INTRODUCTION

Chapter 1.

Forests and People in the Mid-Atlantic Region

Stephanie Fulton, Evan Mercer, and M.Patricia Bradley
Region 4, U.S. Environmental Protection Agency;
Southern Research Station, USDA Forest Service;
Region 3, U.S. Environmental Protection Agency

Human populations in the Mid-Atlantic region over the last 250 years have increased nearly 100-fold, from an estimated few hundred thousand people to over 30 million people (Mercer and Murthy 2000). Increased population growth usually results in the conversion of forestland to nonforest uses, particularly agriculture, pastureland, and urban development. Not only is the quantity of forestland reduced, but forest habitat quality also suffers as harvesting and forest conversion patterns chop the forest landscape into smaller, more isolated patches of forest—a process referred to as fragmentation.

Increased urbanization since European settlement significantly affected the historic extent, distribution, and composition of forests in the Mid Atlantic Integrated Assessment (MAIA) region. Prior to colonization, this multi-State area was a near-continuous cover of forest. During early periods of rapid population growth and colonial expansion, it was almost completely deforested by timber harvests that cleared the land for homes, cities, commercial agriculture, fuel, pastures, fences, railroads, and other uses. Due to improvements in agricultural techniques over the last century, much of the region has recovered from early agricultural land clearing, and forests once again have been dominating the landscape. Yet only isolated fragments of pre-settlement forests have remained. Over time the landscape came to represent a legacy of almost 400 years of settlement and intense use that made the eastern MAIA region a mosaic of forest patches of varying sizes and shapes found within a matrix of mixed urban, agriculture, and pasture land uses.

Both the rate and pattern of forest conversion and forest fragmentation were strongly influenced by regional socioeconomic patterns of land ownership, land use, and economic trade. Although occupying a relatively small portion of the watersheds' total land area, the Mid-Atlantic region's highly urbanized and growing population, coupled with diverse land use and ownership patterns, continued to threaten forest resources. Urban sprawl, with its associated impacts on forest resources, remains one of the region's most pressing forest health issues.

The purpose of this report is to describe the forested landscape based on data available through the year 2000, to show how land-use change and other stressors had affected the Mid-Atlantic region's forests. The large size of the region sometimes prohibited structuring any one complete data set that describes forest characteristics for the region as a whole. Therefore, we sometimes used different data sets to compile various landscape-scale indicators of forest health and sustainability. Our purpose was to quantify the impacts of land use change on critical forest ecosystem components and processes, and highlight where future risk to ecological stability may be the greatest.

Ancient Forests in the Mid-Atlantic Region

Prior to colonists settling in the region, Eastern forests were estimated to have covered 95 percent of the land surface. Fossil pollen records from the last ice age and beyond indicate that ancient forests in the region were composed primarily of spruce, pine, and fir, with some birch and alder, indicative of a cooler boreal climate, about 3º F to 8º F cooler than late in the last century (Brush 1986). Approximately 10,000 years ago temperatures rose, and oaks became more abundant, quickly followed by increased numbers of hemlock and hickory. Forests of the MAIA region 5,000 years ago resembled present-day forests in species composition, but abundances of species have fluctuated in response to climatic variations. Between 2750 BCE and 1450 BCE, forests were characterized by black gum and sweet gum, components of a wetter climate. Abundances of these species were greatly decreased after 1450 BCE. By 400 CE, holly, chestnut, and ericaceous shrubs, indicative of drier climates, dominated the landscape and remained dominant until European settlement approximately 1200 years later (Brush 1986).

Pre-European Settlement—Forest Extent and Composition

Tree species in relative dominance patterns commonly found together are referred to as forest types. According to Küchler (1964), the primary potential natural vegetation types in the Middle Atlantic Coastal Plain and Southeastern Plains pre-settlement were oak–hickory–pine forest (beech, sweet gum, magnolia, pine, and oak). In the southern flood plain forest (Omernik 1977; McNab and Avers 1994) and in the Piedmont areas oak–hickory–pine forest and southern mixed forest were found. Orwig and Abrams (1994) found that pre-settlement vegetation (prior to 1721) in Piedmont and Coastal Plains forests was a mixture of oak, primarily red and white oak, although black oak was of minor importance as were hickory species.

The Northern Piedmont region has been classified by Küchler (1964) as oak–hickory and by Braun (1950) as oak–chestnut. Before the early 17th century, native vegetation was composed mainly of oak and hickory; chestnut, yellow poplar, ash, walnut, and elm were associated species; and maple was dominant on wet bottomlands of the Piedmont (Loeb 1987).

Küchler (1964) described vegetation types in the North Central Appalachians as northern hardwoods forest (alternately referred to as maple-beech-birch forests) and Appalachian oak forest. Whitney (1990) wrote that the region lies in Braun's (1950) hemlock–white pine–northern hardwood region and Küchler's (1964) hemlock–northern hardwood forest type, and included extensions of more Southern Appalachian oak forests up into major river valleys of the region. Early surveys suggested that vast forests of white pine and hemlock once covered higher portions of the plateau in northern Pennsylvania (Sargent 1884; Whitney 1990). Early survey notes (1814 to 1815) for the region indicated a preponderance of beech and hemlock (> 60 percent) as witness trees—trees to which distances and azimuths from a particular point on the ground or object were recorded—and are distributed widely throughout the High Plateau, though neither species was common off the plateau (Whitney 1990). Sugar maple was associated with the flat top of the Plateau, birch occupied moister soils of foot slopes, and oak species preferentially occupied drier upper-slope positions.

The Blue Ridge Mountains region was classified by Küchler (1964) as a mixture of Appalachian oak, southeastern spruce-fir, and northern hardwoods forests. The Central Appalachian Ridge and Valleys regions were mapped by Küchler as Appalachian oak forest, oak–hickory–pine forest, and some northern hardwoods forest. Braun (1950) classified much of the area as oak-chestnut, but later revised the area to oak–hickory or mixed-oak forest (Nowacki and Abrams 1992). American chestnut was common in the region until chestnut blight decimated the species in the 1930s (Anagnostakis 1995, Brush 1986; Schlarbaum and others 1997). Nowacki and Abrams (1992) identified four forest types common in the region prior to European settlement (all dominated by oak species): (1) sweet birch–chestnut oak–northern red oak; (2) chestnut oak–northern red oak on forested ridges; (3) mixed oak species on mesic valley floors and transitional ridge/valley zones; and (4) white oak on gently sloping, low elevation sites. Oak species, pine species, and American chestnut were common on ridges; eastern hemlock increased while chestnut oak decreased in coves; and oak–pine–hickory (dominated by white oak) species dominated valley floors (Nowacki and Abrams 1992).

The Central Appalachians were mapped as northeastern spruce-fir, northern hardwoods, mixed-mesophytic Appalachian oak, and oak–hickory–pine forests. The Western Allegheny Plateau included beech–maple, Appalachian oak, northern hardwood, mixed mesophytic forests, and a small amount of oak–hickory types (Küchler 1964).

Post-European Settlement and Land Use

One of the most explosive periods of growth in the Chesapeake Bay region occurred between the initial colonization and the Revolutionary War. Early settlements were concentrated in the "Tidewater" areas of the Chesapeake Bay during the 17th century (Miller 1986), where colonists lived on isolated plantations scattered along creeks and river tributaries of the Chesapeake Bay. According to Miller (1986), early settlers showed a preference for waterfront property: Ninety-seven percent of 17th century archaeological sites were found within one mile of the water (75 percent were within 1,000 feet of the shore). Miller (1986) suggested this preference was a result of: (1) readily available land, (2) a primarily agricultural economy, (3) a market system dependent upon water transportation, and (4) a desire to live near water for easier travel and exploitation of estuarine resources.

Soil erosion was minimal during the 17th and early 18th centuries, due to the extensive use of slash-and-burn agricultural practices taught to the settlers by Native Americans (Miller 1986). Cleared forest was farmed using axe-and-hoe planting, but after 6 to 8 years the soil was exhausted and the land was abandoned to reforestation. After laying fallow for 20 years or so, the land was brought back into production. These practices created a patchwork of agricultural clearings buffered by riparian vegetation along streams, and interspersed with patches of forest in various stages of reforestation. While only a small amount of land was planted, a large area of land was needed to sustain the system over time.

Brush (1986) compared sediment accumulation rates before and after European settlement and estimated the extent and rates of forest clearing. Sedimentation rates were primarily controlled by climatic events (storms) and anthropogenic activity (land clearing, intensive agriculture). Brush (1984a, 1984b; 1986) found that although sediment accumulation

rates were highly variable before European settlement, they were consistently higher after. Sedimentation rates were greatest during periods (circa 1830 to 1930) of commercial agriculture (Cooper 1995), and did not begin to decrease until the late 1930s when soil conservation practices began.

During this early period of rapid growth and expansion, the Mid-Atlantic region experienced near-complete deforestation. Rapidly increasing populations, coupled with changing agricultural practices and the settlers' land tenure, soon led to the demise of the slash-and-burn techniques of the early colonial agricultural system (Miller 1986). For example, Maryland, established as a State in 1634, had 34,000 colonists by 1700, 100,000 by 1740, and 300,000 by the end of the colonial period. Population densities around Annapolis, MD, increased from 18 people per square mile in 1705, to 42 people per square mile at the beginning of the Revolutionary War. Land in southern Maryland under agricultural production rose from 2 percent in 1720 to nearly 40 percent in the early 1800s (Miller 1986). Planters essentially ran out of space to continue the long-term slash-and-burn, then lie-fallow system. In addition, land tenure changed from long-term leases at low annual rents to short-term leases at high annual rents.

Agriculture was widespread throughout the region by 1760 (Cooper 1995). All of the Tidewater and most of the Piedmont region of Maryland and Virginia were occupied, or in the process of being settled by the end of the Revolutionary War. Planters stopped rotating-cultivation, and shifted to intensive plow agriculture associated with grain production. This change in farm practice was hastened by instability of grain and tobacco markets after the Revolution, and became widespread in the Tidewater area during the last quarter of the 17th century. Development continued to expand into interior and Piedmont regions during the 18th century, and soil erosion and sediment runoff from the hilly Piedmont lands increased dramatically. The city of Baltimore's port had to be dredged regularly by 1780, and by 1807 small ports along navigable rivers draining into Chesapeake Bay had to be abandoned because of silt.

Increased Chenopodiaceous pollen (from plants that grow in marshes and in newly cleared fields) (Brush 1986) and the highest average sedimentation rates recorded (Cooper 1995) indicate landscape disturbance from agricultural was most intense from about 1830 to 1930. Not coincidentally, the population growth rate was also at its peak in the mid-to-late 19th century. According to census data, 40 to 50 percent of the land had been cleared for agriculture by 1840 (Cooper 1995), and by the end of the 19th century, land cleared for agriculture had increased to 80 percent (Brush 1986).