Virginia Statewide Assessment of Forest Resources

A Comprehensive Analysis of Forest Conditions, Trends, Threats and Priorities

June 2010

VIRGINIA DEPARTMENT OF FORESTRY

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Section I
Executive Summary

Overview

Beginning in 2007, the US Forest Service (USFS) and the National Association of State Foresters (NASF) cooperatively embarked on establishing fundamental changes to their process of delivering services and programs within the individual states. The purpose of this "Redesign of State and Private Forestry" (S&PF) is to shape and influence the use of forestland to optimize the benefits from trees and forests for both current and future generations.

As part of the redesign process, each state is required to complete a comprehensive, statewide assessment of the forest resource and any potential threats to that resource. Both the redesign effort and the state assessments are focused on three consensus-developed S&PF national themes:

- Conserve working forest landscapes
- Protect forests from harm
- Enhance public benefits from trees and forests

This Assessment of Virginia's Forest Resources and the companion document, the Virginia Department of Forestry's Strategic Plan, comprise the first two required components of the assessment and planning process. Section II, page 13, provides an in-depth explanation of the assessment process.

Trends and Conditions

Several important changes in Virginia will significantly impact the health, quality and extent of Virginia's forests in the foreseeable future. These include:

- Population growth and demographic changes, including decentralization, an aging population, and increasing ethnic diversity.
- Continued loss of forestland over most of the state.
- Changes in forest ownership.

These changes will increase the need for innovative and proactive water quality; forest stewardship; forest health, and urban forestry efforts in all areas of the Commonwealth.

Important existing or potential threats that may impact Virginia's forests include:

- Wildland fire and the expansion of the wildland/urban interface;
- Forest sustainability, particularly as new markets and products are established;
- Loss of forestland to other land-use types, which is likely to continue with increasing population and without counterbalancing efforts;
- The impact of the potential effects of climate change;
- Declining reforestation, particularly as major forest products companies and other large landholders divest themselves of significant land holdings;
- Insufficient funding for natural resources programs across all levels of government, and
- Other important threats, such of the loss of viable forest industry, declining tree species, poorly funded conservation education and a diminishing focus on tree improvement.

Section III, page 19, gives a detailed analysis of all trends and conditions.

The Virginia Department of Forestry

The VDOF has a number of program areas, each generally focused on a specific aspect of forestry or the forest resource or specifically tied to a national-level program of the US Forest Service. These program areas are administered at the agency headquarters level, with a majority of the projects and activities being conducted through our field staff assigned to the three operational regions. Six program areas are specifically tied to Forest Service program areas. These include:

- Wildfire Suppression and Public Safety
- Forest Health
- Forest Legacy/Land Conservation
- Forest Stewardship and Management
- Urban and Community Forestry
- Forest Inventory and Analysis (FIA)

In addition, other notable VDOF program areas include:

- Water Quality
- Forest Research
- Tree Improvement
- Forest Products Marketing and Utilization
- Ecosystem Services
- Conservation Education
- Tree Nursery Program
- State Forest System

Section IV, page 37, provides detailed overviews and program emphases for all VDOF programs.

Identified Issues Impacting Virginia's Forests

Through a collaborative process involving a large number of stakeholders, both internal and external, numerous issues important to the forests of Virginia and the Virginia forestry community were identified. Some issues are of sufficient scope, scale and/or geography that they either lend themselves to or demand a multi-state cooperative approach to address, including:

- Restoration of the Chesapeake Bay;
- Forest health issues, including Southern Pine Beetle mitigation and Emerald Ash Borer eradication;
- Diminished species restoration for Atlantic white-cedar, longleaf pine, shortleaf pine and the American chestnut;
- Land conservation in the New River Valley (southwest Virginia) and the Chowan River basin (southeast Virginia), and
- Restoration of the Appalachian forest.

Success dealing with most of these multi-jurisdictional issues will depend largely on federal-level funding and collaborative leadership.

Section V, page 98, provides more details on multi-state issues.

Identified issues that can be significantly addressed within Virginia include (issues organized by appropriate national theme):

A. National Theme – Conserve Working Forestlands

1. Conserve the forestland base
2. Promote a larger, connected forest landscape
3. Ensure the sustainable use of woody biomass

B. National Theme – Protect Forests from Harm

1. Protect woodland homes communities from fire
2. Protect forests from invasive species
3. Conserve and restore diminished species

C. National Theme – Enhance Public Benefits from Trees and Forests

1. Enhance the role of forests in maintaining water quantity and quality
2. Promote initiatives for ecosystem services
3. Expand and improve urban and community forests
4. Facilitate opportunities for forest certification among landowners

This report described each issue and highlights opportunities for action in high-priority forest areas of the state (see Section VI, page 105). These issues have helped inform the development of state goals and strategies which can be found in the companion document **Virginia Department of Forestry Strategic Plan**.

Section II
Overview of the State Assessment Process

Beginning in 2007, the US Forest Service (USFS) and the National Association of State Foresters (NASF) cooperatively embarked on establishing fundamental changes to their process of delivering services and programs within the individual states. The purpose of this "Redesign of State and Private Forestry" (S&PF) is to shape and influence the use of forestland to optimize the benefits from trees and forests for both current and future generations.

As part of the redesign process, each state is required to complete a comprehensive, statewide assessment of the forest resource and any potential threats to that resource. Both the redesign effort and the state assessments are focused on three consensus-developed S&PF national themes, each having two or more sub-themes:

- Conserve working forest landscapes
  - Identify, conserve and manage high-priority forest ecosystems and landscapes
  - Influence urbanization, fragmentation and loss of forestland
- Protect forests from harm
  - Minimize potential and reduce impact of wildfire
  - Identify and manage threats to forest health
- Enhance public benefits from trees and forests
  - Protect and enhance water quality and priority watersheds
  - Conserve fish and wildlife habitat
  - Enhance forest resource market opportunities
  - Connect people to forests
  - Improve air quality and offset carbon emissions
  - Work with communities to plan for and reduce wildfire risks

In the future, the comprehensive statewide assessment will be used to ensure scarce S&PF resources are being focused on high-priority projects and areas with the greatest opportunity to provide meaningful outcomes. They will also provide a valuable opportunity to demonstrate the full scale of resources needed to address the identified priorities, both within a state and across a region, where appropriate.

At a minimum, the statewide assessment will:

- Describe the condition of the forest across the various ownerships within the state;
- Identify forestry related benefits and services;
- Identify threats to the forest resources;
- Highlight issues and trends of concern as well as opportunities for action;
- Delineate high-priority forest landscapes to be addressed, and
- Be geospatially based and make use of the best existing data.

This Assessment of Virginia's Forest Resources and its companion document, the Virginia Department of Forestry's Strategic Plan, comprise the first two required components of the assessment and planning process:

- The Statewide Assessment of Forest Resources, which provides an analysis of forest conditions and trends in the state and, where appropriate, delineates priority rural and urban forest landscape areas.
- The Statewide Forest Resource Strategy, which provides long-term strategies for investing state, federal and other resources to manage priority landscapes identified in the assessment, identifying where federal investment can most effectively stimulate or leverage desired action and engage multiple partners.

After approval of the Assessment and Strategy documents and implementation of the identified strategies, an Annual Report on Use of Funds will be produced. This periodic document will describe how S&PF funds were used to address the assessment and strategies, including the leveraging of funding and resources through partnerships, for any given fiscal year.

Virginia is a member of the Southern Group of State Foresters (SGSF) organization, and lies within the USFS Region 8. As a guide for the assessment process, SGSF and USFS have identified a set of regional priority issues that could be used to focus attention during the assessment's production. These include:

- Significant forest ecosystems and landscapes;
- Urbanization, fragmentation and loss of forestland;
- Fire;
- Forest health;
- Water quality protection and watershed management;
- Wildlife habitat and species conservation, and
- Forest resource market opportunities.

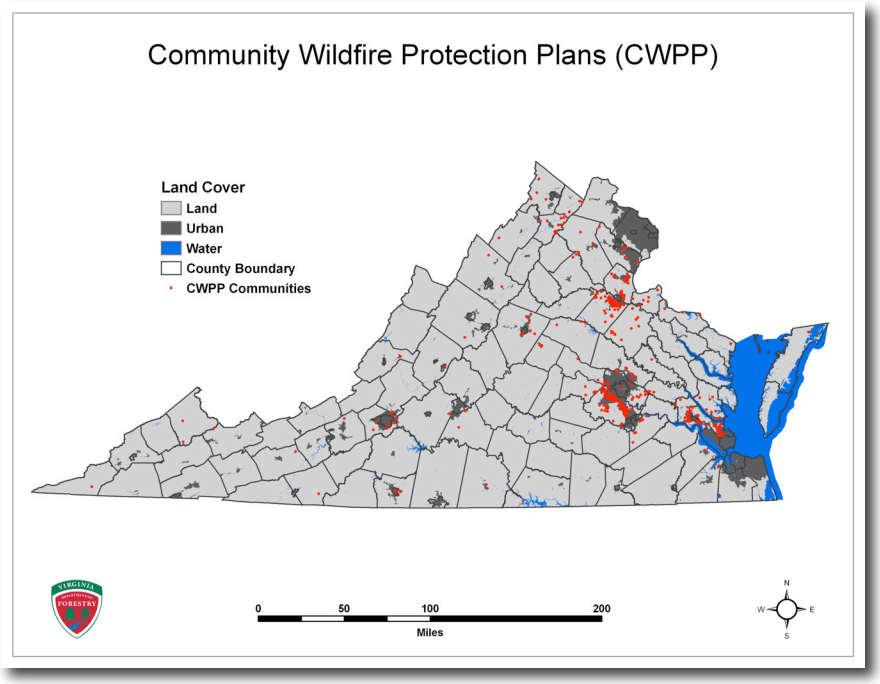
Coordination with Other Plans

One requirement of the assessment is that it coordinate with and incorporate (where possible) other similar natural resource-related plans for the Commonwealth, notably any Community Wildfire Protection Plans (CWPP) and the State Wildlife Action Plan.

Community Wildfire Protection Plans

Virginia has a relatively small number of communities that have elected to have a CWPP produced. Despite this low level of participation, the VDOF remains committed to encouraging participation from more communities and expanding the use of this valuable wildfire prevention tool. Plans are written by our mitigation specialists, all of whom are paid through grants funds provided by the US Forest Service. Our continued ability to produce these plans and/or expand their coverage is tied to receipt of appropriate funding by the US Forest Service.

Figure 1: Community Wildfire Protection Plans in Virginia (communities with a plan are marked with a red dot)



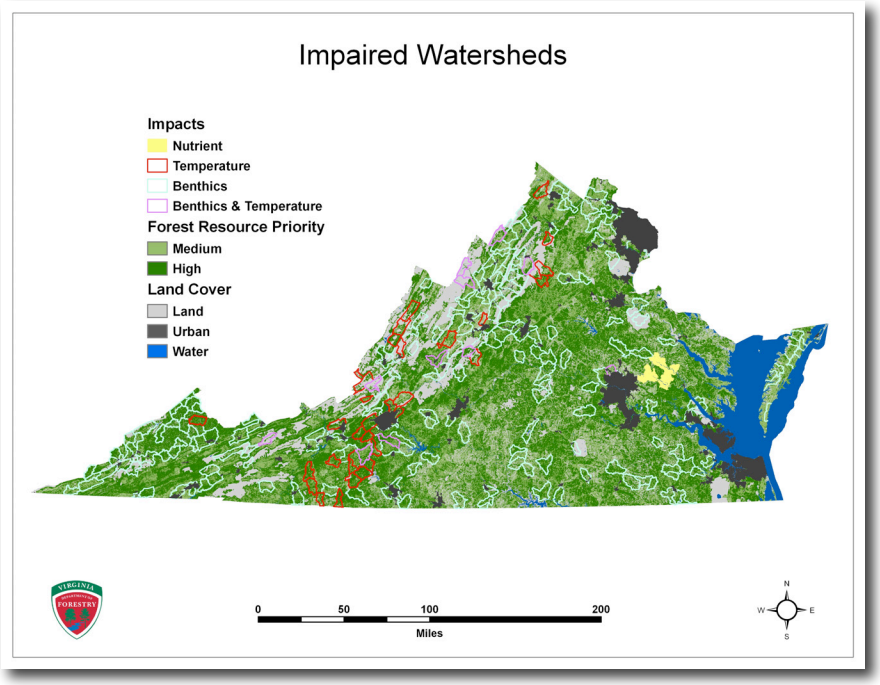
Virginia Wildlife Action Plan

The Virginia Wildlife Action Plan is a massive document, forged from a lengthy process undertaken by the Virginia Department of Game and Inland Fisheries (DGIF). It is possible to view the entire document at this link: http://bewildvirginia.org/wildlifeplan/

To appropriately coordinate this plan with the forest assessment, VDOF representatives met with DGIF representatives several times to reach understanding on how the forest assessment could best serve the needs identified in the Wildlife Action Plan. Within the context of the Wildlife Action

Plan, the best coordination lies within forested watersheds that show impacts to the Species of Greatest Conservation Concern (SGCC) in the Wildlife Action Plan. Figure 2 shows the areas of benthic, nutrient and thermal impacts that overlay with our Stewardship priority areas.

Figure 2: Impaired Watersheds



As a matter of procedure and in the future, the Department's Stewardship planning efforts have referenced threatened and endangered species and their relationship to management practices and recommendations. The State Wildlife Action Plan provides more detail, and will allow for greater recognition and detail regarding species of greatest concern.

Stakeholder Groups Coordinated with for the Statewide Assessment and Strategy

During the Assessment process, a wide range of groups and stakeholders were sought out for engagement by the Virginia Department of Forestry (VDOF). Instructions from the Forest Service required coordination with several groups, including:

The Statewide Forest Stewardship Coordinating Committee – VDOF participated in two committee meetings, explaining the assessment process, opportunities for participation and the assessment timeline. During the meetings, VDOF actively engaged the committee members and sought input on the assessment and its attendant strategies.

The Virginia Department of Game and Inland Fisheries (State Wildlife Agency) – VDOF met with agency representatives, seeking input on priority areas and assistance in tying the **Virginia Wildlife Action Plan** to the assessment.

State Technical Committee – VDOF informed committee of the assessment process, participation opportunities and timeline. While attending the meeting, the Technical Committee was actively polled for input to the assessment.

Federal Land Management Agencies – All applicable federal land management agencies were contacted and multiple opportunities for input and information were provided. Specific agencies contacted included the National Park Service; the US Forest Service (George Washington and Jefferson National Forest); the US Fish and Wildlife Service, and the Army Corps of Engineers.

In addition, a multitude of stakeholders, including state and federal agencies; non-governmental organizations; forest products industry representatives; private citizens; elected officials, and others, were provided opportunity for participation. These include:

Various Virginia State Senators and Delegates
Office of the Governor of Virginia
Virginia Division of Mines, Minerals and Energy
Virginia Department of Transportation
Virginia Department of Conservation and Recreation
Virginia Department of Agriculture and Consumer Services
Virginia Department of Environmental Quality
Virginia Outdoors Foundation
Virginia Secretaries of Agriculture and Forestry; Natural Resources, and Commerce and Trade
Virginia Farm Bureau
Virginia Loggers Association
Virginia Association of Planning District Commissions
Virginia Association of Soil and Water Conservation Districts
Virginia Association of Resource Conservation and Development Districts
Virginia Forest Products Association
Virginia Forestry Association
Virginia Association of Counties
Virginia Municipal League
Virginia Fire Chiefs Association
Virginia Forest Watch
Virginia Forestry Association
Virginia Manufacturers Association
Virginia Christmas Tree Growers Association
The College of Natural Resources at Virginia Tech
The Virginia Association of Realtors
Virginia State University
Association of Consulting Foresters
Chesapeake Bay Foundation
Virginia Agribusiness Council
The National Wild Turkey Federation
Virginia Fire Prevention Association
Forest Landowners Association
USDA Natural Resources Conservation Service
The Nature Conservancy
Virginia United Land Trusts
Virginia Department of Fire Programs
Society of American Foresters
Virginia Urban Forest Council
MeadWestvaco Corporation
International Paper
Smurfitt-Stone Container Corporation
Glatfelter Corporation

Georgia Pacific Corporation
Hancock Forest Management
Forest Investment Associates
Home Builders Association of Virginia
Virginia Firefighters Association
Virginia Association of Science Teachers
Environmental Defense Fund
Ducks Unlimited
Quail Unlimited
Trout Unlimited
American Chestnut Foundation
Ruffed Grouse Society
Southern Environmental Law Center
Virginia Tree Farm
National Woodland Owners Association
Virginia Cooperative Extension

As expected, participation by these various and disparate groups ranged from extensive through partially engaged to non-existent. VDOF efforts to facilitate engagement included two stakeholder meetings in Charlottesville; a widely disseminated online survey concerning the 10 issues and their original proposed strategies, and publicizing the assessment effort through our normal publications and before various groups.

Section III
Virginia Forest Trends and Conditions

Populations and Demographics

Virginia's population stands at more than 7.8 million. With an annual growth rate of 1.12 percent, it is projected to climb to more than 10 million sometime around the year 2030[1]. Three critical trends associated with this growth will have significant impact on the forestry resource[2]. These trends are:

- **Selective Decentralization** – The rate of people moving from central cities to surrounding suburbs and exurbs will increase. This will create higher demands for forestland conversion – not only for housing, but for business areas; shopping venues; schools; recreational areas, and the other trappings of modern life.
- **Aging Population** – The average age of the population will increase. By the year 2030, 20 percent of Virginians will be over age 65, and a majority of this population will be female. This population will likely have widely divergent views of what they want from their forestland, and the demand for services from the forest community will have to keep up with the increase in the number of landowners and the increasing diversity in services desired.
- **Increasing Racial and Ethnic Diversity** – Rising immigration and births to immigrant parents will increase racial and ethnic diversity. With this increased diversity will come differing values and cultural beliefs as they relate to forests and forestland. Immigration will likely lead to an increasing number of landowners who are not fully conversant in English. The need to develop ways to reach these populations in new and innovative ways is evident.

Besides these special trends, the overall increase in population will increase demand for forest-related recreational opportunities; expand the need for both traditional and non-traditional wood products from Virginia's forests, and almost certainly lead to more clashes over the proper use of forests and what activities should take place in the forests – both private and public.

[1] U.S. Census bureau website – State Population Projections
[2] Council on Virginia's Future Report – "Virginia's Demographic Profile 2009"

Forested Land

In 2008, almost 15.8 million acres – more than 62 percent of the Commonwealth – qualified as forestland[3]. Of this forestland, 15.3 million acres are categorized as commercial timberland and 500,000 acres are categorized as reserved forestland.

Table 1: Forest Types

Forest Types	
Forestland Timber Types	**Acres**
Upland Hardwood	10,072,400
Lowland Hardwood	549,800
Oak–Pine	1,532,800
Natural Pine	1,374,100
Pine Plantation	1,666,000
Non-Stocked	113,700
Total Timberland	**15,308,800**
Reserved Forestland	410,200
Other Forestland (Unproductive)	41,600
Reserved Other Forestland (Unproductive)	5,100
Total Forestland	**15,765,700**

Glossary of Forest Inventory Terms

Forestland – Land at least 10 percent stocked by forest trees of any size, or formerly having such tree cover, and not currently developed for non-forest use. The minimum area considered for classification is one acre. Forested strips must be at least 120 feet wide.

Timberland – Forestland capable of producing 20 cubic feet of industrial wood per acre annually and not withdrawn from timber utilization.

Reserved Forestland – Forestland withdrawn from timber utilization by legislation or statute (e.g. National Park lands or designated Wilderness Areas).

[3] In August 2008, Virginia Department of Forestry staff completed the first panel of the 9th Survey of Virginia's forest resources. Information from nearly 5,000 plots measured during the past five years was analyzed and summarized by the US Forest Service.

Forest Ownership

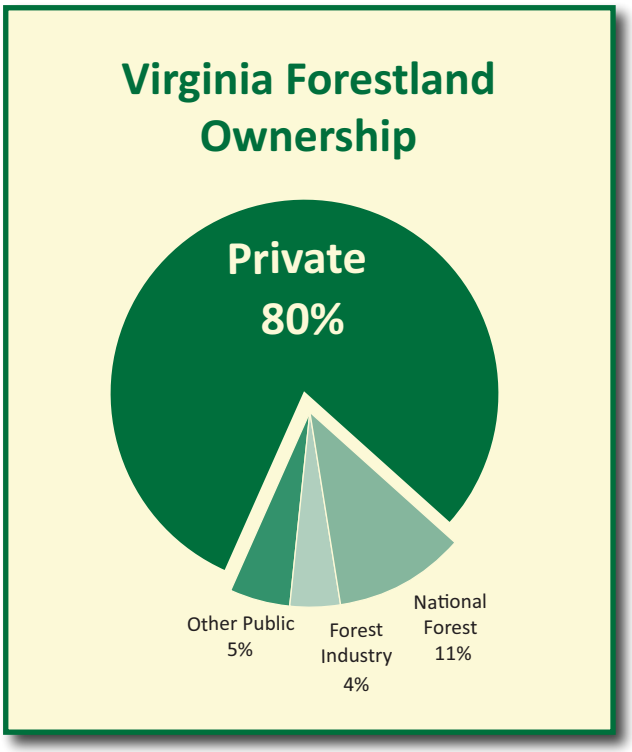
Most of Virginia's forestland (more than 12.9 million acres) is privately owned. More than 373,600 individuals and families hold a total of 10.1 million acres. These private holdings average less than 75 acres in size, but range from one acre to thousands of acres.

By 2007, ownership of forestland by forest products firms had declined to less than four percent of the total (550,000 acres). This is a reduction from seven percent in 2001 and 11 percent in 1992. Timber investment management organizations (TIMOs) and real estate investment trusts (REITs) account for more than 300,000 acres of forestland divested by forest industry. These two categories of owners continue professional forest management on the properties in their holdings. However, the long-term trend is likely further subdivision and development of these lands.

The balance of Virginia's forestlands (16 percent) is owned by federal, state and local governments – the largest entity being the US Forest Service National Forest lands at 1.6 million acres.

The Virginia Department of Forestry – through its 20 state forests – holds more than 65,000 acres of forestland. Figure 3 shows the general forestland ownership pattern for Virginia.

Figure 3: Virginia Forestland Ownership



Forest Benefits

Each year, Virginia's forests provide more than $27.5 billion in economic benefits to the Commonwealth. These economic benefits include:

- More than $23.4 billion generated by the forest products industry and related activities, including:

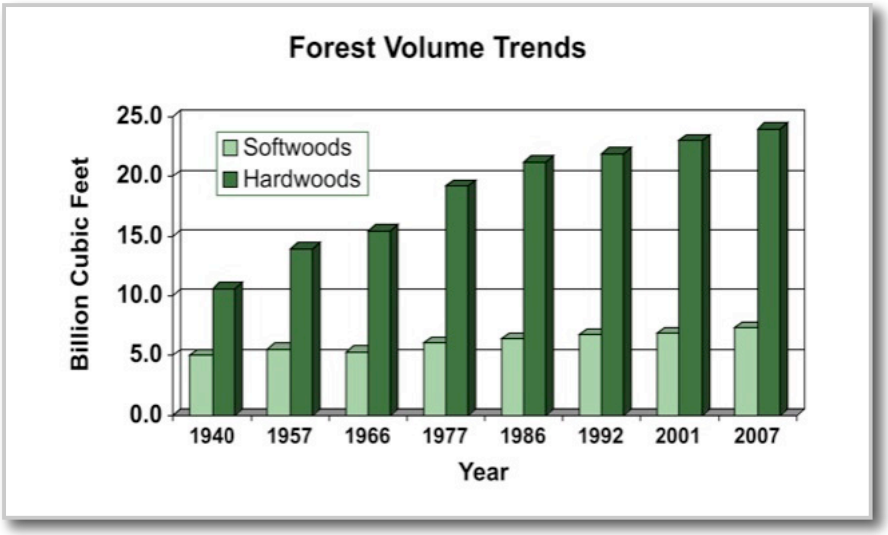
Table 2: Forest Products Industry and Related Activities

Forest Products Industry and Related Activities	
Forest Products Industry	**Benefit**
Forest Management	$179 million
Stumpage	$276 million
Logging	$928 million
Primary Processing	$4.10 billion
Secondary Processing	$5.93 billion
Construction	$3.82 billion
Indirect Impacts	$3.06 billion
Induced Impacts	$6.91 billion

- 144,380 jobs in the forest products industry.
- Returning more than $276 million annually to Virginia landowners for selling timber.
- Specialty forest products, including such diverse items as maple syrup; naval stores (turpentine, pine rosin, etc.); pine tips for wreaths; fruits and nuts; pine cones and pine straw; mushrooms; ginseng; medicinal plants; firewood, and more, add another $60 million to local economies each year.
- Forest and forest wildlife-related recreation in Virginia is enjoyed by more than 27 million people annually. These visitors contributed more than $2.5 billion to state and local economies.

The future supply of merchantable wood volume appears secure, subject to the real possibility of continued significant loss of forested land. Figure 4 shows the continued upward trend in both pine and hardwood volume in the Commonwealth.

Figure 4: Forest Volume Trends



In addition to the direct economic benefits, the extensive cover of forestland in Virginia provides its citizens with many valuable ecological services, including:

- Protection of water quality – Approximately 50 percent of Virginia's streams have forest buffers. These buffers are the single best natural filter that can effectively remove pollutants from waterways.
- Protection of air quality – Virginia's forest provide more than $900 million of air pollution abatement each year, based on conservative estimates of what it would cost to remove similar quantities of major pollutants through alternative means.
- Aesthetic quality.
- Moderation of climate, including the offsetting of carbon emissions that contribute to global warming.
- Provision of habitat for many plant and animal species.
- Sequestering more than 392 million metric tons of carbon, with an estimated annual value of more than $182 million.

These "non-market" services have been conservatively valued at more than $1.7 billion annually.

Ecosystem Services

Virginia's forests provide a vast array of ecosystem services. Simply defined, ecosystem services are the many benefits and services that forests provide. These services include: ameliorating nitrogen and phosphorus nutrient load reductions; carbon sequestration; biodiversity; pollination; recreation; aesthetics, and air quality improvements to name a few. The Virginia Department of Forestry is committed to increasing awareness of these vital services and finding solutions that keep working forests on Virginia's landscape sustainably providing ecosystem services.

Forest growth in Virginia annually sequesters, or captures and stores, about 6.42 million metric tons of carbon dioxide emissions. This growth roughly offsets about 14 percent of the total annual carbon dioxide emissions in the state. Voluntary markets are beginning to emerge to help forest landowners capture a value for the carbon sequestration service. The ability of forest growth to sequester carbon dioxide emissions and help provide solutions to climate change is a positive story to tell. However, each year, approximately 1 million metric tons of carbon dioxide are emitted into the atmosphere due to land-use changes, such as the loss of forest cover.

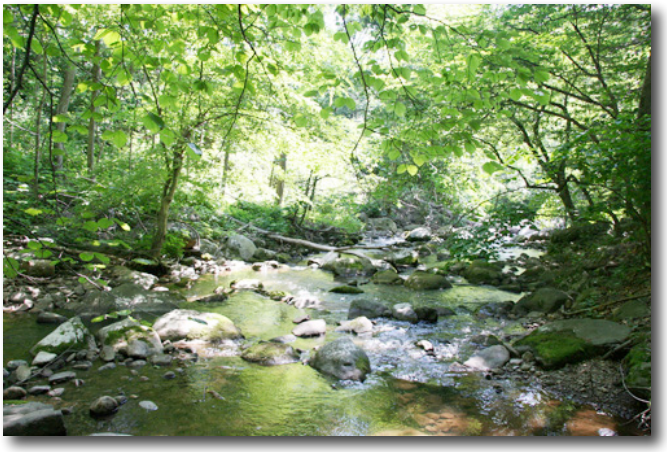
In addition to carbon markets, other market opportunities are emerging for landowners. Tree planting projects on open land are being looked at as solutions to reduce nitrogen and phosphorus loading and, therefore, enhance water quality. There is a tremendous effort to reduce nutrient loading in the Chesapeake Bay, and forestry will have a role to play.

Other ecosystem services, such as providing for and enhancing biodiversity, are extremely important. How we manage our forests and plan for the development of Virginia's landscape need to consider biodiversity values. The VDOF is working with Virginia Tech and other state agencies to develop tools that will enhance our ability to include ecosystem service considerations in our land-use planning efforts.

Protecting Virginia's Water Quality

Water quality is important to all Virginians. Studies have shown that the cleanest water comes from forested watersheds. These watersheds are critical sources of pure drinking water; habitat for important fisheries, and areas that are treasured for their recreational value and purity of life. Two of the ways the Virginia Department of Forestry works to ensure water quality protection are through promoting Best Management Practices on forest harvesting operations to protecting streams from sediment and improving and protecting watersheds through management and land conservation.

The Virginia Department of Forestry has been involved with the protection of our forested watersheds since the early 1970s with the development of our first set of Forestry Best Management Practices (BMPs) for Water Quality. The Department is now utilizing the fourth edition of those guidelines, and has circulated copies of its latest version nationwide as well as to numerous countries worldwide. The backbone for the Department's water quality effort is the harvest inspection program, which began in the mid-'80s. This program has provided for one-on-one contact between VDOF and the harvest operators, and is a welcomed opportunity to educate the operators on BMPs and the latest in water quality protection techniques. In fiscal year 2009, VDOF field personnel inspected 4,245 timber harvest sites across Virginia on 207,226 acres.



In July 1993, the General Assembly of Virginia – with the support of the forest industry – enacted the Virginia Silvicultural Water Quality Law, §10-1-1181.1 through §10.1-1181.7. The law was created to provide Virginia with an enforcement mechanism to address water pollution originating from silvicultural activities. The law grants the authority to the State Forester to assess civil penalties to those owners and operators who fail to protect

water quality on their operations. This law was amended by the General Assembly in 2009 to require inspection of timber harvest sites and to require timber operators to provide landowner contact information as part of the notification process. Virginia continues to be the only state in the southeastern United States that grants enforcement authority under such a law to the state's forestry agency. In fiscal year 2009, the VDOF was involved with 323 water quality actions initiated under the Silvicultural Law. Of these actions, 17 resulted in Special Orders being issued for violations of the law. Several of these proceeded to the issuance of civil penalties. All penalties collected under this law are placed in the Water Quality Penalty Fund, which is a non-reverting fund to be used for education, demonstration and research.

During fiscal year 2006, the VDOF developed and implemented a BMP Logger Cost-Share Program. Funding for this unique initiative was made available through a grant from the Commonwealth's Water Quality Improvement Fund. This program provides a 50 percent cost-share to timber harvesting contractors who implement appropriate BMPs on eligible stream crossings. The program will cover items, such as culvert pipes, equipment time to construct water diversion structures as well as material to revegetate the site. But probably the one feature of the program that will have a lasting effect on water quality in the Commonwealth is that the program will provide cost-share for the purchase of portable timber bridges that will continue to provide water quality protection for sites beyond the original site for which they were purchased. In fiscal year 2009, this program funded 46 BMP projects throughout the Commonwealth with 70 percent of those being in the Chesapeake Bay Watershed. Of those projects, 32 involved the purchase of portable bridges.

Through the promotion of BMPs; enforcement of the Silvicultural Water Quality Law, and our unique Logger BMP cost-share program, the Virginia Department of Forestry continues a proud history of ensuring the Commonwealth's forestlands continue to provide the clean water so vital to our citizens.

Watershed Protection

Forests provide the best protection for watersheds. Because of this, one of the Commonwealth's and the Department's goals is to increase the amount of forestland conserved, protected and established in Virginia's watersheds. The concept here is to focus on tools and practices that will have a high benefit to water quality, specifically conserving land permanently; establishing and maintaining riparian buffer zones; planting trees on non-forested open land, and increasing urban forest canopy by planting trees. All of these activities are closely related to meeting water quality goals associated with the Chesapeake Bay restoration and watersheds for Virginia's southern rivers. It will be increasingly important to continue, and even increase, these efforts as watersheds come under continued and increased developmental and conversion pressures.

Forest Management and Forest Stewardship

Forests provide a multitude of benefits to the Commonwealth and its citizens. These include: forest products; clean water; pure air; habitat for wildlife; outdoor recreation; natural classrooms; defense against environmental stresses, and settings for quality living. The value and quality of these benefits can be greatly enhanced through planning and implementation of good forest management practices. The VDOF continues to strongly emphasize the need for long-range forest planning and silvicultural practice implementation in the agency's work plans and performance measures.

Forests are, by nature, long in development and duration. Because of this, long-term planning is essential to realize long-term benefits. Planned forest management practices, implemented over time, will ensure sustainable and continuous benefit from forest resources. The VDOF has a small but strong corps of professional foresters who accomplish this planning on privately-held and state-owned forestland. Department foresters partner with other state agencies and private natural resource professionals – including game biologists; soil and water conservation specialists, and private consulting foresters – to develop and encourage the implementation of these plans.

Planning provides the blueprint for future concrete implementation of practices. VDOF staff, landowners, contractors and other forestry professionals cooperate to put the plans into action. In Virginia, plans are written for properties located throughout the state on areas ranging in size from less than an acre to hundreds of acres, and in all landscapes, from rural to urban settings. All plans are designed to build healthy, valuable and productive forests.

There are a number of programs designed to encourage and assist private landowners in implementation of these practices. In addition to planning assistance, state and federal programs help to offset landowner cost of doing the work. The flagship program for planting and improving pine forests is Virginia's Reforestation of Timberlands Program (RT). Since its inception in 1970, the program has been funded by a combination of a severance tax on the wood-using industry and a portion of general fund tax money. The program has supported work on nearly 1.5 million acres, a tremendous accomplishment.

Another essential part of any comprehensive forest management program is education and outreach to non-industrial private landowners. For nearly 60 years, the VDOF has supported a forest research program to develop and demonstrate better forest management and stewardship practices. Those efforts have resulted in more than 125 reports; a bi-annual review publication; countless presentations and field tours for landowners and other stakeholders, and strong, ongoing collaborations with universities and research cooperatives. The VDOF has formed a strong partnership with the Virginia Cooperative Extension Service to utilize the best of both agencies' strengths to provide forest resource management programs for landowners.

The VDOF has strong cooperative relationships with the Virginia Department of Conservation and Recreation; the USDA Natural Resource Conservation Service (NRCS), and the Farm Service Agency and the assistance programs they administer. The VDOF and Virginia NRCS working relationship through the Environmental Quality Incentive Program has been used as a national model for other states. Private support for forest management is active as well, with several private firms funding the purchase of 416,000 tree seedlings for private landowners in 2008-2009.

Accomplishing the work in forest management is truly a cooperative effort with private owners, forest industry, loggers, consulting foresters and contractors all playing a role. Historically, VDOF has worked very closely with private landowners to coordinate and implement forest management projects. Recently, the Department has been working to increase the role of the private sector in

project implementation. Successful examples include regional tree planting and three spray area pine site preparation and release contracts developed and aggregated by VDOF, but accomplished by consulting foresters and private contractors.

Two of the important native pine species in Virginia, longleaf and shortleaf pine, have declined significantly over time. Longleaf pine – the premier southern pine for lumber, naval stores and wildlife habitat – used to occupy 1.5 million acres in Southeast Virginia but has been reduced to a scattered handful of native specimens. Shortleaf pine, the tree that built the heart of Virginia and once abundant statewide, has declined to less than 10 percent of 1940 levels. The Department worked closely with our co-operators to help revise existing cost-share programs to encourage the planting of longleaf pine in its native Virginia ranges.

Planning and professional advice prior to harvest is the key to successful resource management. Pine forests in Virginia have been very successfully and intensively managed through genetic improvement of seed, planting and intermediate stand treatments. Hardwood forests are more diverse; occupy a much larger acreage, and have a longer growth cycle. These forests produce trees that are used for a wide range of products – from pallets and crossties to high-quality furniture and flooring. There remain many opportunities to improve management of hardwood forests through proper planning and appropriate management practices.

Forest Health

Drought and unusually warm temperatures have been a regular occurrence in Virginia and other parts of the South during the last 10 years. The cumulative effects of drought and severe storms in some locations during the past five to seven years have taken their toll on many trees, particularly urban and landscape trees. Drought and record-high temperatures have exacerbated the impacts on previously stressed trees, leading to widespread secondary insect and disease problems and subsequent tree mortality. Red oak trees are among those that continue to be hard hit, although most tree species suffer from sustained drought.

Due to recent high rains, gypsy moth populations have been decimated by a naturally occurring fungus called *Entomophaga maimaiga*, which thrives during moist spring weather. Insecticide spraying is effective at controlling damage locally, but it cannot stop overall gypsy moth numbers from surging once these build-ups gain momentum. Only diseases, such as the fungus and a naturally occurring virus, can cause these populations to crash so dramatically. However, it can often take a number of years of severe defoliation before this happens. If we can continue to see normal rainfall activity in the near future, defoliation levels should continue to remain relatively insignificant for the next five years.

The southern pine beetle has been relatively quiet during the last seven years. The last significant outbreak was during the late 1990s and had a major impact on pine in the mountains, particularly in southwest Virginia. As a result, many isolated areas once dominated by pine will revert to hardwood cover. However, the pine resource in central and southeast Virginia remains healthy and productive. Federal funds from the US Forest Service, Forest Health Protection support our (Southern Pine Beetle Prevention) cost-share program with landowners for pre-commercial thinning of pine stands. To date, Virginia has pre-commercially thinned about 25,000 acres of loblolly pine out of approximately 130,000 acres estimated to be overstocked and in the appropriate pre-commercial age class. First commercial thinnings on small tracts are also being supported with a new logger incentive program. Due to high moving costs, loggers often lose money visiting tracts smaller than 50 acres. Because of increasing rates of fragmentation and parcelization in Virginia, smaller tract sizes are becoming more common but are in no less need of thinning to

maintain health. The efforts will continue to be used to reduce the potential hazards of this destructive native pest.

Invasive species remain the most significant threat to forest health. During the last century and most recently, our efforts to keep invasive species from entering North America and wreaking havoc represent a battle that we are largely losing. The pathogens that cause chestnut blight and Dutch elm disease have virtually eliminated the American chestnut and American elm, respectively, from our natural and urban forests. The pathogen that causes sudden oak death in western forests can potentially devastate Virginia's oaks and other species, if introduced. Other pathogens that cause butternut canker, dogwood anthracnose and beech bark disease threaten those tree species with serious decline over longer time scales. Eastern hemlock faces the same threat from the hemlock woolly adelgid, an insect that has killed up to 90 percent of the hemlocks in Shenandoah National Park and other areas in Virginia during the last 50 years.

The most recent threat is the emerald ash borer, discovered during the summer of 2008 in three locations across Fairfax County. Evidence suggests these infestations were at least two to three years old, meaning the pest has likely spread to other areas. Eradication is not being pursued – at this stage it would be too expensive and, more importantly, very unlikely to succeed. Virginia and the nation face the prospect of losing all ash species from the natural and urban landscapes in the forthcoming decades, an impact that could eventually cost the state hundreds of millions of dollars. Its primary means of spread is through the unrestricted movement of firewood across state lines by private citizens. A survey by the Virginia Dept. of Agriculture and Consumer Services also demonstrated that firewood is being brought into Virginia for sale from 15 states and three countries.

All of this tree mortality in conjunction with trends towards increasing land parcelization and forest fragmentation serve to disturb intact forest and create ideal environments for invasive weeds. Many species of invasive weeds, including trees, shrubs, vines, grasses and forbs, plague Virginia's forests. Some of these plants were brought here by European colonists hundreds of years ago for urban and landscape plantings and erosion control. What most of these plants have in common are their ability for rapid growth and reproduction and their ability to colonize disturbed habitats, such as roadsides and forest edges. Once established, many invasive weeds are able to encroach upon intact forest, out-competing native plant species. Complete eradication of well-established invasive plants is all but impossible, and management is often impractical. Forests dominated by invasive weeds typically have less biodiversity, productivity and natural beauty.

To change this disturbing trend will require bold, decisive and enforceable legislation at the federal level to ensure that no new organisms are introduced into North America via international travel or trade. Likewise, major restrictions on the movement of firewood, mulch and other unregulated or untreated goods between states must be in place to limit or slow the spread of newly established pests. Compliance must be enforced at all levels – anything less will continue to put Virginia's forests at risk of catastrophic changes.

Urban and Community Forestry

Trees and forests in communities provide numerous benefits to the citizens of Virginia. Aesthetic appeal, shade and contact with nature are the readily apparent benefits associated with community trees. Less apparent, but perhaps even more important, are the positive impact community forests have on clean air; water quality; business district enhancement; view-shed protection; community health, and the quality of life in general. Through its Urban and Community Forestry Program, the VDOF helps Virginia communities maintain and enhance their community forests.

Participation in the Tree City USA program continues to increase, and 54 communities are certified. Interest in various cost-share programs aimed at promoting urban forest projects also continues to increase. Since 1991, these programs have funded an average of 45 projects annually and have assisted 62 cities and towns; 22 counties; 65 non-profit organizations, and a number of universities, colleges and community colleges. In addition, the program has funded 28 educational events, several of which continue to be offered on an annual basis.

Beginning in 2009, VDOF made significant progress in helping Virginia's municipalities establish urban tree canopy (UTC) goals. The Chesapeake Bay Agreement has identified the development, retention and enhancement of urban tree canopy as an effective strategy to improve the health of the Chesapeake Bay. The Chesapeake Bay Agreement bases this strategy on USFS research that has shown that urban tree canopy makes a significant contribution to urban water quality and storm flow reduction. The Chesapeake Bay Agreement established a goal of five Virginia municipalities developing UTC goals by 2010. The Department has identified 16 target municipalities to work with on UTC goals. The Department has already done comprehensive UTC assessments in eight of these communities and will complete this work for the remaining communities in 2010. Already, four municipalities have formally established UTC goals.

Rapid urbanization in Virginia has increased interest in *green infrastructure* planning in urbanizing counties and even very rural counties. VDOF has formed strategic partnerships with the University of Virginia; Virginia Tech, and the non-profit Green Infrastructure Center to engage Planning District Commissions (PDCs) in identifying critical forestland and stream corridors and developing strategies for protection.

VDOF also continues to play an important role in encouraging greenway development in communities across Virginia and is involved in several projects in partnership with the Virginia Department of Conservation and Recreation. Greenway development has become an important strategy in defining and protecting green infrastructure in communities, and greenway projects have strong local advocacy groups.

Current and Potential Threats

Wildland Fire

Each year, the wildland firefighting efforts of the Virginia Department of Forestry protect more than 1,200 homes and other structures. These protected structures have a value in excess of $178 million. Sadly, nearly 70 buildings of various types are damaged or destroyed by wildfires every year. As part of our important legislative mandate to protect the homes, businesses and woodlands of the Commonwealth from wildfire, the VDOF responds to more than 1,280 wildland fires that burn more than 12,400 acres annually (based on a 10-year average, 1999 – 2008).

The Agency relies on highly-trained and experienced personnel operating a fleet of 200 4x4 engines; nine specially equipped Hummers; five specially equipped wildland brush trucks, and 89 bulldozer/wildland fire plow suppression units for quick response to any reported wildland fire or other weather-related emergency. The assistance of Virginia's 765 fire departments and close working relationships with federal land management agencies and other public and private landholders in the Commonwealth ensure that wildland fire response in Virginia is both efficient and effective.

VDOF fire suppression operations are organized at the county level and rely on close cooperation with local fire department resources. County personnel are linked to one of three VDOF Regional offices to provide dispatch coverage; a common communications network, and the ability to easily combine local resources for larger incidents.

One of the greatest impacts on the wildland fire environment in Virginia is the ever- increasing rate of home developments in the wildland urban interface (WUI). The rate of home development throughout the state has gone up at an ever-increasing rate since the VDOF began formal inventory of this trend in the early 1980s. WUI-related fire suppression requires greater numbers of suppression resources and a mix of more specialized equipment based on the need to protect residential homes at the same time as suppression activities are being completed on an uncontrolled wildfire. This situation leads to a higher personal risk for response personnel; increased fire sizes, and greater potential for property loss.

One program to help combat the increasing rate of WUI development is the national Firewise Communities USA program. The program identifies and works with high-risk woodland home communities to reduce the potential for damaging wildfire. Based on the agency's statewide wildfire risk assessment information, the Commonwealth's highest risk woodland home communities are targeted for hazard mitigation activities, including Community Wildfire Protection Plans (CWPPs) designed to lower their overall fire risk. The program relies on heavy citizen

involvement and is designed to give residents the information they need to come together for the improvement of their own community. The national Firewise Communities USA program then recognizes communities with the highest level of achievement. Virginia is fifth in the nation for the number of fully certified communities at 34.

Forest Sustainability

"We envision forest resources that support and enhance a healthy living environment."

"We protect and develop healthy, sustainable forest resources for Virginians."

-VDOF 2014 Shaping Virginia's Forests (Strategic Plan)

When we address the issue of whether Virginia's private and public forests are healthy and are being managed sustainably, we can look at several indicators. One of these is the ratio of the net growth versus the removal of forest volume, due to harvesting and land conversion. The latest available forest inventory data indicate a net growth to removal ratio of 1.42 for hardwoods statewide. In other words, for every unit of hardwood removed, 1.42 units have grown to replace it. For softwoods (pine), the ratio is also positive: 1.11 statewide.

In terms of composition, the forests of Virginia continue to display good diversity. Hardwood and hardwood-pine forest types make up more than 12 million acres of the Commonwealth's forest – more than 78 percent. The area of hardwood forest types has increased steadily since the first forest inventory in 1940, when 8.1 million acres existed. The hardwood forests of Virginia are maturing, with more than 6.6 million acres in stands 60 years old or older.

Concerns do exist with the hardwood resource. While five upland oak species are among the top-10 tree species for total volume in the state, only two upland oak species – white oak and chestnut oak – occupy a top-10 position for number of individual trees. The exclusion of fire and presence of high-grading are significant factors in limiting oak regeneration. In its place, shade-tolerant regeneration – such as red maple and blackgum – is becoming more prevalent. Tables 3 and 4 show the top-10 Virginia trees in terms of number of trees and total wood volume.

Table 3: Ten Most Common Tree Species in Virginia by Volume

Ten Most Common Tree Species in Virginia by Volume	
Species	**Cubic Feet**
Yellow-Poplar	5,107,951,438
Loblolly Pine	4,263,493,317
Chestnut Oak	3,101,666,446
White Oak	3,021,351,320
Red Maple	2,289,964,979
Northern Red Oak	1,666,825,810
Virginia Pine	1,455,328,247
Sweetgum	1,127,619,390
Scarlet Oak	1,053,714,774
Black Oak	1,045,775,421

Table 4: Ten Most Common Tree Species in Virginia by Number of Trees

Ten Most Common Tree Species in Virginia by Number of Trees	
Species	**Number of Trees**
Red Maple	1,409,672,312
Loblolly Pine	1,046,480,418
Yellow-Poplar	846,035,017
Sweetgum	697,418,160
Blackgum	618,087,417
Virginia Pine	471,683,467
American Holly	443,890,629
White Oak	437,716,069
Chestnut Oak	359,767,912
Flowering Dogwood	320,737,921

Pine forests represent approximately 3 million acres (more than 20 percent) of Virginia's forestland. This is a decline from the 6.2 million acres of pine found during the 1940 inventory. Pine plantations now constitute more than 50 percent of the pine acreage. Plantations help offset the loss of natural pine acreage, due to their higher productivity when intensively managed. These productivity increases should continue in the future with the use of genetically improved seedlings from the Virginia Department of Forestry nurseries and other private sources.

A number of tree species have suffered significant decline over the latest inventory period: table-mountain pine, pitch pine and shortleaf pine, due to southern pine beetle infestation, and eastern hemlock, due to hemlock woolly adelgid infestation.

Several uncommon tree species in Virginia are receiving special attention: Atlantic white-cedar stands are being actively regenerated in the Great Dismal Swamp, and the Virginia Department of Forestry is actively promoting the propagation and planting of longleaf pine. On-going efforts by the American Chestnut Foundation, the VDOF and others continue to focus on restoring blight-resistant American chestnut to the landscape.

Loss of Forestland to Other Land-Use Types

With a Forest Inventory and Analysis (FIA) average plot re-measurement period of five years, the net loss of forestland was 27,000 acres per year, up from 20,000 acres per year during the 7th Survey period. This translates to a rate of one acre lost every 20 minutes. If the long-term trend continues, Virginia could lose 1 million acres of forest within the next 25 years. By comparison, Virginia's largest state forest (Appomattox-Buckingham State Forest) is slightly less than 20,000 acres in size.

Interestingly, the loss of forestland to other land uses is dynamic – other land uses are reverting back to forestland simultaneously. During the 2001 to 2007 period, for every four acres diverted to non-forestland uses, three acres reverted back to forest within the state. The coastal plain experienced the highest ratio of diversions to reversions with almost two acres of forestland cleared for each acre reverted. Table 4 illustrates the land-use changes by region.

Table 5: Land-Use Changes 2001-2007

Land-Use Changes 2001-2007			
Region	**Diversions from Forestland**	**Reversions to Forestland**	**Ratio**
Coastal Plain	107,334	64,238	0.60
Southern Piedmont	86,164	76,381	0.89
Northern Piedmont	107,200	82,792	0.77
Northern Mountains	74,739	52,849	0.71
Southern Mountains	109,529	78,122	0.71
Statewide	**484,966**	**354,382**	**0.73**

Climate Change and Virginia's Forests

Climate Change will grow in importance over the next few decades, and continue to be an issue that impacts Virginia's forests.

Although its effects on the forest resource are speculative and somewhat unpredictable, Virginia and the VDOF will need to monitor potential impacts to the forest and develop appropriate responses if impacts are identified. Species migration, particularly at high altitudes and for species at the southern edge of their range, is a real possibility. Inventory methods (notably FIA) should enable us to watch for overall changes in species dispersion and possibly conduct more detailed surveys if a potential problem is identified. VDOF will continue its efforts to restore shortleaf and longleaf pine to the landscape. Both of these species are drier-condition species that will fair better if some of the potential impacts of climate change are realized.

One of the most cost-effective and beneficial means to mitigate the effects of global warming is to increase tree planting and practice sound forest management. The VDOF will continue to promote these practices; assist landowners with their implementation, and educate the general public on the climate change benefits of forests and forest management.

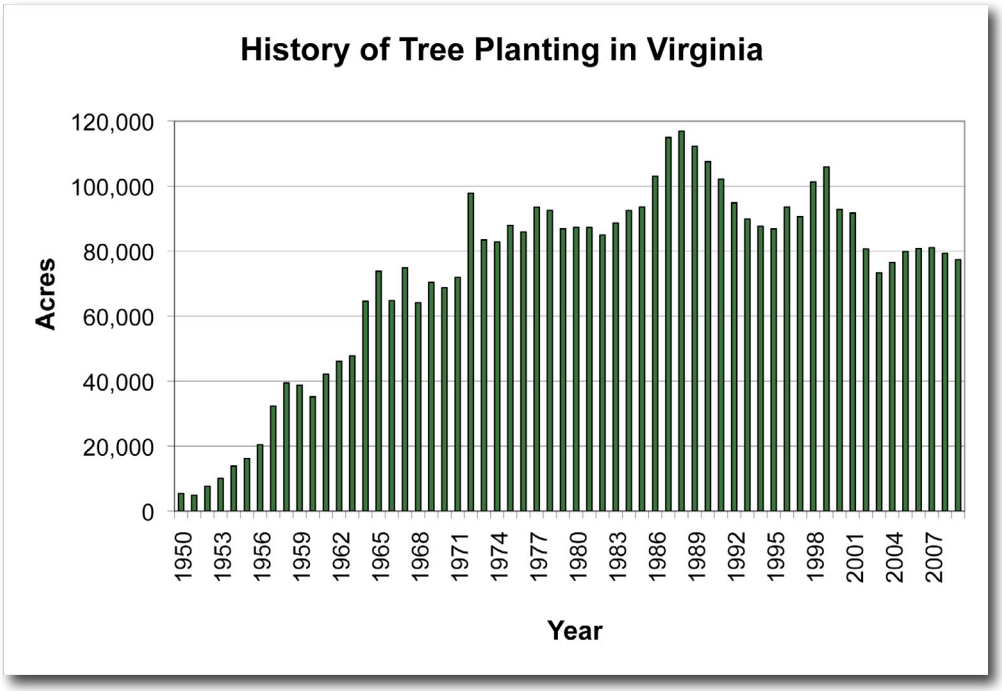
Declining Reforestation

Virginia has a strong history of tree planting that been fostered over time – from Thomas Jefferson's experimental tree planting at Monticello to conservation planting during the depression; from large-scale industrial forestry in the mid-20th century to scientifically proven techniques today, tree planting has been a tradition in the Old Dominion. The chart below graphically displays trends in tree planting, which reflect the circumstances of economics, support, policy and demand. Due to ease of propagation, transplanting and good survival, pine planting (loblolly and to a lesser degree white) is dominant.

Early efforts focused on rehabilitating abused agricultural land through the Civilian Conservation Corps in the 1930s and the USDA Soil Bank Program of the 1950s. The paper industry and resulting demand for wood grew following World War II and resulted in large-scale mechanical site preparation and replanting of cutover woodland. Additionally, the Seed Tree Law was enacted in 1950. It requires either replanting or leaving pine seed trees. Planting on private, non-industrial lands took a monumental leap in 1970, with the enactment of the Reforestation of Timberlands (RT) Program. Funded through a self-imposed forest products tax and general state tax funds, the

program has for 40 years provided cost incentives to landowners for site preparation; pine planting, and release from competition.

Figure 5: History of Tree Planting in Virginia



Tree planting increased with the growth of the RT program; the federal Forestry Incentives Program, and a strong forest products industry. A significant surge in planting occurred in the late 1980s, due to the USDA Conservation Reserve Program, a program to retire highly erodible land. Combined with a strong timber economy, reforestation peaked in 1988 at 116,000 acres. Accomplishments dipped slightly, but rebounded at the turn of the century. A sharp drop occurred in the early 2000s due to economic slowdown and reduced RT incentive. Planting has recovered and stabilized, but it is below previous high levels.

Hardwood tree planting increased somewhat in the late 1980s, due primarily to industrial plantations in southeast Virginia. There was also a spike in hardwood planting, beginning in 1999, due to riparian forest buffer planting through the Conservation Reserve Enhancement Program.

A number of factors has led to a drop in tree planting. Forestland acreage in Virginia had been steadily increasing since the first forest survey in 1940, due mostly to reversions of open land. However, the 1987 forest survey showed a net loss in acreage, which continues to occur due to clearing associated with population growth. Forest industry ownership has dropped very rapidly in the past 15 years, with land sales to investors; timber management investment organizations (TIMO); real estate investment trusts (REITS), and private individuals. Harvesting and tree planting still occur on these properties, but there is more varied and some less-intensive management. The severe national economic downturn, beginning in 2008, has softened wood demand, resulting in lower harvest and replanting acres. Additionally, landowners have been less likely to invest in tree planting. Sawmill closures; general reduced demand, and the closure of a large paper mill in early 2010 will likely affect overall tree planting.

Tree nursery production is directly related to planting and has expanded and contracted with these trends. At the height of tree planting, three VDOF and two forest industry nurseries were in operation. Production at VDOF nurseries was 59 million seedlings in 2000. Currently, there are two state nurseries, with a 2010 production of less than 25 million. While much of this is due to fewer acres planted, seedling density has been reduced over the years. White pine production and planting has dropped as well, from a high of 6 million seedlings to less than 1 million.

What will be the future of tree planting in Virginia? We can anticipate continued loss of and fragmentation of timberland. Ownership will be more diverse, with more non-timber objectives. However, the diversity of the resource and central location of the state will continue to make Virginia an attractive home for wood-using industries. There remain significant opportunities for tree planting on marginal open land – for riparian forest establishment; mitigation of forest loss; bio-fuel power production, and to store carbon. Significant advances in genetics, tree improvement and management techniques will allow higher production and tree quality on fewer acres. Land conservation efforts will keep lands available as sustainable working forests. Challenges exist, but opportunities abound for tree planting to continue to and grow in Virginia.

Natural Resources Program Funding

As is common in most states, Virginia has a long history of aggressive marketing and implementation of its various forestry programs. From landowner assistance to wildland firefighting and state land management to tree growing, the VDOF has sought to bring the highest quality forestry programs and information to the broadest possible audience in all corners of the Commonwealth.

This blanket approach has made the VDOF an important part of the natural resources landscape across Virginia. Unfortunately, this broad approach also comes with a hefty price tag. Providing staffing and program support over a state the size of Virginia is expensive. As new program focal points have been added, this cost has continued to climb, often without a corresponding increase in revenue provided by the legislature.

The recent economic downturn has only served to highlight and exacerbate an already existing problem in natural resources funding. Since 2007, the VDOF has lost more than $6 million in general funds money. This has resulted in more than 30 positions being eliminated and programs being curtailed, either across the state or in select areas. Although it would be nice to assume this trend will turn around when the overall economic outlook is better, it is very dangerous to assume that state budgets will immediately rebound, and equally dangerous to assume the first place funding will be restored will be to the natural resources arena.

To ensure natural resources agencies can continue to function effectively and carry out their legislatively mandated missions, innovative funding streams will need to be considered and sought out.

Other Important Threats

In a state as large and diverse as Virginia, many different forested ecosystems exist, as do many different current and potential threats to these various ecosystems. Besides those covered in the sections above, several are dealt with in depth in other portions of this document and the related Strategic Plan document. These include:

Loss of Viable Forest Industry

Continued loss of viable forest products manufacturers, including one of the largest pulp and paper mills in the Commonwealth, has had a significant impact on the number and location of markets for loggers and landowners. The emerging markets of woody biomass energy and ecosystem services may stem the tide of these losses, but questions remain.

Declining Species

Several current or formerly important tree species have severely declined in numbers and/or range, or are in a state of decline. These species include: American chestnut; longleaf pine; shortleaf pine; Atlantic white-cedar, and eastern hemlock. VDOF and a variety of partners and stakeholders are undertaking efforts to reverse these trends, but much work and research still needs to be accomplished for most species.

Conservation Education

Conservation education efforts remain a chronically under-funded and understaffed endeavor for most state agencies, and Virginia is no exception. With an increasing percentage of children having few, if any, ties to the natural world and our natural resources, it will be ever-more important reach these future decision makers and give them an understanding of nature in general and forests in particular.

Tree Improvement

As the Commonwealth continues to experience the loss of forestland and society demands more and different benefits from forests, it will become more important to use the remaining forests in the most efficient and effective manner possible. One important way the VDOF can help in this effort is to continue and expand its pine tree improvement efforts. By producing seedlings that grow faster and produce more desirable characteristics, tree improvement work can help ensure a resource for the forest industry and help ensure forests are managed and harvested in a sustainable manner.

Section IV
Program Areas within the Virginia Department of Forestry

The VDOF has a number of program areas, each generally focused on a specific aspect of forestry in Virginia or the forest resource or specifically tied to a National-level program of the US Forest Service. These program areas are administered at the agency headquarters level, with a majority of the projects and activities being conducted through our field staff assigned to the three operational regions. Six program areas are specifically tied to Forest Service program areas. These include:

- Wildfire Suppression and Public Safety
- Forest Health
- Forest Legacy/Land Conservation
- Forest Stewardship and Management
- Urban and Community Forestry
- Forest Inventory and Analysis (FIA)

In addition, other notable VDOF program areas include:

- Water Quality
- Forest Research
- Tree Improvement
- Forest Products Marketing and Utilization
- Ecosystem Services
- Conservation Education
- Tree Nursery Program
- State Forest System

Wildfire Suppression and Public Safety

Program Overview

The VDOF is responsible for the suppression and management of all wildfires in the Commonwealth occurring on private and state-owned lands. The VDOF's unique mix of county-based emergency response personnel along with specialized tools and equipment routinely pulls the agency into other key public safety roles during almost any local and/or statewide emergency. VDOF is one of the Commonwealth's Virginia Emergency Response Team agencies called upon when the Governor declares an emergency.

Based on a 10-year average for the years 1999 – 2008, the VDOF responds to more than 1,280 wildland fires that burn more than 12,400 acres annually. Each year, while nearly 70 homes and other structures are damaged or destroyed by wildland fire, agency efforts

protect more than 1,200 others at a value of more than $178 million dollars.

The Agency relies on highly trained and experienced personnel operating a fleet of 200 4x4 engines; nine specially equipped Hummers; five specially equipped wildland brush trucks, and 89 bulldozer/wildland fire-plow suppression units for quick response to any reported wildland fire or other weather-related emergency. The assistance of Virginia's 765 fire departments and close working relationships with federal land management agencies and other public and private landholders in the Commonwealth ensure that wildland fire response in Virginia is both efficient and effective.

The VDOF's experience in emergency incident management has made the agency one of the leads for all-risk incident management teams in Virginia. This specialized skill set has proven to be a vital asset in recent natural disasters, such as Hurricane Isabel; the 2009/2010 winter storms, as well as other mega-events like the Jamestown 400th anniversary celebration.

On a national basis, VDOF wildland fire managers have come to the aid of other states across the nation. Recent Incident Management Team (IMT) deployments to Hurricane Katrina and Hurricane Ike; the 2009/2010 winter snow storms, along with an average of more than 80 out-of-state agency wildland firefighter deployments annually show the agency's level of experience and overall willingness to provide assistance to others in a time of need.

Priority Areas

Firewise Virginia Program

The Virginia Department of Forestry initiated a program in the early 1980s to focus wildfire prevention and hazard mitigation efforts at Virginia's highest risk woodland home communities. The program provided information and cultivated the community spirit in these targeted communities to push homeowners into taking more responsibility for making their property, and the community as a whole, more fire safe. A culminating feature of this effort was the development of a comprehensive pre-suppression plan that the VDOF referred to as a "Woodland Home Plan." Once established, a community was revisited at least every five years for prevention-focused information and to complete any needed updates of the Plan.

Over the next 20 years, the VDOF continued to expand its program as the number of woodland home communities in Virginia grew exponentially.

By early 2000, the VDOF had incorporated the then-emerging national Firewise USA Community program into this effort, and by the end of 2009, Virginia was a national leader in the number of identified Firewise USA communities, with 31 recognized communities statewide.

Community Wildfire Protection Plans

A key tool of any targeted woodland home community is the Community Wildfire Protection Plan (CWPP). Virginia's CWPP development has taken advantage of earlier efforts with the development of Woodland Home Plans, and incorporated key ideas as outlined under the Healthy Forests Restoration Act (HFRA) as passed by Congress on Nov. 21, 2003. The act clearly defined the role

and importance of CWPPs and outlined how they may directly relate to hazardous fuel reduction funding in years to come. The VDOF has completed CWPPs for nearly 300 high-risk communities; however, this represents only slightly more than 25 percent of Virginia's highest-risk communities, so the effort continues.

Key points for any CWPP, as defined within the HFRA, include:

- Community Wildfire Protection Plans are generally developed by local government with assistance from state and federal agencies and other interested partners.
- Plans can take a variety of forms and may be as simple or complex as necessary, based on the specific needs and desires of the local community or county.
- Plans do not need to be complicated, but they should effectively address local forest and range conditions; values-at-risk, and priorities for action.

The minimum requirements for a CWPP are:

- **Collaboration** – a CWPP must be collaboratively developed by local, state and federal officials as appropriate.
- **Prioritized Fuel Reduction** – a CWPP must identify and prioritize areas for hazardous fuel reduction treatments to reduce the wildfire risk to the community.
- **Treatment of Structural Ignitability** – a CWPP must recommend measures that communities can take to reduce the ignitability of structures in the area covered by the CWPP.

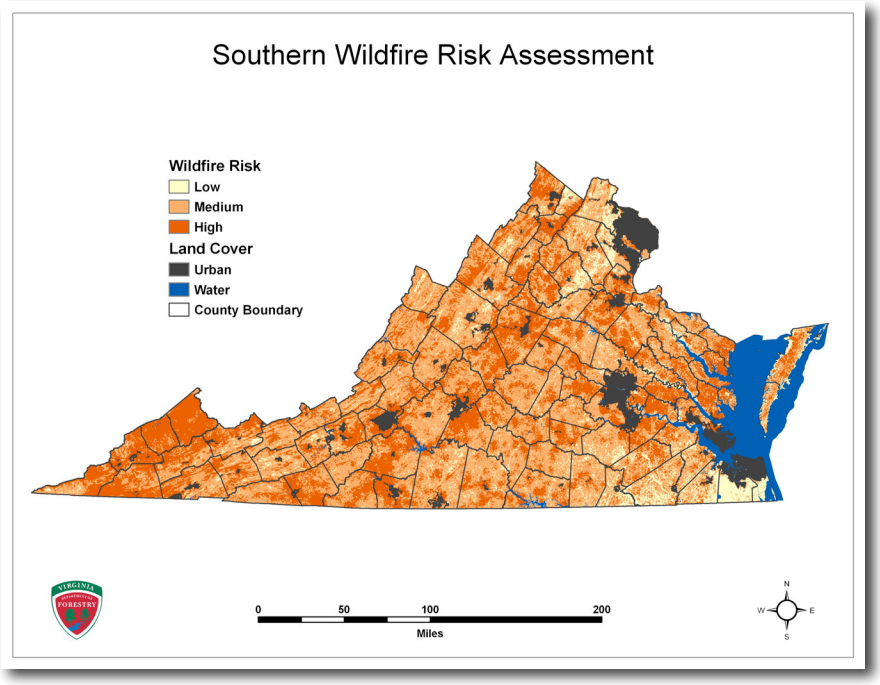
Statewide Wildfire Risk Assessment

The VDOF completed a GIS-based, statewide wildfire risk assessment product in 2001. Taking advantage of the latest GIS technologies, the assessment – which was completed by the VDOF in the early 1990s – expanded on a county by county assessment of conditions. This new product provided an unbiased tool to help qualify and quantify Virginia's overall wildland fire risk.

Using this tool, a wildfire hazard rating of low, medium or high was established for all areas of the Commonwealth. The established hazard ratings can then be used in conjunction with key overlays, such as woodland homes or dry hydrants, to prioritize key agency program needs and focus areas.

In 2005, the GIS-based efforts were further supplemented by the Regionally-based Southern Wildfire Risk Assessment (SWRA), a collaborative effort of the Southern Group of State Foresters. Established to provide a uniform GIS-based information tool for the entire southeastern United States, the SWRA validated the results of the earlier VDOF-initiated risk assessment for the Commonwealth, and provided a means to better compare and prioritize Virginia needs with those of the other 12 southeastern state forestry agencies.

Figure 6: Virginia Portion of Southern Wildfire Risk Assessment (SWRA)



Moving forward, key focuses will include updating the original data layers; highlighting the higher priority needs of the Commonwealth, and comparing Virginia needs to those of the other states.

Dry Hydrant Program

The Virginia Dry Hydrant Grant Program is funded by the General Assembly using money from the Virginia Fire Programs Fund. The program is administered by the Department of Fire Programs and the Virginia Department of Forestry and is assisted by an advisory committee.

The objectives of the program are to:

- Establish new dry hydrants to improve the rural water supply for fire suppression needs;
- Conserve energy by reducing miles traveled to shuttle water;
- Reduce losses from wildland and structural fire, and
- Conserve processed domestic water supplies in urban and urbanizing areas.

All fire department entities within the Commonwealth of Virginia are eligible to apply for the program on an annual basis.

Volunteer Fire Assistance Program (VFA)

The Volunteer Fire Assistance Program is a pass-through grant-funded program of the VDOF. The US Forest Service provides funding for the program, and the VDOF administers the program in Virginia.

The primary program goal is to increase the fire protection capability in the Commonwealth. This is accomplished by making available financial assistance to rural volunteer fire companies to provide additional training and the acquisition of small equipment and wildland personal protective equipment (PPE). Since the 1975 inception of this program, 4,949 grants have been made that provided a total of $2,622,196 in matching grant funds.

The grant program improves the capability and effectiveness of America's 26,000 Rural Volunteer Fire Departments – 585 of them in Virginia – to protect lives and other rural investments.

Wildfire Prevention

Virginia's natural resources put the "wealth" into our Commonwealth. The past, present and future quality of life and economic prosperity for our citizens is linked to the State's forest resources. The Virginia Department of Forestry is responsible for wildfire protection on private and state forestland. While fire can play a beneficial role in the forest ecosystem, it can also be a destructive force that endangers these natural resources; our property, and even our lives. There is a reason Smokey Bear changed his slogan to "Only You Can Prevent Wildfires" – the destruction of land by fire has expanded beyond just the forest. "Wildfire" refers to ANY uncontrolled, outdoor fire, anywhere.

The loss of our natural resources affects all of us. The forests provide more than just "fiber" for the wood products industry.

Prior to the establishment of the Virginia Division of Forestry in 1914 (in 1984 it became the Virginia Department of Forestry), it was not uncommon for many hundreds of thousands of acres of forestland to be burned in wildfires each year. **One of the main roles of the newly established Division of Forestry was to "prevent the destruction of forests by fire."**

It took several years for the Division of Forestry to develop programs; initiate laws; build a workforce, and develop cooperation with various timber-related industries and the US Forest Service, which itself was established only nine years earlier.

Fire occurrence began to drop in 1927, due to a combination of factors that formed the foundation of Virginia's Wildfire Prevention Program, which continues today. The main aspects of Virginia's program include:

- Law Enforcement, considered by the VDOF as an integral component of our prevention campaign. Law Enforcement is a learning opportunity not just a punitive "tool."
- Education.

Law Enforcement

The Virginia Department of Forestry Law Enforcement Program is based on and revolves around several Virginia statutory legal codes. Primary to the VDOF program is the 10.1-1136 Virginia Code, which gives forest wardens power to "enforce all forest and forest fire statutes and regulations of the Commonwealth." In addition, according to code 10.1-1124, Virginia counties and certain cities

pay annual sums for the State Forester to furnish forest fire protection, prevention, detection and suppression services and, thus, all associated forest fire statutes. On July 1, 2009, this "fee" was raised to $0.09/acre of commercial forestland.

All VDOF field personnel attend a Basic Law Enforcement class to learn about the various wildland fire codes; issuing court summonses for violations; procedures for completing fire reports; officer survival techniques; "first responder" expectations, and information on basic wildand fire origin and cause determination. An advanced fire origin and cause determination course, emphasizing the importance of determining a wildfire's cause, is also offered.

To enhance the Law Enforcement program, two VDOF canine units are utilized. Each of these units is at different locations in the state to allow for quicker response across the Commonwealth. These units are comprised of a dog handler along with a bloodhound used for tracking scent left by a suspect. These units have also helped in lost person searches and other types of felonies, where a tracking dog would be beneficial to the case. Virginia's Bloodhound program has been recognized nationally for its ability to deter arson – the most difficult of all wildfire causes to address.

Education

Virginia has been and continues to be a leader in Wildfire Prevention Education. Since Smokey Bear's inception in 1944, Virginia has used Smokey as a focal point to deliver its educational campaign especially to the school-aged children throughout the Commonwealth. Smokey Bear programs are delivered in every rural county and most urbanized counties in Virginia. Reducing human-caused forest fires is considered an agency "key measure" by the Governor's office.

Smokey and his messages of "Only You Can Prevent Wildfires;" "Smokey's Friends Don't Play with Matches and Lighters," and "Always Be Careful with Fire" have served us well.

As mentioned earlier, determining the causes of wildfires is critical to developing messages and programs addressing those causes in an attempt to reduce the incidence and extent of wildfires. Since 95 percent of all wildfires are the result of human negligence in Virginia, we have the opportunity to reduce this negative impact through a strong prevention education program. The leading causes of human-related wildfires are:

- Debris burning;
- Woods Arson;
- Careless discarding of smoking materials;
- Equipment operation, and
- Campfires.

Each of these "causes" is addressed in a variety of ways – from school Smokey Bear programs targeting pre-kindergarten through third graders; to the use of our web page and other social networking, as well as a variety of campaigns using mass media to reach adults.

Forest Health

Program Overview

The Virginia Department of Forestry (VDOF) has one forest health program manager and one forest health forester – the job of the latter being to assist with database management; mapping/GIS, and miscellaneous field work. In addition, the Department has one airplane and pilot available for aerial survey work. Generally, it has not been practical or even possible to survey the entire Commonwealth aerially each year; therefore, there is considerable reliance on ground-based survey and detection from county foresters and technicians; specialists from other agencies, and the public. Close coordination with pest specialists from other municipal, county, state and federal agencies is essential. With limited time, money and staff being a problem for most agencies, pooling of resources to respond to both established and emerging forest health threats is a necessity. In the future, it may be necessary to rely more on contract pilots and surveyors to complete needed aerial survey work, perhaps augmented by the use of satellite imagery. As with most state forest health programs, we lack a trained forest pathologist and invasive plant specialist. Most forest health programs, VDOF included, are managed by forest entomologists who have had to take on the tree disease and non-native invasive plant components of forest health as well, further stretching our expertise and capabilities. Given current and future budgetary constraints, these circumstances are unlikely to change in the short- or even long-term.

The VDOF Forest Health Program receives numerous federal grants to support survey, monitoring and special projects for hemlock woolly adelgid; sudden oak death; emerald ash borer; European woodwasp, and southern pine beetle. In some cases, it is difficult if not impossible to carry out the work associated with some of these grant-funded projects using VDOF forest health staff alone. Therefore, we make extensive use of pass-through agreements, particularly with Virginia Tech, to accomplish survey or research projects. These arrangements accomplish state and federal goals by utilizing the time and expertise of university professors and their graduate students while supporting their academic programs. These mutual agreements have worked well for the VDOF and the USFS and will likely continue into the future.

VDOF is a member of the advisory group authorized by the *Code of Virginia* to assess conditions and recommend actions to control the intrusion and spread of non-native invasive species. The advisory group works under the direction of the Virginia Secretary of Natural Resources and the Virginia Secretary of Agriculture and Forestry with an objective to coordinate the development of strategic actions to be taken by the Commonwealth, individual state and federal agencies, private businesses and landowners related to invasive species prevention; early detection and rapid response; control and management; research and risk assessment, and education and outreach.

Priority Areas

Forest health issues and responses are occasionally an exercise in crisis management, often abruptly changing, and always scientifically and politically challenging. With limited resources – be it personnel, money or landowners willing to assist in control and eradication efforts – any forest health program is a constant struggle between predicting the future and dealing with the present.

The VDOF Forest Health Program has three major components, each covering efforts directed at multiple specific forest health issues. These three components are:

- Native Pests and Established Invasive Insects and Diseases;
- Established Non-native Invasive Plants, and
- Non-established or New Invasive Species Threats.

Native Pests and Established Invasive Insects and Diseases

Southern Pine Beetle (Dendroctonus frontalis)

Background

The southern pine beetle (SPB) is the most economically destructive native insect pest in the Southeastern US, historically causing tens or even hundreds of millions of dollars worth of damage throughout the region annually. Pre-commercial thinning (PCT) and first commercial thinning are important tools for reducing the potential impacts of SPB as well as other common bark beetle pests, such as engraver beetles (*Ips* sp.) and black turpentine beetle (*Dendroctonus terebrans*). Furthermore, thinned loblolly pine stands are healthier due to reduced competition for light, water and nutrients among the remaining trees. Often, however, PCT is not seen as economical by many landowners due to up-front costs. Thus, despite the intrinsic benefits, there is a need for cost-share incentives to make this practice more widespread on private forestlands. Since 2004, funding provided through the USFS Southern Pine Beetle Prevention and Restoration Program has met this need annually.

Program Emphasis

Continued funding for bark beetle prevention and for restoring pines lost to infestation has accomplished a great deal for Virginians. These funds have been directed to three kinds of projects in addition to the necessary and routine functions of detection and evaluation. Most important and helpful has been the establishment of a cost-share program to enable pre-commercial thinning of overstocked stands. Secondly, this support has allowed us to begin restoration of native longleaf pine in those areas where it once flourished (restoration of diminished forest types is discussed in another section). Thirdly, we have been able to restore recently infested pine on certain State Forest lands, some of which would otherwise have reverted to stands of mixed species and ages, which are very difficult to manage.

Overstocked pine stands are a common and widespread condition in Virginia's pine belt. Not only do these forests tend to grow poorly, many that emerge from stagnation remain at high risk to bark beetle infestation. The cost-share program has encouraged many landowners to implement the long-recommended practice of pre-commercial thinning.

Department personnel have continued to make an excellent effort over the years in getting the word out to landowners about the cost-share program. This is exemplified by the fact that the annual number of acres signed up for pre-commercial thinning under the program increased

significantly during the 2008/09 fiscal year, and was, in fact, the highest annual total thus far since the program started in 2004:

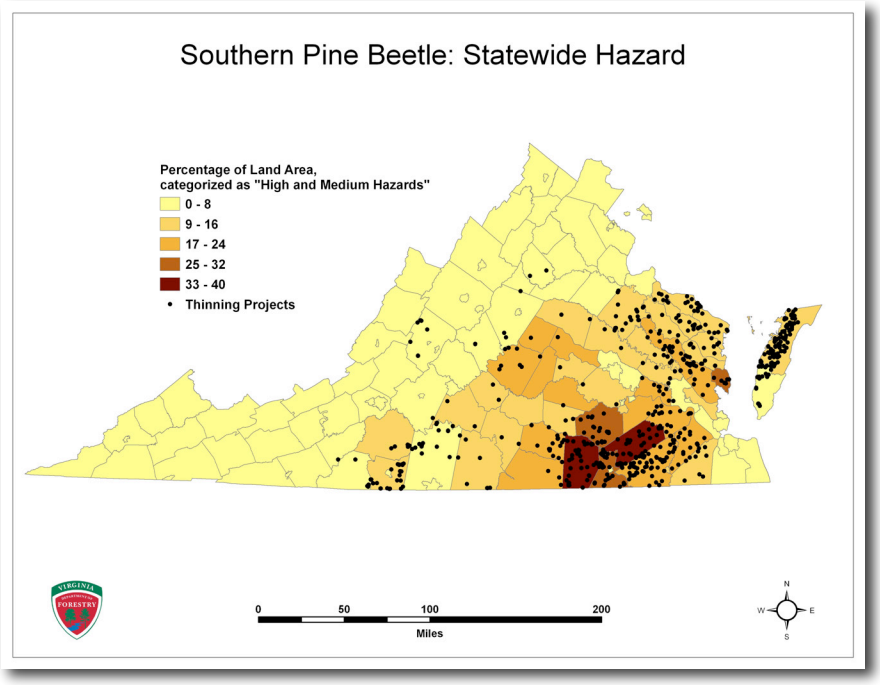
Table 6: Pre-Commercial Thinning Projects

Pre-Commercial Thinning Projects		
FFY	**Number of PCT Projects**	**Sum of PCT Acres**
2004	43	1,846
2005	92	4,871
2006	70	3,074
2007	85	4,546
2008	149	5,931
2009	109	4,313
TOTAL	**548**	**24,580**
Pending	90	3,282
Total + Pending	**638**	**27,862**

In addition to PCT, a new program funded by federal *Redesign* funds provides incentives to loggers to perform first commercial thinnings on tracts under 40 acres. Loggers traditionally avoid such small tracts because low returns are exceeded by high transportation costs. In addition to promoting much-needed bark beetle prevention tactics on small acreages, this program also serves to bolster a weakened logging industry during difficult economic times. Unfortunately, since these payouts are not cost-sharing in nature, additional *Redesign* funds must be forthcoming to maintain the program.

Recently, the USFS Forest Health Technology Enterprise Team (FHTET) and Forest Health Protection (FHP) developed SPB hazard maps for the entire Southern region. A modified county-level hazard map below shows Virginia counties rated moderate to high hazard as being those in which more than eight percent of the county land area falls under moderate to high hazard based on the FHTET models (Figure 7). A majority of PCT projects have occurred in areas with the greatest loblolly pine volumes, including much of the Coastal Plain and Southern Piedmont. These areas correspond well with locations identified as high hazard for SPB.

Figure 7: Locations of Thinning Jobs Relative to Southern Pine Beetle Hazard Regions



Some of the greatest southern pine beetle impact in recent years has occurred on State Forest lands in Virginia's Piedmont (Appomattox-Buckingham, Cumberland and Prince Edward state forests). During FY 2004, infested stands that required salvage on 323 acres have been completely restored and an additional 119 affected acres have been site prepared by burning. Pre-commercial thinning to prevent the development of high-hazard pine stands on State Forest lands was completed on 415 acres. Additional treatments on State Forest lands in subsequent years are summarized in Table 7.

Table 7: Other Southern Pine Beetle Treatments

Other Southern Pine Beetle Treatments				
FFY	**Planted Acres***	**Site Prep Acres (herbicide or burn)**	**Release Acres**	**PCT Acres**
2004	323	199	0	368
2005	125	0	323	0
2006	118	118	104	0
2007	245	245	185	0
2008	40	52	100	33
2009	57	38	102.5	14.5
Total	**908**	**652**	**816.5**	**415.5**

*Almost all loblolly pine, but approximately 20 acres were longleaf pine.

Proposed Action Plan

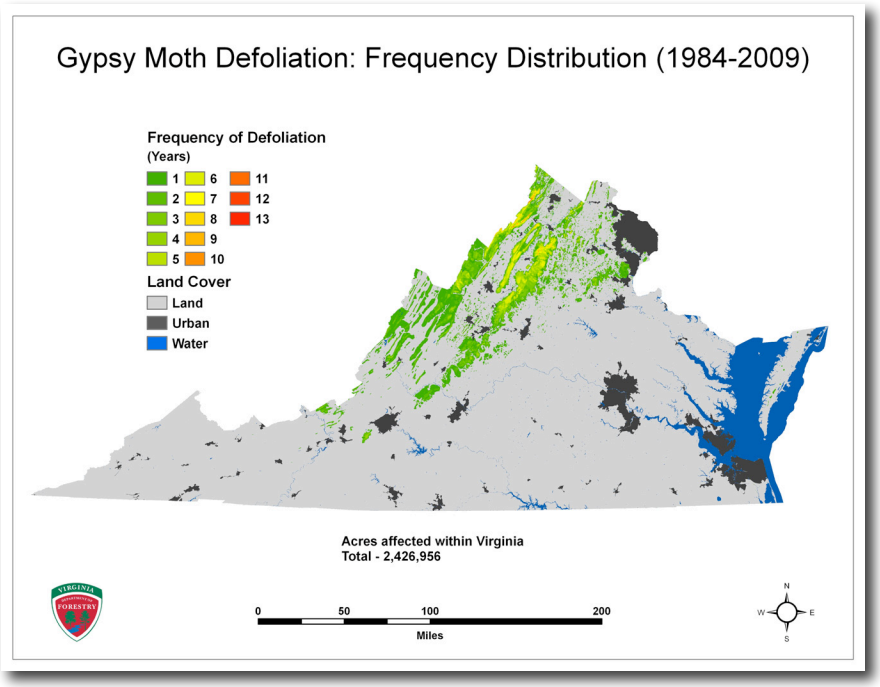
Based on the current level of funding allocated to all completed and pending projects and what is left over, including anticipated funding through the next fiscal year, we can expect to thin as many as **40,000 acres** throughout the Commonwealth, assuming applications continue to be forthcoming and all funds are spent. Based on FIA plot data, Virginia has approximately 120,000 acres of loblolly pine in the age class of 3 to 10 years old that is in an overstocked condition. Therefore, if we reach our goal of 40,000 acres of pre-commercially thinned pine stands in the next two to three years, we will have treated approximately one third of all the lands that need it throughout the Commonwealth.

European Gypsy Moth (Lymantria dispar)

Background

Since its introduction to Massachusetts in 1869, the European gypsy moth has been spreading steadily southward. By the late 1970s and early 1980s, this pest began moving from Pennsylvania through the northern end of Virginia. The first traces of defoliation in Virginia that were detected by aerial survey appeared in 1984. Since that time, gypsy moth has moved steadily south by southwest, and has had a profound impact on the forest ecology of the oak-hickory forest. In particular, the mountainous western part of the Commonwealth has witnessed the greatest impact from repeated annual defoliation. In addition to Shenandoah National Park, almost every square mile of National Forest land in northwest Virginia has been defoliated by the gypsy moth at least once since its arrival (Figure 8). Although defoliating gypsy moth populations have spread throughout the Piedmont and Coastal Plain of Virginia all the way to the North Carolina state line, these provinces are rarely afflicted with levels of defoliation that are easily detected from aerial surveys (Figure 8).

Figure 8: Cumulative Area Defoliated by Gypsy Moth at Least Once (1984-2009)



There are a number of proposed reasons for this pattern.

1. While the Piedmont and Coastal Plain generally contain a patchwork of forested land, there are relatively few large contiguous blocks of forest, particularly those containing the preferred oak-hickory host type. In contrast, the western part of Virginia contains almost all of the federal forestland in the Commonwealth, which includes very large, contiguous acreages of oak-hickory forest in an almost unbroken chain. This provides an easy means of spread and high survival rate for gypsy moth populations.
2. Most heavily defoliated areas occur in mountainous terrain and along ridge lines. Here, soils tend to be poor – rocky, shallow, drought-prone and devoid of nutrients. In such environments, trees experience an almost continuous amount of stress compared to those growing in coves and fertile bottomlands. This stress can be greatly exacerbated by drought conditions. In fact, oak decline due to multiple abiotic and biotic factors is a widespread and common occurrence in the mountains. Stressed trees are less able to produce defensive compounds that ward off insect pests and diseases. Therefore, not only are these trees more likely to be heavily defoliated, but they are less able to recover from such defoliation events, particularly when they occur year after year. Areas that have seen repeated destruction from gypsy moth over the years are highlighted in yellow, orange and red on the map.
3. The western mountains, arguably, have a higher volume and concentration of preferred hosts, particularly chestnut oak, which is often the dominant tree species on many of these dry, rocky ridge tops where large gypsy moth outbreaks often develop. A good example of this is Poor Mountain, near Roanoke, which is dominated by chestnut oak and has recently experienced five straight years of severe defoliation, leading to widespread mortality.
4. Another reason Figure 8 appears as it does is likely a human artifact. No doubt there is visible defoliation from time to time in the Piedmont and Coastal Plain, but, due to the flatness of the terrain and smaller size of the infestations, they are not as easily detected. Furthermore, the Virginia Department of Forestry has always been somewhat limited in its ability to survey the entire Commonwealth with aerial flight lines. The enormous amount of time and effort required to cover the whole Piedmont and Coastal Plain, which are generally devoid of significant disturbances that lend themselves to mapping, has meant these areas are likely to be somewhat underrepresented. However, there is confidence that in any given year, 95 percent to 98 percent of significant, heavy gypsy moth defoliation across the Commonwealth is detected.

Program Emphasis

Resource strategies for gypsy moth include trapping and detection; defoliation surveys; suppression, and slowing-the-spread. These efforts span multiple state and federal agencies and involve hundreds of people. The Virginia Department of Forestry is primarily responsible for documenting and mapping defoliation acreage and intensity for the whole Commonwealth, including federal, state and private lands. Some of this responsibility is shared with the USFS, which surveys a majority of National Forest Lands using its own personnel. Suppression operations using B.t., Dimilin or Gypcheck are conducted and coordinated by the Virginia Department of Agriculture and Consumer Services (VDACS) in cooperation with the USFS. The amount of area sprayed each year varies depending on the severity of the infestation and availability of funding. Over the past five years, suppression acreage has covered anywhere from 20 percent to 90 percent of the

statewide defoliation acreage. These figures will likely continue to vary and be difficult to predict from year to year since there is no way to predict long-term funding or resource limitations. Suppression activities are effective at protecting trees and forests from damage but do not prevent outbreaks from occurring. Typically, high gypsy moth populations eventually succumb to a viral disease and, since the mid 1990s, a fungal disease known as *Entomophaga maimaiga*, the origins of which remain a mystery. This fungus is particularly effective during wet spring weather and may prevent gypsy moth populations from reaching the sustained, catastrophic levels of years past.

The gypsy moth Slow-the-Spread (STS) Program, involving intensive pheromone trapping and the release of pheromone flakes, is run by the USFS and VDACS. Funding for this program varies as well but has been more consistent than suppression funds. The STS action area runs along the southern state line of Virginia from the Atlantic Ocean inland and then curves upwards through southwest Virginia into Kentucky and West Virginia.

Far southwest Virginia has been spared from severe populations of gypsy moth, and defoliation has not yet been documented past the New River thanks to STS efforts. However, within the next 10 to 15 years, populations of gypsy moth capable of causing severe defoliation are likely to cover the entire Commonwealth as the STS line advances forward. Therefore, fewer dollars will be needed in Virginia for STS while many more funds will be needed for adequate suppression activities. As far as an action plan on the forestry side of things, see the discussion in the "oak decline" section.

Oak Decline

Background

Oak decline involves a complex of abiotic and biotic factors that result in the slow decline and death of oak trees. This condition is widespread across the Commonwealth, but the greatest impact from oak decline occurs in the western mountains in the same areas and for similar reasons as those described for gypsy moth above. While oak decline does occur in the absence of gypsy moth, the latter certainly can speed up the process, and these two factors are slowly reducing the mature oak component in the western part of the state. In particular, red oaks seem to be more heavily affected by gypsy moth and oak decline.

The process of oak decline normally begins with one or a series of predisposing environmental factors, including old age, poor sites, strong winds and sustained drought. Trees weakened over time from these agents become more susceptible to secondary insects and diseases that, while ever present, do not normally attack or invade healthy trees. Some common secondary pests associated with oak decline include: the two-lined chestnut borer; *Armillaria* root disease, and *Hypoxylon* canker. The presence of any of these agents usually means tree death is soon to follow due to girdling or root killing. Starting with branch dieback, decline can occur over a period of years or in one season. The more rapid declines tend to occur on drought-prone sites with thin soils. Oak decline typically affects a large number of widely scattered trees over extensive areas and is difficult to adequately document without detailed, annual surveys. Among this mix of pest problems, oak wilt is also widespread in the Appalachians of western Virginia. While not a severe problem compared to other parts of the country, it does contribute to the overall decline and mortality of oak in this region, particularly red oaks.

Program Emphasis

Ultimately, there is very little any one agency can do to curb these trends. While exacerbated to some extent by invasive pests (e.g. gypsy moth, oak wilt), oak decline is a natural process throughout much of the Appalachian forest. With many of these oak forests now reaching maturity; the absence of regular forest fires in our landscape due to decades of fire suppression, and heavy

pressure from deer browse in many locations, oak regeneration is being supplanted by aggressive pioneer species, such as tulip poplar, gray birch and red maple. To some extent, high-grading as a harvest practice has also contributed to unhealthy oak stands that are less resilient to disturbances. Despite years of research in hardwood silviculture and recommendations against high-grading from the forestry profession, this practice still dominates the forest economy throughout the Appalachians and beyond. Without concerted efforts towards oak restoration through use of proper silviculture, seed sources and prescribed fire, many oak species – predominantly red oaks – will continue to decline in this region. Restoration efforts, if adopted, are likely to occur only in selected areas on state and federal lands, but probably won't be substantial enough to reverse these trends at the landscape level. Another open question would be the future role, if any, of blight-resistant American chestnut restoration programs in restoring southern Appalachian forests. Since the dominance of oak is due in large part to the demise of chestnut in the early 20th century, it begs the question as to whether such dominance by oak is sustainable or even desirable on a landscape scale.

No plans are under way to address this issue. To get started, we would first need to compile survey data from western Virginia on the distribution and abundance of oak decline; its primary and secondary causes, and oak regeneration potential or lack thereof. While this data is captured to some extent within the Forest Inventory Analysis (FIA) survey plot system, a much more extensive and detailed survey is necessary to make an adequate assessment of this phenomenon at the state level. Only after detailed data are obtained at a meaningful scale will we be able to tackle this problem at the landscape level. A comparable model would be the North American Maple Project (NAMP) in the Northeast, whereby a long-term study was coordinated by the USFS, Forestry Canada, state cooperators and university personnel to monitor sugar maple health across its core range via a systematic plot system. A similar plan for oak in the southeast is long overdue. While there are potential avenues for funding such a project, such as the Evaluation Monitoring program under the USFS Forest Health Monitoring program, the real limitation is not having the appropriate staff to undertake such a labor-intensive, long-term project.

Hemlock Woolly Adelgid (Adelges tsugae)

Background

The hemlock woolly adelgid (HWA) was first found in the eastern US in Richmond, VA, in 1951. Since that time, it has spread throughout the entire range of eastern hemlock within the Commonwealth, with the exception of a few isolated hemlock populations. To date, many areas, such as Shenandoah National Park, have experienced more than 90 percent hemlock mortality within a short period of time. Other locations have seen mortality at lower levels over a similar time frame. In parts of southwest Virginia, where the adelgid has only arrived within the last 10 years, many hemlocks still look generally healthy, but early stages of decline are evident. Throughout the Commonwealth, levels of mortality and decline are quite variable and hard to predict, but gradual decline and death of infested trees is expected across the state.

Program Emphasis

While effective chemical controls are available and widely used, they are only useful on a very limited scale. Generally, they are only economical or practical when used on ornamental and landscape hemlocks. Biological control provides the only viable long-term option for reducing adelgid pressure enough to preserve the remaining hemlock population. Through USFS funding, Virginia Tech is the primary agent responsible for rearing, mass producing and releasing *Laricobius nigrinus*. This biological control agent is native to the western US and is a specialist predator of HWA. While release of thousands of beetles across the Commonwealth has been undertaken over

the last five years, recovering beetles and assessing their impact has been problematic. While it seems clear that these beetles do become established and are successfully reproducing in the environment, it is not clear whether they are reducing HWA populations to undamaging levels. If effective control of HWA is to be realized, it may be necessary to introduce additional species of biological control agents. The USFS and the Virginia Department of Forestry have supported efforts to monitor the spread of HWA along with subsequent levels of damage and mortality. In addition, VDOF and other state agencies, such as the Virginia Department of Conservation and Recreation (VDCR), have worked with Virginia Tech to facilitate the release of *Laricobius nigrinus* in a number of State Parks. Other releases have occurred in high-priority areas on federal lands. Meanwhile, federally funded efforts by organizations, such as Camcore, strive to preserve the genetic base and diversity of eastern and Carolina hemlock by collecting and preserving seed throughout their respective ranges and growing them in greenhouses far removed from HWA infestations. It is hoped that one day, with HWA reduced to a stable equilibrium from biocontrol, restoration of hemlocks in areas that were devastated by the adelgid will be possible.

Emerald Ash Borer (Agrilus planipennis)

Background

The emerald ash borer is a relatively new invasive insect that was first discovered in Fairfax County Virginia in 2004. This first introduction was traceable to a recent shipment of ash saplings from Michigan and was quickly eradicated. Unfortunately, EAB was discovered again in multiple locations throughout Fairfax County in 2008, with evidence it had been there for some time. This fact, coupled with the reality that EAB was also becoming established in surrounding states, such as PA, MD and WV, meant that eradication no longer had a realistic possibility of success. With this in mind, VDACS, the state agency with animal and plant quarantine authority, decided its approach would be to slow-the-spread by enforcing county quarantine regulations. To date, five counties in northern Virginia (Fairfax, Loudoun, Fauquier, Prince William and Arlington) along with the municipalities of Alexandria, Fairfax, Falls Church, Manassas and Manassas Park, are under quarantine. Ash wood products and firewood are prohibited from leaving these quarantine areas without proper certification by VDACS. Additional counties and municipalities will be similarly quarantined as appropriate when EAB is positively identified or suspected.

Program Emphasis

The VDOF, in concert with many other municipal, county, state and federal agencies and nonprofits, is making a concerted effort to educate the public about EAB. One important focus is to reduce or eliminate the spread of invasive pests, like EAB, from firewood – identified as a major vector for this and other pests, such as gypsy moth and oak wilt. A “Don’t Move Firewood” campaign is in its early stages, and the message is widely disseminated by the above-mentioned cooperators through brochures, websites, presentations, state fairs and other venues. Voluntary compliance by the public as well as stronger regulatory action for firewood distributors is essential if we are to successfully slow the spread of EAB and other emerging pest problems. While eventual spread throughout

Virginia seems inevitable, slowing the spread is still a worthwhile goal because it spreads out costs associated with tree removal and salvage over longer time frames, while providing additional time for research to come up with viable control options, such as biological control and planting of resistant tree species.

Ash, which primarily includes two species – white ash and green ash, represents approximately 1.7 percent of the forest resource by volume in Virginia. These two species are widely scattered throughout the Commonwealth, with white ash more common in uplands and green ash along bottomlands and riparian zones. While white ash is typically a very scattered tree, green ash is often found at higher densities, especially in flood plains. White ash can also produce very valuable crop trees, and its loss can result in lower-value forest stands. Ash is also used widely as an urban tree, both in landscape plantings and as a street tree. While many urban ash trees are relatively young, some areas, such as downtown Abingdon; historic Mount Vernon, and the University of Virginia campus, contain very large, historic ash trees. To remove even one of these trees, not to mention dozens of them, can cost as much as $10,000-$20,000 each. Unlike ash trees in the forest, it is the urban trees that will present the greatest challenge to the Commonwealth if EAB becomes established throughout because dead trees become human hazards in urban areas and must be removed. Unfortunately, a majority of municipalities large and small in Virginia lack street tree inventories, while others are not easily available, thus making it difficult to assess the potential economic impact of EAB to Virginia. To address these concerns, the Virginia Department of Forestry is working with VA Tech to develop a 5 percent to 10 percent sample survey of street trees across all major urban areas in Virginia. Using the statistical software package I-Tree Streets, developed by the US Forest Service, data on the species distribution; diameter distribution, and abundance of street trees will be obtained from pre-existing surveys or derived from new survey work and consolidated.

These data will provide an essential planning tool for the Commonwealth of Virginia to deal not only with EAB, but other threats, such as the Asian Longhorned Beetle, which is a threat to all species of maple as well as other tree genera. To avoid the serious challenges to urban forests posed by invasive pests in the future, municipalities must have the capacity to plan ahead. Only by emphasizing species not under threat and, more importantly, maximizing species diversity across municipalities and within streetscapes, will we be able to adequately limit the potential devastation that can sometimes be caused by one invasive species, as was the case with Dutch Elm Disease.

Established Non-native Invasive Plants

Background

Widespread tree mortality from pests, diseases and abiotic disturbances in conjunction with trends towards increasing land parcelization and forest fragmentation serve to disturb intact forest and create ideal environments for non-native invasive (NNI) weeds. Many species of invasive weeds, including trees, shrubs, vines, grasses and forbs, plague Virginia's forests. Some of these plants were brought here by European colonists hundreds of years ago for urban and landscape plantings and erosion control. What most of these plants have in common are their ability for rapid growth and reproduction and their ability to colonize disturbed habitats, such as roadsides and forest edges. Once established, many invasive weeds are able to encroach upon intact forest, out-competing native plant species. Complete eradication of well-established invasive plants is all but impossible, and management is often impractical. Forests dominated by invasive weeds typically have less biodiversity, productivity and natural beauty and hinder both economic and recreational opportunities.

Program Emphasis

Most NNI weeds are widespread throughout much of Virginia's forestlands, making complete eradication extremely unlikely. Only a highly successful biological control program can reduce a plant population to levels that render it ecologically insignificant. Unfortunately, while worth trying, most biological control programs do not reach that level of success. Furthermore, to introduce a biological control, a great deal of host range testing is required before the proposed biological control agent is introduced into a new environment. This is to ensure there will be little or no impact to non-target plants, in which case the biocontrol may, itself, become the problem rather than the solution. Indeed, a number of common invasive plants are not amenable to biocontrol because of their taxonomic similarity to other, native plants, which could also be seriously impacted. Therefore, this strategy may only be effective for a limited number of NNI plants.

Control using herbicides is effective for most plants, and this is certainly a viable option for localized control of NNI plants. In fact, many high-priority areas, including Shenandoah National Park, have been using herbicides extensively to control invasive plants, such as tree-of-heaven and paulownia. However, eradication using herbicides is not practical or economical for most invasive plants. Quite often you must kill adjacent, native flora along with the invasive plant. Even in situations where you can apply spot-treatments precisely onto the invasive plant (basal spray application on tree of heaven, for example), this is highly labor intensive and expensive and, thus, seriously limits the amount of ground you can practically cover. Other invasive weeds, such as Japanese stilt grass, are so widespread as a ground cover in many sensitive forested landscapes, particularly near watersheds, that extensive herbicide use would be undesirable at best. Therefore, herbicides are likely to be effective locally and should be used in a manner that is carefully tailored to each specific situation or circumstance, the species and growth habits of those plants you are trying to control, along with the characteristics of the surrounding environment in which they grow.

It is clear that the above methods cannot be applied everywhere, and that forested tracts overgrown with NNI plants are going to be a fact of life in most cases. The cost to control even one pervasive weed can be many hundreds of dollars per acre, suggesting that this would only make economic sense in the most valuable forested stands, such as on federal forests and wildlife refuges, State Parks and State Forests. Millions of dollars can easily be spent controlling weeds on a relatively small amount of forestland. Since the vast majority of land in Virginia and the eastern US is privately owned, that means it is primarily up to the individual landowner to bear the brunt of the burden for reducing weed-infestations. This is why public education on the economic and environmental costs of NNI plants is so essential. Government agencies in conjunction with environmental groups like The Nature Conservancy, Master Gardener and Master Naturalist Programs, and Cooperative Extension specialists all need to work together on such efforts. Indeed, this is already occurring at some level.

The Virginia Department of Forestry has received limited funding over the past few years to conduct a small number of invasive weed eradication projects on State Forests. Only with continued, substantial funding can a continuous and meaningful effort in this regard be sustained. While State Forests and Parks are a relatively small percentage of the total forested acreage in Virginia, such control projects can

be used as research and demonstration areas to educate the public. With the appropriate use of signage and field trips, the public can be made more aware of the impact of this problem and may become motivated and educated enough to do some weed control on their own lands.

Most natural resource professionals in Virginia generally agree that tree-of-heaven is one of the worst invasive weed problems on our forested lands. VDOF has recently published a tree-of-heaven booklet for Virginia landowners, summarizing information on how to control it as well as expanding upon possibilities for wood utilization. Utilizing woody invasive plants is a novel approach to addressing this problem as it provides a way to obtain a small amount of income from control efforts, thus increasing the incentive for control. We hope to further develop these ideas as they may apply to other invasive plants. Possibly, momentum for a biomass industry may, in the distant future, allow for the harvest of large quantities of invasive plants of all kinds – including grasses, forbs, vines, shrubs and trees – and could make major weed eradication programs an economic possibility where once they were cost prohibitive.

Finally, detailed distribution data on invasive weeds in Virginia and most other states are lacking. The most detailed maps for any one species are typically presence/absence by County. In a few cases, weedy trees, such as tree-of-heaven, are picked up in the FIA plot system so we have a better idea of where concentrations are. But even in those circumstances, the FIA plot system is not always thorough enough to detect a weed that is present but not widespread, and therefore it is of limited use for early detection. VDOF hopes to better address this problem with our new forest health reporting system – which consists of handheld Trimble GPS/data logger units that have been issued to all of our field foresters and technicians. These units are equipped with forest health pull-down menus that include most of our common weed species. Precise geographic data on the species, extent and severity of weed infestations can be entered from the field and downloaded to a centralized forest health database. In time, with enough entries, we hope to be able to produce more accurate weed distribution maps for the Commonwealth.

Non-established or New Invasive Species Threats

What follows is a discussion of five invasive species – two insects, two diseases and a plant – that threaten Virginia's forests but have not yet been found here or are not widely established.

Asian Longhorned Beetle (ALB) (*Anoplophora glabripennis*)

With the activity surrounding emerald ash borer recently, it's worth noting that another serious non-native wood boring insect pest is out there. The Asian longhorned beetle, if it were to become established in Virginia, could pose an even greater threat to our forest resources than the emerald ash borer. Because its primary host is maple, we stand to lose a great deal more forest and urban trees from this pest if it were to spread and go uncontrolled within the Commonwealth. While our two major ash species, green and white, make up approximately 1.7 percent of all forested volume in Virginia based on FIA inventory data, red maple and a much smaller amount of sugar maple make up approximately eight percent of forested volume. Red maple is also the most abundant tree in Virginia in terms of number of stems and seedlings. This means that red maple will represent an even larger proportion of Virginia's future forest volume. Furthermore, while ash may, on average, make up perhaps two percent to three percent of all urban street trees, the combined plantings of red, sugar, Norway and silver maples could exceed 20 percent of all urban street trees. In addition, birch and other species are potential hosts of ALB.

The good news is that the potential for eradication seems much more promising than with EAB since ALB's rate of spread seems comparatively less dynamic. New York City has been undergoing an eradication program since 1996, Chicago since 1998, and the Jersey City area since 2002. Except for Chicago, which declared ALB eradicated in 2008, the other municipalities are still battling the

beetle but have made significant progress. The bad news is that during the summer of 2008 a large infestation of ALB was discovered in Worcester, MA, which they project has been there longer than five years. This was very troubling news indeed, not only because of the abundance of maple in the city, but because Worcester is right on the edge of the northern hardwood forest, of which sugar maple is a very large component. There is considerable risk that ALB may escape, if it hasn't already, from an urban to a forested setting, greatly reducing the prospect of successful eradication. It also begs the question, "where else is ALB that we don't know about?" The longer an infestation remains undetected, the much greater the likelihood it has spread.

Unless there is a breakthrough in the biological control of this pest, it is difficult to imagine the potential devastation this pest could cause if it became established. One USFS scientist published a paper projecting that the impact to urban forests alone, if ALB established from coast to coast, could be $669 billion with a loss of approximately one third of the urban forest canopy across the nation. We must do everything we can to prevent this insect from spreading and make every effort to eradicate it if discovered here. An eradication program in Virginia, if it comes to that, would likely cost millions.

European Woodwasp (*Sirex noctilio*)

There continues to be concern over the (probably inevitable) arrival of the European woodwasp (*Sirex noctilio* or Sirex) to Virginia. This can occur in one of two ways, either overland by spreading from its current distribution in New York and northern Pennsylvania, or by separate introduction from overseas via one of Virginia's ports. A particular concern is how Sirex will impact loblolly pine, known to be a preferred host. In the Southern hemisphere, where Sirex was introduced from Europe many decades ago, plantations of radiata pine in Australia and loblolly pine in Brazil have been devastated by this pest. While we certainly don't want another invasive insect on our hands, there are some forest entomologists who are less concerned about Sirex in the South than others. There are a number of reasons to be optimistic that this pest may have more bark than bite in the Southern U.S.:

1. The experience thus far with Sirex in New York and northern Pennsylvania has shown that it seems to be having a minimal impact in plantations of white, red and Scotch pine. While it does invade trees, it is mostly those that are already in decline. It does not appear to be acting aggressively in healthy stands.
2. In the U.S., we have a number of insect parasitoids that are proven effective natural enemies against *Sirex noctilio* and other siricids. In fact, some of these insects were already used effectively as biological controls when introduced to Australia.
3. Another effective biological control in the form of a nematode (a tiny parasitic worm) was developed and used very effectively to control outbreaks in Australia. The nematodes were formulated into a paste that could be applied to trees. When contacting the paste, Sirex would move it around through their burrows. The nematode would then invade the bodies of female Sirex and sterilize them. With a little planning, Virginia and other states could obtain this formulation if needed.
4. Unlike Australia and other countries in the southern hemisphere, most of our pine species grown in plantations are native, not exotic. Likewise, we already have a number of native woodwasp species that could act as major competitors of *Sirex noctilio*, not to mention all the other members of the wood boring and bark beetle species complex. These species were mostly lacking in the southern hemisphere locations where non-native pines are grown in large plantation blocks.

That said, nature is unpredictable. *Sirex noctilio*, like other siricids, carries and transmits a fungus and toxic mucus, both of which are inoculated into the tree while laying eggs. It is the tree's negative reaction to the mucus and fungus of *S. noctilio* that causes problems. Thus, it may not take a lot to harm an otherwise healthy tree. There are those who feel, however, that with all of the above-mentioned conditions in place, Sirex will act as no more than a nuisance that serves to take out old and weak trees. This is not unlike the role that bark beetles play in our pine forests. In fact, some suggest that bark beetle prevention tactics, such as pre-commercial and first thinnings in pine stands, will serve as the best defense against problems with *S. noctilio*. Even in the Southern Hemisphere, properly thinned plantations have a much lower incidence of Sirex. If this holds true here, we might not have to do very much more to deal with this pest. In the meantime, let's hope we can keep it out of the South as long as possible so we don't have to find out one way or the other.

Sudden Oak Death Pathogen (*Phytophthora ramorum*)

Sudden oak death (SOD) is caused by a fungus-like organism that spreads through soil and water. It is infesting forested coastal areas of California and Oregon, where many species of oaks and tanoaks have been killed. It also infects, but does not kill, a very long list of other plant species. Many of these plant species include those sold in the nursery trade (especially azaleas, camellias and rhododendrons) and therefore act as effective carriers of the pathogen. Before the full extent of the problem was appreciated, it was clear that the nursery industry in California had spread infected plants to other nurseries all across the country. Since then, however, there seems to be more confidence that nurseries are doing a much better job at screening their high-risk host plants before shipping them. It does not appear that SOD is easily transmitted from infested nursery stock to the natural environment since no naturally established populations of *P. ramorum* have been identified in the Eastern US that haven't been tied directly to a nursery infestation. For the last five years, our annual survey of forested watersheds and nursery perimeters yielded no samples that were positive for the pathogen that causes SOD. It is still unknown what impact, if any, SOD would have in our eastern forests. Although lab inoculation studies have demonstrated that this pathogen can infect many of our native oak species, these studies are hard to carry over to a natural setting. How aggressive this disease will behave and spread in a forested setting is entirely speculative, and could run the spectrum from being relatively harmless to being a catastrophic disease on the order of chestnut blight. Hopefully, our surveys will continue to come up negative until we can learn more about how this pathogen affects eastern oaks.

Beech Bark Disease

Beech bark disease is caused by an insect-fungus complex that can severely injure and kill American beech. The fungus invades the tree through feeding wounds made by a scale insect. Both fungus and insect are thought to be exotic and were first discovered in the United States in Massachusetts in 1929. Since then, the disease has spread like a wave from the northeast southward. The active front of this wave is now about halfway through Pennsylvania. However, outlying populations of diseased trees can be found in the mountains of Virginia, West Virginia, North Carolina and Tennessee. For a while, only three counties in Virginia had reported either beech bark disease (Highland County) or the scale insect without the fungus (Bath and Rockbridge counties). As recently as 2007, biologists from Shenandoah National Park and the Wintergreen Foundation have reported the disease or the scale in Madison, Albemarle and Nelson counties along the Blue Ridge Mountains. These new reports are disturbing. American beech is a very common and important species and, in many areas, is the dominant understory or overstory tree. It makes up approximately 1.7 percent of Virginia's forested volume, making it the 15th most abundant tree in the Commonwealth. It is 14th most abundant in terms of number of stems, or about 1.9 percent of all stems. Abundance is much higher in bottomlands and coves with rich organic soil layers. It represents yet another native tree species facing potentially significant or catastrophic decline in the coming decades.

Wavy leaf basket grass

A relatively new invasive weed, wavy leaf basket grass (*Oplismenus hirtellus* ssp. *undulatifolius*) is showing up in a number of locations throughout the Commonwealth and is causing a lot of concern. Its growth and appearance are somewhat similar to Japanese stilt grass (*Microstegium vimineum*), however, the blades are a bit larger and the leaves have a characteristic 'wavy' appearance. It is extremely shade tolerant and seems to take over a site rapidly, virtually excluding native vegetation. Also, unlike stilt grass, it is a perennial and will overtake stilt grass when the two are growing together. It produces very sticky seed on long stalks, making it easy for a person walking through an infestation to spread the seed over long distances.

It was discovered in the United Sates near Baltimore, MD, in the 1990s and has since been found in Virginia. The first location was near Swift Run and Route 33 on the western end of Shenandoah National Park. Efforts by the Park are underway to eradicate it using herbicides, but it is a large area. The other known location is on Ovoka Farm near Paris in northern Fauquier County. Both sites are near the Appalachian Trail, suggesting it may have been moved by hikers or horses. It has also reportedly been seen in Fairfax County and is likely already pretty widespread in northern Virginia. We must be on the lookout for this new exotic so it can be eradicated before it spreads too far.

Forest Legacy/Land Conservation

Program Overview

Virginia's forests generate $27.5 billion of revenue from forest products and related benefits. However, the conversion of forestland to other uses – statewide average net loss of 27,000 acres per year – continues to be one of the most significant threats to the forest resource in Virginia. When forestland is converted to other uses, even if the forest cover remains largely intact, those acres are essentially lost as working forests, and the other forest amenities of clean water, wildlife habitat, recreation opportunities and scenic vistas are also lost or significantly diminished. Due to the wide range of benefits that forests provide, the loss of forestland impacts the quality of life for all Virginians.

More than three-quarters of Virginia's forests are in private ownership, so forestland conversion in Virginia is largely determined by the decisions of individual landowners acting within the framework of local land-use policy. Slowing the loss of forestland due to conversion will involve influencing the land-use decisions of individual landowners as well as the land-use policies of local governments.

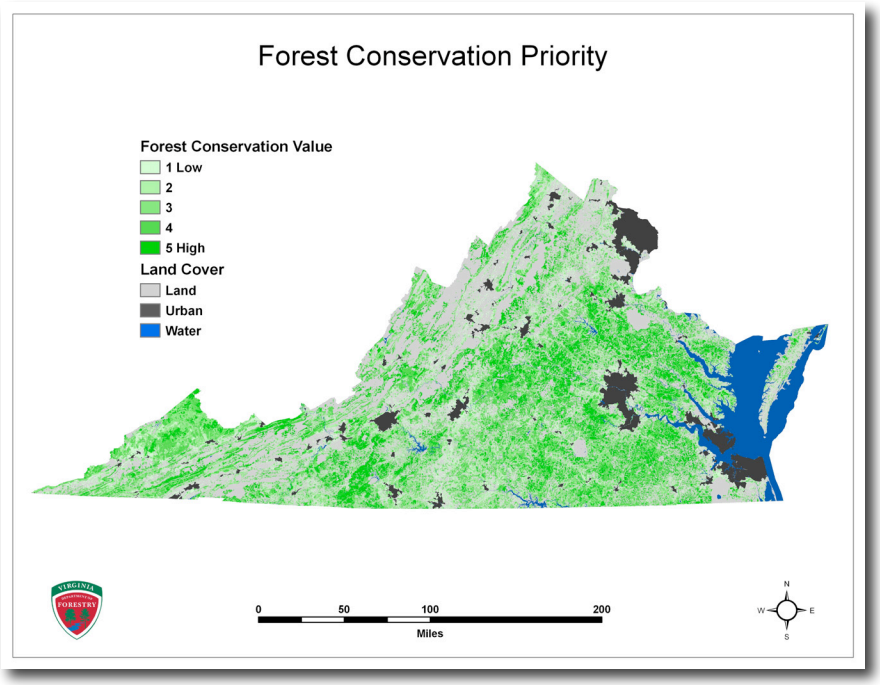
Recognizing the threat posed by forestland conversion, the VDOF has embarked on a concerted effort to develop a forestland conservation program for the Commonwealth. A new headquarters-based Forestland Conservation Division has been established, including a division director and an assistant director for forestland conservation. The central office staff also includes a program manager responsible for managing the Forest Legacy Program and all VDOF land acquisitions. Two operations-level forestland conservation specialists are assigned to two of the three operational regions, and a third position is planned when funding is available.

VDOF land conservation efforts focus on accepting donated conservation easements from willing landowners; providing input on forest benefits and conservation tools to localities, and utilizing the USFS Forest Legacy program and state funding when available to conserve land through easements and acquisitions.

Priority Areas

To better focus efforts for each of these strategies, the VDOF has developed a forestland conservation priority map that ranks all forested acres in the state based on the level of benefits provided and the risk of conversion faced. The forest benefits in the analysis fall into three broad categories: water quality protection; integrity of aquatic and terrestrial habitats, and forest productivity. In the forest conservation priority map (Figure 9), all of the forests in the state that are not under permanent protection are ranked relative to all other forests statewide. The priority map will be used to guide outreach efforts and to rank potential easement and acquisition opportunities.

Figure 9: Virginia's Forestland Conservation Priority Areas



Working Forest Conservation Easements

Virginia has one of the best state-level tax incentive programs in the nation to encourage private landowners to donate land for conservation or to place permanent conservation easements on their land. These tax incentives have created steady demand among landowners to donate conservation easements. The VDOF has responded by creating a conservation easement program focused on conserving working forestlands. The VDOF has developed easement terms that promote proper forest management and restrict the conversion of forests to other rural uses.

Forestland Acquisition

Virginia's State Forest acreage has increased by 35 percent in the last three years. This success has resulted from a state focus on land conservation and the availability of large tracts of forestland for

sale due to the ongoing efforts of timber companies to liquidate their land holdings. This supply of timberlands coupled with the general decline in real estate values creates a tremendous opportunity for state land acquisition. The VDOF has developed a State Forest expansion plan that focuses on ensuring that all Virginian's have access to public forestland and recognizes the availability of large tracts of private forestland.

Local Government

In Virginia, local governments are a key stakeholder in land conservation efforts. Often, they are caught in the middle between the competing interests of demands to conserve land and preserve rural or working landscapes, and the need to fully realize the tax potential on private lands to provide for the many other needs of their citizens. VDOF's outreach efforts focus on making all stakeholders understand the many benefits forests provide to society; emphasizing the costs avoided when land remains in forest, and developing understanding for the tools available under state law that assist in land conservation, including land-use taxation and Ag/forestall districts. VDOF conservation specialists work with local governments and landowners to encourage working forest conservation through zoning, comprehensive plan updates and land-use policies.

Alternative Conservation Strategies

While existing land conservation tools have been effective at protecting rural land from conversion, new strategies are needed to maintain or increase the rate of land conservation. The VDOF land conservation program is working with other state agencies and partners to determine the feasibility of alternative land conservation programs, such as Transfer of Development Rights or voluntary forest mitigation.

Chesapeake Bay Program

Virginia's 2007 commitment for the Chesapeake Bay Program Forest Conservation Directive includes an annual target of permanently protecting 25,000 acres of forests identified as high-priority for conservation within the Bay watershed. The high-priority acres were identified through GIS analysis conducted by the VDOF. The Chesapeake Bay Program provides support for VDOF to conduct outreach to landowners of high-priority forestlands.

Forest Legacy

The Forest Legacy Program (FLP) is an extremely important part of Virginia's land conservation efforts. The 2010 updated version of Virginia's Forest Legacy Guidelines is shown in its entirety in Appendix A of the Strategic Plan that accompanies this document.

The FLP assists state governments in the identification of, and protection of, important private forest tracts that are threatened by conversion to non-forest uses. One of the primary tenets of the Forest Legacy Program in Virginia is to ensure the conservation of working forests that provide the multiple benefits inherent to healthy, productive forests. The primary protection tool under the program, the conservation easement, is an effective means of influencing the disposition of important forestland while continuing private ownership. The program also funds the fee-simple purchase of properties, such as State Forests and other state-owned lands protected from development.

The FLP was initiated in Virginia in October 1999, when then-Gov. James S. Gilmore III designated the VDOF as the State Lead Agency for the program. The VDOF is responsible for managing the program and the associated federal grant funds for the conservation of important state forestlands. The VDOF believes that diverse, well-managed working forests are the healthiest and the most productive and, consequently, provide the most public benefit when protected from the economic pressure for development.

Program Eligibility Criteria

The Eligibility Criteria for Virginia's FLP were revised during 2007 and 2008 during an interim revision to the program's Assessment of Need document (see Appendix A). The current Eligibility Criteria for Virginia's FLP, defined at the time of these interim revisions, are:

- **Threatened by conversion** to non-forest use (fragmentation and reduction in linkages);
- Continued production of **timber and other forest commodities** (local and regional economic base);
- Consideration of **natural heritage resources** (e.g., natural communities; habitat for rare, threatened and endangered species; significant geologic features), and
- **Watershed values** (water quality, wetlands, riparian buffers, groundwater recharge, public water supplies).

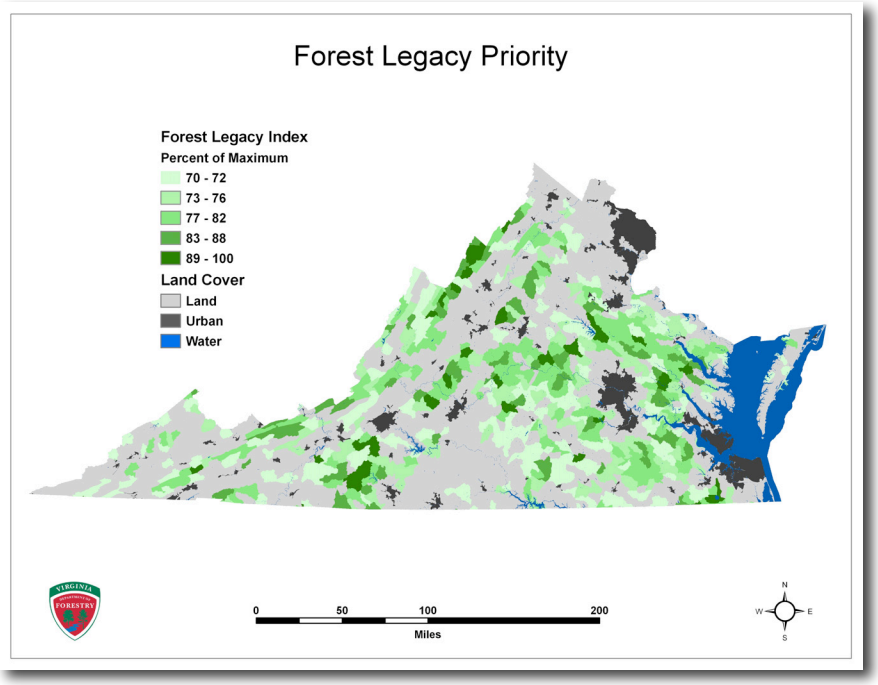
Forest Legacy Area

The FLP must be focused to be effective with limited funding availability and to meet the demands of a competitive grant application and approval process. By identifying areas of the state that possess the highest conservation value (based on the program's Eligibility Criteria), limited grant funding can be best utilized to conserve those areas most deserving of conservation. This strategy also puts the state in a position to compete well at the national level.

Beginning in 2007, Virginia undertook a process to identify the priority areas for the state (see Appendix A of the Strategic Plan). This process resulted in the designation of a revised Forest Legacy Area for the state in 2008, as shown in Appendix A of the Strategic Plan, based on the revisions to the eligibility criteria, and the resulting GIS analysis at that time.

In mid-2009, it became apparent that the GIS analysis in 2008 was flawed because some of the data in one of the models used was not converted from 100 x 100 meter resolution to 30 x 30 meter resolution before the analysis was done. Once this change was made in January 2010, and the GIS analysis was repeated, additional hydrologic units ranked highly enough to be included in the Forest Legacy Area using the same parameters as in 2008. These corrections resulted in a 19 percent increase in land area for the Forest Legacy Area – for a total area of 16 million acres, of which 11.7 million acres are forested. The Forest Legacy Area is 63 percent of the land area in Virginia. The current map for Virginia's Forest Legacy area is shown in Figure 10.

Figure 10: Virginia's Forest Legacy Program Priority Areas



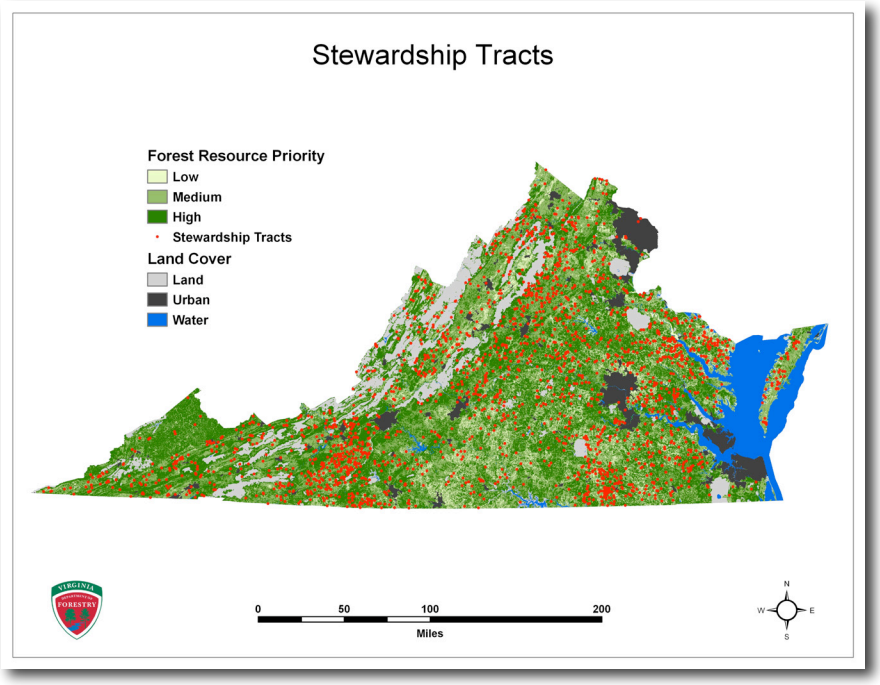
Forest Stewardship and Management

Program Overview

The Forest Stewardship Program in Virginia was started in 1990 and was designed according to the National Stewardship Standards developed by the US Forest Service. The program is implemented through the State Stewardship Operating Plan, which is included in Appendix B of the Strategic Plan. A description of the program and its elements follow – taken from the 2009 National Stewardship Standards and Guidelines.

Virginia has embraced the Stewardship philosophy of management, as evidenced through significant accomplishments over time. Plans have been prepared on 8,622 properties for more than 1.2 million acres of private, non-industrial forestland. Figure 11 displays the location of these stewardship tracts. Through the program, high-quality plans are developed, which lead to implementation of good resource management actions.

Figure 11: Location of Virginia's Stewardship Tracts



The purpose of the Forest Stewardship Program is to encourage the long-term stewardship of non-industrial private forestlands, by assisting the owners of such lands to more actively manage their forest and related resources.

The Forest Stewardship Program provides assistance to owners of forestland and other lands where good stewardship will enhance and sustain the long-term productivity of multiple forest resources. Special attention is given to landowners in important forest resource areas and those new to, or in the early stages of, managing their land in a way that embodies multi-resource stewardship principles. The program provides landowners with the professional planning and technical assistance they need to keep their land in a productive and healthy condition. The planning assistance offered through the Forest Stewardship Program may also provide landowners with enhanced access to other USDA conservation programs and/or forest certification programs.

State Forest Stewardship Coordinating Committees

The State Forester has established and ultimately administers the State Forest Steward Coordinating Committee. The Committee includes, to the extent practicable, individuals representing the following:

- The USFS; Natural Resources Conservation Service (NRCS); Farm Service Agency (FSA), and the Virginia Cooperative Extension Service
- NRCS State Technical Committee
- Local Government
- Soil and water conservation districts
- Consulting foresters

- Environmental organizations
- Forest products industry
- Forest landowners
- Land-trust organizations
- Conservation organizations
- State fish and wildlife agency
- Tribal representatives
- Other relevant interests as deemed appropriate

The Committee addresses stewardship planning and implementation concerns and overall program coordination and meets one to two times per year. The Committee's primary functions are:

- To provide advice and recommendations to the State Forester concerning implementation of the Forest Stewardship Program, and other associated landowner assistance and cost-share programs, and
- To provide assistance and recommendations concerning the development, implementation and updating of the statewide assessment and resource strategy.

Landowner Eligibility and Requirements

For purposes of this program, non-industrial private forest (NIPF) acreage includes lands owned by any private individual, group, association, corporation, Indian tribe or other private legal entity. Further, it includes rural lands with existing tree cover, or those suitable for growing trees.

Private, non-industrial forestlands that are managed under existing federal, state or private sector financial and technical assistance programs are eligible for assistance under the Forest Stewardship Program. Forest resource management activities on such forestlands must meet, or be expanded or enhanced to meet, the requirements of the Forest Stewardship Program.

Participation in the Forest Stewardship Program is voluntary. To enter the program, landowners agree to strive to manage their property according to an approved Forest Stewardship Management Plan. Landowners also understand that they may be asked to participate in future management outcome monitoring activities.

Program Outreach

Virginia is beginning to focus outreach efforts in important forest resource areas that are defined in the statewide assessment and resource strategy. Within those areas, the Forest Stewardship Program should be accessible to all landowners. In addition, outreach efforts will:

- Identify and address underserved communities and groups;
- Balance the needs of participants and potential future participants;
- Coordinate with other landowner assistance programs to avoid duplication and support ongoing efforts as appropriate;
- Identify opportunities for landscape-scale and/or multiple landowner planning and technical assistance delivery, especially where ownerships are relatively small, and
- Promote and foster the development of peer-to-peer landowner networks.

Outreach for Traditionally Underserved Landowners

The Department recognizes that there are traditionally underserved groups of landowners who may need specific outreach methods. Each year, the Department cooperates and provides funding to Virginia Tech for landowner outreach. A portion of these funds are specifically set aside for outreach to these groups. Specific examples of use of these funds have been minority landowner tours and mini-grants for specific projects. The Virginia Department of Forestry and Virginia Tech work with Virginia State University (1890 School) in these efforts. In early 2010, the Department, Virginia State and Virginia Tech signed a Memorandum of Understanding to cooperate on forestry research. Results and application of this research will be targeted at underserved landowners. One of the small farmer outreach coordinators with Virginia State University serves on, and is vice-chair of, the Virginia Reforestation of Timberlands Board. Specific efforts are being made in the current year to recruit minority students to the annual Department of Forestry Camp at Holiday Lake. It may be appropriate as well to include a Virginia State representative on the Virginia Forest Stewardship Committee.

The Forest Stewardship Program and associated outreach efforts must adhere to the USDA non-discrimination policy: The USDA prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status.

Accomplishment Reporting

Virginia maintains and annually reports the following accomplishment data:

- Number of acres covered by current Forest Stewardship Management Plans (cumulative);
- Total number of eligible NIPF acres in spatially defined Important Forest Resource Areas;
- Number of acres in important forest resource areas covered by current Forest Stewardship Management Plans (cumulative);
- Total number of acres in important forest resource areas being managed sustainably, as defined by a current Forest Stewardship Management Plan (cumulative/as confirmed through a monitoring program as described above);
- Number of new or revised Forest Stewardship Management Plans completed;

- Number of landowners receiving Forest Stewardship Program technical assistance, and
- Number of landowners participating in Forest Stewardship Program educational programs.

In Virginia, accomplishments are tracked through the Integrated Forest Resource Information System (IFRIS) that locates Forest Stewardship Plans and accomplishments on the landscape as facilitated through the use of available spatial analysis and plan writing/tracking tools.

Priority Areas

The Virginia Department of Forestry has professional field staff located throughout the Commonwealth. Additionally, as a tax-supported public service agency, we are tasked to provide service to landowners throughout the state in all areas. We have and will continue to do so based upon requests. However, there is a need to concentrate finite staff time and resources in a manner that will be most effective and achieve the greatest results. This will be done through prioritization.

Virginia will take a two-level prioritization process for priority areas for Forest Stewardship.

Level 1 – Landscape-Level Priority Areas

We have identified broad landscape-scale areas within the state in which we will identify regionally specific goals for stewardship delivery, with particular emphasis placed upon implementation of recommended practices. These are:

1. **Cumberland Mountains Mixed Mesophytic Hardwood – Emphasis – Planning initiation, reclaimed lands management.** The area is one of the most heavily forested areas in Virginia. Land-use has historically been extractive in nature for timber and minerals (coal and natural gas) with a high occurrence of damaging wildfire. Emphasis on long-term forest management has been limited. Current (2010) USFS State and Private Forestry funding is focusing on mixed mesophytic hardwood restoration on mined lands.
2. **White Pine Highlands – Emphasis – Diversified landscape management.** This is the primary white pine production area in Virginia with history of management and value-added industries, including furniture, Christmas trees and greenery and lumber. The private forest landscape is fragmented with agricultural uses and primary and second home construction. There is growing interest in diversified management, including a forestry cooperative and through a VDOF-NRCS Conservation Innovation Grant – Extreme Forest Makeover.
3. **Mountain/Valley, Northern Piedmont – Emphasis – Riparian water quality, afforestation, forest improvement, multiple-resource management.** This is a wide-spread and diverse area where forest management is often passive and secondary to other uses, including grazing (cattle and horses); other agriculture, and recreational or estate ownership. Some notable exceptions occur near major wood-using facilities. There is high need and opportunity for improved watershed management through forested buffers and tree planting on marginal open land. Ongoing and projects that exemplify this are the Chesapeake Bay and Southern Rivers riparian forest buffer emphasis and the Forest to Faucets watershed project near Charlottesville. Historic high-grading in the area provides many opportunities for forest improvement. Highly varied ownership objectives offer opportunities to develop diverse resource management, including wildlife management.

4. **Blue Ridge – Emphasis – Enhanced hardwood management, invasive species management.** The eastern slopes of the Blue Ridge provide some of the most productive hardwood sites in the state. There are large cores of non-federal mountain land, as well as dispersed sites well-suited for quality hardwood management. Invasive species are beginning to complicate management on good sites. Central location, good transportation and proximity to metropolitan (small and large) areas make this area attractive for primary and recreational home development and use. There is ample opportunity to coordinate with National Forests along the central Blue Ridge.
5. **Southside – Emphasis – Working forest development and maintenance.** The Southern Piedmont has historic and continuing strong production forestry uses. The landscape is accessible and fragmented with agricultural uses and some extensive (large lot) scale rural home development. This area of Virginia has the greatest potential for continued and improved utilization-based forestry as well as complementary agricultural and wildlife resource management.
6. **Central Virginia Core – Emphasis – Conserving and managing core forest blocks.** These are historically rural but transitioning counties on the outer ring of Virginia's high-development crescent. Here, there are a number of high-priority core forest blocks, often former forest industry lands. There is a window of opportunity for land conservation and continued management in face of future development and fragmentation.
7. **Coastal Plain – Emphasis – Conserving and enhancing working lands.** There is a high concentration here of well-managed forests on productive sites, accessible, with a good transportation network, but with growth pressure from major metropolitan areas. Well-developed wood markets are beginning to transition. Forest industry land ownership transition is nearly complete. There are a concentration of high value and unique and diminished animal and plant habitats, often associated with wetlands. There is a high need for land conservation and continued management. Efforts include State Forest acquisitions and private land conservation work through several land trusts; conservation organizations; county Purchase of Development Rights programs, and VDOF's Tomorrow Woods program. Continued forest management is complementary to the potential for agricultural and wildlife resource management.

Within these areas, we will work develop and emphasis these resource attributes and their potential and values. This will be done in recognition of, and in concert with, the highly varied and diverse objectives of the citizens, organizations, businesses and local governments of these areas.

Level 2 – Area-Based Priority Areas

The VDOF agency service organization is county-based. Within counties, field staff are generalists and function in many capacities to service the varied natural resource management and protection needs of landowners and citizens. Workload is often request-driven and geographically random. Regional and field staff will utilize regional and county-level prioritization maps to focus landowner outreach, planning and implementation to priority areas, based upon the analysis done through the Southern Forest Lands Assessment (SFLA). The agency will use the SFLA Regional Breaks, excluding urban, water and public land, as the principle priority map (see Appendix B of the Strategic Plan). Area offices will have access to the State Natural Breaks map as well, that can assist them in further focus and prioritization. Examples would be scheduling landowner workshops in high priority areas, or, when making planning contacts for management practice implementation, focusing first on tracts in high-priority areas.

Urban and Community Forestry

Program Overview

History

Virginia's Urban and Community Forestry (U&CF) program developed slowly through the 1980s in scattered field offices, but solidified at the agency headquarters level with the inception of federal funding through the 1990 Farm Bill. The initial focus of the program was to support developing municipal programs through the Tree City USA program and small grants through the USFS-funded Urban and Community Forestry grants (federal pass through). The program was also supported by the assistance of the Virginia Urban Forest Council that was founded in 1993. In the mid 1990s, there was emphasis on municipal tree planting as the agency administered the Small Business Administration Tree Planting Grants program. The U&CF program was administered centrally by an Urban and Community Forestry coordinator with minimal support and activity at the field level. As program funding increased and as urbanization began to accelerate, field involvement in the program grew, although no staff was formally assigned to the U&CF program. Using the International Society of Arboriculture (ISA) Certified Arborist Program; federally provided training opportunities; an aggressive internal training program, and the Conservation Fund's Green Infrastructure Training Course, the agency expanded the capacity of its field staff to become involved in U&CF activities. The program was further developed by the formation of strategic partnerships with Virginia Tech; the University of Virginia; ISA, and several regional non-profits. Finally, the agency added the federally required partnership coordinator position in 2005 that has dramatically expanded the effectiveness and reach of the program. However, since 2005, USDA funding for the program has been declining from its peak in 2004. Now in 2010, there are still only two full-time staff persons delivering the program. However, field participation has dramatically increased and regional supervisors are more supportive of their personnel participating in U&CF activities. Further, field expertise in U&CF has steadily increased due to ongoing training efforts by the U&CF staff. Unfortunately, the agency as a whole has diminished by one-third in terms of personnel since the mid 1990s. As in other programs, reduced staff levels have impacted U&CF.

Program Description

The Urban and Community Forestry (U&CF) Program meets the USFS requirements by having the following components:

1. Urban and Community Forestry coordinator position;
2. Partnership coordinator position;
3. A state Urban Forest Council that is supported both financially by the agency and receives "in-kind" support from the agency staff, and
4. A five-year strategic plan the guides the implementation of the program.

The U&CF program is delivered through the following:

- U&CF grants (local governments, 501-c-3 non-profit organizations, state agencies and public universities);
- Educational sessions (conferences, workshops);

- Technical assistance from field staff;
- A limited number of Water Quality Improvement Grants, and
- Support of Urban Tree Canopy (UTC)* analysis in selected communities.

The U&CF grants support strategic partnerships with Virginia Tech; the University of Virginia; selected community colleges; the state urban forest council (Trees Virginia), as well statewide and regional tree advocacy organizations. The U&CF grants also are used to build local municipal capacity and support local organizations. The Virginia Department of Forestry, with several partner organizations, plans and implements a diverse schedule of workshops and conferences that promote good urban forestry practice and/or deal with key urban forestry policy issues. Although resources and staff limit technical assistance, the agency has a highly qualified cadre of ISA Certified Arborists (27) and an excellent network of university specialists it utilizes regularly. As one of the states that is a party to the six states' Chesapeake Bay Agreement, the VDOF has access to funds to support water quality improvement projects through strategic tree planting. It also supports UTC assessments, as this is a specific strategy in the Chesapeake Bay Agreement.

Alignment with USFS Redesign

Since 2007, the Virginia Department of Forestry has focused on alignment of its U&CF program with the USFS *Redesign* themes and the associated goals, objectives and strategies. The following describe the agency's alignment with USFS *Redesign*:

- Reduce the impacts of land-use change, fragmentation and urbanization on forest landscapes:
  - Provide expertise and facilitate the implementation of green infrastructure to identify and protect working and urban forestlands, and
  - Provide technical assistance in the development of land-use planning tools, ordinances, programs and policies.

The VDOF uses its U&CF grant program to support green infrastructure training and planning and is supporting on-the-ground green infrastructure planning through strategic partnerships with the University of Virginia and Virginia Tech. Support for green infrastructure training and planning is directed to planning district commissions and land conservation organizations.

Protect Forests From Harm

- Moderate the impact of catastrophic events:
  - Increase the number of emergency response plans that incorporate urban and community forestry elements, and
  - Enhance state and local pre- and post-event response; damage assessment, and recovery.

The VDOF has been actively promoting the USFS *i-tree suite* with its Storm Damage Assessment Protocol (SDAP) to Virginia communities. It has also been training selected field staff to serve in the southern states' Urban Forest Strike Team (UFST) effort as well as participating in deployments to affected communities.

Enhance Benefits Associated with Trees and Forests

- Increase strategic planning, protection and maintenance of trees to optimize public benefits:
  - Assess needs (quantify tree cover, impervious surfaces), set tree cover/canopy goals;
  - Improve urban watershed forestry planning and management, and
  - Link environmental heath with community well-being.

The VDOF has engaged numerous communities in urban tree canopy (UTC) assessment as part of a Chesapeake Bay Watershed initiative. The agency is also promoting water quality improvement efforts using tree cover as part of the state's water quality improvement initiative (Water Quality Improvement Act). The U&CF program has an active program of outreach to underserved communities through a strategic partnership with Virginia Tech's Community Design Assistance Center. The U&CF program's emphasis and statewide leadership on greenway development is a direct link to community well-being and local environmental health.

Priority Areas

The U&CF program has identified six priority areas for its activities. These are:

State and Local Capacity in Urban and Community Forestry

This priority area focuses on both financial resources available at the local level as well as the availability of professional expertise in day-to-day urban forest management.

There is inadequate political and financial support for urban and community forestry programs at the state and local level. At the state level, urban and community forestry is funded almost exclusively by federal dollars. State-level staffing is minimal. The state legislation dealing with urban forestry issues applies predominantly to Virginia's most populated areas (Northern Virginia and Tidewater) or funding that deals with urban and community forestry. At the local level, many municipalities do not fund urban and community forestry programs or employ qualified professionals to manage urban forest resources. While there is support and staffing for urban forestry programs in larger metropolitan areas, few communities outside of the Tidewater and Northern Virginia areas have strong programs. This is especially true for communities with populations under 25,000. Many of these communities can be identified in the USFS *CARS* data reported annually. CARS data identify these communities as being in the formative or developing categories. The U&CF program will help to address this issue by providing the technical resources that will help local urban forestry managers quantify the benefits of urban forests and pro-active management to local governments. This, in turn, will help local managers advocate for larger local budgets focused on urban forestry management.

Apart from the limited resources available at the state and local level, there are few sources of funding for local programs. More sources of funding need to be developed so that programs can have increased flexibility as to the timing of funds available and the type of projects that might be funded. The U&CF program will work with national and regional non-profit organizations to develop funding opportunities from other sources outside the USFS and advocate for state funded urban forestry initiatives.

Beyond the issue of funding, many communities with populations under 25,000 do not have professional urban foresters, arborists or horticulturists on staff to inform on urban forestry related policy or issues in the field as they arise. The U&CF program can address this situation by targeted educational efforts and providing technical assistance from its field staff. The program already has a solid record in developing strong educational programs.

Ecosystem Service Values and Other Public Benefits of Urban/Community Forests

This priority area focuses on helping communities assess their urban forest and quantify the ecosystem services values that their urban forest provides in terms of air quality; water quality; storm water management; carbon sequestration; energy conservation, and heat island temperature modification.

Using tools, such as *UFORE*, urban forest values can now be quantified in ways not possible a decade ago. This information can be used in decision making at the local level, and its availability has the potential to positively impact local decisions and budgets related to urban forests. More quantitative data on the contribution of urban forests to business district enhancement; public well being, and even public health are now available. The U &CF program will promote assessment work to establish these values in Virginia's communities through educational efforts; focused grant projects, and in cooperative efforts with Virginia Tech's Urban Forestry Program (Department of Forest Resources and Environmental Conservation) and the University of Virginia's Department of Urban and Environmental Planning (School of Architecture). The U&CF Program is assisting 15 communities assess urban tree canopy cover (UTC) using internal geospatial analysis staff; through a partnership with the Virginia Geospatial Extension Program at Virginia Tech, and in consultation with the Spatial Analysis Laboratory of the University of Vermont (through the USFS Chesapeake Bay Program). The U&CF program is also partnering with the Center for Chesapeake Communities – encouraging tree planting as a voluntary measure in the Northern Virginia Air Quality State Implementation Plan.

Impacts of Urbanization and Fragmentation

Virginia's rural landscape is transforming at a rapid rate. The state has some of the most rapidly urbanizing counties in Virginia. An example would be Loudoun County in the Washington, D.C., metropolitan area. Once a bucolic setting of small family farms, Loudoun County is now home to Dulles airport and has seen its population increase exponentially in the last three decades. Urbanization and sprawl are negatively impacting forestland all over Virginia. Rapid urbanization in Tidewater, Northern and Central Virginia is resulting in a rapid conversion of rural forestland to urban uses. As in many southern states, a doubling of Virginia's population has seen a four-fold increase in land consumption. Poor models for land development have resulted in degraded forest ecosystems. Adequate amounts of open green space are not being managed or protected in communities. Urban sprawl is fragmenting forests and negatively impacting the ecological health and aesthetic quality of the Virginia's communities.

Urban sprawl has not only contributed to costly transportation problems in Northern Virginia and Tidewater, it has resulted in changing land-use patterns increasing fragmentation, and changes in land-use values that have threatened traditional forestry practices in numerous counties where traditional forestry was a vibrant activity only a decade ago. This trend culminated recently in the closing of a major paper mill in southeastern Virginia that had long been a mainstay of the region's economy. Urban and community forestry can be only part of the solution to this problem. Its contributions to this issue will be in developing programs that make cities and towns more livable by protecting and enhancing forests; riparian areas, and other green space.

The U&CF Program has been a leader in promoting the *green infrastructure* concept of strategic land conservation, hosting the first statewide training on green infrastructure in 2005. Since that time, the program has supported local initiatives with Urban and Community Forestry grants and some regional initiatives with USFS *Redesign* grants. Strategic partnerships have been formed with the College of Architecture and Urban Studies at Virginia Tech; the Department of Urban and Environmental Planning at the University of Virginia, as well as the non-profit Green Infrastructure Center. Some information already developed in partnership with Virginia Tech can be accessed by going to: http://www.uap.vt.edu/forests/forests.html, and projects with the *Green Infrastructure Center* supported by the U&CF program are discussed at http://www.gicinc.org/projects.htm.

The Urban and Community Forestry Program has also played a significant role in the revival of the greenway movement in Virginia. Greenways are significant components of urban and suburban green infrastructure and also play a significant role in environmental protection as greenways are usually associated with important environmental corridors, such as riparian areas, riverfronts, ridgelines, urban forest parcels, etc. Further, greenways and trail systems can make important contributions to public health; aesthetics; local property values, and economic development. They also provide a non-traditional constituency that can advocate for the benefits of trees and forests. The U&CF Program was instrumental in organizing four *Governor's Conferences on Greenways, Trails and Green Infrastructure* and supports greenway conceptual planning using U&CF grants to communities in partnership with the Community Design Assistance Center (CDAC). Through its participation/sponsorship in conferences and workshops, the U&CF program has inspired numerous projects. The U&CF grant program fills a critical niche by providing planning funds for project start-ups.

Underserved, Diverse and Non-Traditional Populations

The Urban and Community Forestry Program has had mixed results with respect to this priority area. In terms of reaching underserved communities, the program has been successful through its focused funding outreach effort in partnership with Virginia Tech's CDAC. CDAC is an outreach program of Virginia Tech' College of Architecture and Urban Studies and targets its conceptual

planning services to economically challenged communities, many in Southside or Southwest Virginia (areas considered economically depressed). This outreach program has also provided services to some ethnically and culturally diverse communities. The regular U&CF grant program has indirectly benefited ethnically diverse populations, but the program has no strong partnerships with organizations that represent ethnically and culturally diverse populations. Developing such partnerships will be crucial to the continued success of the program, as Virginia is rapidly becoming a more diverse state in terms of both culture and ethnicity. This is especially true in the Northern Virginia area around Washington, D.C., but evident everywhere in the state.

The Department of Forestry has signed a Memorandum of Understanding with Virginia Tech and Virginia State University (VSU). VSU is Virginia's other land grant institution and serves a predominantly minority population. The U&CF program has already established ties with personnel at VSU, and VSU is now represented in the Virginia Urban Forest Council *(Trees Virginia)* and the *Virginia Natural Resources Leadership Institute* (sponsored by the U&CF program). The U&CF program will work to develop this partnership and use VSU as one gateway to engage and serve minority populations.

In the Southwest Virginia coal counties (an economically depressed region), many communities are plagued with long-term environmental problems. The U&CF program has recently been working with partners to organize a series of public forums and trainings where community leaders can envision a productive environmental future for their communities. Potential solutions would include: green infrastructure planning; stream restoration work; a greenway trails initiative; traditional community forestry activities, and environmental leadership training. This initiative, *SW Virginia Community Futures*, would serve communities that have been traditionally underserved by state environmental and forestry programs. Through USFS *Redesign*, Virginia could work with adjacent or nearby states (Kentucky, West Virginia, Ohio) that have similar conditions in their coal counties.

Urban Forestry Profession in Virginia

As Virginia continues to urbanize, there will be a need for adequately trained professionals in both the public and private sector. The U&CF program has partnered with the Mid-Atlantic Chapter of the International Society of Arboriculture (MAC-ISA) to promote the *Certified Arborist Program*. This partnership has resulted in more than 600 arborists becoming ISA certified, and this certification is now recognized as a green industry standard in Virginia. The U&CF remains active with MAC-ISA and will continue to promote the program and host training sessions. Within VDOF, 27 employees have achieved this ISA certification. Virginia has more of its personnel certified than perhaps any other state forestry agency in the nation. The U&CF program will continue to offer this opportunity to its employees.

The U&CF program has also been working closely with the developing urban forestry program at Virginia Tech by providing grant support and, through the state Urban Forest Council (*Trees Virginia),* providing scholarship opportunities for selected students. In addition, the program has networked faculty with other USFS resources, such as NUCFAC. The U&CF coordinator serves on the advisory board for the College of Natural Resources and is a strong advocate for the urban forestry program. It should be noted that Virginia Tech's urban forestry program was the first in the nation to be accredited under the Society of American Foresters' new standards in 2008.

The U&CF program also has strong partnerships with the horticulture and landscape architecture programs at Virginia Tech and has supported several interdisciplinary planning projects enabling students and faculty from urban forestry, horticulture and landscape architecture to work together.

The U&CF program will continue this effort through focus funding to Virginia Tech's Community Design Assistance Center (CDAC).

The U&CF program has been providing training opportunities to professionals in the field through a variety of conferences, workshops, forums and field days it implements or supports with its partners. These efforts have and will continue to be supported with Urban and Community Forestry grants; *Trees Virginia,* and the U &CF program's partnership with MAC-ISA and the Mid-Atlantic Horticulture Short Course (*MAHSC).*

The Urban and Community Forestry program has been providing regular training opportunities to its own field staff and will continue to support new internal initiatives. Recently (2007-2009), the agency involved 14 of its employees in Urban Forest Strike Team training and is now planning an effort focusing on the land-use planning component of the USFS's *Changing Roles*.

Natural Disasters Affecting Urban and Community Forests

Recent natural disasters, like Hurricane Katrina and the devastating ice storms that struck the south in 2008 and 2009, show how vulnerable urban forests can be to the natural elements. When Hurricane Isabel hit Virginia, there was tremendous urban tree damage in eastern Virginia cities. While the VDOF responded to this event along with other state agencies, its response was not one that dealt directly with response and recovery for the urban forest. This storm event highlighted the need to develop an urban forestry response where professional urban foresters could deal directly with storm-related urban forestry problems. In 2005, the USFS developed its *i-tree suite* of urban forestry software tools that included the *Storm Damage Assessment Protocol*. The USFS also mounted an urban forestry response in the aftermath of Hurricane Katrina and gained valuable knowledge and experience on how to assist communities in dealing with urban forest damage.

Seeing the need for a professional, targeted urban forestry response to natural disasters, both the Virginia Department of Forestry and the North Carolina Division of Forest Resources asked the US Forest Service to develop a training program for its personnel where a process for responding to storm events would be developed. Participants were required to be *ISA Certified Arborists* or have equivalent experience.

The first training was held in North Carolina in August of 2007 and additional trainings have been held in Virginia in 2008 and Florida in 2009. Since the initial training, all the southern states (USFS Region 8) and several states from the northeast area have sent participants. The training concept evolved into a response capability called *Urban Forest Strike Teams (UFST)*. Since their inception, UFSTs have responded to storm events in Oklahoma (2008 ice storm); Virginia (tornado 2008); Louisiana (2008 Hurricane Gustav); Arkansas (2009 ice storm), and Kentucky (2009 ice storm). Also, Texas Forest Service personnel, trained in the UFST concept, responded internally to Hurricane Ike in 2009.

The next step in the evolving UFST concept is to have UFSTs formally integrated into response efforts led by the Virginia Department of Emergency Management (VDEM) and/or FEMA. This is critical as funding to support UFSTs for out-of-state deployments is currently limited.

The next step for the VDOF is to provide training to localities in preparedness and response for storms with regard to their urban forests. The goal of this training will be to see that the urban forest is considered in storm planning and that these communities are aware of how to request and use Virginia's 12 trained UFST personnel.

Forest Inventory and Analysis

Program Overview

The Forest Inventory and Analysis (FIA) Program in the Commonwealth of Virginia is the cooperative effort between the VDOF and the US Forest Service, Southern Research Station (SRS) to provide the annualized Forest Inventory in Virginia. Originally, FIA or "Forest Survey" was a federal function required by the McSweeney-McNary Forest Research Act of 1928 to assess the condition of the Nation's forests. The 1998 Farm Bill required that the forest inventories be conducted on an annual basis to provide up to date, statistically reliable information on the condition and composition of the forest resources. In 1997, VDOF entered into a cooperative arrangement with SRS to have VDOF staff conduct the field data collection required for annual forest inventories, while SRS retained the processing, quality assurance and publication/dissemination roles.

The FIA project with the VDOF is assigned to the Forest Resource Management Division. Staffing consists on one inventory coordinator, who reports the FRM director, and six FIA foresters (located one per old VDOF region) – assisted by wage employees – who report to the inventory coordinator. The inventory coordinator serves as the technical contact between the FIA program with the Southern Research Station, USFS and VDOF. VDOF FIA staff members are evaluated on the number of plots completed annually and the overall accuracy of the field work, as evaluated by the quality assurance staff of SRS.

The field data collection effort consists of measuring approximately 4,600 permanent sample plots on a five-year rotation. The project is organized in that 20 percent of the sample plots are visited annually. This data is averaged with the plots measured the previous four years to provide an annual update. After five years, the rotation begins again. The goal is to have the updated data available to users six months after the field work is completed. However, to date, processing has typically taken significantly longer.

The initial Forest Survey of Virginia was completed in 1940 by federal personnel. The field work for the subsequent surveys completed in 1957, 1966, 1977, 1985 and 1992 was also accomplished by federal staff.

The original cooperative agreement for the fieldwork between the VDOF and Southern Research Station in 1997 provided a 50 percent federal/50 percent state funding ratio. However, in 2000, the ratio was adjusted to 75 percent federal/25 percent state funds.

In 1997, state crews began establishing and measuring the new mapped FIA plot design. The five panels/five years of field work for 7th Survey was completed in 2002. The data was compiled and published by the USFS as ***Virginia's Forests, 2001*** *(Resource Bulletin SRS-120)*.

Immediately after completion of 7th Survey field work, Virginia FIA crews began re-measurement of the mapped plots. This field work for 8th Survey was completed in 2007. After processing and compiling the field data, the USFS published ***Virginia's Forests, 2007*** *(Resource Bulletin SRS-159).* In addition, SRS has provided annual updates in 2005, 2006 and 2008.

Virginia FIA crews are starting the fourth year of the 9th Survey of Virginia's Forests. The entire 9th Survey field work should be completed by early 2012.

Priority Areas

Users of this data include the USFS; Virginia Department of Forestry; forest industry; local governments; other federal and state agencies; NGOs, etc. The forest inventory results are disseminated in hard-copy publication form and by online data query applications.

The VDOF utilizes FIA data to assess counties for fire protection coverage; estimate damage from storm events, such as hurricanes and ice storms; estimate the rate of forestland loss to development; evaluate changes in ownership patterns, land fragmentation, changes in forest composition; assess reforestation rates; etc.

The USFS utilizes the FIA data as a basis for the 10-year RPA process, as well as allocation of federal funds to state forestry agencies. While the National Forest System uses the FIA data to analyze forest trends beyond National Forest borders, plans are in place to increase the number of FIA plot on NFS lands to improve analysis of conditions within the National Forests.

Forest industry uses the data to estimate resource availability, based on various procurement circles. The interest in biomass utilization has significantly increased the use of FIA for resource estimation.

Water Quality

Program Overview

The VDOF Water Quality program consists of two major components:

- Operational Forestry
- Watershed Forestry

Each component includes multiple, on-going initiatives, with activities carried out by a combination of headquarters program staff and field personnel.

Operational Forestry

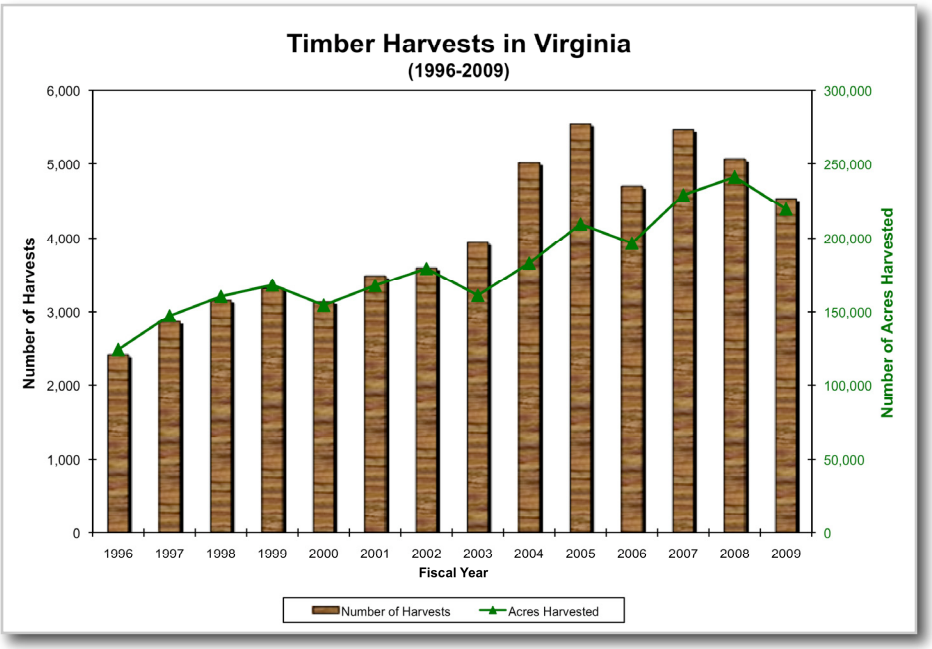
The operational forestry component of the VDOF Water Quality Program is responsible for the protection of water resources associated with silvicultural operations. This involves the development, promotion and implementation of forestry *Best Management Practices* (BMPs) for water quality. The VDOF has been active in water quality protection since the mid-1970s when the first BMP guidance was developed by the agency. Since that time, the program has evolved to include: an "enforceable mechanism" known as the *Virginia Silvicultural Water Quality Law* – an intensive harvest inspection program; a BMP implementation field auditing process; a research component; a forest harvesting educational program, and a "state-of-the-art" database management

system to track timber harvesting geospatially through a seamless process from timber harvest notification through tract closeout.

Harvest Inspection Program

The backbone of the operational forestry water quality program allows for the one-on-one interaction of VDOF field employees with timber harvesting operators for the purpose of enforcement of the Silvicultural Water Quality Law to protect water quality during the timber harvest operation. It provides the VDOF inspector the opportunity to interact with the harvest operator to provide guidance on harvest planning; BMP installation; tract closure, as well as to provide oversight on job performance to protect water quality during the operation. Figure 12 depicts the timber harvest activity in Virginia since 1996. The VDOF provides inspections on active timber harvest sites every 30 days to ensure that water quality is protected during the course of the operation.

Figure 12: Timber Harvests in Virginia (1996-2009)



Law Enforcement

On July 1, 1993, the Virginia General Assembly adopted into law the *Virginia Silvicultural Water Quality Law (§10.1-1181.1 through 1181.7),* which requires the State Forester to protect water quality from impacts occurring as a result of silvicultural activity. This law was enacted with broad support from the forest products industry across the state. It is a civil law that requires the State Forester to inspect sites that do, or are likely to, impact water quality primarily from sediment deposition as a result of the silvicultural activity. The law provides the State Forester with the authority to: issue Special Orders to install corrective measures; issue Stop-Work Orders if the situation is bad enough to warrant it, and to assess civil penalties of up to $5,000 per violation with each day constituting a separate violation. In 1998, the law was amended to include a requirement for timber operators to notify the VDOF when they were beginning a new operation. A separate

penalty matrix and tracking system had to be developed at that time to support this extended law enforcement effort.

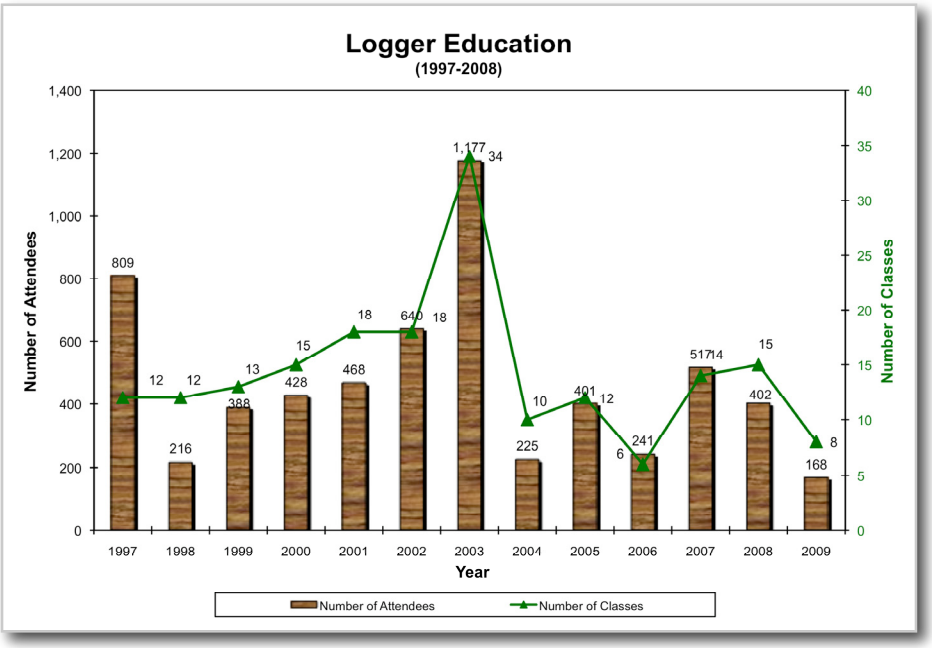
Enforcement of this law is a mandated function of the VDOF by the *Code of Virginia*. There are several other water quality laws, such as the *Debris in Stream Law* and the *Big Sandy Law* in Southwest Virginia, for which the VDOF also has enforcement authority. In addition to these, the VDOF also provides technical expertise to the forestry community on Clean Water Act interpretation and Chesapeake Bay Preservation Act guidance.

The harvest inspection program previously identified is the main process that supports the law enforcement effort for water quality by the VDOF.

Education

The VDOF has been educating timber harvest operators, foresters, landowners and VDOF field employees on forestry BMPs for water quality protection since the mid-1980s. This was done through various workshops, training sessions and demonstration projects over the course of many years. More recently, the Sustainable Forestry Initiative (SFI®) Program in Virginia allowed the VDOF to partner with forest industry, the Virginia Forestry Association and Virginia Tech to train timber harvest operators on various aspects of forest harvesting, including harvest planning and BMPs. These aspects are taught by the VDOF as part of the Sustainable Harvesting and Resource Professional Logger (SHARP Logger) Training Program. Figure 13 denotes the training efforts attributable to that program since 1996.

Figure 13: Attendees at SHARP Logger Training (1997-2008)



The VDOF has created a couple of innovative cost-share programs for timber harvest operators with money provided through the Virginia Water Quality Improvement Fund. The "Logger BMP Cost-Share Program" provides a 50 percent cost-share match to funds provided by the logger to implement BMPs on areas associated with stream crossings. The cap is $2,000 per project, and this rate doubles to $4,000 if the project crossing incorporates the use of a portable bridge. This is a first-of-its-kind cost-share program that has been extremely well received. The "GPS Cost-Share Program for Loggers" provides a 50 percent cost-share match – up to a $65.00 cap – for the purchase of a recreational grade GPS unit for loggers who have gone through the SHARP Logger GPS class. This tool will provide the loggers with the ability to map their harvest areas as well as the ability to notify VDOF using lat/long references and thus having access to the harvest planning maps provided by VDOF though its IFRIS notification application.

Water Quality Research

The VDOF has been involved with water quality research on several levels in past years. The agency has partnered with Virginia Tech; the Virginia Water Resources Center; the Virginia Stream Alliance; the Chesapeake Bay Program Office; U.S.G.S.; the USFS, as well as the Southern Research Station and the National Council for Air and Stream Improvement (NCASI). Most of this research effort has involved BMP effectiveness studies.

In addition, the VDOF has an on-going BMP implementation monitoring project in place to determine voluntary BMP implementation rates statewide. This effort is in conjunction with the Southern Group of State Foresters Water Resources Committee and is done according to a protocol developed by that committee. This process involves the random sampling of 240 sites each year to see the level of BMP implementation based on Virginia's Forestry BMPs for Water Quality (fourth edition). The results are tabulated for each category of BMPs. VDOF is then able to determine the level of implementation and what areas need to be improved. Training is then developed to target those areas that are in need of improvement and offered through the SFI SHARP Logger Program. A result of this effort is a statewide report that is produced for Virginia annually and for the Southern Region every five years that is submitted to US EPA. The BMP implementation rate will be utilized in the future to assist in modeling the levels of sediment loading from silvicultural operations for the Chesapeake Bay Total Maximum Daily Load that is under development.

The VDOF provides monetary support for a forest hydrologist position with the Water Resources Center at Virginia Tech. This position is filled, and the incumbent is developing long-term, watershed-scale research projects.

Water Quality Data Management

Data management for the Water Quality Program has recently been incorporated into the VDOF enterprise data management system, known as IFRIS (Integrated Forest Resource Information System). This system provides a mobile platform for data input from field inspections of silvicultural operations. It allows for tracking of law enforcement actions involving the Silvicultural Water Quality Law and operator performance under law enforcement actions. It provides a portal for harvest operators to notify the VDOF of their harvesting operations, and if they use a lat/long for notification, the system allows the operator access to a group of maps for them to use for harvest planning purposes. The system also keeps track of harvest inspection records for field inspectors to use for workload planning purposes. Harvest activity is tracked geospatially so that the agency can know at any time how much activity is occurring in a specific watershed and the impacts to that watershed from law enforcement actions.

BMP Implementation Monitoring will be included in the IFRIS system in 2010 so that the VDOF will be able to have real-time information regarding BMP implementation rates.

Watershed Forestry

The watershed forestry component of the VDOF Water Quality Program is responsible for the preservation and establishment of forests for the enhancement of water resources in both rural and urban areas. The objective of this portion of the program is to establish the forest's value in providing water quality and quantity sustainability. The VDOF has established several programmatic areas of concentration: the Riparian Forest Buffer Establishment Program; the Riparian Forest Buffer Tax Credit Program, and the Urban Stormwater Management Program. In addition, the VDOF has been involved with the Chesapeake Bay Clean-up Initiative since its inception, and has been a part of the Chesapeake Bay Forestry Workgroup, a group composed of the six signatory states plus the District of Columbia and US EPA.

Riparian Forest Buffer Establishment Program

It has been well established that the riparian area of a stream provides the best protection and habitat for stream health and water quality enhancement. The VDOF is involved with the establishment of riparian forest buffers on agricultural and abandoned agricultural lands. This is an effort involving a partnership with the State Division of Soil and Water Conservation; NRCS; FSA, and the local SWCDs under the umbrella of the Virginia Association of Soil and Water Conservation Districts. The VDOF is the agency responsible for reporting the riparian forest buffer establishment goals for the Chesapeake Bay restoration effort. This effort utilizes various state and federal cost-share programs, such as the federal CRP, CREP, EQUIP programs and the state Water Quality Improvement Fund, to develop forested buffers to assist landowners in establishing these valuable forests. VDOF field staff provides technical expertise to landowners in identifying projects; providing cost-share guidance, and assisting with project implementation and quality control. The agency has developed buffer planting guidelines as well as a methodology for planting quality checks and survival counts to support the various cost-share programs and to ensure that buffer establishment projects will be successful.

While the Chesapeake Bay restoration effort has been a driving force in program development, the VDOF has taken this program statewide and has had a great deal of success in riparian forest buffer establishment in the Southern Rivers watershed and especially in areas of southwest Virginia where stream segments have been overgrazed by cattle.

Riparian Forest Buffer Tax Credit Program

A tax credit for the retention of riparian forests during a timber harvest was established by the Virginia General Assembly in 2000. Eligible landowners who retain a forest buffer as part of the timber sale can receive up to 25 percent of the value of the timber left in the buffer up to a maximum of $17,500 for a tax year. The tax credit requires that the buffer be retained for 15 years and is monitored by the VDOF for the tenure of the credit. This monitoring is done through "change detection" technology requiring all buffers that receive the credit to be GPS mapped. The VDOF has the responsibility for determining and issuing the tax credit for the landowner. This whole process will become part of the new public phase of IFRIS – called "InForest" – within the next few years. This will enable the private landowner to apply for the tax credit on-line, making it more accessible to the private landowner.

Urban Forest Stormwater Program

This part of the VDOF water quality program works in close conjunction with the Department's Urban and Community Forestry Program. The program is responsible for promoting the use of trees in urban stormwater management programs throughout the state. Through the utilization of various funding mechanisms, such as Chesapeake Bay competitive grant funds and the state Water Quality Improvement Fund, this program oversees the use of these funds for completing assessments of urban tree canopies in various communities across the state and to work with these communities to set goals for increasing the overall urban tree canopy in the target community. This program also promotes – through demonstration projects – the use of forest trees in rain gardens as an alternative to the standard, engineered stormwater retention basins used in urban stormwater management plans.

Forest Research

Program Overview

With a 56-year history of scientific research and extension related to the health and sustainability of Virginia's forests, the Virginia Department of Forestry's Applied Forest Research Program is unique among state agencies, and has been developing and demonstrating breakthrough ideas for the Commonwealth's forest landowners for more than half a century. More than 160 reports, fact sheets and analytical tools have been developed and published summarizing research on a wide array of subjects.

The staff includes one forest research program manager and one research forester. VDOF resources are leveraged wherever possible through collaborations with nationally recognized research cooperatives, universities and other state and federal agencies. We continue to test new information and techniques as ownership patterns and objectives evolve. The findings are shared in

the semi-annual Research Review publication, which is also available online at www.dof.virginia.gov, and through frequent presentations to stakeholder groups.

The research program depends upon collaborations with colleagues and stakeholders with common interests to best leverage our staff time and resources. VDOF continues to develop, establish and monitor research and demonstration projects that meet practical forest management challenges and address emerging issues. The important products of those efforts are applicable results, techniques and recommendations that VDOF employees, Virginia landowners and others can apply to continuously improve the forests of the Commonwealth.

Priority Areas

As part of the Forest Management Division, the current Applied Forest Research Program is divided into six primary subject areas: pine silviculture; hardwood silviculture; pine genetics; diminished species restoration; invasive species control, and forest growth and yield modeling. Studies designed to address specific information needs or biological systems are installed and monitored across the state – often for periods of years or even decades.

Pine Silviculture

Ongoing work in pine silviculture includes studies of: combinations of thinning and nutrients for maintaining forest vigor and increasing productivity (in collaboration with the Virginia Tech / NC State Forest Nutrition Cooperative); two new insecticide products (PTM and SilvaShield) for tipmoth control; growth effects of biosolid applications to those of traditional inorganic fertilizers; effects of planting density and interplanting following mortality to maximize product yields; pre-commercial thinning; long-term growth and yield monitoring, and effects of various competition control methods and strategies.

Hardwood Silviculture

We continue to evaluate growth responses of Appalachian hardwoods following shelterwood harvests; crop tree release / fertilization; different establishment methods for hardwood planting (particularly in riparian areas under CREP), and planted hardwood seedling size.

Pine Genetics

In the spring of 2009, we conducted a pilot-scale mass controlled pollination (MCP) test to determine optimal logistics, work flows and phenology for producing improved loblolly seed. Other tests involve comparisons of clonal versus traditional open-pollinated seedlings, and the fourth generation of progeny tests in collaboration with the North Carolina State University Tree Improvement Program. We aggressively support the ongoing selection, testing and deployment of the best loblolly, shortleaf, eastern white and longleaf pine for Virginia citizens.

Diminished Species Restoration

Conservation and restoration of rare or at-risk species is among the most forward-looking of these subject areas. We maintain studies pertaining to three diminished species: shortleaf pine (establishment methods, geographic seed sources); American chestnut (breeding for blight

resistance, establishment methods), and longleaf pine (establishment methods, geographic seed source and grafting techniques).

Invasive Plant Control

VDOF is continuing a series of tests to evaluate the effectiveness of basal bark herbicide treatments applied using a backpack sprayer at various times through the year for control of tree-of-heaven.

Growth and Yield

Early data from our internal, long-term growth and yield plots is being used to test the accuracy projections from published models. Our collaboration with the Virginia Tech / NC State Forest Nutrition Cooperative and the Virginia Tech Forest Modeling Cooperative helped develop the Loblolly Pine Decision Support System, which integrates a number of models to give foresters a user-friendly method of comparing the effects of different silvicultural options on forest structure and cash flow during the life of the stand. We continue to monitor long-term plots in conjunction with that project.

Tree Improvement

Program Overview

The tree improvement program focuses on the selection, testing and production of superior pine seed – primarily loblolly, but also eastern white, shortleaf and longleaf pines. It is supported by one tree improvement manager and two technicians – all of whom report to the research program manager.

Prior to tree improvement, loblolly seeds were collected from unimproved natural stands – mostly from trees felled during logging operations. In 1956, the North Carolina State University Industry Cooperative Tree Improvement Program was created. Today, this program is a partnership among 12 industries; four state forestry agencies (including VDOF), and North Carolina State University, with a mission to economically increase forest productivity through the selection process. Our objective as a co-op member is to breed, test and select trees that result in economic benefit to Virginians and other co-op members. The co-op has accumulated 7,511 selections to conserve the loblolly pine genetic resource for future generations of breeders and foresters, and 6,230 control crosses among loblolly pine selections have been tested in field trials.

Selection in Virginia and elsewhere was first done in natural stands. Cuttings from selected trees were grafted and used to establish the 300-acre first generation seed orchards at New Kent Forestry Center and Appomattox-Buckingham State Forest. Offspring from those trees were tested to evaluate parent performance, and the poorer performers were removed from the orchards. This further increased volume gains over unimproved seedlings, since the poorer performers were no longer part of the pollen "mix." Crosses of parents from that first orchard along with new selections were then used to establish a 125-acre, second-generation orchard in Milledgeville, GA. After years of further testing and selection, VDOF recently completed establishment of 150 acres of third-cycle orchards, also at New Kent Forestry Center and Appomattox- Buckingham State Forest. The first

seed from those orchards is being collected now, and we are in our fourth iteration of selecting and testing superior crosses for our future orchards.

By 1988, all seedlings produced in Virginia nurseries were from this genetic improvement process. Cone collection from the first generation orchard was phased out in 1997, and collections from the second generation orchard peaked in 2003. In 2006, we harvested 200 bushels of green cones from the first third-cycle, and the number of seedlings of third cycle origin will gradually increase to 100 percent of VDOF's nursery production by 2012.

In the spring of 2009, we conducted a pilot-scale MCP test to determine optimal logistics, work flows, and phenology for producing improved loblolly seed. Working on 123 individual trees of our 11 best selections, we installed 4,133 pollination bags. We estimate that the average productivity gain from a mix of the resulting seed will be 50 percent over unimproved seed as compared to 37 percent from the best offering VDOF has previously produced. Individual crosses will have gains as high as 60 percent. If our efforts this spring are successful, we will have roughly 1 million MCP seedlings for our nursery crop in 2011.

The primary threat to the continuation of gain and increased profit to landowners is the likely reduction in support for, and effort by, tree improvement research programs. This might sound strange given the long history of breeding and the high rates of return on the investments in tree improvement. But, as the forest industry has transformed with mergers and consolidations and forestland ownership has changed from the large vertically integrated forest products companies that owned both land and mills to more institutional investors that often own land for only short periods of time, the number of tree improvement, seed orchard and nursery programs has decreased dramatically. Compared to just 20 years ago, the number of companies and state agencies actively involved in the NC State Cooperative's breeding program has gone from 29 to 12. In Virginia, there is only one organization (VDOF) actively breeding trees for our landowners. In the 1990s, there were five.

Priority Areas

Selection and Breeding Research

As part of the NC State Tree Improvement Cooperative, we continue to make selections and controlled crosses of superior genotypes for testing. Each year, we establish approximately six acres to eight acres of new progeny tests, and maintain and remeasure those tests already established. Data from these tests are the basis for selections that will be included in our future seed orchards.

Seed Orchard Maintenance

All actively producing seed orchards must be continually protected from fire, insects, diseases and other potentially damaging agents. They are mowed; fertilized; irrigated; protected from deer damage, and sprayed for insect control whenever needed to ensure their health and continued productivity as seed collection areas. The loblolly, eastern white, shortleaf and longleaf seed production areas comprise a combined total of more than 350 acres that are under this program.

Cone Collection and Seed Processing

Whenever seed is needed and as crops are available, the tree improvement program is responsible for deciding which families will be harvested and how many cones and seeds will be produced. The cone collection and seed cleaning/sorting efforts are accomplished by both internal DOF crews and – when needed – contracted crews.

Mass Controlled Pollination

MCP is a tree-breeding technique that increases genetic gains compared to traditional wind-pollination. The best-performing male and female parents are chosen in advance. Once the best female parents are chosen, flowers are isolated by covering them with pollinating bags at an early stage of development to prevent pollen contamination. When they are fully receptive, fresh pollen extracted from the best male parents is introduced into the bags. The resulting seedlings are thus "full-sib," i.e. both parents are known, contrasted with traditional "half-sib" seedlings for which only the female parent was known.

Since 2000, more than 94 million full-sib family seedlings have been planted in the South. While the current annual production of full-sib seedlings is only about three percent of the total seedling production of the 800,000,000 to one billion loblolly pine seedlings, experts anticipate that full-sib seedling production will become a much more significant component of the seedling market in coming years.

MCP seedlings are being produced and sold at a rate of more than 27 million each year. Two companies (ArborGen and CellFor) are marketing varietal (cloned) seedlings (with zero genetic variation), and landowners in Virginia are expressing interest in these offerings. VDOF does not have the capability to produce varietal seedlings. Offerings of MCP seedlings would provide Virginia landowners with a lower-risk, lower-cost alternative to varietal that still provide gains of 10 percent to 20 percent or more in volume and sawtimber quality over second- and third-generation, open-pollinated seedlings. The resulting stands will be more uniform in growth and vigor because variation caused by uncontrolled pollen sources will be removed.

Proposed Action Plan

VDOF will continue to produce seed of these pine species to meet the production needs of our nurseries. We will maintain and protect the existing orchards as well as the established progeny tests for future selection work. We will select, breed and test the parent trees for a fourth generation loblolly orchard. As budgets and resources allow, we will work to expand the availability of MCP seedlings.

We plan to standardize our loblolly seedling offerings using a productivity rating system (PRS) for ranking all loblolly pine families developed in collaboration with the NC State cooperative program. These rankings are based on **p**roductivity (volume growth), **r**ust resistance, and **s**traightness of these families in hundreds of tests over many years, and will enable us to identify the "best of the best" for our customers. This will help to capture even more benefits from the tree improvement effort for Virginia landowners. We will collect cones only from the best-ranked parents and keep them separate to allow us to custom blend offerings of superior performance in desired traits (most often growth and stem straightness).

Forest Products Marketing and Utilization

Program Overview

The VDOF has been active in forest products utilization and marketing for decades. The program's goal is to promote a prosperous forest industry and markets for forest-related products. Management and duties have moved between dedicated forest products personnel or dispersed among various programs over the years due to budget concerns and changing priorities. In 1999, the various forest utilization and marketing activities were consolidated and a program manager was hired to address the increasing changes that were occurring in the forest industry and related markets. Since then, the program has been placed under various divisions and now resides in the Forestland Conservation Division. Although most of the core activities and program manager were retained during the moves, each division had different priorities. This has lead to the program evolving into addressing all types of forest products and benefits. Program staffing includes a utilization and marketing manager, and shared office staff. Additional assistance includes temporary, usually project-specific personnel and the VDOF Resource Conservation and Development (RC&D) forester. The Forestland Conservation Division director manages ecosystem services related projects.

The purpose of the utilization and marketing program is to help Virginia to have a prosperous forest products industry and to assist with creating markets and other benefits for forestland owners. This is to help support Virginia's largest manufacturing sector and to maximize incentives for forest landowners to keep their lands in forest.

The utilization and marketing program contains several program areas. There can be considerable overlap since many of the projects fall in multiple areas. The first three are more general and cover all sectors of forest products and markets. The final area includes more specific programs that are focused on specific forest sectors or grant projects.

Program Areas

- Technical assistance to forest industry and other customers

- Promotion of Virginia's forest industry and economic development
- Development and dissemination of forest resource and industry data
- Grant programs and special projects

Technical Assistance

This area focuses on collecting and distributing information to businesses and forest landowners in Virginia so that they can be more competitive. It includes providing information that has been collected at trade shows, plant tours and with other industry contacts, on latest equipment, technology and markets to Virginia firms; assisting with demonstrations of new equipment and techniques; promoting techniques that improve efficiency, and investigating new products and ways to increase value from forest resources. This assistance can occur with individual companies on site or in group training and educational programs held with partners at more centralized sites. Great effort is made to work with improving competitiveness of existing and traditional forest industry while also helping businesses to grow by introducing them to new markets.

Promotion of Forest Industry and Economic Development

Improving markets for Virginia's forest resources is vital to maintaining a prosperous forest industry and maintaining working forests. The VDOF works with other state agencies and organizations to promote Virginia's forests and industry at regional, national and international trade shows and events. Data compiled by the utilization and marketing program are used to develop materials for promotional materials. Much of this information is also used in media articles and public meetings to highlight the importance of Virginia's forests and forest industry to the state's economy and quality of life.

Part of this area includes working with state economic development and other agencies to encourage business to locate or expand in Virginia. Maintaining current information on forest resources and industry, and in the form needed, is vital to this effort. New markets are requiring that different types of information be available for potential businesses to evaluate. Being involved with various groups and associations, such as the VA Forest-Based Economic Development Council; Virginia Biomass Energy Group, and Southern Group of State Forester's Services, Utilization and Marketing (SUM) Taskforce, helps with these efforts.

VDOF held a forest industry roundtable that brought together representatives from all sectors of forest industry to discuss issues facing the industry and what the state could do to address them. Work is underway on addressing a number of the issues presented.

There is an emphasis on rural economic development to try to maintain jobs in these areas and encourage keeping land in forests.

Development and Dissemination of Forest Resource and Industry Data

Through cooperative agreements with various agencies and organizations, forest resource and industry information is collected, analyzed and disseminated to stakeholders and other interested parties. This information is used to promote Virginia's forests and industry; monitor forest and forest industry sustainability, ownership and other changes; analyze economic impact and quality of life issues, and assist localities with comprehensive planning. Virginia landowners, businesses and others also request information on types, values, production and location of various products. Information sources used include: IMPLAN input-output model to calculate economic impact of

forestry in Virginia; Virginia Forest Products Tax database; USDA Timber Products Output (TPO) and Forest Inventory and Analysis (FIA) databases, and Virginia Forest Products database.

Grant Programs and Special Projects

Virginia's utilization and marketing program tries to work with all types of forest products and markets to maximize the options that may be available to forest landowners and industry. Many times, new or changing markets have issues that need to be addressed to best be able to take advantage of new opportunities. Virginia is involved with several such projects. The major ones are described below.

Ecosystem Services Program

The development of new forest markets is being lead by projects examining ways to compensate forest landowners for the environmental services they provide society, so they will have more incentive to keep their land forested. VDOF's ecosystem services program has received a lot of recognition and several grants to develop online calculators and compensation models for landowners who are protecting water quality and bio-diversity and sequestering carbon.

Resource Conservation and Development (RC&D) Program

Working with the USDA Natural Resources Conservation Service (NRCS), VDOF has been active with the RC&D program for more than 20 years and has had a dedicated RC&D forester for most of that time. The position was created with the establishment of the second RC&D Council Area in Southwest Virginia to address the large forest-related needs identified. Today, Virginia has seven RC&D Council Areas and several have active forestry programs. The program has been involved in numerous grassroots projects that have obtained financial and other resources; increased jobs; improved conservation efforts, and enhanced other quality of life issues in these areas. To continue to meet the increasing local demands, additional resources will be needed in the future.

Biomass Energy

Changing forest markets and demand for more locally produced renewable energy have increased focus on biomass energy. The VDOF is working with partners to identify better ways to evaluate and use forest resources for bioenergy production. We are also working with partners to increase domestic production and use of biomass energy through several initiatives, including seminars and tours about bioenergy use and providing technical and other support. Association with other state agencies and groups, such as the Virginia Biomass Energy Group; 25x25 Initiative; Southern Alliance for the Utilization of Biomass Resources, and USDA Forest Products Lab, is also helping in this effort.

Forest Certification

Demand is building, both domestically and internationally, for "green" products that come from sustainably grown forests. In many cases, customers want some kind of guarantee or documentation that the products actually came from certified, sustainably managed forests. In most cases, availability of certified forestry programs for small, private forest landowners have been extremely limited, non-existent or unaffordable. If this trend continues, private forest landowners – who own the majority of the forestland in Virginia – could see their ability to sell forest products diminish. VDOF is working with partners to determine the barriers for landowner participation in sustainable forestry programs and find ways to address them. This program is also looking at the certification issue throughout the forest products supply chain.

Forest Operator and Service Providers for Changing Forests and Markets

As forest markets, land ownership and demographics change, new opportunities appear to meet these needs. However, they also have an impact on many traditional businesses. Virginia, like many other states, is very concerned about the decline in timber harvesters and other forest operators and service providers. They are the key link to having healthy, sustainably managed forests and providing the raw resources needed to produce the forest products on which we all depend. There are on-going efforts to assist current businesses to adjust to changing markets and also encourage the development of new businesses to meet landowner needs.

Specialty Forest Products

The forests of Virginia provide many non-traditional products that can provide income to landowners and small businesses, especially in rural areas. Working with cooperative extension, universities and other partners, research, educational programs and demonstrations have been on-going in a number of areas, including controlling invasives through utilization; lump charcoal production; shiitake mushroom propagation; specialty woods for custom furniture and other use, and production of forest-based foods, medicines, etc.

Ecosystem Services

Program Overview

Beginning in 2006, the VDOF began to explore how Virginia landowners could benefit from greater involvement in and exposure to the emerging arena of ecosystem services. In 2008, this exploration led to the formation of the Land Conservation Division within the agency, with the division director serving the primary role as ecosystem services program manager for the Department. Because both the discipline of ecosystem services and the agency's ecosystem services program are both new and fast evolving, the ecosystem services program area is not established in the same manner as most of our other program areas, with relatively defined roles; program offerings; target audiences, and priority areas.

The VDOF has become involved in various initiatives related to ecosystem services over the past three years. These efforts have evolved as part of the VDOF effort to find ways to slow the loss of forestland being converted to other land uses. In addition to traditional forest products, it has become apparent that we need to better articulate and value the many other environmental benefits and services provided by forestland. These initiatives include:

InFOREST

One of the first steps in being able to value ecosystem services for both developing markets and mitigation efforts is quantification of these services. Unless we are able to quantify these services, it is nearly impossible to participate in a marketplace. In addition, accurately quantifying the loss of specific ecosystem services will allow for more credible mitigation to take place.

VDOF has been collaborating with various partners in developing a web-based, GIS-enabled (Geographic Information System) platform for mapping, report writing and running various ecosystem service calculators. The vision is for the user to develop an "ecosystem service portfolio" for various ecosystem services provided by a tract of land. The services being considered at this time include: carbon sequestration; nutrient load reduction (nitrogen and phosphorus); sediment load reduction, and biodiversity.

This tool will enable the user to make what-if scenario comparisons of the portfolios when certain land management practices or land-use changes are anticipated or made on the tract. The ability to do this will enable natural resource managers, land-use planners, landowners and other users to make more informed decisions on activities that impact the forest resource. In addition to enhancing landowner ability to participate in developing ecosystem service markets, other utilities for these tools will be to perform environmental mitigation analyses for municipal infrastructure (roads, powerlines, developments, etc.), and enable county governments and other land-use planners to make informed natural resource decisions as demands from growing populations are addressed.

Tool development will include a user-friendly interface where users can spatially outline their area of interest; enter any additional required data, and run their report. The GIS will utilize extant data (field or remotely-sensed) as well as new inputs when needed. The best available models that are already developed are being utilized to "run behind the scenes" to generate the quantities of ecosystem services provided. For example, the FASTLOB model (carbon sequestered in southern yellow pine); FVS (Forest Vegetation Simulator) model (carbon sequestered in hardwoods), and GWLF model (Generalized Watershed Loading Function Model for nutrients and sediment) are all peer reviewed, scientifically validated models that yield good results.

Funding for InFOREST is being sought through federal grants, private sector support and state general funds. The degree to which InFOREST can be built out will be dependent on the success of developing funding sources.

Forests to Faucets

This initiative is funded by a grant from the U.S. Endowment for Forestry and Communities. This effort will use payments for ecosystem services (PES) for various forest management practices implemented by private landowners that are designed to improve water quality (nutrient and sediment loading) in the South Fork Rivanna River (SFRR) Reservoir Watershed in Albemarle County. The SFRR reservoir, completed in 1966, has an exceptionally large watershed-to-surface-area ratio for a water supply reservoir (390 acres: 285 square miles), making the reservoir quick to fill but also more susceptible to large pollutant loads, especially sediment.

The project will link the financial interests of landowners in the reservoir watershed and their forest management practices to urban consumers of the municipal water supply. This effort creates a process and a financial mechanism to positively influence forest landowner behavior in a way that ultimately reduces the costs of both urban and rural users of the water resources in the South Fork Rivanna Reservoir Watershed.

The project will educate local governments; the business sector; environmental entities, and landowners on the value of forests and the ecosystem services they provide. In this educational process, special emphasis will be placed on the environmental value-added contributions that occur when investing in natural infrastructure versus utilizing engineered technologies to accomplish the same end. Expensive, engineered technologies address the pollutant of concern, but often

contribute little to improving other environmental values, such as air quality, biodiversity or carbon sequestration. This is a success story the forestry community desperately needs to tell.

The project will move beyond basic research to increase forest cover and the ecosystem services it provides. The service of interest is water quality, specifically sediment and nutrient load reduction. Virginia's Nutrient Credit Trading Program recognizes that establishing new forest cover through afforestation generates a nutrient load reduction (nitrogen and phosphorus) credit larger than any other offset practice. This fact creates "added emphasis" for establishing a forestry focused payment for ecosystem services program for a watershed in which a wastewater treatment plant, such as Rivanna Water and Sewer Authority (RWSA), operates.

Outreach

A great deal of effort has been made to increase awareness of ecosystem services and emerging markets. Presentations are made annually at conferences; various universities; landowner workshops; state agency meetings, and stakeholder groups. Drafting and incorporating appropriate ecosystem service language into County Comprehensive Plans and Forest Stewardship Management Plans will be done. PowerPoint presentations have been developed and are provided to other speakers upon request. An ecosystem services brochure has been developed for landowners.

As the ecosystem services program continues to develop alongside the discipline itself, additional initiatives will surely be added to the agency's efforts. Our ability to fully take advantage of future opportunities will hinge largely on appropriate funding being secured to staff the effort, at both the headquarters program level and the field implementation level.

Conservation Education

Program Overview

VDOF's mission is **to protect and develop healthy, sustainable forest resources for Virginians.** Conserving the forestland base is critical to the health of the environment; to the supply of forest products, and to overall quality of life. Conservation education efforts spread this message to Virginia's citizens, to help ensure a bright future for Virginia's forests.

For many years, information transfer was a mainstay of VDOF's education efforts. Clientele often had long-standing connections with the land and were somewhat familiar with the agency's message. Many contacts with the public still involve information transfer, which can provide specific resources to those who know what they need to learn. For example, a forester might provide resources to a landowner with experience growing hardwoods who would like to try growing pines. Information transfer can also be a critical first step in changing people's awareness of forest resources and issues. Examples of this type of information transfer include providing publications, hosting exhibits and interacting with people at the Virginia State Fair; Virginia Highlands Festival; Sawmill and Logging Expo, and numerous local events.

In recent years, many Virginians, even landowners, have moved away from an intimate association with the land. Therefore, more in-depth education has become an important tool to change citizens' knowledge, skills, attitudes and behaviors regarding forestland. Education is particularly important to conservation of the forestland base, since most of the state's forestland is privately owned. VDOF often partners with other agencies and groups to conduct educational programs, such as

workshops, tours and training programs. Partnerships maximize staff, knowledge and financial resources. They also help to reach wider audiences, especially those who are traditionally underserved.

Long-term efforts to conserve forestland will depend on tomorrow's forest landowners, decision makers and voters. Making forestry relevant to today's young people is a key component to the conservation message. VDOF works with many partners – schools, agencies, youth organizations, forest business and industry – to teach Virginia's youth about all types of forests, from vast wilderness areas to managed State Forests, pine plantations, backyard woods and even urban street trees.

VDOF uses a variety of resources to support its educational programs. Existing resources from Project Learning Tree (PLT); Cooperative Extension; universities, and other research-based sources are used whenever possible to avoid duplication of effort. When there are gaps to fill, VDOF also produces its own educational materials. Most programs are delivered by local field staff, but the agency also has a conservation education coordinator and two forest education specialists who develop and deliver programs on State Forests and other locations. Volunteers, such as Master Naturalists, Tree Stewards and PLT facilitators, assist with programs as well.

Priority Areas

Project Learning Tree (PLT)

Project Learning Tree is a curriculum supplement that teaches youth about the environment; stimulates thinking; encourages informed decision making, and inspires action. Each year, more than 1,200 Virginia teachers and non-formal educators are trained to use PLT with students and other groups. Trainees include pre-service teachers (education majors in colleges and universities), who are then prepared to use PLT in their first classrooms. In a recent survey of PLT-trained educators, 75 percent had used PLT in their teaching. Ninety-five percent of those educators who used PLT said the activities enhanced their ability to teach State standards in science.

Forestry Camp

For more than 60 years, Holiday Lake Forestry Camp has provided field experiences in natural resource management to young Virginians. Approximately 80 campers aged 13-16 attend the week-long residential camp annually. Hosted and staffed by VDOF, the camp also receives financial and staff support from other agencies, businesses and organizations.

State Forest Education

The department continues to explore ways to use state lands as educational spaces. Forest education specialists at the New Kent Forestry Center in eastern Virginia and the Matthews State Forest in western Virginia plan and lead programs, such as school field trips and Scout merit badge

training. Most State Forests do not have staff to maintain infrastructure and deliver programs, so VDOF has established self-guided activities, such as trails, geocaches and driving tours, on some forests.

Local Programs for Youth and Adults

VDOF field staff (foresters and technicians) understand local needs and build relationships, so they are the agency's best resource for educating people where they live. Many staff have been trained in teaching methodology and resource materials for hands-on education. Continued training will occur as funds are available. VDOF staff offers educational programs for both youth and adults, many in partnership with other agencies and organizations. Examples of youth programs include: natural resource days for students; Arbor Day programs in schools and communities, and Envirothon training sessions. Adult programs include: landowner short courses or single-day workshops on forestry topics; forestry tours, and forestry training for Master Naturalists. Statewide, more than 1,200 youth and adult programs reached an estimated 18,000 citizens in the past year.

Virginia Master Naturalist Program

The Virginia Master Naturalist program trains volunteers to do educational, scientific and stewardship work benefiting the state's natural resources. VDOF is one of five state agency sponsors of the program, which now has 27 chapters. VDOF staff serves as advisers for eight of these chapters and are involved with training or projects in almost every chapter. In its first four years, the program's 800+ volunteers have donated more than 94,000 hours in education, stewardship and citizen science projects – a value of nearly $2 million.

Outreach to Underserved Audiences

As with most VDOF programs, partnerships are critical in reaching out to traditionally underserved audiences. Key partners in outreach are Virginia State University; Virginia Polytechnic Institute and State University, and Cooperative Extension. In the past year, more than 160 VDOF programs for adults included underserved clientele. These programs included presentations to civic groups, local government, landowner/homeowner associations or other local organizations; workshops; training for colleges, volunteers and organizations/agencies; tours and field days; Project Learning Tree educator trainings, and exhibits at community events or fairs.

Virginia's State Nursery System

Program Overview

Virginia's State Nurseries serve an important role in the larger forest conservation and improvement role of the Virginia Department of Forestry. The enabling legislation allowing establishment and continued operation of the state nurseries is found in the Title 10.1-1114 of the Code of Virginia. The nurseries have been in operation for more than 90 years and provide more than 30 million seedlings, of various species, a year.

The multiple management objectives of the Virginia State Nurseries include: providing seedlings to meet reforestation demands; providing genetically improved seeds for the reforestation program; providing seedlings for wildlife habitat enhancement and restoration, and natural urban aesthetics.

Seedlings are purchased primarily by private forest landowners, but the forest industry also purchases seedlings for its lands. The seedlings are selected for Virginia's climate and for maximum growth. Several species, including loblolly pine, are a result of the genetic improvement work. Additionally, VDOF has made genetic gains in white and shortleaf pine.

The nurseries are a self-supporting operation (no general funds dedicated to them). The financial support for their operations comes through the generation of revenues from seedlings sales. The sale of forest tree seedlings supports both the operational and capital expenses of the nursery program.

The nurseries have three forestry centers that cover more than 1,200 acres. The largest forestry center is New Kent Forestry Center (NKFC). NKFC is used for tree improvement and seed orchards.

Augusta Forestry Center (AFC) covers 178 acres in Augusta County adjacent to the South River. AFC is Virginia's hardwood/white pine tree nursery. More than 40 species of Virginia hardwoods and softwoods are grown in seedbeds that cover 100 acres. AFC also collects 10,000 or more pounds of hard mast seed from local sources every year. And AFC serves as the UPS shipping center for landowners who prefer to have their seedlings delivered to them this way.

Garland Gray Forestry Center (GGFC) covers 213 acres in Sussex County adjacent to the Nottoway River. GGFC is the pine seedlings nursery. The sandy soils are ideal for loblolly pine production. Loblolly is offered in four different varieties: 2nd Generation Loblolly; Premium Loblolly (top three and four families); Elite Loblolly (top two families), and 3rd Cycle Loblolly (the newest genetic upgrade).

The nursery systems are staffed by a nursery superintendent; a nursery supervisor; a nursery forester; a nursery technician; an administrative staff specialist; a program support technician, and

several part-time positions. Other VDOF regional and headquarters staff occasionally assist when additional staffing is required to help during the lifting and shipping seasons.

Over the past few years, landowners' planting objectives have become more diversified. A shift to wildlife habitat enhancement and riparian buffers (CREP projects) has occurred. The nurseries are finding ways to provide the landowners with more options by adding new species. Also, landowners now can buy seedlings in very small quantities for their small projects.

The Christmas tree market has also changed. The focus has shifted from eastern white pine to various fir species. The nurseries have adapted to these market changes by trying to find species that would help meet the needs of its Virginia customers.

Priority Areas

Developing a sound business plan is the main priority for the nursery staff. With the changes in demand and economics, it is challenging to be profitable. A college intern working on her MBA has been hired for the summer of this year to help put together an operations and marketing plan. Implementing the plan will help the nurseries remain viable and self-supporting.

Management to upgrade genetics will always be in demand. When the tree improvement team creates a new strand, the nurseries plan to offer seedlings to the landowners quickly. Research in blight-resistant American chestnut hybrids continues to progress, and it is hoped that these seedlings will be available for out-planting in the not-to-distant future.

Enhancing the awareness of the State Nurseries to the general public is another priority. An information and education campaign will help landowners understand the concepts of planting seedlings and possible cost-share programs. Providing more education will help the environment and attract new tree planters – landowners willing to plant trees for both timber and wildlife goals.

Virginia's State Forest System

Program Overview

Virginia's State Forests are unique among other state lands in their purpose, funding and use by the public. Other state lands have uses focused mainly on one objective. State forestlands have multiple objectives and are managed to provide the greatest benefit to the citizens of Virginia. These multiple objectives must be met within the 70-year-old, self-supporting mandate of the state forest system. The primary goal of this mandate, and the State Forest System overall, is maintaining the forest ecosystem as a whole.

The State Forests are well distributed around the Commonwealth and vary in size from 121 acres to 19,808 acres. The largest State Forests, primarily located in Central Virginia, are the core of the self-supporting concept and provide the majority of the income to fund the forest system. The smaller forests, some of which are not working forests, have developed uses that meet the needs of the local community.

Forestland in Virginia's State Forest System totals 65,381 acres and is found on 19 different forests in all regions of the state with vastly differing landscapes and extremes in population and demographics. Except where restricted by deed or access issues, these lands are open to the public, but often roads and trails are restricted to foot traffic. The main purpose of these forests is to provide a working demonstration of forest management that focuses on six core principles. These principles include: the conservation of biological diversity; the utilization of the productive capacity; the maintenance of health and vigor; the enhancement of carbon cycle budgets; the improvement of socio-economic benefits, and the protection of water quality.

The multiple objectives that the Virginia State Forests are managed for include: the demonstration of good forest management; a land base for applied forest research as well as wildlife habitat; the protection of watersheds; the support of biodiversity, and opportunities for outdoor recreation. It is important to know that the Virginia State Forest System is self-supporting. Ninety-five percent of the operational income is generated through timber sales, but other sources of income include: hunting permits, building rentals and donations. A State Forest use permit was enacted by the Virginia General Assembly in July 2009, and is now required by forest users who ride horses; fish; hunt; trap, or ride mountain bikes. The revenue raised from this permit is yet to be determined.

Recreational opportunities on State Forests are focused on self-directed activities that are not available on many other state lands. These activities include: hiking; bike riding; horse riding; orienteering; hunting; fishing, and wildlife viewing. The central Virginia State Forests provide for an especially unique opportunity to enjoy the out-of-doors due to their large size, which provides for an outdoor experience far removed from many of the distractions found in more densely populated areas. State Forest resources are finite, however, and cannot provide everything to everyone.

The State Forest System is staffed by a state forest manager; assistant manager; program support technician; three foresters, and four equipment operators. Timber management constitutes the majority of the work performed by state forest personnel. Selected regional VDOF personnel contribute to the management of smaller state forests.

As the areas surrounding the State Forests continue to grow in population, recreational uses of the land will evolve with changing expectations from the general public. The State Forest will continue to be conscious of the changing expectations of the public and work towards providing recreational opportunities compatible with State Forest timber management objectives, all the while providing a rewarding outdoor recreation experience.

Over the past few years, forest users have become more diverse, and this can create situations that generate conflict among various user groups. Or, some users may object to particular implemented forest management practices in certain areas on the forest. Traditional uses, such as

hunting and fishing, are popular uses of the forest, while newer interests, such as: hiking; horseback riding; mountain biking; adventure races; orienteering; bird watching, and as a place where people come just for the solitude, are becoming more popular.

Increased recreational use of the State Forests will have a greater impact on State Forest infrastructure; funding; specialized staffing; timber management, and the forest ecosystem. Developing strategies for recreational uses on these lands will become even more important if conflict is to be minimized; timber management continues in a self-supporting manner, and if the quality of the forest for recreational uses is maintained and improved.

Recreation is a secondary management objective on the State Forests, and decisions made concerning recreation must be made in regard to the primary objective of timber management. Many recreational activities are compatible. Each activity will be managed to minimize impact on the natural resources; meet recreational needs, and reduce visitor conflicts.

Every 10 years, the forests are inventoried and plans are developed to establish harvest levels, which determine income. A payment in lieu of taxes is paid to each county in which a forest is located. Twenty-five percent of the gross income is returned to the county. An exception to this rule covers the Cumberland and Appomattox-Buckingham state forests. Beginning in 2007, 12.5 percent of the gross revenue generated from these forests is specifically retained to enhance and maintain recreational resources on the respective State Forest within that county.

In the 1990 Farm Bill, the federal government established the Forest Legacy Program with the intent to protect important forestlands that are under threat of conversion to other uses. This enabled the VDOF, working in partnership with the USFS, to acquire the 2,043-acre Sandy Point State Forest in King William County, and the 1,811 acres that established the Dragon Run State Forest in King and Queen County.

In 2009, VDOF added 7,752 acres to the Dragon Run State Forest in King and Queen County. This property was purchased from The Nature Conservancy with funds provided by state bonds. While not actually on the Dragon Run water course, it provides protection to those acres in the Dragon Run watershed, which is widely recognized as an important watershed in the state for its pristine ecologic condition. At 9,563 acres, this places Dragon Run State Forest as the third largest State Forest in Virginia – behind the Appomattox-Buckingham and Cumberland state forests.

Priority Areas

Management of the timber on the State Forests is the main priority for the State Forest staff. When the State Forest System was established, the funding system was designed to demonstrate to private landowners that a managed forest could be profitable. As the expectations and uses of state forestlands have changed, funding operations has become more challenging under the self-supporting system.

Management plans will need to be created; infrastructure developed, and management initiated on the recently acquired forests. These forests consist of 16,500 acres on which considerable work is needed to improve roads; establish recreational trails, and develop other basic infrastructure.

Enhancing recreational opportunities on the State Forests is receiving additional attention. The development of equestrian areas; new or improved parking areas; new trails, and more extensive signage – combined with improving the existing trail systems – should make the State Forest System well positioned to accommodate old and new users alike.

Section V
Multi-State Issues and Priority Areas

Nature in general and forests in particular are not easily contained within man-made, artificial administrative boundaries, such as state borders. Often, impacts to forests come from a variety of sources, including neighboring states and even other countries. When impacts come from a variety of sources and/or jurisdictions, ways to deal with those impacts generally must be a collaborative effort among the jurisdictions from where the impacts originate.

Possibly the best example of this in the East is the massive effort to restore the Chesapeake Bay to its original vitality. Impacts enter the Bay from six states and the District of Columbia. Untold state, county and municipal administrative areas overlay the Bay's 62,499 square miles of drainage area. Without cooperative efforts from these many different areas, little gains can be made in the cleanup effort.

Much like the Chesapeake Bay, forests spread across many jurisdictions. Sometimes, priority areas for improving these forests will need to be multi-state in nature. During the course of Virginia's statewide forest assessment, several potential multi-state priority areas were identified. These include:

Table 8: Potential Multi-State Priority Areas

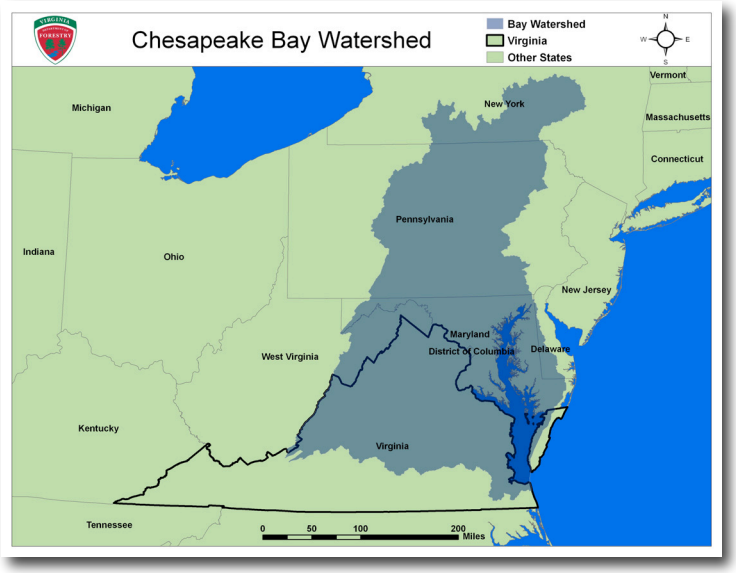
Potential Multi-State Priority Areas	
Multi-State Issue	**Cooperating States/Entities**
Chesapeake Bay Restoration	WV, MD, PA, NY, DE, DC, Federal Agencies
Emerald Ash Borer	KY, TN, NC, other southern states
Southern Pine Beetle	NC, TX, other southern states
Appalachian Interior Forest Restoration	PA, NY, NJ, WV, MD
American Chestnut Restoration	NC, WV, TN, KY, MD, American Chestnut Foundation
Longleaf Pine Restoration	Atlantic and Gulf Seaboard states
Shortleaf Pine Restoration	NC, TN, AR, OK
Atlantic White-cedar Restoration	DE, NY, NJ, MD
Applied Forest Research	NC, SC, GA, FL, AL, TN, MS, LA, AR, TX, OK
Land Conservation in the New River Valley (SW) and the Chowan River Basin (SE)	NC, WV

Priority Areas

Chesapeake Bay Restoration

Sixty percent of the Commonwealth of Virginia lies within the Chesapeake Bay watershed. Figure 14 shows the entire bay watershed and the six states within which it lies.

Figure 14: Chesapeake Bay Watershed



As one of the three states containing the largest portion of the watershed, Virginia has a long history of both economic integration with the Bay and has been participating in the Bay restoration efforts for the past 25 years. Federal efforts have begun to ramp up to address the Presidential Executive Order 13508 "to protect and restore the health, heritage, natural resources, and social and economic value of the nation's largest estuarine ecosystem and natural sustainability of its watershed," and the subsequent TMDL development for the Chesapeake Bay.

The VDOF has been actively engaged in participation on the Chesapeake Bay Forestry Work Group since its beginning in the late 1980s and, as a result of that participation, has been engaged in the development of the Chesapeake 2000 agreement among the various signatory states and the District of Columbia that is the foundation for the various Executive Committee Directives involving the Bay restoration effort to date. Three of the major restoration directives directly involving forestry actions in which the VDOF is actively engaged are: (1) The restoration and establishment of riparian forest buffers; (2) conserving forested acres on areas identified as forests of "high value," and (3) development of goals for urban tree canopy establishment and restoration in urban areas throughout the Bay watershed. The VDOF will continue its involvement in this important effort for Chesapeake Bay restoration.

The Bay restoration effort and VDOF involvement will continue to be a priority for the agency as well as many other agencies within the Virginia Secretariats of Agriculture and Forestry and Natural Resources. The increased emphasis as a result of the Presidential Executive Order on the

Bay cleanup effort will require all signatory states and the District of Columbia to participate in the renewed effort and will have to incorporate new and innovative mechanisms for the environmental restoration effort. For these collaborative efforts to achieve the scale of success necessary to improve and restore the Bay, both federal funding and federal collaborative leadership will be vitally important.

Forest Health Issues

As outlined in the Program Area section of this document, the VDOF is significantly involved in a variety of forest health issues, including the efforts to combat the emerald ash borer and the southern pine beetle. Almost all these efforts are funded by federal grants, mostly from the US Forest Service. Virginia would like to participate in multi-state collaboration with these issues but would require additional funding, perhaps through the *Redesign* process, to do so.

Emerald Ash Borer

Federal funding to VDOF for emerald ash borer is being funneled to Virginia Tech to inventory the abundance of ash across Virginia's urban forests. The goal is to develop a five percent to 10 percent sample survey of street trees across all major urban areas in Virginia. Using the statistical software package i-tree suites, developed by the USFS, data on the species distribution, diameter distribution and abundance of street trees will be obtained from pre-existing surveys or derived from new survey work and consolidated. This will not only enable municipalities across Virginia to prepare and plan for the arrival of emerald ash borer, but other invasive pests, such as the Asian longhorned beetle, as well.

It is likely that most other southern states lack adequate urban tree inventories as well, so this kind of project would be logical to implement across the southern region to augment existing inventories. A regional inventory of the urban ash resource would greatly benefit the South by allowing for a more precise estimate of the economic impacts of emerald ash borer as it continues to move southward (assuming it will). Limited funding could be funneled more precisely to those areas that will need it the most. Not only would this make an excellent multi-state project for a future *Redesign* proposal, but it would also allow for Forest Health and Urban and Community Forestry programs within states to work together on a project of mutual interest.

Southern Pine Beetle

In a previous section, we mentioned a new VDOF program funded by federal *Redesign* funds that provides incentives to loggers to perform first commercial thinning on tracts less than 40 acres. Such small tracts are traditionally avoided by loggers because low returns are exceeded by high transportation costs. In addition to promoting much-needed bark beetle prevention tactics on small acreages, this program also serves to bolster a weakened logging industry during difficult economic times. Unfortunately, since these payouts are not cost-sharing in nature, additional *Redesign* funds must be forthcoming to maintain the program. We anticipate applying for additional funding for this program through *Redesign*, but would likely render further benefits by coordinating with other states – particularly our neighboring state of North Carolina – to apply for multi-state project funding. North Carolina loggers with appropriate NC certification are already eligible to apply for assistance when thinning qualified tracts in Virginia. Likewise, Virginia loggers could participate in North Carolina's logger incentive program, should they be interested in starting one. Texas also has a logger incentive program and would be another potential partner.

Diminished Species Restoration

American Chestnut

The VDOF has long been involved in American chestnut restoration with its archiving of hybrids and back-crossing work at Lesesne State Forest, and has been cooperating with the American Chestnut Foundation by raising Foundation seedlings at our nurseries and planting them at Matthews State Forest. More recently, we have assisted the Forest Health Initiative scientists at the University of Georgia and the USFS Southern Research Station in their efforts to safely and effectively develop an American chestnut that is resistant to the chestnut blight and root rot, and which can be safely restored to our forests. Commitment to American chestnut restoration spans beyond the borders of the Commonwealth, with a high level of interest in states throughout the original range. As research advances, and blight-resistant planting stock becomes more reliable and available, implementation will follow. This has already started, with work on National Forest land and in surface mine reclamation in other states. A US Forest Service *Redesign* Grant of 2010-11 focuses on surface mine reclamation in Virginia, Kentucky and Alabama. Included in the outcomes of the grant are demonstration planting and techniques for restoring American chestnut.

Longleaf Pine

The VDOF is in the beginning stages of an effort to restore the longleaf pine to sites in Virginia. Longleaf pine forests provide quality wildlife habitat; promote ecosystem diversity; offer opportunities for financial gain, and are aesthetically pleasing. Public opinion and political views are positive toward the restoration of this diminishing species. The Department's modality will be to identify and protect sites where native longleaf is present as well as those places suitable for the establishment of this species. Maintenance and preservation of the native seed source will allow for increased production of native Virginia longleaf pine seedlings. Education for resource professionals and landowners; partnerships with other agencies and organizations, and the use of incentive programs will enable us to manage longleaf pine in the landscape now and in the future. With the concern related to a warming climate and tree species migration, Virginia is uniquely positioned to lead in expanding the northern range of this important species. Initial efforts have included demonstration and operational longleaf planting projects within and beyond the original range in Virginia.

Shortleaf Pine

Shortleaf pine has been a declining forest component for much of its range since the 1940s, as extensive harvesting; conversion to loblolly pine, agriculture or development, as well as natural forest succession has decreased this forest type considerably. VDOF's intent is to maintain or re-establish shortleaf pine in the landscape in its natural range as a viable silvicultural option to offer to landowners. The strategies designed to meet this goal include: developing geographic seed sources and supplies; developing external marketing plans; internal agency training; increased demonstration on suitable public forests; conducting research to use in marketing and management, and incentives, such as cost-share funding, agency funding opportunities, partnerships or cooperatives. The decline of shortleaf has occurred in other states and these strategies are applicable to many states. In recognition of this, Virginia, North Carolina, Oklahoma and Arkansas were successful in a 2010-11 USFS *Redesign* Grant for shortleaf restoration (Virginia was dropped due to funding constraints).

Atlantic White-cedar

Atlantic white cedar grows in a narrow coastal belt 50 miles to 130 miles wide from Maine to northern Florida and west to southern Mississippi. It is most useful commercially in southeastern New Jersey, southeastern Virginia and northwestern Florida, but its importance has always been limited because of its patchy distribution (limited by the scarcity of suitable sites). Atlantic white cedar is now classified as a globally threatened forest ecosystem, and its overall acreage continues to decline. In recent years, there has been much interest in restoring these forests in response to an increasing awareness of the importance of wetlands and demand for cedar products. Virginia has done some initial work in propagation of seedlings. Most of the suitable sites in Virginia are in the Dismal Swamp National Wildlife Refuge, which extends into North Carolina. Multi-state cooperation and funding could assist in expanding restorative work into suitable private land.

Applied Forest Research

The demand for a growing array of forest products is continuing to increase. The land base used for forest production is largely in plantations, which can be managed to produce more wood and generate greater value than currently realized. Integrated management of site (nutrients and water) and genetic resources is now recognized as essential if more, higher valued forest products are to be grown in a cost-effective and environmentally sustainable manner. As forestlands change ownership and the area and intensity of plantation management responds to and affects the supply and price of wood, the development of new knowledge and rapid implementation of new practices are critical for success.

The VDOF has a history of collaborative research with state agencies across the Southeast to conduct important research in a cost-effective and timely manner. For example, VDOF collaborates with industries, agencies and other stakeholders from North Carolina to Florida to Texas as a member of the Forest Nutrition (Virginia Tech, NC State); Tree Improvement (NC State), and Forest Modeling (Virginia Tech) Research cooperatives. Land ownership changes and economic constraints have resulted in a diminishing investment in applied research over the last decade or more. Increased federal support and funding of multi-state projects could significantly improve and secure opportunities for continued success in developing more productive and sustainable forests.

Appalachian Forest Restoration

Two potential areas for significant and effective cooperation exist in the Appalachian Region.

Forest Management

The Appalachian Mountain Chain spans an entire third of Virginia. Historically, this terrain has been both an obstacle and benefit to the state – a barrier to early western expansion and agriculture, but later a source of charcoal and timber that fueled an early iron industry and then the state's highest timber output in the early 1900s. A myriad of deleterious conditions have impacted these forests: damaging harvesting practices; clearing; wildfire; loss of the American chestnut; high-grading of second-growth stands; surface mining (far southwest); gypsy moth; hemlock wooly adelgid; invasive plants; elevated deer populations; later fire exclusion, and drought-related stresses. Despite all of these factors, the forests have been remarkably resilient, with increasing volume, value and multiple resource benefits. Virginia shares mountain forest issues and opportunities with Maryland, West Virginia, Kentucky, Tennessee and North Carolina. The Washington-Jefferson National Forest and the Shenandoah National Park form large cores of mountain forests, as they do in neighboring states.

Because most of these conditions are shared, collaboration on these common issues is very logical and desirable. An example is the 2011 "Mixed Mesophytic Hardwood Restoration on Priority III Mined Lands" USFS *Redesign* Grant in Kentucky, Alabama and Virginia (**Note:** This was originally a multi-state, multi-region initiative that included Ohio and West Virginia).

Recreation and Ecotourism

Despite a century of coal mining, the counties in the coal region of SW Virginia, Eastern Kentucky, Southern West Virginia, and Southeast Ohio continue to be among the poorest in the nation. Further, this region is plagued with numerous coal mining-related environmental problems. Population and economic growth have not kept pace with other areas, and many counties are actually losing population. Elected officials and community leaders in the region are trying to broaden the economic base and make their communities more attractive to attract new and diverse businesses. One of the strategies is to encourage the development of forest-based recreation and eco-tourism in the region. Within the last decade, local trail authorities have been formed and there is already cooperation across state lines in this area. State forestry agencies can encourage forest-based recreation strategies involving private landowners.

This forest-based recreation/eco-tourism strategy will demand that local communities become more attractive and deal with local environmental and social problems, such as degraded streams, the lack of public open space, etc. The Community Forestry programs in Virginia and Kentucky are well positioned to assist communities in this regard as they can draw on the resources of various partner organizations to assist in community environmental planning. Virginia already has a strong partner with Virginia Tech's Community Design Assistance Center that is already engaged in some community forestry supported planning in the region. Neighboring Kentucky is developing similar partnerships. There are numerous opportunities for multi-state projects and some have already been proposed in the USFS *Redesign* process. These proposals have received favorable reviews, but no funding as yet. Further, the opportunity exists to work with West Virginia and Ohio on a multi-regional basis.

Land Conservation and Water Quality Efforts in the New River Valley and Chowan River Basin

Conversion of forestland to other uses is common throughout the South and the Atlantic Seaboard. Land and related watershed conservation efforts have begun and expanded in several areas of Virginia and North Carolina. These continue to provide opportunities for partnerships and multi-state efforts.

On the eastern side of Virginia and North Carolina, a series of small rivers form the Chowan, and flow into the Albemarle Sound. The Albemarle-Pamlico National Estuary Program [http://www.apnep.org/pages/who.html] is a joint federal-state-local effort to plan and protect important natural resources in the Basin. Agencies of both states are represented and provide opportunities for cooperative grants and projects. The Nature Conservancy, the Virginia Department of Conservation and Recreation and the VDOF have been active in southeast Virginia, focusing on conserving bottomland hardwood forests, habitat for the red-cockaded woodpecker and the diminished longleaf pine. Submissions to the Forest Legacy program for these projects in Virginia and North Carolina have scored well and several significant projects have been funded within the watershed.

The New River Watershed is the nation's oldest river and offers both multi-state and multi-regional opportunity in terms of forestland conservation works as it starts in western North Carolina and has considerable mileage in both Virginia and West Virginia (Northeast Area USFS). The New River is popular for several types of recreation and has several state parks along its length. In Virginia, the 50+-mile New River Trail is popular with hikers, cyclists and horse enthusiasts. An economic impact study done by the USFS in 2002 indicated that the New River Trail had a large and growing economic impact in the area. In West Virginia, the New River is a major tourist draw for whitewater rafters and kayakers, and the economic impact of this activity is considerable, especially in the Fayetteville area.

The New River Watershed has been experiencing an increase in forest fragmentation and development pressure in recent years. Advocacy groups, such as the National Committee for the New River; the New River Land Trust, and others, have sprung up to encourage forestland conservation and view-shed protection in all three states. The New River Planning District Commission in Virginia (Floyd, Pulaski, Montgomery and Giles counties) has utilized a modest USFS *Redesign* grant to map green infrastructure in its work area. The City of Radford has also done some green infrastructure planning. However, many counties in the New River Watershed lack the planning tools or political will to implement effective land conservation strategies.

The conditions in the New River Watershed offer the opportunity for multi-state (and multi-regional) efforts to implement more effective conservation practices. The conservation of private forestlands in the New River Valley is crucial to protecting this valuable resource. Further, the region continues to offer numerous opportunities to develop river- and forest-based recreation opportunities.

Section VI
Virginia Issues

Through a collaborative process, the Virginia Department of Forestry developed a list of 10 critical issues that would impact Virginia's forests over the next five to 10 years. This process included internal discussions and review; stakeholder input via a targeted stakeholder meeting; an open opportunity for input from interested parties, and further internal review and selection of the final list. This process led to this list of issues, grouped by appropriate National State Assessment Theme.

A. National Theme – Conserve Working Forestlands

1. Conserve the forestland base
2. Promote a larger, connected forest landscape
3. Ensure the sustainable use of woody biomass

B. National Theme – Protect Forests from Harm

1. Protect woodland homes communities from fire
2. Protect forests from invasive species
3. Conserve and restore diminished species

C. National Theme – Enhance Public Benefits from Trees and Forests

1. Enhance the role of forests in maintaining water quantity and quality
2. Promote initiatives for ecosystem services
3. Expand and improve urban and community forests
4. Facilitate opportunities for forest certification among landowners

To ensure a common understanding of each issue and allow for productive discussion of its importance and potential strategic responses, VDOF developed the following synopses of the issues and used them for the survey stakeholders completed and all subsequent discussions.

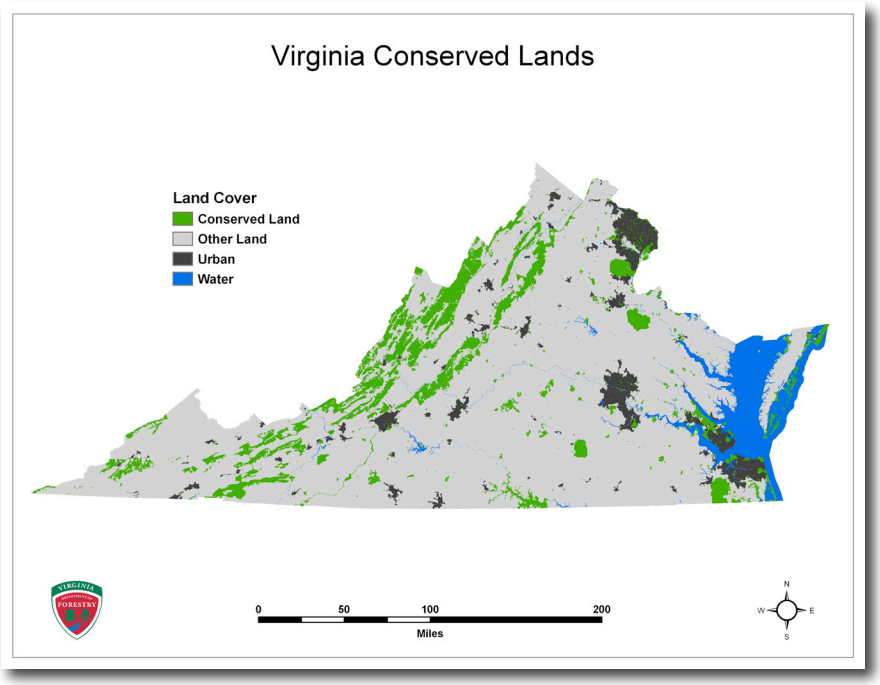
Issue A1: Conserve the Forestland Base

Issue Description

Virginia's forests generate $27.5 billion of revenue from forest products and related benefits. However, the conversion of forestland to other uses (statewide average net loss of 27,000 acres per year) continues to be one of the most significant threats to the forest resources of Virginia. Due to the wide range of benefits that forests provide, including clean air; water; wildlife habitat, and forest products, the loss of forestland impacts the quality of life for all Virginians. Forestland conservation in Virginia is largely determined by the decisions of individual landowners acting within the framework of local land-use policy. Slowing the loss of forestland due to conversion will involve influencing the land-use decisions of individual landowners as well as the land-use policies of the Commonwealth

and its localities. Virginia has made significant gains in permanently conserving land, but there is a need for increased efforts to ensure sufficient natural resources will be available for future generations. Figure 15 shows the current perpetually conserved lands in Virginia.

Figure 15: Virginia's Conserved Lands



Priority Areas

Recognizing the threat posed by forestland conversion, the VDOF has embarked on a concerted effort to develop a forestland conservation program for the Commonwealth. A new Forestland Conservation Division has been established, including a division director and an assistant director for forestland conservation. Two operations-level forestland conservation specialists are assigned to two of the three operational regions, and a third position is planned when funds allow for it. VDOF land conservation efforts focus on accepting donated land conservation easements from willing landowners; providing input on forest benefits and conservation tools to localities, and utilizing the USFS Forest Legacy program and state funding when available to conserve land through easements and acquisitions.

To better focus efforts for each of these strategies, the VDOF is developing a forestland conservation priority map that ranks all forested acres in the state based on the level of benefits provided and the risk of conversion faced. The forest benefits in the analysis fall into three broad categories: water quality protection; integrity of aquatic and terrestrial habitats, and forest productivity. In the forest conservation priority map (Figure 16), all of the forests in the state that are not under permanent protection are ranked relative to all other forests statewide. The priority map will be used to guide outreach efforts and to rank potential easement and acquisition opportunities. In a similar GIS analysis to that used in

development of the conservation priority map, the statewide forest resources were given a conservation value ranking as a means of developing priority areas for the Forest Legacy Program in the state. Hydrologic units across the state that scored high in conservation value were combined with target areas of the state's land conservation organizations to define the state's Forest Legacy Area (Figure 17).

Figure 16: Virginia's Forestland Conservation Priority Areas

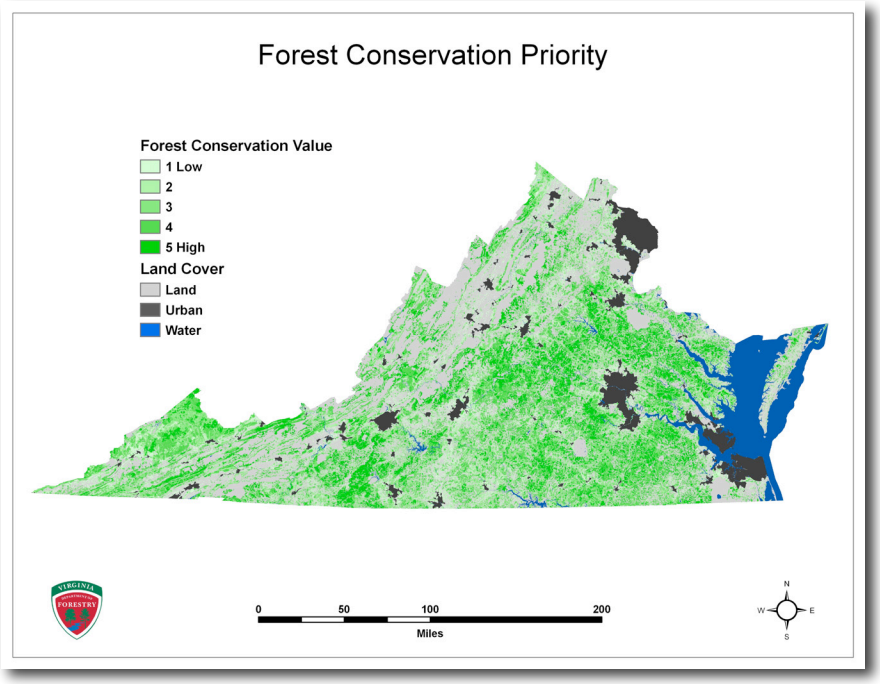
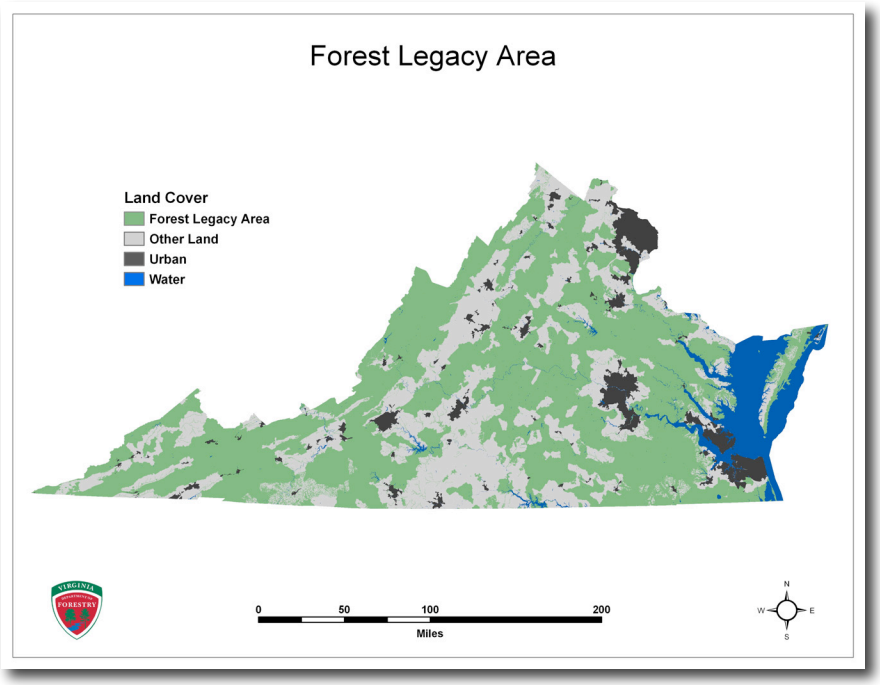


Figure 17: Virginia's Forest Legacy Program Areas



Issue A2: Promote a Larger, Connected Forest Landscape

Issue Description

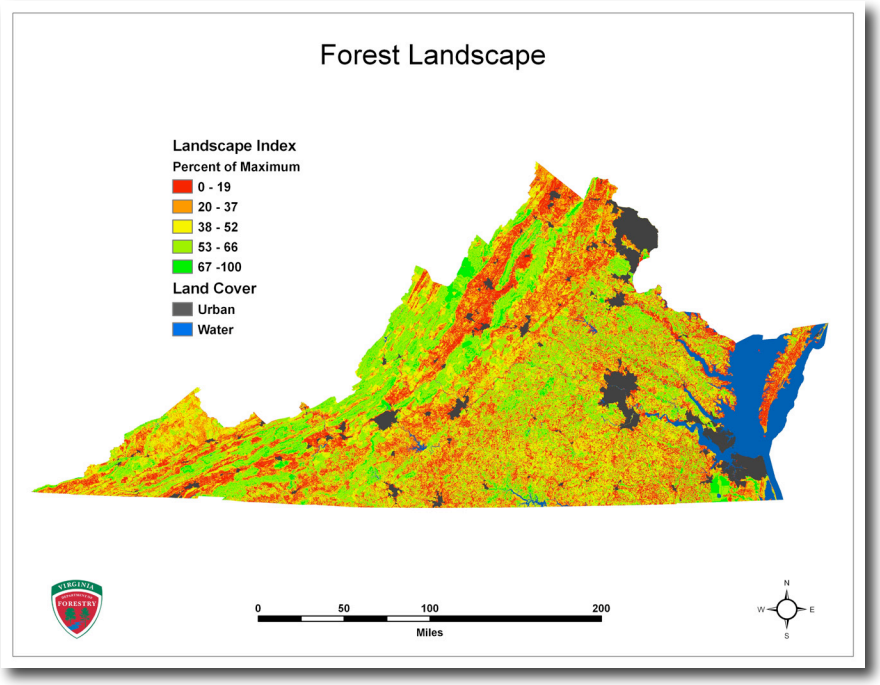
Larger, intact forests can support more plant and animal species while resisting diseases and invasive species. Larger forests also can better support sustainable forest products timber management. However, forest fragmentation is increasing rapidly as roads, utility corridors and buildings break up forests into patches that are often too small to manage for timber or for conservation goals, such as ensuring wildlife diversity. Unfortunately, communities often expend most of their resources in designing and constructing gray infrastructure (roads, utilities) at the expense of natural resources or "green infrastructure." In addition to having larger blocks of forests, it is also important to connect them. Comprehensive local land planning is essential to achieving important successes. When forests are isolated, species within them are at greater risk to decline since animals and plants cannot re-colonize isolated areas. Connecting forests though wide, vegetated corridors facilitates the movement of animals, pollinators and plants over time to ensure species can repopulate areas.

Priority Areas

The following priority area map (Figure 18) was generated using data from the Southern Forest Land Assessment (SFLA) GIS data, and utilizes these SFLA data layers, by order of

weight, from greatest to lowest: Forestland, Forest Patches, Riparian Areas, Protected Areas, Development Level, Priority Watersheds, Wetlands and Public Drinking Water. We will focus our efforts at promoting larger forested areas that provide a higher level of benefits from forests. Percentages in Figure 18 indicate the relative forest cover in the area and how critical that forest area is. For example, an area in deep red (0-19) indicates low levels of forest cover and an area where we could make significant gains through afforestation.

Figure 18: Virginia's Forest Landscapes



Issue A3: Ensure the Sustainable Use of Woody Biomass

Issue Description

Virginia's and the nation's energy needs are growing, as are concerns over the use and cost of nonrenewable energy sources. Using woody biomass for energy production can be a part of the solution. Woody biomass can include forest materials as well as woody debris cleared for construction and land development. According to the Virginia State Forester, the growth of forest biomass continues to exceed the rate of removal by a ratio of three to two, despite losses in forested land cover in Virginia. Additionally, the use of woody biomass in energy production counts towards Virginia's Renewable Portfolio Standards (RPS) goals.

There are a number of issues surrounding the uses of woody biomass in Virginia. Maintaining forest sustainability and promoting the emerging biofuels industry are needed

while also ensuring a sufficient supply of raw materials for existing forest industry manufacturers, timber harvesters and landowners.

Priority Areas

The concept of priority areas for this issue is a very difficult one. There exists no generally agreed upon definition of what constitutes woody biomass, and many competing philosophies are vying to write one. Since the development of facilities is also in its infancy, there is no clear indication of where markets will be and what wood sources these future markets will demand as raw materials.

For these reasons, we have not developed a priority area at this time. As the definition of woody biomass is formalized and local markets are established, the VDOF will seek to incorporate a priority area concept into our planning efforts.

Issue B1: Protect Forest and Woodland Home Communities From Wildfire

Issue Description

The protection of lives, property and resources from wildfire is paramount and continues to be a foundational issue for Virginia. Each year in Virginia, more than 12,000 acres are burned by nearly 1,300 wildfires, resulting in damages totaling close to $2 million. Virginia's leading cause of wildfire continues to be careless debris burning, accounting for nearly 40 percent of all wildfire causes. Additionally, the state's rapidly growing population is pushing development of homes into formerly forested areas, resulting in increased fire risks and greater challenges for protecting citizens and homes. Virginia expects to see more development in the next 40 years than during the last 400 years (VA Outdoors Plan, 2008). Numbers of woodland communities and homes have increased substantially in recent years (as of 2009, there were 4,700 woodland communities representing more than 360,000 homes), with a corresponding increase in the number of homes threatened or destroyed by fire. The state's increasing population; increasing home development in rural areas, and increasing push by Virginia's citizens to enjoy the forests, all combine to make wildfire a threat.

Priority Areas

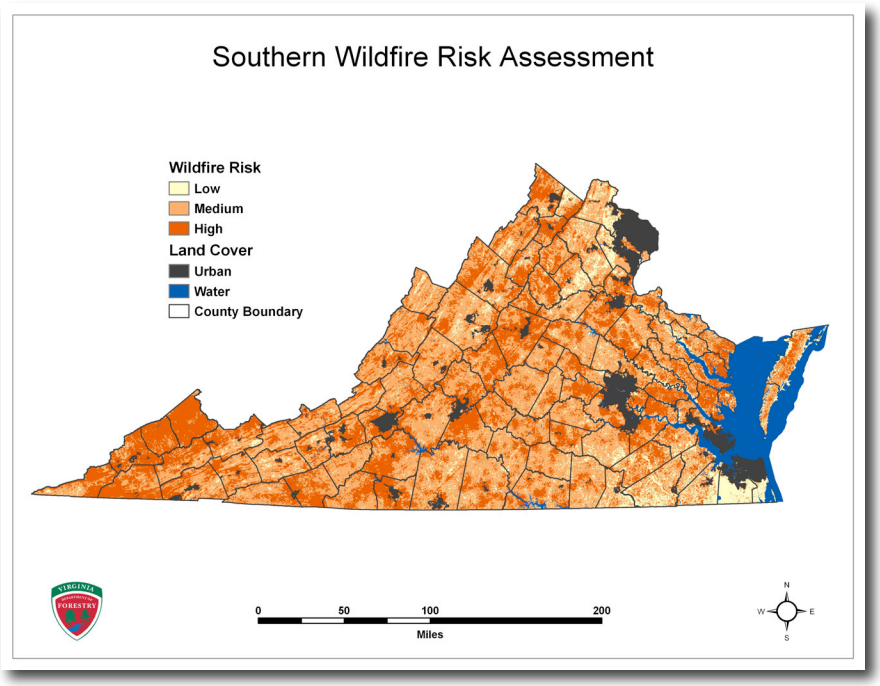
The Virginia Department of Forestry is utilizing the results of the Geographic Information System (GIS)-based Southern Wildfire Risk Assessment (SWRA) project to prioritize those

areas where information, planning and community interaction or treatments would be the most effective to reduce fuels and the overall risk from wildland fire.

The SWRA GIS project provides the unique ability to overlay and analyze various land form data, such as land cover types, topography and water sources; infrastructure data, such as road networks and residential development, and point-specific information, such as historical wildfire occurrence and response resource locations, to provide distinct visual representation of the overall level of wildfire risk.

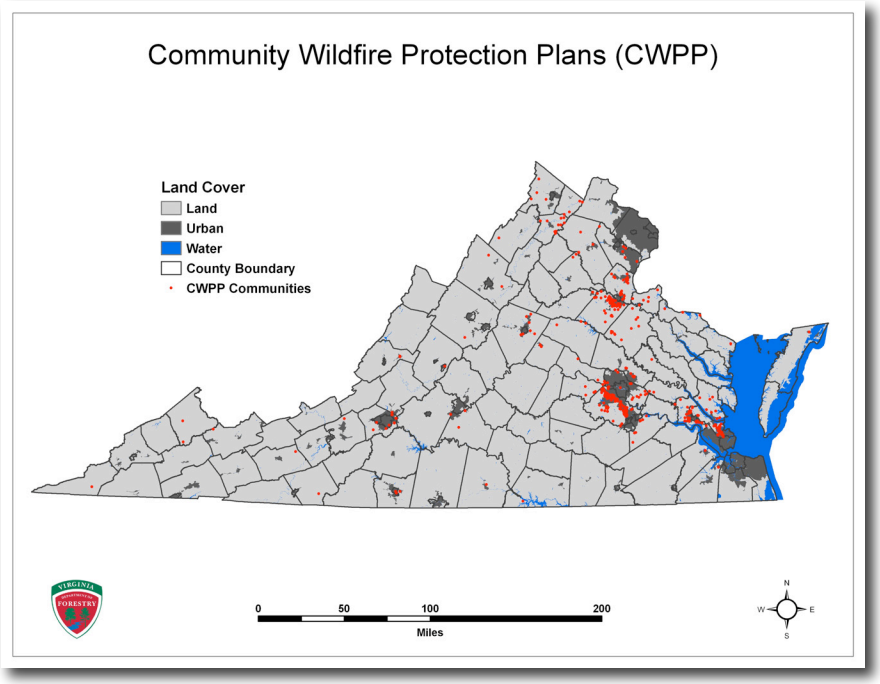
Figure 19 provides the most basic overview of the potential for fire risk and impacts in the Commonwealth over the risk gradients of Low, Medium and High. This information allows fire managers in the Virginia Department of Forestry to identify those areas most prone to wildfire as well as to categorize woodland home Communities-at-Risk and to identify areas where mitigation measures may be of greatest value to the public.

Figure 19: Virginia portion of Southern Wildfire Risk Assessment (SWRA)



Woodland home communities are a growing phenomenon in the Commonwealth. As these communities proliferate, the importance of these areas having a Community Wildfire Protection Plan (CWPP) has increased, and awareness of the need for the plans has expanded. Figure 20 shows the number and locations of Virginia communities with a CWPP.

Figure 20: Community Wildfire Protection Plans in Virginia (communities with a plan are marked with a red dot)



Issue B2: Protect Forests from Invasive Species

Issue Description

Ever-increasing globalization and international trade activity has opened the floodgates for both purposeful and accidental introductions of invasive species to Virginia from all over the world. Every year, invasive species cause estimated economic losses for the United States of more than $137 billion through damage to crops, pastures and forests, while causing human diseases and associated control costs. In Virginia, economic losses may be as high as $1 billion per year (Pimentel, et al. 2000). Purposeful introductions include: ornamental plants for gardens; erosion control; food for both livestock and people, and pets. Accidental introductions include: "stowaways" in ship ballast water; in shipping crates; mixed in with seed from other parts of the world, and "hitchhiking" on travelers' clothes, luggage and vehicles. More recently, intrastate movement of firewood has been identified as a major vector for pests, such as emerald ash borer, gypsy moth and oak wilt, and it remains unregulated.

Invasive species spread aggressively and displace or destroy both native and commercially cultivated plants and animals. After development and habitat conversion, invasive species are considered to be the greatest threat to natural systems, agriculture and aquaculture. Invasive species damage and degrade crops, pasture and forestlands; clog waterways; spread human and livestock diseases, and destroy street trees. As international trade and

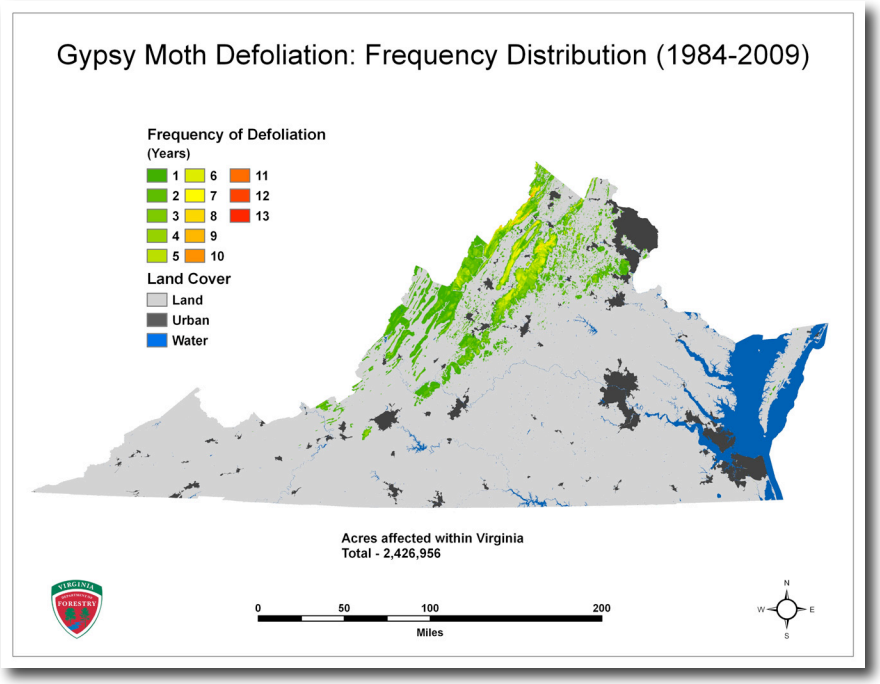
travel continue to expand and increase, we face growing ecological and economic threats from invasive species to our farmlands; forests; rivers and streams, and quality of life.

Priority Areas

The Forest Health Priority Area map (Figure 21) reflects three overlapping data layers, weighted accordingly:

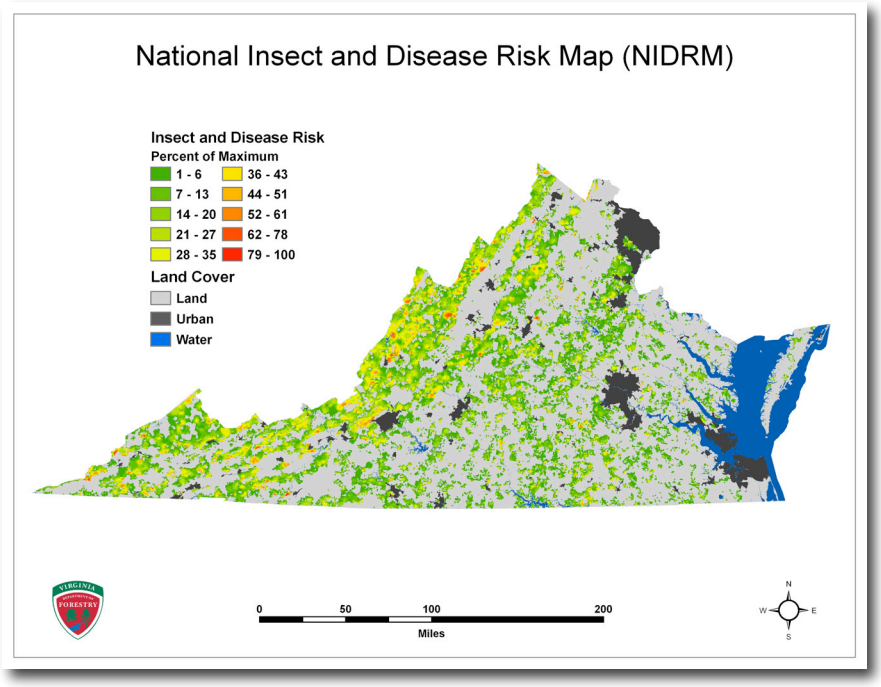
1. A **cumulative gypsy moth defoliation** map for the period 1984-2009 (Figure 21). 1984 was the first year gypsy moth defoliation was detected and mapped in Virginia. Some locations saw only one defoliation in that time period while others, particularly in northern Virginia, have been defoliated as many as 13 out of 25 years. **Weighted 50 percent.**

Figure 21: Cumulative Gypsy Moth Defoliation (1984 – 2009)



2. The **2006 National Insect and Disease Risk Map (NIDRM)** for Virginia (Figure 22). This map, developed by US Forest Service Forest Health Technology Enterprise Team (FHTET) staff, represents perceived risk of tree mortality based in part on host data layers and likely future damage to those resources based on known pest risks. While far from perfect, this early version of the NIDRM emphasizes the hazard to the oak resource posed by gypsy moth and oak decline, particularly in the western portion of Virginia. In addition, and to a much lesser degree, it includes hazard areas associated with hemlock woolly adelgid and beech bark disease. **Weighted 25 percent.**

Figure 22: 2006 National Insect and Disease Risk Map (NIDRM)



3. The **US Forest Service Southern Pine Beetle Hazard map** (Figure 23). This map derives from dividing Virginia into four eco-regions and applies slightly different models to each region to come up with a composite hazard map for southern pine beetle. In all cases, host density (basal area) or percent host is a major variable influencing the model. Other variables included in some of the models were soil drainage index; percent clay; slope, and aspect. **Weighted 25 percent**.

Figure 23: US Forest Service Southern Pine Beetle Hazard

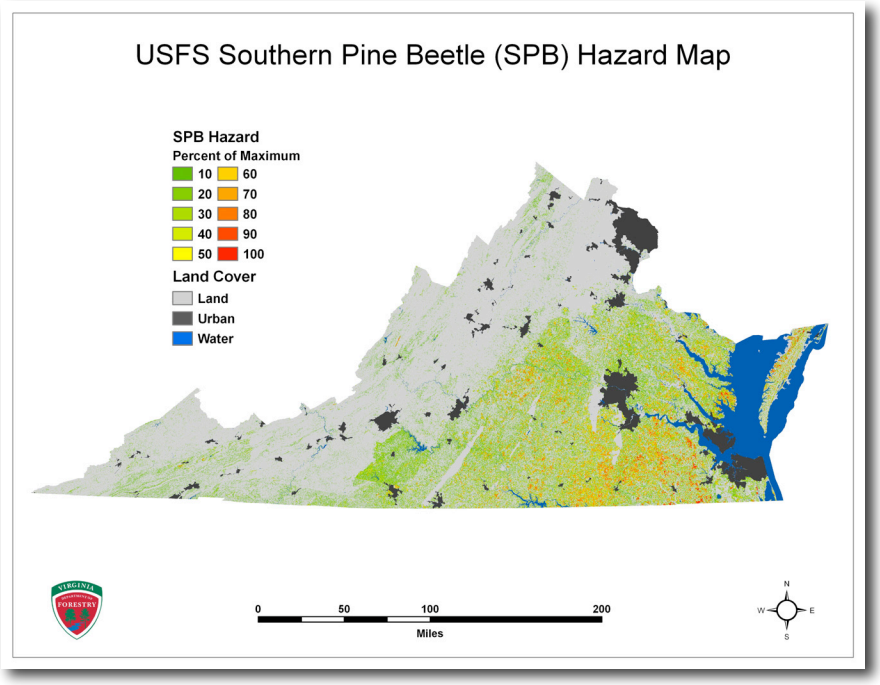
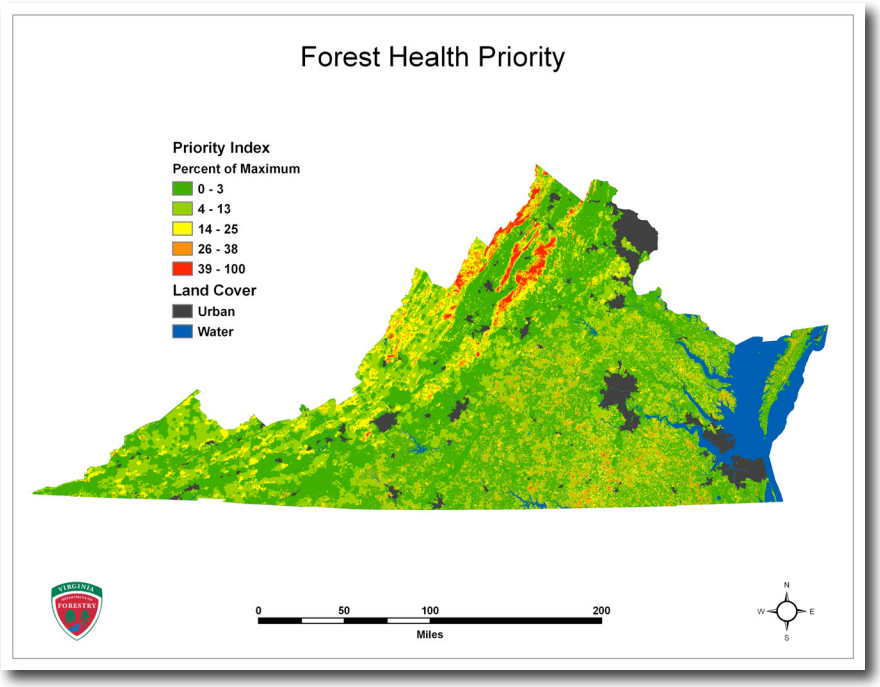


Figure 24: Forest Health Priority Areas



These layers were chosen to represent prevailing forest health conditions across Virginia for a variety of reasons. Gypsy moth is viewed to be the single most important biotic forest disturbance factor on a landscape scale in the Commonwealth and is also one for which precise annual defoliation data is available. Second in priority was oak decline, which closely mirrors the gypsy moth layer in terms of affected hosts and areas of greatest impact. Oak decline is a complex of abiotic and biotic factors and is difficult to study and quantify without more detailed surveys than currently exist. However, the 2006 NIDRM was the first attempt at quantifying this phenomenon on a state level, and it is all we have available at this time. It should be pointed out that another major component of the NIDRM map layer is gypsy moth hazard based in part on host layers. However, this differs fundamentally from the gypsy moth defoliation map layer because it deals with future threats rather than current and past events. Finally, southern pine beetle has historically been the most important native insect in terms of landscape-level disturbance. While damage from southern pine beetle is generally restricted to pine plantations, these plantations cover a large area of the Coastal Plain and Piedmont. Indeed, loblolly pine is the second most abundant tree species in Virginia by volume.

The weights associated with each map layer require further explanation. A 50 percent weight was applied to the gypsy moth defoliation map because it represents a major disturbance to a significant part of the landscape over a 25-year period. In particular, significant tree mortality and decline have resulted from gypsy moth defoliation in the mountainous northwest portion of the Commonwealth. Much of this damage has occurred on federal lands within the George Washington National Forest and Shenandoah National Park, locations which can be clearly identified from the map. While the NIDRM map also reflects gypsy moth and oak decline, it reflects future potential rather than past events, and so it was given less weight. Gypsy moth is likely to continue moving into southwest Virginia and further encroach upon the Jefferson National Forest and surrounding areas, but the risk of widespread mortality and decline associated with this incursion is at least five years into the future and, therefore, was emphasized less. Finally, while hazard from southern pine beetle is a significant concern, the nature of this hazard is more economic than ecological – particularly in the pine basket areas of the Coastal Plain and southern Piedmont. That is, loblolly pine as a species and a resource is not likely to be significantly threatened by a native insect pest like southern pine beetle. Furthermore, with initiation of the USFS SPB Prevention and Restoration Program in 2003, it is hoped that better forest management practices, such as low-density planting; pre-commercial thinnings; first commercial thinnings, and better matching of tree species to appropriate sites, will further mitigate southern pine beetle impacts in the distant future. Therefore, this layer was also weighted less. Gypsy moth, by comparison, will more likely be a major contributor to diminishing some species of oaks, which, without successful regeneration, could be reduced in importance across much of our forested landscape as pioneer species replace them.

While non-native invasive plants will also play an important future role in forest health assessments, we lack sufficient distribution data for most invasive plants to be able to quantify or map these impacts. Furthermore, the number of invasive plants and their complex interactions with native species prohibit us from making more than very general statements about their importance on a landscape-scale. However, they should be included in some fashion in future analyses of forest health.

Issue B3: Conserve and Restore Diminished Forest Types

Issue Description

Several important tree species and associated forest communities in Virginia have been, or are being, significantly reduced or eliminated over time. The causes vary, but may include: mortality due to native or introduced pests or pathogens; harvesting followed by replacement with alternative species, and changes in land-use patterns or priorities. These causal factors are ongoing, so it seems likely that additional species will continue to be negatively affected in the future. Their decline brings losses in biological, cultural and economic value. Examples include: longleaf pine; American chestnut, and shortleaf pine.

When European colonists came to Virginia in 1607, the uplands south of the James River were dominated by **longleaf pine** (*Pinus palustris*) forests, which reached their northern range here. Covering between 1 million and 1.5 million acres in Virginia, this forest type stretched across 90 million acres of the southeastern coastal U.S. all the way to Texas. Maintained by frequent low-intensity fires, longleaf pine forests were extremely high in biological diversity and also provided some of the most important resources needed by the early colonists in Virginia: naval stores (tar and pitch) for use in ship building and lubricating wagon axles; high-quality open range for livestock, and high-quality timber for various construction purposes. Over time, depleted seed stores; increased competition; fire prevention, and soil instability and seedling mortality due to feral pigs caused the longleaf forests of Virginia to decline by the mid-19th century. Since then, increased competition from other species and changing land-use practices have continued to decrease the longleaf population to the point of near disappearance in Virginia. While the species remains in viable numbers in the sandhills of North Carolina and southward, today only between 150 to 200 mature longleaf trees remain in Virginia.

Prior to 1900, the **American chestnut** (*Castanea dentata*) was present from Maine to Alabama. Trees were large and widespread, covering up to 40 percent of some forest types. The nuts were used by wildlife, livestock and humans for food. Farmers used the trees for lumber, firewood and split rail fences. In 1904, American chestnut trees were found dying in the New York City Zoological Garden from an unknown disease soon to be called the "chestnut blight." The disease apparently had entered this country on infected nursery stock, and rapidly spread to surrounding states. Traveling at a rate of about 20 miles a year, it infected the last of the chestnut in the southern Appalachians by the early 1940s. The losses were catastrophic, estimated at 25 percent of the total timber volume. Today, only widely scattered large trees can be found, and most are infected by the blight. Stump sprouts from blight-killed trees are very common; they live several years (often long enough to flower and occasionally to produce a few nuts) and then succumb to the blight, usually to be succeeded by other sprouts.

Known as old field pine or black pine, **shortleaf pine** (*Pinus echinata*) has the widest range of any pine in the Southeast, and is one of the four most important commercial conifers in that region. Shortleaf was believed to be heavily used during settlement and development of the Commonwealth. The wood is straight and durable, particularly the heartwood found in older trees. Prior to European settlement, Virginia's forests were significantly affected by the use of fire by Native Americans. Shortleaf pine, with its moderately thick bark and

ability to resprout following top-kill, allowed it to survive in this landscape. The land clearing, disturbance and land abandonment regime associated with settlement was also favorable for shortleaf pine establishment. In Virginia, shortleaf pine occurs statewide with the exception of the Eastern Shore. The areas with the highest concentration of shortleaf are in the southern Piedmont counties. While still present as scattered individuals or components of mixed stands, the conversion of many stands to loblolly pine has resulted in a dramatic decrease in the number of acres of shortleaf pine – from 1.4 million acres in 1940 to just under 120,000 acres in 2007.

Priority Areas

Priority areas for any diminished species restoration are first and foremost dictated by the historic range of the species. The following three maps illustrate the ranges for longleaf pine; American chestnut, and shortleaf, respectively.

Figure 25: Longleaf Pine Historic Range

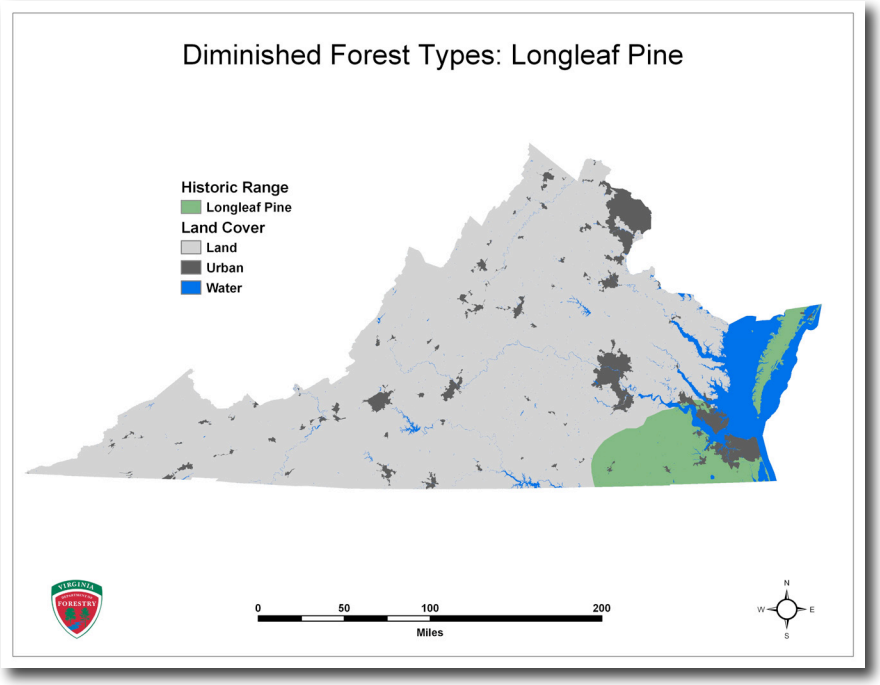


Figure 26: American Chestnut Historic Range

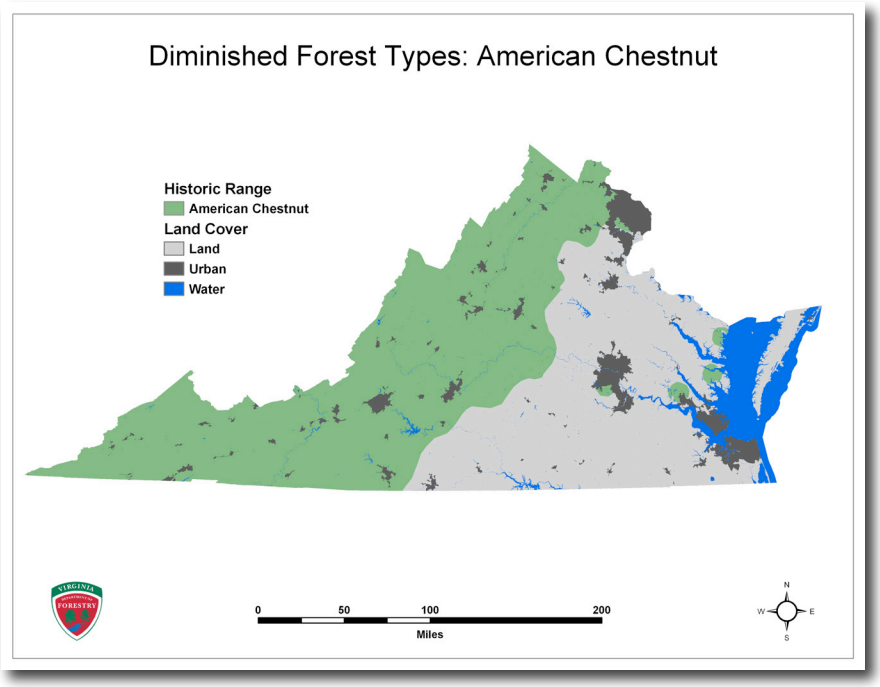
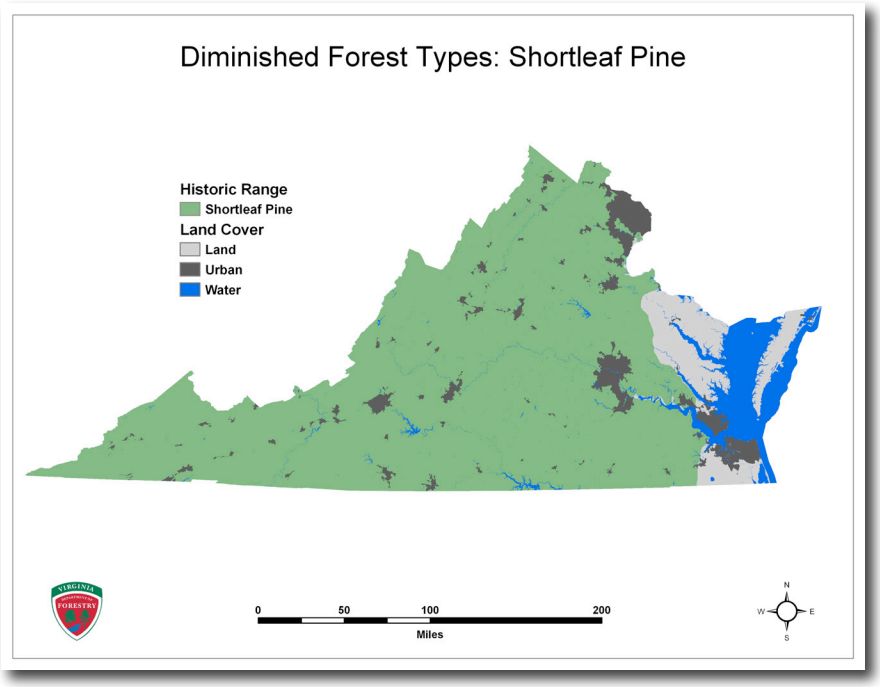


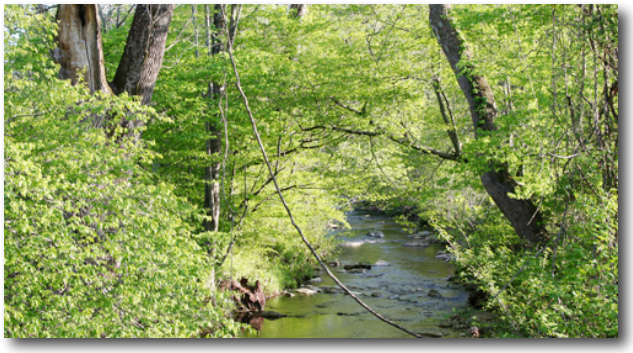
Figure 27: Shortleaf Pine Historic Range



Restoration efforts will be aimed at lands within these historic ranges. Particular focus will be on lands that are likely to remain forested, such as public lands and areas under perpetual easement. In addition, we will try to ensure efforts to restore a species on a stand-level are prioritized based on its importance to biodiversity; likelihood of success, and potential economic value.

Issue C1: Enhance the Role of Forests in Maintaining Water Quantity and Quality

Issue Description

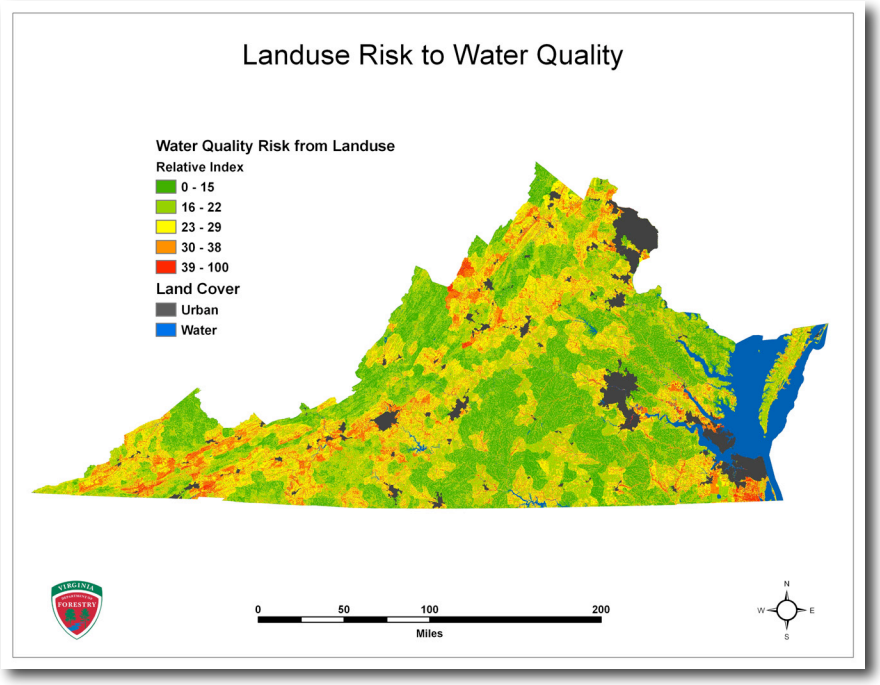


Perhaps one of the most important contributions of Virginia's forests is cleaning and storing water. Virginia has strong efforts and guidelines to maintain water quality during timber harvesting operations, as well as participation in establishing new forested buffers. Virginia requires all localities to adopt water supply plans that show how they propose to provide clean and abundant drinking water over the long term. It costs less to treat drinking water from forested watersheds (Trust for Public Lands, 2007). However, streams continue to degrade in some areas. In Virginia, 60 percent of the watersheds drain to the Chesapeake Bay. The remaining 40 percent of the watersheds comprise the southern watersheds, such as the Albemarle Sound watersheds to the south and east; the New River, and the Upper Tennessee Watershed to the southwest, which includes the Clinch, Holston and Powell rivers. All of these major watersheds contain impaired streams. Increasing population; changes in land-use, and more intensive use of the land are decreasing the forest cover within watershed drainages and adversely affecting the ability of forests to filter, slow and store water.

Priority Areas

The need for high-quality water and forests to protect these waters is universal across the Commonwealth. Despite this ubiquitous need, there are ways to make water quality efforts more effective. The following priority area map (Figure 28) was generated using data from the Southern Forest Land Assessment (SFLA) GIS data, and utilizes these SFLA data layers, by order of weight, from greatest to lowest: Riparian Area, Priority Watersheds, Slope, Public Drinking Water, Wetlands, Threatened and Endangered Species, Development Level and Forestland. Areas in red are at the highest risk of impacting local and/or regional water quality when disturbed by land-use activities. Areas in green indicate a high level of water quality protection and/or a low level of possible deleterious impact.

Figure 28: Water Quality Priority Areas for Virginia



Issue C2: Promote Initiatives for Ecosystem Services

Issue Description

More than 62 percent of Virginia is forestland area. This represents a significant potential for forests to contribute critical benefits essential to human life and a high standard of living. These forests are our natural capital that provide vital ecosystem services. The link between economic and environmental sustainability is driving the emergence and development of new ecosystem service markets and inclusion of ecosystem services in land development planning. Recent developments in the markets for ecosystem services will present some new opportunities for forest landowners. There is increasing recognition of the importance these provisioning, regulating and cultural ecosystem services provide to society. Many of the services, such as clean air and water; biodiversity, and viewsheds, have been provided by forestland with little consideration of their market value to the landowner.

The infrastructure for capturing the economic value of provisioning ecosystem services, such as supplying traditional forest products, is well established. However, the same cannot be said for the vast array of regulating and cultural ecosystem services. Virginia's forests reduce nutrient and sediment loads delivered to streams; sequester (capture) and store carbon that may contribute to climate change; enhance biodiversity; foster pollination, and

improve air quality through removal of various air pollutants. Each year, Virginia's forests capture 6.42 million tons of carbon – that's 14 percent of our state's emissions sequestered for free by our forests.

The market infrastructure is emerging for voluntary carbon transactions (e.g., Over-the-Counter trades, Chicago Climate Exchange). However, an adequate market infrastructure is not in place for enabling forest landowners to realize an economic return for providing other "free" ecosystem services, such as clean air (e.g., ozone, nitrous oxides, particulate matter) and clean water.

Better valuing the environmental benefits and services provided by forestland will be key to slowing the loss of forestland in Virginia. The loss of these forested acres and the ecosystem services they provide represents a significant cost to society. This loss often necessitates the need to engineer expensive, technological solutions to address potential climate impacts, storm water management, nutrient loading abatement, etc. In addition to initiatives that promote market-based conservation, it is important to promote inclusion of ecosystem service considerations in our land-use planning activities.

Priority Areas

The field of ecosystem services is rapidly evolving. Issues, such as ecosystem service quantification and valuation, are being addressed at both the state and federal levels. It is important to understand that not all ecosystem services are created equal. Each has a different metric (unit of quantification) and a different market scale (geographic area). For example, a water utility managing a municipal water supply reservoir may want to manage how forest cover in the reservoir watershed reduces tons of sediment reaching the reservoir. As another example, an electric utility may want to offset its carbon emissions by purchasing carbon credits. Since carbon is globally fungible, the credits (metric tons of carbon dioxide equivalents – $mtCO^2$) can theoretically be purchased from any forest-offset project in the world.

Factors including: geographic scale; metrics for quantification; ensuring additionality and permanence, and designing offset project databases make delineating priority areas for various ecosystem services problematic at this point in time. As these issues become resolved, priority areas can be readdressed and refined into meaningful areas. That being said, there are opportunities to address establishing priority areas for some ecosystem services that are obtained from forests. For example, watersheds that supply municipal water supplies could be targeted for the ecosystem service of water quality and quantity.

Issue C3: Expand and Improve Urban and Community Forests

Issue Description

Urban forests and tree canopy are critical to improving air quality; cooling urban landscapes; reducing urban storm water runoff, and contributing to the quality of life for residents. In Virginia, the decline in air quality, particularly in and near the urban centers, is of great concern. Virginia's urban areas are rapidly expanding, often leading to tree canopy loss and fragmentation of the remaining forestlands.

Urban and community forests absorb and clean pollutants from land runoff and also reduce peak storm flows, thereby minimizing flooding. A national study of the value of urban tree cover for reducing stormwater problems and improving air quality shows that the trees in our cities save more than $400 billion from not having to build structures to clean our air and water[4]. The urban forests perform this work far more cost effectively than any engineered solutions. Urban tree canopy goals are now an accepted air quality improvement strategy in mandated regional air quality improvement plans. In addition, well-managed urban tree populations have been shown to make a positive contribution to community well-being; community aesthetics; business district appeal, and residential property values.

Within the Virginia Department of Forestry, there exists a long history of in-depth planning, prioritization and focused delivery of programs and projects in the urban forestry arena. This is partly due to the fact that we began to focus agency efforts on these areas only much more recently than our more traditional areas of fire and forest management. Another significant reason for the more robust nature of our planning in the urban arena is we have been almost exclusively tied to federal funding for our project delivery from the time the program was established in the 1980s.

Priority Areas

Unlike other issue areas, which have attempted to focus limited resources on specific geographic areas, in the urban arena, the priorities are established based upon specific actions that have been deemed to be high priority. These programs and/or actions will be delivered where appropriate across the state, but the nature of the program assumes they will generally be delivered in urban, suburban and small community areas.

These priorities are part of the five-year Urban and Community Forestry Strategic Plan and are structured into six priority areas, including:

1. **State and local capacity in urban and community forestry.**

   Strengthening urban and community forestry programs at all levels is the focus in this priority area. The goal is to build the capacity of city, town and county governments, as well as local and regional non-profit organizations, to implement effective local urban forestry programs. The strategies in this priority area focus on making the case for localities to increase professional staff and budgets for urban forestry management by showing the multiple benefits provided by effective urban forest management. Education, technical assistance, quantifying urban forest values and advocacy are key components of these strategies.

2. **Ecosystem service values and other public benefits of urban/community forests.**

   This priority area focuses on assisting communities assess their urban forest and quantifying the ecosystem services values that their urban forest provides in terms of air quality; water quality; storm water management; carbon sequestration; energy conservation, and heat island temperature modification.

   Using tools such as *UFORE*, urban forest values can now be quantified in ways not possible a decade ago. This information can be used in decision making at the local level, and its availability has the potential to positively impact local decisions and budgets related to

[4] Gangloff, Deborah; Moll, Gary. "Putting Trees on the Payroll," American Forests, Autumn 2003, Vol. 109 Issue 3.

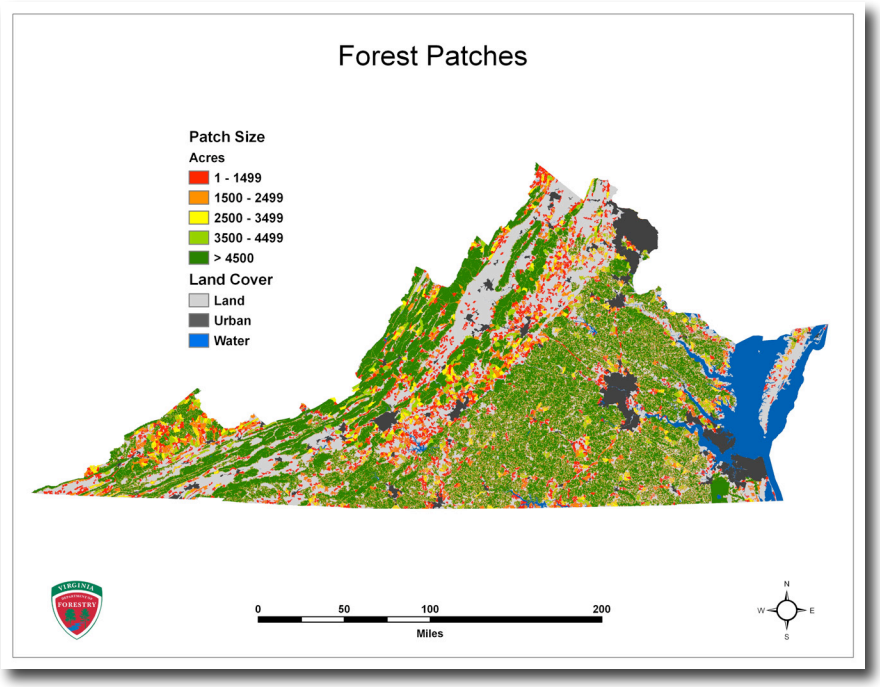
urban forests. More quantitative data on the contribution of urban forests to business district enhancement, public well-being and even public health are now available.

Using geospatial analysis and continuing the VDOF's urban tree canopy (UTC) initiative are key strategies within this priority area. These efforts will require strong partnerships with university and regional partners that are identified.

3. **Impacts of urbanization and fragmentation.**

As Virginia's population grows and, to an extent, decentralizes, the forest cover also becomes more fragmented and disparate, thereby losing or at least deceasing some of the important benefits that forestland provides. Figure 29 shows the degree to which the once highly contiguous forests of Virginia have been broken into smaller, more isolated areas of forestland. The VDOF has played a significant role in advancing the green infrastructure concept of ecosystem management and land conservation in Virginia. Using green infrastructure concepts will be key to the strategies in this priority area that will address ecosystem management along the rural-to-urban continuum.

Figure 29: Forest Patches in Virginia



U&CF grants and three *US Forest Service Redesign* grants have already provided some green infrastructure and other land planning/conservation tools that can be employed in this priority area. See http://www.uap.vt.edu/forests/forests.html and http://www.gicinc.org/projects.htm. Working with our university and non-profit partners (Green Infrastructure Center, various land trust organizations, etc.), critical forested landscapes can be identified. Using the land-use planning modules in the US Forest Service *Changing Roles* to train VDOF field personnel will assist them in working with local planning officials on green infrastructure and other land planning/conservation efforts. Continuing

efforts to conserve and enhance urban green space and open space will make cities and towns more desirable places to live. Promoting greenway efforts is also an effective strategy in developing *green infrastructure* networks. As funding levels permit, U&CF grants can support local *green infrastructure* planning and education efforts.

4. **Underserved, diverse and non-traditional populations.**

   Delivering the U&CF program to underserved and diverse audiences has been a long-standing commitment of the program as well as a continual challenge. Our existing partnership with the Community Design Assistance Center (CDAC) at Virginia Tech has been quite successful in reaching underserved communities and working with CDAC will continue to be an important strategy in the future.

   The VDOF has recently signed a Memorandum of Understanding with Virginia Tech and *Virginia State University (VSU)*. *VSU* is Virginia's other land grant institution and serves a predominantly minority population. The U&CF program has already established ties with personnel at VSU, and VSU is now represented in the Virginia Urban Forest Council *(Trees Virginia)* and the *Virginia Natural Resources Leadership Institute* (sponsored by the U&CF program). The U&CF program will work to develop this partnership and use VSU as one gateway to engage and serve minority populations.

   Other strategies include an outreach program to economically underserved SW Virginia where environmental problems abound, as well as increased efforts to include more diversity in *Trees Virginia* and the *Virginia Natural Resources Leadership Institute (VNRLI)* through more intense recruitment efforts.

5. **Urban forestry profession in Virginia.**

   This priority area has both an internal and external focus. External strategies include: continuing the VDOF's support of the developing urban forestry program at Virginia Tech; promoting the *ISA Certified Arborist Program*; offering or supporting seminars, workshops, etc., to professionals, and working with *Tress Virginia* to provide scholarships to students in urban forestry related disciplines.

   Internally, the VDOF will continue to build its numbers of *ISA Certified Arborists* and make other urban forestry training available to field personnel (conferences, workshops, seminars, etc.). There will also be a focus on presenting the US Forest Service C*hanging Roles* training to our field personnel.

6. **Natural disasters affecting urban and community forests.**

   This priority area will focus on how the VDOF can assist communities in preparing for catastrophic storm events that can potentially have a devastating impact on urban forests. Factoring the urban forest into community emergency preparedness plans will be stressed. Another strategy will focus on training VDOF personnel in *Urban Forest Strike Team (UFST)* concepts. The Virginia Department of Forestry must also pursue a stable funding source to support UFST deployment.

Issue C4: Facilitate Opportunities for Forest Certification Among Forest Landowners

Issue Description

Forest products markets in Virginia are well established, with raw and finished materials distributed locally and throughout the world. Virginia has worked to develop and expand these markets. Increasing national and worldwide emphasis on environmental sustainability has led to the development of several forest product certification systems. Non-industrial forest landowners account for 80 percent of private forestland ownership, yet few of these landowners are engaged in certification. Only 15 percent are even involved in any type of sustainable forestry program, which is a certain requirement for participating in any certification program. Major green building program requirements make most wood harvested in Virginia ineligible for credit, but forest products industries are increasingly making location and expansions decisions based on the availability of certified sustainable wood, particularly secondary wood manufacturing companies. All these things are creating a competitive disadvantage or exclusion from some markets for many of Virginia's forest landowners.

Priority Areas

Certification systems for forest products can hardly be described as a new concept. However, the small forest landowners who own the majority of Virginia's forestland in tracts averaging less than 30 acres in size have largely been either ignored by the established systems (SFI and FSC) or slow to adopt the systems available to them (American Tree Farm System).

With the noticeable exception of Northern Virginia, Virginia's forest products markets are generally well dispersed across the Commonwealth, and the larger companies are all participants in one or more certification system, so the potential demand for certified forest products is also well-dispersed. With acceptable markets in almost all areas of the state, and the growing understanding among forest products manufacturers that the demand from retailers and consumers for certified forest products will increase in the future, it is likely that certification systems for small forest landowners will have strong applicability across the state.

Because certification systems for small forest landowners continue to rapidly evolve; acceptable markets are well dispersed across the state, and the demand for certified products is certain to increase, it is likely that this issue will not need a priority area focus like the others in this forest assessment. Until the need for this type of focus becomes clear, no priority area will be delineated.

Section VII

Linking Issues to Actions

The primary purpose of this ***Virginia Assessment of Forest Resources*** has been to gather a snapshot of the current condition of the forests in Virginia and articulate some desired outcomes for Virginia's forests of the future. The companion document, the ***Virginia Department of Forestry Strategic Plan*** lists 8 goals, 26 objectives, 34 measures and 106 strategies, all aimed at shaping Virginia's future forests and achieving these desired outcomes.

Out of the assessment process, a broad range of stakeholders chose 10 major issues as the most important or having the broadest potential impact. These include:

A. National Theme – Conserve Working Forestlands

1. Conserve the forestland base
2. Promote a larger, connected forest landscape
3. Ensure the sustainable use of woody biomass

B. National Theme – Protect Forests from Harm

1. Protect woodland homes communities from fire
2. Protect forests from invasive species
3. Conserve and restore diminished species

C. National Theme – Enhance Public Benefits from Trees and Forests

1. Enhance the role of forests in maintaining water quantity and quality
2. Promote initiatives for ecosystem services
3. Expand and improve urban and community forests
4. Facilitate opportunities for forest certification among landowners

Each issue has a variety of objectives and associated strategies aimed at helping achieve the desired future outcome. In order to bridge the gap between identified issues and practical actions, this section lists the applicable objectives from the companion strategic plan, grouped by the issue they are designed to address. Specific strategies associated with these objectives can be found in the companion strategic planning document.

Issue A1: Conserve the Forestland Base

Objective 2.1 – Increase the amount of forestland protected and/or established in Virginia watersheds, with a priority on significant watersheds.

Objective 3.1 – We will increase the number of forest management projects implemented on private land and promote cost-share funding for all appropriate projects.

Objective 3.3 – Increase the amount of forest management assistance on private lands in the Commonwealth.

Objective 4.1 – Increase the number of acres of forestland protected from conversion, focusing, where possible, on lands ranked as high in "Forest Conservation Value." Include expanding efforts in non-permanent conservation.

Objective 4.2 – Increase awareness of the importance of and need for forestland conservation among landowners and local governments.

Objective 4.3 – Manage the state forestlands on a sustainable basis for research, demonstration, education and multiple-use benefits while staying within the allowable forest harvest levels.

Objective 5.1 – Promote diversification of forest markets and a healthy forest industry to keep forests in forests.

Objective 6.2 – Provide an inventory of forest natural resources in Virginia on a continual basis.

Issue A2: Promote a Larger, Connected Forest Landscape

Objective 2.1 – Increase the amount of forestland protected and/or established in Virginia watersheds, with a priority on significant watersheds.

Objective 3.1 – We will increase the number of forest management projects implemented on private land and promote cost-share funding for all appropriate projects.

Objective 3.3 – Increase the amount of forest management assistance on private lands in the Commonwealth.

Objective 4.1 – Increase the number of acres of forestland protected from conversion, focusing, where possible, on lands ranked as high in "Forest Conservation Value." Include expanding efforts in non-permanent conservation.

Objective 4.3 – Manage the state forestlands on a sustainable basis for research, demonstration, education and multiple-use benefits while staying within the allowable forest harvest levels.

Objective 4.4 – Promote a larger, connected forest landscape.

Issue A3: Ensure the Sustainable Use of Woody Biomass

Objective 5.1 – Promote diversification of forest markets and a healthy forest industry to keep forests in forests.

Objective 5.5 – Promote stakeholder cooperation in growing Virginia's Green Energy sector.

Issue B1: Protect Woodland Home Communities from Fire

Objective 1.1 – We will reduce the forestland burned by wildfires

Objective 1.2 – Provide available financial resources to rural volunteer fire departments for training and the acquisition of small equipment and wildland fire personnel protective equipment.

Objective 1.3 – Continue long history of proactive fire prevention efforts, particularly in identified high-risk areas.

Objective 8.1 – We will be prepared to act in the interest of the citizens of the Commonwealth and its infrastructure during emergency situations by actively planning and training both as an agency and as individuals.

Objective 8.2 – We will test the VDOF Continuity of Operations Plan (COOP) sufficiently enough to encompass headquarters, regions, state forests and nurseries and determine its effectiveness in a true emergency.

Issue B2: Protect Forests from Invasive Species

Objective 3.4 – Implement actions to protect Virginia's forest resource from species loss and from the impacts of detrimental native and invasive plants and pests.

Issue B3: Conserve and Restore Diminished Species

Objective 3.4 – Implement actions to protect Virginia's forest resource from species loss and from the impacts of detrimental native and invasive plants and pests.

Objective 5.3 – Manage the nurseries to provide the best quality seedling types demanded by the customer.

Issue C1: Enhance the Role of Forests in Maintaining Water Quantity and Quality

Objective 2.1 – Increase the amount of forestland protected and/or established in Virginia watersheds, with a priority on significant watersheds.

Objective 2.2 – We will protect and enhance water quality by increasing compliance with BMPs on forest harvest sites.

Objective 2.3 – Mitigate the water quality impact of urban and suburban stormwater and impervious surfaces.

Objective 3.1 – We will increase the number of forest management projects implemented on private land and promote cost-share funding for all appropriate projects.

Issue C2: Promote Initiatives for Ecosystem Services

Objective 5.1 – Promote diversification of forest markets and a healthy forest industry to keep forests in forests.

Objective 5.2 – Increase awareness of ecosystem services provided by forestland and urban forest tree canopy to foster market development and incorporation into land-use planning.

Issue C3: Expand and Improve Urban and Community Forests

Objective 2.3 – Mitigate the water quality impact of urban and suburban stormwater and impervious surfaces.

Objective 3.2 – Increase urban forest management in Virginia communities, particularly state and local capacity to address urban forestry issues and concerns.

Objective 5.2 – Increase awareness of ecosystem services provided by forestland and urban forest tree canopy to foster market development and incorporation into land-use planning.

Objective 8.3 – Develop the capacity of state and local urban forestry programs and professionals to prepare for and respond to natural disasters affecting urban forests.

Issue C4: Facilitate Opportunities for Forest Certification among Landowners

Objective 3.3 – Increase the amount of forest management assistance on private lands in the Commonwealth.

Objective 5.6 – Facilitate opportunities for forest certification among private forest landowners.