.0        |
| Hardwood types                 | Oak-pine                | 216.7            | 100.3                         | 50.5            | 65.9           | 0.0        |
|                                | Oak-hickory             | 490.8            | 314.0                         | 102.2           | 74.6           | 0.0        |
|                                | Oak-gum-cypress         | 87.7             | 53.6                          | 21.8            | 12.3           | 0.0        |
|                                | Elm-ash-cottonwood      | 28.7             | 16.6                          | 2.9             | 9.2            | 0.0        |
|                                | Maple-beech-birch       | -0.6             | -0.9                          | 0.2             | 0.0            | 0.0        |
|                                | Aspen-birch             | 0.6              | 0.5                           | 0.1             | 0.0            | 0.0        |
|                                | Other hardwoods         | 4.9              | 3.0                           | 1.0             | 0.9            | 0.0        |
|                                | Exotic hardwoods        | 1.9              | 0.0                           | 1.6             | 0.2            | 0.0        |
|                                | Total hardwoods         | 830.7            | 487.2                         | 180.3           | 163.2          | 0.0        |
|                                | Nonstocked              | 2.1              | 0.0                           | 0.0             | 0.0            | 2.1        |
| All groups                     |                         | 1,650.4          | 845.4                         | 509.2           | 293.7          | 2.1        |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on past conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.26**—Average annual net growth of live trees on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018)

| Species group               |                                 | All ownerships | Ownership group <sup>1</sup> |               |                            |                 |                       |
|-----------------------------|---------------------------------|----------------|------------------------------|---------------|----------------------------|-----------------|-----------------------|
|                             |                                 |                | USDA Forest Service          | Other Federal | State and local government | Forest industry | Nonindustrial private |
| million cubic feet per year |                                 |                |                              |               |                            |                 |                       |
| Softwood                    | Longleaf and slash pines        | 23.7           | 0.6                          | 3.9           | 3.6                        | 2.4             | 13.2                  |
|                             | Loblolly and shortleaf pines    | 839.2          | 4.5                          | 9.2           | 41.4                       | 80.0            | 704.2                 |
|                             | Other yellow pines              | 29.0           | 2.9                          | -1.6          | 1.6                        | 0.4             | 25.7                  |
|                             | Eastern white and red pines     | 35.8           | 2.9                          | 0.0           | 1.9                        | -0.4            | 31.4                  |
|                             | Spruce and balsam fir           | 1.1            | 0.8                          | 0.0           | 0.2                        | 0.0             | 0.1                   |
|                             | Eastern hemlock                 | -13.9          | -5.1                         | 0.0           | -0.6                       | 0.0             | -8.2                  |
|                             | Cypress                         | 10.3           | 0.3                          | 0.0           | 1.1                        | 0.3             | 8.8                   |
|                             | Other eastern softwoods         | 4.3            | 0.0                          | 0.2           | 0.1                        | 0.0             | 4.0                   |
|                             | Total softwoods                 | 929.5          | 7.0                          | 11.6          | 49.2                       | 82.6            | 779.2                 |
| Hardwood                    | Select white oaks               | 72.2           | 3.7                          | 0.5           | 2.6                        | 0.5             | 64.9                  |
|                             | Select red oaks                 | 31.6           | 5.2                          | 0.4           | 1.9                        | 0.3             | 23.8                  |
|                             | Other white oaks                | 35.0           | 5.2                          | 0.1           | 2.2                        | 0.4             | 27.0                  |
|                             | Other red oaks                  | 66.9           | 3.2                          | 0.1           | 3.5                        | 0.7             | 59.5                  |
|                             | Hickory                         | 24.5           | 1.5                          | 0.3           | 0.8                        | 0.5             | 21.3                  |
|                             | Yellow birch                    | 1.1            | 0.2                          | 0.0           | 0.0                        | 0.1             | 0.7                   |
|                             | Hard maple                      | 5.5            | 1.2                          | 0.0           | 0.2                        | 0.0             | 4.1                   |
|                             | Soft maple                      | 75.8           | 6.2                          | 0.7           | 4.4                        | 2.0             | 62.5                  |
|                             | Beech                           | 8.5            | 0.1                          | 0.1           | 0.4                        | 0.0             | 7.9                   |
|                             | Sweetgum                        | 91.4           | 0.5                          | 0.5           | 2.1                        | 2.7             | 85.6                  |
|                             | Tupelo and blackgum             | 20.9           | 0.2                          | 0.3           | 1.6                        | 1.4             | 17.4                  |
|                             | Ash                             | 16.2           | 0.3                          | 0.0           | 0.1                        | 0.3             | 15.5                  |
|                             | Cottonwood and aspen            | 2.1            | 0.0                          | 0.0           | 0.4                        | 0.0             | 1.7                   |
|                             | Basswood                        | 1.6            | 0.9                          | 0.0           | 0.0                        | 0.1             | 0.5                   |
|                             | Yellow-poplar                   | 194.4          | 7.8                          | 1.1           | 6.1                        | 0.4             | 179.0                 |
|                             | Black walnut                    | 4.9            | 0.0                          | 0.0           | 0.2                        | 0.1             | 4.5                   |
|                             | Other eastern soft hardwoods    | 42.1           | 3.1                          | -0.9          | 1.6                        | 1.8             | 36.5                  |
|                             | Other eastern hard hardwoods    | 8.8            | 2.1                          | 0.1           | -0.3                       | -0.1            | 7.0                   |
|                             | Eastern noncommercial hardwoods | 17.5           | 1.7                          | 0.5           | 0.4                        | 0.5             | 14.3                  |
|                             | Total hardwoods                 | 720.8          | 43.1                         | 3.8           | 28.4                       | 11.8            | 633.7                 |
| All species                 |                                 | 1,650.4        | 50.1                         | 15.3          | 77.6                       | 94.5            | 1,412.9               |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.27**—Average annual net growth of growing-stock trees on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018)

| Species group               |                                 | All ownerships | Ownership group <sup>1</sup> |               |                            |                 |                       |
|-----------------------------|---------------------------------|----------------|------------------------------|---------------|----------------------------|-----------------|-----------------------|
|                             |                                 |                | USDA Forest Service          | Other Federal | State and local government | Forest industry | Nonindustrial private |
| million cubic feet per year |                                 |                |                              |               |                            |                 |                       |
| Softwood                    | Longleaf and slash pines        | 23.4           | 0.6                          | 3.9           | 3.6                        | 2.4             | 13.0                  |
|                             | Loblolly and shortleaf pines    | 827.2          | 4.4                          | 9.0           | 40.9                       | 79.2            | 693.7                 |
|                             | Other yellow pines              | 26.4           | 3.0                          | -1.5          | 1.3                        | 0.4             | 23.2                  |
|                             | Eastern white and red pines     | 35.8           | 2.9                          | 0.0           | 1.7                        | -0.4            | 31.7                  |
|                             | Spruce and balsam fir           | 1.1            | 0.8                          | 0.0           | 0.2                        | 0.0             | 0.1                   |
|                             | Eastern hemlock                 | -10.6          | -4.7                         | 0.0           | -0.6                       | 0.0             | -5.4                  |
|                             | Cypress                         | 9.3            | 0.3                          | 0.0           | 1.4                        | 0.3             | 7.4                   |
|                             | Other eastern softwoods         | 3.7            | 0.0                          | 0.2           | 0.0                        | 0.0             | 3.4                   |
|                             | Total softwoods                 | 916.3          | 7.3                          | 11.5          | 48.7                       | 81.9            | 767.0                 |
| Hardwood                    | Select white oaks               | 67.4           | 2.9                          | 0.5           | 2.6                        | 0.3             | 61.1                  |
|                             | Select red oaks                 | 30.3           | 4.8                          | 0.4           | 1.9                        | 0.4             | 22.8                  |
|                             | Other white oaks                | 29.6           | 4.8                          | 0.1           | 2.0                        | 0.4             | 22.4                  |
|                             | Other red oaks                  | 60.3           | 3.5                          | 0.2           | 3.1                        | 0.6             | 52.9                  |
|                             | Hickory                         | 22.5           | 1.6                          | 0.3           | 0.9                        | 0.4             | 19.2                  |
|                             | Yellow birch                    | 1.2            | 0.8                          | 0.0           | 0.0                        | 0.0             | 0.4                   |
|                             | Hard maple                      | 4.5            | 0.8                          | 0.0           | 0.2                        | 0.0             | 3.5                   |
|                             | Soft maple                      | 65.1           | 5.9                          | 0.5           | 2.9                        | 1.9             | 54.1                  |
|                             | Beech                           | 7.2            | 0.1                          | 0.0           | 0.4                        | 0.0             | 6.7                   |
|                             | Sweetgum                        | 88.8           | 0.4                          | 0.5           | 2.0                        | 2.4             | 83.4                  |
|                             | Tupelo and blackgum             | 20.9           | 0.1                          | 0.6           | 2.0                        | 1.3             | 16.8                  |
|                             | Ash                             | 15.6           | 0.4                          | 0.0           | 0.3                        | 0.3             | 14.6                  |
|                             | Cottonwood and aspen            | 2.2            | 0.0                          | 0.0           | 0.5                        | 0.0             | 1.7                   |
|                             | Basswood                        | 1.6            | 1.0                          | 0.0           | 0.0                        | 0.1             | 0.4                   |
|                             | Yellow-poplar                   | 189.8          | 8.5                          | 1.1           | 5.9                        | 0.4             | 173.9                 |
|                             | Black walnut                    | 4.0            | 0.0                          | 0.0           | 0.2                        | 0.1             | 3.7                   |
|                             | Other eastern soft hardwoods    | 36.6           | 2.7                          | -0.3          | 1.0                        | 1.6             | 31.6                  |
|                             | Other eastern hard hardwoods    | 9.5            | 2.7                          | 0.1           | -0.1                       | 0.0             | 6.9                   |
|                             | Eastern noncommercial hardwoods | 0.0            | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.0                   |
|                             | Total hardwoods                 | 657.1          | 41.1                         | 3.8           | 25.8                       | 10.1            | 576.2                 |
| All species                 |                                 | 1,573.4        | 48.4                         | 15.3          | 74.5                       | 92.0            | 1,343.2               |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.28**—Average annual net growth of sawtimber on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018)

| Species group               |                                 |         | Ownership group <sup>1</sup> |                     |               |                            |                 |
|-----------------------------|---------------------------------|---------|------------------------------|---------------------|---------------|----------------------------|-----------------|
|                             |                                 |         | All ownerships               | USDA Forest Service | Other Federal | State and local government | Forest industry |
| million board feet per year |                                 |         |                              |                     |               |                            |                 |
| Softwood                    | Longleaf and slash pines        | 106.7   | 2.1                          | 18.5                | 16.2          | 13.4                       | 56.5            |
|                             | Loblolly and shortleaf pines    | 3,428.4 | 37.6                         | 42.6                | 187.0         | 300.9                      | 2,860.3         |
|                             | Other yellow pines              | 131.5   | 14.6                         | -3.2                | 11.0          | 1.3                        | 107.8           |
|                             | Eastern white and red pines     | 212.8   | 18.8                         | 0.0                 | 10.3          | -2.5                       | 186.1           |
|                             | Spruce and balsam fir           | 5.1     | 4.0                          | 0.0                 | 1.0           | 0.0                        | 0.1             |
|                             | Eastern hemlock                 | -41.9   | -18.9                        | 0.0                 | -2.6          | 0.2                        | -20.6           |
|                             | Cypress                         | 46.2    | 1.6                          | 0.0                 | 6.6           | 0.7                        | 37.4            |
|                             | Other eastern softwoods         | 12.3    | 0.0                          | 0.5                 | 0.9           | 0.0                        | 10.9            |
|                             | Total softwoods                 | 3,901.2 | 59.9                         | 58.4                | 230.4         | 314.0                      | 3,238.6         |
| Hardwood                    | Select white oaks               | 318.2   | 15.6                         | 2.0                 | 14.7          | 0.7                        | 285.2           |
|                             | Select red oaks                 | 145.6   | 25.4                         | 1.9                 | 8.9           | 1.3                        | 108.1           |
|                             | Other white oaks                | 144.2   | 23.6                         | 0.4                 | 10.0          | 1.5                        | 108.7           |
|                             | Other red oaks                  | 258.4   | 18.9                         | 1.9                 | 14.9          | 1.3                        | 221.4           |
|                             | Hickory                         | 96.5    | 8.1                          | 1.2                 | 3.9           | 1.8                        | 81.5            |
|                             | Yellow birch                    | 4.9     | 3.8                          | 0.0                 | 0.0           | 0.1                        | 1.0             |
|                             | Hard maple                      | 15.0    | 4.2                          | -0.1                | 0.7           | 0.0                        | 10.2            |
|                             | Soft maple                      | 191.8   | 18.8                         | 0.6                 | 7.3           | 4.7                        | 160.4           |
|                             | Beech                           | 25.6    | -0.5                         | 0.2                 | 1.9           | 0.5                        | 23.3            |
|                             | Sweetgum                        | 277.5   | 1.2                          | 1.7                 | 2.7           | 5.4                        | 266.4           |
|                             | Tupelo and blackgum             | 97.4    | 0.3                          | 2.7                 | 10.8          | 5.6                        | 78.0            |
|                             | Ash                             | 64.3    | 1.5                          | 1.1                 | -0.5          | 0.7                        | 61.6            |
|                             | Cottonwood and aspen            | 11.6    | 0.2                          | 0.0                 | 1.7           | 0.0                        | 9.6             |
|                             | Basswood                        | 9.3     | 3.0                          | 0.0                 | 0.0           | 0.7                        | 5.6             |
|                             | Yellow-poplar                   | 918.2   | 50.3                         | 5.7                 | 33.3          | 0.8                        | 828.1           |
|                             | Black walnut                    | 10.6    | 0.0                          | 0.0                 | 0.7           | 0.6                        | 9.3             |
|                             | Other eastern soft hardwoods    | 108.4   | 7.8                          | 1.6                 | 0.9           | 6.9                        | 91.3            |
|                             | Other eastern hard hardwoods    | 20.2    | 9.1                          | 0.0                 | -0.1          | 0.4                        | 10.8            |
|                             | Eastern noncommercial hardwoods | 0.0     | 0.0                          | 0.0                 | 0.0           | 0.0                        | 0.0             |
|                             | Total hardwoods                 | 2,717.8 | 191.5                        | 20.8                | 111.8         | 33.0                       | 2,360.7         |
| All species                 |                                 | 6,619.1 | 251.4                        | 79.3                | 342.2         | 347.0                      | 5,599.3         |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.29**—Average annual mortality of live trees on timberland by forest-type group and stand-size class, North Carolina, 2018 (2003–2013 to 2009–2018)

| Forest-type group <sup>1</sup> |                         | All classes | Stand-size class <sup>1</sup> |                 |                |            |
|--------------------------------|-------------------------|-------------|-------------------------------|-----------------|----------------|------------|
|                                |                         |             | Large diameter                | Medium diameter | Small diameter | Nonstocked |
| million cubic feet per year    |                         |             |                               |                 |                |            |
| Softwood types                 | White-red-jack pine     | 4.9         | 4.9                           | 0.0             | 0.0            | 0.0        |
|                                | Spruce-fir              | 0.8         | 0.5                           | 0.2             | 0.0            | 0.0        |
|                                | Longleaf-slash pine     | 2.4         | 2.0                           | 0.3             | 0.0            | 0.0        |
|                                | Loblolly-shortleaf pine | 90.4        | 65.1                          | 23.4            | 1.9            | 0.0        |
|                                | Other eastern softwoods | 0.3         | 0.3                           | 0.0             | 0.0            | 0.0        |
|                                | Total softwoods         | 98.8        | 72.9                          | 23.9            | 2.0            | 0.0        |
| Hardwood types                 | Oak-pine                | 39.3        | 30.3                          | 7.6             | 1.3            | 0.0        |
|                                | Oak-hickory             | 150.2       | 125.9                         | 20.7            | 3.6            | 0.0        |
|                                | Oak-gum-cypress         | 49.8        | 39.8                          | 7.0             | 3.0            | 0.0        |
|                                | Elm-ash-cottonwood      | 16.6        | 14.7                          | 1.3             | 0.6            | 0.0        |
|                                | Maple-beech-birch       | 4.1         | 4.1                           | 0.1             | 0.0            | 0.0        |
|                                | Aspen-birch             | 0.0         | 0.0                           | 0.0             | 0.0            | 0.0        |
|                                | Other hardwoods         | 4.1         | 3.7                           | 0.3             | 0.2            | 0.0        |
|                                | Exotic hardwoods        | 0.2         | 0.0                           | 0.1             | 0.0            | 0.0        |
|                                | Total hardwoods         | 264.2       | 218.4                         | 37.1            | 8.7            | 0.0        |
| Nonstocked                     |                         | 0.1         | 0.0                           | 0.0             | 0.0            | 0.1        |
| All groups                     |                         | 363.2       | 291.4                         | 61.0            | 10.7           | 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 &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on past conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.30**—Average annual mortality of live trees on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018)

| Species group |                                 | Ownership group <sup>1</sup> |                     |               |                            |                 |                       |
|---------------|---------------------------------|------------------------------|---------------------|---------------|----------------------------|-----------------|-----------------------|
|               |                                 | All ownerships               | USDA Forest Service | Other Federal | State and local government | Forest industry | Nonindustrial private |
|               |                                 | million cubic feet per year  |                     |               |                            |                 |                       |
| Softwood      | Longleaf and slash pines        | 2.7                          | 0.0                 | 0.5           | 0.3                        | 0.0             | 1.8                   |
|               | Loblolly and shortleaf pines    | 66.3                         | 4.2                 | 0.8           | 3.3                        | 2.3             | 55.7                  |
|               | Other yellow pines              | 39.5                         | 1.3                 | 3.1           | 4.1                        | 0.0             | 31.1                  |
|               | Eastern white and red pines     | 11.4                         | 2.6                 | 0.0           | 0.3                        | 0.8             | 7.8                   |
|               | Spruce and balsam fir           | 0.5                          | 0.2                 | 0.0           | 0.3                        | 0.0             | 0.0                   |
|               | Eastern hemlock                 | 18.0                         | 6.1                 | 0.0           | 0.7                        | 0.0             | 11.1                  |
|               | Cypress                         | 1.4                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 1.3                   |
|               | Other eastern softwoods         | 2.3                          | 0.0                 | 0.0           | 0.5                        | 0.0             | 1.8                   |
|               | Total softwoods                 | 142.2                        | 14.3                | 4.4           | 9.6                        | 3.2             | 110.7                 |
| Hardwood      | Select white oaks               | 8.2                          | 0.9                 | 0.0           | 0.3                        | 0.0             | 6.9                   |
|               | Select red oaks                 | 11.9                         | 2.6                 | 0.0           | 0.5                        | 0.0             | 8.8                   |
|               | Other white oaks                | 13.5                         | 5.9                 | 0.0           | 0.2                        | 0.0             | 7.5                   |
|               | Other red oaks                  | 36.4                         | 4.0                 | 1.0           | 1.1                        | 0.0             | 30.3                  |
|               | Hickory                         | 5.6                          | 0.2                 | 0.0           | 0.3                        | 0.0             | 5.0                   |
|               | Yellow birch                    | 0.5                          | 0.4                 | 0.0           | 0.0                        | 0.0             | 0.2                   |
|               | Hard maple                      | 0.2                          | 0.1                 | 0.0           | 0.0                        | 0.0             | 0.1                   |
|               | Soft maple                      | 31.8                         | 2.5                 | 0.5           | 2.9                        | 0.2             | 25.8                  |
|               | Beech                           | 3.2                          | 1.2                 | 0.1           | 0.0                        | 0.1             | 1.8                   |
|               | Sweetgum                        | 19.5                         | 0.0                 | 0.2           | 3.3                        | 0.1             | 15.9                  |
|               | Tupelo and blackgum             | 14.2                         | 0.6                 | 1.2           | 0.6                        | 0.8             | 11.0                  |
|               | Ash                             | 7.5                          | 0.2                 | 0.1           | 2.0                        | 0.0             | 5.2                   |
|               | Cottonwood and aspen            | 0.2                          | 0.0                 | 0.0           | 0.1                        | 0.0             | 0.1                   |
|               | Basswood                        | 1.4                          | 0.1                 | 0.0           | 0.0                        | 0.0             | 1.4                   |
|               | Yellow-poplar                   | 21.2                         | 0.7                 | 0.0           | 1.1                        | 1.6             | 17.8                  |
|               | Black walnut                    | 0.3                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.2                   |
|               | Other eastern soft hardwoods    | 25.0                         | 0.9                 | 2.8           | 1.5                        | 0.0             | 19.8                  |
|               | Other eastern hard hardwoods    | 13.5                         | 1.8                 | 0.0           | 0.7                        | 0.4             | 10.6                  |
|               | Eastern noncommercial hardwoods | 6.7                          | 1.1                 | 0.2           | 0.4                        | 0.3             | 4.7                   |
|               | Total hardwoods                 | 221.1                        | 23.1                | 6.1           | 15.0                       | 3.7             | 173.2                 |
| All species   |                                 | 363.2                        | 37.4                | 10.5          | 24.6                       | 6.9             | 283.8                 |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.31**—Average annual mortality of growing-stock trees on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018)

| Species group |                                 | Ownership group <sup>1</sup> |                     |               |                            |                 |                       |
|---------------|---------------------------------|------------------------------|---------------------|---------------|----------------------------|-----------------|-----------------------|
|               |                                 | All ownerships               | USDA Forest Service | Other Federal | State and local government | Forest industry | Nonindustrial private |
|               |                                 | million cubic feet per year  |                     |               |                            |                 |                       |
| Softwood      | Longleaf and slash pines        | 2.4                          | 0.0                 | 0.5           | 0.3                        | 0.0             | 1.6                   |
|               | Loblolly and shortleaf pines    | 62.4                         | 4.2                 | 0.8           | 3.3                        | 2.3             | 51.8                  |
|               | Other yellow pines              | 37.0                         | 1.1                 | 2.9           | 3.8                        | 0.0             | 29.3                  |
|               | Eastern white and red pines     | 9.9                          | 2.6                 | 0.0           | 0.3                        | 0.8             | 6.3                   |
|               | Spruce and balsam fir           | 0.4                          | 0.2                 | 0.0           | 0.3                        | 0.0             | 0.0                   |
|               | Eastern hemlock                 | 14.1                         | 5.6                 | 0.0           | 0.7                        | 0.0             | 7.7                   |
|               | Cypress                         | 1.3                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 1.3                   |
|               | Other eastern softwoods         | 1.6                          | 0.0                 | 0.0           | 0.5                        | 0.0             | 1.1                   |
|               | Total softwoods                 | 129.2                        | 13.7                | 4.2           | 9.2                        | 3.2             | 99.0                  |
| Hardwood      | Select white oaks               | 6.9                          | 0.9                 | 0.0           | 0.3                        | 0.0             | 5.6                   |
|               | Select red oaks                 | 10.9                         | 2.4                 | 0.0           | 0.5                        | 0.0             | 8.1                   |
|               | Other white oaks                | 9.6                          | 3.6                 | 0.0           | 0.2                        | 0.0             | 5.8                   |
|               | Other red oaks                  | 32.0                         | 3.1                 | 0.8           | 0.8                        | 0.0             | 27.3                  |
|               | Hickory                         | 4.8                          | 0.2                 | 0.0           | 0.0                        | 0.0             | 4.6                   |
|               | Yellow birch                    | 0.2                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.1                   |
|               | Hard maple                      | 0.2                          | 0.1                 | 0.0           | 0.0                        | 0.0             | 0.1                   |
|               | Soft maple                      | 19.0                         | 1.6                 | 0.3           | 2.4                        | 0.0             | 14.6                  |
|               | Beech                           | 2.3                          | 0.9                 | 0.1           | 0.0                        | 0.1             | 1.3                   |
|               | Sweetgum                        | 16.8                         | 0.0                 | 0.1           | 3.2                        | 0.1             | 13.4                  |
|               | Tupelo and blackgum             | 12.4                         | 0.6                 | 0.7           | 0.4                        | 0.8             | 9.8                   |
|               | Ash                             | 5.8                          | 0.0                 | 0.1           | 1.6                        | 0.0             | 4.1                   |
|               | Cottonwood and aspen            | 0.1                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.1                   |
|               | Basswood                        | 1.4                          | 0.1                 | 0.0           | 0.0                        | 0.0             | 1.3                   |
|               | Yellow-poplar                   | 19.1                         | 0.7                 | 0.0           | 0.9                        | 1.6             | 16.0                  |
|               | Black walnut                    | 0.1                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.1                   |
|               | Other eastern soft hardwoods    | 16.5                         | 0.4                 | 2.0           | 1.2                        | 0.0             | 12.9                  |
|               | Other eastern hard hardwoods    | 8.2                          | 0.6                 | 0.0           | 0.5                        | 0.2             | 6.8                   |
|               | Eastern noncommercial hardwoods | 0.0                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Total hardwoods                 | 166.3                        | 15.1                | 4.1           | 12.0                       | 3.0             | 132.1                 |
| All species   |                                 | 295.5                        | 28.8                | 8.3           | 21.2                       | 6.2             | 231.1                 |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.32**—Average annual mortality of sawtimber on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018)

| Species group               |                                 | All ownerships | Ownership group <sup>1</sup> |               |                            |                 |                       |
|-----------------------------|---------------------------------|----------------|------------------------------|---------------|----------------------------|-----------------|-----------------------|
|                             |                                 |                | USDA Forest Service          | Other Federal | State and local government | Forest industry | Nonindustrial private |
| million board feet per year |                                 |                |                              |               |                            |                 |                       |
| Softwood                    | Longleaf and slash pines        | 9.8            | 0.0                          | 2.7           | 1.0                        | 0.0             | 6.1                   |
|                             | Loblolly and shortleaf pines    | 165.5          | 14.4                         | 3.4           | 10.1                       | 6.7             | 130.9                 |
|                             | Other yellow pines              | 118.1          | 3.2                          | 10.9          | 13.7                       | 0.0             | 90.3                  |
|                             | Eastern white and red pines     | 46.0           | 12.4                         | 0.0           | 1.0                        | 5.1             | 27.4                  |
|                             | Spruce and balsam fir           | 1.2            | 0.0                          | 0.0           | 1.2                        | 0.0             | 0.0                   |
|                             | Eastern hemlock                 | 56.1           | 23.1                         | 0.0           | 3.5                        | 0.0             | 29.6                  |
|                             | Cypress                         | 6.2            | 0.0                          | 0.0           | 0.0                        | 0.0             | 6.2                   |
|                             | Other eastern softwoods         | 2.8            | 0.0                          | 0.0           | 1.3                        | 0.0             | 1.5                   |
|                             | Total softwoods                 | 405.7          | 53.2                         | 17.0          | 31.8                       | 11.8            | 292.0                 |
| Hardwood                    | Select white oaks               | 23.6           | 3.4                          | 0.0           | 0.2                        | 0.0             | 19.9                  |
|                             | Select red oaks                 | 43.2           | 9.4                          | 0.0           | 2.1                        | 0.0             | 31.7                  |
|                             | Other white oaks                | 40.0           | 18.1                         | 0.0           | 0.0                        | 0.0             | 21.9                  |
|                             | Other red oaks                  | 126.7          | 11.7                         | 3.1           | 1.4                        | 0.0             | 110.5                 |
|                             | Hickory                         | 17.0           | 0.5                          | 0.0           | 0.0                        | 0.0             | 16.5                  |
|                             | Yellow birch                    | 0.3            | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.3                   |
|                             | Hard maple                      | 0.0            | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.0                   |
|                             | Soft maple                      | 44.2           | 4.0                          | 0.3           | 7.3                        | 0.0             | 32.6                  |
|                             | Beech                           | 7.6            | 3.3                          | 0.0           | 0.0                        | 0.0             | 4.4                   |
|                             | Sweetgum                        | 56.1           | 0.0                          | 0.0           | 16.4                       | 0.0             | 39.8                  |
|                             | Tupelo and blackgum             | 43.6           | 1.9                          | 2.1           | 0.9                        | 3.5             | 35.1                  |
|                             | Ash                             | 17.6           | 0.0                          | 0.5           | 7.3                        | 0.0             | 9.8                   |
|                             | Cottonwood and aspen            | 0.0            | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.0                   |
|                             | Basswood                        | 2.0            | 0.0                          | 0.0           | 0.0                        | 0.0             | 2.0                   |
|                             | Yellow-poplar                   | 69.4           | 0.0                          | 0.0           | 2.8                        | 8.9             | 57.7                  |
|                             | Black walnut                    | 0.3            | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.3                   |
|                             | Other eastern soft hardwoods    | 36.1           | 0.3                          | 0.0           | 2.7                        | 0.0             | 33.1                  |
|                             | Other eastern hard hardwoods    | 19.9           | 0.7                          | 0.0           | 0.9                        | 0.0             | 18.4                  |
|                             | Eastern noncommercial hardwoods | 0.0            | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.0                   |
|                             | Total hardwoods                 | 547.7          | 53.2                         | 6.1           | 42.1                       | 12.5            | 433.9                 |
| All species                 |                                 | 953.5          | 106.4                        | 23.0          | 73.9                       | 24.3            | 725.9                 |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.33**—Average annual removals of live trees on timberland by forest-type group and stand-size class, North Carolina, 2018 (2003–2013 to 2009–2018)

| Forest-type group <sup>1</sup> |                         | All classes | Stand-size class <sup>1</sup> |                 |                |            |
|--------------------------------|-------------------------|-------------|-------------------------------|-----------------|----------------|------------|
|                                |                         |             | Large diameter                | Medium diameter | Small diameter | Nonstocked |
| million cubic feet per year    |                         |             |                               |                 |                |            |
| Softwood types                 | White-red-jack pine     | 21.5        | 21.5                          | 0.0             | 0.0            | 0.0        |
|                                | Spruce-fir              | 0.4         | 0.0                           | 0.4             | 0.0            | 0.0        |
|                                | Longleaf-slash pine     | 12.3        | 9.5                           | 2.8             | 0.0            | 0.0        |
|                                | Loblolly-shortleaf pine | 559.0       | 403.6                         | 149.5           | 5.8            | 0.0        |
|                                | Other eastern softwoods | 0.1         | 0.1                           | 0.0             | 0.0            | 0.0        |
|                                | Total softwoods         | 593.3       | 434.7                         | 152.7           | 5.9            | 0.0        |
| Hardwood types                 | Oak-pine                | 96.2        | 68.0                          | 25.8            | 2.4            | 0.0        |
|                                | Oak-hickory             | 216.5       | 185.1                         | 27.6            | 3.8            | 0.0        |
|                                | Oak-gum-cypress         | 46.6        | 38.2                          | 6.3             | 2.1            | 0.0        |
|                                | Elm-ash-cottonwood      | 6.9         | 6.5                           | 0.0             | 0.4            | 0.0        |
|                                | Maple-beech-birch       | 0.1         | 0.1                           | 0.0             | 0.0            | 0.0        |
|                                | Aspen-birch             | 0.0         | 0.0                           | 0.0             | 0.0            | 0.0        |
|                                | Other hardwoods         | 0.2         | 0.0                           | 0.2             | 0.0            | 0.0        |
|                                | Exotic hardwoods        | 0.0         | 0.0                           | 0.0             | 0.0            | 0.0        |
|                                | Total hardwoods         | 366.5       | 297.9                         | 59.9            | 8.7            | 0.0        |
| Nonstocked                     |                         | 0.8         | 0.0                           | 0.0             | 0.0            | 0.8        |
| All groups                     |                         | 960.6       | 732.6                         | 212.7           | 14.6           | 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 &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on past conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.34**—Average annual removals of live trees on forest land by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018)

| Species group |                                 | All ownerships              | Ownership group¹    |               |                            |                 |                       |
|---------------|---------------------------------|-----------------------------|---------------------|---------------|----------------------------|-----------------|-----------------------|
|               |                                 |                             | USDA Forest Service | Other Federal | State and local government | Forest industry | Nonindustrial private |
|               |                                 | million cubic feet per year |                     |               |                            |                 |                       |
| Softwood      | Longleaf and slash pines        | 12.8                        | 0.0                 | 0.8           | 1.7                        | 0.6             | 9.7                   |
|               | Loblolly and shortleaf pines    | 540.8                       | 3.4                 | 1.2           | 17.3                       | 103.4           | 415.5                 |
|               | Other yellow pines              | 28.1                        | 0.0                 | 0.6           | 0.7                        | 1.6             | 25.2                  |
|               | Eastern white and red pines     | 24.9                        | 0.0                 | 0.0           | 1.4                        | 0.6             | 22.8                  |
|               | Spruce and balsam fir           | 0.0                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Eastern hemlock                 | 1.1                         | 0.0                 | 0.0           | 0.0                        | 0.1             | 1.0                   |
|               | Cypress                         | 1.8                         | 0.0                 | 0.0           | 0.0                        | 0.1             | 1.7                   |
|               | Other eastern softwoods         | 2.3                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 2.3                   |
|               | Total softwoods                 | 611.7                       | 3.4                 | 2.6           | 21.2                       | 106.3           | 478.2                 |
| Hardwood      | Select white oaks               | 41.3                        | 0.0                 | 0.0           | 1.6                        | 0.1             | 39.6                  |
|               | Select red oaks                 | 11.6                        | 0.0                 | 0.0           | 0.1                        | 0.0             | 11.5                  |
|               | Other white oaks                | 8.2                         | 0.0                 | 0.0           | 0.2                        | 0.0             | 7.9                   |
|               | Other red oaks                  | 43.1                        | 0.1                 | 0.2           | 0.9                        | 0.4             | 41.6                  |
|               | Hickory                         | 9.0                         | 0.0                 | 0.0           | 0.1                        | 0.0             | 8.9                   |
|               | Yellow birch                    | 0.0                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Hard maple                      | 1.0                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 1.0                   |
|               | Soft maple                      | 39.6                        | 0.2                 | 0.0           | 0.5                        | 3.7             | 35.2                  |
|               | Beech                           | 5.4                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 5.4                   |
|               | Sweetgum                        | 46.5                        | 0.0                 | 0.0           | 0.2                        | 3.9             | 42.4                  |
|               | Tupelo and blackgum             | 22.6                        | 0.0                 | 0.0           | 0.0                        | 9.6             | 13.0                  |
|               | Ash                             | 5.0                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 5.0                   |
|               | Cottonwood and aspen            | 0.0                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Basswood                        | 1.0                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 1.0                   |
|               | Yellow-poplar                   | 92.6                        | 0.2                 | 0.0           | 4.5                        | 2.0             | 85.9                  |
|               | Black walnut                    | 0.6                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.6                   |
|               | Other eastern soft hardwoods    | 8.6                         | 0.0                 | 0.1           | 0.2                        | 0.2             | 8.0                   |
|               | Other eastern hard hardwoods    | 6.9                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 6.9                   |
|               | Eastern noncommercial hardwoods | 6.5                         | 0.0                 | 0.0           | 0.2                        | 0.5             | 5.7                   |
|               | Total hardwoods                 | 349.6                       | 0.5                 | 0.4           | 8.6                        | 20.4            | 319.7                 |
| All species   |                                 | 961.3                       | 3.9                 | 3.0           | 29.7                       | 126.7           | 797.9                 |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.35**—Average annual removals of growing-stock trees on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018)

| Species group |                                 | All ownerships              | Ownership group <sup>1</sup> |               |                            |                 |                       |
|---------------|---------------------------------|-----------------------------|------------------------------|---------------|----------------------------|-----------------|-----------------------|
|               |                                 |                             | USDA Forest Service          | Other Federal | State and local government | Forest industry | Nonindustrial private |
|               |                                 | million cubic feet per year |                              |               |                            |                 |                       |
| Softwood      | Longleaf and slash pines        | 12.8                        | 0.0                          | 0.8           | 1.7                        | 0.6             | 9.7                   |
|               | Loblolly and shortleaf pines    | 532.0                       | 3.4                          | 1.2           | 17.3                       | 102.6           | 407.6                 |
|               | Other yellow pines              | 25.8                        | 0.0                          | 0.1           | 0.6                        | 1.6             | 23.6                  |
|               | Eastern white and red pines     | 24.8                        | 0.0                          | 0.0           | 1.4                        | 0.6             | 22.8                  |
|               | Spruce and balsam fir           | 0.0                         | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Eastern hemlock                 | 1.0                         | 0.0                          | 0.0           | 0.0                        | 0.1             | 0.9                   |
|               | Cypress                         | 1.8                         | 0.0                          | 0.0           | 0.0                        | 0.1             | 1.7                   |
|               | Other eastern softwoods         | 1.4                         | 0.0                          | 0.0           | 0.0                        | 0.0             | 1.4                   |
|               | Total softwoods                 | 599.6                       | 3.4                          | 2.0           | 21.1                       | 105.5           | 467.5                 |
| Hardwood      | Select white oaks               | 39.2                        | 0.0                          | 0.0           | 1.3                        | 0.1             | 37.8                  |
|               | Select red oaks                 | 11.5                        | 0.0                          | 0.0           | 0.1                        | 0.0             | 11.4                  |
|               | Other white oaks                | 7.5                         | 0.0                          | 0.0           | 0.2                        | 0.0             | 7.2                   |
|               | Other red oaks                  | 39.9                        | 0.1                          | 0.1           | 0.7                        | 0.3             | 38.6                  |
|               | Hickory                         | 8.5                         | 0.0                          | 0.0           | 0.1                        | 0.0             | 8.4                   |
|               | Yellow birch                    | 0.0                         | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Hard maple                      | 1.0                         | 0.0                          | 0.0           | 0.0                        | 0.0             | 1.0                   |
|               | Soft maple                      | 30.0                        | 0.2                          | 0.0           | 0.3                        | 2.6             | 26.8                  |
|               | Beech                           | 5.2                         | 0.0                          | 0.0           | 0.0                        | 0.0             | 5.2                   |
|               | Sweetgum                        | 43.9                        | 0.0                          | 0.0           | 0.2                        | 3.4             | 40.3                  |
|               | Tupelo and blackgum             | 21.4                        | 0.0                          | 0.0           | 0.0                        | 9.2             | 12.2                  |
|               | Ash                             | 4.8                         | 0.0                          | 0.0           | 0.0                        | 0.0             | 4.8                   |
|               | Cottonwood and aspen            | 0.0                         | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Basswood                        | 0.9                         | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.9                   |
|               | Yellow-poplar                   | 91.1                        | 0.2                          | 0.0           | 4.3                        | 2.0             | 84.7                  |
|               | Black walnut                    | 0.4                         | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.4                   |
|               | Other eastern soft hardwoods    | 5.7                         | 0.0                          | 0.0           | 0.1                        | 0.1             | 5.5                   |
|               | Other eastern hard hardwoods    | 4.9                         | 0.0                          | 0.0           | 0.0                        | 0.0             | 4.8                   |
|               | Eastern noncommercial hardwoods | 0.0                         | 0.0                          | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Total hardwoods                 | 315.7                       | 0.5                          | 0.1           | 7.4                        | 17.7            | 290.0                 |
| All species   |                                 | 915.4                       | 3.9                          | 2.1           | 28.5                       | 123.2           | 757.6                 |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.

## NORTH CAROLINA'S FORESTS, 2018

**Table A4.36**—Average annual removals of sawtimber on timberland by species group and ownership group, North Carolina, 2018 (2003–2013 to 2009–2018)

| Species group |                                 | Ownership group <sup>1</sup> |                     |               |                            |                 |                       |
|---------------|---------------------------------|------------------------------|---------------------|---------------|----------------------------|-----------------|-----------------------|
|               |                                 | All ownerships               | USDA Forest Service | Other Federal | State and local government | Forest industry | Nonindustrial private |
|               |                                 | million board feet per year  |                     |               |                            |                 |                       |
| Softwood      | Longleaf and slash pines        | 47.0                         | 0.0                 | 3.1           | 2.9                        | 1.3             | 39.7                  |
|               | Loblolly and shortleaf pines    | 2,045.0                      | 14.6                | 6.0           | 85.7                       | 448.0           | 1,490.7               |
|               | Other yellow pines              | 78.2                         | 0.0                 | 0.1           | 1.3                        | 8.2             | 68.7                  |
|               | Eastern white and red pines     | 143.2                        | 0.0                 | 0.0           | 7.6                        | 3.6             | 132.0                 |
|               | Spruce and balsam fir           | 0.0                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Eastern hemlock                 | 3.1                          | 0.0                 | 0.0           | 0.0                        | 0.2             | 2.9                   |
|               | Cypress                         | 7.6                          | 0.0                 | 0.0           | 0.0                        | 0.3             | 7.2                   |
|               | Other eastern softwoods         | 2.8                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 2.8                   |
|               | Total softwoods                 | 2,326.9                      | 14.6                | 9.2           | 97.5                       | 461.7           | 1,743.9               |
| Hardwood      | Select white oaks               | 151.2                        | 0.0                 | 0.0           | 4.5                        | 0.0             | 146.6                 |
|               | Select red oaks                 | 45.1                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 45.1                  |
|               | Other white oaks                | 22.6                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 22.6                  |
|               | Other red oaks                  | 134.7                        | 0.0                 | 0.0           | 1.0                        | 0.9             | 132.9                 |
|               | Hickory                         | 26.3                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 26.3                  |
|               | Yellow birch                    | 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                   |
|               | Soft maple                      | 67.4                         | 0.0                 | 0.0           | 0.3                        | 4.3             | 62.8                  |
|               | Beech                           | 16.0                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 16.0                  |
|               | Sweetgum                        | 99.4                         | 0.0                 | 0.0           | 0.3                        | 2.4             | 96.7                  |
|               | Tupelo and blackgum             | 64.9                         | 0.0                 | 0.0           | 0.0                        | 28.1            | 36.8                  |
|               | Ash                             | 13.8                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 13.8                  |
|               | Cottonwood and aspen            | 0.0                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Basswood                        | 3.8                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 3.8                   |
|               | Yellow-poplar                   | 403.6                        | 0.0                 | 0.0           | 17.8                       | 7.5             | 378.3                 |
|               | Black walnut                    | 0.0                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Other eastern soft hardwoods    | 9.5                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 9.5                   |
|               | Other eastern hard hardwoods    | 10.6                         | 0.0                 | 0.0           | 0.0                        | 0.0             | 10.6                  |
|               | Eastern noncommercial hardwoods | 0.0                          | 0.0                 | 0.0           | 0.0                        | 0.0             | 0.0                   |
|               | Total hardwoods                 | 1,072.2                      | 0.0                 | 0.0           | 23.8                       | 43.2            | 1,005.3               |
| All species   |                                 | 3,399.1                      | 14.6                | 9.2           | 121.3                      | 504.8           | 2,749.2               |

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

0.0 = no sample for the cell or a value of &gt;0.0 but &lt;0.05.

<sup>1</sup> Based on current conditions.



**Brown, M.J.; Lambert, S.G.** 2024. North Carolina's forests, 2018. Resour. Bull. SRS-239. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 93 p. <https://doi.org/10.2737/SRS-RB-239>.

The principal findings from five panels of the 10<sup>th</sup> forest survey of North Carolina are presented. In 2018, forests covered nearly 18.8 million acres of the State, of which 18.1 million were classified as timberland. Oak-hickory was the most common forest-type group and covered 6.9 million acres of the timberland. The second most common forest-type group was loblolly-shortleaf pine, which covered 5.8 million acres of timberland. Nonindustrial private forest ownerships hold 82 percent of the State's timberland. Hardwood tree species accounted for 63 percent of the 42.3 billion cubic feet all-live wood volume that occurred on the State's timberland. Total net growth of all-live trees on timberland averaged almost 1.7 billion cubic feet and removals averaged 1.0 billion cubic feet.

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



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