Virginia's Forest Resources

Few things invigorate our bodies and minds like a brisk walk through a forest. The panoply of colors, shadows, textures, and shapes soothes the mind and frees the thought process. Just as important, forests beautify the landscape while offering quiet places to observe nature. Forests renew our spirits.

On a practical level, forests moderate climate, help cleanse the air and water, and house wildlife. They also provide thousands of wood products and related jobs.

Virginia's forests are diverse. From the extensive loblolly pine forests of the flat, low-lying Coastal Plain, through the patchwork of pines and hardwood forests of the rolling Piedmont, to the white pine and upland hardwoods of the western mountains and valleys, forests wear many faces.

Forest Ecology

A forest is more than just trees. It is an ecological system made up of all the organisms that inhabit it — from trees to mosses, from birds to bacteria. All are interdependent, and it is the myriad interactions among living components of the forest and surrounding physical environment that keep a forest productive and self-sustaining for many years.

Forests come in lots of varieties. Different tree species dominate at various sites. Some forests are denser and more productive than others, and tree ages vary. In fact, the type of forest that naturally exists at a particular site is the result of many factors, including conditions of the physical environment and the history of disturbance there. Critical factors that shape a forest's character include soil type, moisture, slope, aspect (or exposure), climate, fire, wind, and sunlight.

Forests are also ever-changing. Sometimes the changes are swift, resulting from natural or human forces. Other times these changes are slow, occurring over many seasons. But regardless of such changes, the forest ecosystem continues to function. Processes such as succession, maturation, and decay are continuously at work.

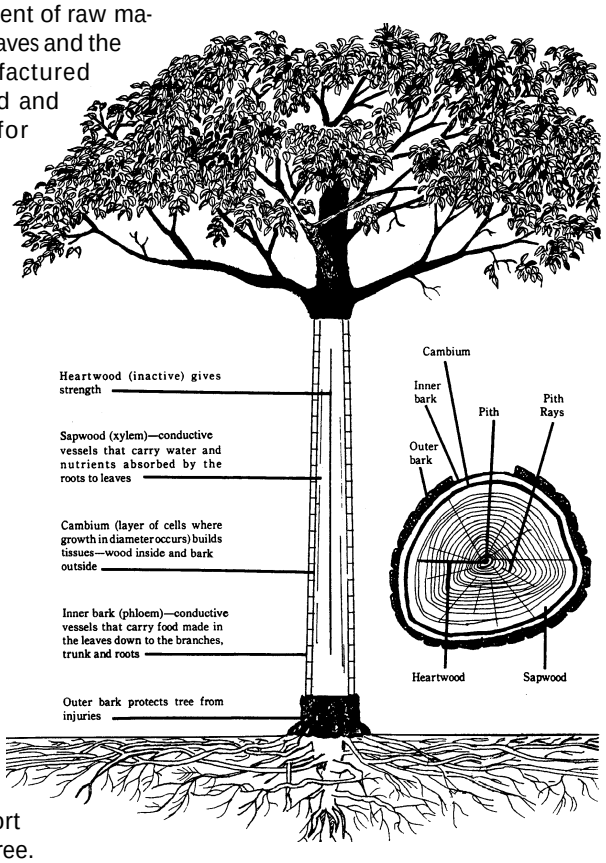
Active management of a forest modifies what occurs naturally on a given site. For example, sometimes we choose to harvest mature trees rather than let them grow old, fall, and decay as they would in the natural cycle. And, when choosing to create openings to benefit wildlife, it is at the expense of birds and plants that live in forest interiors. Each management choice favors some species and enhances

How a Tree Grows

The crown consists of the leaves and branches. The leaves should be called the tree's "chemical laboratory." They contain small green bodies called chloroplasts. Chloroplasts contain chlorophyll, the substance that gives the green color to the leaves. In the presence of sunlight, the leaves use the carbon dioxide from the air to produce glucose and oxygen. The oxygen is released to the atmosphere and the glucose is stored in the trunk and roots. This process is called photosynthesis.

The trunk, or main stem, of the tree supports the crown and contains the conductive vessels that run between the roots and the leaves. These vessels allow the movement of raw materials up to the leaves and the return of manufactured food to the wood and root systems for growth and storage.

The root system is the most important part of a tree, yet is the most frequently ignored. A tree's root system usually extends horizontally beyond the branch tips. The majority of the root system is located in the upper 12 to 18 inches of soil because of the high levels of oxygen which the roots require. Roots absorb nutrients and water, store food, and support and anchor the tree.



some processes at the expense of others.

Diversity of species mix and age keeps a forest healthy, helps reduce insect and disease problems, and benefits a variety of wildlife. Forests are kept healthy and growing through proper management. Occasionally this includes harvesting older trees or forest stands to make room for younger ones. When this happens, primary concern should be to create conditions favorable for the development of a healthy, new stand.

All plants and trees eventually die. As trees die they attract insects which, in turn, become food for birds. Cavities provide shelter for animals such as squirrels, raccoons, and opossums. As wood is further broken down by fungi and bacteria, the organic matter and nutrients are released from the wood and work their way back into the soil. These nutrients are recycled and used by different, competing plants. Nutrient recycling in a forest ecosystem, then, is key to healthy succession.

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Nearly all of the natural forests in Virginia have been extensively modified by human activities during the past 300 years. Throughout the Piedmont and Coastal Plain regions, land was cleared for agricultural use in colonial times. Many sites have been harvested or cleared several times since for crop cultivation or pasture, then abandoned to become reforested over several generations.

Hardwood forests currently cover more than 70% of the total forest area of Virginia — over 11 million acres. Hardwoods reproduce abundantly from stump sprouts, roots, or seeds in the soil when exposed to increased light and moisture. Usually, in fact, there is no need to replant seedlings unless a particular species desired does not exist on site.

Pines are mostly pioneer species, meaning they are the first trees to go to seed on bare ground after a fire or in an abandoned field. Like most oak trees, pine seedlings need full sunlight to grow. They cannot tolerate shade. Loblolly pine is the most common species found in the southern part of Virginia. Shortleaf pine and Virginia pine can also be found here, but are more common on old abandoned fields.

Pine trees do not sprout from stumps or roots like many hardwoods. They often germinate from wind-blown seeds produced by mature trees nearby. Many landowners reforest cut-over sites by planting pine seedlings produced from improved seed sources and grown in a Virginia Department of Forestry nursery. The seed sources for these "superior" tree seedlings have been selected and tested through intensive research to grow faster, resist insects and diseases better, and survive better than natural seedlings. Since most pine stands are planted or originate from seeds on bare soil, all the trees in a particular stand are usually about the same age.

Extensive research has dramatically increased the growth potential and range of loblolly pine. Each year over 60 million pine seedlings are planted to reforest cut-over or abandoned land throughout the Commonwealth!

Economic Value of Virginia's Forests

Virginia's forests are comprised of 66% hardwood, 22% pine, and 12% oak-pine mixed. This expansive resource, almost 15.5 million acres of commercially productive woodland, serves Virginians well:

- In 1993, the forest industry was the number one manufacturing industry in Virginia, worth $5.8 billion per year to the state's economy.
- One out of every 7 manufacturing workers—130,000 wage earners—are employed in forest-related industries.
- Forest-related industries are located in every county in Virginia and include 285 sawmills, 178 furniture plants, 7 pulp mills, 7 veneer plants, and 1,100 harvesting contractors.
- Forest resources contribute $7.4 billion annually to Virginia's economy.
- Forests offer many recreational benefits for Virginians while purifying the air and water. These attributes are estimated to be worth another $1.6 billion to the people of Virginia and its economy.

In many parts of the state, soils do not produce good quality hardwoods but will support crops of pine timber. Hot, dry, less fertile sites are best for pine tree growth after timber harvesting is completed. With good management, planted seedlings will often exceed two feet in height growth each year, rapidly outgrowing the hardwood sprout competition.

The Role of Streamside Forests

Forests play a critical role in keeping surface waters clean. Acting as a "living filter," forests capture rainfall, regulate stormwater and stream flow, filter nutrients and sediments, and help prevent erosion. When streams are buffered by surrounding forests, runoff is greatly reduced. Even a narrow strip of trees adjacent to a stream can improve water quality.

Healthy, forested stream corridors, called "riparian buffers," provide much needed habitat for many animals and plants, while moderating water temperatures — critical for many fish and aquatic organisms. Decaying leaves and twigs form the basis of food in the stream system and are used by small organisms and insects that, in turn, become prey for fish. Riparian areas are used as travel corridors. It is here that birds, reptiles, amphibians, and mammals move about, eat, rest, and raise their young.

Forested riparian buffers also enhance the beauty of our waterways. They can slow the spread of wildfires by creating a cooler, wetter zone, and offer shaded relief for recreational activities like fishing, hiking, and bird watching.

Managing for Healthy Forests

Forest management and timber harvesting can be accomplished without harming the soil and water. The key is a well planned project using "best management practices," or BMPs for short. Log roads that allow trucks to neatly enter and exit an area, skid trails where skidders drag logs to an area called a landing to be loaded onto log trucks, and replanting disturbed soil with grass immediately are all examples of best management practices.

In some types of forests, low intensity fires are important to maintaining healthy, dynamic ecosystems. For this reason, foresters and wildlife managers often use controlled, or "prescribed," burning to improve tree planting and habitat conditions. Fire clears the forest of woody debris, providing room for new plants to grow. This new growth becomes food and habitat for many birds and animals. Some plants even depend upon occasional fires for reproduction.

Fire also promotes the release of nutrients from woody material. Phosphorus, potash and other essential nutrients are found in the ash left behind. It is nature's way of fertilizing new plant growth.

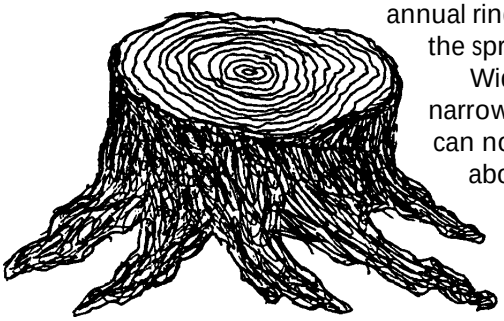
Since the mid-1960s, populations of quail, rabbit, and at least 18 other species with the same habitat requirements have been in decline. Clean farming and more houses creeping into rural areas have contributed to the problem. So it is important that the forests remaining are kept in a state conducive to productive habitat. Prescribed fire by professionals to clear cut-over areas for tree planting and to remove understory brush in older stands helps.

Of the 16 million acres of forestland in Virginia, nearly 75% is owned by non-industrial, private land owners, estimated to be about 300,000 people. State and federal governments own 12% and forest industries own 13%.

Aging a Tree

If you look at a cross-section of a tree trunk, you will see that it is marked by a series of concentric rings. Each growing season, a tree adds a layer of new wood to its "girth," or circumference. During the cold months, when the sap ceases to flow, growth is temporarily halted and the tree rests. Thus, the rings are clearly marked. By counting the rings, it is possible to arrive at a reasonably accurate estimate of the tree's age.

The layer just under the bark of the tree, called the cambium, produces the tree's new wood and bark growth each year. One annual ring consists of the light, spring wood band and the darker, summer wood band. The spring wood (which is softer and more porous) is toward the inside of the annual ring, and the summer (harder) wood is toward the outside -- because the spring wood grew first.



Width of the rings can vary from year to year. Dry seasons produce narrow rings; wet seasons, broad rings. Armed with this knowledge, you can not only approximate the age of the tree, but also draw conclusions about the weather and other natural conditions that influenced growth. For example, what effect would these factors have on a tree's growth: shading by another nearby tree, too many trees growing in one place, diversion of a creek away from the tree roots?

Wildfires (or forest fires) which occur during hot, dry, windy periods can destroy a forest, wildlife habitat, and nearby houses. In Virginia, 99 percent of these destructive fires are caused by people being careless. Each year, wildfires cost hundreds of thousands of dollars to control. Annually, about a thousand fires burn 4,000 acres of forest land. In addition to destroying the timber, hot fires wipe out the cover on the forest floor, leading to erosion during storm events.

For over 50 years, Smokey Bear has been the symbol of forest fire prevention. Smokey reminds us that, "Only YOU can prevent forest fires." Most fires can be prevented by using common sense, following safety rules, and obeying fire laws. Smokey's rules include:

- Never leave a fire unattended.
- Don't play with matches.
- Drown your campfire "dead out."
- Clear a 10-foot safety circle of leaves and dry grass.
- If your home is in or near the woods, have a fire safety inspection done by a forest warden or fireman to be sure you are fire-safe.

Forest wardens and volunteer firemen work together to control forest fires and save lives, properties, and forest resources. Forest wardens investigate all forest fires to find the person responsible, collect "suppression" costs, or issue a summons to court for violations of the law.

Insects and Disease

More trees are killed each year by insects and disease than all other causes combined. These naturally occurring forest pests can devastate large areas of a forest (such as what was experienced with the Gypsy Moth and Southern Pine Bark Beetle) or individual trees around your home (familiar culprits include tent caterpillars and bagworms). Many insect and disease problems can be minimized by simply managing the trees to maintain their vigor and health.

When trees reach maturity, their growth and vigor decline, particularly in unmanaged stands where competition for limited resources can be severe. Well managed stands will stay healthier longer. Forests with mixed ages and species are far less likely to sustain pest outbreaks than pure, even-aged stands. Recognizing pest problems early and seeking advice from a professional forester can often help reduce or prevent tree losses.

Conserving the Forest Land Base

One of the greatest threats to our forests is not wildfires, insects, or diseases, but the conversion of forest lands to other uses. Fragmentation of large land parcels occurs when they are broken into smaller blocks for houses, roads, and other uses—sought by a swelling population base. Forest fragmentation is on the rise, and it limits the options for both management and production. It threatens those wildlife species needing a sizeable habitat free of constant disturbance and human competition. Fragmentation also threatens the vitality of Virginia's natural landscape—the backbone of the tourism industry.

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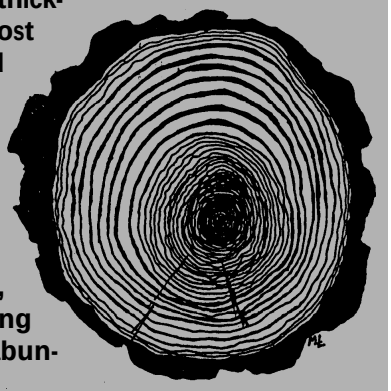
Responsible, sustainable forest management and forest conservation measures are needed now in Virginia. Such measures would complement comprehensive land use planning, and should be based upon the most recent assessment data and scientific research available. Wise stewardship will ensure that Virginia forests continue to provide us with the many aesthetic, economic, environmental, and cultural benefits that daily improve our quality of life.



Cross-section of a loblolly pine, showing the effect of light upon annual ring thickness. The innermost rings were formed while the young tree was densely shaded. Outer rings show increased width following removal of adjacent trees, allowing the young pine to receive abundant light.

The Value of Forested Riparian Buffers

Streamside, or riparian, forests make excellent buffers between upland areas and waterways. Studies have shown dramatic reductions in nutrients (nitrogen and phosphorus), sediments, pesticides, and other pollutants in surface and ground water after passing through a forest buffer. Riparian forests freely support the many economic benefits of clean water (versus the costs of repairing damaged and degraded natural systems) by performing the following functions:

r **Trapping Sediment & Maintaining Stream Integrity:** Studies indicate that an urban stream system may fail to function if 10% or more of the land in its watershed is covered by paved or impervious surfaces, resulting in a system that silts downstream areas and increases flood potential. Riparian forests filter sediment from stormwater *before* it reaches waterways and help maintain stream integrity.

Repairing streams is expensive! In urban Fairfax County, a local bond issue provided nearly $1.5 million to restore 2 miles of degraded stream and riparian area. That's about $750,000 per mile.

r **Nutrient Removal:** Adequate riparian forest buffers can reduce costly water treatment to remove pollutants like nitrogen and phosphorus.

An acre of riparian forest buffer can remove an estimated 21 lbs. of nitrogen each year for $0.30 per pound and about 4 lbs. of phosphorus every year for $1.65 per pound.

❒ **Erosion Control:** Erosion and sediment control is costly to communities both during development and in maintenance down the road. Trees provide deep root systems that hold soil in place, stabilizing streambanks and floodplains and reducing erosion.

Average costs for subdivision development include clearing of the forest (at $4,000 per acre) and sediment control (at $800 per acre). Forest conservation keeps soil on site, resulting in less time and labor to re-grade, stabilize, and re-landscape the site.

❒ **Flood Protection:** When floods pass through a forested stream corridor or floodplain, the roughness of the forest and its lush vegetation help to reduce the energy of the water flow and thereby reduce downstream flood damage. Forests also serve as a storage area for stormwater, absorbing and slowly releasing water to a stream or under ground.

Retaining forest area and buffers has been estimated to reduce stormwater costs in Fairfax County by $57 million.

❒ **Wildlife Habitat:** Habitat diversity provided by trees, shrubs, and grasses makes riparian forests critical to the life stages of over half of all native Chesapeake Bay species. Organic matter produced by riparian trees is the foundation of the food web in most stream environments.

Tourists and residents place a high value on wildlife watching. Studies confirm that a majority of suburban residents are willing to pay greater prices for homes in settings that attract wildlife.

Source: Chesapeake Bay Program.

Trees for Good Health

t Trees help relieve stress associated with living in cities. Medical research indicates that patients in rooms with a view of trees get better faster.

t Trees can reduce air conditioning needs by 30 percent, and used as windbreaks, trees can save 20 to 50 percent in energy used for heating.

t Trees reduce noise pollution by absorbing unpleasant sounds.

t People shop longer along tree-lined streets and apartments, and offices rent more quickly in wooded areas. Trees can add 10 percent or more to a property's value.

t Trees improve air quality by trapping and holding dust particles that can damage human lungs. Tree leaves absorb carbon dioxide and other poisonous gases and, in turn, replenish the atmosphere with oxygen for us to breathe. (One acre of trees provides oxygen for 18 people.)

Additional Resources

Web Sites:

u Virginia Department of Forestry; www.dof.state.va.us

u FORsite (Forestry Outreach Site for middle schools); www.fw.vt.edu/dendro/forsite/welcome.htm

u 4-H Tree Identification Project Guide; www.fw.vt.edu/4h/

u Virginia Big Tree Program; www.fw.vt.edu/4h/bigtree/index.htm

u Forestry and Wildlife Clubs; www.ext.vt.edu/resources/4h/environment/forestry/forestry.html

Other Resources:

u Virginia Department of Forestry has fact sheets and materials on a range of topics, and a new CD that allows the user to take a *virtual walk* in the woods; available from DOF headquarters by calling (804) 977-6555 or on-line (see above).

u Virginia Tech (VPI&SU), College of Forestry and Wildlife Resources, (540) 231-5481.

Fundamental Learnings Related to Forest Resources

R Forests are a renewable natural resource of tremendous value to people for providing environmental, economic, and cultural benefits essential to our quality of life.

R A forest ecosystem is an interactive community of plants, animals, and microbes which is dynamic and ever-changing over time either as a result of human activities or by natural forces such as succession, mortality, decay, weather, fire, insects, and disease.

R Using wise stewardship management practices, healthy forests with a diversity of forest stand types and ages can be created that sustain wildlife habitat, clean water, and fresh air, and provide recreation opportunities, wood products, scenic beauty, and spiritual renewal.

R Each tree species has a range of tolerance for basic environmental factors that control its survival—including sunlight, water, temperature, and nutrients. Forest managers apply these basic ecological principles to manipulate or control natural changes and reactions to planned "disturbance" activities.

R Fire in a forest can be good or bad depending upon how and when it is used. In the proper time and place and under the right conditions, controlled fire can be used by a trained professional resource manager to improve forest health and enhance wildlife habitat.

R Private landowners own 75% of Virginia's forestlands. Forest areas are getting smaller and more fragmented due to increasing development. The greatest threats to our forest resources are population growth and unplanned development.

R A timber harvest is not the end of the forest but, rather, the beginning of a new, young, vigorous forest. A timber harvest is disruptive, but does not need to be destructive. A professional natural resource manager should always be contacted for assistance before any timber is harvested.

R The way we care for our forests today will determine what types of forests we will have in the future.