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Maryland Forests 2018: Summary Report



Citation

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Abstract

This summary report provides an overview of the current conditions, changing trends, issues, and threats to Statewide forest resources based on findings from the 2018 inventory of Maryland's forests based on data collected from 2012 through 2018. There are an estimated 2.4 million acres of forest land in Maryland primarily in private ownership (72 percent). Forest land is dominated by the oak/hickory forest-type group which occupies 59 percent of the total forest land area. Since 2013, growing-stock volume increased by 3 percent, totaling 5.7 billion cubic feet in 2018. Annual net growth of growing-stock trees on timberland averages 110 million cubic feet, and the ratio of net growth-to-removals (2.9:1.0) increased slightly from what was reported in 2008 (2.7:1.0). This report includes additional information on forest attributes, land-use change, carbon, timber products, and forest health. A detailed interactive report and supplemental information, including (1) tables summarizing quality assurance, (2) a core set of tabular estimates for a variety of forest resources, and (3) user and database guides can be accessed at <https://doi.org/10.2737/NRS-RB-148>.

Keywords: forest resources, forest health, volume, biomass, carbon, habitat

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Cover photo: Sunset view from Annapolis Rocks, along the Appalachian Trail on South Mountain, Maryland. Licensed photo by jonbilous/Adobe Stock.

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Contents

Highlights..... 1

Background..... 2

Forest Features..... 4

Forest Resource Attributes..... 11

Forests and People 18

Forest Ecosystem Services..... 26

References..... 30

Appendix—Tree Species in Maryland..... 32

Interactive Report available at: <https://doi.org/10.2737/NRS-RB-148>.

Maryland Forests Quality Assurance Tables available at: <https://doi.org/10.2737/NRS-RB-148>.

Maryland Forests Summary Tablesavailable at: <https://doi.org/10.2737/NRS-RB-148>.

Maryland Forests Database .csv Filesavailable at: <https://doi.org/10.2737/NRS-RB-148>.

User and Database Guides..... available at: <https://doi.org/10.2737/NRS-RB-148>.

Highlights

On the Plus Side

- Successive inventories since the early 1960s in Maryland have shown forest land area decreasing, however there has been little change in forest area since the first full annual inventory was completed in 2008.
- Over the last 5 years, loblolly pine has replaced sweetgum as the second most numerous species in the State, and loblolly pine is the most abundant sawtimber-sized tree with nearly twice as many stems as the second most prevalent sawtimber-sized tree, red maple.
- Trees contain 5.7 billion cubic feet of growing-stock volume in Maryland, an increase of 3 percent from 2013 to 2018.
- Sawtimber volume in the State increased 5 percent from 2008 to 2013 and 5 percent again from 2013 to 2018.
- Net growth of growing-stock trees on timberland averages 110 million cubic feet in the State, and the ratio of net growth-to-removals (2.9:1.0) increased slightly from what was reported for 2008 (2.7:1.0).
- Trees cover 52 percent of the urban land in Maryland and offer a wide range of benefits to urban residents including the improvement of air and water quality, cooling effects, aesthetic appeal and visual barriers, and mitigation of rainfall runoff and flooding.
- Despite activity by several damaging forest pests, the trees of most of the important species in the forests of Maryland generally have healthy crowns.
- Total forest ecosystem carbon stocks in Maryland are an estimated 255 million tons. This represents an increase of nearly 3 percent since 2008 and is largely attributed to a maturing forest.

Issues to Watch

- The most prevalent forest-type group in Maryland, the oak/hickory group, has decreased in area over the last decade. This may be related to declines in oak species attributed to a combination of factors including an aging oak population, inadequate regeneration, invasive pests, and climate.
- Among tree species having at least 2 percent of total hardwood sawtimber volume, American beech has the lowest percentage of volume in grade 1 trees at just 5 percent, due in part to cankers caused by beech bark disease.
- The proportion of timberland in sawtimber-sized stands has increased to 79 percent in Maryland, and this, coupled with an increase in stand age indicate a maturing forest resource. Maintaining a diverse range of size and age classes will be an important part of future forest sustainability in Maryland.
- Seventy-two percent of Maryland's forest land is privately owned, the majority of which is in family forest ownerships. Given the average age of family forest owners in the State is 64 years, many acres of land will be passing on to the next generation soon.

- Urbanization is affecting an increasing amount of forest area in Maryland, including areas of forest that are intact and unfragmented.
- The impact of emerald ash borer activity continues to be detected, with the average annual mortality of ash increasing from 669 thousand cubic feet in 2013 to 3.9 million cubic feet in 2018.
- Invasive plant species are a concern in Maryland, being recorded on 61 percent of plots monitored. Multiflora rose is the most prevalent invasive species.

Background

What is FIA?

The U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis (FIA) program, is often referred to as the Nation's forest census. FIA is a national program that conducts and maintains a comprehensive inventory of forest resources in the United States and its territories. Key definitions, data collection methods, and estimation procedures are summarized in this report. For more detailed information, see "Statistics and Quality Assurance for the Northern Research Station Forest Inventory and Analysis Program" (Gormanson et al. 2023).

Visit the [National FIA program](#) website for additional information.

What is this report?

This report summarizes the findings of the eighth survey of the forest resources of Maryland and is based on sample plots measured from 2012 through 2018, collectively referred to as the 2018 inventory. The content is broken into chapters that focus on forest features, forest resource attributes, forests and people, and forest ecosystem services. This summary report and additional resource materials are available online at <https://doi.org/10.2737/NRS-RB-148>.

More detailed results are available in the [Maryland Forests 2018: Interactive Report StoryMap collection](#) (Fig. 1). It includes interactive maps, charts, and dashboards that summarize data and illustrate trends, making it easy for readers to compare between inventory periods, geographic locations, or ecological divisions. This document offers a summary of those results.

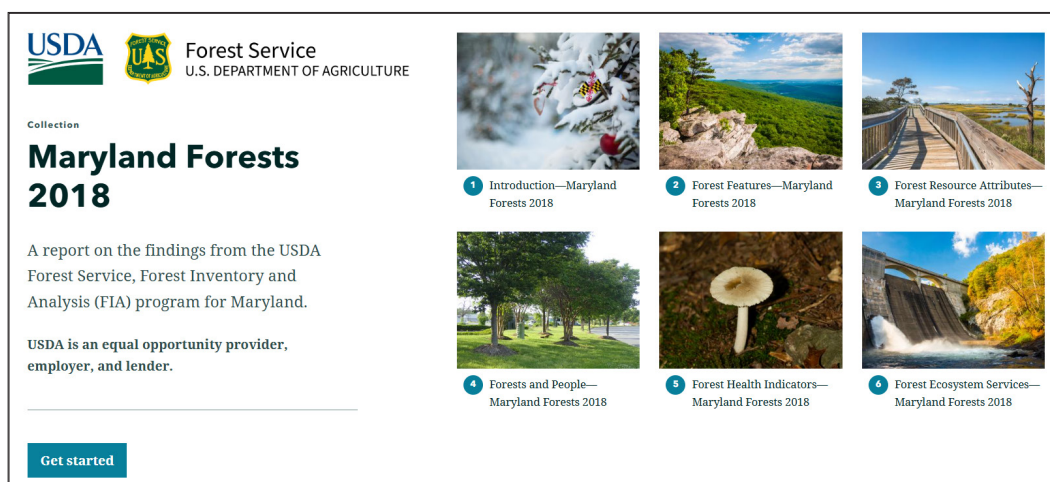


Figure 1.—The Maryland Forests 2018: Interactive Report, which contains a series of StoryMaps that focus on different forest aspects. In the interactive report, select the Get Started button or one of the photos to view an individual StoryMap within the collection.

Maryland Forest Inventories

Information on the condition and status of forests in Maryland was obtained from the U.S. Forest Service, Northern Research Station, Forest Inventory and Analysis (NRS-FIA) program.

Prior to 2000, inventories were conducted periodically, or approximately once every 10 to 20 years. Previous periodic inventories were completed in 1950 (Northeastern Forest Exp. Stn. 1955), 1964 (Ferguson 1967), 1976 (Powell and Kingsley 1980), 1986 (Frieswyk and DiGiovanni 1988), and 1999 (Frieswyk 2001).

Maryland began annual inventories in 2004. Under the annual inventory system, approximately one-fifth of all field plots were measured each year. This resulted in a completed inventory every 5 years, with estimates being produced using a 5-year moving average. A comprehensive report based on annual inventory data was completed in 2008 (Lister et al. 2011). In 2014, Maryland moved from a 5-year cycle, completing 20 percent of plots annually to a 7-year cycle, completing 14.3 percent of plots annually. For this report, plots measured from 2012 through 2018 are collectively referred to as the 2018 inventory.

For the 2018 inventory, current estimates of forest area, composition, volume, and other statistics are based on 983 plots. Estimates of change (e.g., forest area change, growth, mortality, and removals) are based on 932 plots that were measured both during the 2018 inventory cycle and the previous cycle which ended in 2013. Information published in this report and in related tables is based on Forest Inventory and Analysis Database (FIADB), collected under NRS field guides 4.0 to 7.2 and compiled in the National Information Management System (NIMS). Version 7.2 of the FIA field methods guide was released October 2017 (USDA Forest Service 2017). It describes the current set of nationally consistent core field procedures used by all FIA units for projects that begin after the date of release. This version of the field guide covers all core and core optional measurements collected on Nationwide Forest Inventory (NFI) or phase 2 plots (the standard base FIA sample grid, each sample location represents approximately 6,000 acres). See Bechtold and Patterson (2005) and Gormanson et al. (2023) for definitions and technical details. FIA estimates, tabular data, and maps may be generated using the various applications in the [FIA Data and Tools](#) page.

Forest Features

Forest Area

Maryland hosts a unique mix of physiographic, ecological, economic, and demographic conditions. Surrounding the Nation's Capital, encompassing Baltimore, and containing a section of the U.S. Interstate 95 corridor, the landscape of the central and eastern portion of the State is characterized by a mixture of urban and suburban land uses interspersed with agricultural and other human-impacted ecosystems. The Chesapeake Bay is the dominant natural feature in this portion of the State, thus wetland and riparian forests are also prominent. In Maryland's "Eastern Shore," which includes land east of the Chesapeake Bay, forest land has a large softwood component including most of the State's loblolly pine resource. In the western portion of Maryland, oak/hickory and northern hardwood forests begin to dominate in the areas that exhibit more topographic relief. These forests, and those that remain in the more developed eastern portions of the State, play a critical role in the protection of water quality, maintenance of biodiversity, generation of wood products, sequestration and storage of carbon, and other ecosystem services that contribute to Maryland's unique role in the mid-Atlantic region.

Given the importance of Maryland's forests, it is vital to track their distribution and extent, and to monitor changes in the forest area over time. The amount of forest land and timberland are vital measures for assessing forest resources and making informed decisions about their management. Gains or losses in forest area are an indication of forest sustainability, ecosystem health, and land-use practices, and they have a direct effect on the ability of forests to provide goods and services.

There are an estimated 2.4 million acres of forest land in Maryland. Timberland accounts for 88 percent of this forest land or 2.1 million acres. An estimated 12 percent of forest land is reserved from timber production and less than 1/4 percent is other forest land identified as not meeting minimum productivity standards.

As the distribution of forest land varies across the State, it's helpful to summarize the forest resource spatially. FIA groups contiguous counties that have similar forest cover, soil, and economic conditions into geographic units, referred to in this report as FIA units or inventory units. The greatest concentration of forest is found in Maryland's western inventory unit; Allegany County hosts 212,084 acres of forest land or 76 percent of the land area, and Garrett County has 273,156 acres of forest, covering 67 percent of the land area. The percentage of forest land is lowest in the north central inventory unit, especially in Baltimore City (4 percent), and the counties of Carroll (17 percent), Anne Arundel (19 percent), Caroline (26 percent), and Cecil (26 percent) (Fig. 2).

Successive inventories since the early 1960s have shown a consistent decrease in forest land area, however, there has been little change in forest area since the first full annual inventory was completed in 2008 (Fig. 3). Over the same time period, the proportion of forest land area considered to be timberland has decreased. This is due in part to changes in how FIA classifies reserved land.

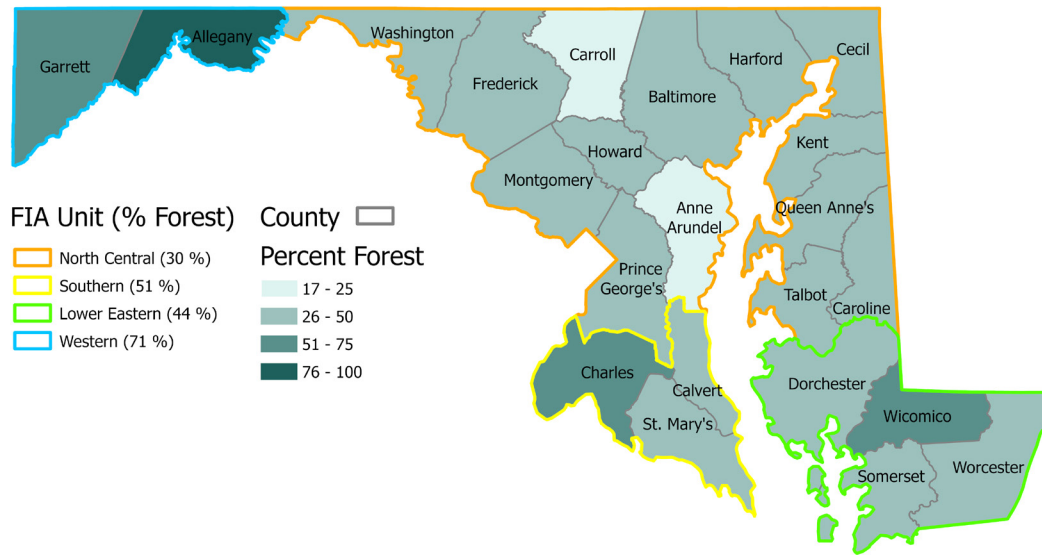


Figure 2.—Percent of land area in forest by county and FIA inventory unit, Maryland, 2018.

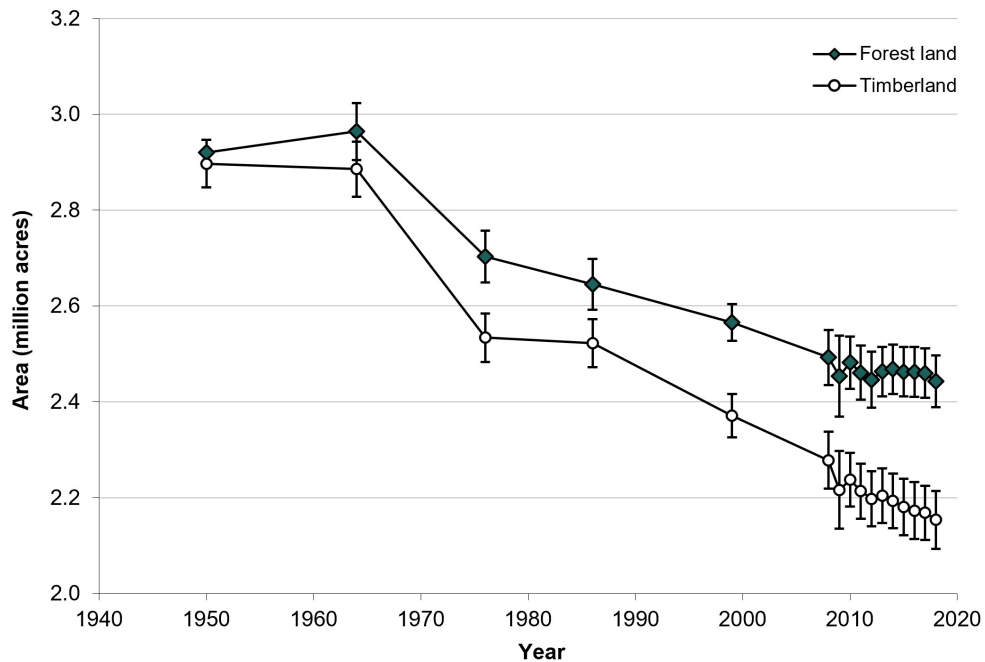


Figure 3.—Forest land and timberland area by year, Maryland. Error bars represent a 68 percent confidence interval.

Forest change dynamics in Maryland are due to a complex interaction of patterns of population growth, land development, reversion of agricultural land to forest, conservation policies and the availability of land open to development. Despite having one of the highest population density levels among states in the nation and experiencing the pressure of urban expansion as the population grows, Maryland has maintained a relatively high proportion of forest land. This is due in part to the pioneering policies that have been adopted in the State including Maryland’s reforestation law (State of Maryland 1989), the Forest Conservation Act of 1991 (State of Maryland 1991), and the Forest Preservation Act of 2013 (FPA 2013) which set the goal of “No Net Loss of Forest” in Maryland.

Future changes in Maryland's forest land base will depend on the pace of land development and the economics of farming, as well as forest disturbance, management, and climate regimes. Over the past 10 years, the rate of land development in Allegany and Garrett Counties has increased; as these counties have the largest blocks of contiguous forest in the State, continued development increases vulnerability to habitat fragmentation and poses risks to wildlife, water quality, and aesthetic value. As land available for development becomes scarcer in the central and eastern counties, it is likely that more pressure will be put on these relatively intact forests to the west.

Land-use Change

Forests cover 37 percent of Maryland's land area; terrestrial nonforest land uses and water comprise the remaining 56 and 7 percent, respectively. Of terrestrial land uses, 39 percent of area is forest land, providing a critical resource and offering a wide range of benefits. FIA further characterizes land area by using several land use categories, which are aggregated for this report into agriculture, developed, forest, pasture/rangeland, water, wetlands, and other land (including undeveloped beaches, nonvegetated lands, and persisting snow and ice). The conversion of forest land to nonforest and water uses is referred to as gross forest loss (or diversion), and the conversion of nonforest land and water to forest is known as gross forest gain (or reversion). The magnitude of the difference between gross loss and gross gain is defined as net forest change. By comparing the land uses on current Maryland inventory plots (2012 through 2018) with the land uses recorded for the same plots measured during the previous inventory (2009 through 2013), hereafter referred to as 2018 and 2013, we can characterize forest land-use change dynamics. The total area of forest land in Maryland has seen a 0.16 percent average annual rate of decrease since the previous inventory. Understanding land-use change dynamics is essential for monitoring the sustainability of Maryland's forest resources and helps land managers make informed policy decisions.

Forest land area in Maryland comprises about 2.4 million acres; other land uses cover almost 4.3 million acres of the States' surface area. Between 2013 and 2018, just over 35 percent of the land use in Maryland remained forested, 63 percent remained in a nonforest land use, and over 2 percent of land area experienced change, either as forest diversions or reversions. The amount of forest that diverted to nonforest land (112,000 acres) exceeded the amount of nonforest reverted to new forest (33,000 acres), leading to a net loss in total forest land area (Fig. 4). Gains in forest land came mostly from developed and agricultural land uses (59 and 32 percent, respectively). Thirty-nine percent of the gross forest loss went to developed land uses and 34 percent to agriculture. While the shift from developed land uses to forest land may seem surprising, it is not at all uncommon. Small changes in maintenance lines, changes in ownership, or both can result in areas meeting minimum forest land size and canopy cover thresholds.

There were more gross losses of forest land than gross gains, resulting in a net loss of 20,000 acres of forest land. Gains and losses from multiple causes are driving forest land-use change dynamics in Maryland. Movement between forest and nonforest classifications may be a result of land meeting or not meeting FIA's definition of forest land due to small changes in understory disturbance, forest extent, or forest cover. Thus, some reported changes are not necessarily permanent.

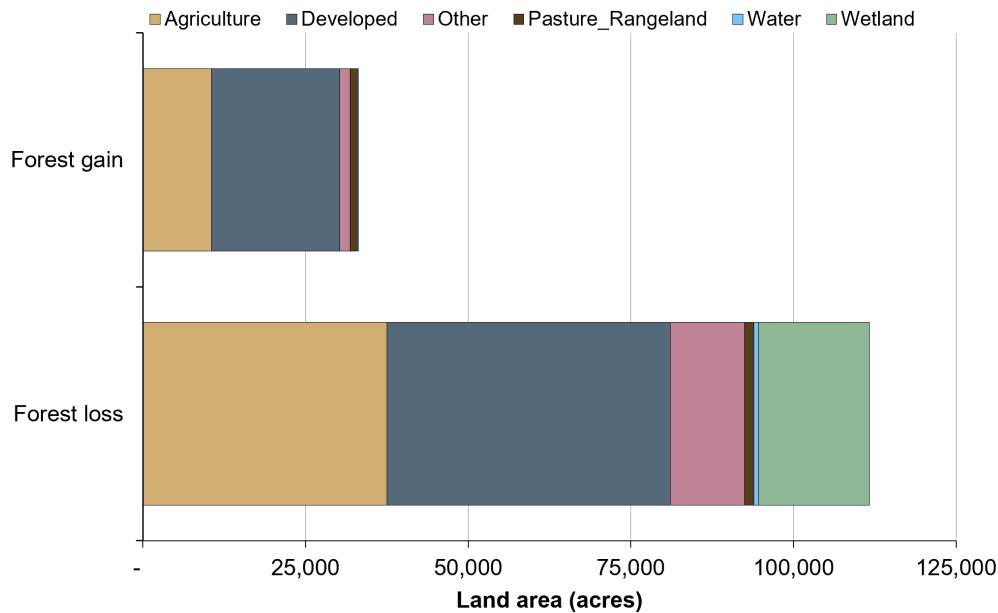


Figure 4.—Gross area forest loss and forest gain by land-use category, Maryland, 2009–2013 to 2012–2018. The “other” land use category includes undeveloped beaches and nonvegetated land not qualifying as another of the listed land uses.

Tree Species Composition

The species composition of a forest is the result of the long-term interaction of climate, soils, disturbance, competition among trees species, and other factors. Causes of forest disturbances in Maryland include timber harvesting, insects and diseases, ice storms, droughts, wildfires, and land clearing followed by abandonment. White-tailed deer (*Odocoileus virginianus*) can also impact species composition by heavily browsing some species while avoiding others. As forests recover from disturbances and mature, changes in growing conditions often favor the growth of shade-tolerant species over shade-intolerant species in the understory unless forest management practices intervene to work toward the perpetuation of shade intolerant species.

The 2018 inventory identified 88 tree species in Maryland (see Appendix). Eighty-two percent of the State (2 million acres) is predominately occupied by stands of hardwood species, and 13 percent (416,719 acres) is predominately occupied by softwood species. There are over 6 billion trees (greater than 1.0-inch in diameter at breast height [d.b.h.]) on forest land in the State and red maple is the most abundant tree totaling over 214 million stems (Fig. 5). The other top species by number are loblolly pine, sweetgum, and American holly.

Across successive inventories since 2008, the number of live trees within individual species has seen some fluctuations; most notably, red maple which has decreased in abundance by 12 percent since 2013, and loblolly pine which has increased by 71 percent during the same period. Despite the losses, red maple is still the most abundant species. Loblolly pine now outnumbers sweetgum as the second most abundant tree greater than 1.0-inch in diameter in Maryland. Loss and gain in abundance of red maple and loblolly pine, respectively, occurred across all tree size classes, but the largest percent changes were in trees less than 5.0 inches in diameter (sapling-sized trees).

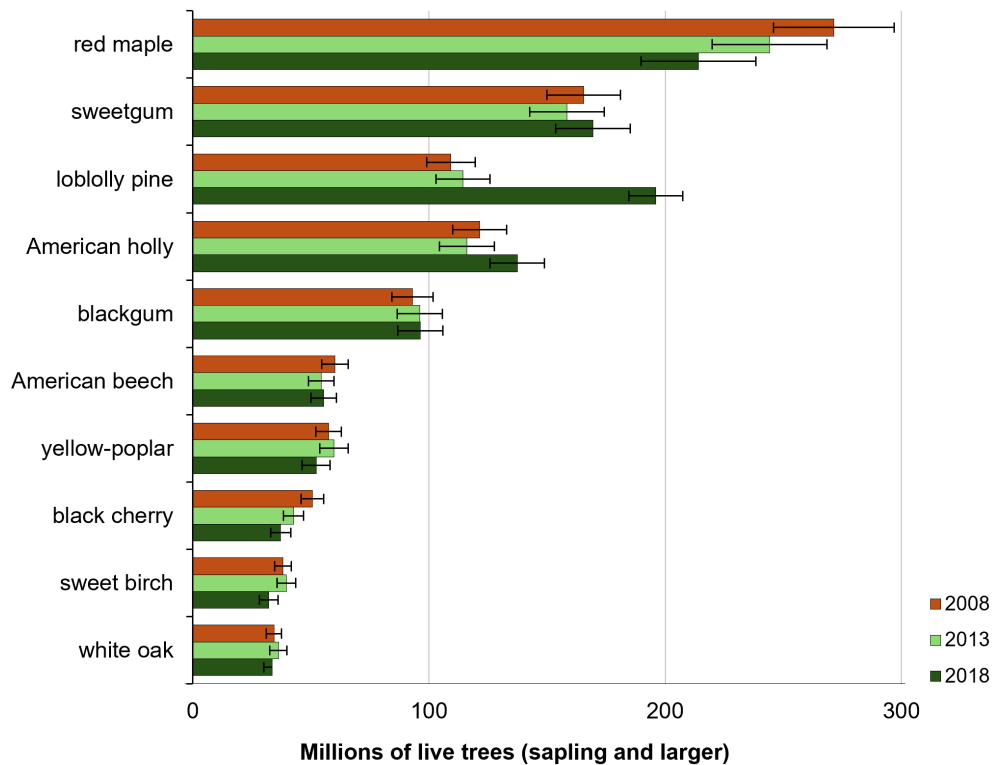


Figure 5.—Number of live trees (sapling or larger, at least 1.0-inch d.b.h.) on forest land by species and inventory year, Maryland. Error bars represent a 68 percent confidence interval.

Approximately 10 percent of the trees in Maryland are sawtimber size (149 million), representing more than 77 different tree species (Fig. 6). Sawtimber-sized trees are at least 9.0 inches d.b.h. for softwoods and at least 11.0 inches d.b.h. for hardwoods. The top sawtimber species are loblolly pine, red maple, yellow-poplar, and white oak, which collectively account for more than half the total number of sawtimber trees in Maryland. Since 2013, the abundance of the most prominent sawtimber species has generally remained the same, with the exception of loblolly pine which has increased since 2008.

In the seedling size class, which includes trees less than 1.0-inch in diameter, pawpaw is the most numerous species followed by red maple, sweetgum, American holly, and loblolly pine (Fig. 7). Although pawpaw ranks high in seedling size trees, this species rarely grows to sawtimber size and is usually confined to the understory. Since 2008, the total number of seedlings on forest land has been decreasing. Assessing trends in the number of seedlings by species is challenging due to the variability associated with the estimates. The confidence intervals for each year's estimate by species generally overlap, but red maple, sweetgum, and black cherry appear to show the largest, most consistent decrease in numbers of seedlings since 2008. Since 2008, there have also been decreases in the proportion of oak species represented within each tree size class (seedling, sapling, poletimber, and sawtimber).

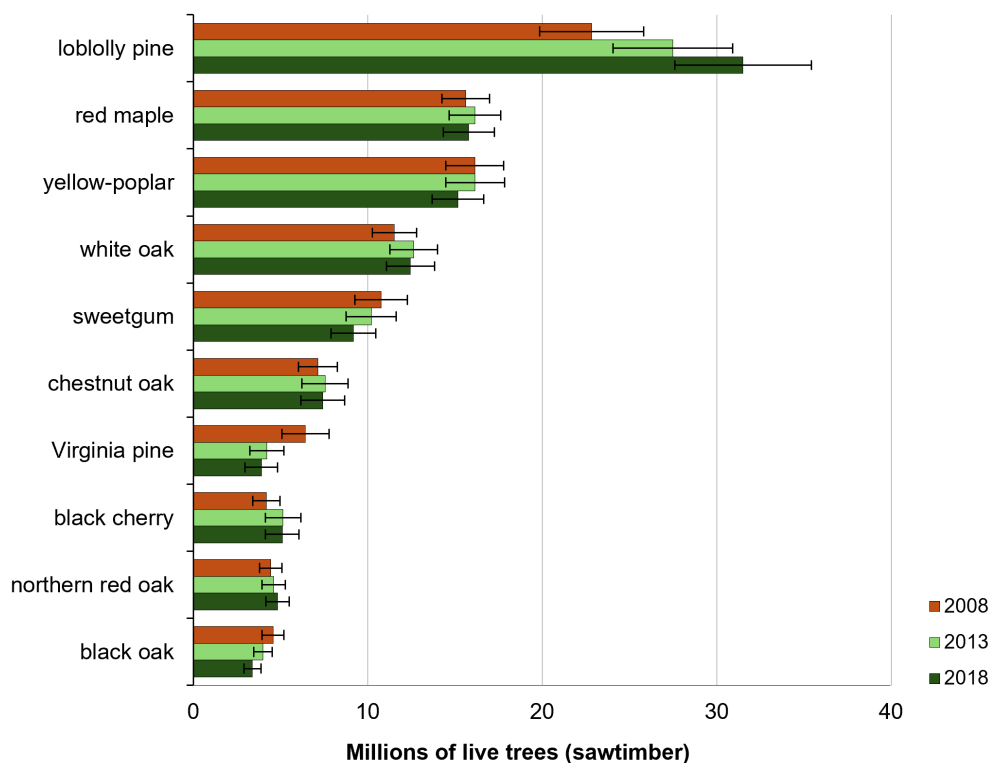


Figure 6.—Number of live sawtimber-size trees on forest land by species and inventory year, Maryland. Error bars represent a 68 percent confidence interval.

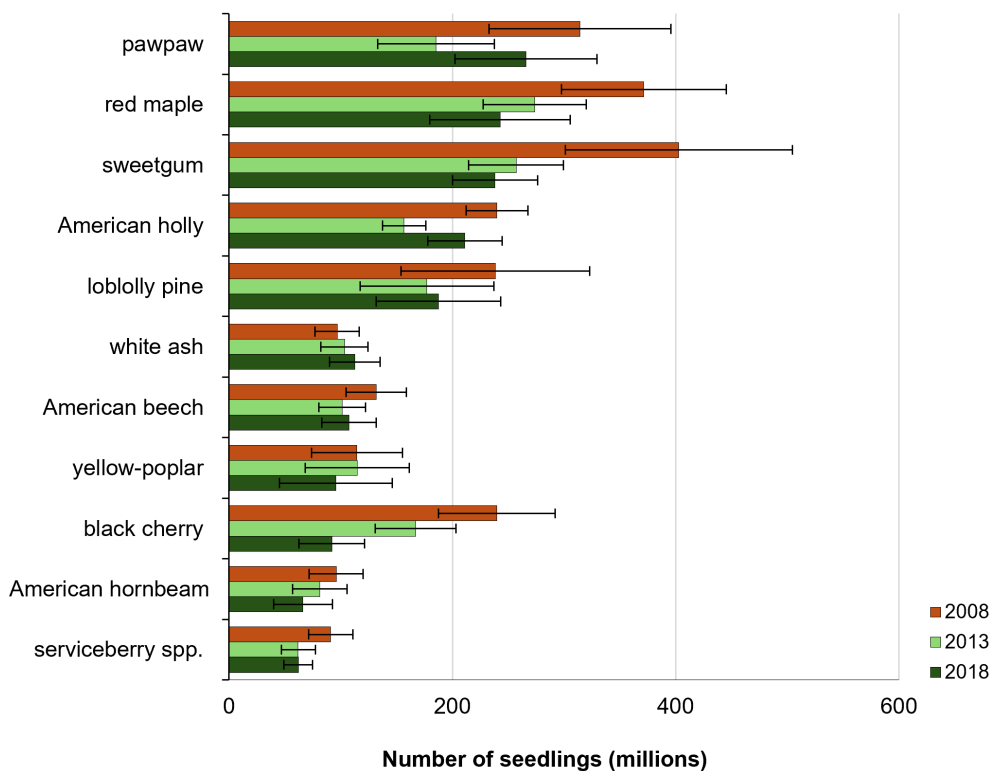


Figure 7.—Number of seedlings for species composing at least 2 percent of total seedling number, by species and inventory year, Maryland. Error bars represent a 68 percent confidence interval.

In the current inventory, oaks and yellow-poplar are better represented in the larger diameter classes than in the smaller diameter class. Respectively, oaks and yellow-poplar represent 33 and 27 percent of the trees 19.0 inches and larger in diameter, but only 6 and 3 percent of trees less than 5.0 inches in diameter (Fig. 8). Conversely, sweetgum, American holly, and blackgum have disproportionate shares of trees less than 5.0 inches in diameter, amounting to 13, 12, and 7 percent of saplings, respectively, compared to their presence in trees 20.0 inches d.b.h. and larger at 4, 0, and 1 percent, respectively. Red maple is ubiquitous and occurs in large numbers across all diameter classes (16 percent of saplings and 9 percent of trees 20.0 inches and larger). Other major species such as loblolly pine, hickory, black cherry, and beech are well distributed across diameter classes.

Over the last 5 years, loblolly pine has replaced sweetgum as the second most numerous species in Maryland. Loblolly pine is the most abundant sawtimber-sized tree in the State with nearly twice as many stems as the second most prevalent sawtimber-sized tree, red maple. Loblolly pine is managed as a commercial species, growing primarily in the southern and eastern shore regions of the State. While estimates of loblolly pine abundance have increased in all tree diameter classes, the gain is greatest in the sapling tree size class. Over the last two decades, Loblolly pine has been less intensively managed, and the data collected over the last decade suggest an increase in the proportion of loblolly trees growing in natural stands. Naturally regenerating stands may have larger seedling and sapling counts than those that are planted deliberately where spacing is planned and competing vegetation controlled.

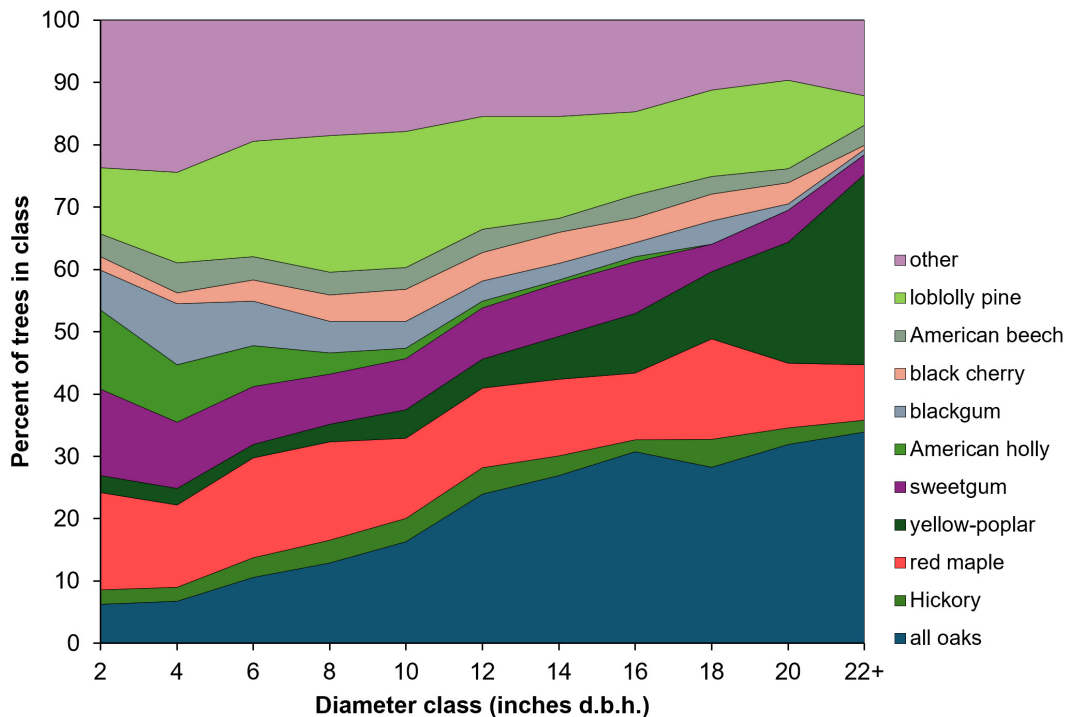


Figure 8.—Proportional tree species composition on forest land by species and diameter class, Maryland, 2018.

The numbers of seedlings and saplings by species indicate which species are thriving in the understory and available for recruitment into the overstory, whereas numbers of larger diameter trees are those that currently dominate the overstory. Throughout the State, a lack of oaks in the smaller diameter classes means that as large oaks are harvested or die, they will likely be replaced by species such as red maple and blackgum. Decreases in the oak portion of the resource have been attributed to inadequate oak regeneration and the subsequent lack of oaks growing into larger diameter classes. Contributing factors to poor oak regeneration are lack of fire, understory growing conditions that favor more shade-tolerant hardwoods, white-tailed deer preferentially browsing oak seedlings, and low intensity harvesting practices that leave only small gaps in the canopy.

In the sapling and seedling size classes, some species that are less preferred browse for white-tail deer are more prevalent in the understory, including American holly, red maple, and pawpaw. These species are also tolerant of shaded conditions and can respond well to gaps created by partial harvests and other disturbances.

Variations in the percent change in numbers of large trees by species indicate that shifts in composition are occurring. The overall decreases in numbers of seedlings, saplings, and poletimber-sized trees since 2008 are not likely due to problems in forest health. Typically, as stands mature, as Maryland's forests are, they support fewer trees as they grow and occupy more space. See the ["number of live trees on forest land" Tableau visualization](#) to view or download raw data for Maryland. The data can be filtered by species group or species and by tree size.

Forest Resource Attributes

Forest Structure

The relationships between forest type, stand size, and stand age provide insight about overall forest composition and structure. Although stand size and stand age are closely related, examined separately, they can each provide valuable information about different aspects of a forest. While stand size may provide information important for timber products development and ecosystem services, stand age may help to better understand habitat availability and forest succession.

Three classes are used to describe the stand size of forested conditions. The seedling/sapling (small) size class is assigned to stands where at least half of the total stocking present is in seedlings and saplings (trees less than 5.0 inches d.b.h.). The poletimber (medium) stand-size class describes stands where at least half of the stocking is of trees at least 5.0 inches d.b.h. but less than the diameter standards for a softwood or hardwood sawtimber tree. When the majority of stocking in a stand is made up of softwoods at least 9.0 inches d.b.h. and hardwood species at least 11.0 inches d.b.h., the sawtimber (large) stand-size class is assigned. Stand age is assigned to forested areas based on the average age of trees in the predominant stand-size class that are not overtopped. An examination of trends in stand size and age may provide valuable information to help forest managers maintain the health and sustainability of the forest.

Since 1986, the total area of timberland in Maryland has declined by 270,000 acres; 75 percent of this loss has occurred in medium-sized stands, while the area of sawtimber stands has remained relatively stable leading to slight increases in the proportion of these stands. Covering an estimated 1.7 million acres, sawtimber stands currently make up 79 percent of timberland in 2018 (Fig. 9).

As suggested by the increasing proportion of sawtimber-sized stands, the age of stands across Maryland is also increasing. A direct comparison of stand age acreage between periodic (1999) and annual (2008, 2013, and 2018) inventories is complicated due to the use of a mixed age category during periodic inventories. In Figure 10, for the 1999 periodic data, we assumed that the mixed age category had the same distribution of age classes as the overall population in Maryland in 1999 without the mixed age class. The data show a shift from younger to older stands over time (Fig. 10). Since the first annual inventory in 2008 the acreage of stands 80 years and younger has declined by 20 percent (332,000 acres) while the acreage of stands older than 80 years has increased 36 percent (227,000 acres). Today 50 percent of timberland stands are 61 to 100 years old.

The declining acreage of younger stands in Maryland and a continuing increase in the proportion of older stands indicates an aging forest resource. Total acres of timberland are slowly decreasing throughout the State, and this is primarily occurring in small- and medium-diameter size class stands. Maryland's forests are also maturing and as the proportion of sawtimber-sized stands increases, the habitat and potential forest products supplied by smaller diameter stands become less available. Attention to the management of other forest types across the State can help ensure that maturing stands are producing the regeneration required to sustain these forests into the future.

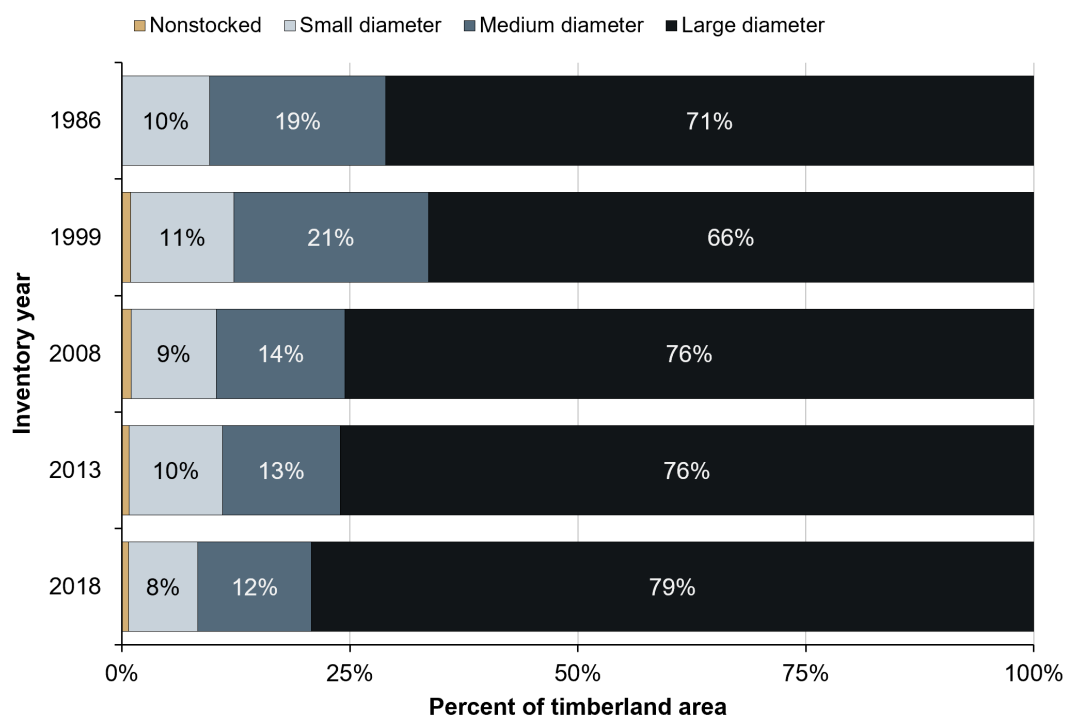


Figure 9.—Percent of timberland area by stand-size class and inventory year, Maryland.

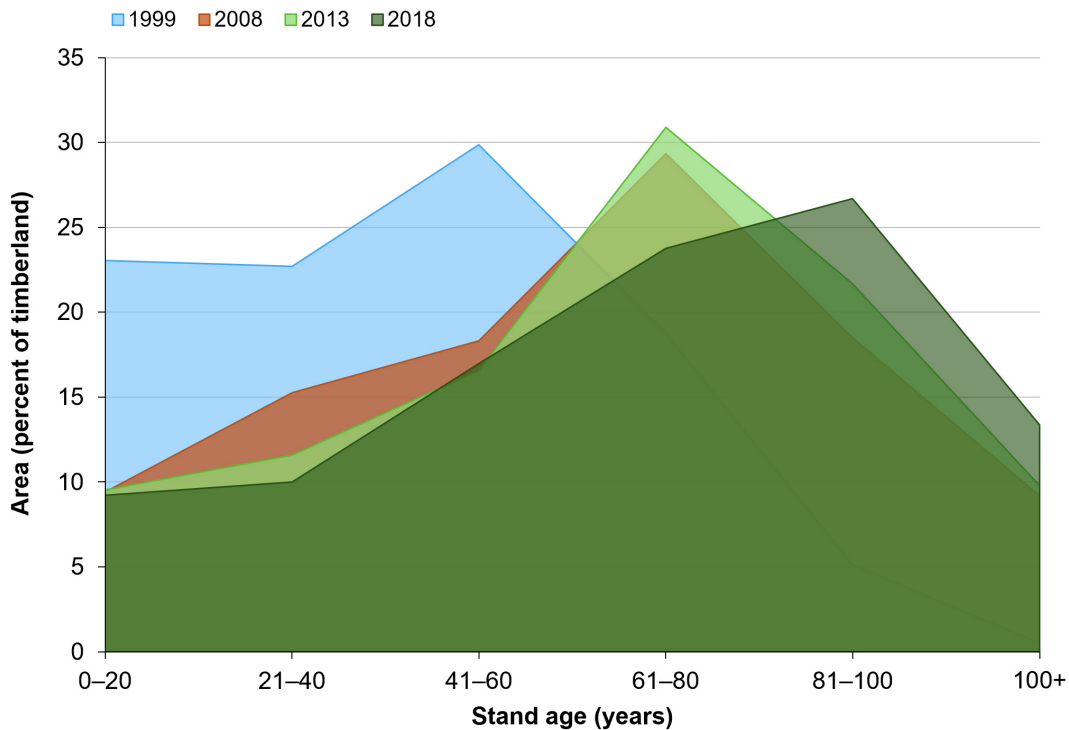


Figure 10.—Percent of timberland area by stand age and inventory year, Maryland.

Tree Volume

Assessing the volume of live trees provides information on trends, potential uses of wood, and economic value. Volume is reported for trees at least 5.0 inches in diameter. Sound volume is defined as the total volume less deductions for rotten and unsound wood. Net volume is sound volume minus additional deductions for roughness and form defects. Growing-stock volume is the amount of sound wood in live, commercial tree species that are 5.0 inches in d.b.h. or greater and free of defect. Estimates of the volume of growing stock are important considerations in economic planning and when evaluating forest sustainability. Trees not meeting merchantable requirements are called rough or rotten cull; while unsuitable for timber utilization, they provide critical wildlife habitat and carbon storage.

Sound volume on forest land in Maryland increased 3 percent from 2013 to 2018 to 7.9 billion cubic feet. Net volume on timberland is 6.1 billion cubic feet, representing a 2 percent increase. Ninety-three percent of net volume is in growing-stock trees. The proportion of net volume in growing stock decreased from 96 percent in 2008 to 93 percent in 2013 and has remained at that level.

Yellow-poplar is the most voluminous tree species in Maryland and accounts for 20 percent of the State's total growing-stock volume, followed by loblolly pine (13 percent), red maple (10 percent), white oak (8 percent), and sweetgum (7 percent). Between 2013 and 2018, growing-stock volume increased by 3 percent to 5.7 billion cubic feet. Much of the increase in growing-stock volume can be attributed to a 131.6 million cubic feet rise in loblolly pine volume (Fig. 11). Northern red oak and American beech also experienced gains in growing-stock volume, 29 percent and 40 percent respectively since 2013. Yellow-poplar, the most voluminous species in the State, decreased 3 percent in growing-stock volume over the same time period.

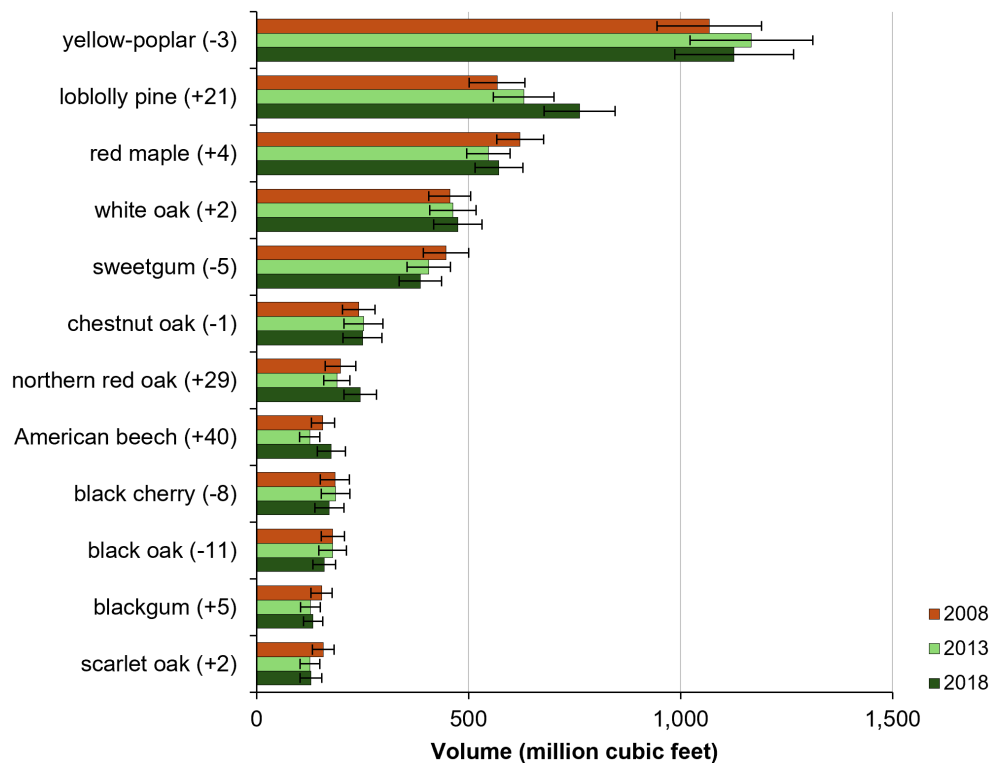


Figure 11.—Growing-stock volume for species having at least 2 percent of total growing-stock volume, by species and inventory year, with percentage change between 2013 and 2018 in parentheses, Maryland. Error bars represent a 68 percent confidence interval.

Sawtimber volume on timberland increased 5 percent between 2013 and 2018 to 23.5 billion board feet (International ¼-inch). Yellow-poplar, with 6.2 billion board feet, makes up the largest percent of sawtimber volume (Fig. 12). Loblolly pine has the most sawtimber volume of any softwood in the State and its volume increased 20 percent from 2013 to 2.5 billion board feet. Northern red oak and American beech sawtimber volume increased by 33 percent and 48 percent, respectively.

Sawtimber volume on timberland is 8,297 board feet per acre Statewide, a 7 percent increase from 2013. The per acre estimate is highest on county and municipal ownership at 13,417 board feet per acre, followed by private land with 11,245 board feet per acre, a 6 percent increase since 2013, and state land with 8,297 board feet per acre.

Since 2008, hardwood sawtimber volume on timberland has slightly increased to 20.2 billion board feet due to increases in lower quality grade sawtimber (grade 3, tie/timber, and uppers) (Fig. 13).

Hardwood sawtimber is of greater quality on private property than on public lands, with 46 percent of grade 1 hardwood sawtimber volume on private land compared to 27 percent on public land. Tree grades 1 and 2 are diameter dependent and the greater proportion of those grades on private property reflects a higher percentage of hardwood sawtimber volume on private land in large diameter classes.

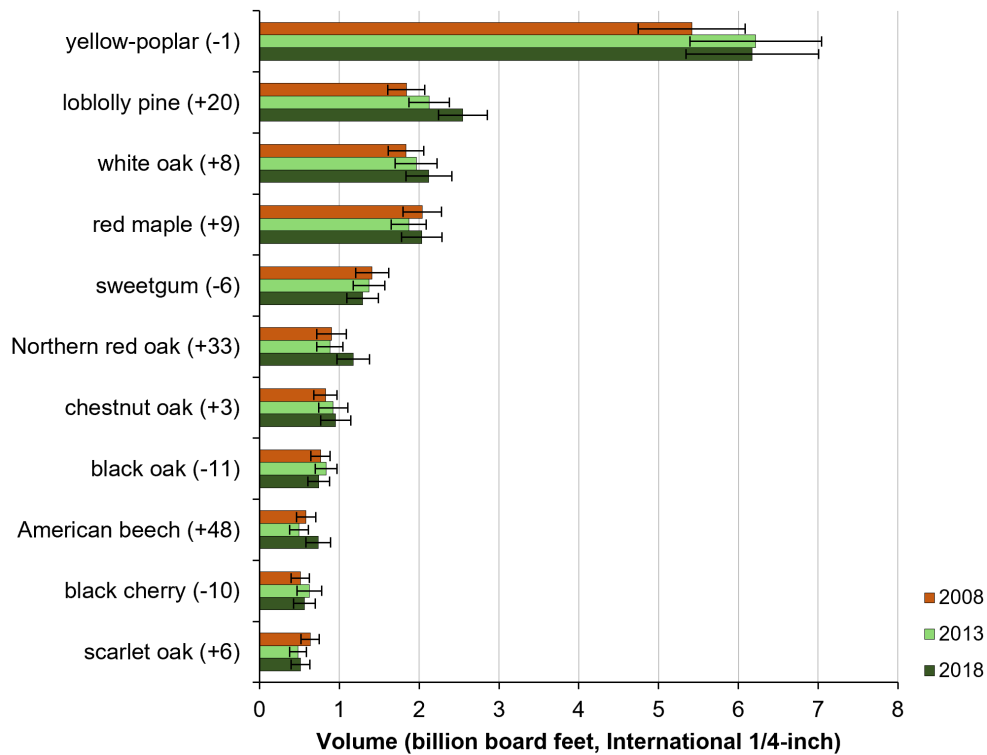


Figure 12.—Net volume of sawtimber trees on timberland for species having at least 2 percent of total sawtimber volume, by species and inventory year, with percentage change between 2013 and 2018 in parentheses, Maryland. Error bars represent a 68 percent confidence interval.

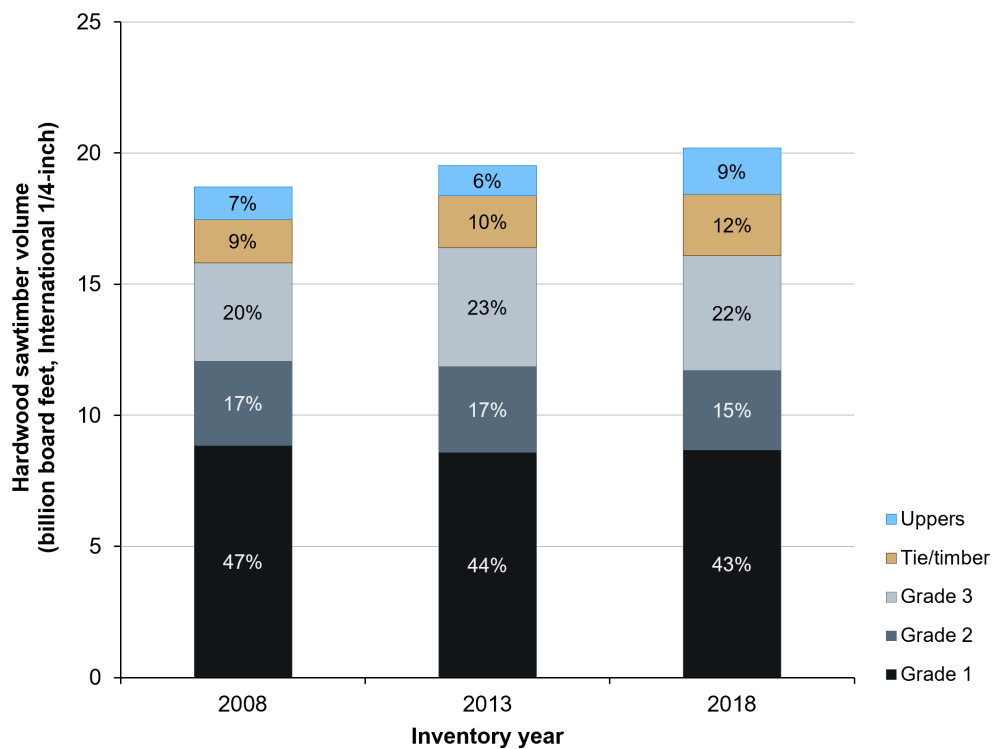


Figure 13.—Percentage of hardwood sawtimber volume by tree grade and inventory year, Maryland. "Uppers" refers to trees containing a qualifying saw log outside the butt section.

Among tree species having at least 2 percent of total hardwood sawtimber volume, four species have over 40 percent of their volume in grade 1 trees (Fig. 14): yellow-poplar (66 percent), white oak (49 percent), black oak (48 percent), and northern red oak (47 percent). American beech has the lowest percentage of volume in grade 1 trees at just 5 percent, likely due in part to cankers caused by beech bark disease.

As the forests of Maryland continue to mature, all measures of volume have increased since 2013. Sawtimber volume experienced the largest increase, attributed in great part to a 20 percent increase in loblolly pine volume. Low levels of harvest removals likely contributed to the increase in loblolly pine volume.

Maryland leads the Northern Research Station states in proportional hardwood sawtimber volume in high quality tree grades, but that percentage is declining. This decrease coupled with an increase in sawtimber volume suggests that higher grade sawtimber is being harvested at a disproportional rate. Careful monitoring of this trend is important to ensuring Maryland can provide a sustainable supply of high quality sawtimber in the future.

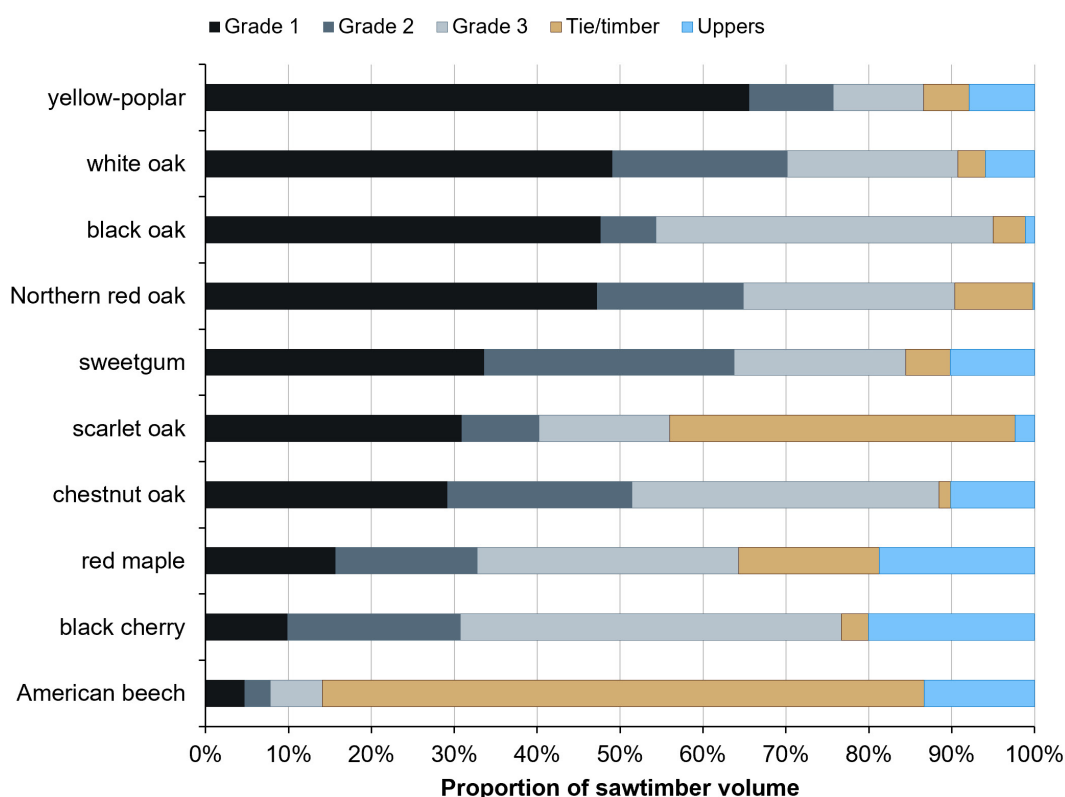


Figure 14.—Proportion of hardwood sawtimber volume on timberland by tree grade for species having at least 2 percent of total hardwood sawtimber volume, Maryland, 2018. "Uppers" refers to trees containing a qualifying saw log outside the butt section.

Growth, Removals, and Mortality

Forests are a renewable resource when managed to provide a constant supply of useful products without diminishing long-term productivity. The rate of growth is an indicator of the overall condition of a stand as well as forest health, successional stage, and tree vigor. Average annual net growth (gross growth minus mortality) is calculated by measuring trees at two points in time and determining the average annual change over the time period. Negative net growth occurs when mortality exceeds gross growth and is indicative of a serious forest health issue and results in a reduction of total inventory volume. Average annual net growth estimates are based on the change in volume of growing stock on timberland between inventories. The terms average annual net growth and net growth are used interchangeably. A useful measure to assess growth is the ratio of annual net growth to current inventory volume.

Removals refer to the volume of trees removed from the inventory and are comprised of two general types: removals due to harvest activities, and other removals which refers to trees lost due to a change in land use. Changes in land use include conversions to nonforest land as well as changes in productivity or reserve status that removes a stand from the timberland classification.

Mortality is a natural part of stand development in healthy forest ecosystems. Many factors contribute to mortality, including competition, succession, insects, disease, fire, human activity, and severe weather events. Mortality is often initiated by one causal agent (inciting factor) that is followed by other contributing stress factors, making it difficult to identify the underlying cause. Although mortality is a natural event in a functional forest ecosystem, dramatic increases in mortality can be an indication of forest health problems. Average annual growing-stock mortality estimates represent the average cubic-foot volume of sound wood that dies each year between inventories.

Since 2008, average annual net growth and removals of growing stock on timberland have decreased in Maryland while average annual mortality increased slightly. Net growth of growing stock trees on timberland averages 110 million cubic feet, and the ratio of net growth-to-removals (2.9:1.0) increased slightly from what was reported for 2008 (2.7:1.0) (Fig. 15). An [interactive version of Figure 15](#), that allows for data exploration and download, is available as a Tableau visualization.

The growth-to-removal ratio of growing-stock on timberland in Maryland is nearly 3.0:1.0 and it has increased since 2008 (2.7:1.0). Annual net growth of growing stock on timberland has continued to decrease since 2008 after increasing substantially between 1999 and 2008. All recorded removal volume was due to harvesting and not land-use change. Trees can be expected to regenerate as long as the land is not developed. A comparison of the growth-to-removals ratios on forest land of individual species to the average for all species is an indicator of sustainable harvesting. The high growth-to-harvest removals ratios of yellow-poplar, loblolly pine, red maple, white oak, sweetgum, chestnut oak, northern red oak, and black oak (above 2.0:1.0) suggest that these species will continue to increase in volume.

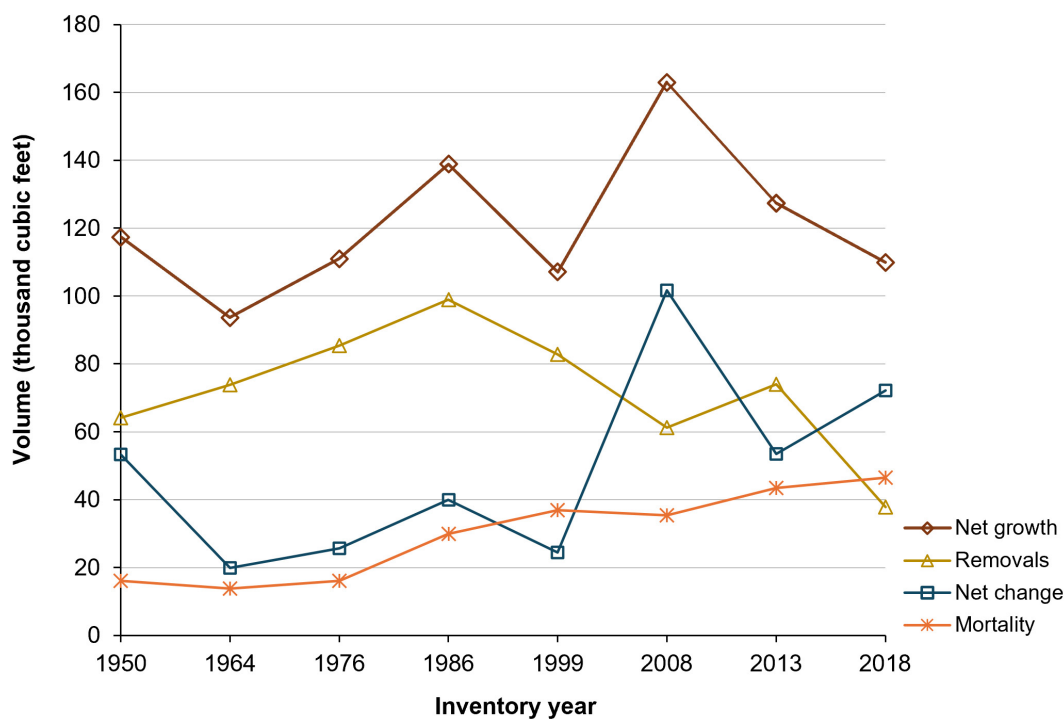


Figure 15.—Average annual net growth, total removals, mortality, and net change of growing stock volume by inventory year, Maryland..

Tree mortality rates on forest land in Maryland are similar to those in many surrounding states. Some of the mortality can be explained by stand dynamics (e.g., competition and succession) and the impacts of insects and diseases that affect specific species (e.g., emerald ash borer [*Agrilus planipennis*] on ash species). Most economically important species in Maryland have low mortality rates, but ash species have elevated rates. Ash species have been heavily impacted by emerald ash borer in recent years and this can be expected to continue to increase.

Forests and People

Forest Ownership

To a large extent, the quantity and quality of forest resources are determined by landowners, including recreational opportunities, timber supply, and wildlife habitat. By understanding the priorities of forest landowners, the forest conservation community can better help owners meet their needs, and in so doing, help conserve the State's forests for future generations. FIA's [National Woodland Owner Survey](#) (NWOS) studies private forest owners' attitudes, management objectives, and concerns with a focus on the families, individuals, and other unincorporated groups collectively referred to as "family forest ownerships." The NWOS results reported here are from studies completed in 2006 (Butler 2008), 2013 (Butler et al. 2016), and 2018 (Butler et al. 2020). Apart from the overall forest land distribution, the results presented are for family forest ownerships with 10 or more acres of forest land.

Seventy-two percent of Maryland's forest land is privately owned (Fig. 16). The vast majority of these private acres, an estimated 1.3 million acres, are family forests. Corporate ownerships have an estimated 381,000 acres across the State and other private owners, including conservation organizations and unincorporated clubs and partnerships, own an additional estimated 96,000 acres. Federal, state, and local governments are responsible for the other 28 percent of the forest land in the State. Most of this public forest land is managed by state forestry, parks, and wildlife agencies. The area of forest land by ownership group has stayed relatively consistent since 2013.

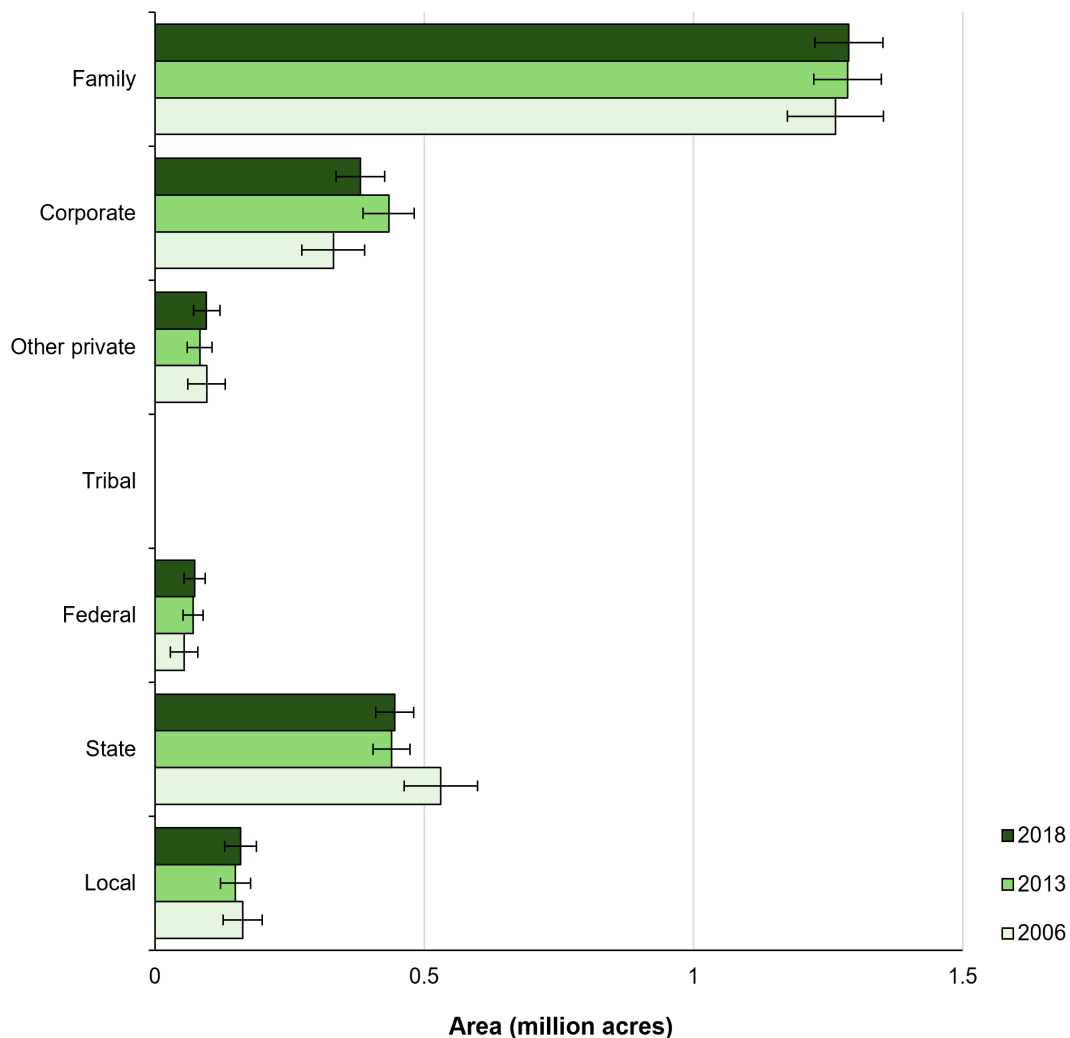


Figure 16.—Area of forest land by ownership group, Maryland, 2006, 2013, and 2018. Error bars represent a 68 percent confidence interval.

Just over half of the forest land in Maryland is owned by family forest owners. As of 2018, there are an estimated 25,000 family forest ownerships with 10 or more acres of forest land in the State (Fig. 17a). An estimated 77 percent of these family forest ownerships own less than 50 acres of forest land, but 64 percent of the family forest land is in holdings of 50 acres or more (Fig. 17b). The average size of family forest holdings is 42 acres in 2018, which, due in part to large sampling errors, is not substantially different than the averages in 2013 and 2006.

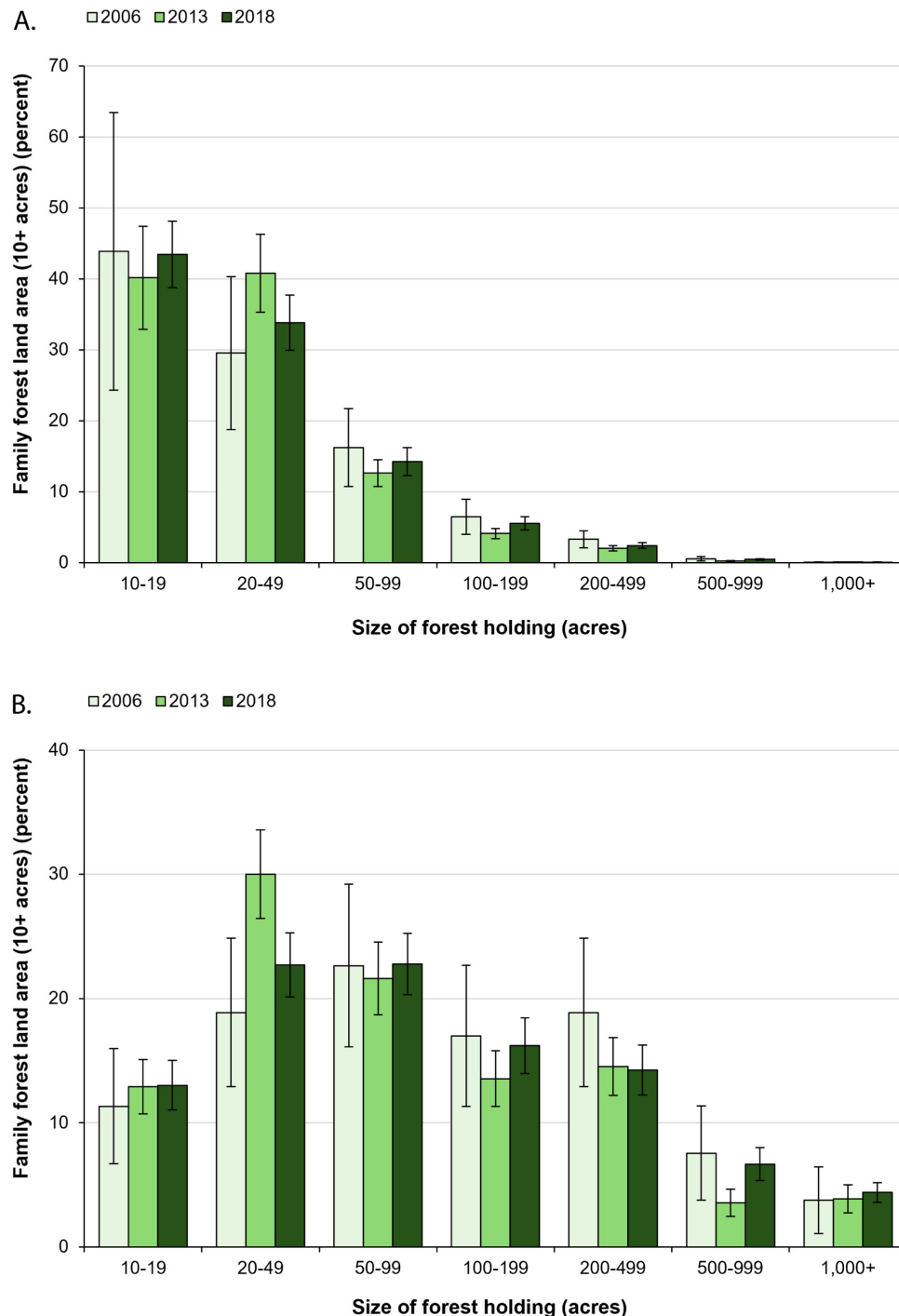


Figure 17.—Family forest (10+ acres) (A) ownerships and (B) acreage by size of forest holdings, Maryland, 2006, 2013, and 2018. Error bars represent a 68 percent confidence interval.

The primary reasons for owning family forests are related to amenity values, such as wildlife, aesthetics, and nature (Fig. 18). Objectives related to financial values, including timber production and land investment, are rated as dominant ownership reasons much less frequently. The overall order of reasons for owning did not change substantially between 2013 and 2018.

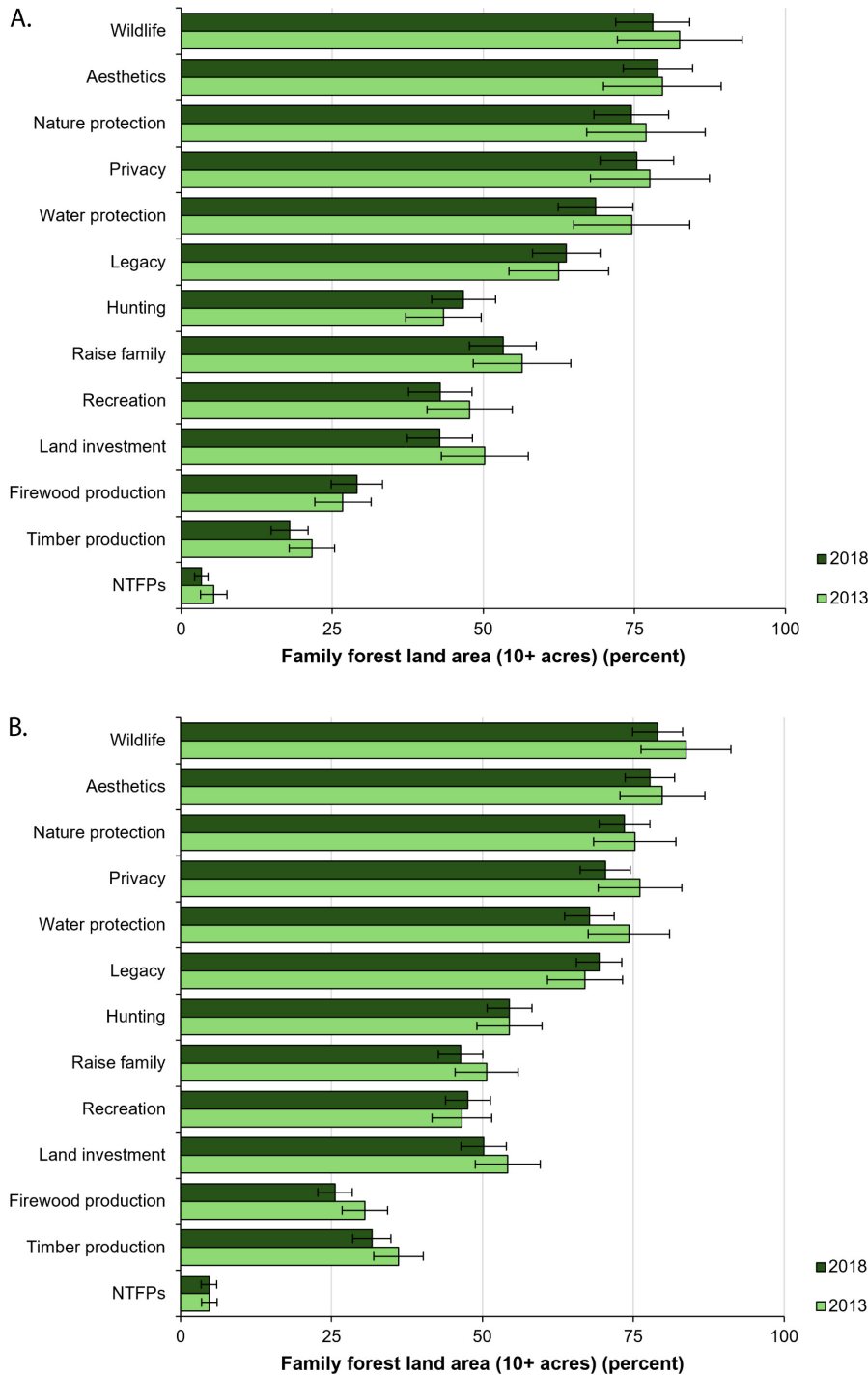


Figure 18.—Family forest (10+ acres) (A) ownerships and (B) acreage by reasons for owning, Maryland, 2013 and 2018. Percentages include those who responded a specific reason was important or very important on a 5-point Likert scale. Error bars represent a 68 percent confidence interval. Due to differences in options offered, data from 2006 are excluded.

The most common activity on family forest land in Maryland in the previous 5 years is personal recreation; 63 percent of the family forest ownerships that own 65 percent of the family forest land participated in activities such as hiking or hunting on their land. One of the next most common activities is cutting wood for personal use, such as firewood (31 percent of family forest ownerships; 30 percent of family forest land). Commercial timber harvesting in the previous 5 years was done by 7 percent of the family forest ownerships who own 17 percent of the family forest land.

In regard to management practices and programs, 23 percent of the family forest ownerships, who hold 30 percent of the family forest land, have received advice in the last 5 years and 37 percent of the family forest ownerships, who control 47 percent of the family forest land, have a written forest management plan. Participation in a preferential property tax programs is reported by 32 percent of the family forest ownership who control 32 percent of the family forest land. Conservation easements on some or all of their forest land are reported for 14 percent of the family forest ownership who control 22 percent of the family forest land. In the previous 5 years, 4 percent of the family forest ownership, who control 12 percent of the family forest land, have participated in a cost share program.

The fate of the forests lies primarily in the hands of those who own and manage the land. It is therefore critical to understand forest owners and what policies and programs can help them conserve the forests for current and future generations. Looking particularly at family forest ownerships, the group that is the least understood and the fate whose land is arguably the most uncertain, they own their land primarily for amenity reasons, but many are actively doing things with their land. Although the percentages of ownerships who have received advice and who have written forest managements plans is higher compared to many other states, there are still significant opportunities to help these owners increase their engagement and stewardship of their lands. Another important trend to watch is the aging of the family forest owners. Given the average age of family forest owners in the State, 64 years (Fig. 19), many acres of land will be passing on to the next generation relatively soon.

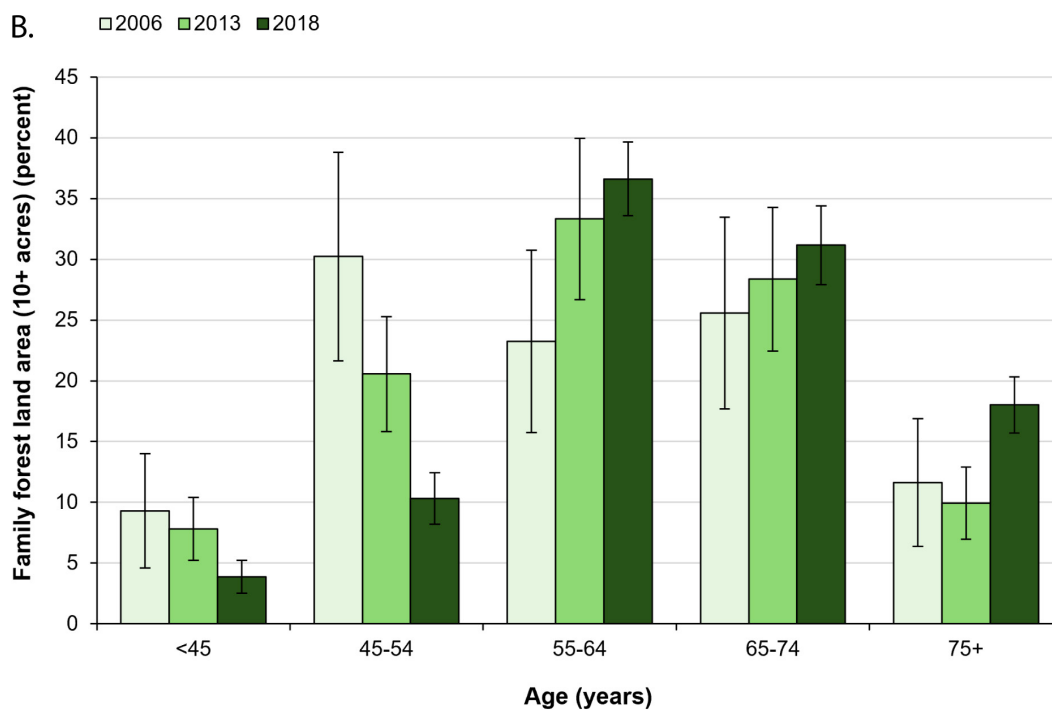
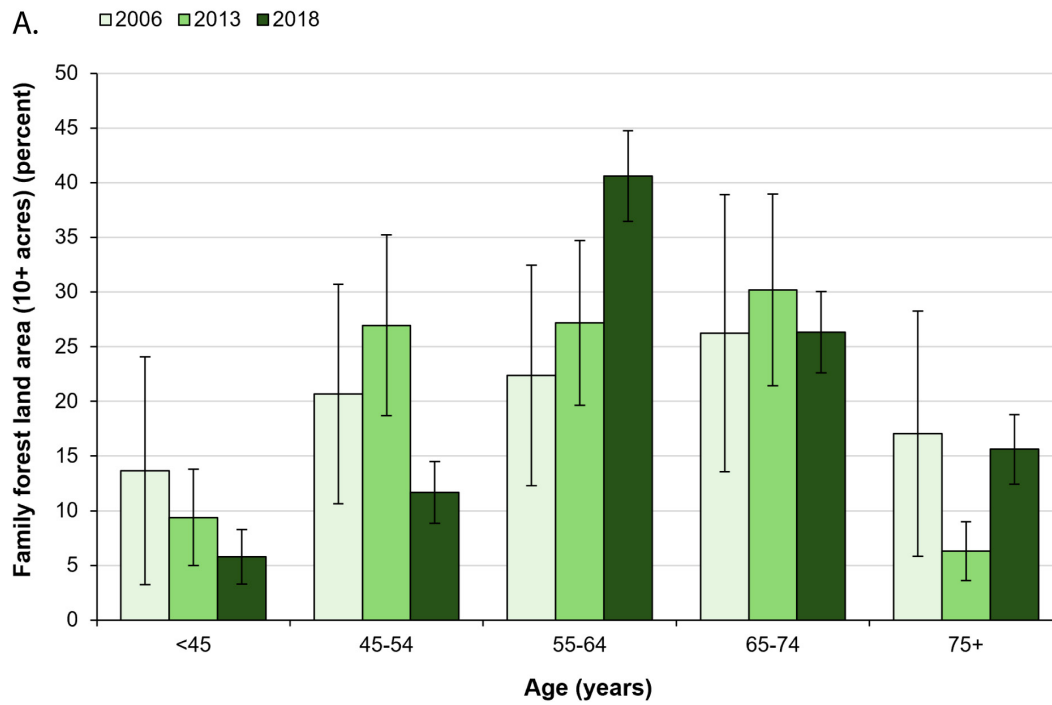


Figure 19.—Family forest (10+ acres) (A) ownerships and (B) acreage by age of primary decision maker, Maryland, 2006, 2013, and 2018. Error bars represent a 68 percent confidence interval.

Urban Forests

More than 80 percent of the U.S. population lives in urban areas and trees in these areas offer a wide range of benefits to urban residents including the improvement of air and water quality, aesthetic appeal and visual barriers, mitigation of rainfall runoff and flooding, and lower noise impacts. Given the ecological and economic importance of urban forests, there is a need to quantify and monitor this critical resource.

Historically, the focus of the FIA inventory had been to collect information on trees that were part of a forest at least an acre in size with a natural or unmaintained understory. Because many urban trees do not fall into this category, they were not captured in the traditional FIA inventory. To address this data gap and improve urban forest monitoring, FIA established a national urban forest inventory program in 2014 and began monitoring in urban areas, focusing on the most populous cities. The Urban FIA program uses established FIA monitoring methods, database and reporting tools, and statistical techniques, along with i-Tree software tools that quantify ecosystem services. The goal of this effort is to have a seamless reporting system that uses the existing FIA protocols to provide new and valuable information on urban trees that were previously unmeasured.

According to the 2010 U.S. Census, Maryland has 1.3 million acres of urban land, which covers 21 percent of the State's land area (U.S. Census Bureau 2010). This places Maryland 6th among the top 10 states with the greatest percentage of urban land. Sixty-nine percent of the State's urban land is concentrated in the counties of Anne Arundel, Baltimore, Carroll, Harford, Howard, and Prince George's, which comprise the Baltimore metro area. Urban area increased by 209,000 acres in Maryland between 2000 and 2010 and is projected to increase 22 percent by the year 2060 (Nowak and Greenfield 2018b).

With the goal of characterizing Maryland's urban tree resource and its associated benefits and values, FIA established urban inventory plots within U.S. Census urban areas in the city of Baltimore (1 plot per 260 acres) and in the surrounding counties of Anne Arundel, Baltimore, Carroll, Harford, Howard, and Prince George's (1 plot per 6,000 acres). As an early adopter of the Urban FIA inventory, data collection began in Maryland in 2014, and in 2018, the sample area was expanded beyond Baltimore City and surrounding metro counties, to include U.S. Census urban areas across the State (1 plot per 6,000 acres). Data collection on these plots occurs over a 7-year cycle, so 1/7th of the plots are visited each year and remeasurement occurs every 7th year. At full implementation, tree and site field data will be monitored on approximately 200 plots within the Baltimore city sample and approximately 200 plots within additional urban areas across the State (Fig. 20).

Urban FIA inventory monitoring has also been established in neighboring Washington, DC. Data collection within the District began in 2017 and data collection was accelerated so that all approximately 200 plots within the city were completed in one year. Beginning in 2018, remeasurement of these plots occurs over a 7-year cycle, so 1/7th of the plots are visited each year.

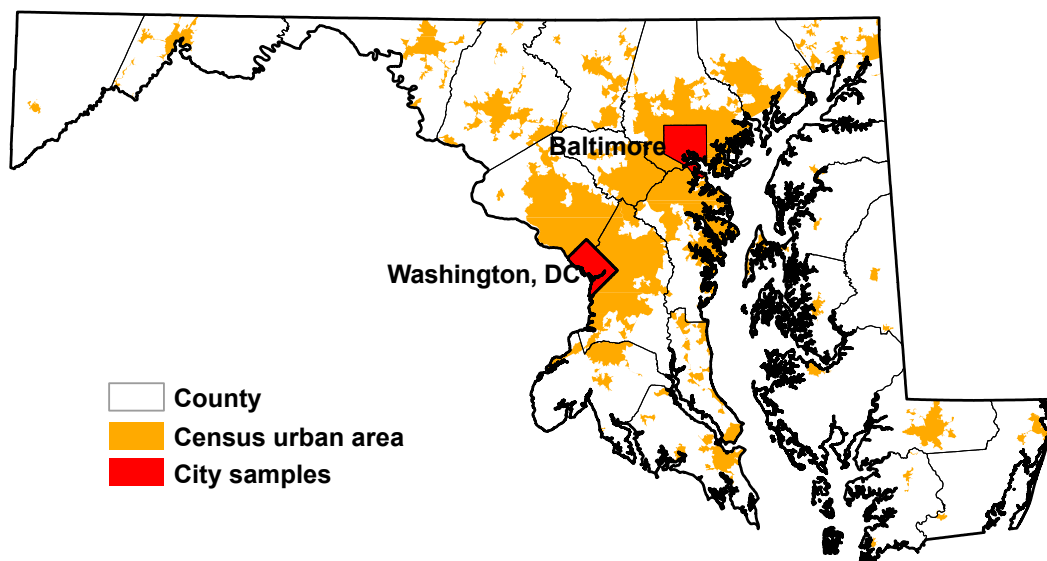


Figure 20.—Urban FIA monitoring is intensified in the cities of Baltimore and Washington D.C. with a lower intensity of sample plots distributed throughout the additional U.S. Census urban areas of Maryland.

The Urban FIA inventory in Maryland is still being established, so it will be a couple years before a complete cycle of data are published. However, research by Nowak and Greenfield (2018a) showed tree cover in Maryland's urban areas was 52.2 percent in 2014, which dropped slightly from 52.7 percent in 2009. This average annual decrease of 0.1 percent per year is below the national estimate of 0.2 percent per year decrease in urban tree cover.

Based on tree cover data and various generalizations and assumptions using Maryland-specific data, the dollar value of ecosystem services associated with the urban forest (carbon sequestration, air pollution removal, avoided energy use, and avoided emissions) was estimated to be roughly \$720 million per year (Nowak and Greenfield 2018b).

Trees cover 52 percent of the urban land in Maryland and represent a vital resource. With 87 percent of the State's residents living in urban areas, urban forests are important to the health and well-being of the people of Maryland, and the ecosystem services these forests provide have both ecological and economic value. For these reasons, along with constant forest changes due to such forces as development, storms, aging and mortality, insects and diseases, tree planting and natural regeneration, it is especially important to monitor the urban forest resource and quantify changes in its structure, composition, and health. With implementation of the Urban FIA program in Maryland, data will soon be available to provide sample-based estimates of urban forest structure and associated ecosystem services, as well as provide a means to monitor resource changes through time.

Urban inventory data for cities with completed cycles are available on the [Urban DataMart](#) and posted for interactive data exploration on the [My City's Trees App](#) and [Urban Forest Stats](#) tool. More information on the Urban FIA program, including field guides and a national implementation map, is available on the [Urban FIA website](#).

Forest Ecosystem Services

Forest Carbon

Among terrestrial ecosystems, forests contain the largest reserves of sequestered carbon. The accumulation of carbon in forests helps to mitigate emissions of carbon dioxide to the atmosphere from sources such as wildfires or the burning of fossil fuels. Carbon accumulates in growing trees via the photosynthetically driven production of structural and energy-containing organic (carbon) compounds that primarily accumulate in trees as wood; approximately 50 percent of tree biomass is carbon (based on dry weight). Over time, this stored carbon also accumulates in standing dead trees, down woody materials, litter, and forest soils. The FIA program uses a combination of field measurements and models to estimate forest carbon stocks. Procedures for the estimation of carbon are detailed in the “Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2017” (U.S. EPA 2019). Forest carbon is often broken down into storage pools. The carbon pools and their components discussed here are defined as: live biomass (live trees at least 1.0-inch d.b.h. and live understory vegetation), dead wood (standing dead trees at least 1.0-inch d.b.h. and down dead wood), forest floor litter, and soil organic matter estimated to a depth of 1 meter (39 inches).

Total forest ecosystem carbon stocks in Maryland are an estimated 255 million tons. This represents an increase of nearly 3 percent since 2008, despite a decrease in the area of forest land. Carbon density is an estimated 104 tons per acre of forest land. Soil organic carbon and live trees are the largest components; combined, these account for 90 percent of forest carbon stocks (Fig. 21).

Forest ecosystem carbon stocks have continued to rise in Maryland, despite a net loss of forest land in the State. The increase in carbon stocks is primarily a result of maturing stands accumulating carbon in the live biomass pool. Soil organic carbon stocks represent the largest pool in Maryland and are important to long-term carbon storage. The carbon stocks in live biomass are nearly as large as those in soil and there are opportunities to increase carbon stocks in the near term, as this pool is most affected by forest management. However, the greatest threat to the carbon stocks of Maryland forests is loss of forest land. As mitigating U.S. greenhouse gas emissions becomes increasingly important, an understanding of trends in carbon sequestration in the face of land-use change will be an essential tool for forest managers.

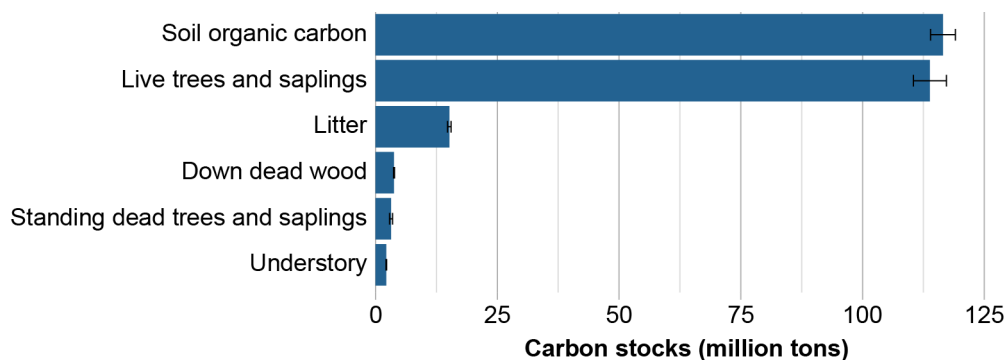


Figure 21.—Carbon stocks on forest land by component, Maryland, 2018. Error bars represent a 68 percent confidence interval around each estimate.

Timber Products

The harvesting and processing of timber products produces a stream of income shared by timber owners, managers, marketers, loggers, truckers, and processors. In 2018, the wood products and paper manufacturing industries (NAICS codes 321 and 322) in Maryland employed 5,283 people, with an average annual payroll of \$258 million, and a total revenue of \$1.7 billion (U.S. Census Bureau 2019). To better manage the State's forests, it is important to know the species, amounts, and locations of timber being harvested.

Starting in 2019, the wood-processing mills in Maryland are surveyed annually to estimate the amount of wood volume that is processed into products, by species and country, state, and county of origin. The 2019 survey reports information for the 2018 production year. This is supplemented with annual surveys conducted in surrounding states that processed wood harvested from Maryland. Prior to 2019, all known primary wood processors in Maryland were canvassed periodically, with the last canvasses being for production years 2008 and 2015.

The survey of primary wood-using mills reports 47 mills that processed 64.8 million cubic feet of industrial roundwood, a 21 percent increase from the 2015 volume of 53.5 million cubic feet (USDA Forest Service 2024).

In 2018, 44.4 million cubic feet of industrial roundwood was harvested from Maryland's forest land to supply the raw material for the primary wood processors in Maryland and surrounding states, a 22 percent increase from 2015. Sixty-eight percent of the industrial roundwood harvested went to sawmills, 20 percent went to pulp mill, 4 percent was used for industrial and residential fuelwood, and the remaining 8 percent was used for veneer, post, poles, pilings, composite panel products, and other miscellaneous products. The loblolly/shortleaf pine species group accounted for 28 percent of the volume of industrial roundwood harvested, followed by yellow-poplar (17 percent), red oaks (15 percent), and white oaks (11 percent) (Fig. 22). Other important species groups harvested were soft maples, sweetgum, beech, and black cherry.

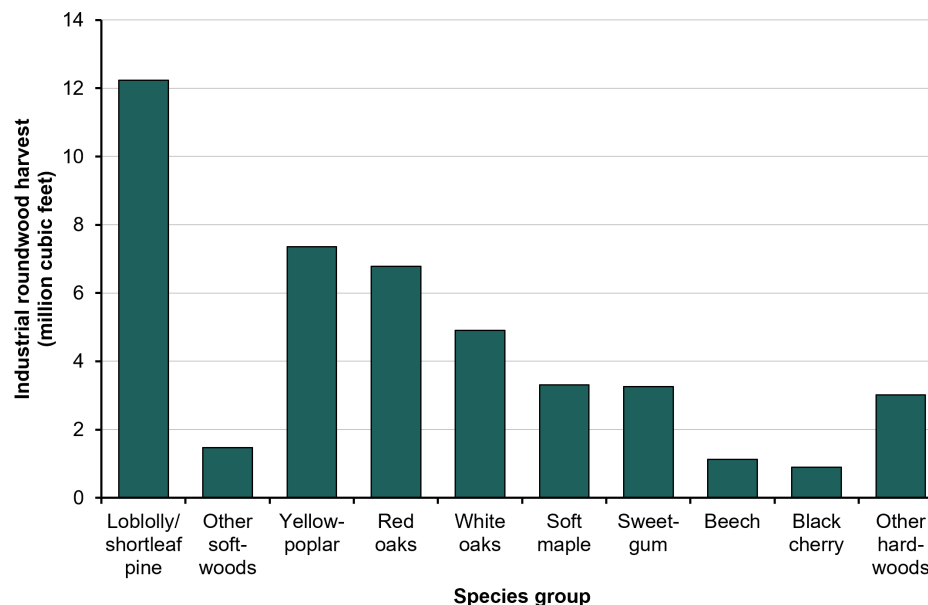


Figure 22.—Industrial roundwood harvested by species group, Maryland, 2018.

In the process of harvesting industrial roundwood, 31.5 million cubic feet, or 42 percent of the total removals due to harvesting were left on the ground as harvest residues (Fig. 23). Almost three-quarters (74 percent) of the harvest residues came from non-growing stock sources such as crooked or rotten trees, trees on nonforest land, tops and limbs, and dead trees. The processing of industrial roundwood by the State's primary wood-using mills generated another 700.5 thousand green tons of wood and bark residues (Fig. 24). Twenty-three percent of the mill residues generated were used for industrial fuelwood, and 18 percent was used for mulch or soil additives. Other uses for mill residues included pulp or composite panel production, residential fuelwood, animal bedding, industrial fuelwood, pellets, and other bioenergy products. Less than 1 percent of the mill residues were not used for other products, and were either landfilled, burned, or left on site.

The desire for wood products is likely to increase, placing a greater demand on the resource. An important consideration for the future of the primary wood-products industry is the ability to retain and diversify industrial roundwood processing facilities. The number of wood processing mills has been steadily declining. The loss of processing facilities makes it harder for landowners to find markets for the timber harvested from management activities on their forest land.

Two important issues are the loss of pulpwood markets and the amount of unused harvest residues in the State. The only pulp mill in Maryland closed in 2019. Pulp mills can use smaller size and lower quality material than sawmills or veneer mills, which leads to better utilization of the timber resource. In addition, the ability of pulp mills to utilize lower grade material provides markets for landowners to better manage their forest land. Industrial fuelwood or increased pulpwood markets could lead to better utilization of the forest land and better use of the logging residues in the State.

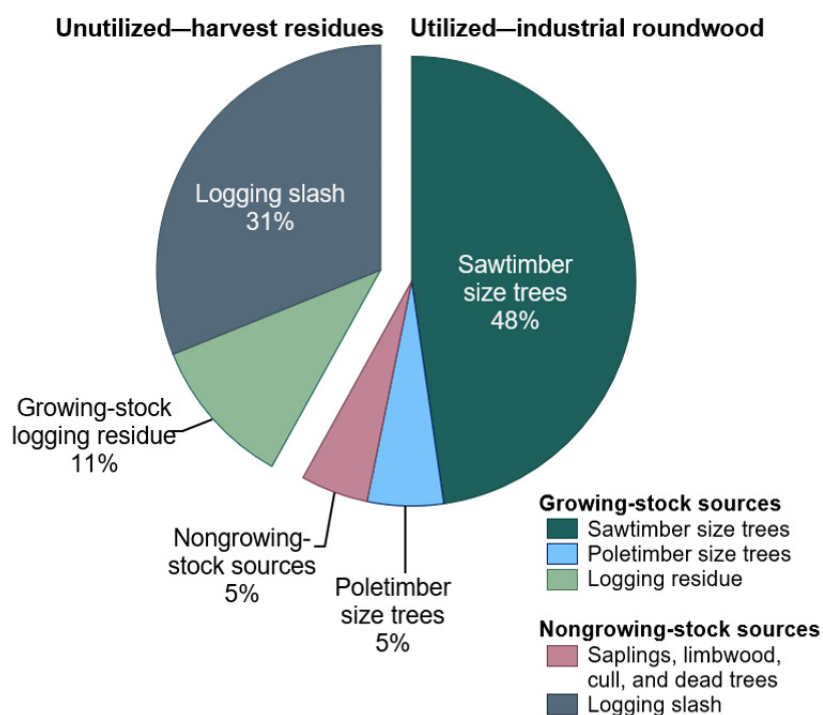


Figure 23.—Utilized industrial roundwood and unutilized harvest residues by growing stock and nongrowing stock, Maryland, 2018.

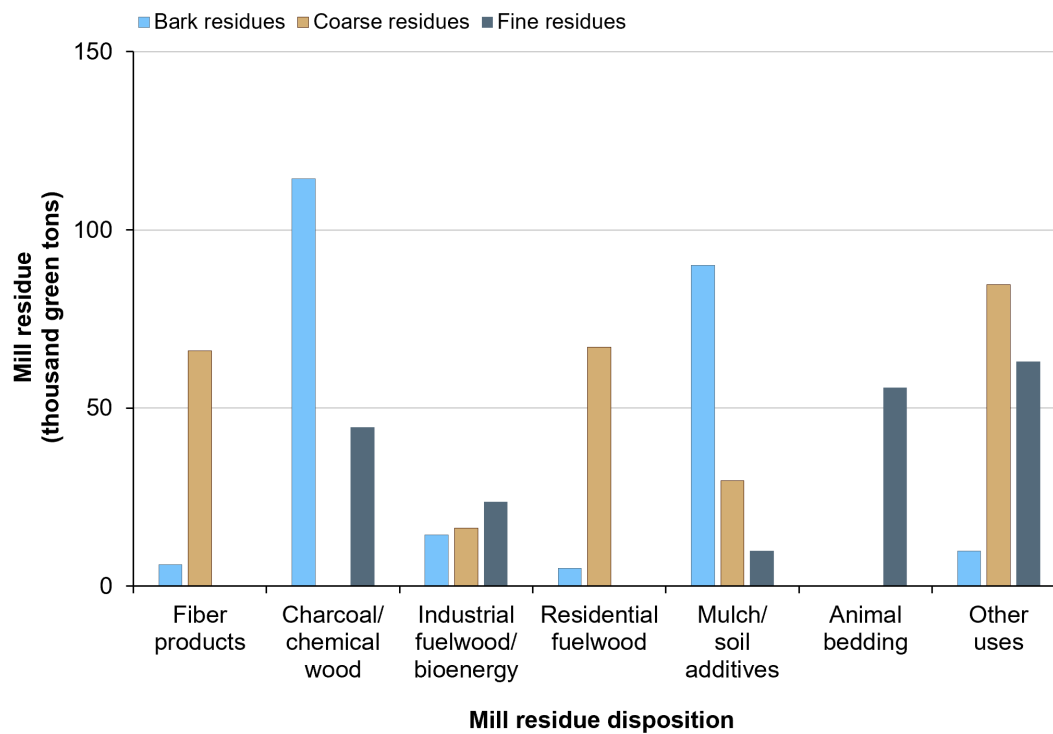


Figure 24.—Disposition of mill residues generated by primary wood-using mills, Maryland, 2018.

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Appendix—Tree Species in Maryland

Table 1.—List of tree species, seedlings and larger, found on Forest Inventory and Analysis plots, Maryland, 2018

Species common name	Genus	Species	Species group
Atlantic white-cedar	<i>Chamaecyparis</i>	<i>thyoides</i>	Other eastern softwoods
redcedar/juniper spp.	<i>Juniperus</i>	spp.	Other eastern softwoods
eastern redcedar	<i>Juniperus</i>	<i>virginiana</i>	Other eastern softwoods
Norway spruce	<i>Picea</i>	<i>abies</i>	Other eastern softwoods
shortleaf pine	<i>Pinus</i>	<i>echinata</i>	Loblolly and shortleaf pines
Table Mountain pine	<i>Pinus</i>	<i>pungens</i>	Other yellow pines
red pine	<i>Pinus</i>	<i>resinosa</i>	Eastern white and red pines
pitch pine	<i>Pinus</i>	<i>rigida</i>	Other yellow pines
eastern white pine	<i>Pinus</i>	<i>strobus</i>	Eastern white and red pines
Scotch pine	<i>Pinus</i>	<i>sylvestris</i>	Other yellow pines
loblolly pine	<i>Pinus</i>	<i>taeda</i>	Loblolly and shortleaf pines
Virginia pine	<i>Pinus</i>	<i>virginiana</i>	Other yellow pines
baldcypress	<i>Taxodium</i>	<i>distichum</i>	Cypress
eastern hemlock	<i>Tsuga</i>	<i>canadensis</i>	Eastern hemlock
boxelder	<i>Acer</i>	<i>negundo</i>	Other eastern soft hardwoods
striped maple	<i>Acer</i>	<i>pensylvanicum</i>	Eastern noncommercial hardwoods
red maple	<i>Acer</i>	<i>rubrum</i>	Soft maple
silver maple	<i>Acer</i>	<i>saccharinum</i>	Soft maple
sugar maple	<i>Acer</i>	<i>saccharum</i>	Hard maple
Norway maple	<i>Acer</i>	<i>platanoides</i>	Hard maple
buckeye, horsechestnut spp.	<i>Aesculus</i>	spp.	Other eastern soft hardwoods
ailanthus	<i>Ailanthus</i>	<i>altissima</i>	Eastern noncommercial hardwoods
European alder	<i>Alnus</i>	<i>glutinosa</i>	Eastern noncommercial hardwoods
serviceberry spp.	<i>Amelanchier</i>	spp.	Eastern noncommercial hardwoods
pawpaw	<i>Asimina</i>	<i>triloba</i>	Eastern noncommercial hardwoods
yellow birch	<i>Betula</i>	<i>alleghaniensis</i>	Yellow birch
sweet birch	<i>Betula</i>	<i>lenta</i>	Other eastern hard hardwoods
river birch	<i>Betula</i>	<i>nigra</i>	Other eastern soft hardwoods
American hornbeam, musclewood	<i>Carpinus</i>	<i>caroliniana</i>	Eastern noncommercial hardwoods
bitternut hickory	<i>Carya</i>	<i>cordiformis</i>	Hickory
pignut hickory	<i>Carya</i>	<i>glabra</i>	Hickory
shagbark hickory	<i>Carya</i>	<i>ovata</i>	Hickory
mockernut hickory	<i>Carya</i>	<i>alba</i>	Hickory
sand hickory	<i>Carya</i>	<i>pallida</i>	Hickory
American chestnut	<i>Castanea</i>	<i>dentata</i>	Eastern noncommercial hardwoods
hackberry	<i>Celtis</i>	<i>occidentalis</i>	Other eastern soft hardwoods
eastern redbud	<i>Cercis</i>	<i>canadensis</i>	Eastern noncommercial hardwoods
flowering dogwood	<i>Cornus</i>	<i>florida</i>	Other eastern hard hardwoods
hawthorn spp.	<i>Crataegus</i>	spp.	Eastern noncommercial hardwoods

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Table 1 (continued).—List of tree species, seedlings and larger, found on Forest Inventory and Analysis plots, Maryland, 2018

Species common name	Genus	Species	Species group
common persimmon	<i>Diospyros</i>	<i>virginiana</i>	Other eastern hard hardwoods
American beech	<i>Fagus</i>	<i>grandifolia</i>	Beech
white ash	<i>Fraxinus</i>	<i>americana</i>	Ash
green ash	<i>Fraxinus</i>	<i>pennsylvanica</i>	Ash
American holly	<i>Ilex</i>	<i>opaca</i>	Other eastern hard hardwoods
black walnut	<i>Juglans</i>	<i>nigra</i>	Black walnut
sweetgum	<i>Liquidambar</i>	<i>styraciflua</i>	Sweetgum
yellow-poplar	<i>Liriodendron</i>	<i>tulipifera</i>	Yellow-poplar
Osage-orange	<i>Maclura</i>	<i>pomifera</i>	Eastern noncommercial hardwoods
cucumbertree	<i>Magnolia</i>	<i>acuminata</i>	Other eastern soft hardwoods
sweetbay	<i>Magnolia</i>	<i>virginiana</i>	Eastern noncommercial hardwoods
apple spp.	<i>Malus</i>	spp.	Eastern noncommercial hardwoods
mulberry spp.	<i>Morus</i>	spp.	Other eastern hard hardwoods
white mulberry	<i>Morus</i>	<i>alba</i>	Other eastern hard hardwoods
red mulberry	<i>Morus</i>	<i>rubra</i>	Other eastern hard hardwoods
blackgum	<i>Nyssa</i>	<i>sylvatica</i>	Tupelo and blackgum
eastern hophornbeam	<i>Ostrya</i>	<i>virginiana</i>	Eastern noncommercial hardwoods
paulownia, empress-tree	<i>Paulownia</i>	<i>tomentosa</i>	Other eastern soft hardwoods
redbay	<i>Persea</i>	<i>borbonia</i>	Other eastern soft hardwoods
American sycamore	<i>Platanus</i>	<i>occidentalis</i>	Other eastern soft hardwoods
eastern cottonwood	<i>Populus</i>	<i>deltoides</i>	Cottonwood and aspen
bigtooth aspen	<i>Populus</i>	<i>grandidentata</i>	Cottonwood and aspen
quaking aspen	<i>Populus</i>	<i>tremuloides</i>	Cottonwood and aspen
cherry and plum spp.	<i>Prunus</i>	spp.	Eastern noncommercial hardwoods
pin cherry	<i>Prunus</i>	<i>pensylvanica</i>	Eastern noncommercial hardwoods
black cherry	<i>Prunus</i>	<i>serotina</i>	Other eastern soft hardwoods
chokecherry	<i>Prunus</i>	<i>virginiana</i>	Eastern noncommercial hardwoods
American plum	<i>Prunus</i>	<i>americana</i>	Eastern noncommercial hardwoods
sweet cherry	<i>Prunus</i>	<i>avium</i>	Eastern noncommercial hardwoods
oak spp.	<i>Quercus</i>	spp.	Other eastern hard hardwoods
white oak	<i>Quercus</i>	<i>alba</i>	Select white oaks
swamp white oak	<i>Quercus</i>	<i>bicolor</i>	Select white oaks
scarlet oak	<i>Quercus</i>	<i>coccinea</i>	Other red oaks
southern red oak	<i>Quercus</i>	<i>falcata</i>	Other red oaks
cherrybark oak	<i>Quercus</i>	<i>pagoda</i>	Select red oaks
scrub oak	<i>Quercus</i>	<i>ilicifolia</i>	Eastern noncommercial hardwoods
overcup oak	<i>Quercus</i>	<i>lyrata</i>	Other white oaks
blackjack oak	<i>Quercus</i>	<i>marilandica</i>	Other red oaks
swamp chestnut oak	<i>Quercus</i>	<i>michauxii</i>	Select white oaks

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Table 1 (continued).—List of tree species, seedlings and larger, found on Forest Inventory and Analysis plots, Maryland, 2018

Species common name	Genus	Species	Species group
water oak	<i>Quercus</i>	<i>nigra</i>	Other red oaks
pin oak	<i>Quercus</i>	<i>palustris</i>	Other red oaks
willow oak	<i>Quercus</i>	<i>phellos</i>	Other red oaks
chestnut oak	<i>Quercus</i>	<i>prinus</i>	Other white oaks
northern red oak	<i>Quercus</i>	<i>rubra</i>	Select red oaks
post oak	<i>Quercus</i>	<i>stellata</i>	Other white oaks
black oak	<i>Quercus</i>	<i>velutina</i>	Other red oaks
black locust	<i>Robinia</i>	<i>pseudoacacia</i>	Other eastern hard hardwoods
black willow	<i>Salix</i>	<i>nigra</i>	Other eastern soft hardwoods
sassafras	<i>Sassafras</i>	<i>albidum</i>	Other eastern soft hardwoods
American basswood	<i>Tilia</i>	<i>americana</i>	Basswood
American elm	<i>Ulmus</i>	<i>americana</i>	Other eastern soft hardwoods
slippery elm	<i>Ulmus</i>	<i>rubra</i>	Other eastern soft hardwoods
other or unknown live tree	Tree	unknown	Eastern noncommercial hardwoods

Red fox (*Vulpes vulpes*) peeking from behind a tree in a Maryland forest.
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Crape myrtle tree in the Baltimore, Maryland area.
U.S. Forest Service photo by Sjana Schanning.



Forested waterfall on the Gunpowder River, Maryland.
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