



# 2013 STATE OF THE FOREST



ANNUAL REPORT  
ON VIRGINIA'S FORESTS

# CONTENTS

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<b>FROM THE STATE FORESTER</b>	<b>3</b>
<b>VIRGINIA FOREST TRENDS</b>	<b>4</b>
FORESTED LAND	4
FOREST OWNERSHIP	4
FOREST TYPES	5
FOREST SUSTAINABILITY - SOUTHERN FUTURES PROJECT	5
<b>ECOSYSTEM SERVICES</b>	<b>7</b>
<b>FORESTLAND CONSERVATION</b>	<b>8</b>
VOLUNTARY FOREST MITIGATION PROGRAM ADDRESSES FOREST CONVERSION IN VIRGINIA	9
<b>OUR STATE FORESTS</b>	<b>10</b>
<b>FOREST MANAGEMENT</b>	<b>11</b>
SPECIAL PROJECT EMPHASIS	11
<b>FOREST PROTECTION FROM WILDFIRE</b>	<b>12</b>
TRAINING PROGRAM	12
DRY HYDRANT PROGRAM	12
VOLUNTEER FIRE ASSISTANCE PROGRAM (VFA)	12
WILDFIRE PREVENTION	13
<b>WATER QUALITY PROTECTION</b>	<b>14</b>
WATERSHED PROTECTION	15
<b>FOREST HEALTH</b>	<b>16</b>
PERIODICAL CICADA	16
<b>FOREST RESEARCH</b>	<b>17</b>
<b>FOREST INDUSTRY AND MARKETS</b>	<b>19</b>
<b>URBAN AND COMMUNITY FORESTRY</b>	<b>21</b>
GREEN INFRASTRUCTURE	21
GREENWAYS AND RECREATION	21
NATURAL DISASTER RESPONSE	22
TREES VIRGINIA (VIRGINIA URBAN FOREST COUNCIL)	22
<b>ACCOMPLISHMENT REPORT</b>	<b>23</b>

# FROM THE STATE FORESTER

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On the eve of our 100th Anniversary as a state agency, I'm pleased to present to you the State of the Forest Report that covers our 99th year of protecting and serving the citizens of the Commonwealth.

The sluggish U.S. economy continued its negative impact on the forest industry this year, according to the most recent study of the state's agriculture and forest industries. The report shows the overall economic output of Virginia's forest industry at more than \$17 Billion annually, and 103,000 Virginians working in forestry and related industry. While forestry is still a major player in the Virginia economy (and together with Agriculture it remains Virginia's No. 1 economic engine), there has been some contraction over the last few years.

But we are seeing signs of improvement in some sectors. One of the strongest areas is the biomass energy sector. There are several biomass power plants in operation across the state; expansions of biomass energy systems at multiple sites, and the addition of two pellet mills. Traditional forest industries are also experiencing a resurgence, and overseas demand for Virginia wood products continues to expand.

More than 62 percent of the Commonwealth is forestland, the bulk of which is privately owned. More than 373,600 individuals and families control 10 million acres of Virginia forestland. Forest products firms own just 1 percent (186,700 acres) of the forestland – that's down from 7 percent in 2001. While we hear some people say otherwise, the forests of Virginia actually continue to display good species diversity. Hardwood and hardwood-pine forest types make up more than 12.6 million acres – that's more than 79 percent of the forestland! And pine forests represent 20 percent (about 3 million acres) of the state's forestland – a far cry from the 1940 inventory when pine constituted 6.2 million acres.

Another report that came out this year was the Southern Forest Futures Project, which was designed to model and project the tentative impact of urbanization/population growth, climate change, non-native invasive species and timber markets/demand on the extent and composition of the forests of the South 50 years from now. While I can't share the entire report with you in the space I have here, a couple items of note from the report include: an estimated annual loss of 20,800 acres of Virginia timberland (that's 956,800 acres lost through the year 2058), and an average annual increase of 12,000 acres of pine plantation (552,000 acres through 2058).

On the pages that follow, you'll find a lot of information in other areas, such as forest health, research, forest management, resource protection, land conservation, ecosystem services and, of course, water quality, that are of interest to you. Thank you for your support of forestry in the Commonwealth.

Sincerely,

Carl E. Garrison III  
State Forester

# VIRGINIA FOREST TRENDS



## FORESTED LAND

For 2013, more than 15.8 million acres – more than 62 percent of the Commonwealth (figure 1) – qualified as forestland. Of this forestland, 15.3 million acres are categorized as commercial timberland and 500,000 acres are categorized as reserved forestland, e.g., Shenandoah National Park, VA state parks, etc.

While the Commonwealth had been losing an average of 16,000 acres of forestland annually in recent years, the amount of forestland has stabilized for the past few years (possibly a reflection of the economic downturn). However, in 2012, the amount of forestland again experienced a net loss.

## FOREST OWNERSHIP

Most of Virginia's forestland is privately owned (more than 12.8 million acres). More than 373,600 individuals and families hold a total of 10 million acres. These private holdings average less than 75 acres in size, but range from a few acres to thousands of acres.

By 2012, ownership of forestland by forest products firms had declined to slightly more than 1 percent (186,700 acres) of the total forestland area. This is a reduction from seven percent in 2001 and 11 percent in 1992.

The balance of Virginia's forestlands (18 percent) is owned by federal, state and local governments – the largest entity being the USDA Forest Service National Forest System lands at 1.7 million acres. (Figure 2)

The Virginia Department of Forestry – through its 23 state forests - holds 68,359 acres of forestland.

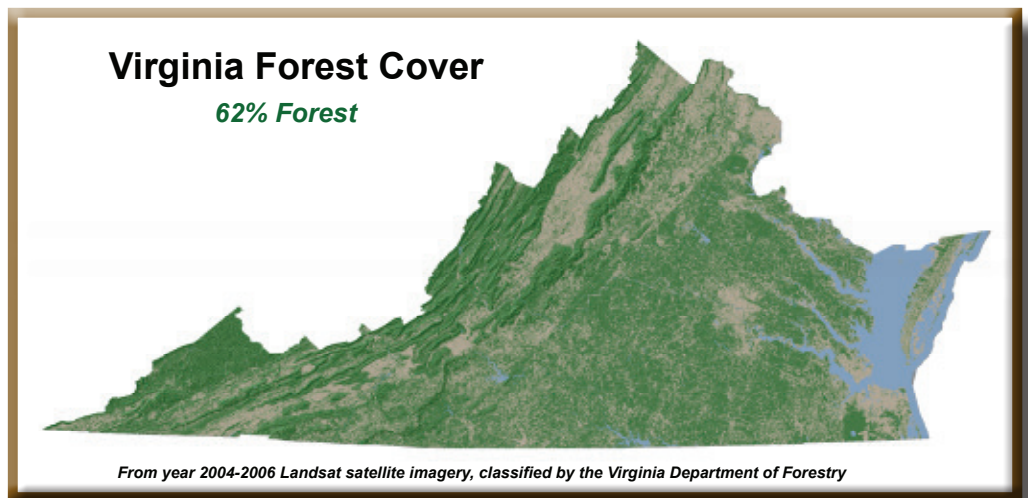


Figure 1 Virginia Forest Cover

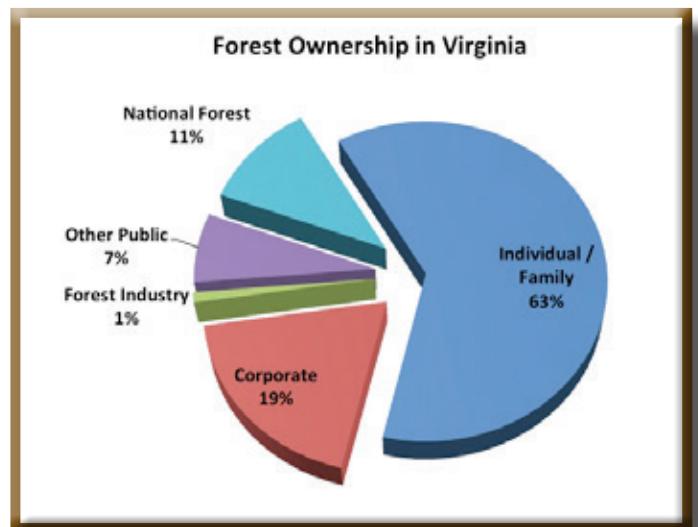


Figure 2 Forest Ownership in Virginia

# VIRGINIA FOREST TRENDS,

*continued*



## FOREST TYPES

In terms of composition, the forests of Virginia continue to display good diversity. Hardwood and hardwood-pine forest types make up more than 12.6 million acres of the Commonwealth's forest – more than 79 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 half the hardwood acreage in stands 60 years old or older.

Pine forests represent approximately 3 million acres (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 65 percent of the pine acreage. (Figure 3)

## FOREST SUSTAINABILITY – SOUTHERN FOREST FUTURES PROJECT

In late 2012, the Southern Forest Futures Project (SFFP) summary report (Wear, D.N. & Greis, J.G., USDA-Forest Service, Asheville, NC SRS-GTR-168) was released, which will be followed by sub-regional summaries. The goal of this project is to model and project the tentative impact of urbanization/population growth; climate change; non-native invasive and timber markets/demand on the extent and composition of the forests of the South. The study uses six scenarios or "cornerstones" to project future trends in forestland area, forest type and timber volume production among other parameters.

For Virginia, the SFFP study estimates an annual loss of 20,800 acres of timberland through the year 2058

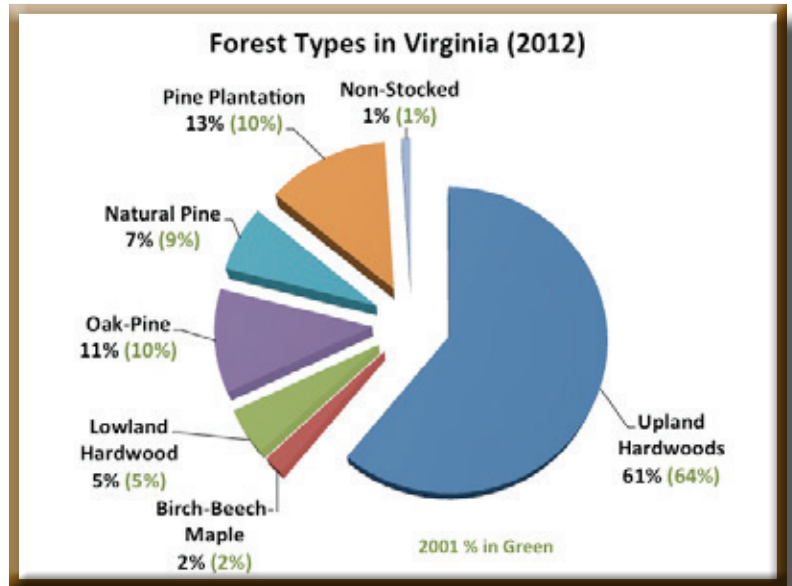


Figure 3 Forest Types in Virginia

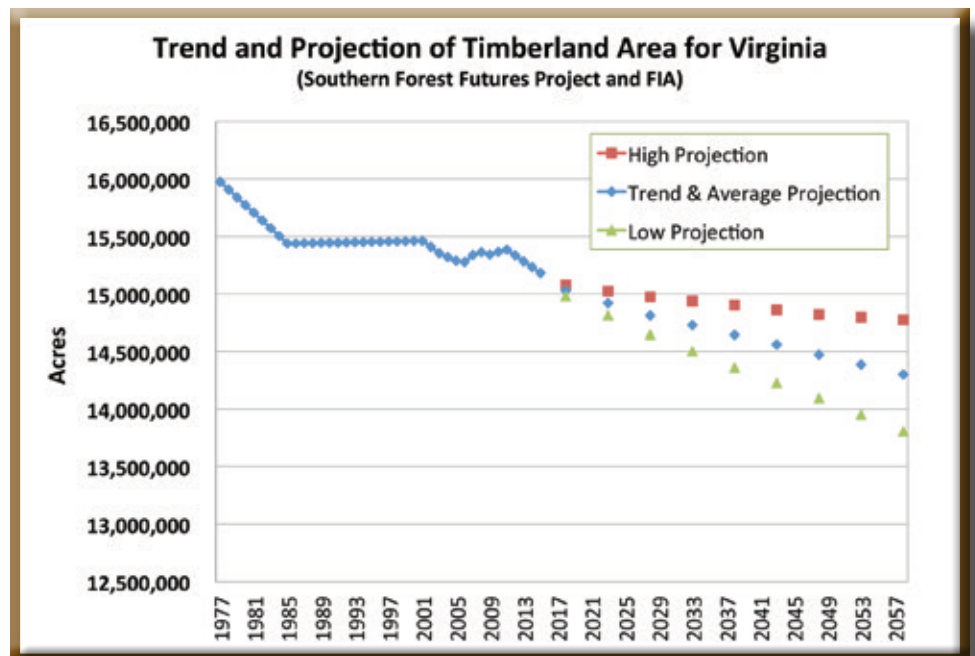


Figure 4 Trend and Projection of Timberland Area in Virginia (Southern Forest Futures Project & FIA)

# VIRGINIA FOREST TRENDS,

*continued*



(Figure 4). The loss of forest area is distributed among the various forest types, with the exception of pine plantations (Figure 5).

SFFP predicts an average annual increase of 12,000 acres in pine plantation through 2058 (Figure 6). In terms of carbon sequestration, wood fiber for forest products and biomass, etc., this increase in the area of pine plantations somewhat mitigates the loss in area of the other forest types, due to the greater productivity of these managed forests.

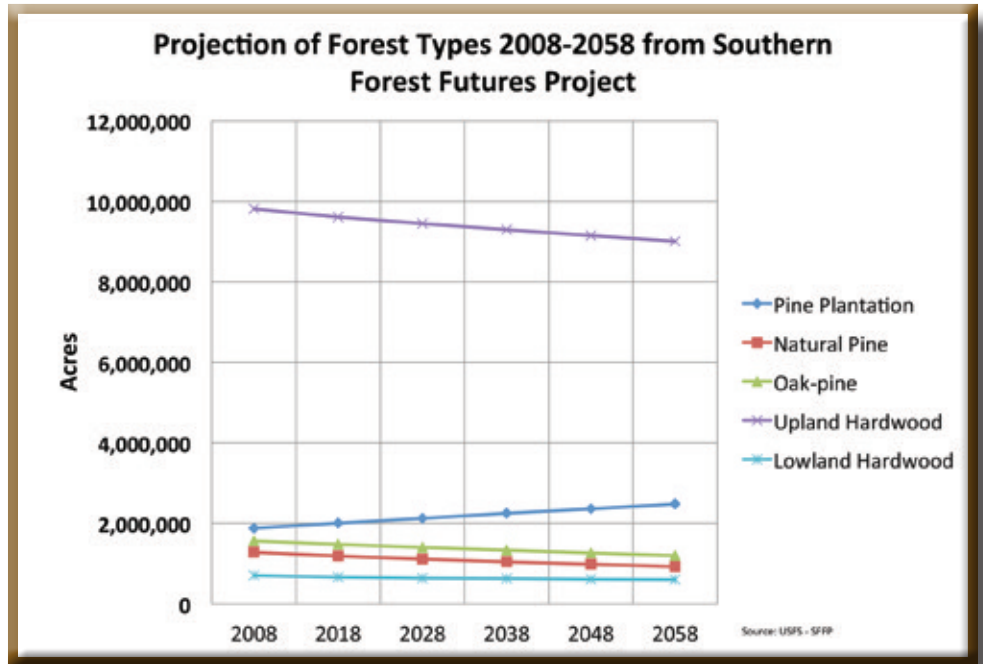


Figure 5 Projection of Forest Types 2008-2058 (Southern Forest Futures Project)

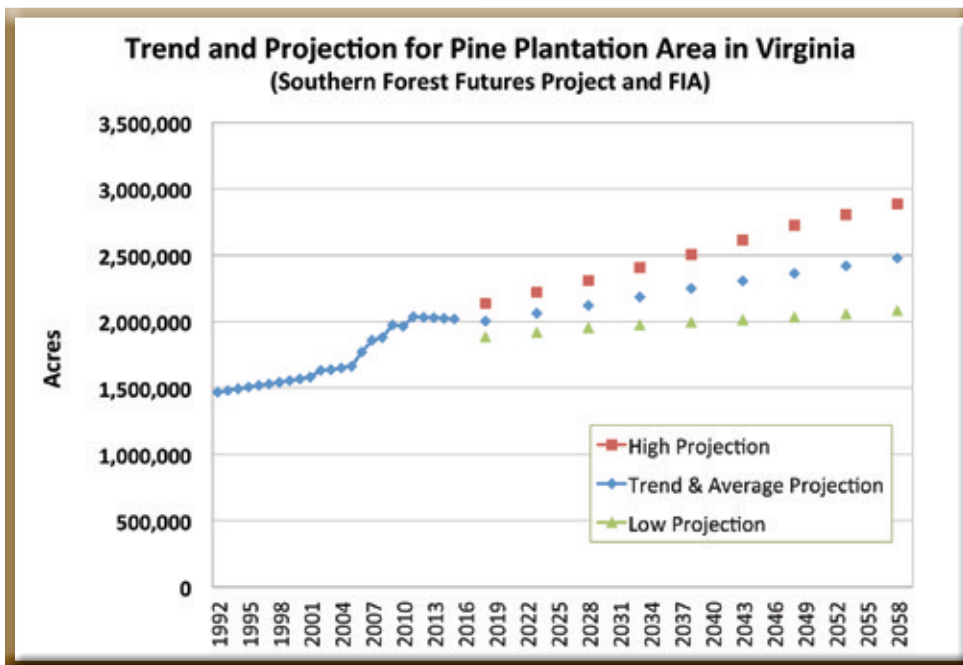


Figure 6 Trend and Projection of Pine Plantation Area in Virginia (Southern Forest Futures Project & FIA)

# ECOSYSTEM SERVICES



Virginia's forests provide many environmental benefits and services, such as carbon sequestration, biodiversity, pollination, recreation, aesthetics, reducing nutrient loads to streams and enhancing air quality. These regulating and cultural services are in addition to the traditional wood products our forests provide. Our forests are truly the natural infrastructure upon which our quality of life depends. The 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 23.5 million metric tons of carbon dioxide emissions. Carbon dioxide is considered by many to be a major greenhouse gas. The growth of Virginia's forests offsets about 14% 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 one million metric tons of carbon dioxide are emitted into the atmosphere due to land-use changes, such as the loss of forest cover.

Other emerging market opportunities include planting trees to enhance water quality. For example, in Virginia's Nutrient Credit Trading Program, tree planting projects on open land are recognized as a management practice that generates saleable credits. The plantings reduce nitrogen and phosphorus loading and, therefore, enhance water quality. Forestry will have a role to play in reducing nutrient loading in the Chesapeake Bay and other Virginia waters. In addition to playing a key role in getting recognition for existing forest cover into the Chesapeake Bay Phase II Watershed Implementation Plan (WIP), VDOF has been involved with the Commonwealth's effort to expand the Nutrient Credit Trading Program.

The Forests to Faucets (F2F) program, a national-level initiative funded by the U.S. Endowment for Forestry and Communities and the Natural Resources Conservation Service, is designed to develop a process that financially links urban water consumers to the rural landowners managing the watershed that provides the water supply. The specific project area includes the entire Rivanna River Basin. Landowners in the basin can receive a financial incentive for tree planting, donated conservation easements, riparian buffers, forest stewardship plans and stabilizing forest harvest sites. The objective is to demonstrate that good forestland management is an effective tool in reducing sediment and nutrient loads to the reservoir.

In addition to carbon sequestration and water quality, other forest ecosystem services, such as providing biodiversity and air quality, are extremely important. How we manage our forests and plan for the development of Virginia's landscape need to

consider these values. The Department of Forestry, working with Virginia Tech and other State agencies, has developed and launched InFOREST, a web-based tool that will enhance our ability to include ecosystem service considerations in our land-use planning efforts. InFOREST can be used to quantify ecosystem services, such as carbon sequestration and water quality, provided by forestland. In partner with VDOF, Virginia Tech is further developing InFOREST to include additional ecosystem service calculators. InFOREST is becoming a valuable tool for doing forest consulting work, environmental impact reviews and developing conservation easements.



# FORESTLAND CONSERVATION



Forest inventory data indicate that Virginia loses approximately 16,000 acres of forestland annually, based on a rolling 10-year average. The rate of forest loss has slowed in recent years in response to the decline in the economy and the related pressures of land development. While the economic downturn may be reducing the current rate of forest conversion, it is also having an impact on land conservation efforts. The reduction in property values means that landowners who donate land or conservation easements on their land see the value of their donation reduced. Their donation then generates fewer of the tax benefits that provide the financial incentive for land conservation. Combined with the uncertainty of the future of tax benefits associated with donations, this situation led to an overall decrease in land conservation activity in the Commonwealth for 2012. While most landowners conserve their land out of a desire to perpetuate their woodland legacy, the financial incentives are critical for helping landowners justify the surrender of a significant portion of their property's value.

Despite these factors, the VDOF continues to see steady demand from forest landowners to donate conservation easements on their properties. The VDOF permanently protected 5,040 acres of open space through 17 conservation easements in 2012 – a pace of roughly three-quarters of an acre every hour. The properties ranged in size from 49 acres to 2,348 acres, which is now the largest property in the VDOF easement portfolio. Our 2012 easements were 96 percent forested; 92 percent of the forestland is considered high forest conservation value (FCV). In total, 31.5 miles of watercourses were protected by VDOF easements. The easements were recorded in 12 counties, including the first VDOF easements in Madison, Southampton and Sussex counties.

During calendar 2012, three easements were purchased, or partially purchased, utilizing USDA Forest Service Forest Legacy funds. Two-hundred-sixteen acres were conserved along the Nottoway River in Southampton County and a large, 2,348-acre property owned by Isle of Wight County along the Blackwater River was placed under a joint Dept. of Forestry/Dept. of Conservation and Recreation easement. This easement created the 815-acre Blackwater Sandhills Natural Area Preserve. In addition, a 78-acre privately-owned property along the bluffs overlooking the New River was conserved in Grayson County. VDOF utilizes the Forest Legacy Program, administered by the USDA Forest Service, to conserve important forested properties, many of which provide a buffer along waterways that are sources of public drinking water. This competitive Federal grant program is intended to fund the purchase of conservation easements or fee acquisitions of land for conservation purposes. The program's purpose is to conserve environmentally-important forested areas that are threatened by conversion to non-forest uses.

VDOF continues to offer two local sources of funding to provide incentives for landowners who donate conservation easements. The Tomorrow Woods program utilizes forest mitigation funds to reward landowners for the donation of a conservation easement with enhanced forest protection and management terms. These funds are available to landowners in the counties of Dinwiddie, Isle of Wight, Prince George, Southampton, Surry, Sussex and the City of Suffolk. Forests to Faucets is an innovative program that







was developed to link urban water users with the landowners who manage the land within the Rivanna River Basin. This watershed provides drinking water to thousands of consumers. One element of this program is an incentive payment to landowners who have donated a conservation easement that contains enhanced protections for water quality, such as wider riparian buffers.

Nearly two-thirds of Virginia's woodlands are in the hands of more than 373,000 family forest owners. These family woodlands are relied upon for not only a sustained flow of forest products but for invaluable forest functions and natural values. The management and conservation decisions made by family forest owners play a crucial role in maintaining a viable forestland base in Virginia. Recognizing that conservation easements are only one tool in our effort to preserve Virginia's legacy of working forests, the VDOF and Virginia Cooperative Extension continued to offer forestland succession planning outreach for forest landowners. This seminar focuses on issues related to the transfer of forestland and its management from one generation to the next. The goal is to help landowners begin to make plans for the inevitable transfer of not just the family land but also the family's land management legacy. Follow-up surveys revealed that more than three-quarters of the participants had begun forestland transition planning with an estimated average family savings of \$625,000 as a result of the program. As these landowners continue executing their plans, 47,000 acres of Virginia's forestland are expected to remain sustainable, family-owned and intact. We also continue to work with our conservation partners, within both the public and private sectors, to encourage sustainable forest management on conserved lands

## VOLUNTARY FOREST MITIGATION PROGRAM ADDRESSES FOREST CONVERSION IN VIRGINIA

Virginia has been losing 16,000 acres of forestland to conversion annually, based on a rolling 10- year average using FIA data through 2010. To combat this loss, the Virginia Department of Forestry has been working collaboratively with other state agencies, federal agencies, industry, conservation organizations and other stakeholders to develop ideas for mitigating the loss of upland forests. Upland forests are those forestlands not protected by wetlands regulations. The focus is on three broad categories of mitigation: Preservation, Restoration and Creation. On-site mitigation efforts alone are often insufficient to stem the tide of forest conversion to other, more intensive land uses. Off-site voluntary mitigation is needed as well, and the new VDOF initiative is focused on addressing both concerns. Mitigation responses generally include avoidance of forest conversion through planning, restoration of the forest resource, creating new forests, or an in-lieu payment with the funding used to carry out the mitigation response. VDOF's goal is to create a sustainable forestland mitigation

framework that addresses the loss of upland forest environmental functions and values brought on by necessary municipal infrastructure (highways, power lines, gas lines, etc.), urbanization and other development pressures.

Much of this effort has been funded by a USDA Forest Service grant. A strong focus during the first year of the grant has been strengthening forest conversion avoidance efforts. This has been accomplished through enhancing the project evaluation criteria used to assess impacts of proposed state projects and by the VDOF participating more fully in the Commonwealth's environmental impact review process. Another major thrust this year has been to begin dialogues with its many stakeholders aimed at building consensus on how to standardize mitigation responses through developing a framework. This addresses both the level of mitigation requested and the associated costs. Such a mitigation framework would reduce uncertainty for project proposers and enable project planners to better design and budget for projects. Similarly, VDOF would be able to better plan for and engage the private sector in forest management activities designed to address upland forest loss. Achieving statewide forest conservation goals while simultaneously contributing to economic growth in the Commonwealth is important.

# OUR STATE FORESTS



Virginia's 23 state forests, totaling 68,359 acres, are unique in their purpose, funding and use by the public. State forest lands have multiple objectives and are managed to provide the greatest range of benefits to the citizens of Virginia while remaining self-supporting and protecting or improving the forest ecosystem.

The purpose of management is for the demonstration of scientific forest management, applied forest research, development of diverse wildlife habitat, watershed protection, forest management to develop diverse timber stands that support biological diversity and provide for passive outdoor recreation.

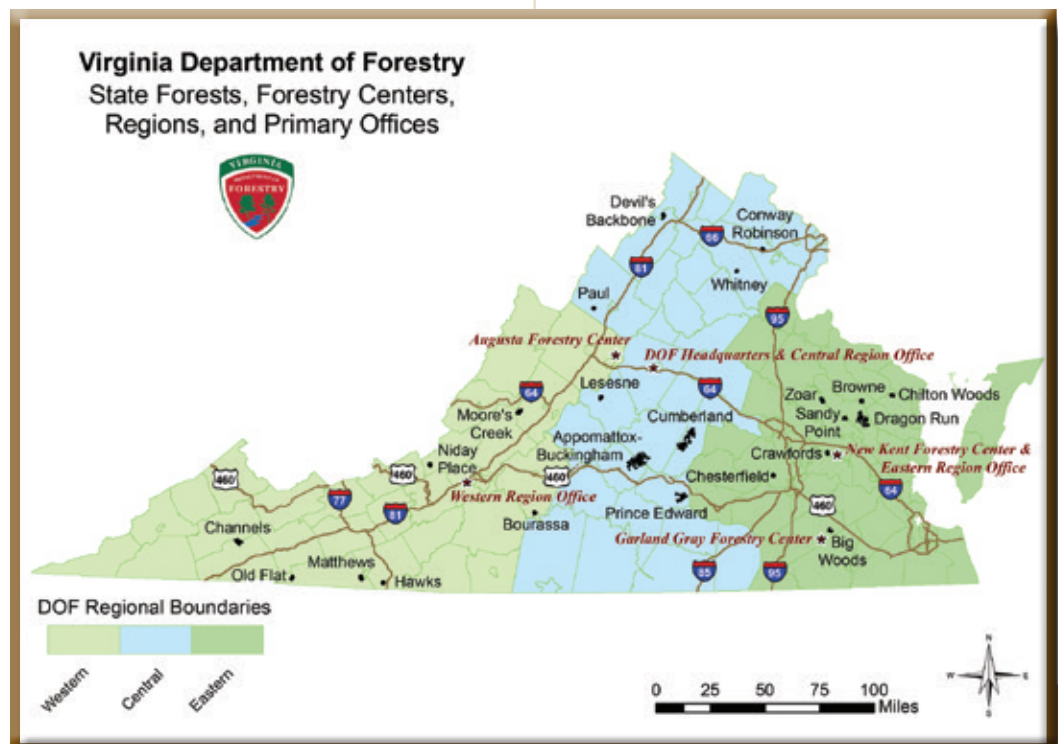
The state forests are well distributed around the Commonwealth and vary in size from 121 acres to 19,808 acres. The large state forests in central Virginia and southeastern Virginia are the core of the working-forest concept and provide the majority of the income to fund the forest system. The smaller forests have developed uses that meet the needs of local users.

Recreational opportunities on these lands 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 a 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 limited, however, and recreational usage must be balanced with good forest management to protect the integrity of the state forest purpose.

As the areas surrounding the state forests continue to grow in population, recreational uses of the land will change along with the expectations from the general public. The department 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 while providing a rewarding outdoor recreation experience for the public. A signage program is being expanded within the state forests to help educate the public about silvicultural operations that are required to maintain a healthy forest.

Over the past few years, forest users have become more diverse as have their expectations of forest accessibility and usage. Traditional uses, such as hunting and fishing, remain popular uses of the forest, while new 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 uses in recent years.



# FOREST MANAGEMENT



The value and quality of forest benefits can be greatly enhanced through planning and implementation of good forest management practices. In 2013, the Department continued to emphasize planning and practice implementation on private lands in the Commonwealth.

Forests, by nature, require time to grow and develop. 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. Department of Forestry, private consulting and industry foresters can develop these plans, and partner with state and federal conservation agencies and contractors to support and implement them. In FY2013, foresters completed plans on 123,912 acres.

Silvicultural practices – management activities that utilize the art and science of tending forests – are the means to build good forests. There are many different types of forest management practices: preparing sites and planting trees; thinning; controlling competing or invasive vegetation; crop tree management; partial or complete harvesting for natural forest regeneration, and prescribed burning. This fiscal year, 3,300 forest management projects were implemented by private landowners throughout the state, and all were designed to build healthy, valuable and productive forests.

There are a number of programs designed to encourage and assist private landowners in implementing forestry practices. The Virginia Reforestation of Timberlands Program provides assistance for planting and improving pine forests. The program is funded by the wood-using forest industry and state general funds. For the past year, the program assisted owners through incentive payments with 1,011 projects on 39,508 acres. Through the history of the program, more than 43,400 planting or improvement projects have been completed on more than 1.6 million acres of Virginia forestland.

The Department is also partnering with other state and federal agencies to leverage the combined resources to implement good forest management practices on private lands. Through several programs available through the USDA Natural Resources Conservation Service (NRCS), Virginia landowners are able to receive incentive payments for forestry, conservation and wildlife practices. In 2013, more than \$1.4 million were obligated to private landowners to implement good forest management practices over the next three years.



## SPECIAL PROJECT EMPHASIS

In addition to the well-established statewide programs to emphasize and encourage forest management, the Department of Forestry is working on special initiatives that are improving the resource and helping landowners meet objectives. The Open Lands Tree Planting Initiative was begun in three geographic focus areas with higher concentrations of open land. There are many acres of open land which naturally revert back to forests each year, but only a small percentage of these are purposefully replanted. The goal of the initiative is to identify these lands, reach out to these landowners, and encourage planting of high-quality trees at good spacing for multiple resource benefits. The Forestry Quail Habitat Recovery Program was launched in February 2013. This is a cooperative program between VDOF and the Department of Game and Inland Fisheries to advance quail recovery. Through the program, cost assistance is provided to landowners in focus counties to implement good forestry practices that also enhance habitat for quail. Examples are early forest thinning and establishing shortleaf pine. All of these projects will help improve Virginia's forests by adding to the benefits they provide to our landowners and citizens.

# FOREST PROTECTION FROM WILDFIRE



The Virginia Department of Forestry responds to nearly 1,000 wildland fires that burn approximately 11,000 acres annually (based on a 10-year average, 2004 – 2013).

Although 70 homes and other structures are damaged or destroyed by wildland fire each year, on average, agency efforts protect more than 1,100 others at a value of more than \$124 Million.

From July 1, 2012 through June 30, 2013:

- ▲ 628 fires burned 4,730 acres;
- ▲ more than \$2.3 Million of timber was damaged;
- ▲ damage to homes and other buildings amounted to \$2.7 million, and
- ▲ an astounding 808 homes, worth more than \$109 Million, along with an additional 742 other structures, worth an estimated \$24 Million, were protected thanks to VDOF efforts.

The Agency relies on highly-trained and experienced personnel operating a fleet of 170 4x4 engines; six specially equipped Hummers; five specially equipped wildland brush trucks, and 95 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.

Virginia Department of Forestry personnel also volunteer to provide incident management expertise to support other all-risk incidents when the need exists. VDOF responded to incidents in Arizona, California, Colorado, Idaho and Nevada within the last 12 months. The practical experience gained during these events develops agency employees with a broad base of expertise to handle any emergency in Virginia.

## TRAINING PROGRAM

The Virginia Department of Forestry is a recognized national leader in its delivery of wildfire suppression, incident management and personnel development training for emergency responders. In June of this year, the VDOF held its 13th annual statewide Interagency Wildfire Academy. This academy, one of the four largest in the nation, provided training to more than 350 students representing more than 11,000 hours of total training. The event hosted responders from various state and federal agencies through the Commonwealth, responders from three surrounding states and representation from more than 65 Virginia Volunteer Fire Departments. On a more local basis, VDOF personnel provide at least one regionally based academy every year as well as numerous county-based training opportunities in an effort to further develop the expertise of Virginia's fire service.

## DRY HYDRANT PROGRAM

The Virginia Dry Hydrant Grant Program is funded by the General Assembly using money from the Virginia Fire Programs Fund and administered by the VDOF. The objectives of the program are to:

- ▲ Conserve energy by reducing losses from fire;
- ▲ Conserve energy by reducing miles traveled to shuttle water;
- ▲ Fund the installation of dry hydrants that otherwise would not be installed, and
- ▲ Conserve processed domestic water supplies in urban and urbanizing areas.

Those organizations eligible to apply for dry hydrant grants include the fire departments listed with the Department of Fire Programs. A total of 35 new dry hydrants were installed through the program last year.

## VOLUNTEER FIRE ASSISTANCE PROGRAM (VFA)

The Volunteer Fire Assistance Program continues to increase the fire protection capability in Virginia. 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, 5,244 grants have been made providing a total of \$3,285,777 in matching grant funds.

# FOREST PROTECTION FROM WILDFIRE,

*continued*



The VDOF program is part of a grant that 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. The purpose of this program is to provide financial, technical and other assistance to State Foresters and other appropriate officials to organize, train and equip fire departments in rural communities. In 2012, 117 rural volunteer fire departments in the Commonwealth received \$191,688 in Volunteer Fire Assistance funds made available to Virginia. Requests for support continue to greatly exceed the available funding.

## WILDFIRE PREVENTION

In Virginia, 81 percent of wildfires are human-caused, the most prevalent being debris burning (Figure 7). This makes fire prevention efforts in Virginia critical to the VDOF forest protection program. One such effort focuses on a national prevention program effort called "Firewise."



## FIREWISE

Firefighters in the wildland/urban interface (any area where wildland fuels threaten to ignite combustible homes and structures) must overcome severe challenges. There just aren't enough resources to protect every home threatened by wildfire. Everyone in the vicinity of such a fire is at risk, and the risk is greatly increased in areas that aren't prepared. The main goal of FireWise is to educate homeowners in the wildland/urban interface on how to design, construct, landscape and maintain their homes and property to avoid destruction during a wildfire.

Virginia has an expanding wildland/urban interface and a significant wildfire problem. The VDOF has been a leader nationally in the promotion and expansion of FireWise Program. In an effort to track the problem, the VDOF has conducted a woodland home survey every five years since 1979. There is little doubt that the problem of high-risk homes in a woodland environment is expanding.

To learn more, visit [www.firewisevirginia.org](http://www.firewisevirginia.org).

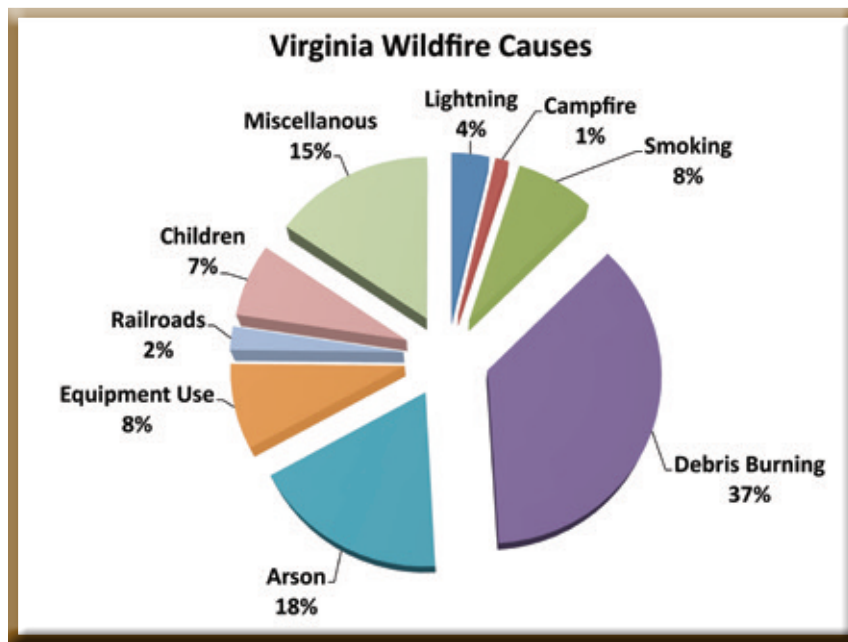


Figure 7 Virginia Wildfire Causes

# WATER QUALITY PROTECTION



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. This is especially important when considering the Total Maximum Daily Load (TMDL) and Watershed Improvement Plan (WIP) that has been developed for the Chesapeake Bay. Two of the Department's important measures involve water quality. One focuses on Best Management Practices on forest harvesting operations and protecting streams from sediment. The other focuses on 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 utilizes the fifth edition of those guidelines, which came out in 2011. 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 a welcomed opportunity to educate the operators on BMPs and the latest in water quality protection techniques. In fiscal year 2013, VDOF field personnel inspected 5,658 timber harvest sites across Virginia on 233,714 acres – a marginally slight decrease in the number of acres harvested over FY2012 (Figure 8).

Another main focus of the VDOF water quality program is logger education. Since the development of the first BMP Manual for Virginia, the VDOF has been involved in the training of harvesting contractors in water quality protection techniques ranging from harvest planning, map reading and the use of GPS units to BMP implementation. This occurred through training that the agency sponsored and, more recently, through VDOF participation in the SFI® SHARP (Sustainable Harvesting and Resource Professional) Logger Training Program. Since

1997, this program has enabled VDOF to assist in training 7,135 harvesting professionals in 229 programs relating to water quality protection. For fiscal year 2013, there were eight training programs offered with a total of 233 people present. Six of these courses were in the core area (202 attendees), and the remaining two courses were for logger continuing education (31 attendees). In addition, the VDOF conducted a Gravel Road Workshop to educate 36 professionals from across the state on proper construction and maintenance techniques for gravel logging roads to reduce the impact of these roads on water quality. The VDOF also promoted water quality protection and BMPs at the Southeast Virginia 2013 Logging Expo in Franklin, Va. This

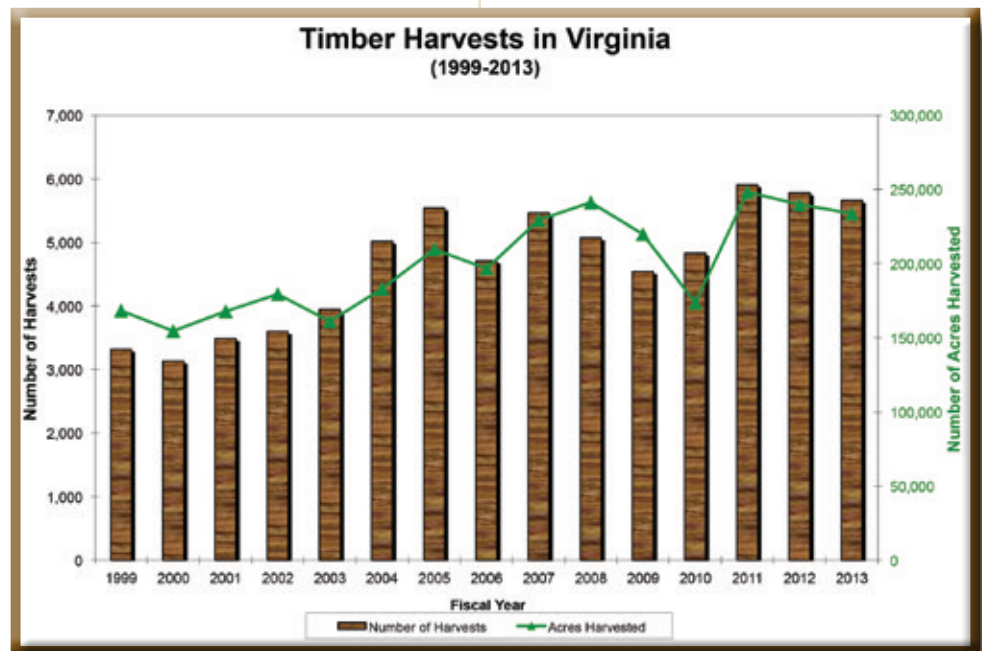


Figure 8 Timber Harvests in Virginia

# WATER QUALITY PROTECTION,

*continued*



exposition is designed to interest potential new timber harvesters in getting started in the harvesting business. Approximately 400 attendees were present to get the BMP message.

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 grants the authority to the State Forester to assess civil penalties to those owners and operators who fail to protect water quality on their forestry operations. 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 2013, the VDOF was involved with 229 water quality actions initiated under the Silvicultural Law. This is an increase of 14 percent from FY2012. Of these actions, three resulted in Special Orders being issued for violations of the law, and one involved the issuance of an Emergency Special Order (Stop Work Order). None of these proceeded to the issuance of a civil penalty.

A statewide audit system has been in place since 1993 to track trends in BMP implementation and effectiveness. Results from the calendar year 2012 data show that overall BMP implementation on 240 randomly selected tracts is 89.8 percent – an increase of 4.3 percentage points over the previous audit cycle. The audit results also show that 100 percent of the sites visited had no active sedimentation present after the close-out of the operation. The information compiled using this audit process will be the basis of reporting for the Watershed Implementation Plan (WIP) that is in response to the TMDL for the Chesapeake Bay. Since the information is captured through GIS technology, this information can be compiled spatially for reporting on those forestry operations that occur within the boundaries of the Bay watershed. For calendar year 2012, the BMP implementation rate tract average for forest harvesting within the Bay Watershed was 91 percent and the average of all BMPs across all tracts within the Bay Watershed was 90 percent. This whole BMP Implementation Monitoring effort has been automated over the past several years to be compatible with VDOF's enterprise database system known as IFRIS (Integrated Forest Resource Information System).

VDOF offers cost-share assistance to timber harvest operators through a unique program offered through the utilization of funding from the Commonwealth's Water Quality Improvement Fund. This unique program shares the cost of the installation of forestry BMPs on timber harvest sites by harvest contractors. Unfortunately, the program was unfunded again for FY 2013.

## WATERSHED PROTECTION

Because forests provide the best protection for watersheds, one of the Department's goals is to increase the amount of forestland conserved, protected and established in Virginia's watersheds. The focus is on 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.

Virginia's Forestry BMPs that address harvesting have been highly successful. One of the most valuable BMPs for water quality is the uncut or partially cut streamside management zone. This voluntary measure assures an unbroken forest groundcover near the stream; shade for the water, and wildlife corridors. Landowners can elect to receive a state tax credit for a portion of the value of the uncut trees in the buffer. By doing so, they agree to leave the buffer undisturbed for 15 years. The number of landowners electing this option in Tax Year 2012 was 39, a 25% increase over the previous year. This watershed protection option provided a tax credit of \$230,476.01 on timber valued at \$1,003,735.41 that was retained in the streamside areas of their property.

Forests provide superior watershed benefits over nearly every other land use. Because of this, the Department is encouraging planting of open land with trees; establishing new riparian forested buffers where none previously existed, and providing protection of existing riparian forests through a tax credit. In the 2013 season, trees were established or protected on 3,199 acres of land.

# FOREST HEALTH



The year 2013 has been mixed concerning forest health news in Virginia. Traditional pests, such as gypsy moth and southern pine beetle, have had minimal impacts, while new pests, such as the emerald ash borer and thousand cankers disease of black walnut, continue to spread and threaten Virginia's forest resources.

Although gypsy moth populations have remained low since 2010, native defoliators were quite active this spring. In particular, for the second year in a row, a massive **cankerworm outbreak** materialized in eastern Virginia during April and May, causing scattered, heavy defoliation over an area that spanned millions of acres from Richmond up to the Northern Neck and Fredericksburg. Wet weather in May helped most trees re-foliate relatively quickly. Some trees, primarily oaks, could suffer long-term health impacts and begin to decline if they were severely defoliated during both years. However, a very wet season with ample soil moisture will make oak decline less likely.

The **southern pine beetle** has been relatively quiet during the last 10 years. In general, the southern pine resource in central and southeast Virginia remains healthy and productive. Federal funds from the USDA Forest Service, Forest Health Protection support our (Southern Pine Beetle Prevention) cost-share program with landowners and loggers for thinning of pine stands. To date, Virginia has thinned about 45,000 acres of loblolly pine out of approximately 130,000 acres estimated to be overstocked. Overstocked pine stands are more vulnerable to bark beetle outbreaks, and thinning is the best method of reducing this threat. Only one area in western Hanover County is witnessing significant southern pine beetle activity, mostly in and around subdivisions that were built into now-unmanaged pine stands.

A more recent threat is the **emerald ash borer** (EAB). First discovered in Virginia during 2004 in Fairfax County, it has since spread to at least 17 counties across the Commonwealth and was also found to be causing widespread ash mortality in several forested areas throughout Virginia. Virginia and the nation face the prospect of losing all ash species from natural and urban landscapes in the forthcoming decades. In Virginia, the impact may include the loss of the approximately 187 million ash trees in her forests and could eventually cost the Commonwealth many millions of dollars.

The newest threat to Virginia's forests is **thousand cankers disease** (TCD) of black walnut, which, in 2011, was discovered in and around the Richmond area at multiple locations and in Fairfax and Prince William counties last year. TCD is spread by a tiny bark beetle called the walnut twig beetle. Quarantines established for this pest aim to limit the spread of this pest complex. To date, 10 counties and six municipalities are included in a state quarantine for black walnut. TCD threatens black walnut trees in urban and forested settings, and there are no effective controls available to protect trees.

Other threatening non-native pests and pathogens causing major death and decline to their respective hosts include the **hemlock woolly adelgid**, **dogwood anthracnose**, **beech bark disease** and **butternut canker**.



## PERIODICAL CICADA

Brood II of the periodical (17-year) cicada emerged throughout much of the Piedmont and Coastal Plain this May. Although populations were extremely heavy in some places, the distribution was spotty. Many locations within this region showed extensive "flagging" of vegetation due to oviposition damage by the adult female cicadas. That is, the female used her sharp ovipositor to cut into twigs and insert her eggs. If enough slits were made on a particular twig, girdling may occur which results in flagging (where the terminal foot or so of a branch turns brown). In some instances, this flagging was heavy enough to damage trees significantly, mostly oaks. However, serious, permanent damage is generally more likely on small saplings.



# FOREST RESEARCH



Each year brings new opportunities and associated concerns for the forests of the Commonwealth and their stakeholders. The role of the VDOF's applied research program for the last 58 years has been to gather information to help examine and develop those opportunities and address the concerns. We strive to find the answers and information that will continue to protect and develop healthy, sustainable forest resources for Virginians in the future.

The research program staff (one research program manager, one tree improvement manager and one technician) maintains active studies located across the Commonwealth organized in four subject areas: tree improvement; diminished species restoration; pine silviculture, and hardwood silviculture. During 2013, we have installed three new test locations, maintained and re-measured existing studies, distributed new results and recommendations in 12 written reports and 15 oral presentations, and responded daily to requests for information or advice. A significant change was made in reporting as our last hard-copy issue of the Forest Research Review was distributed in September. Going forward, we will distribute reports and updates electronically as they become available to anyone who subscribes at <http://virginia.us6.list-manage1.com/subscribe?u=6eb51e1a62222601f1f2cf220&id=fcb91bbf72>.

The tree improvement program continues to advance the health, productivity and economic value of the loblolly pine seedlings used for reforestation across the Commonwealth. Working with the North Carolina State University Cooperative Tree Improvement Program, we have begun breeding and selecting the parent trees that will make up the fourth generation of seed production orchards. The families and mixes in our current orchards range from 25 to more than 60 percent greater in productivity (growth rate) than those available before selection and breeding efforts began. And current projections are that this 4th cycle of improvement will further increase the gain getting to landowners by 25% or more. This research has delivered approximately 0.5% of productivity gain per year over the last 40 years. And over the last decade, we estimate that this has increased to 1% gain per year. With more emphasis on breeding the best parents, it is thought that we can increase this annual rate of improvement to 1.25% or beyond. This work has a significant impact on Virginia's economy. For example, increasing the rate of gain from 1% per year to 1.25% per year is conservatively estimated to increase the present value of each acre planted by approximately \$600.

In the area of diminished species, the Department continues work to preserve and restore American chestnut, longleaf pine and

*Wayne Bowman (VDOF) and Dr. Harold Burkhart and Dr. Amy Brunner (Virginia Tech) in the 2012 cold-hardy hybrid poplar trial located at Appomattox-Buckingham State Forest approximately 16 months after planting.*



*Rainfall exclusion devices on the PineMap project location at Appomattox-Buckingham State Forest studying the responses of loblolly pine to simulated drought and fertilizer additions.*



*A white oak tree seven years after a crop tree release and fertilizer application, treatments which have enhanced the trees growth by a combined 80 percent.*

# FOREST RESEARCH,

*continued*



*Research Program Manager Jerre Creighton with a 4-month-old eucalyptus (*E. benthamii*) growing in a test of cold-hardiness at the Appomattox-Buckingham State Forest.*

shortleaf pine. We are working on expanding our collaboration with the American Chestnut Foundation and seeking grant funding to increase our production of northern source longleaf pine seedlings.

Like our tree improvement research, much of the study of pine silviculture is leveraged by our memberships in research cooperatives. An outstanding example of this collaboration is the PineMap study, which focuses on the 20 million acres of planted pine forests managed by private landowners from Virginia to Texas. We host one of the four field study locations at our Appomattox-Buckingham State Forest, with a goal of harnessing productivity to mitigate atmospheric carbon dioxide, more efficiently utilize nitrogen and other fertilizer inputs, and adapt forest management approaches to increase resilience in the face of changing climate. After just two years, the test is yielding valuable information. For example, we have learned that nitrogen applied as fertilizer is being taken up by trees throughout the growing season (primarily into the leaves) and that more is available when fertilizer is applied in the winter instead of the summer. Early indications from a second effort indicate that our current models may be overestimating the potential impacts of forests on carbon sequestration. It is only because of our close alliance with the Forest Productivity Cooperative at Virginia Tech / NC State and the Forest Modeling Cooperative at Virginia Tech that we can participate in such advanced research and have access to the earliest findings.

Our hardwood research program continues to evaluate impacts of harvest methods, crop tree release, stand nutrition, establishment methods for hardwood planting, planted seedling size, and tree shelters. During 2012, we collaborated with Virginia Tech and NC State University to establish trials looking for promising hybrid poplar or eucalyptus families for short-rotation planting in central Virginia. With permission from MeadWestvaco, we re-measured a 14-year-old hardwood species study that showed wide ranging performance in both growth and survival, highlighting the need to match the species to the site when considering short-rotation planting for biomass / bioenergy production. The best species in that test averaged more than eight inches in diameter and nearly 80 feet in height at age 14. The 2012 cold-hardy hybrid poplar test is quite promising, with excellent survival of all families and excellent height growth (approaching 15 feet in less than two years for trees in some families). Combined, these tests demonstrate the potential for rapid production of hardwood fiber for developing energy markets.



*One of VDOF's progeny test plots on the Hockley Research Forest (near West Point) from which our nursery's future loblolly pine seedling selections will be developed. Notice the contrast in growth and form between the select tree on the left and the unimproved tree on the right.*



*A pruned loblolly pine plot 12 growing seasons after planting in a study of pruning effects established in collaboration with the Forest Modeling Cooperative at Virginia Tech.*

# FOREST INDUSTRY AND MARKETS



Virginia's forest industry and forests provide billions of dollars of economic output and other benefits annually. A recently released report on "The Economic Impacts of Agriculture and Forest Industries in Virginia" calculated the overall economic output of Virginia's forest industry at more than \$17 billion and 103,000 jobs, annually. Other documented values, such as wildlife and forest-based recreational activities, environmental benefits, such as water quality and quantity, air pollution reductions and other services, provide an additional \$9 billion dollars and tens of thousands of jobs, annually. These numbers are even more impressive when you realize that most of this activity happened during the worst recession in 80 years.

Although there is a way to go for many of the markets to return to pre-recession levels and ongoing challenges that include changing forest markets, slow housing recovery, changing demographics and forestland ownership, loss of forestland and concerns on the sustainability of the resource, we are seeing improvement in many sectors of the forest industry. With more than 80 percent of Virginia's forests owned by private landowners, the future of the industry and available markets will depend on ensuring that the values and benefits they seek for owning forestlands complement each other. The VDOF continues to be very active in looking for solutions to maximizing working forests and improving markets and value for Virginia's forest landowners.

As the economy slowly improves, forest industries and markets are also improving. The strongest area continues to be in biomass energy with several biomass power plants coming on line this year. These include three coal-to-biomass Dominion Power plants in Alta Vista, Hopewell and Southampton, and one new Northern Virginia Electric Coop plant in South Boston. Other biomass operations include Ferrum College's biomass plant; updates and expansions of systems by MeadWestvaco in Covington and Longwood University in Farmville; building of additional pellet mills with Enviva in Southampton and Wood Fuel Developers in Waverly, and Piedmont BioProducts hopes to soon start commercial production of bio-oil. While these plants are welcome, as with new major market expansions, there are concerns with volatility, resource availability and sustainability and competition with existing markets and industry.

With the economy beginning to improve, we are also seeing creation and expansion of more traditional forest industries. Two major announcements were the reopening of the IP mill in Franklin to produce fluff pulp, and a plan to reopen a 60 million-board-foot pine mill in Franklin (recipient of an Agriculture and Forestry Industries Development Fund grant). Additional forest industry expansions in neighboring states are also providing jobs and new markets for Virginians.

Virginia forest industries continue to take advantage of overseas demands for wood products to expand market opportunities. This has been critical to many businesses' survival

as domestic demand decreased. The low value of the dollar, export-related programs and excellent port facilities should continue to improve these opportunities.

The VDOF continues to work to identify and promote emerging markets as well as opportunities to enhance the traditional markets that have been the backbone of the industry. Maintaining diverse markets, cutting-edge technology and a trained workforce are necessary for all forest-related businesses to remain prosperous and relevant in today's world.

The VDOF is leading a number of programs to ensure that forest landowners and industry continue to have markets for their products now and in the future. We are continuing work with partners to improve landowner access to forest certification programs and certified wood markets. We are also looking at how to involve more timber harvesters and primary industry in chain-of-custody certification. As demands for



# FOREST INDUSTRY AND MARKETS,

*continued*



documenting the sustainability of forest products increases, it is important that our landowners and industry can provide those assurances.

Although off to a slow start, the VDOF is working to expand the Virginia Grown Forest Products program to promote new and expanding forest-related businesses in Virginia. Part of this effort is to try to increase other Virginians' awareness to the important role that forest products have in their life.

VDOF has been awarded a grant to develop a community wood energy program in Virginia. The goal of the program is to help local schools, communities and industry reduce energy costs by converting to biomass energy systems that use local resources and producers to provide the fuel. The goal is also to develop markets for low quality and waste wood so we can improve forest management and waste reduction. A related project is being implemented on the Matthews State Forest to have a focus on renewable energy with educational programs and demonstrations of various technologies.

VDOF was recently awarded a grant to improve markets for urban wood and develop service providers that can provide management assistance on small forestland acres and forest in more populated areas. Around 30 percent of Virginia's forestland is now considered to be in small acreage or in urban/suburban areas. This will require new forest operators and service providers who can focus on small woodlot or community forest management; utilize urban wood; harvest biomass for energy production; provide invasive species control and natural disaster mitigation, and provide ecosystem services assistance.

To be able to provide the needed assistance on forest markets and other forest benefits that landowners, industry and other stakeholders require, the VDOF maintains or has access to information on forest inventory and values, forest industries, new technologies, technical consultants, service providers, agencies and other organizations and other technical support services.

Although a small program area within the VDOF, Utilization and Marketing is working with partners and other VDOF divisions to keep Virginia at the forefront of assisting our forest landowners, industry and other stakeholders in being able to take advantage of both the traditional and emerging market opportunities and other forest values. This is because, to have healthy sustainable forests, we need healthy sustainable forest industries and markets.



# URBAN AND COMMUNITY FORESTRY



The Urban and Community Forestry (U & CF) Program helps Virginia communities maintain and enhance their community forests, and has raised awareness that these community forests provide multiple benefits: clean air, clean water, storm water management, community revitalization, community health and well-being, business district enhancement, viewshed protection, aesthetics and contact with nature.

The Urban and Community Forestry Program works with communities of all sizes, providing technical assistance, educational opportunities, professional development and grants for specific projects. Technical assistance is provided in such areas as tree selection and maintenance, riparian restoration, tree/utility issues and selection of contractors. Educational opportunities include workshops around the state as well as professional forums in both Northern Virginia and Tidewater. The program also provides scholarship opportunities to statewide, regional and national educational events, such as the Mid-Atlantic Horticulture Short Course, the Municipal Foresters Institute, and the Arbor Day Foundation Partner's Conference. VDOF also oversees the Tree City USA® Program in which 56 communities participate. Through its Urban and Community Forestry Assistance Program, the Department has supported projects in 68 cities and towns, 26 counties and 73 non-profit organizations and several educational institutions since the program's inception. Funding for this program continues to be modest, but the program is very popular and shows positive results statewide. Small tree-planting grants for water quality improvement are also provided through Urban & Community Forestry.

The Urban and Community Program has been emphasizing the importance of tree canopy cover to communities. VDOF has engaged 27 communities in conducting an urban tree canopy (UTC) analysis and is working with three selected communities to develop goals and public policy for expanding their canopy cover.

Our partnership with Virginia Tech supports the urban and community forestry curriculum in the School of Forest Resources and Environmental Conservation (FREC); the Community Design Assistance Center (CDAC), and the U&CF coordinator is serving as the chair of the FREC advisory board. CDAC continues to provide landscape and environmental planning assistance to communities statewide and is providing services in bordering states. CDAC completed several planning projects in Southwest Virginia during 2013. At the University of Virginia, the program continues to provide financial and training support to the Virginia Natural Resources Leadership Institute (VNRLI), which focuses on critical natural resource issues. The Department continues to provide assistance to an evolving urban forestry program at Virginia State University.

## GREEN INFRASTRUCTURE

The Department continued a strong partnership with the Green Infrastructure Center (GIC). Working under a VDOF-managed federal grant, GIC conducted several green infrastructure training workshops across the Commonwealth for regional planning entities. The grant also resulted in GIC publishing *Evaluating and Conserving Green Infrastructure Across the Landscape: A Practitioner's Guide*. This publication is getting wide distribution within the land-use planning community and is being replicated in two other southern states (North Carolina and Arkansas). VDOF is also working with the Planning Program at the University of Virginia to prepare a green infrastructure study for the City of Waynesboro.

## GREENWAYS AND RECREATION

Working through its partnership with CDAC, the Department assisted with several park-open-space-trail plans in southwest Virginia in coordination with the Clinch River Valley Initiative (CRVI). Plans were finalized in Wise, St. Paul, Richlands and Cleveland. In Front Royal, implementation began on a greenway plan developed in 2009 with VDOF support and guidance. Plans were also developed for Phase IV of the very successful Luray-Hawksbill Greenway. Plans are also being developed for an addition to a new greenway in Waynesboro. VDOF, through its partnership with the University of Virginia, is assisting with planning and

# URBAN AND COMMUNITY FORESTRY,

*continued*



visioning for the Crozet Tunnel project that will involve three counties in the Afton Mountain area. VDOF is continuing to support the Clinch River Valley Initiative (CRVI) that has forest-based recreation as one of its key elements.

## NATURAL DISASTER RESPONSE

Natural disasters can have a devastating impact on urban forests. To help communities recover from storm events (hurricanes, ice storms, etc.), VDOF has developed Urban Forest Strike Teams. Since their inception, these teams have responded to storm events in several southern states. VDOF personnel have assisted in training personnel in all southern states and several states in the mid-Atlantic region. In September of 2013, VDOF organized a mock storm response exercise in the Hampton Roads area in coordination with the Virginia Department of Emergency Management and local municipal foresters. The exercise also tested mechanisms to involve personnel from other southern states, and forestry agency personnel from North Carolina, South Carolina and Georgia participated. In November, VDOF personnel assisted with an Urban Forest Strike Team training for personnel from Washington, D.C., and several mid-Atlantic states.

## TREES VIRGINIA (VIRGINIA URBAN FOREST COUNCIL)

VDOF continues its strong and longstanding partnership with Trees Virginia (the non-profit Virginia Urban Forest Council). Together with Trees Virginia, the Department hosts quarterly forums in both Northern Virginia and Hampton Roads attended by local urban forestry professionals from municipalities. Again in 2013, Trees Virginia and VDOF made major program contributions to the Mid-Atlantic Horticulture Short Course (Virginia's major conference for green industry professionals). The partnership with Trees Virginia also continued with its very successful Waynesboro and Roanoke workshops. The citizen volunteer Tree Steward program saw a new group formed in Harrisonburg and the Charlottesville Area Tree Stewards launched a very successful tree voucher program with assistance from the BAMA Foundation (affiliated with the Dave Mathews Band). Trees Virginia also assisted with the organization of the Urban Forest Institute. This week-long training was held in Nashville, Tenn., in May and had several Virginia participants.



*Waynesboro Workshop Arborist Demonstration*



*Waynesboro Workshop Nursery-Grown Tree Standards*

# ACCOMPLISHMENT REPORT

July 2012 - June 2013



Objectives	Target Goal	Accomplished
<b>Goal 1: Protect the citizens, their property and the forest resource from wildfire.</b>		
Measure 1.1.1: Percentage of wildfire responses that are 30 minutes or less.	85%	82.6%
Measure 1.1.2: Percentage of eligible rural volunteer fire departments receiving available state and federal financial assistance.	25%	24.35%
Measure 1.1.3: Agency preparedness assessment score	100	100
<b>Goal 2: Protect, promote and enhance forested watersheds, non-tidal wetlands and riparian areas.</b>		
Measure 2.1.1: Cost to conduct a forest harvest water quality inspection.	\$4.60/acre	\$4.36/acre
Measure 2.1.2: Percentage of harvest sites with sediment not reaching streams.	95%	100%
<b>Goal 3: Improve the stewardship, health and diversity of the forest resources.</b>		
Measure 3.1.1: Percentage of eligible Reforestation of Timberlands incentive received by landowners.	95%	95%
Measure 3.1.2: Number of forestry management projects implemented on private land.	2,600 projects	3,408 projects
Measure 3.1.3: Number of acres of all forest management plan types achieved on private and appropriate public forestland.	88,000 acres	125,457 acres
Measure 3.1.4: Number of communities assisted with forest and/or tree resource management.	115 communities	110 communities
<b>Goal 4: Conserve the forestland base.</b>		
Measure 4.1.1: Number of acres of forestland established and/or protected in Virginia watersheds.	3,500 acres	3,190 acres
Measure 4.1.2: Number of acres protected from conversion to development.	5,500 acres	5,768 acres
Measure 4.3.1: Percentage of annual allowable harvests actually harvested.	85%	94%
<b>Goal 5: Promote forest industry and diversified markets for forest landowners including ecosystem service markets.</b>		
Measure 5.1.1: Number of new and/or expanding forest-related businesses or markets.	3 markets/ businesses	4 markets/ businesses
<b>Goal 7: Manage agency resources to effectively and efficiently accomplish the strategic initiatives.</b>		
Measure 7.1.1: Percentage of customers who rate the quality of VDOF's seedlings as satisfactory.	95%	96%
Measure 7.1.2: Percentage annual increase in nursery cash balance.	9.2%	47.4%



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