

Fall Foliage and The Watershed

Tom Schueler/Center for Watershed Protection

The leaves are turning, and will soon drop to the ground. As we begin our annual ritual of leaf raking, it's a good time to think about how important forests are to the health of the Chesapeake Bay and within our neighborhoods. Prior to European settlement, almost all of the 64,000 square mile Bay watershed was forested, mostly with oaks and hickory trees, but also pine trees in areas with poor sandy soils¹. Forests then were nearly 40% taller than they are today with the average hardwood tree exceeding 100 feet in height.¹ Lumber was one of the first exports from the colonies, and the watershed experienced massive clearing over the next three centuries for agriculture, fence posts, charcoal and even railroad ties. By the beginning of the 20th Century, the forests of the Chesapeake Bay had shrunk to about a third of their original area². Forest cover gradually recovered in the Bay from 1900 to 1970, as marginal farms were abandoned and modern forestry techniques began to reforest the landscape. By 1970, forest cover had increased to just over 60% of the total area of the Bay watershed.¹

Since then, forest cover in the Bay has trended downward, as land development have caused a new cycle of forest clearing. According to some sources, forest cover has declined by nearly 80,000 acres per year in the Chesapeake Bay between 1973 and 1997³. To put this annual forest loss in perspective, consider that it is equivalent to an area about 1.5 times larger than the District of Columbia. The greatest forest loss has occurred in the rapidly-growing Baltimore-Washington- Richmond corridor (collective loss of 32% of forest cover in this area in last three decades)³. Today, overall forest cover in the Chesapeake Bay has declined to less than 60% of the watershed, and is predicted to decline even further if urban sprawl does not abate.⁴ The sharp loss of forest cover in suburban and rural areas of the Chesapeake Bay has been masked by the expansion of forest cover in more distant and mountainous areas of the watershed.¹ The alarming loss of forest cover along the I-95 corridor in the last few decades is well documented by American Forests.

From an ecological standpoint, forests are the highest and best use of land in any watershed. For example, although forests comprise about 60% of the total land area in the Bay watershed, they only produce four percent of its nutrient load, and even less of other pollutants that harm the Bay.⁵

The location of forests is also very important. In particular, stream-side forests play a critical role in the ecology of small streams and rivers in the watersheds. According to the Chesapeake Bay program, almost half of the 100,000 miles of streams and rivers that drain to the Bay lack an adequate forest buffer along their banks.⁵ Reforesting these missing buffers has emerged as one of the most important and inexpensive strategies to restore the Bay's health.

Autumn leaf fall also signals two major changes in the watershed. The first change is that the "leaf pump" is turned off across much of the watershed. During the growing season, trees are pretty thirsty. For example, an acre of mature trees can take up more than 1800 gallons of water each day from groundwater to drive the photosynthesis process. Consequently, groundwater and stream flows levels usually drop sharply while trees are pumping water from the ground. Even in normal rainfall years, stream flow and groundwater levels drop to their lowest levels of the year by the end of the growing season (September and October). Once the leaves drop from the forest, the pump is effectively turned off until Spring. In most years, the Fall and Winter are the primary seasons that replenish groundwater. If rainfall is abundant, stream flows usually begin to recover, as well. Given the drought of the last few years, we will need as much as twenty to thirty inches of rain in the next six months to fully restore normal groundwater and stream flow levels.

The second major change associated with leaf fall is the movement of leaves into small streams. The loss

of leaves is a gift to small streams and rivers. Few people realize that fallen leaves are the single most important source of energy driving stream ecosystems.⁶ Quite simply, streams depend on autumn leaves to supply the energy needed to support stream life throughout the rest of the year. When the leaves blow into the stream, they form “packs” that gradually break down over time. The leaf packs typically lose about 1 or 2% of their mass each day. Leaf packs are colonized by fungi, which, in turn, are consumed by aquatic insects such as caddisflies, stone flies and crane flies. These insects, known as shredders and collectors, live on the bottom of the stream, and are a major part of the diet of fish and other aquatic life. At a time of year when growth is dormant elsewhere, the first few months after leaf fall usually triggers the biggest pulse of growth and activity in the small streams of the Chesapeake Bay.⁷

Factoids: Did you really know the value of trees in your neighborhood?

Forested neighborhoods (i.e., those with a 40% forest canopy) save homeowners at least 4% in heating costs in the winter and 10% on cooling costs in the summer. Energy savings can be as high as 30% when trees are planted on east and west sides of each home.¹⁰

Trees contribute to better neighborhoods, and home buyers are willing to pay a premium to live in forested neighborhoods. Economic research has shown that property values are at least 5% higher in forested neighborhoods, compared to unforested ones.¹¹

The branches and trees of urban forests help to intercept and slowdown rainfall. Our typical oak tree can intercept and retain more than 500 gallons of rainfall in a given year.¹¹ This helps to reduce the volume of stormwater runoff in our cities. According to researchers, a healthy forest canopy can reduce stormwater runoff by as much as seven percent.³ While this doesn't seem like much, it would cost more than five billion dollars to replace this free service within the Baltimore-Washington Area.³

Trees help to cool the urban landscape. For example, an unshaded parking lot is 5 to 7 degrees F warmer during the summer than a neighborhood with a forest cover of 40% or more.^{12, 13} According to recent California research, an increase in the tree canopy of parking lots from 8% to 50% could measurably reduce many air pollutants from automobiles in smog-prone metropolitan areas.¹²

Trees help reduce noise levels in urban and suburban areas. Even a fifty foot wide belt of trees can reduce noise levels by as much as 50%.¹³

The tranquil setting of a forest can make us feel better. For example, medical researchers have also noted that a forest setting reduces blood pressure, and even a view of forest from a hospital room can improve recovery rates.^{11, 12}

Trees help remove air pollutants that create smog in our congested urban areas. In the Baltimore Washington Area, researchers have calculated that our urban forest collectively reduce more than 34 millions pounds of air pollutants every year. This free service would cost more than 88 million dollars to replace.³

An acre of trees can remove 40 tons of carbon from the atmosphere and incorporates it into woody structure each year (which is a useful strategy to compensate for local and global increases in carbon dioxide). The same acre produces enough oxygen each year to sustain about a thousand people.

Sources and Resources

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Other useful resources and websites:

American Forests:	http://www.americanforests.org/
National Arbor Day Foundation:	http://www.arboday.org/
Treelink	http://www.treelink.org/
Center for Urban Forest Research	http://www.cufre.ucdavis.edu/