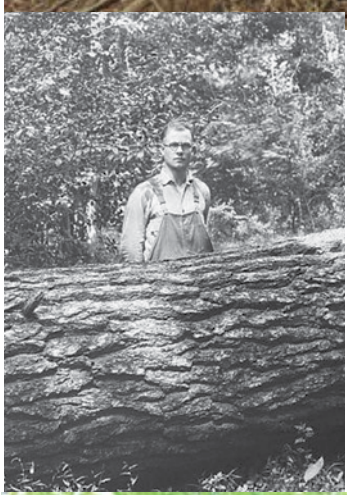
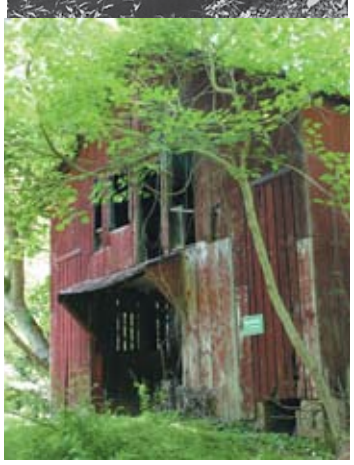




# Chapter 1:

# Linking the Past to the Present

## Key Findings

- Native Americans shaped Chesapeake forests for thousands of years, though their influences were localized and most prominent along coastal areas.

- When Europeans arrived in the 17th century, they found vast, resilient, and diverse forests dominating 95% of the watershed.

- The comparatively brief period of European settlement had dramatic and lasting effects on forest age, composition, structure, and distribution as well as water quality.

- By the late 1800s, nearly 50% of forestland had been harvested for agriculture, fuel, timber, and other uses.

- Throughout the 20th century, "new" forests grew back on abandoned farmland and in heavily logged forests. Forests now cover approximately 58% of the Bay watershed, a recovery that reflects the natural resiliency of forests.

## Ancient Chesapeake Forests

Tens of thousands of years of natural and cyclic change established the forests that early North American inhabitants first traversed some 13,600 years ago.[1] These forests were primarily filled with conifers: fir, spruce, and pine. The abundance of cold-tolerant species reflected the influence of the recent ice age. Today, you can see and touch similar forest communities in areas such as the headwaters of the Potomac River in West Virginia, Mt. Rogers in Virginia, and Bear Meadows in Pennsylvania. Just west of the Chesapeake Bay watershed, in Maryland's Swallow Falls State Park, an ancient hemlock forest, moist and sensitive to fire, provides a chance to experience a cool, dark woodland, with deadfalls of centuries-old trees.

## Chesapeake forests at European settlement

European settlers in the early 1600s found a vast and spectacularly diverse forest dominating approximately 95% of the Chesapeake Bay watershed. Along the Bay and its rivers, these newcomers found a seemingly infinite variety of trees that were astonishing in their "bulk and antiquity."[2] Ancient oak, yellow poplar, eastern hemlock, beech, loblolly pine, white pine, American chestnut, and other species in these forests stood as much as 40% higher than those living today.[3] The trees of Chesapeake forests also reached magnificent widths, some rivaling the size of giant sequoias. The largest tree known to exist in West Virginia, a white oak, grew to 10 feet in diameter 31 feet off the ground and was well over 1,000 years old.[4] Captain John Smith wrote about encountering trees, including the cypress, which had circumferences of 18 feet.[5]

## Early Forest Composition

In general, upland from rivers and the Bay, forests were composed of hardwoods, mostly oak and hickory, while pines dominated more sandy soils.[7] In Pennsylvania, early land surveys show an abundance of white oak in pre-European settlement forests. A botanist from the early 19th century noted that "large forests, nine tenths of which consisted of white oaks," dominated western Pennsylvania.[8] Oak, American chestnut, and hickory were major components in all but the northernmost forests in Pennsylvania, where American beech dominated across the New York border, mixed with eastern hemlock, sugar maple, and birch.[9]

Under the lofty hardwood canopies grew a diverse, shade tolerant layer of shrubs such as eastern hophornbeam, viburnum, and witch hazel. In the moist duff of the forest litter grew ferns, violets, lady's slipper, and mosses.[14] Interlocking tree roots conserved soil and water, and reduced the amount of sediment and nutrients that stormwater runoff could carry to nearby waterways. Around these roots existed invaluable, immense, and long-lived symbiotic associations with fungi, which efficiently recycled nutrients in the soil. Therefore, forests were stingy in their release of nitrogen and phosphorus to adjacent streams, which resulted in clear waters feeding the Bay.

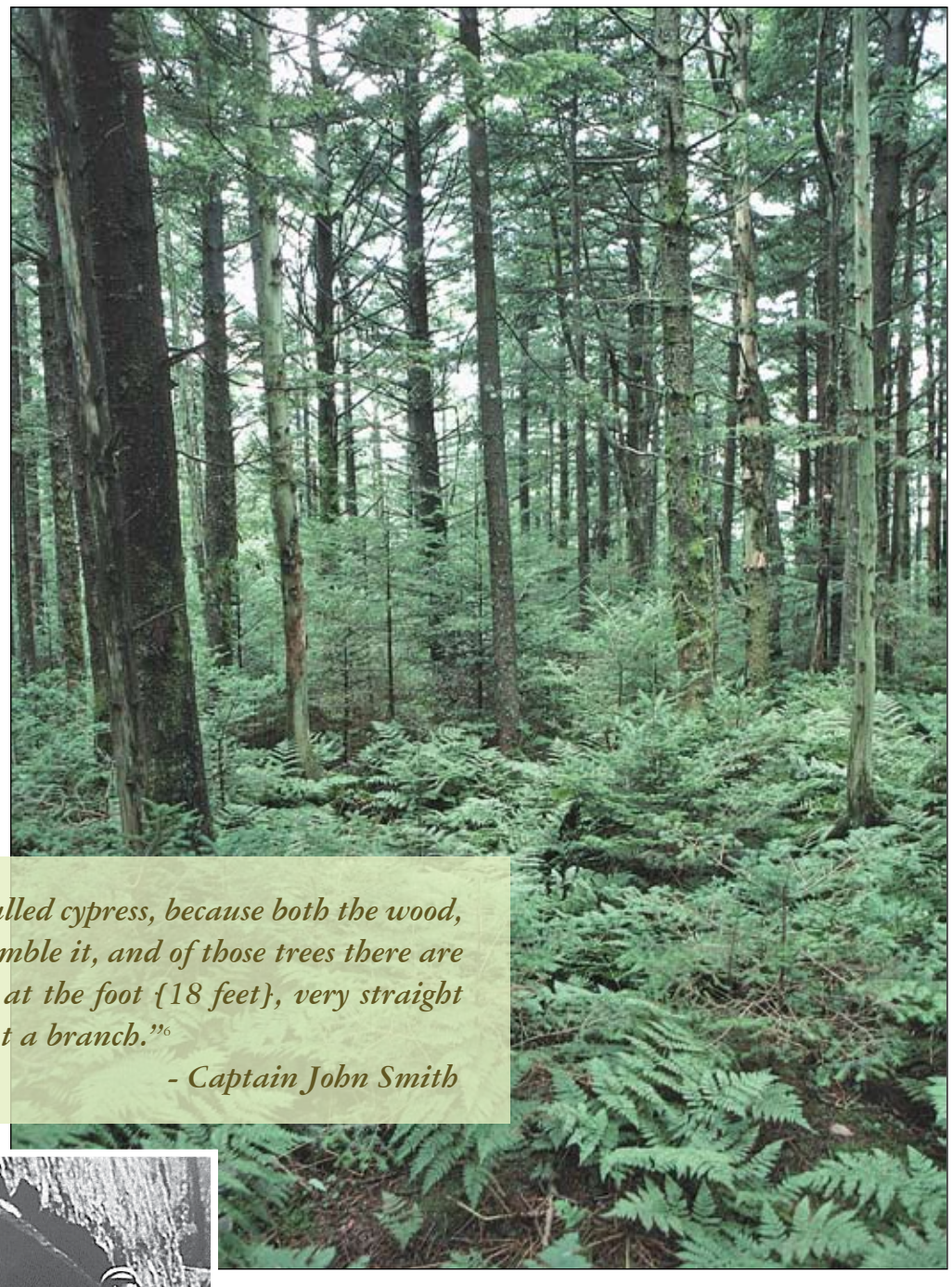


Photo: Gary P. Fleming © VA DCR Natural Heritage

*Frasier Fir Forest with Mountain Wood fern/Mt. Rogers, Virginia*

> *"…there is a kind of wood we called cypress, because both the wood, the fruit, and leaf did most resemble it, and of those trees there are some near three fathoms about at the foot {18 feet}, very straight and 50, 60, or 80 {feet} without a branch."*[6]
>
> *- Captain John Smith*

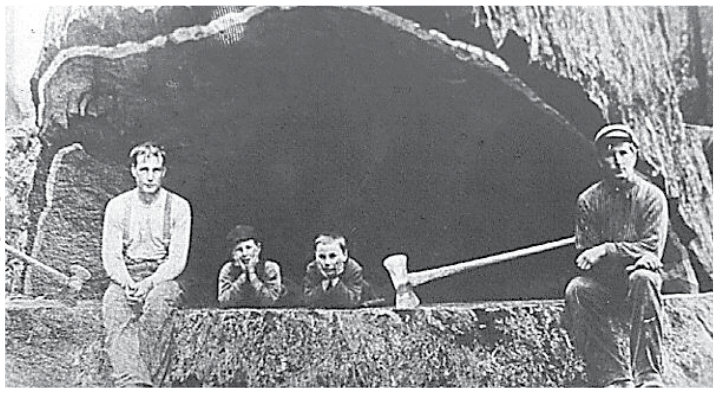
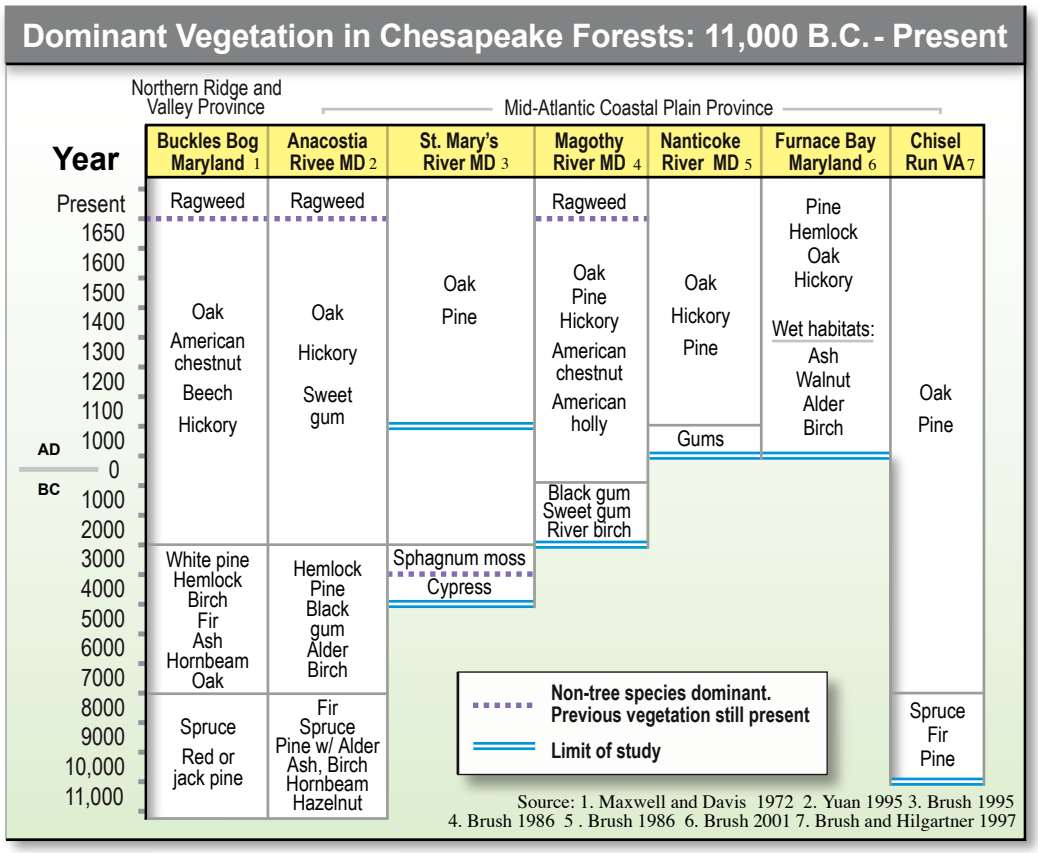


Photo: McClain Printing Company

*White Oak/West Virginia, 1913*

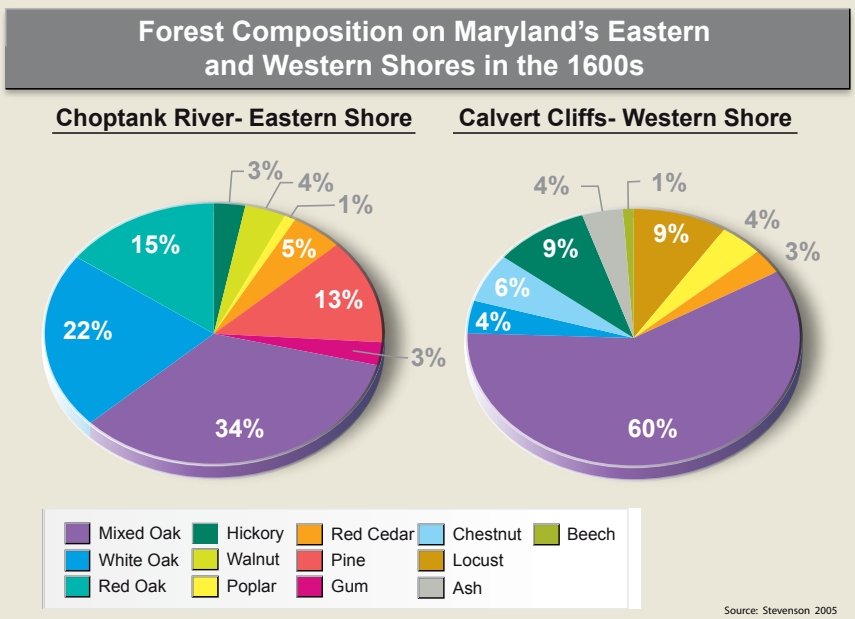



## Historic Forest Composition in The Maryland Coastal Plain

Early 17th century land patents or deeds used trees to mark property lines and other points of interest. A study of these patents on the Eastern and Western Shores of Maryland provides insight into the composition of forests in the Coastal Plain and Piedmont areas at the time of European settlement.[10]

Along the Western Shore, the Calvert Cliffs area was dominated by oak in the 1600s, especially white oak.[11] The dominance of oak is not surprising, given that oak is still a major forest component there.[12] However, the original surveys list no pine trees, in spite of their current prevalence. This suggests that pine was not a significant fraction of the forest on the Western Shore at that time. Before European settlement, the Calvert Cliffs area also lacked red maple and hosted a large number of locust trees. This indicates that fire was a common occurrence, because the thin bark of red maple makes the species particularly vulnerable to fire and locust often colonizes an area after disturbance.[13]

The Eastern Shore patent describes property that runs along the Choptank River in Dorchester County. According to the land patents in the 1600s, oak was even more dominant along the Choptank than on Calvert Cliffs. Today, oak is not as abundant, having declined as land clearing and fire suppression took place on the Eastern Shore.




## Wildlife

A large, diverse forest led to a richness of the region's wildlife, which amazed early explorers and settlers. Large mammals such as the white-tailed deer, black bear, elk, and even woodland bison roamed the forests, while huge numbers of turkey, heath hens, grouse, and seasonal hosts of waterfowl lived in forest habitats. Great flocks of passenger pigeons, the most numerous bird species on the continent, could block sunlight as they migrated and foraged for nuts throughout the Bay watershed.[15]

## Appearance

While European settlers found forests widely distributed across the Bay watershed, the forests were not uniform. Natural processes like high winds, fires, and hurricanes created significant forest openings every 800 to 14,000 years.[9,16] These natural events, along with heavy grazing by herbivores like deer and elk, maintained areas of grassland and open woodlands. While the exact amount is debated, early reports suggest the Shenandoah Valley in Virginia and Wyoming Valley along Pennsylvania's Susquehanna River had some large grassland areas.[17]

Early explorers remarked on the park-like setting of coastal areas in the mid-Atlantic. Captain John Smith observed that a "man could gallop a horse through these woods."[18] These open woodlands were the result of brush-clearing fires set by Native Americans to improve the ease of hunting, production of herbs, the driving off or killing dangerous animals, and many other uses.[9] In general, these fires occurred every few years with a low intensity and localized effects. However, in more populated regions, fire could substantially alter the landscape. In the early 1600s, 30 to 40 acres were cleared for every individual in Virginia.[18]

The Native American population for the principal portion of the Chesapeake Piedmont and Coastal Plain provinces was between 24,000 and 33,000 people in the 16th century.[19] In 1608, Native Americans living along the lower Potomac River, from below Great Falls to its mouth, ranged from a low of 5,500 to a high of 11,000 people.[20] However, Native American communities were severely impacted by European diseases such as small pox and thousands of Native Americans died soon after European contact.

# Forest use and change

## 17th Century: European Settlement Begins

Most scholars agree that the first centuries of settlement by Europeans produced the most extensive environmental change in the Chesapeake Bay region since the last ice age.[19] European settlers viewed the removal of forest as a requirement for economic development and saw the overarching forest resource as limitless. To the settlers stepping off a shallop on untouched shoreline, the wall of forest—which they faced with only an axe, flint, and steel—was daunting. Even John Smith, who often showed appreciation for natural resources, commented, "…all the country is overgrown with trees whose droppings continually turneth their grass [a grazing resource valued by the English] to weeds by reason of the rankness of the ground. Which would soon be amended by good husbandry."

Initially, the impact of colonists on the Chesapeake environment was minimal and focused primarily in coastal areas, where colonists sought land already cleared by the Indians. However, Europeans quickly began to mold the landscape in new ways. Timber resources were of great interest, perhaps second only to gold, which was never found in quantity. John Smith loaded the ship "Phoenix" with eastern red cedar as the first real useful cargo to leave Jamestown for England in 1608. The next year, a ship arrived that was specially fitted to accept long timbers for masts and other spars, only to find that she was still too short to contain the great trees brought down for transport. The resource became so valued that by the middle of the 1600s colonists had established a booming trade in ship masts and lumber.

Colonists also cleared the land to produce crops, primarily tobacco, and to provide firewood, their chief fuel source. By the end of the 17th century, settled areas were already facing shortages of easily worked timber used for homes and garden fences. Livestock, especially pigs, foraged at will in nearby woodlands, which had disastrous effects on herbaceous plants and soil structure. By the 1700s, Europeans were bringing plants with them across the Atlantic, creating a landscape in settled areas where one in every ten plants collected by colonial botanists was non-native.[21]

Photo: Maryland State Archives

*From Forest to Farm/Western Maryland*

## 18th Century: Expansion of Agriculture and Logging

By the mid-1700s, 20 to 30% of forestland in the Bay watershed had been cleared to accommodate the growing population and its cash crop, tobacco.[2] By the American Revolution, all of the Tidewater and most of the Piedmont of Maryland and Virginia were occupied or actively being settled.[22] This land clearance began to adversely affect water quality as the loss of trees and other vegetation allowed greater soil erosion. The effects of erosion were perceived as early as 1753, when a Pennsylvania settler wrote:

"... our runs dry up apace, several which would turn a mill are now scarce sufficient for the farm. The reason is this. When the country was covered with woods, the rain that fell was detained by the woods and so had time to insinuate into the earth and contribute to our springs and runs. But now the country is clear'd and the rain as fast as it falls is hurried into our creeks and washes away the soil...and makes shoals in them, and hence creeks told by Mr. Penn to be navigable are no longer so."[23]

Timber shortages at home, plus long wars on the European continent, led the English to export greater quantities of wood from the colonies. In the Chesapeake and Carolinas, nearly 100 billion board feet—equal in area to the size of the Maryland—were logged

Photo: Maryland State Archives

*Hillside Deforestation/Keyser Ridge, Garrett County, Maryland*

during the colonial period alone.[18] Oak and pine were especially valued for shipbuilding. An English warship could require as many as two thousand oak trees in its construction.[19] In addition, the English sought the tall and straight eastern white pine to create masts greater than 30 inches in diameter for their larger ships.[9]

## 19th Century: Demands of the Industrial Age

By the late 1800s, 40 to 50% of the land in the Bay watershed had been cleared of forests.[2] In the heavily settled Coastal Plain, as much as 80 to 90% of the landscape was deforested—covered with herbaceous vegetation or used for agriculture and other human uses.[16] From 1860 to 1910, settlers cleared forests at a rate of over 8,500 acres per day in the United States.[24] By 1880, logging replaced agriculture as the leading cause of deforestation.[9]

The ecological impacts of deforestation began to show in earnest in the 1800s. Water tables and water quality in streams and estuaries continued to fall as their natural buffers were removed. Soils that were slowly built by perhaps an inch every 600 years were quickly washed into streams.[25] During the late 1800s, soil erosion in the northeastern United States increased six-fold, from 100 to 600 tons per square mile.[26]

The huge influx of sediment had profound effects for aquatic life in the Bay by decreasing oxygen and burying habitat for bottom-dwelling species, like the oyster. This new ecosystem favored greater numbers of floating planktonic organisms and swimming creatures that dwell in the water column.[27]

At the same time, populations of many forest wildlife species reached their lows because of over hunting and habitat loss. By the 1890s, there were almost no white-tailed deer in Pennsylvania and very few in other portions of the Bay watershed. Today, twice as many deer die due to car collisions in the Eastern United States than existed in 1890.[28] Along with deer, populations of black bear, beaver, and other wildlife were either extirpated or severely depleted.

### Fuel

Until the late 1800s, wood was the primary source of heat, light, and building materials in the United States. An era of cold temperatures from the mid-14th century to mid-19th century, known as the Little Ice Age, required colonists to burn immense quantities of wood to stay warm. A single household could consume 20 to 40 cords [i] of wood annually. The residents of Philadelphia alone consumed 140,000 cords of wood between 1826 and 1827, requiring the harvest of more than 7,000 acres of woods.[9]

Charcoal—produced by the slow burning of wood—fueled furnaces, foundries, and factories to meet the surging demand for iron in the 1800s.[28] Bay watershed residents needed considerable amounts of iron for tools, horseshoes, and cookware, as well as to expand the growing network of railroads.[29] For the average furnace, it took 20,000 to 30,000 acres of woodland to produce enough charcoal to smelt 1,000 tons of iron a year.[2] In addition, millions of pounds of iron ore were mined from forested wetlands for use in the smelting process.[29] Across the country, 5 billion cords of wood were harvested on approximately 200,000 square miles of woodland to fuel trains, furnaces, and steamboats between 1810 and 1867.[30]

Photo: Maryland State Archives

*Hemlock Storage Shed/Curtis Bay, Maryland*

### Fencing

Wood was also used prodigiously to construct fences. In fact, the volume of wood used for fencing exceeded that of lumber until the 1840s. One mile of the classic "split rail" worm fence required 6,500 lengths of timber.[18] By 1850, there were enough miles of wooden fence in the United States to encircle the earth 120 times.[15]

### Building Construction

The population of the United States was booming by the mid-19th century. While it had taken 150 years for the colonies to reach a population of 3 million people, the population grew seven-fold in the 65 years between 1785 and 1850, reaching more than 23 million. Development in the East and settlement of the mid-western prairie led to a large demand for imported timber. Approximately 10 million dwellings were built in the United States between 1860 and 1900, and the vast majority of these were constructed with wood.[9]

### Mining

Coal exploitation in the Chesapeake region began in the 1840s. In Western Maryland's Allegany and Garrett Counties, there was a high demand for props to support the walls and ceilings of mining tunnels. The hills surrounding the mouth of mines were often denuded for mine props. Coal exploitation also had

i A "cord" is a stack of wood 4ft x 8ft x 4ft

## American Chestnut

The American chestnut was an extremely valuable and common tree throughout most of the pre-European Chesapeake Bay watershed even if the tree was less dominant than past research has suggested.[9,32,33] In virgin forests throughout its range, mature American chestnut trees averaged up to five feet in diameter with many specimens reaching 8 to 10 feet. Some trees reached 100 feet high.[7]

In 1901, chestnut blight was introduced to the East Coast in nursery stock from Asia. The blight quickly began to kill chestnut leaves, flowers, and stems. By 1950, the blight had decimated the species. Because the roots of the American chestnut are not affected by the blight, its sprouts survive a few years, but within 10 to 15 years they become infected and die.

After filling important ecological niches in Chesapeake forests for millennia, American chestnuts have been reduced to an understory shrub. The Blight Commission of 1911 noted that chestnut comprised between 8 and 50% of all trees in Bay counties with a median value of 25%.[34] However, in the same counties today, American chestnut trees exist as only a small fraction of the total number of trees.[35]

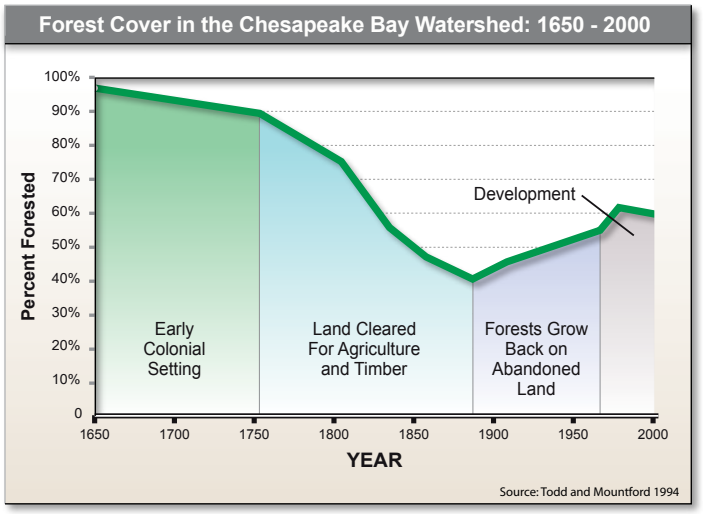
Blight resistant varieties and hybrids with Asian trees are currently being developed and tested in field studies with the goal of returning the American chestnut to Eastern forests. In 2005, a blight-resistant American chestnut was planted on the White House lawn to commemorate Arbor Day. Within a decade, the chestnut may begin their return to Chesapeake forests.

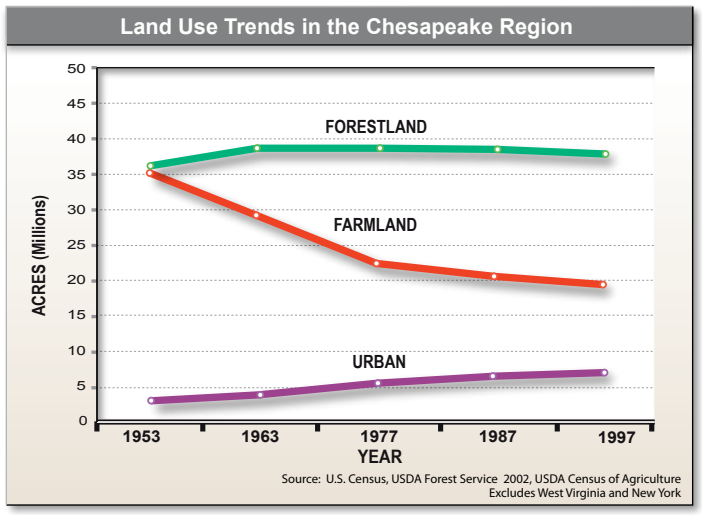
Photo: Ted Weber

profound and disastrous consequences for many Chesapeake tributaries in the western drainage states, because the water leaching from the mines was acidic enough to kill vegetation and stream organisms, rendering the streams devoid of life.

### Railroads

Coal enabled the expansion of commercial railroads beginning in the 1830s. Trains, in turn, exerted additional demands on Chesapeake forests. Early tracks required a constant supply of wood ties, cribbing, and trestles. The first trains burned firewood in large quantities, and woods near the tracks were quickly cut to meet this demand. Wood-burning steam engines threw vast showers of sparks, which in dry weather caused countless brush and forest fires.[9]




### Leather Tanning

The high tannin content in hemlock bark made the tree especially valuable to the leather industry. Pennsylvania's old growth forests of hemlock, with stands so dense in the northern part of the state that they were dubbed the Black Forest, provided approximately half of the hemlock used in the leather industry at the turn of the century. In the late 1800s, large tanning operations were harvesting 1,000 acres of hemlock a year. By the 1920s, Pennsylvania's seemingly inexhaustible supply of hemlock essentially disappeared.[9]

## Twentieth Century: Extensive Clearing Ends

While the records are incomplete for the turn of the century, it is clear that 60 to 70% of Chesapeake forests were gone as a result of agriculture, logging, and other uses.[2] Nearly all of West Virginia's forests had been harvested by 1930. Mature white pine was essentially eliminated from Pennsylvania because of the harvesting of 32 billion board feet of lumber by 1900.[9] This equals to over 100 million board feet per year over the previous 300 years. In 2002, Pennsylvania harvested around 13 million board feet of white pine.[31]

Maryland's first state forester, Fred Besley, noted that early logging operations consistently removed the most valuable trees from the forest—often the largest and most well adapted trees—leaving regeneration of the next forest to stump sprouts and, generally, less healthy trees.[30] This unsustainable harvesting practice, known as high grading, continues on many private lands today.

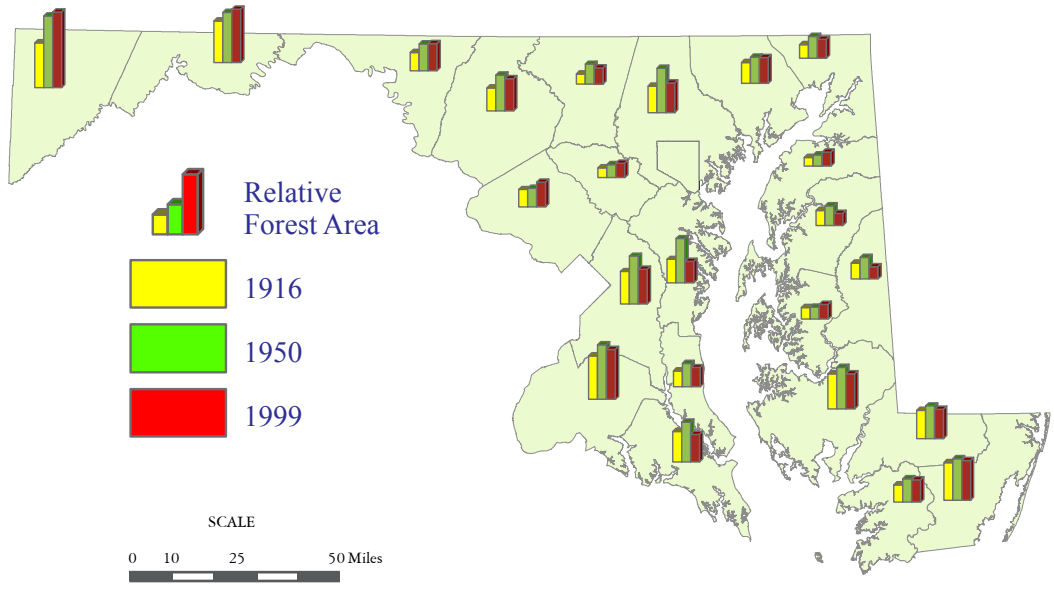
## A New Forest is Born

Chesapeake forests today are largely a product of many changes in land use over the past 400 years. With so much woodland removed for agriculture in the 19th century, today's forests are primarily regrowth, with only small, scattered enclaves of undisturbed forest. Until the late 20th century, the Bay watershed saw nearly a hundred years of increasing overall forest cover.[36,37,38] Much of the regrowth took place on former farm fields, as America's agricultural production shifted westward, dairy incentives declined, farm policies changed, and marginal farm lands proved uneconomical.

Humans have repeatedly used the growing forest for timber, pulp, firewood, and development throughout the 20th century. Furthermore, changes such as the decline of white oak, white pine, and eastern hemlock, as well as the disappearance of species like the American chestnut, have altered forest composition. The loss of the American chestnut, because of its toughness and durability, had a big impact on the American wood market. As late as the 1980s, 16 to 18 inch chestnut logs left behind on the forest floor were collected and sawn commercially.[39] The shift in forest composition has created conditions favorable to other species such as black cherry and red maple—which today enjoys a remarkable and unprecedented dominance of the forest.[9]

The new forest is much more heavily fragmented than the once vast and contiguous Chesapeake forest. Only 40% of Chesapeake forests contain the "interior" conditions of early forests. The 133,000 acres of forest in Baltimore County, Maryland, are separated into more than 9,000 individual pieces by farms, developments, and roads. Less than 0.1% is in patches 100 acres or larger.[30] Furthermore, development and disturbance of previously eroded or legacy sediment ensures that sedimentation rates remain high today, even though forest cover has greatly expanded throughout the watershed.[40]

## Forest Cover Trends in Maryland




Source: 1. Besley, F.W. 1916
2. USDA Forest Service / NE Forest Experiment Station 1955
3. USDA Forest Service / FIA 2005

# Chapter in Perspective

Land management and natural events over the past several thousand years have combined to create today's forest conditions and define its value as habitat, role in watershed function, importance to quality of life, and ability to contribute to the regional economy. Relatively new forces of change such as suburban sprawl are greatly increasing human influence on Chesapeake forests and further compounding historic effects. The history of Chesapeake forests provides numerous lessons for Bay watershed leaders to consider as they grapple with the influence of multiple and cumulative forces of change on the varied functions of forests.